

Rainer Lisowski | Lydia Scholz | Christiane Trüe [Eds.]

Academia, Administration, Digitalization and Sustainability

Change and Transformation the EU Way



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Change and Transformation the EU Way



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Part I:
**European impulses – local action: actors and
drivers of change**

Rainer Lisowski¹, Lydia Scholz², Christiane Trüe³

Introduction: Change and transformation the EU way

Impulses from Brussels, national interpretations and supplements, manifold local implementations and variations

A. Europe, Academia and Administration

Dealing with public administration is not necessarily the central interest of most social sciences, law or economics. The academically relevant subject, administrative science, leads a rather marginalised existence at most universities. Not infrequently, it is even outsourced to special administrative universities, such as those in Germany, for example, in Speyer or at the Federal University of Applied Administrative Sciences. The entire field of administration is often regarded as dusty, backward and not very innovative.

At the same time, there is no human organisation that is so diverse and wide-ranging in its range of tasks. Government and administration, i.e. the

-
- 1 Rainer Lisowski is Professor for Public Management at the School of International Business, University of Applied Sciences Bremen, Germany. He has studied Political Science and Economics. Before being appointed as Professor in Bremen he worked in various functions in Public Management, public and private companies. He travels to Africa and Asia on a regular base for research and lecturing purposes. His research is mainly empirically driven, often following qualitative research paradigm. He has published several books on various political issues. Contact: rainer.lisowski@hs-bremen.de.
 - 2 Lydia Scholz is Professor of Business Law at the School of International Business, University of Applied Sciences Bremen, Germany. She has studied law and worked in various functions in the Energy Industry in Berlin and Brussels as well as in different universities in Germany and in the UK. Her research activities include energy law, in particular renewable energy law and hydrogen law. Contact: Lydia.Scholz@hs-bremen.de.
 - 3 Christiane Trüe is Professor for Public Law at the University of Applied Sciences Bremen, Germany. Her experience stems both from German and English academia and from legal practice in international law firms and in public administration. She has published monographs, articles and contributions in the area of her denomination, in particular on EU law, constitutional and administrative law and environmental law, often with an international or comparative perspective. At the moment she is working on climate change law and EU internal market law including the AI Act. Contact: Christiane.Truee@HS-Bremen.de

administrative apparatus of a country, are now responsible for almost all the tasks of modern life. Regulations have to be found for the coexistence of people on a large scale (defence policy, monetary policy, digital policy) as well as on a very small scale (designation of residential areas, construction of hospitals).

The relationship between the academic world and public administration is also difficult. On the one hand, speeches often emphasise how much modern society is a scientific society. On the other hand, it is often noted that ministries or local administrations rarely show an active interest in updating their knowledge and integrating academic research into their day-to-day business. Cooperation between academia, industry and administration in funded special projects, which the European Union wanted to promote for a while under the slogan of the triple helix, works a bit better. However, there is much room for improvement. The continued, relative lack of dialogue between the three is actually a surprising finding, considering that Richard Florida's Creative City ideas are already another 20 years old and that in numerous European countries more should be done to network academia, administration and the population as part of so-called PUSH Initiatives (Public Understanding of Science and Humanities), which have also been running for two decades and longer. Especially as both academia and administration are repeatedly identified as key drivers of economic and social transformation towards a more ecological and sustainable society. Incidentally, this is precisely what is reaffirmed many times in this book.

Something else will become clear in this book: the special role of the European Union. The aforementioned issues of cooperation between academia and administration, as well as the issue of digital and sustainable transformation, which will be addressed in the next paragraph, are of concern to almost all societies around the world. In Europe, however, a state entity *sui generis* has emerged in the form of the European Union. A microcosm of its own that functions differently to all political systems in the world. Over decades, a political centre with two engines has emerged. One engine has developed a European life of its own (European Parliament, European Commission, European Court of Justice), the second engine runs somewhat differently and consists of national governments that nevertheless collaborate on a European level (Council of the EU). This unique entity, powered by two engines at times pulling into different directions, sets the economic, political and legal framework for more and more policy areas for roundabout 500 million people. A framework which, however, is often filled with life and put into political practice in a highly variable way at national and even more so at municipal level.

B. Transformation: sustainable and digital

Transformation towards more sustainability is perhaps the current social buzzword par excellence. Everything seems to be under pressure to transform. Energy generation is to be decarbonised; this requires a transformation in the way we heat our homes (heat pumps instead of oil and gas); how we generate electricity (renewables instead of fossil fuel power plants); how we power our transport (electric instead of fossil fuels). This transformation process is - at least here all economic researchers seem to agree - an expensive process that must therefore be organised in a socially just manner and should be based on the principle of ‘energy democracy’. It is also a risky process, because new financial burdens - for example, additional taxes on fossil energy production - make Europe's products more expensive in the world and European undertakings less competitive compared to companies in Asia, for example.

The digital transformation is also causing lawmakers and judges a lot of headaches. Artificial intelligence, as the newest “hype” in digitalization, is emerging at breathtaking speed, with opportunities and chances we can only guess. Is, after centuries, a slave-owning society returning - with machines that work for us, while we can muse all day long? With digital tools that help us to solve the problem of sustainability (as some of the essays in this book will discuss)? Or do we have to learn to work together with machines? Or will it even ultimately be the machines that set the tone and we will have to submit or disappear? So, is this not a beautiful utopia at all, but a dark dystopia? One that has to be prevented by tight regulation now – while we still can?

When dealing with these transformation tasks, the EU's political system should not be thought of as the administration of a unitary state with a strong top-down approach. Instead, the EU ‘engines’ tend to first negotiate either a uniform piece of legislation (in the shape of a Regulation, at times now called an ‘Act’, like the AI Act) or a framework legislation (in the shape of an EU Directive) in a complicated legislative process between the Commission, Council and Parliament (similar to the legislative process in a federal state like Germany, securing Member State control over EU legislation by the requirement of Council consent by at least a qualified majority, as well as the European Parliament’s consent). Where the form of a Directive is used, this framework is then transposed into national law - and here it is up to the national legislators to make the choice of form and methods of transposition, whilst being bound as to the result to be achieved. In doing so, they may include their own legislative wishes in their legislation transposing the Directive. How these requirements are then implemented

by the administrations at national and sub-national level, whether strictly or laxly, is yet another open question, occasionally leading to a case before the European Court of Justice if this amounts to a persistent breach of the EU Directive.

Last but not least, the perspective of the respective discipline always plays a major role in the evaluation of transformation efforts by the academic community. Law, for example, approaches the topic of the use of artificial intelligence in administrative action differently to that of business management.

The more you think about it, the more the aspects of sustainability and digitalisation become a kaleidoscope: Which scientific perspective is taken? Which government level is being addressed? Which stakeholders are being considered? Which political topic area and which strategic approaches are involved? (see Table 1).

Table 1: Complex Perspectives

Perspective of academic disciplines	Levels und Actors			
	Level	European Union	Member state	Sub-state level
Social sciences (i.e. Economics, Sociology) or Humanities (i.e. Law)	Actors (state, non-governmental)	Commission, Parliament, European Court of Justice	Governments, Parliaments, Courts	Municipal Governments
		Council		
		Undertakings, Citizens		
		NGOs		
	Topics and Strategies			
	Topics (i.e. economic policy, environmental policy, transport policy, social policy)	Strategies (i.e. Digitalisation for more sustainability, financial instruments as leverage, legal framework)		

All in all, we can speak of an ‘EU-style’ change that cannot be found in the rich economic nations of Asia, the USA or Canada. It is always multi-layered, often confusing, sometimes controlled, sometimes chaotic, at times even self-contradictory. This book is an attempt to trace aspects of transformation on the one hand and its connection with administration and science on the other in 15 articles. The articles are written on the extended basis of papers given at a conference that took place on 31 August and 1 September 2023 at the House of Science in Bremen (Germany).

C. Structure of the book

This book is divided into three parts:

The **first part** is primarily concerned with the question of **actors** as drivers of transformations. Since many of us come from the field of administration, law or administrative sciences, a special focus is placed here on the smallest level of government, the municipalities. This is because it is not only in Germany that municipal administrations are often the decisive backbone of the state authority apparatus.

Silvia Ručinská, Miroslav Fečko and Ondrej Mita present the results of an Erasmus-funded research project, which was carried out in a network of scientific institutions from Slovakia, Italy, Austria and Romania under the leadership of the Pavol Jozef Šafárik University of Košice. The study highlights how cities and local authorities are often at the centre of a digital and green transition.

Lydia Scholz, on the one hand, and Niklas Korte and Michael Krisch, on the other hand, join this point with a view to Germany. Scholz looks primarily from a legal perspective at how local authorities can change the local heating market through planning procedures in order to become core players in a different, greener supply of thermal energy. Korte and Krisch also focus on local administrations and the question of how they can utilise previously largely untapped potential for photovoltaics on apartment blocks. This is because it is often difficult to supply houses with complex ownership structures with solar energy, as a number of legal problems often stand in the way of successful implementation.

Completing the first part, Joanna Bednarz and Magdalena Markiewicz consider universities as catalysts of digitalization and sustainable socio-economic transformation in their case studies of telemedicine, digitalization, and cultural aspects of the study programs in academic collaborations. Universities are uniquely positioned as research and knowledge dissemination centers in this rapidly evolving landscape. Their paper aims to explore the complex role of universities in driving sustainable socio-economic development through implementing new courses and engagement in education proposals that follow the challenges of digitalization and environmental considerations.

The **second part** of this anthology looks at **patterns, policy approaches and strategies of digital and green transformation** in various policy fields. Two essays focus on mechanisms that are primarily looking at financial instruments. Christian Bussmann critically assesses the European Green Bond Standard and the evolving ESG rating regulation. Teona Grigolashvili takes a more economic view of monetary policy and uses the example of

Georgia and mathematical modelling to explore the question of how monetary policy can influence sustainable growth.

The two essays by Tatjana Muravska and Sergejs Stacenko and Liga Sileniece and Sergejs Stacenko deal with green economic policy. The first of the two essays is primarily concerned with the instruments and strategies of green industrial and economic policy and the question of how the EU framework influences the corresponding policy in Latvia. They conclude, for example, that the EU's green economic and industrial policy is increasingly being accepted as a driver of economic transformation and that the corresponding goals and instruments are reflected in national policy. The second article takes a closer look at the enterprises level, especially SMEs. Here, the authors come to a similar conclusion: if we look at the activities and change efforts of enterprises to become 'greener', also, at their level, it is not 'business as usual', but we can detect a change in behaviour. However, the authors also warn that although it can be assumed that a 'green transition' will have a positive financial impact in the long term, too, competitive advantages are at stake in the short term. For policymakers, this means that a kind of smart balancing regulations must be found.

The last essay in this chapter takes up a completely different policy area. Rainer Lisowski looks at the activities of the European Union in relation to the protection of biodiversity. His focus shifts back to the municipal level, whereby the focus is not on them as actors, but on their activities. Using the example of municipal biodiversity strategies, he analyses how municipalities are trying to better protect biodiversity.

The **third part** of the book is devoted to the equally topical issue of **digitalisation**, which in turn can all too often be linked to the issue of sustainability (see Ručinská's contribution as an example). The section begins with two legal assessments. Christiane Trüe raises the question of whether the EU AI Act Regulation will make AI sufficiently trustworthy for use in public administration. Public administration may profit from AI in appropriate cases, provided its use respects fundamental rights and abides by the rule of law in general. The EU AI Act may help in developing AI into the right direction, by ensuring that only 'trustworthy' AI is available on the market, and hence to public administration. The AI Act, as a first attempt at regulating AI, follows a risk-based approach, leaving considerable substantive leeway for developing AI further, but imposing onerous, mostly procedural, risk and quality management obligations on providers, and also on deployers, such as public administration. Overall it is a first step which should also enable public administration to use AI, with the relevant precautions taken, namely a well-organised human oversight.

The article by John van de Pas looks at undesirable consequences of digital administration. Cities around the world are working on so-called ‘smart city’ strategies. Large amounts of user and behaviour-related data are collected, processed and displayed on interfaces. Van de Pas argues that this could have considerable negative effects. For this reason, he calls - in the best republican sense - for more deliberative processes in which citizens themselves negotiate how much ‘smartness’ they want.

The same applies to the world of work in companies. Radu-Ioan Popa therefore examines various viewpoints on the human challenges associated with artificial intelligence and new technologies in the workplace.

In contrast, Attila Németh, Michel Linnenbank, Mijneke Roeland and Anouk Visser show how much benefit data-based administrative action can bring. They develop a data-based model that uses ‘big data’ to make an econometric assessment of political and administrative action. Using the Dutch probation system as an example, their study shows that the benefits clearly exceed the costs of the policy approaches currently being pursued. For the administration, this result means a reassurance of its own actions.

The next article also deals with the specific use of digital tools. Evita Grigorovica, Andreta Slavinska and Guntis Bahs take a look at the healthcare sector. Digital expertise is increasingly in demand here, as more and more technology is being used in the healthcare sector, for example to monitor people's state of health. However, the devices themselves need to be monitored by people who need to be trained in the use of these technologies.

Finally, Marc Stauch considers the example of the United Kingdom's ‘Verify’ system for public services. ‘Verify’ was a system rolled out in the UK in 2016 to verify citizens’ digital identity when accessing public services online. It was characterised by innovative features designed to enhance data protection, including the use of designated private companies to check on personal attributes in a way that avoided the formation of a central data base. Unfortunately, as the chapter recounts, it proved a failure in practice and was subsequently replaced in 2021 by a more centralized system, UKGov One-login, with fewer safeguards but which so far appears more user-friendly and successful. The contribution considers what lessons may be learned in terms of necessary trade-offs between usability and data protection, in particular against the background of making digital public service delivery more relevant and responsive to individual citizen needs.

D. Acknowledgements

The editors would like to thank all the authors of this anthology and also all those who took part in the conference of the same name in Bremen in August / September 2023.

The editors would also like to thank the Faculty of Business and Economics and the Zentrum für Public Management (zep), which provided financial support for the organisation of the conference and the printing of this book, and the Bremen State and University Library (SUUB), which made it financially possible for us to publish this book Open Access.

Silvia Ručinská¹, Miroslav Fečko², Ondrej Mital³

Municipalities and cities in the center of the digital and green transition

Summary: Digital and green transformation are being guided not only as a result of central government's policies, but also other stakeholders are actively contributing. Municipalities and cities often implement unique and innovative solutions in this regard, with the overall intention of increasing the inhabitant's quality of life. Moreover, communal self-governments increasingly reflect the social impact of the implemented digital and green solutions, fulfilling the essence of the triple transition. The study contributes to the scientific and scholarly debate on twin and triple transition by providing theoretical backgrounds, and case study examples from six concrete municipalities and cities from the Slovak Republic.

Keywords: Municipalities, Cities, Twin transition, Triple transition, trends and challenges in the public administration

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- 1 Doc. Ing. Silvia Ručinská, PhD. is a Professor for Political Science at the Pavol Jozef Šafárik University in Košice, Faculty of Public Administration, Slovak Republic. She has published several monographs, articles on public management, digitalization, Fake News and Hate Speech in the public policy. At the moment she is working on the issue of Digital and Green Cities, Disinformation and on the project oriented on joint public services. Contact: silvia.rucinska@upjs.sk
 - 2 PhDr. Miroslav Fečko, PhD. is an Assistant Professor at the Pavol Jozef Šafárik University in Košice, Faculty of Public Administration. He concentrates his research on inter-municipal cooperation, implementation of selected modern methods that utilize ICT at the municipal level, digital and green transition, disinformation, public policy, and theory of public administration. Contact: miroslav.fecko@upjs.sk
 - 3 PhDr. Ondrej Mital, PhD. currently works as an Assistant Professor at the Pavol Jozef Šafárik University in Košice. As a member of the Department of Public Policy and Theory of Public Administration concentrates his research activities on the impacts of new digital forms of communication on the municipalities and cities, use of social media by public institutions and in policymaking. Within his research, he also deals with the importance of trust, transparency and openness of public institutions. Contact: ondrej.mital@upjs.sk

A. Introduction

Municipalities and cities face a variety of trends and challenges in the exercise of their competencies, the occurrence and strength of the impact of which can vary in intensity. All trends and challenges present municipalities with factories that are pressing on them. They affect the quality of the management of municipalities and towns, and they also affect the quality of the public services that are provided, the character of the relationships that municipalities develop externally or internally. Theory and practice offer several approaches that are used by municipalities and cities to deal with and respond to these external influences, among the established urban management approaches are Smart City, Green City, Resilient City, Happy City, Functional City Region or triple-helix models and its variations, innovation ecosystems and many other approaches respectively (OECD, 2024; Mital' et al., 2023; Chew and Show, 2022; Zhu et al., 2022; Kuzior and Kuzior, 2020; Ručinská and Fečko, 2019; Wiking 2019; Ručinská and Fečko, 2017). Local government units are affected by different trends and challenges to different degrees and therefore apply different approaches in different ways. We consider twin transitions, consisting of digital and green transitions, to be key trends and challenges that municipalities and cities need to respond to. Twin transition is the result of combining the creation, use and benefits of tools and measures that can simultaneously address the digital and green challenges of municipalities and cities. At the same time, however, there is now a gradual emphasis on triple transition, which enriches digital and green solutions with their potential positive impact on the social dimension of local communities.

The ambition of the study is to examine measures and activities implemented by cities that respond to digital and green transition, mainly those activities that reflect twin and triple transition at the same time. The study aims to answer the research question of how digital and green transition influences also the social aspects of communal life. With the use of the case study method, this study examines measures adopted by selected cities in the Slovak Republic. Six case studies from six cities in the Slovak Republic were analyzed covering the period 2021-2024.

B. Municipalities and cities - approaches to trends and challenges

Municipalities and cities are complex environments. The needs of different stakeholders, such as individuals, communities, private companies, or non-governmental organizations usually influence local governance and policy-

making. From a theoretical and practical point of view, different approaches have evolved and been implemented to satisfy the stakeholders' well-being at the communal level. We perceive approaches as a form of reaction and a combination of tools, measures and actions that help municipalities and cities in responding to contemporary trends and challenges.

I. Modern cities and approaches to enhance communal life

The first group of approaches represents the ambition of a municipality and city to reach a specific status, achieve some ambitions, or conditions. These approaches express the determining quality of a particular municipality and city, such as a smart, green, circular, or resilient city.

A smart city usually represents an approach that helps municipalities and cities make traditional networks and services more efficient with the use of digital solutions (European Commission, 2024). The Smart City approach also presumes that digital technologies are being used for the benefit of the inhabitants, businesses, as well as municipalities and cities. Smart city initiatives and solutions can be developed as “in-house” solutions by municipalities and cities, but also can come from the private and non-profit sectors as “readymade” solutions (Ručinská and Fečko, 2019).

Green cities are also known as sustainable cities. Green cities represent the intention of municipalities and cities to achieve urban sustainability thanks to the maximization of the ecosystem's functioning (Steele, et al., 2020). Green cities represent an approach focused on lowering the environmental impacts caused by daily human activities, mainly thanks to waste reduction, promoting recycling, and lowering emissions (Chew and Show, 2022).

The circular city approach contributes to the development of cities together with smart and green city concepts. The circular city concept is based on several principles, mainly on the principle or ability of the city to regenerate, share, optimize, loop, virtualize and exchange flows, materials, or processes (Prendeville et al., 2018). The strategic planning in a circular city must consider the partnerships and collaboration between various stakeholders (city, community, industry, business, ...), while these interactions produce different systems at different scales (energy recovery systems, water recycling process, updates of spatial plans, reuse of circular waste, production of recycled materials, etc.) (Williams, 2023).

Resilient municipalities and cities can absorb, recover and prepare for future shocks (OECD, 2024). Resilient cities concern processes, preparedness, know-how, and responsibility throughout the system, which acts autonomously to respond to exogenous and endogenous shocks (Baibarac and

Petrescu, 2019; Welsch, 2013). In this regard, the strengthening of partial aspects of communal resilience, mainly participation and inclusion, must be seen as a key part of modern cities and municipalities and robust local democracy.

Other approaches focus on the collaboration among stakeholders at the communal level. Helix models are built on the assumption that knowledge and innovation have the potential to integrate and manage increasing interactions of multiple societal subsystems (König et al., 2020). These models aim to build and foster collaboration in territories that produce innovations. The triple helix model highlights collaboration between the local government, business environment and higher educational institutions (Cai and Etkowitz, 2020). Quadruple helix is another approach that describes interactions involving the local government, business environment, higher educational institutions, and the society (Kuzior and Kuzior, 2020). An additional viewpoint of this approach adds the impact of media as another key interaction in contemporary societies (Sumarto, et al., 2020).

These approaches reflect the intention of municipalities and cities when responding to trends and challenges. The selected combination of approaches influences the formulation and implementation of policymaking at the communal level. The decisions of municipalities and cities concerning the applied approach must be made by the key stakeholders in the territory, such as the elected representatives, administrators, citizens, businesses, non-governmental organizations, and many others. The scope of involved stakeholders may lead to better outcomes and outputs of policymaking. Municipalities and cities should involve all the relevant stakeholders to make proper decisions on which trends and challenges are important for the local community.

II. Trends and challenges shaping the future of municipalities and cities

The exponential development of modern society creates and accelerates many challenges and trends. The four key trends identified by the OECD represent a systematic evolution, rather than the introduction of brand-new concepts: new forms of accountability for a new era of local government, new approaches to care, new methods for preserving identities and strengthening equity, and new ways of engaging citizens and residents (OECD, 2023a). Municipalities and cities in the European area are also transforming in order to ensure satisfaction with living in the city, safety and cohesion, housing, earning and living, mobility and commute, culture, public spaces and healthcare, healthy cities, as well as the quality of local public administration (European Commission, 2023). The commutation of different trends

and challenges may cause negative impacts on the quality of life in the local community. Municipalities and cities should ensure positive outcomes of trends and challenges.

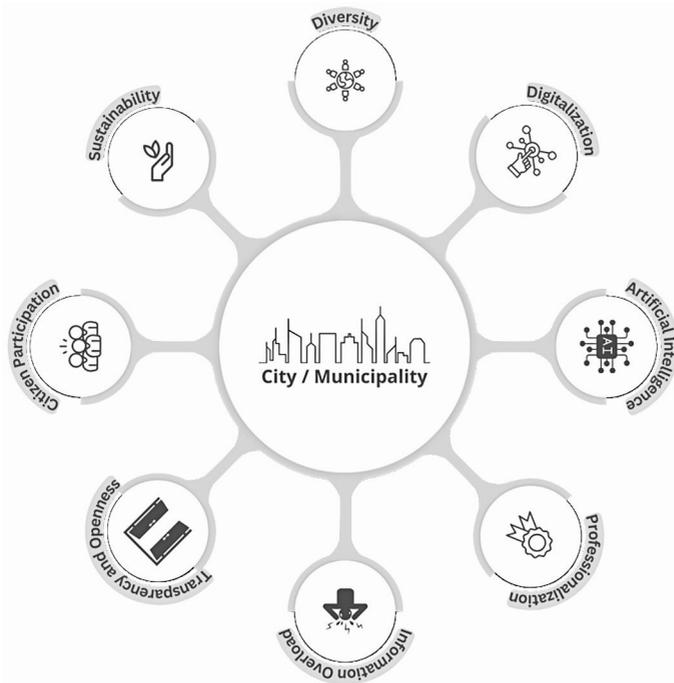
The abovementioned approaches help municipalities and cities respond to challenges and trends with different degrees of success. Theory and practice identify multiple lines to defining trends and challenges that influence local governments (Eggers et al., 2023; OECD, 2023a; Rowley 2022). We argue that municipalities and cities should find useful solutions to handle challenges and trends that improve the perceived quality of life, but they face several challenges and trends (Figure 1): Digitalization, sustainability, citizen participation, diversity, artificial intelligence (AI), professionalization of public services and public management and agile administration, expectations of higher transparency and openness of public administration, information overload and tendency to dataism vs. data sharing. However, none of the lines or listing of trends and challenges is the final one, even ours. As well as cities and municipalities as smaller territorial units with partially limited resources, both types of territorial units are under the influence of the trends and challenges we have identified.

Figures 1a) and 1b) show the variety and difference in the scope of the challenges and trends. The same challenges and trends can be perceived differently by each particular municipality and city. Therefore, each of them has its own mix of trends and challenges that affect it. The way the identified factors are arranged in the form of trends are unique to each town and municipality, for example some municipalities are very strongly influenced by some trends and conversely for some municipalities they may not have any influence at all. The size of the bubbles in the figures represents the strength of the factor affecting the municipality, and the proximity of the bubbles to the municipalities tells how responsive the territorial unit is to the stimulus.

The importance of challenges and trends perceived by the relevant stakeholders is usually transformed into policies and strategies. The challenge that is seen as the most important one by a city with 200,000 citizens, can be identified as less important by a city with 5,000 citizens.

Trends can be defined as general directions for changes and development in the spheres of society. Municipalities and cities can be influenced by some trends but may be avoided by others. However, municipalities and cities can be proactive, because if some trends do not influence communal life in particular self-government units now, it may probably impact municipalities and cities in the future. In this regard, foreseeing adaptation to trends can be beneficial for self-government units and the public as well.

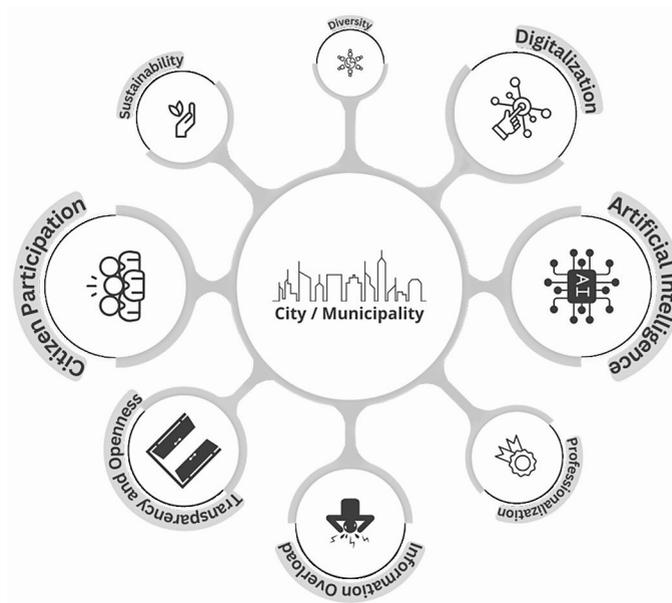
Figure 1a: Trends and challenges at the communal level



Challenges are usually perceived as a competitive situation or an obstacle that tests the ability of municipalities and cities to execute their competencies. Challenges represent a set of practical issues that municipalities and cities cannot avoid. Responding to trends cannot prevent challenges from arising. However, the preparedness of municipalities and cities can increase the number of anticipated challenges and decrease the level of unexpected sets of issues.

Digitalization and green sustainability, regardless the size of municipalities and cities, are integral parts of policymaking at the communal level. Municipalities and cities integrate individuals, capacities, industries and business activities; thus, municipalities and cities are the leaders in digital and green transition (Ma et al., 2023; Manjon et al., 2022). Digital and green transitions share the broader goal of a more sustainable future, and lead to the transformation of the society's subsystems (Müller et al., 2024). In this

Figure 1b: Trends and challenges at the communal level



Source: Authors

regard, digital and green transitions can improve the quality of life at the communal level.

C. From digital and green transition towards triple transition

1. Digitalization of public services

Digitalization as a doctrine improves the execution of governance and competencies, mainly through the extensive use of ICT and innovative solutions. Digitalization in municipalities and cities is an ongoing process that is deeply challenging and requires more and more sophisticated approaches (Toll, et al., 2023). Digitalization of municipalities and cities is perceived as a necessary step towards a higher quality of life, both from citizens' and local authorities' points of view. Digital transformation and the use of digital technologies are transforming the provision of public services through new

opportunities that expand and enrich the execution of competencies (Frenert, 2019). Digitalization helps the different types of municipalities to solve various issues with no negative effect on the quality, or at least the influence will be relatively small compared to the current situation (Wokoun et al., 2023).

The implementation of innovative digital solutions is frequently supported by the acceptance and contribution of the different local stakeholders, such as businesses, civil society, or higher education institutions. The municipalities that develop ecosystems like digitalization, via collaboration and innovative approaches, are further ahead of other municipalities in digitalization, and provide public services of higher digital quality (Nessa a Erdal, 2022; Chang et al., 2020). Digitalization modifies the existing practices and also creates entirely new ones in entities across society (Grabara, et al., 2023). Digital solutions require the stakeholders' feedback to maximize their benefits. Thus, citizens participate in the design and functionality of digital solutions, to maximize the positive impact of these solutions on the perceived quality of their individual lives.

II. Environmental issues and climate change

Municipalities and cities should ensure that digital transition is implemented environmentally friendly and emphasize its positive impacts on climate change. Modern municipalities and cities seek to improve the quality of life of their citizens by developing both digital innovations and green sustainable solutions (Delitheou et al, 2019). Digitalization makes information and data more accessible for the citizens, thus decentralized decision-making processes in the environmental aspects of public policies are easier and more efficient (Balogun et al, 2020). A significant part of green solutions can also be seen simultaneously as a digital solution. The separation of these dimensions is sometimes difficult.

As the global trend towards environmental sustainability continues, municipalities and cities naturally transmit climate change topics into communal strategies. Green cities can respond to environmental sustainability challenges, especially through energy and climate strategies (Bibri, 2020). Digital technologies produce solutions focused on the reduction of pollution hazards, traffic jams, resource usage, energy consumption, or public safety (Almalki, et al., 2023). However, the contribution of communities is also very important, as was proven by many cases, e.g., individual cooling strategies that help to reduce the effects of hot weather and heat extremes (Jay et al., 2021), or the importance of the gardens' contribution to urban green spaces (Hanson et al., 2021). Green solutions require the active partici-

pation of the stakeholders, because the behavior and actions of individuals and businesses directly impact the sustainability of the local community.

III. Twin and triple transition

Digital and green transition reinforce each other, but to make the most out of twin transition, proactive and interactive management is needed (Muench, et al., 2022). Twin transition combines digital and green goals to unlock the benefits in terms of efficiency and productivity and to achieve the sustainability goals (Blüm, 2022; Killeen, 2022).

Twin transition highlights the potential synergies between the green and digital transitions, with potentially wide-ranging impact on inequalities at the economic, social and geographical levels (Diodato et al., 2023). The benefits of digital and green transition must be supplemented by a healthy environment that supports the collaboration among the stakeholders (Paiho, et al., 2023; Rehman, et al., 2023). However, socio-economic conditions, challenges and risks are mostly perceived as secondary for digital and green transitions.

Triple transition is continuously converting into an approach that exceeds the original meaning of digital and green aspects of society. Twin transition cannot be successful without addressing the social dimension of the transformation, while focusing on reducing social and territorial inequalities (Schmerber, 2024). Digital and green transitions appear necessary but insufficient to break social, economic and environmental imbalances and conflicts (Council of the European Union, 2023; OECD, 2023b). Governments are forced to manage a triple transition in the areas of digital transformation, climate change and social evolution (Schwarzer, et al., 2022). Triple transition can be seen as a starting point for policymakers to protect society against a vast array of imminent socio-economic and demographic risks (Petmesidou and Guillén, 2022). In this regard, triple transition concentrates the attention of municipalities and cities on brand-new social issues, but also offers municipalities innovative solutions for traditional and common social issues.

Both, twin and triple transitions help municipalities and cities to overcome crises, such as pandemics, economic, energy, or ecological crisis (Leuzo, 2023; Muench et al., 2022). However, twin and triple transition cannot be perceived as a multi-purpose fix for issues, challenges and trends, but can be seen as an appropriate set of tools that helps municipalities and cities to adapt to the dynamic development of our society.

D. Results and discussion

I. Methodology

The study examines the measures and activities implemented by cities that respond to digital and green transitions, mainly those activities that reflect twin and triple transition at the same time. Before of this analysis, the study examines, in a theoretical way, approaches that help municipalities and cities to respond to twin and triple transitions. The study aims to answer the research question of how digital and green transitions influence the social aspect of communal life. With the use of the case study method, this study examines measures adopted by selected cities in the Slovak Republic.

The research sample was selected purposefully, taking the spatial fragmentation of the Slovak Republic, the cities' competencies, and their roles in the territory into consideration. Municipalities and cities are often perceived as initiators of innovative solutions in the Slovak Republic's conditions. The main difference between cities and municipalities is determined by the fact that cities realize key activities focused on the provision of public services both for their residents and residents from the nearest region. Six case studies from six cities in the Slovak Republic were analyzed covering the period 2021-2024. The case studies represent the appropriate tool, which was used to demonstrate how cities respond to twin and triple transitions.

II. Cases

The following case studies demonstrate the digital and green activities of the selected cities that go-beyond twin transition. Each of the six case studies includes a basic explanation, the description of the adopted solutions, and the impacts of the implemented solutions on communal life.

1. Climate and energy plan of the city

As a reaction to climate change, the city of Piešťany has an ambition to elaborate the Climate and energy plan of the city of Piešťany. The formulation of basic issues began in 2021, and the final version of the document and action plan will be prepared in 2026 (Piešťany, 2024). The document presumes that digital and green solutions will help to mitigate the negative impacts of climate change in the city.

The city of Piešťany aims to use digital solutions mainly to increase the energy and water efficiency of public buildings owned by the city, modernize streetlights, foster ecologic transport, and disseminate the importance of

circular economy and waste management, as well as support and protect the citizens affected by social and energy poverty, and increase the awareness of the various stakeholders on collaboration in mitigation measures (Piešťany, 2022).

The importance of the social dimension was already clearly stated in the formulation phase of the document. Educational and awareness-raising activities focused on climate change and mitigation measures are necessary for collaboration in the city. The ambition of the city to support and protect its citizens negatively affected by social and energy poverty is also a significant sign of the wider social impact of the climate and energy plan.

2. Smart streetlights

The city of Košice continuously modernizes the system of streetlights in the city districts. Restoring the streetlight system with smart streetlights confirms the importance of smart and digital technologies. The new smart lights use LED technology and smart switches with remote control, what will lead to the saving of financial resources in the future.

The modernization of the streetlight system has a wider impact on the quality of life in the city. The city of Košice aims to increase the safety of its citizens because the priority is to add new smart streetlights in places with insufficient coverage (Košice, 2024).

The new smart streetlights represent an ideal example of digital and green transition. This solution combines digital and ecologically friendly measures adopted at the communal level. Contrary to old streetlights, this solution increases the citizens' safety thanks to better luminosity and lower failure rate.

3. Low carbon strategy

As a result of the negative impact of climate change, a low carbon strategy was adopted by the city of Trnava. The strategy also emphasizes the importance of digital solutions as an integral part of mitigation measures. The low carbon strategy of the city of Trnava for the years 2022-2027 identifies the current state, priorities, and future activities in the fields of local government buildings, residential buildings, streetlight systems, industry, transportation, smart city, climate change, and also describes planning, regulation and the position of the public (Trnava, 2022).

The strategy reacts to climate change but strongly incorporates digital solutions that lead to energy efficiency and carbon footprint reduction. Simultaneously, the strategy underlines the importance of the public and other stakeholders in the territory. The city declares that the successful

implementation of the strategy is directly influenced by the behavior of citizens and business activities. In this regard, the strategy presumes communication, guidance, and education.

4. Smart platform for socially responsible behavior during a crisis

The digital solution adopted by the city of Prešov was the first of its kind among the cities in the Slovak Republic. A similar mobile app is currently used only by the Mountain Rescue Service and Air Rescue Service in Slovakia. The platform called “Safety” allows the use of multimedia communication to be added to the standard emergency call. After the initialization of the emergency call, the individual will receive an SMS message with a specific link from the operator of the emergency center. When the individuals click on this link, they confirm sharing their location, and start a video call after allowing access to the phone’s camera. The platform also includes a chat function with the possibility of translation to 30 languages (Prešov, 2024).

The digital solution adopted by the city of Prešov demonstrates the ability of the city to connect the digital and social aspects of its competencies. This case study confirms that a smart app can be focused on the citizens’ basic social needs - a safe and secure environment. The application is also inclusive, because the benefits of the application can be perceived by different types of groups regardless of age, education, or social status, and without previous registration or authorization. The citizens benefit from the use of this digital solution because it can strengthen their ability to react in a socially responsible way, according to legal acts, social norms, and public interest.

5. Circular map of the city

The functioning of the local circular and shared local economy is easier thanks to the interactive circular map of Bratislava. The interactive map helps the citizens to find different goods and services in the city. The circular map of Bratislava provides information on different aspects of the circular and shared economy in the city, for example, zero-waste packaging-free stores and markets, second-hand shops, collection places and yards, car and bike-sharing solutions, rental and repair services, services and repair shops, community gardens, community compost sites (Bratislava, 2024).

The implemented solution is another successful example of a twin transition. Moreover, the selected solution strengthens the networking among communities in the city. The digital and green dimension of the interactive circular map also builds awareness of the circular economy.

Table 1. Comprehensive summary of the examined case studies

	Twin transition		
	Triple transition		
	Digital solution	Green solution	Social impact
Case 1 Climate and energy plan of the city	x	x	x
Case 2 Smart streetlights	x	x	x
Case 3 Low carbon strategy	x	x	x
Case 4 Smart platform for socially responsible behavior during a crisis	x	-	x
Case 5 Circular map of the city	x	x	x
Case 6 Green and blue infrastructure	-	x	x

Source: authors

6. Green and blue infrastructure

The city of Banská Bystrica declared its ambition to improve the green and blue infrastructure in the territory. Green and blue infrastructure usually combines the elements of greenery and water in the urban territory of the cities. As it is proclaimed by the city document, the green and blue infrastructure increases air humidity, provides shades, reduces noise, dust and temperature, supports the regeneration of the organisms, contributes to education, and improves the environment and conditions for adaptation to climate change (Banská Bystrica, 2021).

The wider social impact of the mentioned ambition of the city of Banská Bystrica can be seen in several dimensions. Green and blue infrastructure improves the quality of life. Citizens can perceive the benefits through the improvement of their physical and mental health. Simultaneously, the relatively high financial investments in the following years will burden the city budget to a smaller extent than the elimination of the negative impacts of climate change in the future.

III. Discussion

The examined case studies showed that the analyzed solutions implemented by the cities also have a wider social impact. Table 1 provides a comprehensive summary of the analyzed cases focusing on the adopted solutions as parts of twin and triple transitions.

The case studies showed that the selected Slovak cities implemented digital and green solutions in different fields of communal matters. Four case studies confirmed that the cities proactively reflect the trend of triple transition. The examined cases of digital and green solutions also have a wider impact that positively influences the social aspect of communal life. Simultaneously, the wider impact on the social aspect of communal life was identified in one digital solution and also in one green solution.

The trend of triple transition is the reaction to the development of a continuously transforming society. As proven by the theory and the examined case studies, triple transition can be described with the feature of transformability. In the case of twin transition, digital solutions were implemented as a priority but they were subsequently also applied in the process of solving the sustainability and climate change adaptation issues. Digital solutions can still be implemented as stand-alone solutions, but municipalities and cities use them to solve necessary and key green issues. The same situation is currently repeating in the case of the evolving triple transition. Municipalities and cities reflect the need to solve social issues at the communal level, and simultaneously satisfy the digital and green needs of their citizens.

E. Conclusion

Triple transition can currently be perceived as a natural and pragmatic evolution of twin transition. Twin transition is basically a common part of policymaking at the communal level today. However, the relevant stakeholders gradually begin to perceive the need to solve and mitigate social imbalances, inconsistencies, and conflicts.

Both theory and research have confirmed that digital and green solutions can have a wider impact, thanks to which they help municipalities and cities deal with challenges in the social field. However, these complex solutions are not yet possible to characterize at the level of municipalities and cities as prevailing. The purpose of our research was to point out the ever-increasing tendency of municipalities and cities to respond to trends and challenges with complex local policies, and the study also serves as a platform for the dissemination of examples of good practices in Slovakia.

The direction of future research will reflect the rising occurrence and scope of social issues in society. Future research will identify the potential modification of the existing twin transition solutions and also the development of brand-new triple transition solutions.

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*Lydia Scholz*¹

Municipal Planning for District Heating in Germany. Municipalities as Key Players in Heating Transition

Summary: Germany is driving the transformation of heating systems in the building sector. Heating systems, which are still predominantly based on fossil fuels as primary energy sources, play a key role. The transition to renewable energy systems is seen as an important pillar of the heating system transformation. The focus is particularly on district heating, which could not only lead to zero emissions but also reduce the burden on citizens. For this reason, the German legislator has mandated municipal heating planning before homeowners have to install individual climate-friendly heating systems. Municipalities thus play a key role in the heating transition. This paper discusses the new key planning role of municipalities in providing services of general interest, taking into account the challenges they will face to receive relevant data, to ensure a democratic heat transition and to develop heat plans with limited human and financial resources.

Keywords: public services, municipal heat planning, heat transition, services of general interest

A. Introduction

Germany wants to promote the heating transition and to achieve climate-neutral heating by 2045. This is intended to make a significant contribution to the climate protection target², which was agreed at international level

1 Lydia Scholz is Professor of Business Law at the School of International Business, University of Applied Sciences Bremen, Germany. She has studied law and worked in various functions in the Energy Industry in Berlin and Brussels as well as in different universities in Germany and in the UK. Her research activities include energy law, in particular renewable energy law and hydrogen law. Contact: Lydia.Scholz@hs-bremen.de.

2 See Paris Agreement. More than 180 countries worldwide, including the European Union and the Federal Republic of Germany, have ratified the Paris Agreement which aims to limit global warming to 1.5 degrees Celsius compared to the pre-industrial age.

in the United Nations Paris Agreement in 2015.³ The decarbonisation of the heating sector is a key component to achieve this climate target, as the provision of space heating and hot water accounts for around half of the total final energy consumption and also accounts for 40 per cent of energy-related CO₂ emissions in Germany each year.⁴ Fossil fuels were still the most widely used primary energy source in 2023. Almost 34 per cent of homes were heated with gas central heating and 23 per cent with oil central heating in Germany.⁵

The goal of a nationwide, climate-neutral heat supply can only be achieved if primary energy consumption can be significantly and permanently reduced through energy efficiency measures, such as the energy-efficient refurbishment of buildings, and if the remaining demand can be satisfied by renewable energy sources. To achieve this, waste heat potential, i.e. the unavoidable heat that is a by-product of industrial processes and is discharged unused via air or water, must be utilised more consistently in future by means of combined heat and power generation. Furthermore, heat from solar thermal energy, geothermal energy and environmental heat must be better integrated into the heating systems.⁶

There is a significant potential for grid-connected heat supply via district heating from industrial waste heat or from natural heat sources such as geothermal energy. However, only 15.2 per cent of district heating is used for heating throughout Germany, with the city states of Berlin and Hamburg standing out with 37.6 per cent and 32.1 per cent respectively.⁷

The German federal government wanted to promote the heating transition in 2023 with significant legislative amendments to the Building Energy Act („Gebäudeenergiegesetz“) by the implementation of the obligation to install or set up only those heating systems in a building which generate at least 65 per cent of the heat with renewable energies or unavoidable waste heat. The German government was heavily criticised by both, the opposition and the society⁸ and tried to calm things down with the implementation of the instrument “municipal heat planning”. This planning instrument, which has now been stipulated in the Heat Planning Act

3 Bundesministerium für Wohnen, Stadtentwicklung und Bauwesen (Federal Ministry of Housing, Urban Development and Building).

4 Riechel, Robert/Walter, Jan, p. 8.

5 BDEW (German Electricity and Water Association).

6 Die Bundesregierung (The Federal Government).

7 BDEW (German Energy and Water Association).

8 Riechel, Robert/Walter, Jan, p. 8.

(„Wärmeplanungsgesetz“), aims to provide certainty about the heat supply that can be expected locally.

In this respect, municipal planning represents a strategic planning approach for dealing with the coordination problems caused by the heating transition and for developing a socially and economically viable transformation path to a climate-neutral building stock.⁹ It creates an overall picture of the state of the infrastructure for heating, the municipal structures and the energy efficiency of buildings, determines future heat requirements and compares these with the local potential of renewable energy and heat sources. The heating plans thus provide an effective tool for investment decisions, which usually last for several decades due to their long investment cycles and therefore require a long-term strategy aligned with climate protection goals.¹⁰

The Heat Planning Act finally obliges approximately 11,000 municipalities which exist in Germany to provide heat planning by 2028 at the latest. Different timeframes apply depending on the size of the municipal area or the number of inhabitants in a municipality: For example, large cities with more than 100,000 inhabitants have to submit their heat plan by June 2026; and municipalities with an area of less than 100,000 inhabitants by June 2028. For smaller municipalities with fewer than 10,000 inhabitants, the federal states can decide on a simplified heat planning procedure.¹¹

The municipalities thus are at the centre of the heating transition. This article aims to critically analyse the new role of municipalities. First, the overall legal framework that governs municipal heat planning at both, the European Union level and the German federal level will be outlined (B). This will be followed by an overview of the roles of relevant actors including municipalities and stakeholders (C.). On this basis, the new key role of municipalities under the German Heat Planning Act will be analysed with focus on the challenges they face to plan and to provide services of general interest as well as to ensure a democratic heat transition on the one hand, and to manage these tasks with their limited human and financial resources on the other (D.).

9 Riechel, Robert/Walter, Jan, p. 18.

10 Riechel, Robert/Walter, Jan, p. 13, 18.

11 Die Bundesregierung (The Federal Government).

B. The legal framework for municipal heat planning

Municipal heat planning is a key component in the multi-level system of environmental law at both, European and German level.

1. *The European legal framework*

The Energy Efficiency Directive (EU) 2023/1791, which amended the existing Energy Efficiency Directive in 2023, provides a common framework for measures to promote energy efficiency throughout the EU by establishing rules for energy efficiency measures in all sectors.¹² Taking into account the principle of "energy efficiency first", the Member States shall jointly achieve a reduction in energy consumption of at least 11.7 per cent by 2030 compared to the EU's 2020 reference scenario.¹³ To this end, each Member State shall set an indicative national energy efficiency contribution based on energy consumption that is appropriate to contribute to the Union's final energy consumption target.¹⁴

The directive also shapes the heating transition: It obliges the Member States to reduce the total energy consumption of all public institutions together by at least 1.9 per cent annually compared to the 2021 level¹⁵ and to increase the renovation rate of these buildings to at least three per cent.¹⁶ In addition, the Member States are required to submit a comprehensive assessment of the heating and cooling supply to the Commission as part of their integrated national energy and climate plans.¹⁷ If these assessments show that there is potential for the use of highly efficient combined heat and power and/or district heating and cooling from waste heat, the Member States must take appropriate measures to develop a corresponding infrastructure for its utilisation.¹⁸ They shall also ensure that regional and local authorities, at least in municipalities with a total population of more than 45,000 inhabitants, develop municipal plans for the supply of heating and cooling.¹⁹ The latter instrument in particular forms the legal framework for municipal heat planning at European level.

12 Art. 1 Energy Efficiency Directive.

13 At. 4 Energy Efficiency Directive.

14 Art. 4 (2) Energy Efficiency Directive.

15 Art. 5 (1) Energy Efficiency Directive.

16 Art. 6 (1) Energy Efficiency Directive.

17 Art. 25 (1) Energy Efficiency Directive.

18 Art. 25 (4) Energy Efficiency Directive.

19 Art. 25 (6) Energy Efficiency Directive.

II. The German legal framework

The German legal framework for municipal heat planning is a result of the German Energy Efficiency Strategy 2050 (1.). It consists of the Building Energy Act (2.) and the Heat Planning Act (3.), both of them legislated at federal level.

1. The German Energy Efficiency Strategy 2050

Although Germany saves more primary energy each year than the European Union on average, effective measures are needed to achieve the efficiency targets, particularly in the building sector.²⁰ While annual primary energy consumption in the European Union was reduced by 13 per cent in 2021 compared to 2005 levels, Germany achieved a reduction of 17 per cent in the same period.²¹ However, in order to achieve the target of halving primary energy consumption by 2050, there is a need for action in all relevant sectors, especially in the building sector.

The German government thus adopted the Energy Efficiency Strategy 2050 at the end of 2019 and defined targets for the reduction of primary energy consumption for the first time and has since set the course for strengthening Germany's energy efficiency policy.²² According to this strategy, primary energy consumption in Germany is to be reduced by 30 per cent by 2030 compared to 2008 levels and halved by 2050. The energy efficiency strategy thus also represents Germany's contribution to achieving the targets of the amended Energy Efficiency Directive.

The German energy efficiency strategy bundles the targeted measures in the new National Action Plan on Energy Efficiency.²³ The so-called NAPE 2.0 is focused on the demand side of the energy system and addresses cross-sectoral measures and instruments that are intended to achieve the necessary reduction in final energy consumption in the relevant areas, in particular industry, buildings and heating infrastructure. The building sector plays a key role here, as it accounts for around 35 per cent of final energy consumption and a quarter of greenhouse gas emissions in Germany. At the same time, however, there is also potential to significantly reduce energy consumption

20 Bundesministerium für Wirtschaft und Energie (Federal Ministry for Economic Affairs and Energy), p. 9.

21 Statistisches Bundesamt (Federal Statistical Office).

22 Bundesministerium für Wirtschaft und Energie (Federal Ministry for Economic Affairs and Energy), p. 7 and 9.

23 Bundesministerium für Wirtschaft und Energie (Federal Ministry for Economic Affairs and Energy), p. 9.

in this sector by integrating renewable energies into heating and cooling generation and through energy efficiency measures such as the energy-efficient refurbishment of buildings. In urban areas in particular, local and district heating networks also represent a promising decarbonisation option due to the potentially high connection density, provided they are powered by renewables.²⁴

2. The German Building Energy Act

The amended Building Energy Act now stipulates that a heating system may only be installed or set up in a building if it generates at least 65 per cent of the heat provided by the system using renewable energies or unavoidable waste heat.²⁵ However, depending on the number of inhabitants, it is possible to replace or utilise a heating system that does not meet these requirements. The Building Energy Act stipulates in detail that this option is available until 30 June 2026 if the building is located in a municipal area with a registered population of more than 100,000. If 100,000 inhabitants or fewer are registered in the municipal area, there is the option of a free choice of heating system until 30 June 2028. Heat planning thus plays a special role. If there is a heating plan for the municipal area and if the area in question is designated for the construction or expansion of a heating network or as a hydrogen network expansion area, house owners are not obliged to install heating systems that are 65 per cent powered by renewable energies.

3. The German Heat Planning Act

The key instrument of heat planning is based on the Federal Heat Planning Act, which came into force in 2024. The term "heat planning" refers to legally non-binding, strategic planning that identifies opportunities for the use of renewable energies and unavoidable waste heat in the heat supply and describes the medium and long-term design of the heating infrastructure for a planned area.²⁶ The heat plan represents the result of heat planning intended for publication.²⁷ It has no external legal effect and does not establish any enforceable rights or obligations.²⁸ However, the findings in

24 Bundesministerium für Wirtschaft und Energie (Federal Ministry for Economic Affairs and Energy), p. 14. 15.

25 Section 71 Gebäudeenergiegesetz (Building Energy Act).

26 Section 3 (1) no. 20 Wärmeplanungsgesetz (Heat Planning Act).

27 Section 3 (1) no. 19 Wärmeplanungsgesetz (Heat Planning Act).

28 Section 23 (4) Wärmeplanungsgesetz (Heat Planning Act).

the heating plan must be taken into account with other public and private concerns when deciding on the designation of an area for the construction or expansion of heating networks or as a hydrogen network expansion area.²⁹

The Federal Heat Planning Act provides a standardised nationwide legal framework for heat planning, which has so far been regulated very heterogeneously in the federal states. In addition to the climate protection laws at states' level, in which some states have regulated the obligation to develop heat plans, the states have the choice to manage the task of municipal heat planning.³⁰ These include incentives for voluntary action by local authorities.³¹

Not all German states make equal use of the opportunities to organise municipal heat planning. While states such as Baden-Württemberg, Schleswig-Holstein and Lower Saxony have already incorporated the heat planning obligation into their state climate protection laws for several years, other federal states have not yet adopted any regulations on municipal heat planning. However, with the Heat Planning Act at federal level, heat planning has now become mandatory for a large number of the 11,000 local authorities in Germany. Areas for which a heat plan has already been developed are exempted from the heat planning obligation under the Heat Planning Act.

The German states must ensure that heat plans are developed for their territory.³² However, they are also authorised to transfer the obligation to develop a heat plan to municipalities or associations of municipalities on their territory and to designate these as the bodies responsible for planning.³³

Heat planning is divided into a preparatory coordination phase and four planning phases in which the state or municipality responsible for planning should investigate the suitability of the planned area for supply by a heating network. Areas are unsuitable if they do not have a local heating network or if there is no potential for heat from renewable energies or unavoidable waste heat. Areas in which a future supply via a heating network is not economically viable are also unsuitable.³⁴

As part of the inventory analysis, the municipality determines the current heat demand or consumption within the planned area, including the

29 Section 26 (1) Wärmeplanungsgesetz (Heat Planning Act).

30 See Balling, Victoria. et al. (2023), p. 16.

31 See Balling, Victoria. et al. (2023), p. 16.

32 Section 4 (1) Wärmeplanungsgesetz (Heat Planning Act).

33 Section 33 (1) Wärmeplanungsgesetz (Heat Planning Act).

34 Sections 13 to 20 Wärmeplanungsgesetz (Heat Planning Act).

energy sources used, the existing heat generation plants and the energy infrastructure facilities relevant to the heat supply.³⁵ This inventory analysis is followed by the potential analysis, in which the municipality determines the existing potential for generating heat from renewable energies, for utilising unavoidable waste heat and for central heat storage in the planned area in a quantitative and differentiated manner.³⁶ The municipalities provide the data in so-called heat registers and publish them.³⁷ On the basis of the suitability test and the potential analyses, the municipality identifies a target scenario that describes the long-term development of the heat supply for the planned area.³⁸ It divides the area into heat supply areas and presents the most cost-efficient type of heat supply.³⁹ Finally, the municipality responsible for planning develops an implementation strategy with implementation measures with which a supply of heat generated exclusively from renewable energies or from unavoidable waste heat can be achieved by the target year. The municipality is responsible for realising the implementation measures itself.⁴⁰

C. The role of municipalities in the heating transition

The phases outlined in chapter B. will be connected with new obligations for German municipalities.

I. Heat planning by municipalities

The addressees of the heat planning obligation by the federal act are first and foremost the federal states. They must ensure that heat plans are developed on their territory. However, the federal states are authorised to transfer this obligation to develop a heat plan to municipalities, associations of municipalities or other legal entities in their territory and to designate these as the institutions responsible for planning.⁴¹ The German Constitution, the German Basic Law, prohibits the federal government from directly transfer-

35 Section 15 (1) Wärmeplanungsgesetz (Heat Planning Act).

36 Section 16 (1) Wärmeplanungsgesetz (Heat Planning Act).

37 Riechel, Robert/Walter, Jan, p. 25.

38 Section 17 Wärmeplanungsgesetz (Heat Planning Act).

39 Section 18 (1) Wärmeplanungsgesetz (Heat Planning Act).

40 Section 20 (1) Wärmeplanungsgesetz (Heat Planning Act).

41 Section 4 (1) and Section 33 (1) Wärmeplanungsgesetz (Heat Planning Act).

ring tasks to the municipalities.⁴² This intends to safeguard the financial limits of the municipalities.⁴³

The transfer of the obligation to develop heat plans to the municipal level is entirely in line with the principle of subsidiarity, as municipalities are closely connected to citizens and local businesses. They will be able to carry out the planning and strategy process and to implement the identified measures close to those who will be affected by the plans and by the implementation measures, the citizens and local businesses. Following the principle of subsidiarity, the instrument of municipal planning has existed in Denmark since the 1980s. Municipal heat planning has also been carried out in Switzerland for a number of years.⁴⁴

Depending on the size of a municipal area or the number of inhabitants in a municipality, different time frames will apply: For example, the heat plans for municipal areas with more than 100,000 inhabitants are to be drawn up by the end of June 2026 and for those comprising fewer than 100,000 inhabitants by the end of June 2028. For smaller municipalities with fewer than 10,000 inhabitants, the federal states may provide for a simplified procedure.⁴⁵ Furthermore, for municipal areas with more than 45,000 inhabitants, there are additional minimum requirements for heat plans resulting from the provisions of the Energy Efficiency Directive.⁴⁶

II. Two-stage stakeholder participation

Heat planning should be organised as a transparent and integrative participatory process. To this end, the Heat Planning Act provides for a two-stage stakeholder participation process: The municipality responsible for planning must involve the public, all authorities and public bodies whose areas of responsibility are affected by the heat planning, as well as the relevant natural and legal persons, in particular the operators of local energy supply and heating networks.⁴⁷ In addition, the municipality responsible for planning has the discretion to expand the group of possible stakeholders in the course of optional participation and to adapt it to local circumstances.⁴⁸ These stakeholders are important for the heat supply infrastructure, their

42 Article 84 Grundgesetz (German Basic Law).

43 Maaß, Christian, p. 22, 29.

44 Maaß, Christian, p. 22.

45 This has to be in line with Section 22 Wärmeplanungsgesetz (Federal Heat Planning Act).

46 Art. 25 (6) Energy Efficiency Directive.

47 Section 7 Wärmeplanungsgesetz (Heat Planning Act).

48 Schnittker, Friederike/Fründ, Daniel. p. 289, 290.

interests could be affected by heat planning in the planned area. These include potential producers of waste heat, gaseous energy sources or large-scale consumers of heat or gas.

D. Heat planning as a task of general interest

This chapter discusses the new key role of municipalities in the area of providing services of general interest, taking into account their limited human and financial resources.

I. Services of general interest

Heat planning is a task within the framework of services of general interest.⁴⁹ Local services of general interest have characterised the image of municipalities in Germany for more than one hundred years.⁵⁰ The constitution guarantees the municipalities the right to regulate all local community affairs within the legal framework,⁵¹ which is known as the concept of “*kommunale Selbstverwaltung*”. This includes the provision of services of general interest and in particular the organisation of the provision of these services and its financing.

Municipalities are able to assess the interests of citizens and local businesses and to take local conditions into account when developing heating plans.⁵² In addition, municipalities often own large housing stocks and infrastructure facilities, have a large number of rights of way and manage data on building and settlement structures, heat requirements and existing potential for renewable energy and heat sources. The municipalities therefore not only have a central coordinating and controlling function, they also enjoy planning sovereignty at local level.⁵³

II. Challenges

With heat planning, municipalities are being assigned a task that they have not previously undertaken in this obligatory form. Considering that the

49 Riechel, Robert/Walter, Jan. p. 9.

50 Knauff, Matthias. p. 80.

51 Article 28 (2) Grundgesetz (German Basic Law).

52 Riechel, Robert/ Walter, Jan. p. 15.

53 Riechel, Robert/Walter, Jan. p. 15.

development of a heat plan takes two to three years⁵⁴, municipalities face challenges, which the German Association of Towns and Municipalities “Deutscher Städte- und Gemeindetag” has identified in a survey of its 119 member municipalities in 2023.⁵⁵ According to the survey, in which multiple answers were possible, 76 per cent of the municipalities surveyed considered the coordination of the heating concept with the relevant stakeholders to be time-consuming and the biggest challenge. For 70 per cent, a challenge lies in the resulting personnel requirements in local government. 67 per cent found the possible uses of potential and future energy sources uncertain and associated with planning uncertainties. A further challenge for 33 per cent was the lack of data, e.g. energy data on the building stock. For 18 per cent, the advisory services offered to local authorities by the federal and state governments are not yet sufficient. Two key challenges can be derived from this: the need for data and the diversity of players (1.) as well as human and financial resources (2.).

1. Data requirements and diversity of players

A major challenge is seen in the diversity of players, which makes it difficult to obtain and pass on the necessary data.⁵⁶

a. Data procurement

Heat planning requires sufficient data from relevant stakeholders. These include energy supply companies and companies in the housing industry. Due to the very small-scale ownership structure of buildings in Germany and a supply infrastructure for electricity, gas and heat owned and operated by different companies, there is a heterogeneous diversity of actors, which leads to a high level of complexity to receive relevant data. Analysing potential involves the challenge of estimating the potential for saving energy by reducing heat demand in buildings and in industrial or commercial processes. The reason for this is that waste heat potentials have often been unutilised and there is therefore hardly any information on their integration into the heat supply system.

To analyse the current situation, municipalities need access to third-party data, such as that held by energy supply companies and chimney sweeps.

54 Deutscher Städte- und Gemeindetag (German Association of Cities) Berlin and Cologne, p. 3.

55 Deutscher Städte- und Gemeindetag (German Association of Cities) Berlin and Cologne.

56 Deutscher Städte- und Gemeindetag (German Association of Cities) Berlin and Cologne, p. 3.

This is ensured by the right to information in the Heat Planning Act.⁵⁷ However, the collection of data is a complex task not only in light of the knowledge required to understand the relevance of the data for heat planning but also in light of the limited human and financial resources.

b. Ensuring a democratic heat transition

Democracy requires a heat transition that takes into account the needs of all groups of citizens. Citizens own buildings, are tenants and consume heat, they thus have to financially bear the infrastructural changes and demand a socially acceptable heating transition.⁵⁸ To address this demand, municipalities have to identify the interests of different groups of citizens and to balance these interests in the heat plan.

Furthermore, heat planning does not only require the collection of data but also the provision of information to the citizens and local businesses by municipalities. As the heat transition directly affects the housing and the financial situation of house owners, they have a strong interest in receiving information to align their investment decisions. Municipalities thus have to provide relevant information on demand which challenges them in light of limited personnel resources.

2. Human and financial resources

The task of heat planning can be assigned to the municipalities' own employees or civil servants or to external service providers. Both ways are associated with costs. In the explanatory memorandum to the draft bill, the German government quantifies these costs for those bodies that are to carry out heat planning, i.e. the municipalities. The implementation of heat planning, participation in heat planning and processing when heat plans are first developed will incur costs of around 361 million Euros by 2028. Costs of around 104 million Euros are estimated for the organisation of participation events, around 6 million Euros for the processing of data and around 64 million Euros for the decision on the designation of areas within the meaning of the Building Energy Act. The heating plans must also be updated. This will result in annual compliance costs of around 39 million Euros.⁵⁹

57 Riechel, Robert/Walter, Jan, p. 24.

58 Riechel, Robert/Walter, Jan, p. 13.

59 Die Bundesregierung, (Federal Government). Draft law for heat planning and decarbonisation of the heating networks, p. 6.

Even if the municipality outsources the development of the plans to external service providers, the Federal Government assumes that knowledge needs to be built up within the local authority concerned in order to accompany the heat planning and to stabilise the necessary processes. The Federal Government assumes that around 200 hours are required for the initial preparation of the plan in order to ensure that knowledge is built up.⁶⁰

If external service providers are commissioned, in addition to the costs incurred, there is the challenge of capacity bottlenecks on the part of the external experts. However, this can be countered by the different deadlines depending on the municipal area and the possibility of carrying out joint heat planning for several municipal areas.⁶¹

In view of the fact that German municipalities are already reaching the limits of their capacity with their existing financial resources and personnel capacities, this is a major challenge.⁶² In addition to the immediate task of heat planning, there is a high demand for information and advice from citizens, which can hardly be met by the advisory structures currently on offer.⁶³

Those federal states that have already enshrined an obligation for heat planning in their state climate protection laws have also created a legal basis for financial compensation in favour of the municipalities. To cover the costs incurred for heat planning, the municipalities are entitled to financial compensation from the state in accordance with the principle of connectivity.⁶⁴ The legal principle, which is intended to ensure the preservation of the financial basis of local self-government⁶⁵, states that the administration of tasks and finances must be carried out by the same level of government.⁶⁶ The federal government is funding heat planning under the National Climate Initiative's Municipal Guidelines. Until 31 December 2023, eligible applicants could have applied for a funding rate of up to 90 per cent, and

60 Die Bundesregierung, (Federal Government). Draft law for heat planning and decarbonisation of the heating networks, p. 57.

61 Die Bundesregierung, (Federal Government). Draft law for heat planning and decarbonisation of the heating networks, p. 58.

62 Riechel, Robert/Walter, Jan, p. 13.

63 Deutscher Städte- und Gemeindetag (German Association of Cities) Berlin and Cologne, p. 3.

64 Section 34 (2) Klimagesetz Baden-Württemberg (Climate Act Baden-Württemberg), section 7 (9) Energiewende- und Klimaschutzgesetz Schleswig-Holstein (Energy Transition and Climate Protection Act Schleswig-Holstein) and section 20 (6) Niedersächsisches Klimagesetz (Climate Act of Lower Saxony). Maaß, Christian, p. 22, 29.

65 Article 28 (2) Grundgesetz (German Basic Law).

66 Balling, Victoria. et al. p. 19.

financially weak municipalities could even apply for full funding of the eligible expenses for the development of a heat plan.⁶⁷ However, municipalities demand more funding for heat planning in order to compensate for the increased financial and personnel costs.

E. Conclusion

As the municipalities are responsible for planning at the local level, they have a central coordinating and steering role in the heating transition.⁶⁸ Geographical proximity and the mandate to provide services of general interest give the municipalities the opportunity to assess the specific concerns of citizens and local business and to better take local conditions into account when developing heating plans.⁶⁹ Although the German legislator has assigned the task of municipal heat planning to the federal states, it will be the municipalities that are commissioned by the federal states to develop heating plans. This task poses challenges resulting from the variety of stakeholders who have to provide relevant data and whose interests have to be taken into account. This makes it difficult to obtain information in the mixed situation of energy supply companies and housing companies, but also to provide information to citizens in order to meet the requirements of a democratic heating transition. Against this backdrop, local authorities are increasingly faced with the challenge of balancing the specific interests of the various stakeholders with their own objectives and competencies in order to achieve the goal of climate-neutral heat supply for existing buildings.⁷⁰ This is accompanied by a high demand on existing human and financial resources, which can only be met with an appropriate funding system.

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67 Schwintowski, Hans-Peter, p. 255, 259.

68 On the growing importance of local authorities, see also Scheer, Nina, p. 261.

69 Riechel, Robert/Walter, Jan, p. 15.

70 Riechel, Robert/Walter, Jan, p. 13.

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Wärmeplanungsgesetz of 20 December 2023 (Federal Law Gazette 2023 I Nr. 394) (Heat Planning Act)

Niklas Korte¹, Michael Krisch²

Unlocking the untapped potential

How local administrations coordinate decentralized Photovoltaic Systems on Multi-Family House Roofs

Summary: This research paper explores the untapped potential of multi-family house roofs for photovoltaic (PV) installations and the role of local governments in coordinating their utilization. It highlights the significance of decentralized, private power generation and the integration of artificial intelligence (AI) for roof surface identification. The paper emphasizes the need for coordination through local administrations to facilitate the implementation of PV systems on multi-family house roofs. By leveraging AI technology, local governments can efficiently identify suitable rooftops and coordinate among various stakeholders to enable the expansion of decentralized PV systems. The study underscores the importance of collaboration between local governments and their residential companies and citizens. The study also contributes to the Actor Network Theory by incorporating the role of administrations and emphasizing the significance of data sets as components within a network.

Keywords: PV Systems, Multi-Family House Roofs, Public Administration, Structural Hole Theory, Chief Sustainability Officer

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- 1 Niklas Korte is a research assistant at ERCIS, the European Research Center for Information Systems, and a doctoral student at the Chair of Prof. Dr. Tobias Brandt for Digital Innovation and the Public Sector at the University of Münster. His research focuses on the transformation of public organizations, especially municipalities. Contact: niklas.korte@ercis.uni-muenster.de
 - 2 Michael Krisch works for the City of Osnabrück and is a PhD Candidate at the Chair of Prof. Dr. Peter Nitschke for Political Science at the University of Vechta. His research focuses on the Chinese influence on German municipalities as part of the Belt and Road Initiative. He is also lecturer for local government law at the University of Applied Science of Osnabrück. Contact: michael.krisch@hs-osnabrueck.de

A. Introduction

The reduction of fossil fuel consumption is a pressing concern in many European countries, driven by the imperative to address climate change and promote sustainable development. United Nations Sustainable Development Goal (SDG) 7 emphasizes the need for universal access to "affordable, reliable, sustainable and modern energy for all" (United Nations 2015). Renewable energy sources, such as wind, hydro, and PV systems, are recognized as key technologies in achieving these targets, and their deployment is advancing worldwide (Gielen et al. 2019). Renewable energy technologies, with their lower cost per kWh and reduced CO₂ emissions compared to traditional fossil fuels, play a vital role in meeting these goals (Gernaat et al. 2021). To achieve the set targets, the expansion of carbon-neutral energy sources needs to double every 5 to 7 years (Rockström et al. 2017).

The transition from fossil fuels to renewable energy technologies also has the potential to drive transformation in production, distribution, and consumption patterns. The energy transition is not merely about enhancing efficiency in economic and climate protection contexts; it has the power to revolutionize the entire energy market. Consumers can become "prosumers" (a portmanteau of *producers* and *consumers*) through decentralized electricity generation. In many developing countries lacking robust energy infrastructure and grid systems, off-grid solutions, especially those based on PV systems, have emerged as a common means of electricity generation and consumption (Kemausuor et al. 2018). These solutions offer a high degree of energy independence, which has sparked discussions in developed countries like Germany, particularly in the aftermath of the Russian invasion of Ukraine. The Russian war of aggression acted as a catalyst: In response to the war and rising energy and electricity prices, demand for balcony power plants rose in Germany (Der Tagesspiegel 05.07.2023).

Despite having well-established energy infrastructure, Germany has witnessed an increased drive for greater sovereignty from Russian gas imports. To address this concern, a key pillar outlined in the coalition agreement involves incentivizing the utilization of rooftop space for solar energy (SPD & Bündnis 90/Die Grünen & FDP 2021, p. 44). The building sector accounts for 34% of Germany's final energy consumption (BMWK 2021, p. 56). To combat the climate crisis and achieve climate goals equitably, the expansion of renewable energy, especially PV systems in the building sector, is a critical step. Although the deployment of PV systems on private buildings has been heavily promoted nationwide for years, progress remains slow, particularly for multi-family houses in urban areas. While federal and state governments provide the necessary financial resources, the financial incentives alone seem

insufficient. In contrast, municipalities can play a decisive role, being closely attuned to the needs of citizens and capable of collaborative engagement with them (Arda et al. 2023).

This study thus aims to explore the research question: *How can municipalities promote the expansion of PV systems on multi-family houses?* The study will address the following sub-questions: *Which stakeholders are crucial for the expansion of PV systems on multi-family houses? How can municipalities coordinate these stakeholders to foster PV expansion?* Employing an actor-network methodological approach, the study will comprehensively analyze the entire network of stakeholders associated with this topic. The Structural Hole Theory will be employed to identify where and what type of further coordination among the identified stakeholders is necessary. Various stakeholders will be interviewed to ascertain their roles and connections within the thematic context. Through these connections to other stakeholders, diverse actors have been identified.

B. Theoretical background and related work

The impact of fossil fuel energy utilization has been extensively researched. There is a scientific consensus that the consequences of climate change on the environment, economy, and our collective coexistence are profound, necessitating urgent action. Decision-makers of municipal energy providers have already acknowledged that the electricity market will undergo transformations. This chapter delves into the current state of the transition towards a more decentralized electricity market, presenting the latest scientific insights. Additionally, it outlines the relevant stakeholders identified thus far, elucidates the economic, legal, and technical frameworks, and describes the theory underpinning this research.

1. PV systems on multi-family houses

The potential of PV systems in Germany remains vastly untapped. According to a study by market research firm EUPD Research, there are approximately 11.7 million single and two-family houses suitable for PV installations in Germany.³ In this study, multi-family houses are defined as residen-

3 In Germany, the construction type of single- and two-family houses is predominant in residential buildings: at the end of 2018, 83% of residential buildings had only one or two dwellings, with only minor differences between the eastern German states (82%) and the western German states (84%). Even in the city states (Berlin, Bremen and Hamburg),

tial buildings with more than three residential units. Their share of the German housing market has been rising for several years, due in particular to increased construction and financing costs (Schmid 2021). However, with only 1.3 million PV installations on such buildings by the end of 2020, there is an untapped potential of 89% of the considered roof areas (Schwartzman 2021). Another study of Fraunhofer ISE found that less than 10% of the total available roof potential is currently utilized (Wirth 2023). These figures underscore the significant expansion opportunities for PV systems in Germany and its potential contribution to the overall energy generation.

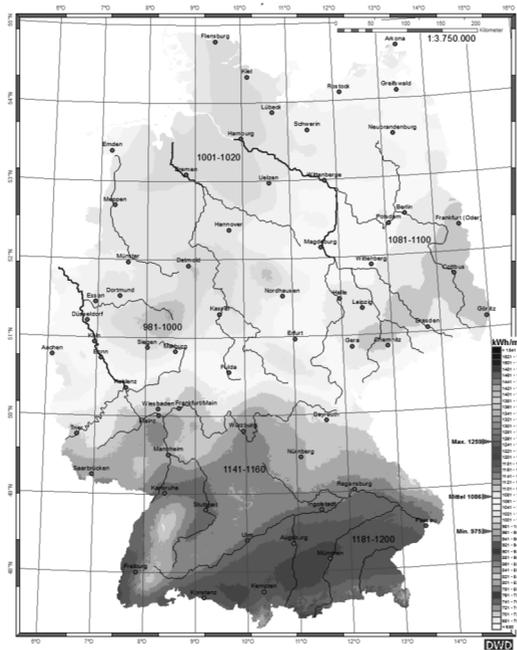
To maximize electricity generation from PV panels, sufficient solar irradiation is crucial. Apart from factors like altitude and average cloud cover at a location, latitude plays a pivotal role in determining the intensity of local solar radiation. In general, PV installations in southern Germany are more efficient than those in the north (see figure 1). Additionally, PV panels should be oriented correctly towards the sun, facing south, and free from obstruction by trees, buildings, or other structures. These various criteria need to be individually assessed for each property. However, residents or property owners are often unaware of most of this data, with some information being stored in public institutions.⁴

In this context, the rooftops of multi-family houses present significant potential for further PV expansion. However, progress in this area has been minimal in recent years, and a large portion of the available spaces remains unutilized. One of the reasons is the resistance of landlords towards PV installations on rental properties, often related to the issue of *split incentive* (Penny 2019). This problem arises because, in standalone PV investments, property owners bear the entire cost and risk, while the primary benefits accrue to the tenants. This situation has been exacerbated in recent years

the figure was 65%, or about two-thirds of all residential buildings (Sascha Krieger et al. 23.06.2021).

4 As the first city in Europe, the city of Osnabrück has established an area-wide solar potential register under the name "Sun-Area" (Martina Klärle et al. 2009) in cooperation with the Osnabrück University of Applied Sciences. This uses laser scanning data for a location analysis and potential calculation for PV and thermal solar systems for buildings in the city of Osnabrück. The latest edition of this web-based platform introduces homeowners to an expanded array of information. In addition to assessing the viability of their rooftop for PV installations, users can now explore the potential for solar thermal systems dedicated to water heating or heating support. Furthermore, the inclusion of a yield calculator provides an avenue for evaluating the economic viability of implementing a personal PV setup. This assessment takes into consideration prevailing investment expenditures, regulatory feed-in tariffs, and the attainable level of self-consumption of generated electricity (Stadt Osnabrück 2023).

Figure 1: Global radiation in Germany (German Meteorological Service 2021)



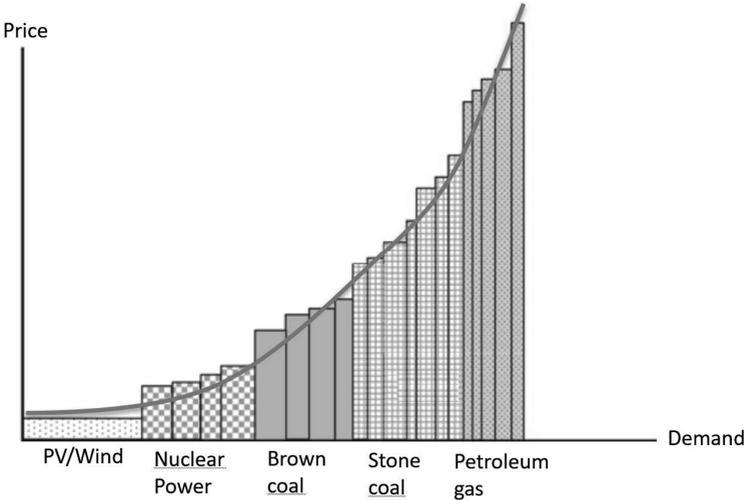
due to declining feed-in tariffs, leading to reduced profitability for PV operators. The financial benefits for tenants could prompt property owners to increase the net cold rent, citing lower ancillary costs. However, the acceptance of such an approach by tenants is currently unknown. Neither the current municipal support nor the economic attractiveness of electricity generation has led to a massive expansion of PV systems. While the idea that a profitable business model leads to more investment in this model seems intuitive, the implementation is more complex and less straightforward.

II. Energy Market Status Quo

The energy sector traditionally lacks a strong consumer-oriented focus, leading consumers to perceive electricity as a commodity that requires no active management on their part (Wang and Hu 2009). Furthermore, most users have limited understanding of the energy sector (Chen et al. 2021) and,

according to Wörner et al. (2022), "do not feel the need to develop an understanding of topics such as market logic of supply and demand or abstract measurement units such as kilowatt-hours." However, consumer awareness of this information is crucial to making economically sensible decisions. Electricity prices can be formed based on the Merit-Order Model (s. figure 2), where the price is determined by the cost of the most expensive power plant that is demanded or required for electricity supply (currently gas power plants) (Wawer 2022). Since the infrastructure will continue to rely on gas power plants, it is expected that end consumers may not benefit from an infrastructure predominantly influenced by renewable energies.

Figure 2: Merit Order Principle (Wawer, 2022)



In the emerging decentralized energy market, various stakeholders have achieved success. An exemplar of this trend and a significant constituent of the decentralized energy landscape is the concept of citizen energy cooperatives, highlighted as a positive illustration (Ahlemeyer et al. 2022). According to Ahlemeyer et al. (2022), this cooperative approach necessitates the identification of local key individuals, whose capacities should not be overburdened. Furthermore, it has been observed that political and regulatory/bureaucratic obstacles have frequently hindered the implementation of energy projects within this framework. Following a similar trajectory to the referenced study or as a natural extension thereof, our research delves

into the exploration of potential key individuals. In doing so, our study particularly adopt the lens of the public sector, focusing on the pivotal role played by municipalities.

III. Structural Hole Theory

Emerging fields of study are often observed and explored from various perspectives. New technologies, user preferences, or changing environmental factors need to be contextualized within the existing legal framework. Additionally, these aspects are evaluated from political, economic, and organizational viewpoints. The scenario investigated in this paper involves stakeholders from civil society, administration, and the business sector, while considering the legal and technological context. In such open and interdisciplinary fields with a high degree of diversity among the involved actors, the Structural Hole (SH) Theory is particularly applicable (Lin et al. 2022). The SH theory was developed by Burt (1992) for network analysis, focusing on the *who and how* of social structures in networks. The SH theory is used, among other things, to explain managerial performance by examining the advantages and disadvantages of individual positions (Rodan 2010). Other studies employ the SH theory to investigate knowledge transfer in informal networks (Reagans and McEvily 2003) or network dynamics in neighborhoods (Perez and Ting 2022). As a result, the theory is applicable to scenarios that examine a network and the different roles of its actors. The SH theory has become a recognized method in public administration research (Lee and Kim 2010; Reagans and McEvily 2003).

According to Burt (2010), there are typically few connections between groups or communities in networks, resulting in limited communication among them. This lack of connection is referred to as a Structural Hole, which, according to the SH theory, can be occupied by an SH spanner, acting as a broker of information or similar between the groups. Similarly, Lin et al. (2022) describe the absence of connections between actors as SH, which can be filled by other actors (SH spanners) as "bridges or intermediaries between them," better coordinating multiple tasks of diverse communities (Lin et al. 2022, 724). The SH theory thus appears suitable for our hypothesis and study. Through the lens of the SH theory, the existing network will be examined to identify potential SHs and corresponding SH spanners.

C. Research Design

In an Actor-network approach, the observation extends beyond human actors to include technology, infrastructure, and other non-human entities. Each actor plays a distinct role within the network and has connections to at least one other actor. The Actor-network methodology was chosen to investigate the human actors, their roles, and their connections within the network. This study focuses on actors at the municipal level who actively participate as actors in the network. These actors comprise individuals, companies, governmental institutions, digital tools, data, and infrastructure.

1. Case Selection and Description

Examining a network of various actors is particularly successful in a well-defined region. The Osnabrück region was selected due to several advantages, including the author's existing contacts with the municipal energy provider, local government, and property management. Nevertheless, most actors also possess experience or current tasks in this field on a supra-regional level. The federal and state levels were deliberately excluded, even though the topic of PV installations in the private sector and the utilization of multi-family buildings is also discussed at these upper federal levels. However, networks at the municipal level differ significantly from those at the state and federal levels in terms of actor types, tasks, and themes.

Data collection was carried out through various methods involving multiple actors. Interviews were conducted via video calls, phone calls, and face-to-face interactions. Additionally, a moderated exchange between two actors took place through video calls, and several thematically related workshops were held with one actor as part of a project seminar. Each interviewed actor was also asked about other actors they deemed significant in this subject area, enabling the identification of a diverse set of actors and facilitating access to other actors within the network through existing connections. This snowballing approach proves particularly valuable in this context to explore the network comprehensively and avoid overlooking any actors. The initial actors were contacted based on the author's assumption of their role within the network, and further actors were reached out to based on recommendations from previous interviewees.

II. Data Collection and Analysis

The current state of existing connections was first assessed and presented. Primarily, unstructured interviews were conducted with various individuals on the topic. Unstructured interviews were chosen since the author had limited prior knowledge about the specific domains of the actors. The actors were asked about their general views on the subject, and the author followed up with spontaneous queries that arose during the interviews. No interview guide or other standardized instruments were employed because each interview was unique, and no two actors were interviewed in the same manner. All actors were solely questioned about their tasks, needs, and connections to other actors in the subject domain. Subsequently, potential collaborations were mapped, and an actor-network was developed to encompass all connections.

In addition to the interviews, an inductive approach involved a moderated discussion between two actors to test their expressed requirements for another actor. Furthermore, multiple workshops were conducted with one actor to extensively collect their requirements. Specifically, a face-to-face interview (IN-I) was conducted with a property management representative from Osnabrück. This individual professionally manages numerous properties in Lower Saxony, primarily acting as an external property manager for multi-family houses owned by various property owners. The same individual was subsequently brought into a video conference with a startup founder (Startup I) from Lower Saxony, specialized in leasing roof spaces of multi-family houses for the installation of PV systems. Both actors engaged in a discussion moderated by the author (MD-I) on the topic of PV systems on multi-family houses.

An interview on Smart Metering was conducted via video conference with the CEO of a municipal energy provider (IN-II). Several workshops (WS-I) on decentralized power supply were held with Stadtwerke Münster as part of a project seminar. A telephone call (IN-III) was made with the originator of the SoFiE project (Solar Finder Engine; Startup II) from the Münster Hackathon 2021, and publicly available data on the project was gathered. The project had won first place in the previous Hackathon, and the originator is now employed by Stadtwerke Münster for its implementation.

Lastly, a face-to-face interview (IN-IV) was conducted with a municipal executive to discuss the requirements and potential tasks of municipalities in this context.

Table 1. Overview of interviewees

Pseudonym	Position	Affiliation	Type	Topic
IN-I	CEO	Property management	Face-to-face interview	Power dynamics in owner's meeting
MD-I	Managing Director + Founder	Property management + Startup I	Video-Call	Lease of roof spaces
IN-II	CEO	Municipal Energy supplier	Video-Call	Smart Metering
WS-I	Head of Department IoT	Municipal Energy Supplier	Workshops	Tenant electricity
IN-III	Founder	Startup II	Phone Call	Solar Finder Engine
IN-VI	Head of Department Organization & Digitalization	Municipality	Face-to-face interview	Municipal sustainability strategy and organization

D. Findings

The following section presents the results of the qualitative analysis pertaining to the actors and the overall network. The information is derived from the interviews and reflects the self-disclosures of the respective interviewees. A brief description of each actor is provided, along with their classification into the corresponding group. Furthermore, the connections among the different groups are illustrated, and potential Structural Holes (SH) are identified.

I. Group "Multifamily houses"

The decision regarding the utilization of rooftop space for PV installations is made by the respective property owners, who may not necessarily be the occupants of the property. In the case of multi-family houses, the property owners are often landlords of one or more apartments within the building. A property can be occupied by either owners or tenants, and in multi-family houses, a mix of both can be present. Frequently, property management companies are engaged to handle tasks such as billing for utilities, adminis-

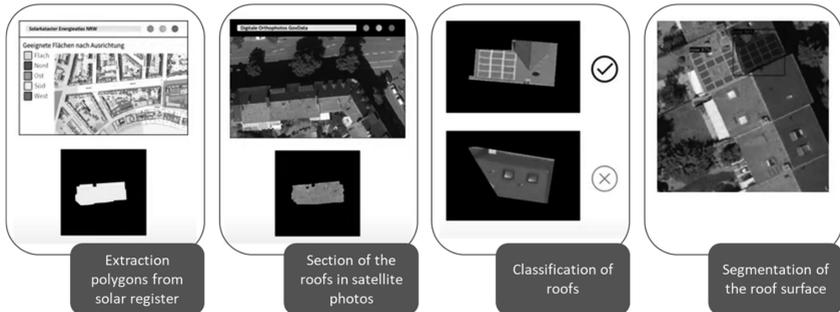
tering repairs, and maintaining the property. According to IN-I, this also includes activities like window, heating, and rooftop maintenance, which property management companies routinely mention on their own. However, organizing the installation of a PV system is not a standard responsibility of property management so far and must be explicitly commissioned by the owner's community.

Tenants residing in a multi-family house do not have voting rights within the owner's community, thus lacking direct influence over whether a PV system is installed on the rooftop or not. They can only exert influence through expressing a desire for renewable energy usage, expressing interest in purchasing an electric vehicle and requiring a charging station, or deciding to enter or terminate a tenancy. As such, tenants are the actor group with the least impact on the decision-making process. However, as direct beneficiaries, they could significantly profit if locally generated electricity were provided to them at favorable rates.

Property owners, especially those not residing in the respective properties, stand to benefit less from such installations. A discounted electricity tariff is not of interest to them, and adding lower utility costs to the rent is not appealing. According to the property manager (IN-I), owners do not expect tenants to consider these long-term costs when seeking a rental property. Moreover, the demand, especially in urban areas, is so high that rental properties are unlikely to remain vacant for extended periods. This lack of financial incentives, coupled with the complexity of decision-making processes within usually annual owner's meetings, results in a limited motivation for owners to engage in decentralized power generation. IN-I points out that owners would not only require the financial means for the initial investment but also need a high degree of idealism due to the lack of incentives. In a typical owner's meeting, there is often insufficient time to thoroughly address the complex topic.

The group consisting of property owners, tenants, and the infrastructure related to the respective rooftop spaces typically does not act as individual entities but is organized through property management. This group has connections to the municipal energy provider and private businesses, such as craftsmen, through property management. Thus, gaining access to this group is usually achieved through property management, which has access to all actors within this group. According to IN-I, property management holds a kind of preparatory power by highlighting the possibility of installing a PV system and preparing corresponding decision-making processes for the owner's meeting. However, this is rarely done due to the associated high effort. IN-I suggests that with a more straightforward con-

Figure 3. AI Model of Solar Finder Engine (SoFiE, MünsterHack 2021).



ceptualization, more property management companies would utilize this option.

II. Group “Startup”

The context of PV installations on multi-family houses is still relatively new and evolving. It is not uncommon for startups to emerge in this environment, driving innovation and experimenting with suitable business models. During WS-I, a startup was identified that specializes in AI-based detection of suitable rooftop spaces. Using machine learning, the startup trained an AI that automatically identifies rooftops based on solar exposure and recognizes rooftops already occupied by PV installations. Initially, publicly available data (solar cadastre) was used to extract polygons and generate roof segments from satellite images (Digital Orthophotos GovData). The startup performed manual classification of these segments to train the AI (figure 3). The startup then develops a score that represents the suitability of a rooftop. Publicly available data on roof pitch, which can be found, for example, in the construction office of the municipality, are required for this purpose. Establishing a connection with the municipality would, therefore, be beneficial. With the score, property owners or property management companies could be targeted with information about how suitable their respective properties are.

In the conversation with the CEO of the municipal energy provider (IN-II), another startup was discussed, which focuses on leasing rooftop spaces for PV installations. The business case of this startup involves aggregating suitable rooftops (pitch, size, condition) and subsequently installing

PV systems. The PV system is operated by the startup, and the generated electricity is sold. The above-mentioned model of tenant electricity is used, which is offered to the residents of the property. The remaining electricity is fed into the power grid, and the corresponding compensation is received. According to IN-II, the startup takes over the coordination of all approval and installation matters related to the PV system, relieving property owners of the decision-making process. The lease payment for property owners is an additional source of revenue without any cost.

Access to property management companies or owner communities as potential customers is crucial for this startup. During the moderated interview (MD-I), mutual requirements and needs were elucidated. The power dynamics within the owner's community were not entirely known to the group of startups. Additionally, the startup could add another criterion for assessing rooftop spaces. Rooftops that will require repairs in the coming years cannot be economically fitted with a PV system beforehand. From this, the insight was derived that synergy effects could be utilized, such as reusing the scaffolding for the installation of the PV system during the roof repair or renewal. This collection of mutual requirements is deemed highly important for the respective groups.

III. Group “Municipal utilities”

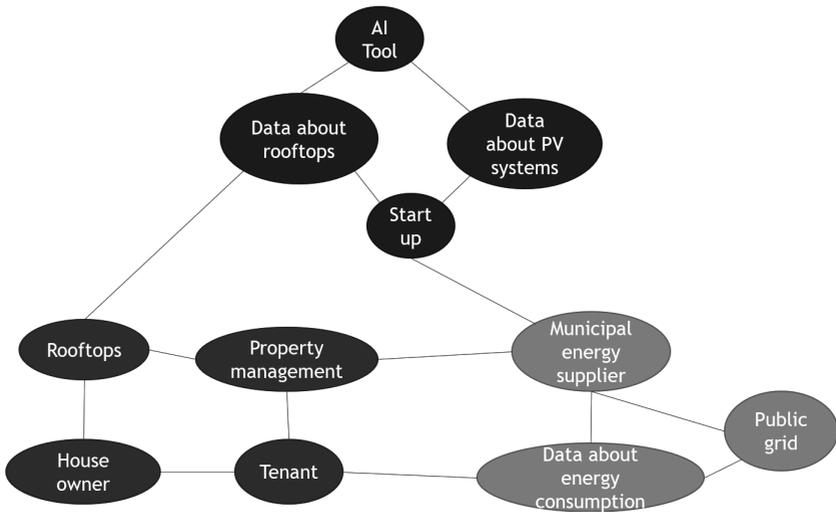
Municipal utilities traditionally hold responsibility for electricity generation and distribution within their jurisdictions. They play a significant role in advancing the energy transition locally and have corresponding strategies in place. A critical task of municipal utilities is to balance electricity supply and demand, which must be maintained at a constant frequency of 50 Hertz. The storage capacity for electricity is limited in this context. The prediction of electricity demand for the following day or the next few months is based on historical consumption data, taking into account factors such as weekdays, times of the day, and seasonal variations. According to WS-I, these forecasts have become increasingly challenging due to the decentralization of the electricity market.

Based on these new conditions (decentralized electricity market, more challenging predictions, prosumers), the municipal utilities from WS-I derived the task of establishing a smart grid. Intelligent metering systems are utilized to enable intelligent control of the lower two grid levels (low-voltage and medium-voltage levels). Various sensors are installed to build a so-called Smart Grid. The municipal utility involved in WS-I uses LoRaWAN sensors and gateways for transmitting electricity consumption data from end-consumers. Additionally, visualizing consumption data on an energy

data platform for end-consumers has been identified as another task. The data collected from the Smart Grid is processed and made available to end-consumers to provide insights into their electricity consumption or possible electricity production. The municipal utilities are also contemplating offering end-consumers a tenant electricity model or similar models. However, as these efforts are only tangentially related to their core business, the activities in this area are still limited. As a result, connections to end-consumers exist primarily in the context of electricity contracts but not specifically related to the installation of PV systems. The innovative approaches of startups are closely monitored by municipal utilities, and in the case of WS-I, they are even supported through a hackathon.

From the interviews and workshops, several insights were gained regarding the tasks and connections of relevant actors in the context of PV installations on multi-family houses. Missing connections were particularly noted concerning data exchange (roof suitability, roof pitch, smart meter data, and contact persons of property owners). The following section presents an actor-network that corresponds to the current situation developed in this chapter, followed by proposing an extension in the next chapter.

Figure 4: Actor Network with different actor groups



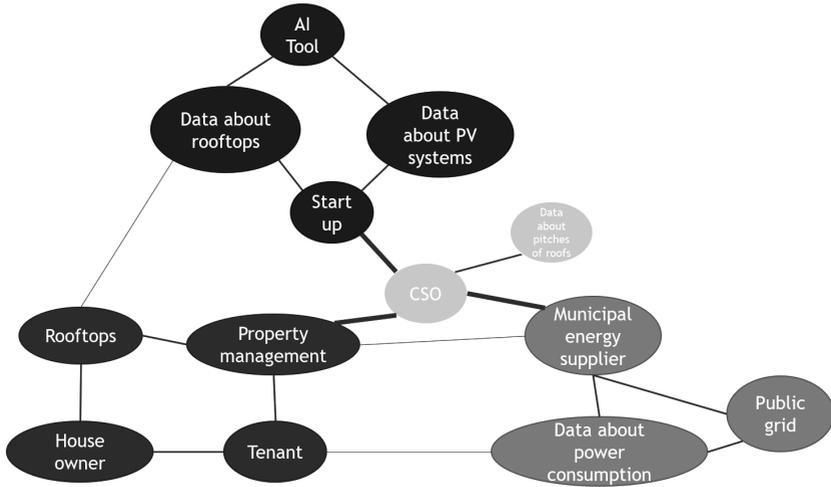
E. Chief Sustainability Officer and Discussion

The developed and depicted network reveals three groups with internal connections and partial connections with other groups. Municipal utilities are linked to both other groups through startups and property management companies. Apart from these connections, there are loose links between individual actors in the network, such as between tenants and data on their electricity consumption. Particularly, the data within each group are of interest to the other groups. For identifying suitable rooftop areas and facilitating decision-making in property owners' meetings, the exchange of all relevant data is crucial.

However, there is currently no cooperation between the different groups. Property management companies do not consider this as their responsibility, and municipal utilities also focus on other core business areas. Although some startups attempt to develop business models involving cooperation, they face various capacity issues related to regulations or influential connections. Additionally, limited personnel in their early stages hinders their ability to contact potential customers extensively. A coordinating entity that gathers and transparently presents the requirements and needs of all stakeholders is lacking. Furthermore, such a coordinating entity could address the inclusion of missing actors, such as in this case, the data on the pitch of the roofs. Most interviewed actors expressed positive views on the prospect of a municipal coordinating body when directly questioned.

This coordinating entity was presented by interviewees either as a position in the local administration, which we call Chief Sustainability Officer (CSO), or as a cooperative platform at the municipal level. The CSO acts as a classic SH spanner, filling a structural "hole" by having access to all groups and collecting their requirements and needs. From this position, cooperation between the groups can be actively organized, no longer relying on informal networks. In this case, the establishment of a CSO in municipal administration could provide a better overview and easier access to official data within the administrative organization. The proposed platform could also serve as a SH spanner, particularly suitable for data exchange. According to the Actor Network Methodology, such a platform is considered an actor, just like natural persons, institutions, infrastructure, data, or software. However, in this specific context, the focus is primarily on stakeholder requirement analysis, coordination tasks, and establishing connections between the actors.

Figure 5: Actor Network with CSO as a SH spanner



F. Implication and Conclusion

The technological components necessary for addressing climate change are already available. However, the progress towards achieving the set goals regarding global warming is alarmingly slow, putting the targets at serious risk. It is evident that the solution to this challenge lies not only in major political arenas or innovative technologies but also in the formation of new networks. This study contributes one of the crucial building blocks, among many, towards tackling climate change through a qualitative analysis. The study presents a possibility to promote the expansion of renewable energy generation, focusing on the building sector and describing how relevant actors in the network can be coordinated to facilitate the installation of PV systems on multi-family houses.

Practical implications arise from depicting this actor network and defining the role of a municipal CSO in this specific context. The actors have been categorized into four groups (property management companies, startups, municipal utilities, and administrations), with some loose connections already existing between individual actors. However, to expedite and streamline the expansion of PV systems on multi-family houses, active coordination among all actors is imperative. Currently, there is no actor fulfilling this

coordinating role within the existing network. Such a role could be assumed by a CSO, adding it as another responsibility in their portfolio. Additionally, a municipal CSO can provide crucial public data to the focused network, further justifying the role of a CSO in this context. Moreover, having this coordination activity in public hands is beneficial, as it is rarely financially rewarded, and a municipal CSO operates without a profit motive.

Expanding the role of a CSO prompts consideration of additional responsibilities that can contribute to sustainable development. One potential avenue involves the monitoring of sustainability initiatives, ensuring compliance with sustainability laws, and implementing appropriate educational initiatives as needed (Farri et al. 2023). Furthermore, the inclusion of new stakeholders or the identification and integration of existing ones within the network could enhance its effectiveness. For instance, the group of investors, comprising private investors, national government funding programs, or local banks, could be taken into account. This group could establish suitable funding programs aligned with specific planned activities by the CSO. Although this particular stakeholder group of investors was not mentioned in any of the interviews or workshops, its potential inclusion remains conceivable, providing avenues for future research and practical implementation. The notion of a more comprehensive portfolio for the CSO thus opens up opportunities for broadening their scope of influence and fostering collaboration across an even wider spectrum of actors.

Theoretical contributions lie in describing the interconnections between actors beyond the structural hole spanners and examining the perspective of a non-profit-driven SH spanner. The study demonstrates that various actors can establish connections with one another even in the absence of a SH spanner. While some connections may be relatively loose, they are still present. Certain connections may only be directly known to one actor, particularly concerning data collection, where natural and legal persons, as well as infrastructure, must be considered as actors within the network.

The actor network analysis conducted in this research sheds light on the interconnections and interactions among various stakeholders involved in the deployment of PV systems on multi-family houses. The identified actor network highlights the presence of three distinct groups, each having internal connections and some shared links with other groups. The crucial role played by the CSO as a structural hole spanner is evident in facilitating communication and collaboration among the different groups.

One significant implication of this study is the recognition of the need for enhanced cooperation and data exchange between the identified actor groups. The lack of cooperation and data sharing among these stakeholders hinders the effective implementation of PV systems on multi-family houses.

Establishing a coordinating entity, such as a CSO or a municipal-level cooperation platform, could bridge the existing gaps and promote collaborative efforts among the actors.

The findings also highlight the potential of startups in driving innovation and promoting sustainable solutions in the context of PV systems. However, these startups face capacity constraints, regulatory challenges, and resource limitations. Therefore, supporting these startups and providing them with opportunities to grow and collaborate with other stakeholders can significantly contribute to overcoming barriers in the adoption of PV systems. Furthermore, the importance of data accessibility and transparency cannot be understated. Making relevant data, including roof suitability, roof inclination, and smart meter information, publicly accessible would enable informed decision-making and encourage broader participation from stakeholders. This aspect becomes particularly relevant in the context of a CSO or a cooperation platform, which can facilitate the exchange of critical data among the relevant actors.

In conclusion, this research has provided valuable insights into the actor network involved in the deployment of PV systems on multi-family houses. The actor network analysis has elucidated the interconnected relationships among the identified groups, emphasizing the significance of the CSO as a pivotal figure in bridging communication gaps between stakeholders. The study's implications highlight the need for improved collaboration and data sharing among the various actor groups. Establishing a coordinating entity, such as a CSO or a municipal cooperation platform, presents a promising solution to address existing challenges and foster synergistic efforts. The role of startups in driving innovation and exploring new business models for sustainable energy solutions has been acknowledged. Supporting these startups and removing regulatory hurdles can pave the way for innovative solutions to flourish.

Overall, this research contributes to the understanding of actor interactions and provides a foundation for future studies and initiatives aimed at advancing the adoption of renewable energy solutions in multi-family houses. By recognizing the significance of coordination and data transparency, stakeholders can work together to overcome barriers and accelerate the transition towards a greener and more sustainable future.

The study has some limitations. The study's scope is relatively regional, focusing on the Münsterland and southern part of Niedersachsen. Nevertheless, it is reasonable to assume that other regions in Germany may exhibit similar or at least comparable networks. Nonetheless, some information and data are limited to the German context and may only apply to other countries with different legal, political, and technical conditions to a limited

extent. The most significant limitation is the small sample size. To enhance the rigor of the findings, future studies should explore whether actors with similar roles in other regions produce the same results.

Declaration of generative AI and AI-assisted technologies in the writing process

During the preparation of this work the authors used ChatGPT3.5 in order to improve language and readability. After using this tool, the authors reviewed and edited the content as needed and take full responsibility for the content of the publication.

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*Joanna Bednarz*¹, *Magdalena Markiewicz*²

Universities as Catalysts of Digitalization and Sustainable Socio-Economic Transformation

Case studies of telemedicine, digitalization, and cultural aspects of the study programs in academic collaborations

Summary:

The pandemic was a catharsis in many aspects, including digital development, followed by the widespread use of digitalization and artificial intelligence, which continues to reshape the labor market, societal norms, economies, and governance. Universities are uniquely positioned as research and knowledge dissemination centers in this rapidly evolving landscape. They are not only at the forefront of sustainable practices and digital integration but likewise have the potential to raise a sense of social responsibility among their stakeholders. This empowerment can drive positive change in their communities and beyond, nurturing environmentally conscious mindsets and practices for a mobile society and generational inclusiveness, both with digital natives and members of an aging society, which will be a focal point of discussion.

The paper aims to explore the complex role of universities in driving sustainable socio-economic development through implementing new courses and engagement in education proposals that follow the challenges of digitalization and environmental considerations. To illustrate these concepts, the analysis includes two specific case studies of innovation in the study

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- 1 Joanna Bednarz is an Associate Professor at the Faculty of Economics, University of Gdansk in Poland. She is the head of the Department of International Business. Her research interests include building competitive advantage of enterprises, consumer purchasing behavior, product and brand management. Contact: joanna.bednarz@ug.edu.pl.
 - 2 Magdalena Markiewicz is an Assistant Professor of International Financial Markets at the Faculty of Economics, University of Gdansk in Poland. Her research focuses on sustainable finance, digital and green banking, international and digital currencies, mergers and acquisitions. She performs as deputy dean for development and cooperation at the Faculty of Economics. Contact: [magdalena.markiewicz@ug.edu.pl](mailto:magdalenamarkiewicz@ug.edu.pl).

programs: telemedicine and healthcare projects and security and cultural aspects of digitalization in teaching.

Keywords: university, digitalization, sustainability, helix, SDG

A. The role of academia in developing digitalization and sustainable development

To explore universities' multifaceted role in driving sustainable socio-economic development amidst the challenges of digitalization and environmental considerations, we research the interplay between academia, public administration, digitalization, and sustainability. As digitalization processes and the use of artificial intelligence continue to reshape societal norms, economies, and governance, universities must navigate these transformations being actively engaged in relations with their socioeconomic environment. Diverse administrative cultures and legal frameworks require adaptable approaches to address local needs while enhancing a harmonious regional and global ecosystem. Universities, as the centers of research and knowledge dissemination, are uniquely positioned at the forefront of sustainable practices and digital integration. They play a crucial role in using innovative teaching methodologies that help to raise environmentally conscious mindsets and practices for a mobile society, cultural diversity, and generation differences. We explore the complex role of universities in driving sustainable socio-economic development within the challenges of digitalization and environmental considerations in the light of cooperation models³, highlighting the main features and mechanisms of digitalization in education for future employment in the labor market, which would promote a more inclusive society.

The study aims to show how universities can align their research and teaching to outreach digital initiatives and contribute meaningfully to digitalization challenges and sustainable development goals. Following this aim, we highlighted two case studies, being successful examples of cooperation of academia, business, and public administration in technology implementation based on realized projects: (1) innovative interdisciplinary study programs focused on telemedicine and healthcare projects, and (2) security and cultural aspects of digitalization in teaching. The case study examples

3 Cai, Yuzhuo & Henry Etzkowitz: Theorizing the Triple Helix Model: Past, Present, and Future, in: *Triple Helix*, 2020 7(2–3).

covered the digitalization-related projects realized at European universities in 2018-2023.

B. The models of cooperation of academia, business, and public administration in developing digitalization and sustainable development

1. Helix models of business, academia, and government cooperation

The general models explaining the relations in the socioeconomic environment are helix models, among which triple, quadruple, and quintuple models of cooperation between businesses, universities, and administration are most recognized for researching sustainability problems⁴. The contemporary subschemas continuously develop, reaching the new layers of the N-tuple Helix for innovation, Sustainable Development Goals (SDGs), and growth⁵. Etzkowitz and Zhou also proposed a Sustainability Triple Helix of university-public-government complementing the Innovation Triple Helix of university-industry-government, a new dynamic element into the traditional model⁶. The Triple Helix Model, pioneered by Etzkowitz and Leydesdorff, emphasized the dynamic interaction between academia, industry, and government as crucial actors in promoting innovation and economic development⁷. It underscored the importance of university-industry-government collaborations in driving technological advancements and societal progress⁸. However, as the innovation landscape continues to evolve, the

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- 4 Leydesdorff, Loet & Henry Etzkowitz: Emergence of a Triple Helix of University-Industry-Government Relations, *Science and Public Policy*, 1996 23(5). doi: 10.1093/spp/23.5.279.
 - 5 Gebhardt, Christiane, Mariza Almeida & Henry Etzkowitz: Triple Helix Twins: Operationalizing the Sustainability Agenda in the Northern Black Forest National Park in Germany, in: *Triple Helix*, 2022 5(2). doi: 10.1163/21971927-bja10031. Zhou, Chunyan & Henry Etzkowitz: Triple Helix Twins: A Framework for Achieving Innovation and Un Sustainable Development Goals, in: *Sustainability*, 2021 13(12). doi: 10.3390/su13126535.
 - 6 Leydesdorff, Loet & Henry Etzkowitz: Emergence of a Triple Helix of University-Industry-Government Relations, *Science and Public Policy*, 1996 23(5). doi: 10.1093/spp/23.5.279. Etzkowitz, Henry & Chunyan Zhou: Triple Helix Twins: Innovation and Sustainability, in: *Science and Public Policy*, 2006 33(1). doi: 10.3152/147154306781779154.
 - 7 Etzkowitz, Henry & Chunyan Zhou: Triple Helix Twins: Innovation and Sustainability, in: *Science and Public Policy*, 2006 33(1). doi: 10.3152/147154306781779154.
 - 8 Leydesdorff, Loet: The Triple Helix, Quadruple Helix, ..., and an N-Tuple of Helices: Explanatory Models for Analyzing the Knowledge-Based Economy? in: *Journal of the Knowledge Economy*, 2012 3(1). doi: 10.1007/s13132-011-0049-4.

role of universities has shifted from only knowledge generators to active participants in the innovation process⁹. This transition gave rise to the Quadruple Helix Model, introduced by Carayannis and Campbell, who added a fourth helix, the civil society¹⁰. This model recognized the integral role of citizens, communities, and societal values in shaping innovation ecosystems. The Quintuple Helix Model, furthermore proposed by Carayannis and Campbell, introduced a fifth helix: the natural environment¹¹. It emphasized sustainability and the need for responsible innovation practices that consider environmental impacts. As these helix models evolve, universities are increasingly positioned as catalysts for inclusive and sustainable innovation ecosystems that transcend traditional boundaries and embrace diverse stakeholders¹². This shift highlights the imperative for universities to adapt their strategies and collaborations to address complex societal challenges while adopting innovation for the benefit of all.

The helix models redefine universities' roles in innovation ecosystems. However, they impact students' preparation for the labor market and acting as entrepreneurs. Emphasizing interdisciplinary collaboration and engagement with diverse stakeholders, students are encouraged to develop technical expertise, intercultural communication, teamwork in transnational teams, and ethical reasoning skills¹³. The traditional model of education, focused solely on academic knowledge acquisition, is giving way to a more holistic approach that integrates practical experiences, real-world problem-solving, and social responsibility.

In this context, universities are challenged more than ever to rethink their curricula and pedagogical approaches to better align with the needs

9 Leydesdorff, Loet & Henry Etzkowitz: The Triple Helix as a Model for Innovation Studies, in: *Science and Public Policy*, 1998 (25).

10 Carayannis, Elias G. & Campbell, David F. J.: Triple Helix, Quadruple Helix and Quintuple Helix and How Do Knowledge, Innovation and the Environment Relate to Each Other? A Proposed Framework for a Trans-Disciplinary Analysis of Sustainable Development and Social Ecology, in: *International Journal of Social Ecology and Sustainable Development*, 2010 1(1). doi: 10.4018/jsesd.2010010105.

11 Ibidem.

12 Bonilla-Jurado, Diego, Guevara Cesar, Sánchez Montero, Ivanna Karina, Iza Pazmiño, Sarah Jacqueline, and Chenet Zuta, Manuel Enrique, The Triple Helix Model Linked to Knowledge Transfer and Economic Progress from Universities. *Salud, Ciencia y Tecnología*, 3 2023. doi: 10.56294/SALUDCYT2023314.

13 Trencher, Gregory, Masaru Yarime, Kes B. McCormick, Christopher N. H. Doll, and Steven B. Kraines, Beyond the Third Mission: Exploring the Emerging University Function of Co-Creation for Sustainability, *Science and Public Policy* 41(2) 2014. doi: 10.1093/scipol/sct044.

of the evolving market competencies. Interdisciplinary programs and experiential learning opportunities, such as internships, industry projects, and community engagement initiatives, become essential for student preparation. Implementing a Triple Helix relationship practically contributes to the creation of study program enhancing innovation, and supporting the changes in the program structures¹⁴. The Triple, Quadruple, and Quintuple Helix Models have created influential frameworks for understanding innovation ecosystems and universities' roles. Scholars continue to propose new conceptualizations and frameworks to capture the complexity of innovation processes and the roles of various stakeholders¹⁵.

II. Other models of business, academia, and government cooperation

In H. Chesbrough's open innovation concepts, scholars have explored different models emphasizing innovation's collaborative and open nature¹⁶. These models often highlight the importance of external partnerships and co-creation in driving innovation. With the increasing interconnectedness of global innovation networks, there's a growing focus on understanding how organizations, individuals, and institutions collaborate and exchange knowledge. Network-based innovation models emphasize the dynamics of relationships and information flows within and across ecosystems¹⁷. Given the pressing challenges of digitalization, climate change, or environmental degradation, there's a rising interest in models integrating sustainability principles into innovation ecosystems. Sustainability-oriented models balance economic, social, and ecological objectives¹⁸. As digital technologies continue transforming industries and societies, models specifically address-

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- 14 Schiller, Benjamin, and Liudvika Leišytė, Study Program Innovation in the Triple Helix Context: The Case of Cooperative Study Programs at a German University of Applied Sciences, *Triple Helix* 7(2–3) 2020. doi: 10.1163/21971927-bja10002.
 - 15 Bonilla-Jurado, Diego, Guevara Cesar, Sánchez Montero, Ivanna Karina, Iza Pazmiño, Sarah Jacqueline, and Chenet Zuta, Manuel Enrique, The Triple Helix Model Linked to Knowledge Transfer and Economic Progress from Universities. *Salud, Ciencia y Tecnología*, 3 2023. doi: 10.56294/SALUDCYT2023314.
 - 16 Chesbrough, Henry W., The Era of Open Innovation, *MIT Sloan Management Review* 44(3) 2003.
 - 17 Breuer, Henning, & Florian Lüdeke-Freund: Values-Based Network and Business Model Innovation, in: *International Journal of Innovation Management*, 2017 21(3). doi: 10.1142/S1363919617500281.
 - 18 Zhou, Chunyan & Henry Etzkowitz: Triple Helix Twins: A Framework for Achieving Innovation and Un Sustainable Development Goals, in: *Sustainability*, 2021 13(12). doi: 10.3390/su13126535.

ing the dynamics of digital innovation ecosystems are needed¹⁹. The digital innovation models explore how platforms, data, and technologies shape innovation networks and value creation. Although all these models have some limitations and may not explicitly use the ‘helix’ metaphor, they contribute to understanding society's ecosystems and the changing roles of universities, businesses, governments, and other stakeholders.

III. Knowledge sharing process between academia, business, and public administration

Knowledge sharing is a dynamic process through which individuals and organizations acquire new know-how, skills, and attitudes by interacting in the social environment. By sharing experiences, perspectives, and best practices, stakeholders can collectively identify challenges, explore innovative solutions, and co-create knowledge that effectively addresses local needs. Engaging students in real-world problem-solving provides hands-on learning experiences and promotes civic engagement. By empowering students to participate actively in sustainable partnerships, universities prepare them to make meaningful community contributions.

Practical cooperation between business, public administration, and academia fosters sustainable partnerships and drives innovation. Public administration agencies provide valuable insights into local needs, regulatory requirements, and policy priorities, while academia offers expertise in research, analysis, and knowledge generation. By collaborating on joint initiatives, such as research projects, policy development, or capacity-building programs, public administration and academia can effectively leverage their strengths to address complex societal challenges²⁰. This cooperation enhances research efforts' relevance, leading to informed decision-making and better outcomes for communities. Investing in human capital through training ensures collaborative long-term sustainability and impact, building key competencies and organizational resilience.

Technological advances and societal expectations profoundly transform governance models in the digital era. Digital transformation promises increased transparency, accountability, and efficiency in government opera-

19 Leising, Eline, Jaco Quist & Nancy Bocken: Circular Economy in the Building Sector: Three Cases and a Collaboration Tool, in: *Journal of Cleaner Production*, 2018 (176). doi: 10.1016/j.jclepro.2017.12.010.

20 Schiller, Benjamin & Liudvika Leišyt: Study Program Innovation in the Triple Helix Context: The Case of Cooperative Study Programs at a German University of Applied Sciences, in: *Triple Helix*, 2020 7(2–3). doi: 10.1163/21971927-bja10002.

tions and service delivery. *E-government* initiatives leverage digital technologies to streamline administrative processes, enhance citizen engagement, and improve the accessibility and quality of public services. *E-study* platforms provide opportunities for lifelong learning, skill development, and knowledge sharing, enabling individuals to access educational resources anytime, anywhere. By embracing the opportunities and challenges of the digital era, governments can build more responsive, inclusive, and resilient governance systems that empower citizens and drive innovation. An example may be the concept of *e-health* supported by telemedicine and healthcare projects. On the other hand, *e-universities* can contribute to knowledge sharing and the efficient management of resources and promote sustainable and inclusive growth, social development, and environmental protection.

C. Case study – telemedicine and healthcare projects studies at the University of Gdansk

In 2019, just before the pandemic, the University of Gdansk in Poland launched the study "Telemedicine²¹ and Projects in Health Care. Health Care Technology", which responded to the contemporary challenges of remote provision of medical services. It was a unique, interdisciplinary, first-in-Poland study that combined economic, legal, and technical perspectives in telemedicine. It addressed the needs of the university to prepare well-educated graduates and the market needs for the qualified administration of healthcare units conducting telemedicine services. This field of study with a practical profile was run jointly by the Faculty of Economics and the Faculty of Law and Administration of the University of Gdansk part-time, which enabled the upgrading of the competencies of candidates working daily²². The program's economic, legal, and technical aspects prepare graduates to work and manage healthcare entities implementing organizational

21 The term 'telemedicine' is commonly used to describe the remote delivery of healthcare and health information. Despite their distinct meanings, 'telehealth' is often used interchangeably with 'telemedicine'. Both terms refer to the electronic transmission of health information between the medical center and the patient.

22 The field of study was planned as part of the project Development Program of the University of Gdansk (ProUG) realized in 2018-2023 and co-financed by the EU Operational Program 'Knowledge Education Development' within the National Centre of Research and Development.

and technical solutions²³. The possibility of using applications and devices that facilitate health monitoring is becoming increasingly common. Intensive development in telemedicine technology implementation is associated with consistently meeting international standards regardless of geographical barriers. The increasing openness of both patients and doctors to new technologies is a global trend. Telemedicine is likewise mentioned in Europe's WHO Regional Digital Health Action Plan for 2023-2030, which concerns European countries²⁴.

Ethics and data protection are essential issues for telemedicine. Nittari, Khuman, and Ricci researched gaps in ethical aspects such as informed consent, data protection, confidentiality, physician malpractice, liability, and telemedicine regulations, which are considered a matter of concern for healthcare operators and public administration²⁵. Similarly, Tiribelli, Monnot, and Kong noted ethical risks that should be detected, prevented, or mitigated due to the responsible use of AI-based telemedicine in and for public health²⁶. Due to the expansion of AI, ethics frameworks and legislation have been developed to support AI-based telemedicine solutions, especially for its adoption in and for public health. In the European Union, the alignment is a Proposal for a Regulation of the European Parliament and of the Council on the European Health Data Space²⁷. Detecting ethical issues for telemedicine services and IT has been critical since its launch. Langarizadeh, Moghbeli, and Aliabadi suggested that the moral issues in telemedicine can be investigated from aspects such as technology, doctor-patient relationship, data confidentiality and security, informed consent, and patient and family satisfaction with healthcare services²⁸. Following ethical

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- 23 American Telemedicine Association. 2024. "Telehealth Basics." Retrieved February 19, 2024 (<https://www.americantelemed.org/resource/why-telemedicine/>).
 - 24 WHO. 2022. EUR/RC72/5: Regional Digital Health Action Plan for the WHO European Region 2023–2030.
 - 25 Nittari, Giulio, Ravjyot Khuman, Simone Baldoni, Graziano Pallotta, Gopi Battineni, Ascanio Sirignano, Francesco Amenta & Giovanna Ricci: Telemedicine Practice: Review of the Current Ethical and Legal Challenges, in: *Telemedicine and E-Health*, 2020, 26(12).
 - 26 Tiribelli, Simona, Annabelle Monnot, Syed F. H. Shah, Anmol Arora, Ping J. Toong & Sokanha Kong: Ethics Principles for Artificial Intelligence–Based Telemedicine for Public Health, *American Journal of Public Health*, 2023 113(5), p. 577–584.
 - 27 European Commission, *Proposal for a Regulation of the European Parliament and of the Council on the European Health Data*, COM (2022) 197 final, 2022/0140(COD), Strasbourg 3.5.2022.
 - 28 Langarizadeh, Mostafa, Fatemeh Moghbeli & Ali Aliabadi: Application of Ethics for Providing Telemedicine Services and Information Technology, *Medical Archives (Sarajevo, Bosnia and Herzegovina)*, 2017 71(5).

issues in telemedicine is a primary aspect of the HL7 Protocol or the Digital Imaging and Communication in Medicine (DICOM).

Rising healthcare costs significantly impact people's quality of life. Continued population growth and aging impact healthcare needs for more advanced scientific solutions. Since the early 1990s, ICT has improved healthcare access, efficiency, quality, and effectiveness. Technological advances, like the *internet of things* and *cloud computing*, have led to the proliferation of low-cost sensors capable of monitoring human body functions and generating large amounts of data in such convenient devices as a watch or a band²⁹. Telemedicine involves conducting diagnostic and therapeutic tests remotely, checking blood pressure, heart rate, or sugar level, and performing surgical and rehabilitation procedures. Innovations in this area change how the medical market works, patient behavior, and providing insurance and assistance services. Telemedicine and healthcare projects include assistance in consultations, improvement of medical care in isolated areas, continuity of care, and quick diagnosis in emergency services. It responds to new, essential social and economic needs by using the latest technologies in health care and the rapidly developing services market. Innovations in this area change changed the medical market and patient behavior. It should be emphasized that a practical field of study responds to the needs of the dynamically developing labor market in telemedicine services (Table 1).

29 Islam, S. M. Riazul, Daehan Kwak, Md Humaun Kabir, Mahmud Hossain & Kyung Sup Kwak: The Internet of Things for Health Care: A Comprehensive Survey, IEEE Access 3, 2015 doi: 10.1109/ACCESS.2015.2437951.

Table 1. New jobs in the labor market connected with telemedicine and health-care projects

Area	Job positions
communication and patient contact	telemedicine consultant (e.g., in the Patient Information Center) patient service specialist specialist coordinating the patient's treatment path specialist in organizing remote consultations specialist for telemedicine services in the field of night and holiday medical care
data security	data security coordinator data security controller
system service	specialist in the implementation of telemedicine systems specialist for telemedicine services telemedicine platform administrator medical services operator
medical e-consultations	specialist for telecardiology consultations rehabilitation specialist/physiotherapist coordinating the treatment of patients with chronic diseases rehabilitation specialist/physiotherapist with individual practice general practitioners conducting teleconsultations
insurance	insurance company consultant employee of the Health Insurance Office of an insurance company consultant/manager of insurance assistance services telemedicine expert in health insurance
management	healthcare project manager telemedicine project manager head of the medical unit telemedicine manager
finance	auditor of healthcare entities financial controller in a medical facility
market analysis	telemedicine and medical market analyst

Source: own elaboration.

Recent events have confirmed that telemedicine solutions and the development of e-health are the fastest-growing trends in medical facility management. Telemedicine studies align with innovative solutions concerning the vital relationship between academia, administration, and business, marking a step on the map of other successfully implemented programs in the academic ecosystem.

D. Case study. Digitalization – security aspects and code of conduct

The imperatives of digitalization, globalization, and the COVID-19 pandemic have compelled universities to enact structural and technological transformations while pioneering novel teaching methods, like gamification, into new study fields tailored to accommodate a cohort of learners often referred to as digital natives³⁰. As a result, integrating digital tools in higher education, particularly security, has become increasingly important³¹. With the rise of digitalization and online learning, in 2018, the European Union issued the world's strictest data protection legislation, the General Data Protection Regulation (GDPR). It is becoming imperative for academic and administrative staff and students to implement and enforce data protection and privacy policies, emphasizing the need for teachers to be prepared to address information security issues, particularly in distance learning and digital exams³². This approach is particularly relevant in the digital transformation of higher education institutions that need help implementing specific regulations when delivering online courses.

The participants in the international project “DigiMates: Development of Innovative, Gamified and Interactive Method for Advanced e-Teaching and E-learning of Skills”³³ faced such a challenge. The project concerned the development of a concept for a didactic game implemented as the e-course, accompanied by detailed security rules (toolkit) dealing with privacy, respect, and understanding of cultural differences, emphasizing digital gender equality, sustainability, and respect for any other differences at the digital level of communication. In addition, recommendations have been made to indicate the principles of the Code of Conduct, considering the national and local rules of the country and university. The toolkit addressed tools and platforms for online courses, sharing game materials with students,

30 Fernández-Raga, Maria, Aleksić, Darija, Ćikiz, Aysun Kapucugi, Markiewicz, Magdalena & Streit, Herbert: Development of a Comprehensive Process for Introducing Game-Based Learning in Higher Education for Lecturers, in: *Sustainability*, 2023 15(4), 3706.

31 Marchisio, Marina, Fabio Roman, Matteo Sacchet & Enrico Spinello: Students' Digital Competencies in Remote and Online Higher Education in the Security and Defence Field, in: *Ubiquity Proceedings 2023* 3(1), p.452–457.

32 Mantykangas, Arja, *Information security issues in higher education*, 14th International Conference eLearning and Software for Education, 2018 (4), p. 378-381. doi: 10.12753/2066-026X-21-267

33 The project under Erasmus+ KA226 Partnership for Digital Education Readiness (2020-1-SI01-KA226-HE-093593) was realized in 2021-2023 by the international consortium: University of Ljubljana (leader), University of Gdansk, Heilbronn University, University of Leon, and Dokuz Eylul University.

without being aware that the password has been stolen or read by others, the user will effectively protect their data from cyber theft.

There were likewise significant differences regarding how teachers use private email addresses for teaching purposes and the provisions of anti-virus software for teachers' private computers. The compliance aspect of keeping records related to online courses can also be different. University regulations specify how long and where records must be kept. At one university participating in the DigiMates project, the documentation can be deleted immediately after the course. In contrast, it must be kept at four universities for over a year. Different security and privacy policies may apply to various aspects, such as sharing documents or other materials (including links to meetings) within the course with external parties, camera use, methods of communication between student-teacher, etc. Differences were additionally noted in policies regarding recording online classes. Due to privacy, security, and general data protection aspects, it is important to inform students about the rules regarding taking screenshots or recording any material or communication used during online classes. It should be noted that a university lecture and the presentation displayed during it are protected, provided they meet the prerequisites for being considered a work under copyright law. For their lawful use, permission must be obtained from the creator – the author of the lecture and presentation. However, some exceptions to this general rule include the so-called permitted personal use, which allows the unrestricted use of already distributed works for one's purposes without the author's permission. From the point of view of copyright, a lecture can be recorded and listened to alone or in the company of people with whom someone has a personal relationship - such as family or friends. On the other hand, its further dissemination, e.g., by posting it on the Internet so that it would be available to an unlimited number of people, does not fall within the limits of permitted personal use. Therefore, such action may result in copyright infringement and, consequently, sanctions provided by law for its violation. Analogous rights and restrictions apply to using images. In recording a lecture, the risk of violating the lecturer's and attending students' rights associated with the recording and subsequent use of his voice is worth noting. The information on whether students can record online classes or take screenshots should be provided to students before or during the first meeting. Rules regarding screenshots or recording any material or communication used during online courses may vary considerably depending on the university and in between national regulations.

Online learning and teaching require a better understanding of the cultural, security, and technical issues in the didactic process, which may

be analyzed from different perspectives. The DigiMates project set out clear rules for communication in online lectures. The idea was to help teachers prepare smooth meetings for group and individual activities with recommendations for better togetherness. A Code of Conduct was prepared based on interview protocol, including feedback and experiences from students and lecturers from the universities participating in the project. It covered external appearance, behavior, formalities and etiquette, and technical and safety issues (Table 2).

Table 2. The summary of the Code of Conduct in online learning from the point of view of students and academic teachers

Academic students	Academic teachers
Be respectful: Respect your teacher, classmates, and the learning environment. Adjust your appearance and voice activity. Avoid using inappropriate language and comments or engaging in discrimination or harassment.	Be respectful: Show respect towards your students by creating a welcoming and inclusive learning environment. Avoid using inappropriate language or critical comments.
Be punctual: Attend class on time and avoid late or missing classes without a valid reason. If you must miss a class, consider informing your teacher beforehand.	Be punctual: Start and end the class on time, and be available before and after class to answer questions and provide additional support if needed.
Be prepared: Come to the class with all the necessary materials, such as textbooks and notebooks, within the reach of your hands.	Be prepared: Come to the class with a well-organized lesson plan. Have all the necessary materials and resources ready for the course.
Participate actively: Engage actively in the learning process by asking, answering, and contributing to discussions. Share your thoughts and ideas with your classmates and teacher.	Communicate effectively and clearly with your students. Be sure you know and have prepared the digital tools properly. Use various teaching methods to cater to different learning styles and abilities.
Follow instructions: Listen carefully and follow your teacher's instructions. If you need help understanding something, ask for clarification.	Encourage participation: Encourage students to participate actively in the learning process by asking questions, answering questions, and contributing to discussions.
Have a positive attitude and a willingness to learn. A positive and respectful learning environment benefits everyone.	Provide feedback: Provide timely and constructive feedback to your students on their progress, assignments, and tests. Help them identify areas for improvement and provide guidance on how to improve.
Be honest: Be honest with your teacher and classmates. Do not make excuses or lie about your progress. If you are struggling with something or need extra help, ask for it.	Treat students fairly: Treat all students fairly and without bias. Avoid showing favoritism or discrimination based on race, gender, religion, or socioeconomic status.
Be responsible: Take responsibility for your learning by completing assignments and homework and studying for tests. Avoid plagiarism and cheating.	Follow ethical standards: Adhere to ethical standards and professional codes of conduct. Respect your students' privacy and confidentiality and avoid any misconduct.

Source: own elaboration.

Overall, it was important for academics and students to recognize and be aware of the different challenges and create a supportive learning environment. These recommendations can help create an engaging and productive online classroom community.

Summary and conclusions

The convergence of digitalization, globalization, and the impact of the COVID-19 pandemic has necessitated profound structural and technological changes within universities. These changes are reflected in the adoption of innovative teaching programs, like telemedicine, e-focused studies, and the involvement of AI and methodologies tailored to accommodate the needs of digital-native learners. Telemedicine revolutionized healthcare services, increasing patients' and physicians' acceptance of new technologies and adherence to ethical data and data protection rules. Ethical considerations such as informed consent and data confidentiality are paramount in telemedicine. The practical field of study responding to evolving labor market demands exemplifies successful collaboration among academia, administration, and business, marking significant strides in the ecosystem.

Simultaneously, integrating digital tools into higher education, crucial for enhancing student engagement and motivation, furthermore brings significant challenges, particularly in ensuring information security and data privacy³⁴. Initiatives like the DigiMates project exemplify efforts to address them by developing a comprehensive security toolkit and code of conduct, emphasizing privacy, cultural sensitivity, and gender equality in digital communication. While universities share common approaches in implementing online teaching platforms and security measures, disparities in policies regarding data retention, communication methods, and intellectual property rights underscore the need for standardized protocols and greater awareness of legal and ethical considerations in online education.

Addressing the challenges of digitalization in education requires enhanced collaborative efforts from academia, industry, and policymakers. Creating a supportive learning environment that prepares students for future careers requires adhering to best practices and guidelines. The Code of Conduct underscored values such as respect, integrity, and responsibility, which are fundamental in professional settings. Employers increasingly val-

34 Doherty, Neil Francis, Leonidas Anastasakis & Heather Fulford: The Information Security Policy Unpacked: A Critical Study of the Content of University Policies, in: *International Journal of Information Management*, 2009 29(6). doi: 10.1016/j.ijinfomgt.2009.05.003.

ue these skills by seeking individuals capable of effectively collaborating, communicating, and problem-solving in digital contexts, contributing to the key competencies of the future. Following the Code of Conduct rules similarly forwards a culture of accountability and mutual respect among peers, mirroring the dynamics of professional environments. Participants who internalize these principles during their academic journey are better equipped to solve ethical dilemmas and take on challenges they may encounter in their future careers.

The analysis of two case studies of innovation in the study programs, telemedicine and healthcare projects and security and cultural aspects of digitalization in teaching, showed the complex role of universities in driving sustainable socio-economic development, which aligns with the triple, quadruple, and quintuple helix model principles. This collaboration among academia, administration, business, and society enhances digital education and creates a supportive and inclusive learning environment that benefits all these parties.

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Part II: Patterns, Policies and Strategies of change in various policy fields

*Christian Bußmann*¹

EU Green Deal and green transformation: A critical review of the European green bond standard and the upcoming ESG rating regulation

Summary: With the green bond standard and the forthcoming regulation for environmental, social and governance (ESG) rating activities, the EU is expanding the regulatory framework for sustainable finance. With these requirements, the EU is attempting to create a harmonized basis for investor protection against greenwashing and to ensure capital market efficiency by channeling financial flows into sustainable finance. Based on existing theories and relevant academic literature, it is doubtful whether the chosen path will achieve its goal. From the perspective of regulators, investors and issuers, it is crucial to analyze whether the green bond standard and forthcoming ESG rating regulation have a positive impact on investor protection and capital market efficiency.

Keywords: Sustainable finance and reporting, EU Green Deal, EU taxonomy, European green bond standard, ESG rating regulation, Investor protection, Capital market efficiency

A. Introduction

In the Paris Agreement of 2015, 195 countries, including the EU Member States, agreed to limit global warming to well below 2 degrees Celsius compared to pre-industrial levels and to strive to limit it to 1.5 degrees Celsius.² The so-called "Green Deal" is the strategy by which the EU intends to achieve its target by 2050.³ In this context, the concept of sustainable finance plays a crucial role, as the EU is exploring how to make sustainability considerations an integral part of private and public investments in order

1 Christian Bußmann is an external PhD candidate at the University of Applied Sciences Bremen and at the University of Bremen, Germany. He is researching the impact of the EU sustainable finance and reporting regulations. Contact: ch.bussmann@googlemail.com.

2 United Nations, The Paris Agreement, 2023.

3 European Council of the European Union, European Green Deal, 2022.

to support the European Green Deal.⁴ To meet this challenge, the EU has created the EU taxonomy, a cornerstone of the EU framework for sustainable finance. With the European green bond standard (EUGBS), the EU aims to take further steps to implement its strategy for financing sustainable growth and the transition to a low-carbon and resource-efficient economy, while combating greenwashing.⁵ To further strengthen the foundations of the EU's sustainable finance framework the Regulation (EU) 2024/3005 on the transparency and integrity of environmental, social and governance (ESG) rating activities was published in the Official Journal of the EU on December 12, 2024 and will enter into force 20 days later. However, it will not apply until mid-2026. With the regulation, the EU intends to strengthen investor confidence by making rating activities more transparent and comparable. The regulation applies in particular to providers of ESG ratings that issue and disseminate them to regulated financial companies in the EU.⁶

This chapter argues that, based on existing theories and the relevant academic literature, there are considerable doubts as to whether the EU's regulatory requirements will achieve their objectives. Its remainder is structured as follows: first, the regulatory and theoretical framework is stated. Afterwards a short Literature Review guided by a categorization of the existing scientific evidence in a regulatory and theoretical context is presented. The chapter concludes with a conclusion and recommendations for further research.

B. Background

Regulatory background

The taxonomy regulation, adopted by the European Parliament in June 2020, is the centerpiece of the EU action plan to achieve the Green Deal

4 European Commission, Platform on Sustainable Finance.

5 European Council of the European Union, European Green Bonds: Council adopts new regulation to promote sustainable finance, 2023.

6 European Union (2024): Regulation (EU) 2024/3005 of the European Parliament and the Council of 27 November 2024 on the transparency and integrity of Environmental, Social and Governance (ESG) rating activities, and amending Regulations (EU) 2019/2088 and (EU) 2023/2859

targets.⁷ It aims to create a standardized classification system for sustainable economic activities. To this end, the taxonomy regulation defines six environmental objectives. Economic activities are considered “sustainable” in the sense of the EU taxonomy if they make a significant contribution to at least one of the six environmental objectives without significantly compromising another objective. The EU taxonomy regulation is a compulsory reporting requirement for large non-financial companies. Starting in 2022, non-financial firms have to disclose the proportion of their revenue, capital expenditure and operating expenditure related to environmentally sustainable activities as defined by the EU taxonomy.⁸ The taxonomy is intended to show potential investors the degree of sustainability of a company, and to direct capital flows according to the Green Deal. In addition to reporting, which is regulated by the taxonomy, there are two other regulatory components: green bonds and ESG ratings.

The EU assigns green bonds an important role in financing assets and projects needed for the low-carbon transition. As opposed to raising equity by issuing shares, a firm can also opt to increase debt selling quoted bonds. With the EUGBS, the EU is aiming to set a standard for such bonds. The standard, which application is voluntary, relies on the detailed criteria of the EU taxonomy to define green economic activities, ensures levels of transparency in line with market best practice, and establishes supervision of companies carrying out pre- and post-issuance reviews at European level. The European Securities and Markets Authority (ESMA) will be supervising these external reviewers. In this way, the EUGBS is intended to provide consumers, but also companies and other institutional investors, with guidance on green investment opportunities. Investors who wish to invest in a sustainable bond should be able to understand and compare the principles according to which the funds are used and which reporting obligations the issuer is subject to with as little effort as possible. Furthermore, the EUGBS is intended to combat greenwashing.⁹

It is also possible for companies to comply with other sustainability standards, such as the Green Bond Principles (GBP) of the International Capital Markets Association (ICMA), the Climate Bonds Standard of the

7 European Union (2020): Regulation (EU) 2020/852 of the European Parliament and the Council of 18 November 2020 on the establishment of a framework to facilitate sustainable investment, and amending Regulation (EU) 2019/2088.

8 European Commission, EU Taxonomy Navigator.

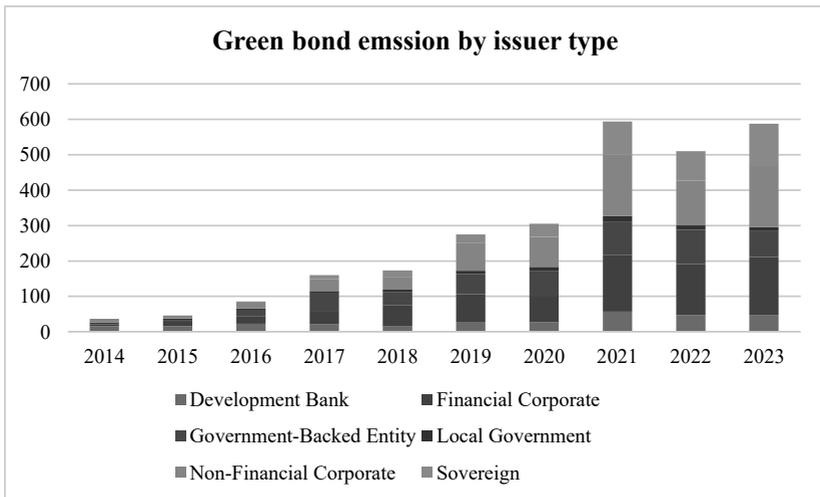
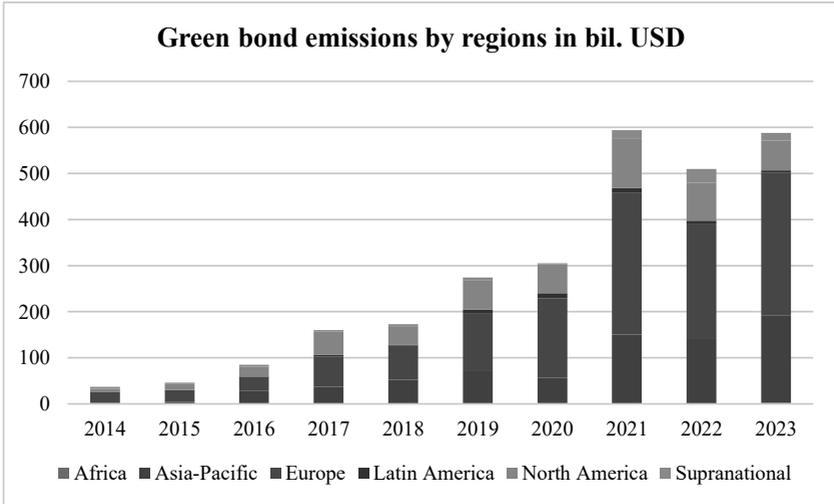
9 European Union (2023): Regulation (EU) 2023/2631 of the European Parliament and of the Council of 22 November 2023 on European Green Bonds and optional disclosures for bonds marketed as environmentally sustainable and for sustainability-linked bonds.

non-profit International Climate Bonds Initiative (CBI), or commission a rating agency to assess the features of the green bond in the form of a second party opinion (SPO). The primary purpose of an SPO is to verify that an issuer's green bond framework or an individual green bond issue is consistent with the standards the issuer claims to follow and the issuer's sustainability strategy. The basis for CBI certification is a proprietary taxonomy which lists assets, activities and projects that are consistent with the goals of the Paris Agreement. In the certification process, the CBI or approved external reviewers confirm that issuers are using the proceeds in accordance with the standards. In 2014, the ICMA announced the first version of its GBP providing guidelines for the issuance of green bonds, requiring transparency on how bond proceeds are used, how projects are evaluated and selected, and how proceeds are managed. Unlike the CBI framework, the GBP does not include a taxonomy, but only identifies key environmental objectives and high-level eligible project categories. It defines several relatively broad categories, such as renewable energy, energy efficiency or clean transport. In contrast to the CBI, external reviews are voluntary but encouraged under the GBP.

The EUGBS can be seen as a combination of the CBI and GBP standards with an SPO. Like the CBI, the EUGBS is based on a green taxonomy - the EU taxonomy - and mandates external reviews in the form of an SPO by approved verifiers. In the case of the EUGBS, SPO providers are required to register with the ESMA, which governs the harmonized rules for how second opinion providers must review bonds and report their findings. Like the GBP, the EUGBS sets out extensive disclosure and reporting requirements for green bond issuers, including how and how often issuers must report on the use of proceeds.¹⁰ As Figure 1 illustrates, global CBI green bond issuance grew steadily from 2014 to 2021. Issuance then declined due to Russia's war of aggression against Ukraine and related inflation and interest rate developments. Most green bonds were issued in Europe. Within the issuer group, companies from both the financial and non-financial sectors account for the largest share.

10 Brückbauer, F./Cézanne, T./Kirschenmann, K./Schröder, M., Does the European Union need another green bond standard? in: ZEW policybrief (10) 2023, p. 1.

Figure 1: CBI green bonds by region and type¹¹



11 Climate Bond Initiative.

If an issuer decides to voluntarily issue its bonds as a European green bond, it must comply with the requirements of the EUGBS. When securities are offered to the public or admitted to trading on a regulated market, a prospectus in accordance with the EU Prospectus Regulation is generally required. Issuers of a European green bond must fulfil various reporting and information obligations. To enable consumers and institutional investors to check whether the proceeds have been used as planned, the issuer must also fulfil downstream transparency obligations with its allocation reports. These must be published annually to document that the funds collected with the European green bond have been properly utilized. The impact report describes the effect of the bond proceeds on the environmental goals that the issuer has pursued by issuing the European green bond. The issuer must prepare and publish this report once after all proceeds from the issue have been utilized.¹²

The new Regulation (EU) 2024/3005 on the transparency and integrity of environmental, social and governance (ESG) rating activities was published in the EU Official Journal on December 12, 2024 and comes into force 20 days later. However, it will not apply until July 2, 2026. According to the European Commission, ESG ratings have an increasingly important impact on the functioning of capital markets and investor confidence in sustainable products.¹³ From their point of view, increasing investor confidence through transparent and regulated ESG ratings can have a significant impact on the transition to a more socially responsible and sustainable future. The ESG Rating Regulation adopted by the European Union aims to enhance the consistency, transparency, and comparability of ESG ratings (Environmental, Social, and Governance) to strengthen investor confidence in sustainable financial products. A central element of the regulation is the introduction of a mandatory licensing requirement for ESG rating providers based in the EU, which will be authorized and supervised by the ESMA. Additionally, rating providers are required to disclose their methodologies, information sources, and the weighting of individual ESG factors (E, S, and G) in their ratings. This enables investors to understand which aspects are emphasized and how the ratings are constructed.

12 European Union (2023): Regulation (EU) 2023/2631 of the European Parliament and of the Council of 22 November 2023 on European Green Bonds and optional disclosures for bonds marketed as environmentally sustainable and for sustainability-linked bonds.

13 European Union (2024): Regulation (EU) 2024/3005 of the European Parliament and the Council of 27 November 2024 on the transparency and integrity of Environmental, Social and Governance (ESG) rating activities, and amending Regulations (EU) 2019/2088 and (EU) 2023/2859..

To prevent conflicts of interest, the regulation includes measures mandating a strict separation of rating activities from other business operations of the providers. For providers from third countries seeking to operate in the EU, specific conditions apply: they must either be recognized by an EU-authorized provider, meet certain quantitative criteria, or be included in the EU register based on an equivalence decision.¹⁴

Theoretical background

A bond is an exchange-listed debt security. Investors who buy the bond are lending money to the company that issues the bond. In return, the company agrees to pay interest and to repay the capital, in most cases when the bond matures. If a company issues debt, *ceteris paribus* its financial structure changes so that the relative debt level rises.¹⁵ Companies know more about their capabilities than their investors. This information asymmetry leads to transaction costs when investors try identifying companies with desirable characteristics.¹⁶ It is therefore in the interest of companies to reduce this information asymmetry by sending out a "signal", i.e. by taking measures that convey this information credibly. According to the signaling theory, a signal is credible if it is expensive for companies with less desirable characteristics to imitate it.¹⁷ The issuance of green corporate bonds can be interpreted with the help of the signaling theory. Investors often do not have sufficient information to be able to judge a company's commitment to the environment. From the investors' point of view, this results in the need for a (credible) distinction between companies that are committed to the environment and those that are not. By issuing green bonds, companies can signal their commitment to the environment.¹⁸ The signaling itself can take the form of voluntary disclosure, such as making the SPO available to investors.

14 European Union (2024): Regulation (EU) 2024/3005 of the European Parliament and the Council of 27 November 2024 on the transparency and integrity of Environmental, Social and Governance (ESG) rating activities, and amending Regulations (EU) 2019/2088 and (EU) 2023/2859

15 U.S. Security and Exchange Commission, Investor Bulletin: What Are Corporate Bonds?.

16 Akerlof, G.A., The market for "lemons": Quality uncertainty and the market mechanism, in: *Quarterly Journal of Economics* (84) 1970, p. 488.

17 Spence, M., Job market signaling, in: *Quarterly Journal of Economics* (87) 1973, p. 355.

18 Flammer, C., Corporate green bonds, *Journal of Financial Economics* (142) 2021, p. 499.

If companies expect a net benefit from the publication of information that goes beyond the minimum requirements, they occasionally make voluntary disclosures.¹⁹ If the increase in the value of the company is interpreted in a broader sense as an increase in the overall value of the company, it becomes clear that the concept of shareholder value in the sense of pure equity orientation falls short. An increase in the market value of equity does not contribute to an increase in the total value of the company if it is at the expense of the value of debt. The corporate objective of increasing the value of the company must therefore be geared towards simultaneously increasing the market value of equity and the market value of debt. This objective could protect the interests of both equity providers (shareholders) and debt providers (bondholders). A key requirement for management therefore is to consider the impact on lenders as well as the impact on shareholder value. Indeed, corporate finance theory argues that a company's business policy focus on creditworthiness and its maintenance is central to any deal.²⁰

A company may expand this concept of bondholder value creation to the green bond environment. By issuing green bonds, companies can signal their commitment towards the environment. This signal is likely to be credible for the following reasons. First, by issuing green bonds, companies commit substantial amounts of money to green projects. Second, green bonds are often certified by independent third parties (i.e. approved by the Climate Bonds Standard Board of the CBI) to guarantee that the proceeds are indeed used to finance the green projects that are outlined in the bond prospectus. Complying with the standards requires substantial managerial effort and resources, which is costly to the issuer. In addition, non-compliance with certification is costly as well. The Board would then suggest corrective actions for compliance to be restored. If compliance is not restored within a reasonable timeframe, the Board would then revoke the certification of the green bond.²¹ In sum, the issuance of green bonds may serve as a credible signal of the company's commitment to the environment and enhance the (green) bondholder value.

In addition, the stewardship theory can explain why companies issue green bonds. This theory goes back to the work of Donaldson, Donaldson

19 Marston, C.L./ Shives, P.J., The Use of Disclosure Indices in Accounting Research: A Review Article, in: *The British Accounting Review* (23) 1991, p. 195.

20 Krämer, W./Schäfer, F., Bondholder Value, in: Everling, O./Schmidt-Bürgel, J., *Kapitalmarkt-rating* 2005, p. 207.

21 Flammer, C., Corporate green bonds, *Journal of Financial Economics* (142) 2021, p. 499.

and Davis and Davis et al.²² It provides a sociological and psychological approach to explaining the organization of corporate management, including the relationship with stakeholders, and acts as a counter-reaction to the "one-sided negative managerial image" of the principal-agent theory according to Berle and Means.²³ The stewards' (agents') pursuit of individual and financial goals at the expense of the owners (headmasters) and thus the construct of "homo oeconomicus" are neglected in the context of stewardship theory. This is due to psychological behavioral patterns, according to which financial motives become less important with increasing satisfaction of needs. The actions of company managers are therefore primarily centered on non-financial (intrinsic) motivational factors that determine the relationship between members and the relationship with stakeholders and are not directly quantifiable. Motivational factors include the assumption of responsibility and challenging activities, the development or enhancement of the company's reputation and the creation of flexibility of action to increase one's own commitment.²⁴

Even if the increase in emissions is remarkable, globally, green bonds account for less than sixper cent of bonds outstanding worldwide. Thus, green bond investors are faced with a short supply. According to the economic principle of supply and demand, there should be excess demand. As a result, companies see themselves in a position to convert the excess demand into reduced (re-) financing costs.²⁵ One method of analyzing bond prices and yields, and therefore the level of bond-specific (re-)financing costs, is to use a supply and demand model. As in any market, the price (and yield) of bonds is influenced by the quantity of bonds demanded by investors and the quantity of bonds offered by issuers. Investors' demand for bonds reflects their preference for bonds over other forms of investments, which is influenced by their expectation of future monetary policy and their perception of risk.²⁶ The perceived risk of green bonds has been found to be

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- 22 Donaldson, L., *The Ethereal Hand: Organizational Economics and Management Theory*, *Academy of Management Review* (15) 1990, p. 369; Donaldson, L./Davis, J.H., *Stewardship Theory or Agency Theory: CEO Governance and Shareholder Returns*, *Australian Journal of Management* (16) 1991, p. 49; Davis, J.H./Schoorman, E.D./Donaldson, L., *Toward a Stewardship Theory of Management*, *The Academy of Management Review* (22) 1997, p. 20.
 - 23 Berle, A., Means, G. *The Modern Corporation and Private Property*, 1932, p.3. New York: Macmillan.
 - 24 Velte, P. *Stewardship-Theorie.*, *Zeitschrift für Planung & Unternehmenssteuerung* (20) 2010, p. 285.
 - 25 Mankiw, N.G./Taylor, M.P. *Grundzüge der Volkswirtschaftslehre* 2012, p. 13.
 - 26 Reserve Bank of Australia, *Bonds and the Yield Curve*, 2024, p. 8.

lower than that of non-green bonds²⁷. This leads to lower yield expectations on the investor side. This means that the companies' total issuing costs fall, while the total return decreases (as the initial yield falls). Green bonds are comparable to traditional bonds in terms of seniority, default risk and rating. However, green bonds have a "green" purpose, whereas traditional bonds are used for general corporate financing. It is not clear whether the green bonds are the cause of the "green" purpose being achieved or whether it could not have been achieved with traditional financial instruments. In this case, the market mechanism of supply and demand does not lead to a socially efficient allocation of resources. It is therefore a situation in which the free market is not able to achieve an optimal result. In the worst case, this can lead to market failure.²⁸ In addition, this may represent a strong incentive for companies to engage in greenwashing.

Regarding ESG ratings, the signaling theory is also a possible explanation for why companies would like to obtain such a certification. Due to prevailing information asymmetries, it is in the company's interest to reduce these by signaling the best possible ESG rating.²⁹ This measure also sends a credible signal about the company's commitment to the environment and increases the (green) value for bondholders. However, as rating providers work closely with the issuers of the rated financial instruments to obtain the necessary information and are generally also paid by them, there is a considerable risk to the objectivity and independence of the rating providers. In addition, the staff of rating providers may be subject to inappropriate incentive structures when producing ratings which may have a negative impact on the accuracy of their ratings (e.g., if analysts are involved in price negotiations with issuers whose products they are later asked to rate). It is crucial that investors and regulators recognize that credit and ESG ratings are not a guarantee, but merely an opinion based on the raw data and methodology of the rating provider.³⁰ Market participants have already experienced this with credit ratings in the aftermath of the financial crisis in 2008 when a market failure had already occurred.³¹ It is therefore not certain that ESG

27 Curley, M., *Finance Policy for Renewable Energy and a Sustainable Environment*, 2014, pp 163.

28 Hochfinger, J., *Das Greenium. Die Bepreisung von Green Bonds*, 2013.

29 Spence, M., *Job market signaling*, *Quarterly Journal of Economics* 1973 (87), p. 355.

30 Carvalho, P./Laux, P. A. /Pereira, J.P. S.S., *The Stability and Accuracy of Credit Ratings*, Working Paper 2014.

31 Stuwe, A./Weiß, M./Philippe, J., *Ratingagenturen: Sind sie notwendig, überflüssig, notwendigen Übel oder schädlich?*, Working Paper fes 2012, p. 5.

ratings help to allocate resources in the (green) bond market in a socially efficient way.

C. Literature Review and context analysis

Pertinent literature has investigated both phenomena: green bonds and ESG ratings. In terms of green bonds, Migliorelli and Dessertine argue that green bonds are the most important innovation within the sustainable finance context because they paved the way for many other green products and services.³² In general, there is both the corporate and the investor perspective. From a companies' point of view, Curley states that green bonds reduce financial expenses on debt. He argues that green bonds can transfer the benefits of flexible payment schedules, credit enhancement techniques, alignment with long-term project schedules, leverage options and other cost-reducing benefits of debt to the green investment space.³³ In addition to that, Flammer finds that U.S. issuers of green bonds can improve their firm-level environmental footprints and financial performance in terms of higher ESG ratings and lower levels of carbon emissions.³⁴ Flammer also investigates that U.S. companies' environmental performance increases when they issued bonds, but the results were only significant for companies with SPOs.³⁵ In this context, Marston and Shrives state that if companies anticipate net benefits of publishing information that exceed minimum requirements, they occasionally make voluntary disclosures.³⁶ Ng argues that it is beneficial for investors if companies issue green bonds and publish additional sustainable data so that they can better support their investment strategies with additional information on issuers' sustainability plans.³⁷ However, Deschryver and de Mariz analyze that the issuance of

32 Berrou, R./Dessertine, P./Migliorelli, M., An Overview of Green Finance, in: Migliorelli, M./Dessertine, P. *The Rise of Green Finance in Europe: Opportunities and Challenges for Issuers, Investors and Marketplaces 2019*, p. 15.

33 Curley, M., *Finance Policy for Renewable Energy and a Sustainable Environment*, 2014, p. 163.

34 Flammer, C., Corporate green bonds, *Journal of Financial Economics*, 2021 (142), p. 499.

35 Flammer, C., Green Bonds: Effectiveness and Implications for Public Policy, *Environmental and Energy Policy and the Economy*, 2020 (1), p. 95.

36 Marston, C.L./ Shrives, P.J., The Use of Disclosure Indices in Accounting Research: A Review Article, in: *The British Accounting Review* (23) 1991, p. 195.

37 Ng, A.W., From sustainability accounting to a green financing system: Institutional legitimacy and market heterogeneity in a global financial centre, *Journal of Cleaner Production*, 2018 (195) p. 585.

green bonds is associated with higher costs and complex processes.³⁸ In addition, when green bonds are issued, investors are often faced with a “greenium”. A greenium is the difference in yield that exists when purchasing a green bond compared to the purchase price of a non-green bond and is calculated as a “lower yield” (green bond premium) compared to the yield level of conventional bonds as measured by Hachenberg and Schiereck.³⁹ Preclaw and Bakshi find that there is a broad range of results from no green bond premium to up to –17 bps of a premium.⁴⁰ Prabhu et al. compared this phenomenon between U.S. and European green bonds. They show that the higher oversubscription and spread compression difference in pricings exists with a tighter spread for the European green bonds. The overall investment-grade profile of the green issuers, 80% being A or above, partly explains the insignificance of the greenium in this market. The situation is the opposite in the high-yield segment—their differences contribute to increasing spread gaps, and consequently to a potential greenium.⁴¹ Based on the results of their analysis, Deschryver and de Mariz summarize that there are more challenges for investors than for issuers in terms of green bonds. According to them, the advantages for issuers outweigh the disadvantages for investors. Based on these results, there is a strong incentive for companies to engage in greenwashing. Thus, greenwashing remains a serious risk for all stakeholders.⁴² Pertinent literature is also available in terms of ESG ratings. According to Rizello, these ratings are crucial for investors to better assess the companies’ ESG-performance.⁴³ In addition, Lin and Lin emphasize that analysts forecast accuracy is crucial for investors and the company. Investors use the analysts’ forecasts in the valuation model to decide the intrinsic value of the firm and make investment decisions.⁴⁴

38 Deschryver, P./de Mariz, F., What Future for the Green Bond Market? How Can Policymakers, Companies, and Investors Unlock the Potential of the Green Bond Market?, in: *Journal of Risk and Financial Management* (3) 2020, p. 1.

39 Hachenberg, B./Schiereck, D., Are green bonds priced differently from conventional bonds?, in: *Journal of Asset Management* (19) 2018, p. 371.

40 Preclaw, R./Bakshi, A., The Cost of Being Green, Working Paper Environmental Finance 2015, p. 2.

41 Prabhu, A./Bendersky, C.B./Tsalhis, M., Why Corporate Green Bonds Have Been Slow to Catch on in the U.S, Working Paper, 2019, p. 2.

42 Deschryver, P./de Mariz, F., What Future for the Green Bond Market? How Can Policymakers, Companies, and Investors Unlock the Potential of the Green Bond Market?, *Journal of Risk and Financial Management*, 2020 (3), p. 10.

43 Rizello, A., Green Investing Changing Paradigms and Future Directions, 2022 pp 1.

44 Lin, B.X./Lin, C.M., SEC FRR No. 48 and analyst forecast accuracy, in: *Applied Economics Letters* (6) 2017, p. 427.

However, several studies - like Berg, Kölbel and Rigobson, Liu and Capizzi et al. - show that ESG ratings diverge between the various providers.⁴⁵ In the vein of the analyst forecast accuracy literature, it can be assumed that diverging ratings harm efficient pricing on capital markets.⁴⁶

Table 1: Context analysis EU green bond standard and ESG rating regulation

Regulatory target		Impact level	Theory	Reference
Green bond standard	ESG rating			
Combat greenwashing	Establish trust	Accounting	Voluntary disclosure	Marston and Shrivs (1991)
		Organization	Stewardship theory	Davis et al. (1997)
Increasing cashflow in sustainable finance	Ensure reliability and comparability	Economics	Signalling	Spence (1973)
			Market efficiency	Mankiw and Taylor (2012)
		Finance	Bondholder value theory	Krämer and Schäfer (2005)
			Market efficiency	Mankiw and Taylor (2012)

Putting the findings from theory and research into an overall context, the following picture emerges, as also shown in Table 1. As far as the European green bond standard is concerned, from a signaling point of view, it seems reasonable to use the standard to signal a certain level of sustainability to investors. However, based on Deschryver and de Mariz, with two green bond standards already in place, there is a risk that a third new standard will drive up the cost of issuance and increase the complexity of processes so that the potential net benefit of voluntary disclosure is not only reduced, but also destroyed. Some research suggests that there will be no increase in net benefits. However, one possible incentive for companies to issue green bonds could be the use of “greenium”, which some research has shown to be the case. However, it seems to depend on the jurisdiction and industry in which a company operates and what ESG rating it has. There seems to

45 Berg, F./Kölbel, J.F./Rigobson, R., Aggregate Confusion: The Divergence of ESG Ratings, in: Review of Finance 2022 (26), p. 1315; Liu, M., Quantitative ESG disclosure and divergence of ESG ratings, in: Frontiers in Psychology (13) 2022, p. 1; Capizzi, V./Gioia, E./Guidici, G./Tenca, F., The divergence of ESG ratings: An analysis of Italian listed companies, in: Journal of Financial Management, Markets and Institutions (9) 2021, p. 1.

46 Orens, R./Lybaert, N., Does the financial analysts' usage of non-financial information influence the analysts' forecast accuracy? Some evidence from the Belgian sell-side financial analyst, in: The International Journal of Accounting (42) 2007, p. 237.

be a strong incentive for companies to engage in greenwashing. This in turn would defeat the purpose of the regulator, increase the risk of market failure, and destroy bondholder value. Based on stewardship theory, however, compliance with the standard seems to make sense.

In view of the forthcoming ESG rating regulation, it would also appear to make sense for companies to signal a certain sustainability quality with a corresponding rating. However, the results of the ratings have so far been very divergent. The harmonization provisions mentioned in the proposed regulation are therefore not sufficient to establish a minimum level of comparability as it does not impose any obligation to standardize the use of raw data, methodology or weighting of ESG factors. Rather, the rating analysts now have an interest in not reducing the divergence in order to signal a corresponding quality leadership in one or more ESG areas in line with the signaling theory. This increased degree of divergence raise overall costs to the detriment of investors.

D. Conclusion and potential for future research

With the European green bond standard and the forthcoming ESG rating regulation, the EU is expanding the regulatory framework for sustainable finance and reporting. With these requirements, the EU is attempting to create a harmonized basis for investor protection - against greenwashing - and to ensure capital market efficiency by channeling financial flows into sustainable finance in order to achieve the goal of the Green Deal. With the GBP and CBS standards, regulatory requirements for issuing green bonds already exist. The question that arises is whether voluntariness is a good incentive for companies to issue green bonds according to the EUGBS. Furthermore, there is a risk that regulatory intervention will lead to a shortage in the supply of green bonds, which increases issuing costs and investment costs. On the other hand, the shortage of supply in the wake of excess demand will reduce refinancing costs. This could lead to an increase in greenwashing and thus counteract the regulatory effect. Therefore, the effect of the EUGBS should be analyzed more closely with the effect of the existing requirements. In addition, the connection between the EUGBS and greenwashing should be analyzed in more detail. From the perspective of regulators, investors and issuers, it is crucial to investigate whether the European green bond standard and the EU taxonomy have a positive impact on investor protection and capital market efficiency. Even if an increase in sustainable investments might be desirable from the perspective of society, based on current theory and academic research, it is doubtful that regulatory

measures will have a positive effect. The approach of regulating ESG ratings does not go far enough, while interfering with market mechanisms seems too far-reaching. In particular, the quality and scope of raw data for rating agencies in terms of ESG ratings should be standardized. Based on existing theories and relevant academic literature, it is doubtful whether the chosen path will achieve its goal. A view combining the green bond standard, ESG ratings and greenwashing needs to be emphasized and further researched. Besides, the recent micro- and macroeconomic changes like higher levels of general (re-)financing costs should be included. Greater emphasis needs to be placed on the link between the taxonomy regulation, the European green bond standard, ESG ratings and greenwashing.

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*Teona Grigolashvili*¹

Sustainable Economic Growth in Georgia and the Monetary Policy Transmission Mechanism

Summary: The paper examines the impact of the monetary policy transmission mechanism on sustainable economic growth. Monetary policy transmission mechanisms can influence real output, also, there is a huge impact on economic growth. For analyzing the importance of the topic, we examine data for the last twenty years, using mathematic models. In recent years, Georgia face different challenges there are a variety of conventional and unconventional approaches, the key to future development

Keywords: Monetary policy, transmission mechanism, Central Bank, Economic growth

A. Overview

The main characteristic of the economic system of the country is instability, which affects its financial system. This is the main reason why the sustainability of the financial system is studied by economists: monetary mechanisms are created as the main financial regulators, and certain flexible restrictions are established according to the frequency of economic signals.

Monetary policy is not only created by the economic goals of the state but different entities from it. Monetary policy reflects the counterbalance that the central bank and credit institutions will take to "give" money the proper direction for sustainable economic growth. In order to the activities carried out by the National Bank to serve positively sustainable economic development of the country, there are various channels through which monetary signals are transmitted.

1 Teona grigolashvili is the Associate Professor in Macroeconomics at the Kutaisi University. She has published one Monograph and several scientific articles. Currently, she is working on the issue of sustainable development and Monetary policy. Contact: teona.grigolashvili@unik.edu.ge

The monetary policy transmission mechanism is the process by which the monetary policy implemented by the central bank is transmitted through the financial markets to businesses and households.

There are a number of definitions offered by researchers and authors interested in studying the topic: "The transmission mechanism of monetary policy describes the change in the nominal money supply or short-term interest rate on real variables such as the combined volume of production and employment."(1) "The monetary transmission mechanism is the process through which the central bank's interest rate policy is implemented, that ultimately affects inflation rates"(2) The transmission mechanism is a set of channels through which monetary impulses are mobilized by central banks.

The central bank collects the necessary information, about the real and financial sector and develops methods to influence the desired element of the system. The outcomes depends on the cycle in which the economy is. This outcomes is a channel of transmission of monetary policy. The Central Bank influences changes in the economic and financial subsystems, using the following key indicators: money supply, trade balance, exchange rate, household incomes, the structure of money aggregates, the structure of incomes and expenses of economic agents, credit facilities of banks and companies, and the level of provision of borrowed funds of farms. At the same time, central banks generate methods that have a beneficial effect on the functioning of the economy.(3)

In most developed countries, transmission channels influence monetary policy and interest rates. It is known that changes in interest rates reduce costs in the private non-financial sector, while increasing the cost of funds, which in turn is the negative effect of the wealth. At the same time, the value increases, as well as interest rates affect the exchange rate. Together, the channels of monetary policy can be referred to as the monetary view of monetary policy, which explains the Keynesian IS-LM model, which considers the impact of monetary policy on interest rates, the interrelationship of variations in the money supply with the demand for money. The IS-LM economic model shows, that the equilibrium level of the interest rate increases during budget deficit, and the rate of economic growth decrease in accordance with the structural changes in investments driven out of the production. Stimulation of production in the medium term and, gradual increase of prices in the long term, is connected to the budget deficit. However, some researchers who study this condition do not give a reason for such an assumption.

Multiple primary pathways for the transmission of monetary policy are set apart:

1. Interest rate channel
2. Channel for Exchange rate
3. Credit channel
4. Channel for Trade balance
5. Channel for Inflation expectation
6. Market expectation channel

However, the National Bank of Georgia uses only interest rate, exchange rate, credit and expectation channels as means of transmitting monetary policy.

In the last century, the interest rate channel was the main channel in the Keynesian IS-LM model of money transmission. The given model can be represented as a diagram $M \uparrow \implies i(r) \downarrow = I \uparrow = Y \uparrow$, where $M \uparrow$ -represents that the result of expansionary monetary policy is a decline in real interest rate ($i(r) \downarrow$), which in turn reduces the cost of capital, leading to an increase in investment spending ($I \uparrow$) and of course an increase in aggregate demand and output (4). The most important feature of the interest rate channel is the influence of the real interest on consumer decisions, rather than nominal interest rate. It is the real interest rate that affects spending, not the nominal rate, which is the most important mechanism for monetary policy to stimulate the economy, even though the nominal rate tends to zero during deflation. The following mechanism indicates that monetary policy can be more effective even when the nominal interest rate has already declined to zero:

$$M \uparrow = P^e \uparrow = \pi^e \uparrow = i_r \downarrow \implies I \uparrow = Y \uparrow,$$

Where the nominal interest rate is within zero, an expansion of the money supply ($M \uparrow$) may increase the expected price level ($P^e \uparrow$) and consequently expected inflation ($\pi^e \uparrow$), thus decrease in the real interest rate ($i_r \downarrow$) even then, when the nominal interest rate is fixed at zero and spending is stimulated through the interest rate channel, (a mechanism that is key to monetarists to explain how the Great Depression was overcome in the US) (4). In 1995, Taylor, in his research on the interest rate channel, provided empirical evidence for the substantial influence of consumption and investment spending on the interest rate. He considered the interest rate channel to be the strongest transmission mechanism.

In the conditions of flexible exchange rate, special attention is paid to the use of the monetary policy transmission mechanism, namely the impact

of the exchange rate on net exports. The exchange rate channel includes the effect of interest rates, to the extent that when the real national interest rate falls, national currency deposits become less attractive compared to foreign currency denominated deposits, which ultimately leads to currency depreciation. This, in turn, significantly decreased the price of domestic goods compared to foreign ones, and increases net exports ($NX \uparrow$) and production volume. Let's look at the transmission scheme of the currency channel:

$$M \uparrow = i, \downarrow \implies E \downarrow \implies NX \uparrow \implies Y \uparrow.$$

The credit channel of monetary policy transmission is a set of factors strengthening the interest rate effect in both the short and long run. According to the theory of the credit mechanism, monetary policy, by changing domestic financial premium savings, directly affects interest rates, the extent of which reflects the imperfection of credit markets. Thus, it can be understood that a change in monetary policy by lowering or increasing the rate in the open market usually changes the domestic financial premium in the same direction. The importance of studying the credit channel is due to the desire to create new instruments of monetary policy and to maintain the effectiveness of the implemented policy. Monetary policy affects the real sector of the economy. The credit channel describes the impact of monetary policy on the volume of credits and the banking sector as a whole. In the conditions of increased interest rates, access to credit becomes difficult, as well as the number of good credit projects decreases, which causes banks to tighten credit standards and reduce the number of loans. Reduced credit minimizes aggregate demand and, ultimately, the inflation rate. A reduction in the policy rate has the opposite effect, it leads to an increase in lending and encourages investment. As a result, aggregate demand and the price level increase.

The influence of monetary methods through the channel of market expectations is the good example, we can cite. The stock market is a place where the created demand and supply for the company's securities can be met by different owners of capital. The goals can be different: to complete the portfolio of investment assets, to find a source of financing for the company, to merge companies, to influence the trend and many others (for example, the time for submitting the annual balance sheet is approaching, where it will be possible to review the relationship between income and expenses). During the declaration of income and expenses, it is revealed that the company's income from one sector has increased significantly. As a result of the expansion of production, jobs are created and it becomes possible

to use borrowed funds to buy shares of other companies. The reaction of the financial environment will be no less logical, just because the demand for credit money has increased during these two years, to increase the circulation of loans in the economy, companies will be able to expand their assets. This leads us to the best financial situation. In turn, the National Bank will wait for a growing reaction from the market, which means that there will be more factors that will strengthen money circulation, which in turn will ensure a possible strengthening of inflationary expectations. At this time, the central bank's task will be to study the necessary control points, after which the increase in the stock market may lead to a decrease in confidence in the national currency, "inflating" the economy with a large amount of unused money carries the threat of inflation. The market expectation channel serves to increase the confidence of the monetary policy towards the loans of economic entities and the national currency rate.

The bank lending channel itself includes a decrease in credits, which in turn has a negative impact on the real economy. Under the balance sheet channel, it is meant that banks are reducing their lending, following the tightening of monetary policy in connection with the restriction of the situation of creditors. The effect of monetary policy through the channel of bank lending can be imagined as follows:

$$M \uparrow \implies \text{Bank Deposits} \uparrow \implies \text{Bank Credits} \uparrow \implies I \uparrow \implies Y.$$

Through the channel of bank lending, it has a great impact on the costs of not so large companies, whose dependence on bank credits is high. The impact is less on large firms, to the extent that they can access credit funds from the bond and stock markets by bypassing the banks. The balance sheet channel arises due to asymmetry in credit markets. The channel chart of the balance sheet can be defined as follows:

$$M \uparrow \implies P^e \uparrow \implies \text{Adverse Selection} \downarrow \text{ Dishonesty risk} \downarrow \\ \implies \text{presented loan} \uparrow \implies I \uparrow = Y \uparrow .$$

Expansionary monetary policy ($M \uparrow$), which leads to an increase in stock prices ($P^e \uparrow$), leads to an increase in firm value, investment spending ($I \uparrow$), and aggregate demand. In addition, ($Y \uparrow$) is associated with a reduction in adverse selection and the risk of dishonesty.

B. Overview of Current Situation in Georgia

After independence (1991), in the first stage of economic reforms, the regulation of monetary policy in Georgia was associated with great difficulties (the National Bank was responsible to the executive government, there were many large state banks), the solution and regulation of which was primarily the responsibility of banks. It was related to solving the issue of commercialization and stakeholders. It was necessary to develop the international credit market, set limitations to the credit, prohibit administrative intervention in the regulation of interest rates, prohibit direct financing of the budget deficit by the National Bank, and others.

International Monetary Fund was the main actor in implementation reforms and achievements Georgia gained in the way of perfection of the monetary policy. Simultaneously with achievements, there was a number of mistakes from different origins (political, methodological, lobbying, exceeding competence and others).

The choice made by Georgia towards Europe is a difficult and not very short path, and therefore, success can be achieved by the gradual establishment of European values. This refers to the monetary policy, which will still have to correct a lot of "committed" mistakes, which the country has made a strong effort in the last decade)...

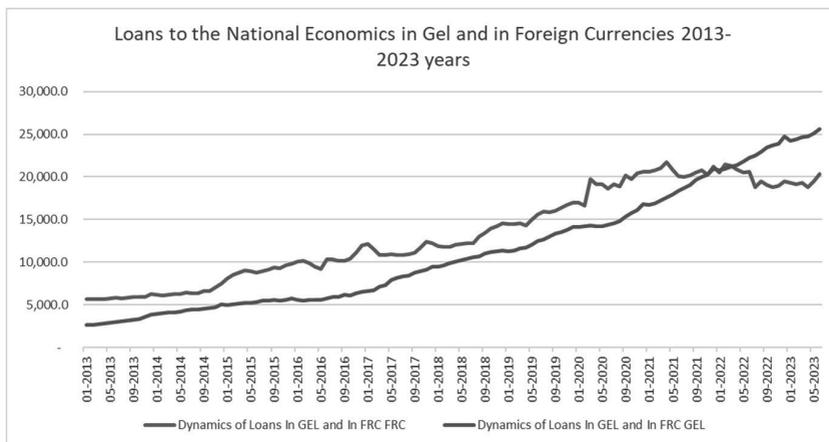
Until 2011, the reserves of commercial banks in Georgia consisted entirely of foreign currency - even funds raised in GEL were reserved in foreign currency. The reserve rate was between 5% and 10% depending on the types of liabilities. Since 2011, the National Bank has introduced 10% and 15% reserve rate, which are still valid today.

The increase in the mandatory reserve ratio of commercial banks was due to the recommendation of the International Monetary Fund in order for the National Bank to reduce the rate of dollarization in Georgian economy. In 2008-2010, the rate of dollarization of the country's economy in terms of debt was on average 72%, and within the period this rate increased to 78%. The introduction of new reserve norms was effective in reducing the level of dollarization, since in the next period, from 2011 to December 2014, it was characterized by constant decline. In November 2014, the indicator of dollarization of the economy decreased significantly and amounted to 60%.

The currency crisis that developed at the end of 2014 had a negative impact on the effective reserve policy of the National Bank. As a result of the drop in the exchange rate of the lari, the rate of dollarization of the funds raised by commercial banks increased sharply, and according to the loans issued, rate was 64-65%. According to the data of 2016, the rate of dollarization of deposits fluctuated within 68%. And as for 2017, it was 70%

in January and 68.8% in February. As of September 1, 2021, the ratio of total loans was 48.02 percent. By the end of June 2023, the ratio of gross loans was 54.81 percent.

Chart 1.



source: *nbg.gov.ge*

It should be noted that the volume of loans issued in GEL exceeds the loans issued in dollars from the second half of 2021. The amount of loans issued by commercial banks (except for interbank loans) in June 2023 increased by 1.60 billion GEL (by 3.50%) compared to the previous month to 47.33 billion GEL at the end of June. In the same period, the amount of loans issued in national currency increased by 633.62 million GEL (by 2.50%), while the volume of loans issued in foreign currency increased by 968.12 million GEL (by 4.74%).

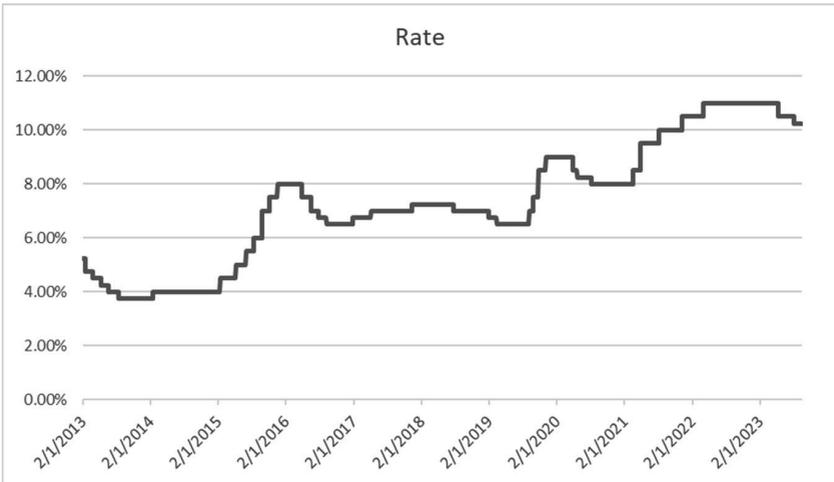
At the end of June 2023 For resident legal entities, , commercial banks issued loans in the amount of 7.63 billion GEL in national currency and 13.17 billion GEL in foreign currency. During June 2023, the lending volume of the sector of resident households increased by 1.95%, i.e. by 480.75 million GEL, and by the end of June it was 25.16 billion GEL.

Reserve requirements are an effective tool in dollarization of the economy, main purpose of the tool is to regulate the money supply in the country. Commercial banks reserve requirement is the main factor in creation new money. The virtual money is created by an individual bank, although it is

the result of the activities of all banks and other financial intermediaries operating in the country under the conditions of the partial (fractional) reserve system. Fractional reserve system is a system in which banks use only a part of their resources stored on deposits as reserves.

In 2015, the National Bank started to tighten the monetary policy and increased the interest rate from 4.5% to 8%. Soon, in 2016, the bank considered it necessary to reduce the policy rate from 8% to 6.5%, and in 2017, the policy rate was 6.75%. The mentioned action was done by National Bank because, wanted to balance the reduced foreign demand with local demand, although it is significant that the mentioned measures are less effective due to the high dollarization rate in Georgia. As of March 2022, the refinancing rate was 11%, and as of August 2023, it is 10.25%. By setting the refinancing rate, the National Bank determines the cost of resources accumulated by banks: the higher the rate is, the higher the cost of refinancing banking operations.

Chart 2. Dynamics of monetary policy rate 2013-2023 years



Source: nbg.gov.ge

The National Bank of Georgia uses the Forecasting and Policy Analysis System (FPAS), where the presented transmission mechanism model does not have a forecasting function. In the conditions of the inflation targeting regime, the goal of the monetary policy of central banks is to manage

inflation and inflationary expectations. For this, the central bank uses the monetary policy rate (short-term nominal interest rate) as a policy tool. The primary choice made by central bank is how to steer the interest rate in order to ensure that the desired level of inflation is reached. As a result, price stability will be obtained as a necessary condition for sustainable economic growth. For this reason, the National Bank of Georgia, like many other central banks, uses its own forecasting and policy analysis system to formulate its current and future monetary policy. However, this model does not have a predictive function.

The New-Keynesian approach(5) on which FPAS relies, describes the dependence of characteristics, the process of the monetary policy transmission mechanism, where changes in the interest rate work through the economy to affect the rate of inflation. If monetary policy is implemented according to similar models, then after some time, the economy reaches equilibrium (for example, the real variables are at their potential level and the target inflation is reached) (6).When monetary policy is implemented with the main goal of price stability, the level of real variables is also independent of monetary policy for a long time. In the short run, monetary policy has a real effect because of unchanged prices. Unchanged prices are maintained for 8 to 11 months. However, in countries with growing markets, the frequency of price changes ranges from 1.5 to 3 months. In the economic model of Georgia, moderate price stability is assumed. Accordingly, the result is reflected in changes in the nominal interest rate, which is transferred to the real interest rate, which leads to a temporary deviation of the real variables. In the long run, the effect of price invariance disappears and returns to bed. And supply negative factors determine the equilibrium level of real variables and monetary policy has no influence on it. However, the only thing that can control the inflation rate over the long term is monetary policy. In the model, changes in the policy rate affect the economy through various channels. Let's say, the central bank decides to cut its policy rate, it will do so via the exchange rate and interest rate channels. Changes in the monetary policy rate affect market interest rates (mortgage and bank deposit rates) and, at the same time, expectations about the future condition of the economy. Lower prices in the short run lead to lower nominal interest rates and lower interest rates. These changes affect the spending, savings and investment behavior of individuals and firms in the economy. For example, low interest rates encourage spending, which has a negative effect to accumulate. Changes in the official interest rate affect the demand for existing goods and services.

Countries with an open economy, like Georgia, it is very important to take into consideration the effect of the real exchange rate on aggregate

demand and net exports. depreciation of the exchange rate increases the competitiveness of local export and stimulates foreign demand for Georgian products. Additionally, the replacement of imported goods and services by local ones will increase the demand in the future. In 2015, the International Monetary Fund considered this process statistically and economically significant.

It is important to include this detail since the country’s strong dollarization increases the effect of the balance sheet on the standard demand equation. Economic agents obtain most of their revenue in local currency, although loans are typically denominated in dollars. Also, due to such currency mismatch, when the nominal exchange rate of GEL/USD depreciates, the prices associated with income growth suppress local demand. For example, some scholars argue that through this mechanism, the economy can experience a self-regulating crisis with a devalued currency and lower output. According to the second part of scientists, this makes the Georgian economy especially dependent on the dollar exchange rate, which is exactly what happened in the recent past. When the GEL depreciates against the dollar, while it remains unchanged against the currencies of the country’s trading partners (the real effective exchange rate does not depreciate accordingly and net exports are no longer stimulated). In order to capture the effect of balance accounts, the production equation includes a cut-off for the nominal exchange rate of GEL/USD (Equation 1)

$$1. S_t^{GEL/USD} = P_s S_{t-1}^{GEL/USD} + (1 - P_s) \left(\Delta S_t^{GEL/USD} + (\Delta Z_t - \pi_t^{tar} + \pi_{t,ss}^{us}) \right)$$

where, $S_t^{GEL/USD}$, is the nominal GEL/USD exchange rate, ΔZ_t , is the real exchange rate appreciation, while $-\pi_t^{tar}$ and $\pi_{t,ss}^{us}$ are local and US target inflation, lastly, it is expected that both standard price supply shocks and high frequency supply shocks will have an impact on local inflation. $\epsilon_t \wedge (u \wedge \pi) + P _1 \epsilon_{(t-1)} \wedge (u \wedge \pi)$ where $-1 < P _1 < 0$.

The monetary policy rule’s characteristics show that the target inflation targets are the source of policy rate’s adjustment. Interest rates fluctuate for a variety of reasons. Basically, a monetary policy rule has the following (mostly standard) functional specification(6):

$$2. i_t = \gamma_1 i_{t-1} + (1 - \gamma_1) \left[i_t^N + \gamma_2 E_t (\pi_{4,t+4} - \pi_{t+4}^{tar}) + \gamma_3 Y_t \right] + \epsilon_t^i - \gamma_4 \epsilon_t^{tar}$$

where $i_t \wedge N$ is the neutral nominal interest rate, $\pi_{(4,t+4)}$ – annual expected inflation next year, $\pi_{(t+4)}^{tar}$ – target inflation next year (differs from current indicators, if target change is planned). Along with the standard

monetary policy shock $\left[\epsilon_{\pi} \right]$ the policy rate has a negative impact on changes in target inflation as a deflationary challenge.

This functional characteristic may lend itself well to optimal monetary policy (minimizing the loss of the social good) when rates below zero are not considered. There is a rate close to zero, since the rate of monetary policy in Georgia is normal, it was not desirable to fall to zero in the future. According to this equation, when the economy is in equilibrium (there is no threat of shocks) the monetary policy rate is at its neutral level, which in turn is the equilibrium, plus the real interest rate plus target inflation.

$$3. i_t^N = r_t + \pi^{tar}$$

Monetary policy is neither optimum nor expansionary when the policy rate is at its neutral level. Fundamental variables like the risk premium in Georgia and productivity growth (as indicated by real interest rate trends) affect the equilibrium real interest rate. In our country, the real exchange rate is positively correlated with productivity. This lowers the real interest rate. On the other hand, the higher the risk premium, the higher the demand for investor compensation, which can push the long-term interest rate higher. All of the factors mentioned above can affect the current monetary policy situation by changing the natural rate.

C. Conclusions

(Based on the analysis of monetary policy transmission channels and the analysis of the current situation in Georgia, we can say that:

Thus, having discussed the monetary policy transmission channels and analyzed the current situation in Georgia, we can say that:

1. A key feature of credit channels is their emphasis on the ways in which monetary policy affects the economy through asset prices and interest rates.
2. It is imprudent to tighten or, conversely, to loosen monetary policy when short-term interest rates are decreasing and increasing, to the extent that most regulators use given rates as the primary monetary policy tool. The movement of the nominal interest rate often does not correspond to the dynamics of the real interest rate, and therefore, the real and not the nominal rate is an important element in the monetary transmission channel.

3. The most important task of the monetary policy is to prevent unexpected price fluctuations and ensure price stability, which in turn contributes to sustainable economic development.
4. Monetary policy has a significant impact on the functioning of the economy, it is necessary for the central bank to act immediately in response to a demand shock. However, in some cases, shocks are not immediately identified by monetary authorities. All this becomes clear after only a few quarters, which is a delayed response to the shocks. A delayed reaction can threaten economic stability.
5. It is important to consider the role of the impact of monetary policy changes on the economy as a whole. First, the tightening of monetary policy will be followed by a decrease in GDP and price levels. On the other hand, final demand will moderate the impact of monetary policy.

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*Sergejs Stacenko*¹, *Tatjana Muravska*²

Green Industrial Policy: Strategic Development and Policy Instruments

Summary:

Green economy and green business are increasingly accepted as key drivers in tackling climate change, pollution, and health to improve life for people. The process of shifting the economies ‘from brown to green’ is one of the most significant socio-economic transformations in modern time. The article aims to contribute to discussions about green transformation, which can be defined as the process of combining economic growth with caring about the environment to guarantee a high quality of life for present and future generations as well as promoting the an effective and rational use of available resources. The authors observe strategies to reach targets of green transformation. One of them is implementation of green industrial policy at the EU and EU Member States levels. The article underlines a new balance between sustainability requirements and strategic economic interests, which is especially essential in the areas of investment, productivity, and economic security. The authors suggest a methodological approach that helps to assess actions and measures related to green economic and business development trends, that require support of societies as well as the improvement of economic efficiency at both the EU and national levels. The article concludes that the EU green industrial policy framework should become embedded in the Member States national reform programmes. Moreover, EU Industrial Policy and national industrial policies require coordinated actions in certain green technologies, regulation, and standardisation, which help to avoid fragmentation in the Single Market and to develop a solid regulatory frame-

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- 1 Sergejs Stacenko, PhD in Public Administration, a Sworn Advocate and Senior Researcher at the Riga Stradins University, Latvia. Visiting professor and a researcher at universities in Germany and India. His research and publications cover EU legal environment, green and employment policies, legal issues related to labour disputes. Contact: sergejs.stacenko@rsu.lv
 - 2 Tatjana Muravska, Professor in Regional Economy and European Integration at the Riga Stradins University, Latvia and Jean Monnet Professor. Her research and publications have covered social and economic issues in the EU. Currently she works on green economy matters. Contact: tatjana.muravska@rsu.lv

work, focused on ensuring competition and access to the Single Market, with common or mutually recognised environmental standards.

Keywords: Green Industrial Policy, Green Transformation, Economic Security

A. Introduction

Societal transformations and structural changes in the EU economies must address a threefold task: overcome geopolitical crises, implement strategies to decarbonised EU economies and ensure long-term economic security of EU nations. Considering the varying capacities of the EU Member States to respond to the short-term and longer-term economic and environmental difficulties, concerns towards the transition of green governance, green entrepreneurship, and innovation are of prime importance.

The achievement of EU Green Policies' objectives will be determined by a combination of dynamics and synergies between public management strategies and instruments that are capable of being effective in implementing public policy with adequate management. Overall, the transition process to green growth is assumed to be largely technocratic and has a strong impact on the decision-making process and any foreseen results achieved by governmental and private business policies.

EU institutions have been instrumental in crafting policy packages for the green transitions, which resulted, as was stressed by a European Parliament study, in a change in thinking - "With this shift in thinking must come a shift in how we govern societies and implement solutions to these global challenges".³ Following this notion, the authors support the idea of considering EU industrial policy to make an impact the structure of an economy, encouraging resources to move into particular sectors that are perceived as desirable for future development. Furthermore, appropriate governance is seen as a precondition for achieving goals in creating and maintaining effective, competitive, and attractive instruments to support implementation of the above-mentioned societal changes.

This article examines the opportunities and challenges in the collaborative engagement between the respective actors and communities of practice in facilitation rational approach that allows for the implementation of green

3 *Europe's approach to implementing the Sustainable Development Goals: good practices and the way forward* (2019) European Parliament. European Union. p. 12. DOI: 10.2861/28364

industrial policy at the EU and national economies level, which turn ensures economic security of population and provides social welfare effects due to the enhancement in public administration services in their coordinated actions with business investments and entrepreneurial activities.

As the European Commission suggested, *the EU needs to maximise the benefits of its economic openness while minimising the risks from of economic interdependencies, through setting up a common strategic framework for EU economic security. With the Strategy, the EU and its Member States will be better equipped to commonly identify and assess the risks to our economic security, to use strategically the available tools for dealing with these risks and to develop new tools where needed.*⁴ Moreover, multi- and inter-disciplinary combinations of different knowledge and technologies, generating extensive technological opportunities in terms of new-product performance or innovative entrepreneurial performance, or a new decision-making approach in governmental functionality.

The most frequently expressed descriptions of the multi-and-inter-disciplinary are the following: the use and combination of different knowledge and skills; the application of innovative methods in problem-solving; a problem-oriented approach, etc.; and, additionally, two main dimensions can be identified in the forms of the multi-disciplinary and the inter-disciplinarity.⁵ Multi- and inter-disciplinary knowledge and new technologies can become a new parameter of competition between national economies in approaching green growth. On a wider regional scale, the implementation of Green Policies and the orientation of government towards efficient functionality along with government - private partnership representing a tool that inevitably helps to increase the environmental competitiveness of the EU and its Member States.

Overall, the term industrial policy has a well-recognised meaning and a long history. However, we will cover industrial policy matters that go beyond industry itself and beyond industrial relations. In view of this, we will use some new terms that have recently discussed by scholars, such as structural transformation policies, green transition and green industrial policy. We will try to answer a question in what ways a green industrial policy must be considered beyond the common practice of industrial policy.

4 European Commission (2023), *European Economic Security Strategy*, Publications Office of the European Union. <https://data.europa.eu/doi/10.2775/689907>

5 Muravska, T. and Ozolina, Z. (eds.) (2011) *Interdisciplinarity in Social Sciences*. University of Latvia, pp.66-70.

B. Green Industrial Policy's fundamentals, challenges, and strategies

It is commonly assumed by EU institutions and experts, the EU's approach in industrial policy has an eclectic and cross-cutting nature as well as the policy is combining interventionist and market-based approaches to secure a framework of favourable conditions to ensure industrial competitiveness at the level of the EU and at the level of the Member States.⁶ The industrial policy is implemented together with other EU policies such as those of regional and cohesion policies and trade policy, thereby fostering better exploitation of the industrial potential of policies of innovation, research, and technological development.⁷ Green industrial policy follows this same approach of state-driven structural change while also promoting broader social and environmental goals. Governments can operationalise the structural change necessary for economic growth, competitiveness, and new jobs. A shift from traditional types of industrial policies to an industrial policy that embraces environmental and energy policies could accelerate structural transformation and enhance productivity of national economies. Green economy and green business are increasingly accepted as key drivers in tackling climate change, pollution, and health-based issues to improve life for people. The process of shifting economies "from brown to green" is one of the most significant socio-economic transformations in modern times. Green transformation can be defined as combining economic growth with caring about the environment in order to guarantee a high quality of life for present and future generations at a level which is attainable due to civilisational development, as well as to the effective and rational use of available resources.⁸ Green growth has the potential to stimulate transformative changes in the direction of sustainable development, but what is more important is the proactive role of governments in restructuring their economies and forming a framework of instruments and measures that impact the activities of business entities in their intentions to become,

6 Stacenko, S. (2024) "Cross-Fertilisation Between EU Green Policies and Instruments Applied by Public Management: Dilemmas and Opportunities". *Studia Europejskie- Studies in European Affairs*, 1/2024, pp.71-86. DOI:10.33067/SE.1.2024.4

7 Article 173. Consolidated versions of the Treaty on European Union and the Treaty on the Functioning of the European Union (TFEU), Official Journal C 326 of 26 October. Available at: <https://eurlex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:12012E/TXT:en:PDF>

8 Cheba, K., Bak, I., Szopik-Depczynska, K. and Ioppolo, G. (2022) „Directions of green transformation of the EU countries”, *Ecological Indicators*. Vol. 136, p. 108601. DOI: 10.1016/j.ecolind.2022.108601.

in the first instance, ecologically sustainable. Such processes concern green transformation and could be considered as part of the concept of the fourth industrial revolution, relying on significant technological advances, thus becoming socially acceptable.⁹ Green transformation is fundamentally driven by introducing renewable energy resources as a new energy regime.¹⁰ One of the strategies to reach targets of green transformation is a green industrial policy at the EU and Member State levels.

On the whole, green industrial policy initiatives are undertaken at regional, national, and EU levels. These initiatives are, however, not necessarily coordinated, which can even lead to conflicting relationships due to differences in policies and their implementation in diverse EU countries. The central issue is the existing fragmentations in the EU Single Market which prevent innovative green technologies from being fully competitive internationally.

One of the ways to increase competitiveness of EU businesses is to strengthen regulation and standardisation, which would reinforce the EU as a leader in common environmental standard-settings as a part of the regulation as one of the essentials of the EU Single Market. It is important to stress, however, that national barriers towards the green transformation of the entire bloc should be diminished further, and energy and transport infrastructure should be widened.

1. The Green Deal Industrial Plan

As a new initiative, the Green Deal Industrial Plan was introduced by the European Commission in 2023 with the aim to ensure the transition to green growth and steady, sustainable development.¹¹ Additionally, the Green Deal Industrial Plan intends to enhance the competitiveness of the bloc's industry on the path to net-zero greenhouse gas emissions. Moreover, there is a strong demand for investment in the green transition. As a result, a

9 Veugelers, R., Tagliapietra, S. (2020) "Green Industrial Policy for Europe" *Bruegel*. Available at: <https://www.bruegel.org/book/green-industrial-policy-europe>

10 Siekmann, F., Schlor, H. and Venghaus, S. (2023) "Linking sustainability and the Fourth Industrial Revolution: a monitoring framework accounting for technological development", *Energy, Sustainability and Society*. Vol. 13(26). DOI: 10.1186/s13705-023-00405-4

11 Net Zero Industry Act. Proposal for a regulation of the European Parliament and of the Council on establishing a framework of measures for strengthening Europe's net-zero technology products manufacturing ecosystem (Net Zero Industry Act). COM(2023) 161, SWD(2023) 68. Available at: https://single-market-economy.ec.europa.eu/publications/net-zero-industry-act_en

new balance between sustainability requirements and strategic economic interests, especially in the areas of trade and investment, is essential. Strategic economic interests are supposed to help to avoid an international disadvantage of EU industry and the risk of a decline in foreign direct investments (FDI) in Europe. As statistics show, in 2022, FDI rose only 1% compared with 2021, and remains 7% lower than in 2019, just before the onset of the COVID-19 pandemic.¹² The shift towards an increase in competitiveness of the EU economy and growth in investments could be achieved as a result of an implementation of the EU industrial strategy and therefore strengthen the bloc's industry.

Taken as a whole, the Green Deal Industrial Plan is to counter the EU's import dependency for other key commodities and technologies by placing it at the forefront of markets that will emerge or change as a result of global decarbonisation efforts. Maintaining the EU's security of supply and competitiveness in this shifting geopolitical environment is at the core of the plan. For the above reasons, the European Commission suggested three legislative initiatives aimed at securing these objectives: to reform of the EU's electricity market, suggestions to reframe supply of critical raw materials and to that accelerate transition to climate neutrality by moving to a situation when the EU is the home of clean tech industries.

First, the reform of the electricity market helps to accelerate a surge in renewables and the phase-out of gas, make consumer bills less dependent on volatile fossil fuel prices, better protect consumers from future price spikes and potential market manipulation, and make the EU's industry clean and more competitive.¹³ The electricity market reform should have an impact on the cost of consumers' payments and to protect them due to the decrease of the effect of fossil fuels. It is foreseen that the reform will boost renewables fair competition in the European wholesale energy markets and enhance industrial competitiveness.¹⁴ Second, to increase competitiveness of the EU, the proposals have been suggested for critical raw materials represented by the Critical Raw Materials Act.¹⁵ The act will ensure EU

12 How can Europe attract next-generation inward investment? (2023) EY Attractiveness Survey Europe. Available at: https://www.ey.com/en_gl/attractiveness/ey-europe-attractiveness-survey.

13 Electricity Market Reform for consumers and annex. Directorate-General for Energy. 2023. COM/2023/148 final, COM/2023/147 final. Available at: <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52023PC0147&camp%3Bqid=1679411047615>

14 Ibid.

15 Critical Raw Materials Act. Proposal for a regulation of the European Parliament and of the Council establishing a framework for ensuring a secure and sustainable supply of critical raw materials. COM(2023) 160, SWD(2023) 160, SWD(2023) 161, SWD(2023) 162,

access to a secure and ensure sustainable supply of critical raw materials, enabling Europe to meet its 2030 climate and digital objectives. Thirdly, a proposal for a Net-Zero Industry Act,¹⁶ that should accelerate transition to climate neutrality and to create a simpler and more predictable legal framework for net-zero industries in the EU, as part of Europe's Green Deal Industrial Plan. According to the legislators, the Act will support the EU's climate-neutrality commitment and the clean energy transition, strengthen the resilience of the EU's energy system, and contribute to establishing a secure supply of clean energy in line with REPowerEU.¹⁷ However, some challenges have accrued in the implementation of the Act. For example, development of new technologies will not benefit from reduced regulatory burdens due to the lack of investments which is badly needed to strengthen the EU competitiveness. The Act does not explicitly include other actors than Russian companies participation in the EU market. As a result, the energy sector remain to be open for high -cost business.

C. Green Policies Orientation and the Concept of Environmentally Responsible Governmental and Business Strategies

Increasingly, environmental issues are causing serious threats to ecology, to human beings, and to economic growth. Nowadays, governments and businesses focus on more sustainable production and integrating sustainable processes at the core of their business activities. Studies suggest that Green Policy orientation has emerged as a core concept in the field of entrepreneurship (Lumpkin, Pidduck, 2021),¹⁸ and resulted from cooperation between businesses and governments. In this context, in attaining environmental, economic, and social performance of businesses and business

SEC(2023) 360. Available at: https://single-market-economy.ec.europa.eu/publications/net-zero-industry-act_en

16 Net Zero Industry Act. Proposal for a regulation of the European Parliament and of the Council on establishing a framework of measures for strengthening Europe's net-zero technology products manufacturing ecosystem (Net Zero Industry Act). COM(2023) 161, SWD(2023) 68. Available at: https://single-market-economy.ec.europa.eu/publications/net-zero-industry-act_en

17 Ibid.

18 Lumpkin, G. T. Pidduck, R.J. (2021) "Global Entrepreneurial Orientation (GEO): An Updated, Multidimensional View of EO" in Corbett, A.C., Kreiser, P.M., Marino, L.D., Wales,W.J./Ed. Entrepreneurial Orientation: Epistemological, Theoretical, and Empirical Perspectives, Advances in Entrepreneurship, Firm Emergence and Growth, Vol. 22, Emerald Publishing Limited, Bingley, pp. 17-68.DOI:10.1108/S1074-754020210000022002

and government partnership, Green Policy orientation and/or sustainable economic performance are considered as sustainable competitive advantages (Afum et al., 2021).¹⁹

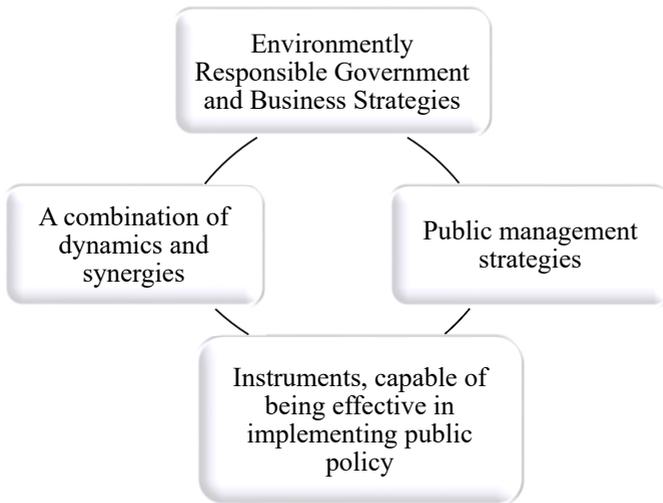
For many businesses entities, to enhance their capabilities and increase competitiveness is to perform towards the initiation of green ventures and the improvement of business and sustainability performance. The transition to a green economy is a dominant part of the EU's economic development, and the European Green Deal that strives to transform the EU into a climate neutral, resource efficient economy by 2050²⁰ has placed green economy in the focus of attention of all national governments of the EU. The implementation of the European Green Deal will provide new opportunities for innovation, investment, and jobs.

Moreover, green entrepreneurs and green businesses are recognised as vital push factors to foster transitions to a green economy. Green entrepreneurs, in implementing their business strategies, aim at reconciling tensions between business activities and environmental objectives in a contrast to entrepreneurs operating under the “business as usual” umbrella.²¹

An essential starting point governing green entrepreneurs is the so-called ‘green growth’ paradigm. In research studies, green growth is primarily associated with climate stabilisation as an accelerator for innovation, investment, and economic growth and is related to political activities on national and regional levels.²² The concept of green innovation was first proposed already in 1996²³ to denote improvements and innovations in product processes that enhance the environmental performance of firms.

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- 19 Afum, E., et al., (2021). The missing links of sustainable supply chain management and green radical product innovation between sustainable entrepreneurship orientation and sustainability performance. *Journal of Engineering, Design and Technology*, p.170. DOI: doi.org/10.1108/JEDT-05-2021-0267
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 - 22 Buch-Hansen, H. and Carstensen, M.B. (2021) “Paradigms and the political economy of ecopolitical projects: Green growth and degrowth compared”, *Competition & Change*. Vol. 25(4), pp. 308–327. DOI: 10.1177/1024529420987528.
 - 23 Fussler, C. and James, P. (1999) *Driving Eco-innovation: A Breakthrough Discipline for Innovation and Sustainability*. Pitman Publishing.

Scheme 1. Environmentally Responsible Government and Business Strategies



Source: authors' design

In addition to this,²⁴ refer to green innovation as processes of the use of innovative resources that may reduce the cost of production and improve a company's performance.

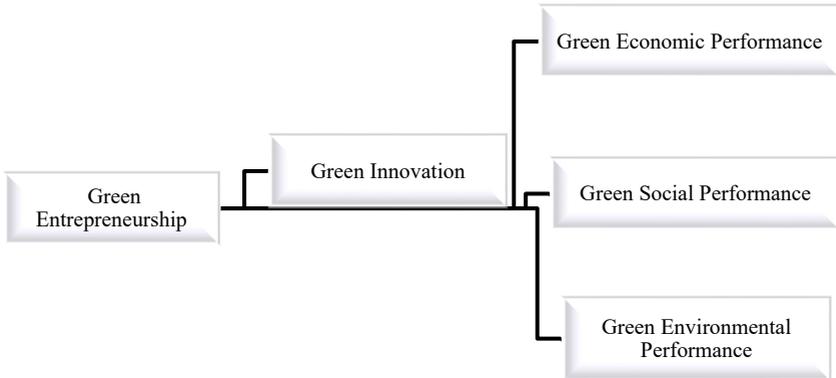
In studies that are relevant to green innovations, the importance of innovation is attached to the economic, environmental, and social performance of a company²⁵, which, in turn, could enhance the strength and competitiveness of business entities and organisations.

Green entrepreneurship leads to green innovation, which sequent to three variables, which include “green social performance”, “green economic performance”, and “green environmental performance”, as illustrated in the scheme below.

24 Borghesi, S., Cainelli, G. and Mazzanti, M (2015) “Linking emission trading to environmental innovation: Evidence from the Italian manufacturing industry”, *Research Policy*. Vol. 44(3), pp. 669–683.

25 Hadjimanolis, A. (2020) *Drivers and Barriers in SMES in the Context of Small Countries in Managing Sustainable Innovation*. Routledge. DOI:10.4324/9780429264962-5

Scheme 2. Green Entrepreneurship and Policies



Source: authors' design

Entrepreneurship plays an important role in delivering more radical green innovations that challenge existing firms and business models. However, the cornerstone of the process is a well-organised government that applies environmentally-responsible business strategies. Green entrepreneurship is a system that reflects a company’s strategic actions to accelerate green innovation and improve sustainable business performance (i.e., that of the environmental, economic, and social).

1. Green Industrial Policy Approach: constrains and barriers

It is widely acknowledged that Green Policies enhance and contribute to the sustainability performance of the demand and supply sides. As a result, there is a need to pay close attention to development of internal environment within national economies and external environment determined by implementation of the SDGs internationally.

Green Policies need the creation of the relevant economic and business environment and green growth, via good governance, fair competition, and an improvement of access to finance, which remains one of a major constraint for the facilitation of the transition to the green growth and new green businesses. These targets can alleviate problems in adopting green innovations. Furthermore, Green Policies can enable businesses to participate in cooperation with a government in knowledge networks and strengthen skills that can lead to innovation that are fundamental in the

green transition. A framework for environmentally responsible business and entrepreneurial strategies should be developed and implemented based to a large extent on the green industrial policy instruments.

D. The Green Industrial Policy role in the economic well-being of a nation

1. *The approach to Economic Security*

A green industrial policy is needed to ensure the success of the green transition and to help maintain and strengthen the EU's socio-economic model. The approach to Economic Security varies in different time periods and depends on the existing geo-political trends, risks, and changes in development at international, regional, and national levels. The concept of Economic Security is in focus of attention of international institutions and scholarly debates. Most studies focused on either national level with a macroeconomic approach (focused on economic vulnerability and capacity of resistance), or an individual approach to Economic Security. As argued by Tamošiūnienė and Munteanu (2015) *the concept of security includes military, economic, energy, environmental security, etc that possess the levels for tackling specific risks to each. Thus, there is a shift from threats to vulnerabilities and risks.*²⁶

The individual approach is studied in the Anglo-Saxon systems of well-being²⁷, the International Labour Organisation is of the same opinion "economic security is composed of basic social security, pertaining to health, education, dwelling, information, and social protection, as well as work-related security."²⁸ Similar view has the Expert Group on the Measurement of Economic Performance and Social Progress,²⁹ the successor of the Stiglitz-Sen-Fitoussi Commission, which suggests the measurement and analysis of Economic Security both as a fundamental feature of economic life and a major influence on subjective well-being and economic behaviour. Further-

26 Tamošiūnienė R., Munteanu, C. (2015) Current research approaches to economic security. DOI: <http://dx.doi.org/10.4995/ICBM.2015.1537>

27 Hacker J. S. Economic Security (2018), in: For Good Measure. Advanced Research on Well-being Metrics Beyond OECD. /Eds. Stiglitz, J.E., Fitoussi, J.P., Durand, M. OECD, pp.204-235.

28 Economic Insecurity is a global crisis (2004) Socio-economic Security Programme. ILO.

29 Stiglitz, J.E., Fitoussi, J.P., Durand, M. (2018) Beyond GDP Measuring What Counts for Economic and Social Performance, OECD, 2018.

more, experts find an error in the fact that it is not adequately reflected in standard national statistics.³⁰ Income volatility is highest in low-income households, but it is increasing among households previously considered to be “secure”—those with medium and higher levels of education, secure employment (*Hacker and Rehm, 2020*)³¹. It is necessary to pay attention to the Economic Security framework as part of national security. Furthermore, a measurement of well-being has to be developed further. The authors are aware that the new knowledge should be developed by experts in academic to suggest comprehensive strategies in overcoming geo-political and environmental risks for better socio-economic outcomes and green employment through entrepreneurial orientation³², that has emerged as a core component in the field of entrepreneurship. A focus on green entrepreneurship as a system that reflects a company’s strategic actions to improve sustainable business performance and sustainable competitive advantage³³ (environmental, economic, and social) should be strengthened. In studies, green entrepreneurship gives rise to three variables which include ‘green social performance’, ‘green economic performance’ and ‘green environmental performance’ and, very importantly, ‘green employment’.³⁴ Moreover, these variables are at the core of the Green Employment Initiative³⁵, which outlines measures to maximize jobs in the green economy. Notable, an environmentally oriented entrepreneurial activities may benefit from a developed ecosystem and good business environment more than conventional entrepreneurship.³⁶

30 Ibid.

31 Hacker, J.S., Rehm, P. (2020) Reducing Risk as well as Inequality: Assessing the Welfare State's Insurance Effects. *British Journal of Political Science*, Volume 52, Issue 1, 2022, pp. 456 – 466.

32 Lumpkin, G. T. Pidduck, R.J. (2021) "Global Entrepreneurial Orientation (GEO): An Updated, Multidimensional View of EO" in Corbett, A.C., Kreiser, P.M., Marino, L.D., Wales, W.J./Ed. *Entrepreneurial Orientation: Epistemological, Theoretical, and Empirical Perspectives, Advances in Entrepreneurship, Firm Emergence and Growth*, Vol. 22, Emerald Publishing Limited, Bingley, pp. 17-68. DOI:10.1108/S1074-754020210000022002

33 Afum, E., et al., (2021). The missing links of sustainable supply chain management and green radical product innovation between sustainable entrepreneurship orientation and sustainability performance. *Journal of Engineering, Design and Technology*. DOI: doi.org/10.1108/JEDT-05-2021-0267

34 Ratten, V., Ramirez-Pasillas, M., Lundberg, H. (2020) *Managing Sustainable Innovation*. Routledge, pp.1-11.

35 Green Employment Initiative: Tapping into the job creation potential of the green economy. Brussels, 2.7.2014 COM(2014) 446 final.

36 Horsch, J. et al. (2017) What influences environmental entrepreneurship? A multilevel analysis of the determinants of entrepreneurs’ environmental orientation. *Small Business Economics*, 48 (1), pp. 47-69. DOI: 10.1007/s11187-016-9765-2

The key factors, influencing an increase of entrepreneurial competences need further research. The question should be answered whether an institutional approach and support policies to entrepreneurial type of education as well as national-level institutions are conducive to entrepreneurship? Suggestions for the ecosystem development and its adoption to green entrepreneurial education, green business and, as a result, to green employment as part of Economic Security should be in focus of studies.

The authors consider that understanding of the conventional entrepreneurship should be reshaped and the academic added value includes multi-disciplinary synergies and extending research-based entrepreneurial education that have a strong impact on employment and Economic Security. Entrepreneurial competences, according to the authors' opinion should be developed further to become relevant to green economy: knowledge, skills, attitudes to develop an expert knowledge in green employment to consider the *potential of employment creation linked to the production of energy from renewable sources, energy efficiency, waste and water management, air quality, restoring and preserving biodiversity and developing green infrastructure is significant and is resilient to changes in the business cycle. Moreover, 54 percent³⁷ of Europeans believe that by 2030 there will be more Social Europe relying on green employment.*

2. *Is Green Industrial Policy in Latvia as a remedy to increase technological improvements and economic security?*

The green industrial policy's framework in Latvia, including its tasks and targets, represents an example of green industrial policy implementation at the level of an EU Member State. Latvia has a small industrial base, but a large agriculture, forestry sector as well as a service sector. Until the outbreak of the COVID-19 pandemic, Latvia's economic growth remained stable, exceeding the EU average. According to the European Parliamentary Research Service, uncertainty remains elevated.³⁸ The OECD noted that that productivity growth went into decline and another risk is the quickly declining size of the Latvian population due to ageing and emigration. The OECD also stresses that policies to enhance digital transformation along with green and digital transition are of prime importance to address the

37 New Eurobarometr survey. April 2024. Available at: <https://ec.europa.eu/social/main.jsp?langId=en&catId=101&furtherNews=yes&tnewsId=10812>

38 Saulnier, J. (2022) Latvia's National Recovery and Resilience Plan. European Parliament. Available at: [https://www.europarl.europa.eu/RegData/etudes/BRIE/2022/698887/EPRS_BRI\(2022\)698887_EN.pdf](https://www.europarl.europa.eu/RegData/etudes/BRIE/2022/698887/EPRS_BRI(2022)698887_EN.pdf)

green industrial policy.³⁹ The data shows, that rapidly increasing prices of natural gas and other energy resources in 2022 and 2023 as the result of the war started as a result of the invasion of Russia in Ukraine and EU sanctions on Russia. The same trend could continue to rise in 2024 and 2025. According to the Central Statistical Bureau of Latvia (CSB), in 2022, electricity prices increased almost twofold compared to the price of electricity in 2021 with the price of natural gas for consumers increasing almost 2.5 times.⁴⁰

The implementation of the green transition goals could be a remedy, however, the Latvian economy needs a reorganisation of the country's industrial system while applying a diverse, cross-sector approach.

Box 1. Strategic Objectives and Measures for Sustainable and Balanced Development -Achieving the 2030 greenhouse gas reduction and achieve climate neutrality by 2050.

Improving adaptability, strengthening resilience, and reducing vulnerability to climate change.

Making progress towards a renewable growth model by decoupling economic growth economic growth from resource use and environmental; depletion and acceleration the transition to a circular economy.

Aiming for zero pollution in an environment, i.e., the removal of toxic substances in the air, water, and soil, this also protecting the health and well-being of Europeans.

Protecting, preserving, and restoring biodiversity and increasing natural capital, in particular the air, water, soil, along with forest, freshwater, wetland, and marine ecosystems.

Promoting environmental sustainability and reducing environmental and climate pressures related to production and consumption in general in the fields of energy, industrial development, buildings and infrastructure, mobility, and food systems.

Source: Saeima, Republic of Latvia, 2020, p. 40-51.

The competitive advantages of the Latvian economy mainly rely on technological factors and improvements in production efficiency and innovations. However, to a lesser extent, the advantages lie in low labour and resource prices. Reframing green investments should be complemented by measures that improve skills and facilitate the reallocation of labour and capital. The labour market itself has been seriously affected by the negative demographic situation in the country, leaving a mark on both unemployment and the dynamics of the number of employees. Furthermore, working-age people will need to cope with an increasing old-age dependency problem, as well as structural and technological changes in economies and businesses expected in the time of the fourth industrial revolution. Furthermore, it becomes increasingly difficult for the unemployed to adapt to new labour-market needs. Risks that some of the unemployed may have difficulty finding a job

39 OECD (2021) *Going For Growth' Report on Latvia*. Available at: <https://www.oecd.org/economy/growth/Latvia-country-note-going-for-growth-2021.pdf>

40 CBS Central Statistical Bureau of Latvia (2022) Available at: https://data.stat.gov.lv/pxweb/lv/OSP_PUB/START__NOZ__EN

matching their skills in the future remain high. According to experts from government institutions,⁴¹ the supply of adequately skilled workers could significantly decrease in the future, and the importance of practice-integrated education in higher educational institutions will continue to surge.⁴² Moreover, to increase the maturity of green economy and business in the country, a high degree of interaction between the public and private sectors is required. In this respect, Latvia's Ministry of Economy, in cooperation with all line ministries, set out tasks and guidelines for the green industrial policy's development, with emphasis on stimulating investment for business development and strengthening the comparative advantages of the national economy towards green transition.⁴³ The guidelines recognise the context of a rapidly changing labour market, as it does the need for employees to constantly acquire new knowledge and the need for employers to invest in technological development and the education of their employees.

The industrial policy's instruments are those of enterprise policy, with the main task to set up an environment and conditions in which entrepreneurs and business entities can take initiatives and implement their innovative activities. As a result of the government-business green partnership, the strengths and weaknesses of the national economy in general and national industries in particular are analysed and corrected according to the changing internal and external environment and may trigger cross-sectoral or sectoral policy initiatives.

Conclusions

The article shows that EU Green Economy and Green Industrial Policy increasingly accepted as key drivers in tackling climate change, pollution, and health to improve life for people. The article contributes to discussions about green transformation and underlines that combining economic growth with caring about the environment is a guarantee a high quality of

41 The Ministry of Economy of the Republic of Latvia. Informative Report "On medium-and long-term labour market forecast". 2020. Available at: https://www.em.gov.lv/sites/em/files/1/abour-market-forecasts-2020-full1_0.pdf

42 Stacenko, S., Muravska, T. and Briņena, L. (2023) *Building the Road to Green Entrepreneurial Orientation in Higher Education and Research: Sharing Experience and Looking Ahead* in Scholz, L. and Trübe, Ch. (eds.) *The EU Green Deal and Its Implementation*. Baden-Baden: Nomos, pp. 187–214.

43 On the guidelines of the National Industrial Policy 2021–2027. The Cabinet of Ministers 2021. 6.02.2021. No 93. Available at: <https://www.em.gov.lv/en/media/13388/download>

life for present and future generations as well as to an effective and rational use of the available resources.

The authors observed strategies related to green transformation targets. One of them is implementation of green industrial policy at the EU and EU Member States levels. The article underlines a new balance between sustainability requirements and strategic economic interests, especially it is essential in the areas of investment, productivity, and economic security.

The authors underlined that a methodological approach have to be developed and improved in assessing actions and measures related to the green economic and business development trends, that require support of societies as well as the improvement of economic efficiency at the EU and national level. The achievement of the EU's green policies is determined by a combination of dynamics and synergies between public management strategies and instruments that are capable of implementing effective public policy in an adequate partnership with private business and entrepreneurship.

The article concludes that the EU green industrial policy framework should become embedded in the Member State national reform programmes. Moreover, EU Industrial Policy and national industrial policies require coordinated actions in certain green technologies, regulation, and standardisation, which help to avoid fragmentation in the Single Market and to develop a solid regulatory framework, focused on ensuring competition and access to the Single Market, with common or mutually recognised environmental standards. The instruments applied in internal economic and business environments are adjusted to the level of economic and business development and specific problems in different sectors of the national economy. The EU's actions in green industrial policy help the Latvian government to develop action plans that include green industrial policy recommendations. As a result of the government- business green partnership, the strengths of the national economy in general and national industries, and their weaknesses in particular, should be assessed and further corrected in relation to changes in the internal and external environment and, as a result, produce efficient cross-sectoral and sectoral policy initiatives. The authors pointed out that an environmentally oriented entrepreneurial activities may benefit from a developed ecosystem and good business environment more the conventional entrepreneurship. Identification of appropriate complex labour market and educational indicators needs to be researched. It is necessary to pay attention to the Economic Security framework as part of national security. Furthermore, a measurement of well-being has to be in focus of socio-economic research. The authors are aware that the new knowledge should be developed by experts in academia to suggest comprehensive

strategies in overcoming geo-political and environmental risks for better socio-economic outcomes and green employment.

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*Līga Sileniece*¹

Green Business Environment: Normative fundamentals and policies for SMEs

Summary:

This paper aims on analysing green business normative fundamentals and policies for SMEs in level that foster green business transition of SMEs on a conceptual. Seeking consistency with The United Nations (UN) set of seventeen Sustainable Development Goals (SDG) business organizations are transforming from “doing business as usual” to sustainable business practices. Regulatory frameworks and incentives are impactful drives of green business transition when contributing to healthy business environment. Based on the overview of scientific literature on the policies and legal framework that establishes green business transition the authors aim to identify and explore presupposed aspects that foster green business transition of SMEs. The article builds on awareness of the significance of SMEs in green transition, underlines current trends in scientific research on regulatory frameworks and policies that create business environment for SMEs and reflects on the European Union`s normative regulations.

Keywords: Green business; Normative regulations; Green business policies; SMEs; The European Union

A. Introduction

Green transition as a response to environmental issues is a global challenge. Environmental risks like severe weather conditions, critical change of Earth systems, biodiversity loss and ecosystems collapse, and natural resource shortages are admitted to be the most dominant and deteriorate in their severity during the next decade (World Economic Forum, 2024). United Na-

1 Sergejs Stacenko, PhD in Public Administration, a Sworn Advocate and Senior Researcher at the Riga Stradins University. Visiting professor and a researcher at universities in Germany and India. His research and publications cover EU legal environment, green and employment policies, legal issues related to labour disputes. Contact: sergejs.stacenko@rsu.lv

tions (UN) have clearly stated that for long time human activities have been main driver of climate change. The Paris agreement being legally binding international treaty aims at holding global warming to well below 2 degrees Celsius and to “pursue efforts” to limit it to 1.5 degrees Celsius (UNFCCC, 2015).

Regional contributions are key components in tackling climate change internationally. Europe has undertaken a role of being a leader for saving planet for future generations. The European Green Deal is an integral part of this EC strategy to implement the United Nation’s 2030 Agenda and the sustainable development goals (European Commission, 2019). The European Green Deal embodies package of policy incentives defining the path of EU’s green transition. Climate neutrality by 2050 is an ambitious goal of the European Union (EU) that commits all the EU members states under the EU Climate Law. EGD was launched by European Commission in 2019. The European Green Deal responds to climate issues by shifting EU economy from conventional to a modern, resource efficient, and competitive economy by launching multiple policies for advancement of green economic growth and EU’s commitment for decarbonization, dematerialization and decoupling of carbon emissions primary (Vela Almeida, D., 2023). The European Green Deal provides framework to ensure that EU legislative and policies are relevant for climate neutrality objective. For that reason The European Green Deal focuses on 1) EU’s climate ambition for 2030 and 2050, 2) Supplying clean, affordable and secure energy, 3) Mobilising industry for a clean and circular economy, 4) Building and renovating in an energy and resource efficient way; 5) Accelerating the shift to sustainable and smart mobility; 6) From ‘Farm to Fork’: designing a fair, healthy and environmentally-friendly food system, 7) Preserving and restoring ecosystems and biodiversity; 8) A zero pollution ambition for a toxic-free environment goals (European Commission, 2019). The EU Taxonomy regulation and the Corporate Sustainability Reporting Directive (CSRD) will force a rigid disclosure system that is organised to support and transition the EU economy to meet its European Green Deal objectives, including the 2050 climate-neutrality target (Cronin, M., & Doyle-Kent, M., 2022)

Green economy is a joint action on a global scale as involvement on individual level is purposeful but too weak to provide expected solutions for climate issues, resource depilation, pollution, and loss of biodiversity. Green economy is a contemporary knowledge area with rapid research growth and industrial adoption rates. Conceptually green economy stands on four fundamental pillars: environmental challenges, human well-being and equity, and economic growth. In other words, a green economy incorporates envi-

ronmental, social, and economic aspects to foster sustainable development. Thus, its topicality is rooted in both - environmental issues and the necessity of sustainable development.

Green business transition demands businesses to go through the process of change. Movement towards sustainability by adoption of green business strategies involves comprehensive shift from traditional way of doing business to doing business under green thinking paradigm. Green thinking fosters businesses to bring sustainability aspect up-front and go through change by having different view on resources, business process, knowledge, competitiveness, innovation and other aspects of business management. Green transition for businesses embodies change in usage of resources from non-sustainable to sustainable, but transition process itself largely depends on capabilities of businesses to go through the process of business transformation. Still, business organization within transition to more sustainable business are meant to strengthen their competitive advantage. Already decades ago, it has been stated that integration of environmental issues is the key to a comprehensive environmental strategy for business organizations, but more research is needed to determine how this integration should happen (Banerjee, S.B., 2001). Although the “business as usual” is not justifiable due to growing environmental issues, the business community faces a challenge of not losing competitiveness in this dynamic green environment.

Green transition addresses both - large corporate companies and SMEs sized companies as well. Sustainable business practices and reorientation from “business as usual” to environmentally friendly business practices is vital due to support SMEs provide for corporate companies (Permatasari, P., & Gunawan, J. 2023). At the same time, scientific literature indicates, that normative regulations serve as significant drives for green transition instead of voluntary participation which remain low (Cronin, M., & Doyle-Kent, M., 2022). Although EU normative regulations set obligations for corporate companies and listed SMEs, vast part of SMEs is mainly taking part in green transition on voluntary basis. Recognizing the significance of SMEs in fostering green transition in EU, voluntary standards (EC, 2019) are being developed to facilitate the pass of SMEs to more sustainable and that environmentally friendly business practices.

B. Green business environment

Business performance critically depends on the business environment in which it operates. Policy makers are interested in rising competitiveness of business environments to foster prosperity of countries. Scientific litera-

ture provides extensive research on different aspects of the business environment and its evaluation instruments, for example *The Enterprise Survey* by the World Bank, *The Doing Business Report* by the World Bank, and *The Competitiveness Index* by the World economic Forum (Qiang, C. Z., et al., 2021, Liu, Q. 2021). The set of indicators used to compare development of business environments in different countries varies in their instruments in accordance with their aim. World Bank`s Doing Business Report is admitted to be based on relatively mature, stable and widely accepted indicators(Li, X., & Xiao, L., 2024). Ten indicators are used to evaluate ease of doing business - time and operation indicators (starting a business, dealing with construction permits, getting electricity, registering property, paying taxes, trading across borders) and legal score indicators (getting credit, protecting minority investors, enforcing contracts, resolving insolvency) (World Bank, 2019). Doing Business Report also measures regulation on employing workers and contracting with the government (World Bank, 2019). An environmentally friendly business environment is inevitable for transition to a green economy. Green business environment aims to establish conditions and provide support for businesses to enhance sustainable development and environmental preservation within their business operations by keeping the balance between economic prosperity and environmental depletion. Green business environment builds on a long-term competitiveness of businesses, continuous progress of society and advancement of ecological civilization (Li, X., & Xiao, L., 2024).

Under a holistic approach green economy is an ambiguous, complex system with many interconnected constitutive subsystems and associated system elements, like circular economy, sustainable development, skull development, food systems, infrastructure, policy, hydroponics, green energy, green logistics (Telukdarie, A., 2024). Nevertheless, based on extensive literature review scholars still refers to the green economy concept as “*highly controversial, partly due to its theoretical blurriness*” (Merino-Saum, A. et al, 2020). They have found 95 definitions of the green economy concept along with additional 45 definitions of the green growth concept often used interchangeably. Findings of this research suggest that definitions of green economy mainly differ by representation of the elements constituting the green economy concepts. Overall, the five (from 40) most often incorporated elements in the green economy definitions are “economy”, “environment”, “economic growth”, “development”, and “natural resources”. Similarly resent research that aimed at exploration of constituent elements of the green economy by conducting bibliometric analysis, have indicated “climate change”, “policy”, “sustainability”, “governance”, and “ecosystem services” as five (from 20) most often in corporate elements in the green

economy concept (Telukdarie, A. et al, 2024). Important components of the green economy comprise low carbon technology and efficiency of natural resources, that results in accounting, conservation, and enhancement of ecosystem services (D'Amato, D. et al, 2019).

Scholars have indicated that actors who shape the concept of the green economy are scientists (scientific literature) and international organizations, and they admit differences in the green economy definition depending on geographical regions (Merino-Saum, A. et al, 2020). These authors have also observed differences between institutional and scientific definitions of the green economy. They point out that international institutions representing political arena are more focused on social issues (society, equity, employment) and they more frequently mentioned into definitions economic terms (economic growth, finance, production).

C. Green business transition and drivers of SMEs.

The term green transformation rather than the green shift is used to capture the magnitude of societal change required across critical social, economic, and political dimensions to enable sustainability and to avoid dangerous climate change. If green transformation is to succeed as a response to climate change, it must be both top-down and bottom-up. This spotlights the concept of **green thinking**. Attention of researchers has been put on investigation of green thinking from perspective of consumer behavior with the aim to provide general advice for rise of green consumption and green markets. However, management's commitment to green transition is admitted as vital factor that fosters green transformation of organizations. Green thinking drives change from both directions: 1) inner necessity of change based on leadership driven by green thinking of management, 2) other demand driven by green thinking of customers

Green entrepreneurs are admitted as key drivers in **green business transition** and "game changing agents" who are meant to abdicate doing business as usual and balance their business aims with environmental aims (O'Neill, K. & Gibbs, D., 2016). Nevertheless, entrepreneurs are not the only ones and common effort is required to facilitate change towards sustainability through enhancement of the green economy. The market, the government, the investors, the technology, the innovator, and the entrepreneur are involved in the modification of the economy (Buch-Hansen, H., & Carstensen, M. B., 2021). The market, the government, the investors, the technology, the innovator, and the entrepreneur are involved in the modification of the economy (Buch-Hansen, H., & Carstensen, M. B., 2021).

Factors that stimulate green transition are capital market acceptance and government intervention: 1) can directly stimulate the demand for green products by government procurement, 2) law requirements of renewable energy, renewable obligation; 3) taxation policies (companies must pay for extra greenhouse gas emissions). Governmental intervention has been studied on theoretical and empirical basis. Experimental research has provided evidence that because of becoming greener the profits of retailers and producers decrease first and then increase, after they receive government subsidy (Wei, D., 2020). The authors of this research conclude that the government subsidy motivates business organizations the producer to renovate green manufacturing technology, and the retailer to further promote green products.

Green business is meant to foster growth of green economy, expansion of green markets, and development of green business models (Chen, Y.-S. et al., 2023). To pursue green business strategies, business organizations should incorporate such goals into their business objectives, thus ensuring that their operations are environmentally sustainable and supportive of the broader global sustainability objectives (Teymourifar, A., & Trindade, M. A. M. 2023). Environmental shift towards greener business might be reached by organizations in eight directions: 1) green consumption and environmental labelling; 2) green contract with consumers; 3) green management modules; 4) environmental auditing; 5) scenario planning; 6) green redesign; 7) corporate consciousness; 8) environmental outreach (McGuire, D., 2010).

The extent to which business organizations are ready to improve their environmental performance is associated with corporate social responsibility of business organizations and their environmental orientation. The concept of environmental orientation is not new and well defined in scientific literature. Banerjee states that environmental orientation reflects managerial perceptions of environmental issues of a business organization and is grounded in integration and accountability in front of stakeholders (Banerjee, S.B., 2001). Banerjee highlights the significance of green marketing and the necessity of building environmental awareness of customers to establish markets for green products and services (Banerjee, S.B., 2001). Further Menguc and Ozanne defined the concept of natural entrepreneurial orientation by stating that this concept is composed of three first-order dimensions, namely entrepreneurship, corporate social responsibility (CSR), and commitment to the natural environment (Menguc, B., & Ozanne, L. K., 2005). Menguc and Ozanne admit these three capabilities are rare, valuable, and difficult to imitate and leading to competitive advantage if implemented correctly (Menguc, B., & Ozanne, L. K., 2005). According to Dean & McMullen entrepreneurs having environmental orientation play

a role in breaking down barriers to the efficient functioning of markets and eliminating the market failures which produce environmental degradation (Dean, T. J., & McMullen, J. S., 2007). The factors fostering green entrepreneurial orientation are mainly associated with actors playing a role in entrepreneurial settings. Recent comprehensive systematic review of scientific literature devoted to environmental orientation states that environmental entrepreneurial orientations includes multiple strategic orientations that are influenced by factors from various dimensions, and it can be enhanced through micro (personality traits, perceptions and values, human and social capital, emotions, moods and feelings), meso (organizational characteristics like corporate governance, leadership, management's awareness and pro-environmental behaviour, organizational mindfulness, entrepreneurial culture ect.), and macro-level drivers (stakeholder demands, regulatory frameworks and incentives, green economy investments and promotion instruments, collaboration and networking, open-innovation strategy ect) (Ameer, F., & Khan, N. R.,2023).

Scientific literature provides clear identification of enablers and barriers for SMEs to enhance sustainable business practices. Technological, managerial, strategic, cultural, skill, financial, supply and demand, and technological advancements are admitted as challenging for SME's to enhance sustainable business practices. General advice from scientific literature suggests using such enablers as operational, strategic, market-related, competition-related, and adaptation related to overcome these challenges (Basit, S. A.,et al, 2024).

D. Green business policies and normative fundamentals

1. Green business policies

Green policy concepts (for example, resource efficiency policies, financial support, regulations of tax breaks, limit of emissions ect.) reflect global policy development such as the Paris Agreement, the Sustainable Development Goals. Green policies aim at creating a supportive framework for green transformation. Green policies elaborate the institutional perspective of green transformation by harmonization of economic, social, and environmental aspects into an organization.

In recent years a reasonable amount of research has been provided on green policies. A stream of literature explores green business policies in two packages – resource efficiency policies and climate mitigation policies. Resource efficiency policy package includes three instruments - resource

efficiency innovations, more efficient resource use, combination of regulations, technical standards, and planning and procurement policies to reduce resource demand. Climate mitigation policy package includes three measures for green-house emissions reduction including carbon tax, development of carbon dioxide removal technology, and emissions reductions from land-use change (Liu, Q., 2021). In scientific literature green policies have been classified on the basis of their aims: 1) renewable energy regulation, that include renewable portfolio standards, mandatory green power options, standards regarding distributed renewable generation technologies, and similar, 2) financial incentives designed to promote renewable energy technologies, 3) energy efficiency policies, which includes regulations and incentives designed to promote energy efficiency, 4) policies focuses specifically on climate change adaptation or mitigation, that include greenhouse gas registries, inventories, and targets, climate adaptation plans, and participation in regional greenhouse gas reduction agreements, 5) public benefit funds, which allocate financial resources (usually generated by fees on customer utility bills) toward energy efficiency and renewable energy programs ranging from consumer education and low-income assistance to renewable energy research and development (Woods, N. D. et al, 2023).

Green finance policies have been studied extensively as well. A lot of research is available on green credit and green bonds. Research suggests that green credit can increase the loan threshold through financing constraints and force businesses to implement green business practice, while green bonds facilitate investments in eco-projects. Mix of green bonds and green credit have positive impact on green innovation of businesses (Liao, Z. et al 2024).

Environmental policies have been studied from perspective of demand and supply side. Findings suggest that significant growth in green markets is most likely to result where a combination of policy instruments directed at the supply side and demand side of the market is simultaneously implemented. However due to knowledge gap the ability of governments to design and implement instrument packages that include demand-side instruments and to ensure that they interact positively with supply-side instrument has been questioned (Daugbjerg, C. and Sønderkov, K.M. 2012).

The EU's environmental policies initially include traditional environmental policies such as biodiversity and water resource protection, gradually covering climate change policies related to emission reduction and renewable energy. In addition to command-based environmental policies, the EU also uses incentivized environmental regulation such as environmental taxes, emission trading rights, and environmental subsidies. Environmental regulations are developed with the aim of protecting the environment,

reducing depilation of natural resources and promotion of sustainable growth. With normative regulations restrictions and obligations are defined to facilitate pass from “doing business as usual” to green business practices.

2. Normative regulations

As normative regulations should govern business strategies of companies and motivate them to enhance sustainable development and environmentally green business models policy makers are looking forward to understand what kind of companies` behavior align with normative regulations (Bartolacci, F. et al 2020). Scholars admit that normative regulations might take a role of enablers as well as create barriers in the pass of businesses towards environmentally friendly business practices (Xiumei, X. et all, 2023.). Environmental regulatory frameworks worldwide form the structure that reveals connection of the type of normative regulations and impact of green transition of SMEs. According to research following clusters of environmental regulations are widely used: 1) Command-controlled environmental regulations, 2) Market-incentive environmental regulations, 3) Public-participative environmental regulations (Xiumei, X. et all, 2023.). These scholars have evaluated the specific regulatory effect of each cluster of regulations (see table 1.)

Table 1. Environmental regulations. Source: Xiumei, X. et al, 2023.

No.	Type	Purpose	Enforcement	Effect
1.	Command-controlled environmental regulations	Dictate the obligations to be undertaken to preserve green society. Violation results in penalties. Examples: limiting carbon emissions, water quality standards for industrial discharges, and regulations governing hazardous waste disposal.	Regulatory agencies are empowered to limit production or shut facilities.	When the government strictly ensures compliance with command-control green regulations in industrial operations, it binds SMEs to transform their operations.
2.	Market-incentive environmental regulations	A set of green policies and approaches to address environmental problems by creating financial incentives for businesses to reduce their ecological impact. Examples: emission trading systems, carbon pricing, tax credits, performance-based standards, and green procurement policies.	Provide flexibility and allow participants to find cost-effective ways to meet environmental goals	Green innovation becomes a key driver. SMEs seek the optimum benefits from the market-incentive environmental regulations.
3.	Public-participative environmental regulations	Involve inclusive decision-making processes where the public, stakeholders, and experts collaborate to shape and enforce environmental policies. The government uses multiple channels, such as self-media and litigation, to involve the public and various stakeholders in the regulatory process.	The government uses multiple channels, such as self-media and litigation, to involve the public and various stakeholders in the regulatory process. These regulations strive to balance economic development and environmental protection while considering the needs and concerns of affected communities.	As public awareness increases, SMEs view sustainability as a necessity for survival rather than a burden. Higher intensity of society's rationality for a green environment ultimately bound SMEs to acquire green technology to comply with consumer preferences for green technology transformation.

As green transformation thrives to foster green growth, building of competitive advantage in new green business environment is a challenge for business organizations. Thus, evaluation of normative regulation effects becomes important. Scholars have indicated following effects of green normative regulations having impact on SMEs: 1) the cost effect, 2) the innovation compensation effect, 3) the crowding out effect, 4) the survival of the fittest effect (Xu, Y. et al, 2024). According to this research environmental regulations tend to increase production costs as business need to ensure legal

compliance. Thus, negative impact of cost effect is exposed. Moreover, not to lose competitive advantage businesses need to invest in green innovation and thus face decrease in economic returns. To mitigate these negative effects, governments issue regulations to pursue innovation compensation effect and subsidies and support to environmental protection and energy-saving enterprises. At the same time businesses that are not affected by innovation compensation effect lose their competitive advantage and are phased out. At this moment the survival of the fittest effect is exposed as green regulations promote the development of green industries (Xu, Y. et al, 2024).

E. Conclusions

The article shows that SMEs are significant players in facilitating green transition due to their presence and support to corporate companies. Normative regulations and policies focused making impact on business behaviour of SMEs might be challenging for policy makers due to their negative effects that need to be compensated in well balanced frameworks or policies and normative regulations.

Although scientific findings suggest that more sustainable and green business practices have positive impact on SMEs financial performance in long term, SMEs still face the challenge of losing competitiveness and overcoming barriers in green transition.

The article builds on awareness of the significance of SMEs in green transition, underlines current trends in scientific research on regulatory frameworks and policies that create business environment for SMEs and reflects on the European Union`s normative regulations.

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*Rainer Lisowski*¹

Strategies on Biodiversity: German Municipal Administrations

Summary: While the discussion about climate change attracts a great deal of media and public attention, another environmental issue is often overshadowed by this discussion: the global loss of biodiversity (species diversity, diversity of natural areas, number of individuals). Wrongly so, because the so-called planetary boundaries have been reached to a greater extent for biodiversity than for climate change. Politicians and administrators at all levels are trying to address the issue. This article is an initial, exploratory approach to analysing municipal biodiversity strategies. Essentially, the aim is to categorise the strategic approaches to be found therein and to roughly assess their significance.

Keywords: biodiversity, biodiversity strategy, environmental protection, public administration

A. Preliminary considerations²

A cartoon on the subject of species loss shows an elderly gentleman in a dressing gown sitting in his reading chair on a cliff, reading about the extinction of various animal species in the newspaper, but shrugging his shoulders and asking what the loss of a few critters has to do with him. A long rope is tied around his neck and lies coiled up behind him. Various animals are tied to this rope, such as a penguin, a tiger or a blue whale,

1 Rainer Lisowski is Professor for Public Management at the School of International Business, University of Applied Sciences Bremen, Germany. He has studied Political Science and Economics. Before being appointed as Professor in Bremen he worked in various functions in Public Management, public and private companies. He travels to Africa and Asia on a regular base for research and lecturing purposes. His research is mainly empirically driven, often following qualitative research paradigm. He has published several books on various political issues. Contact: rainer.lisowski@hs-bremen.de.

2 Disclosure: the translation engine “deepL” was used to translate this chapter from German to English, due to efficient time-management. Quotations that were originally in German have been translated into English, using the same AI.

which fall from the cliff and so it is only a matter of time before the man reading the newspaper is pulled down with them.

It is not uncommon for science, especially the social sciences, to be accused of blurring the line between science committed to objectivity and political activism. This accusation is not always inaccurate. Throughout his life, Karl R. Popper advocated making it clear in advance of a scientific publication which personal convictions and attitudes could influence the respective study in the background. This good example will be followed here: The author of this essay became an enthusiastic hobby beekeeper a few years ago and in this way discovered his love for a few furry insects. This has awakened his interest in the protection of the insect world, on which a large part of the food chain, including us humans, ultimately rests. He was also strongly influenced by the British biologist Dave Goulson's publication 'Silent Earth', which uses the latest entomological research to illustrate the process of biodiversity loss in the insect world in a way that everyone can understand. (Goulson, 2023) This means that there is already a formative previous experience that affects the perception of the problem.

B. The problem in a nutshell

Even an interested specialised public is often unaware that there is also an international scientific panel, the IPBES, for the topic of biodiversity. Similar to the much better-known IPCC for climate change, the IPBES endeavours to keep the global public and political decision-makers informed about the status of research into the loss of biodiversity. This is because it is indeed a problem that actively affects humanity. Destroyed ecosystems provide no habitat for animals. However, humans are dependent on many ecosystem services for their food chain, i.e. services provided by nature that humans cannot create themselves. The pollination activity of insects alone is a quasi-mandatory prerequisite for almost all types of fruit and vegetables that humans consume. Marine ecosystems are indispensable for supplying mankind with protein from the sea. Accordingly, the IPBES attempts to assess the current extinction risk for various animal species, using the well-known Red List of Extinct Animal and Plant Species, among other things. Some of these have already suffered serious losses. In the case of amphibians, for example, 30% of the various species are already considered threatened, which in turn must be differentiated into: vulnerable, endangered and critically endangered (IPBES, 2019, S. 28). One might argue that paleobiologists estimate that 99.9% of all species that have ever lived on Earth are now extinct. In fact, a species has a statistically normal lifespan of only around 10

million years and there have been at least five mass extinctions in the past geological eras. However, this view does not take sufficient account of the time factor, as it is estimated that the current wave of extinctions triggered by humans is taking place around a thousand times faster than natural extinction processes. As in the climate debate, this raises a hotly debated topic, namely the question of so-called tipping points, of which we neither know exactly when they will be reached nor what consequences are to be expected (Fischer & Oberhansberg, 2021, 24, 25, 51).

In the case of biodiversity, one such tipping point would be the destruction of the tropical rainforest. All we know is that it could be difficult or impossible to rebuild the forest within a normal human timeframe and that dramatic consequences are to be expected for the flora and fauna affected. If not for life on the entire planet.

In addition, there are other direct consequences for ecosystems and ultimately for humans. One example of this is the study conducted by the Alfred Wegener Institute for the WWF. It analysed the impact of plastic pollution in the oceans on marina species and marine ecosystems. The results showed that 88% of the species analysed were affected by plastic waste in the ocean. It is estimated that by 2050, 99.8% of all seabirds will have plastic particles in their stomachs (Tekman et al., 2022, 6, 12). Another problem that is difficult to assess is the contamination with nanoplastics. As larger pieces of plastic are not broken down directly, but are instead mechanically reduced in size, they eventually reach the size of nanoparticles. And the fear is that this nanoplastic could cross the blood barrier of the brain and become lodged in the brain as a foreign body. It is precisely at this point that no immediate improvement can be expected, even if action were taken quickly. Even if, hypothetically, all plastic production were to cease as of today, the amount of plastic in the oceans would still double by 2050 due to the delayed entry of plastic into the oceans. (Tekman et al., 2022, S. 10)

C. Local pressure to act and political procedures

These global problems are difficult if not impossible to solve from the perspective of local administrations. At best, small contributions are possible. However, there are also a number of problems at local level that affect biodiversity in rural or urban areas, for example in relation to the insect world, where food chains often begin. Even if the overall situation is unclear, various large-scale studies, for example from Austria, now indicate that populations are changing significantly (Bundesministerium für Land- und Forstwirtschaft, Regionen und Wasserwirtschaft, 2023).

If we look at a medium-sized city that is common in Western Europe, such as the manageable city of Oldenburg, which is now ranked 47th among major German cities, then the following six developments are having a major impact on biodiversity even here in this tranquil local authority:

1. habitat loss due to urban growth
2. fragmentation of habitats
3. use of agrochemicals
4. over-fertilisation
5. climate change
6. neophytes and pathogens

Cities are popular. Due to the strong growth of the city in recent years, new building areas have been designated, leading to the loss of natural habitats on the one hand and the fragmentation of animal habitats in urban areas on the other. A good example of this are solitary bees, many of which are protected in Germany. One wild bee species is the sand bee *Andrena fulva*, which pollinates berries very effectively. They are dependent on loose, sandy, unpaved soils, which are naturally becoming increasingly scarce in densely populated urban areas. Most people are unaware that agrochemicals are also a major problem in the urban context. While a ban on glyphosate is being discussed on agricultural land, this product is freely available for sale under other trade names in almost every DIY store and is also used accordingly. However, the sum of the many small applications is of course just as harmful to nature. Unfortunately, the negative effects of glyphosate on insect populations are only gradually becoming clear. The manufacturer itself points out that the product is not directly lethal to insects. However, studies with bumblebees, which are wild bees, have shown that glyphosate has a sensitive effect on the thermoregulation of the bumblebee nest and thus severely damages the reproductive success of the species (Weidenmüller et al., 2022). A final example is the aforementioned over-fertilisation. Many urban gardens have lawns, which in themselves represent a rather inhospitable habitat for most animals, even if they appear green to the human eye. They are sometimes referred to as 'green deserts'. Increasingly, robotic lawnmowers are being used to avoid the tedious task of mowing the lawn. The mowing rots on site and leads to an ever-increasing enrichment of the soil with humus. This is also referred to as over-fertilisation. If these over-fertilised soils were to be turned back into more attractive habitats, they would have to be depleted again in a lengthy process.

In short, while many agricultural problems are already the subject of intense scientific debate, biodiversity problems in urban areas are rarely

discussed. Yet the local context is essential if the EU's biodiversity policy objectives are to be achieved in any way.

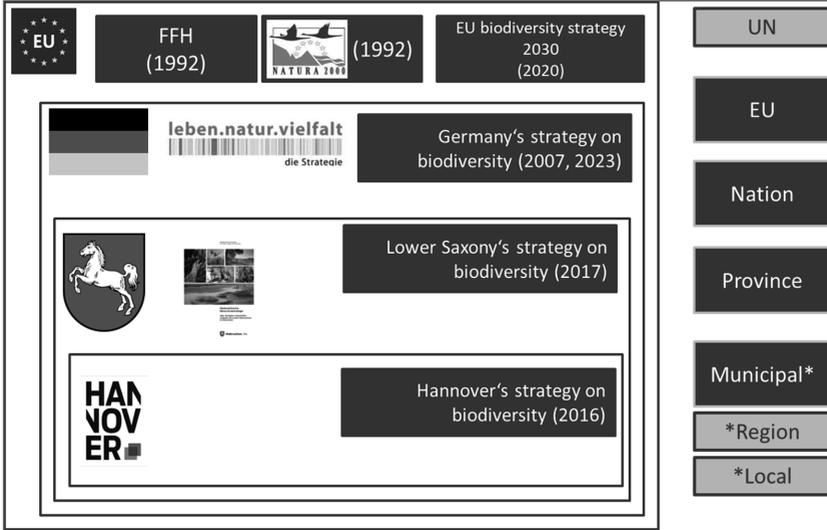
D. Hierarchy of norms and political activities at different levels

As a rule, Europe's political systems are now rightly referred to as a multi-level system due to the penetration of the European Union's activities. If one looks at the political activities in the field of biodiversity, this is easy to understand. Irrespective of the goals of the United Nations (Kunming-Montreal global biodiversity framework), it is above all the European Union that is an important driving force for environmental protection on the Western European continent. Examples of this are the FFH and Natura 2000 initiatives (1992). In the context of the European Green Deal, the EU Biodiversity Strategy 2030 from 2020 is particularly noteworthy (Europäische Kommission, 2020).

However, there are also biodiversity strategies at national level. The German one, for example, dates back to 2007 and was modified and expanded in 2023 (Bundesministerium für Umwelt, Naturschutz, Bau und Reaktorsicherheit, 2015). The federal states have not been idle either. Lower Saxony developed its own strategy for biodiversity in 2017, and thus relatively late (Niedersächsisches Ministerium für Umwelt, Energie und Klimaschutz, 2017). Numerous local authorities have also developed activity programmes, some of them as pioneers. The strategy of the Hannover Region³ on Biodiversity from 2016 is an example and decisive for this study (Region Hannover, 2016).

3 Hannover is the state capital of the German state of Lower Saxony. The Hannover Region is the merger of several districts in the metropolitan region of the state capital.

Overall, this results in the following cascade of actions and regulation:



From a technical and political science perspective, a combination of European and municipal regulations in particular makes sense. As an unelected authority in ‘distant Brussels,’ the EU Commission is less sensitive to strong political dissatisfaction caused by bans that directly affect citizens. The local level, on the other hand, is better placed to decide on a case-by-case basis which biological measures make sense locally, as these should be adapted to the relevant local habitats. If you look at the population density by NUTS 2 regions in Europe in Eurostat alone⁴, it immediately becomes clear that only a community-based fine-tuning model makes sense.

It would be necessary to analyse more closely whether the two levels are well interlinked. A look at the European Union’s biodiversity strategy papers and a glance at the municipal papers give the impression of at least a mixed picture. On the one hand, the EU emphasises the need for systemic change more strongly, but then does not formulate exactly which bans on certain pesticides are envisaged, for example. On the other hand, the European Union operationalises with concrete figures how much more land

4 <https://data.europa.eu/data/datasets/qegn3fjfo7sqo7qpan8t9g?locale=en>

in the EU should be placed under stronger protection. To anticipate the following result: In fact, this expansion of protected areas is a key aspect of the municipal strategy papers.

E. Strategic patterns

However, the aim of this first preliminary study is to examine and analyse some examples of biodiversity strategies of German municipalities in order to create the basis for a more comprehensive study. The interest group 'Communities for Biodiversity', which has documented over 50 such municipal strategy papers on the Internet, provides a good initial basis for this (Kommunen für die biologische Vielfalt e.V., o.J.). Methodologically, a certain degree of caution is necessary here. The term 'strategy paper for biodiversity' is not legally standardised and the various documented plans sometimes pursue different objectives. Nevertheless, this data set provides a good approximation of the field to be analysed.

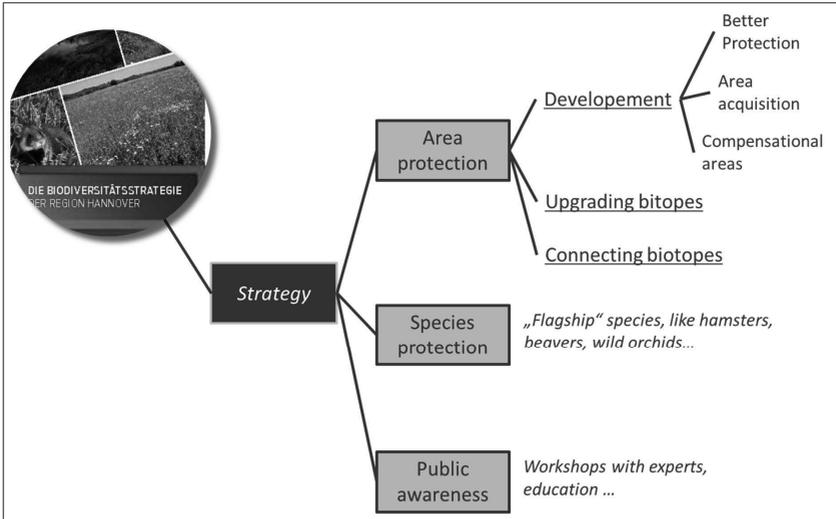
The question remains, which strategy papers should be analysed first? John Creswell proposes a very robust approach for qualitative analyses: "Pick one document (...) – the most interesting one, the shortest, the one on the top of the pile. Go through it, asking yourself ‚what is this about?'" (Creswell, 2014, S. 198).

The biodiversity strategy of the Hannover Region was selected for this study. This was published in March 2016 and comprises 78 pages in eight chapters. Typical of the activities of German local authorities, it first establishes a link to the legal framework of the higher levels and also interprets the concept of strategy. The document also establishes a link to the landscape framework plan. In the German legal framework, landscape framework plans ('Landschaftsrahmenpläne') are legally binding and legally defined instruments of German spatial planning. Unlike a biodiversity strategy, the landscape framework plan is therefore a legally clearly defined instrument. At the same time, a glance at this document reveals what it does not contain: Information on budgets and team strength. What can drive improved biodiversity - resources - is therefore not even mentioned in the document itself.

What else stands out when analysing this political document? First of all, that in several places there are calls for the urgent need for systematic change, but the strategy itself focuses on small-scale and practical measures. This is due to the fact that the authors of the strategy paper will be aware that fundamental change is essential in many respects to improve the situation, but that this is difficult to achieve at the smallest state level.

The specific strategic approaches in the paper can be divided into three main areas (see diagram):

- Placing areas and landscapes under protection,
- protecting certain species and
- public awareness.



The attempt to influence public perception can be interpreted as an attempt by the local level to contribute to the aforementioned systemic change. However, it should be critically noted that less information and public awareness of the general population is aimed at and the approaches pursued are more focussed on workshops and work with experts. If the frequency of words is analysed using MaxQDA's Word Cloud tool and then aggregated, it is primarily public institutions and nature conservation associations that are mentioned, rather than agriculture or other target groups such as the general public. This individual finding is consistent with a quantitative study by the KommBio association (Kommunen für die biologische Vielfalt e.V., o.J.). The association members were asked which stakeholders they cooperate with outside their own administration. Other authorities and nature conservation organisations, i.e. other experts, were also primarily mentioned there. The approaches described under Public Awareness therefore primarily serve to network nature conservation activities. The local level of the

state attempts to bring together and bundle the activities of various nature conservation groups. At best, measures such as public nature trails attempt to sensitise the (school) public to the topic.

The second strategic approach described in the document relates to the protection of certain animal species. As a rule, these are very distinctive animals that are conspicuous and can also be expected to attract a certain amount of sympathy from people. The specific strategy paper mentions, for example, field hamsters, beavers and certain wild orchids. The selection of certain animal species has a management-based reason: animals can be counted at random and this can be used to prove either that the measures taken have been successful after a few years or that there is an urgent need for political action if, for example, populations continue to decline.

However, the third approach, the protection of existing areas, takes up the most space in the strategy paper. In the case of Hanover, there is a lot of talk about improving the networking of biotopes, enhancing biotopes and developing biotopes.

One of the most difficult tasks is to connect biotopes. Accordingly, this is also one of the objectives of the Federal Ministry for the Environment, which is attempting to improve the networking of existing biotopes at national level with the 'Green Belt' action programme, in order to offer migratory animal species in particular an exchange of the genetic pool and greater spatial availability of food. (Bundesministerium für Umwelt, Naturschutz, Bau und Reaktorsicherheit, 2015, S. 112)

From a municipal perspective, this issue is difficult because existing biotopes are generally dissected by agricultural land, some of which is used intensively. The municipal level has three options here: It could negotiate compensation measures with farmers to utilise land less intensively. It could buy such areas (there must be a willingness to sell them) and finally it could place them under stronger protection, which is not trivial due to the reservation of ownership under the Basic Law. Each of these measures tends to be politically challenging and legally difficult.

The situation is somewhat simpler when existing biotopes are to be improved. These are often already legally protected and can be biologically enhanced with comparatively simple measures, for example by managing the areas differently (e.g. leaving dead wood in the forest).

The development of protected areas represents the third approach. A popular instrument used by local authorities is that of compensation areas, as interventions in existing natural areas usually have to be offset by compensation measures. This means that the protection of biodiversity already has a legal framework that local authorities can utilise. The purchase of

land, another option for action, is also mentioned in the paper. However, this usually poses a financial problem for many local authorities.

In addition to the measures, attention should also be paid to how the administration justifies its intended approach. In the strategy paper, as in many other policy papers on biodiversity (e.g. the European Union's Biodiversity Strategy (Europäische Kommission, 2020)), the so-called ecosystem services are used as a strong argument. In the justification of the measures, reference is therefore primarily made to humans themselves. Nature is understood as natural capital. This could be particularly critical because it could in turn undermine a systemic change in behaviour.

F. A first assessment: plasters for deep wounds

The disruption of the biosphere in regard to biodiversity loss appears to be far more advanced than the much more frequently discussed climate change.⁵ In this respect, the question arises as to whether smaller measures are even sufficient to repair this damage. To use a metaphor: If you have a serious, very deep and very large wound, it is not enough to stick a plaster over it. Looking at the literature, the proposed approaches to improving biodiversity could be described in three different stages: Plaster, Surgery and Salutogenesis. The following table breaks down what is meant by each:

	Plaster	Surgery	Salutogenesis (?)
Meaning	Stopping the worst problems. Protecting individual species. Protecting individual biotopes. Cleaning rivers, soils,... reducing emissions	More ambitious measures: structural change in agriculture. Structural change in transportation. Structural change in housing etc.	Total transformation of recent ethics and fundamentals of society. Changing the legal character of Nature and animals, rewarding them human rights.
Described in	Numerous policy papers, including in the Hannover Region Biodiversity Strategy (2017)	For the agriculture and food industry, e.g. (Monbiot, 2022).	philosophical works (on law) such as (Nussbaum, 2023) or (Latour, 2018)
To be found in biodiversity strategies?	Yes	No	No

However, the local authorities should not be blamed too much, because even if the finding that they primarily rely on plasters is correct, it should

5 Cf. <https://helmholtz-klima.de/planetare-belastungs-grenzen>

not be lost sight of the fact that they do not have much more surgical equipment than a first-aid kit at their disposal.

G. Conclusion and outlook

The initial analysis of the municipal strategy papers makes it clear that there are good opportunities to profitably combine municipal efforts with the objectives from Brussels. This is particularly the case if the approaches from Brussels, which are backed by quantified targets, are mirrored at municipal level, which certainly seems to be the case in Germany. In addition, this first study reveals the main axes of the political approach: public awareness, protection of certain species and, above all, protection of certain spatial areas. However, it is also clear that the measures pursued generally do not go beyond the status of ‘repair’ (described here as ‘plasters’). From a political science perspective, further research is required.

The study presented here is merely an exploratory prelude to further action. Specifically, the aim is to analyse political strategies for the protection, conservation or restoration of biodiversity in more detail over the next few years, particularly at the local level. Ideally, this will be done on an interdisciplinary basis in order to capture and analyse the three facets of the concept of policy (policy, politics, polity). The policy level concerns the perspective of biology: What is necessary to protect and improve biodiversity? How are gene pools best protected? The polity dimension asks how legal structures can be created to promote biodiversity through government action. The politics dimension, on the other hand, poses the question of power relations: What power relations need to be changed in order to bring about positive change? How can social and political majorities be organised to achieve this? Who is trying to forge such majorities and with what success or failure? Who is trying to prevent this?

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Part III: Digital future – unclear prospects and unknown challenges

*Christiane Trüe*¹

The EU AI Act Regulation – AI use in innovative public administration?

Summary: Public administration may profit from AI in appropriate cases, provided its use respects fundamental rights and abides by the rule of law in general. The EU AI Act may help in developing AI into the right direction, by ensuring that only ‘trustworthy’ AI is available on the market, and hence to public administration. The AI Act, as a first attempt at regulating AI, follows a risk-based approach, leaving considerable substantive leeway for developing AI further, but imposing onerous, mostly procedural, risk and quality management obligations on providers, and also on deployers, such as public administration. Legally the AI Act appears coherent, however, its effectiveness as a hardly legible legal document gives rise to doubts. Overall it is a first step which should also enable public administration to use AI, with the relevant precautions taken, namely a well-organised human oversight. The AI Act will be kept under review and become subject to amendments in due course, based on experience gathered and documented according to its current provisions.

Keywords: AI Act, public administration, trustworthy AI, fundamental rights, rule of law, risk based approach vs. substantive regulation, risk management, conformity assessment, documentation obligations

A. Introduction

Public administration should serve the citizens, provide good public services, maintain public security, promote sustainable development, and generally set a good framework for people and business to thrive. This requires modern, innovative administration, also using modern technology in public

1 Prof. Dr. Christiane Trüe LL.M. is Professor for Public Law at the University of Applied Sciences Bremen, Germany. She has published monographs, articles and contributions in the area of her denomination, in particular on EU law, constitutional and administrative law and environmental law, often with an international or comparative perspective. At the moment she is working on climate change law and EU internal market law including the AI Act. Contact: Christiane.Truee@HS-Bremen.de

administration. Modern administration may include the use of Artificial Intelligence (AI), which has been used elsewhere already, making public services more efficient, but also with at times disastrous consequences ending in suicides committed due to decision-making based on biased AI-supported risk assessment.² In order to curb and control risk, a legal framework is usually one of the means of choice. The AI Act Regulation of the EU³ ('AI Act' in the following) has been passed after long debate and various amendments, and is, together with more general legislation, such as the General Data Protection Regulation (GDPR)⁴, set to provide the legal framework for AI use in the EU in years to come. Its aim is to promote 'trustworthy' AI, and regulate low-risk, medium-risk and high-risk AI whilst prohibiting AI involving a risk deemed 'unacceptable'. This appears to be the way forward to profit from the benefits and avoid the risks of AI. In the words of EU Commission President Ursula von der Leyen,

*'We all know that Artificial Intelligence can do amazing things. And I think we do not talk enough about what Artificial Intelligence is able to do to improve our daily lives. [...] We want citizens to trust the new technology. And technology is always neutral, it depends on what we make with it. And therefore, we want the application of these new technologies to deserve the trust of our citizens. This is why we are promoting a responsible, human centric approach to Artificial Intelligence.'*⁵

And on a later occasion:

'AI is a general technology that is accessible, powerful and adaptable for a vast range of uses – both civilian and military. And it is moving faster than even its developers

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- 2 Netherlands case of alleged child benefit frauds (2021), e.g. reported on politico <https://www.politico.eu/article/dutch-scandal-serves-as-a-warning-for-europe-over-risks-of-using-algorithms>.
 - 3 Regulation (EU) 2024/1689 of the European Parliament and of the Council of 13 June 2024 laying down harmonised rules on artificial intelligence and amending Regulations (EC) No 300/2008, (EU) No 167/2013, (EU) No 168/2013, (EU) 2018/858, (EU) 2018/1139 and (EU) 2019/2144 and Directives 2014/90/EU, (EU) 2016/797 and (EU) 2020/1828 (Artificial Intelligence Act), OJ L, 2024/1689, 12.7.2024, ELI: <http://data.europa.eu/eli/reg/2024/1689/oj>.
 - 4 Regulation (EU) 2016/679 of the European Parliament and of the Council of 27 April 2016 on the protection of natural persons with regard to the processing of personal data and on the free movement of such data, and repealing Directive 95/46/EC (General Data Protection Regulation), OJ L 119/1. A list of EU legislation relevant to High-risk AI, such as product safety regulations and directives, is accumulated in Annex I of the AI Act, referred to in Art. 8 (2) of the AI Act.
 - 5 Press remarks by President von der Leyen on the Commission's new strategy: Shaping Europe's Digital Future, Brussels, 19 February 2020, https://ec.europa.eu/commission/presscorner/api/files/document/print/nl/speech_20_294/SPEECH_20_294_EN.pdf.

anticipated. So we have a narrowing window of opportunity to guide this technology responsibly. I believe Europe, together with partners, should lead the way on a new global framework for AI, built on three pillars: guardrails, governance and guiding innovation.⁶

Bill Gates appears to confirm this view and also calls for rules:

'This new technology can help people everywhere improve their lives. At the same time, the world needs to establish the rules of the road so that any downsides of artificial intelligence are far outweighed by its benefits, and so that everyone can enjoy those benefits no matter where they live or how much money they have.'⁷

Coming from a civil society side, it is argued that

'increasing power imbalances arise from the fact that the ability to deploy and benefit from large AI systems is concentrated in the hands of a couple of (mostly private) organisations. This leads to issues of democratic accountability and the deepening of societal and economic divides.'⁸

In using AI in its provision of public services, public administration may also have a solution for becoming more effective, and coping with demographic change, in order to provide public services with far fewer civil servants. However, AI may involve a loss of human control and be a step towards government by computers, as depicted in the 'Terminator' movies and the like. From the public administration perspective, the most relevant question is whether the AI Act makes AI sufficiently trustworthy to be used in public administration. In the EU, this must involve an administration governed by the rule of law, i.e. respecting human rights, administrative law, be it general procedural law or administrative law regarding specific areas, such as data protection law, product safety and consumer protection law, planning and building law etc. After all, public administration must not circumvent fundamental rights in providing public services and exercising public authority by using AI, since these are directly binding on the EU in the shape of the Fundamental Rights Charter of the EU (FRC) and on the Member States under their constitutions. At the same time, the EU will need to take care not to stifle innovation by setting too tight a framework

6 2023 State of the Union Address by President von der Leyen, Strasbourg, 13 September 2023, https://ec.europa.eu/commission/presscorner/api/files/document/print/ov/speech_23_4426/SPEECH_23_4426_OV.pdf.

7 Bill Gates, The Bill Gates Blog, A new era – The Age of AI has begun, 21st March 2023, last paragraph, <https://www.gatesnotes.com/The-Age-of-AI-Has-Begun>.

8 Dignum, Virginia, Progressive Post, 15/06/2023: Future-proofing AI: regulation for innovation, human rights and societal progress, <https://feps-europe.eu/future-proofing-ai-regulation-for-innovation-human-rights-and-societal-progress>, para 4.

for AI use: the AI Act thus does not specifically regulate AI in public administration, but AI provision and use in general.

This contribution will provide a first attempt at understanding the EU AI Act, first, its aims (B.) and second, concept and definition of AI covered by the AI Act (C.). This is followed by a brief outline of potential or actual uses of AI in public administration (D.) and threats and risks as well as benefits and opportunities of AI (E.). Following this the main rules of the AI Act will be presented (F.), attempting a first prognosis as to whether it provides for trustworthy AI which admits AI use in public administration, identifying regulatory gaps and shortcomings and, finally, offering some conclusions (G.).

B. Aims of the AI Act

The legislative process regarding the AI Act began with the Commission proposal⁹ presented on 21 April 2021: the Commission's professed aims in presenting its proposal were to 'guarantee the safety and fundamental rights of people and businesses, while strengthening investment and innovation across EU countries.' Relevant fundamental rights under the Fundamental Rights Charter of the EU (FRC) include, as stated in the Commission proposal¹⁰, protection of personal data and privacy (Art. 7/8 FRC), intellectual property rights (Art. 17 (2) FRC), and non-discrimination, in particular on grounds such as sex, race, colour, ethnic or social origin, genetic features, language, religion or belief, political or any other opinion, membership of a national minority, property, birth, disability, age or sexual orientation (Art. 21 FRC) or gender equality (Art. 23 FRC).

Opinions of the Economic and Social Committee¹¹ and the Committee of the Regions¹² as well as of the European Central Bank¹³ were sought. Taking these on board the Council came to a Common Position¹⁴, stressing

9 Proposal for a Regulation of the European Parliament and of the Council laying down harmonised rules on Artificial Intelligence (Artificial Intelligence Act) and amending certain union legislative acts, 21 April 2021 (COM(2021) 206 final).

10 Commission proposal (fn. 9), p. 11/section 3.5. Fundamental rights.

11 22 September 2022, OJ C 517, 22.12.2021, p. 56.

12 2nd December 2022, OJ C 97, 28.2.2022, p. 60.

13 29 December 2022, OJ C 115, 11.3.2022, p. 5

14 Council of the European Union, 29 November 2021, 14278/21, 2021/0106(COD); final decision of the Council of 21 May 2024, <https://www.consilium.europa.eu/en/press/press-releases/2024/05/21/artificial-intelligence-ai-act-council-gives-final-green-light-to-the-first-worldwide-rules-on-ai/>.

the will of the Member States to promote secure AI, respecting fundamental rights. This was followed by a Position of the European Parliament¹⁵ with amendment proposals, and, after a trilogue within the legislative procedure, the AI Act was finally adopted on 13 June 2024, to apply generally from 2 August 2026, but Chapters I and II to apply already from 2 February 2025 (General provisions and provisions on prohibited AI systems); Chapter III Section 4, Chapter V, Chapter VII and Chapter XII and Article 78 shall apply from 2 August 2025, with the exception of Article 101, and Article 6(1) and the corresponding obligations in this Regulation shall apply from 2 August 2027 (Art. 113 AI Act). The AI Act's entering into full force is thus staggered according to urgency and practicality e.g. regarding the set-up of authorities.

This AI Act is the first attempt at setting an AI legal framework worldwide, aimed at setting a legal framework for the EU Internal Market, avoiding fragmentation of the internal market by a joint set of rules rather than individual AI statutes of the Member States, on the legal bases for internal market legislation (Art. 114 TFEU) and data protection (Art. 16).

C. Concept and Definition

First, it is important to define what is to be understood by 'AI'. In fact, we use AI in our everyday lives quite a lot, often without realizing it. In the context of the AI Act this definition is important from a legal perspective, as the AI definition will decide the scope of application of the regulation. The AI Act provides its own definition in its Art. 3:

Article 3 Definitions

For the purposes of this Regulation, the following definitions apply:

- (1) *'AI system' means a machine-based system that is designed to operate with varying levels of autonomy and that may exhibit adaptiveness after deployment, and that, for explicit or implicit objectives, infers, from the input it re-*

15 European Parliament, P9_TA(2023)0236, Artificial Intelligence Act, Amendments adopted by the European Parliament on 14 June 2023 on the proposal for a regulation of the European Parliament and of the Council on laying down harmonised rules on artificial intelligence (Artificial Intelligence Act) and amending certain Union legislative acts (COM(2021)0206 – C9-0146/2021 – 2021/0106(COD)), 14 June 2023; final position of the European Parliament of 13 March 2024, https://www.europarl.europa.eu/doceo/document/TA-9-2024-0138_EN.html#ref_2_1.

ceives, how to generate outputs such as predictions, content, recommendations, or decisions that can influence physical or virtual environments.

(2) ...?

At the draft stage of Art. 3 (1)¹⁶, the Commission had proposed a more detailed and specific approach, providing more legal certainty on the one hand, but raising concerns regarding potential narrowness of definition and potential gaps, with an annex I to bring more legal clarity to the definition:

‘For the purpose of this Regulation, the following definitions apply:

- (1) *‘artificial intelligence system’ (AI system) means software that is developed with one or more of the techniques and approaches listed in Annex I and can, for a given set of human-defined objectives, generate outputs such as content, predictions, recommendations, or decisions influencing the environments they interact with;*
- (2) ...?

Draft Annex I was not adopted in the final version of the AI Act, but is still helpful in making more specific what exactly AI systems are:

‘ANNEX I ARTIFICIAL INTELLIGENCE TECHNIQUES AND APPROACHES referred to in Article 3, point 1

(a) Machine learning approaches, including supervised, unsupervised and reinforcement learning, using a wide variety of methods including deep learning;

(b) Logic- and knowledge-based approaches, including knowledge representation, inductive (logic) programming, knowledge bases, inference and deductive engines, (symbolic) reasoning and expert systems;

(c) Statistical approaches, Bayesian estimation, search and optimization methods.’

During the legislative process, the Council had favoured a definition designed to make a clearer distinction from traditional software:

“artificial intelligence system’ (AI system) means a system that is [1] designed to operate with elements of autonomy and that, [2] based on machine and/or human-provided data and inputs, [3] infers how to achieve a given set of objectives using machine learning and/or logic- and knowledge based approaches, and [4] produces system-generated outputs such as content (gener-

16 Commission Proposal for a Regulation of the European Parliament and of the Council laying down harmonised rules on artificial intelligence (Artificial Intelligence Act) and amending certain union legislative acts {SEC(2021) 167 final} - {SWD(2021) 84 final} - {SWD(2021) 85 final}, 21 April 2021 (COM(2021) 206 final).

ative AI systems), predictions, recommendations or decisions, influencing the environments with which the AI system interacts”.

For its part, the European Parliament had proposed the following amendment:

“artificial intelligence system” (AI system) means a machine-based system that is designed to operate with varying levels of autonomy and that can, for explicit or implicit objectives, generate outputs such as predictions, recommendations, or decisions, that influence physical or virtual environments.’

Summarising these various attempts at definition, they gravitate around four AI criteria:

- elements of autonomy,
- being based on data and inputs (human or machine-based),
- inferring how to achieve objectives using Machine Learning or logic- or knowledge-based approaches,
- producing system-generated outputs (such as predictions, content, recommendations, or decisions) which influence their environment.

Given that the annex of the Commission version was omitted for being potentially too narrow it may be assumed that the annex list can still serve as an example of what definitely constitutes AI, whilst the final version remains in the abstract and allows for an extension of the list as technology progresses.

D. AI use in Public Administration

It is generally believed that AI may be, or already is, used in public administration. This is seen as a potential solution in many European states for the shortage of labour, which also produces a shortage of civil servants and other administrative staff. It may allow public administration to not only fulfil its tasks with less staff, but with improved quality, in particular, by a more objective approach excluding the human factor with its potential for mistakes or for bias.

Areas particularly open to AI use in public administration seem to be:

- Predictive policing; prediction of crime hotspots, recidivism
- Search for victims or criminals (which?)
- Welfare, award of benefits – eg checking that the recipient fulfils requirements
- Healthcare

- Immigration, asylum, and border control
- Education
- Personnel selection
- General advice eg on application procedures, benefits available.¹⁷

In these, and possibly further, areas, AI might help to provide a more effective, efficient, and low-cost public administration and close retirement gaps in administrative staff. In addition, there is the “promise of neutrality” rather than human intuition, allegedly with the potential to overcome cognitive bias and limitations.

E. Threats, Risks and Benefits of AI

However, it is clear that there are dangers to be considered, too, linked both to AI use in general, and its specific use in public administration. Those looking predominantly at the dangers compare the dangers emanating from AI with those of nuclear weapons or refer to Arnold Schwarzenegger’s ‘Terminator’ films, suggesting the danger of extinction of humankind by AI. Another concern is that humanity may be enslaved by AI, as it may be able to control us rather than the other way round if we do not join forces globally to develop it into a beneficial direction and rather seem to compete to develop it fastest at all costs.¹⁸ One might also think of George Orwell’s 1984-‘big brother’s watching you’, invoking the spectre of mass-surveillance, thus signaling the end of privacy and forgetting about data protection.

The promises of AI are also queried, with critics suggesting that AI may rather perpetuate bias and automate inequality than provide the basis for more objective decision-making. AI can only work on the data it gets fed, and where there is human influence, be it only in the data collection, these data will reflect what the data collectors thought relevant, or what was relevant at the time of collection.

Others regard this as exaggerated alarmism, pointing to AI as a similarly important innovation to electrification and the printing press, warning that

17 Commission Strategy and Policy Priorities, webpage, https://commission.europa.eu/strategy-and-policy/priorities-2019-2024/europe-fit-digital-age/excellence-and-trust-artificial-intelligence_en#eu-and-ai. Similarly the more generally-oriented list of benefits put forward by Bill Gates, The Bill Gates Blog, A new era – The Age of AI has begun, 21st March 2023, <https://www.gatesnotes.com/The-Age-of-AI-Has-Begun>.

18 Jonas Breng, Spiegel-Interview: „Starhistoriker Yuval Harari: »KI hat das Potenzial, uns zu versklaven«“, 23/10/2024, <https://www.spiegel.de/geschichte/starhistoriker-yuval-harari-ki-hat-das-potenzial-uns-zu-versklaven-a-70587486-9be1-4c7c-a1ae-a83c743e74ef>.

(over-)regulation might constitute an impediment to innovation, with Europe losing out due to old-fashioned administration.

The EU Commission recognizes both sides and points out the benefits coupled with prerequisites for being able to reap these, requiring excellence and trust in AI: *‘Trustworthy AI can bring many benefits, such as better health-care, safer and cleaner transport, more efficient manufacturing, and cheaper and more sustainable energy’* thus positing that *‘The EU’s approach to AI will give people the confidence to embrace these technologies while encouraging businesses to develop them.’*¹⁹

From this the Commission has drawn four key policy objectives, namely:

- Setting enabling conditions
- Building strategic leadership in the sectors concerned
- Ensure that AI technologies work for people and
- Make the EU the right place.²⁰

Given the experience of BigTech being domiciled in the US, or increasingly in China, these are grand aims, and it remains to be seen whether the EU will be able to achieve them. There may, in particular, be a fear that the AI Act might stifle innovation in Europe. Regarding AI use in public administration, the third aim – ensuring that AI technologies work for people – appears particularly important, as this coincides with the general aim of public administration. The second important aim is the setting of enabling conditions. Public administration forms a framework for technology development and deployment, namely the legal framework of guaranteed freedoms of business and property as well as providing limits to these guided by public interest and the rights of others. These aspects will be looked at in more detail in the following.

19 Fn. 17, Commission Strategy and Policy Priorities 2019 – 2024, https://commission.europa.eu/strategy-and-policy/priorities-2019-2024/europe-fit-digital-age/excellence-and-trust-artificial-intelligence_en.

20 Fn. 17, Commission Strategy and Policy Priorities 2019 – 2024, https://commission.europa.eu/strategy-and-policy/priorities-2019-2024/europe-fit-digital-age/excellence-and-trust-artificial-intelligence_en.

F. Main Rules of the AI Act – Trustworthy AI: Regulation by the AI Act

I. Legal effect and scope of the AI Act

The legal effect of the ‚AI-Act‘ depends on which type of EU act with legislative force it is under Art. 288 TFEU. Its full name clarifies that it is a regulation, meaning that it has direct application in every EU Member State (Art. 288 (2) TFEU), comparable to any member state statute. As a regulation, the AI Act may include individual rights and obligations for each person or undertaking operating in the EU Internal Market, which is confirmed and spelt out in Art. 2 (1) of the AI Act. As mentioned above (B.) the AI Act is a piece of Internal Market and Data Protection regulation based on the legal bases for internal market legislation (Art. 114 TFEU) and data protection (Art. 16 TFEU). This raises the question as to whether the EU can prescribe terms and conditions of AI use for public administration. The EU does not have a legislative competence to legislate on public administration of the Member States generally. The latter is, in principle, subject to autonomous legislation of the Member States with only specific inroads for EU aims, e.g., on legal bases regarding data protection, consumer protection, environmental protection etc.²¹ As far as data protection is concerned, there is a relevant EU competence under Art. 16 TFEU.

Art. 2 (1) of the AI Act confirms a general application for providers and deployers, importers and exporters, manufacturers etc. of AI participating in the EU internal market, as well as any person affected and located in the EU:

Article 2

Scope

1. This Regulation applies to:

- (a) providers placing on the market or putting into service AI systems or placing on the market general-purpose AI models in the Union, irrespective of whether those providers are established or located within the Union or in a third country;*
- (b) deployers of AI systems that have their place of establishment or are located within the Union;*

21 Such as the GDPR with its general application including public administration, or inserting the obligation to conduct an Environmental Impact Assessment into relevant administrative procedures in environmental law, based on the specific legal basis for environmental law, Art. 191/192 TFEU.

- (c) providers and deployers of AI systems that have their place of establishment or are located in a third country, where the output produced by the AI system is used in the Union;
- (d) importers and distributors of AI systems;
- (e) product manufacturers placing on the market or putting into service an AI system together with their product and under their own name or trademark;
- (f) authorised representatives of providers, which are not established in the Union;
- (g) affected persons that are located in the Union.

Even though public administration is not particularly mentioned in the scope of the AI Act, public entities like a state, a sub-state public entity such as a federal state in Germany, or a municipality, or entities organized or otherwise linked to these, may at least count as an ‘affected person,’ unless they are ‘deployers.’ A ‘deployer’ of an AI system is, under Art 3 (4) AI Act ‘a natural or legal person, public authority, agency or other body using an AI system under its authority’ (with the exception of personal non-professional use). This explicit inclusion of public authority AI use clarifies that the AI Act means to bind public authorities, and that this is another inroad into Member State competence to regulate their public administrations autonomously. Accordingly, the scope of application of the AI Act includes any administrative authority using AI, or being otherwise exposed to AI. In addition, the underlying aim that only ‘trustworthy’ AI – AI compliant with the AI Act – should be available on the Internal Market of the EU, and legal to use in the EU, means that public administration, too, will not legally be able to obtain any AI solution not complying with the AI Act, and is bound just like any private entity, to use it legally, i.e. according to the AI Act.

II. Overview, Risk Classification

The AI Act is divided into 13 chapters, beginning with General Provisions in Chapter I, proceeding, according to risk, from unacceptable to minimal or no risk and varying risk:

- Chapter II defines and prohibits AI Practices deemed unacceptable,
- Chapter III regulates high-risk AI Systems, which are permitted but subject to compliance and specific requirements and an *ex-ante* conformity assessment,
- Chapter IV introduces transparency obligations for providers and deployers of certain AI systems with limited risk,
- Chapter V deals with general-purpose AI.

The following chapters include a Chapter VII on Governance, whilst the other chapters appear more relevant for business rather than public administration, and will only be considered further where relevant for AI use in public administration.

III. According to Risk: from Prohibition to Transparency Obligations

1. Unacceptable-Risk: Prohibited AI

Art. 5 of the AI Act provides a list of prohibited AI uses. Some are obviously out of bounds for a state governed by the rule of law and respect for human rights. Under Art. 5 (1) of the AI Act prohibitions exist namely for:

- subliminal behaviour manipulation,
- exploitative behaviour manipulation of vulnerable persons or groups,
- governmental (and private) social scoring (out of context or of a certain gravity),
- risk assessment (apart from certain human-surveilled uses regarding criminal involvement of persons),
- facial recognition (only untargeted scraping of facial images),
- recognition of emotions in workplace and education institutions,
- biometric categorization on criteria which form the basis of discrimination.

Accordingly, Art. 5 (1) of the AI Act prohibits

(a) the placing on the market, the putting into service or the use of an AI system that deploys subliminal techniques beyond a person's consciousness or purposefully manipulative or deceptive techniques, with the objective, or the effect of materially distorting the behaviour of a person or a group of persons by appreciably impairing their ability to make an informed decision, thereby causing them to take a decision that they would not have otherwise taken in a manner that causes or is reasonably likely to cause that person, another person or group of persons significant harm;

(b) the placing on the market, the putting into service or the use of an AI system that exploits any of the vulnerabilities of a natural person or a specific group of persons due to their age, disability or a specific social or economic situation, with the objective, or the effect, of materially distorting the behaviour of that person or a person belonging to that group in a manner that causes or is reasonably likely to cause that person or another person significant harm;

(c) the placing on the market, the putting into service or the use of AI systems for the evaluation or classification of natural persons or groups of persons over a certain period of time based on their social behaviour or known, inferred or

predicted personal or personality characteristics, with the social score leading to either or both of the following:

- (i) detrimental or unfavourable treatment of certain natural persons or groups of persons in social contexts that are unrelated to the contexts in which the data was originally generated or collected;*
- (ii) detrimental or unfavourable treatment of certain natural persons or groups of persons that is unjustified or disproportionate to their social behaviour or its gravity;*
- (d) the placing on the market, the putting into service for this specific purpose, or the use of an AI system for making risk assessments of natural persons in order to assess or predict the risk of a natural person committing a criminal offence, based solely on the profiling of a natural person or on assessing their personality traits and characteristics; this prohibition shall not apply to AI systems used to support the human assessment of the involvement of a person in a criminal activity, which is already based on objective and verifiable facts directly linked to a criminal activity;*
- (e) the placing on the market, the putting into service for this specific purpose, or the use of AI systems that create or expand facial recognition databases through the untargeted scraping of facial images from the internet or CCTV footage;*
- (f) the placing on the market, the putting into service for this specific purpose, or the use of AI systems to infer emotions of a natural person in the areas of workplace and education institutions, except where the use of the AI system is intended to be put in place or into the market for medical or safety reasons;*
- (g) the placing on the market, the putting into service for this specific purpose, or the use of biometric categorisation systems that categorise individually natural persons based on their biometric data to deduce or infer their race, political opinions, trade union membership, religious or philosophical beliefs, sex life or sexual orientation; this prohibition does not cover any labelling or filtering of lawfully acquired biometric datasets, such as images, based on biometric data or categorizing of biometric data in the area of law enforcement;*
- ...*

Each of these types of AI might easily violate human dignity (Art. 1 FRC) above, by making human beings into mere objects of state activity. In addition, and without the space for examining this in more depth, other Charter rights may also be engaged. Article 3 FRC guarantees the right to the physical and mental integrity of any person, Article 7 FRC respect for private and family life, Article 8 FRC, together with the GDPR, the protection of personal data concerning the relevant person. Each of these

fundamental rights might easily be violated by manipulating behavior and by social scoring or mere AI risk assessment.

There is still room for interpretation, and principally beneficial uses may be prohibited, too. For instance, as van de Sloot²² points out, this could apply to

‘[t]he case in which Augmented Reality systems are used in smart cities where people are subconsciously manipulated. Although it is true that these manipulations are so far ‘for the better’ – for example, where Augmented Reality systems are deployed as a means of crowd control to prevent traffic jams or to make people in nightlife areas less aggressive – it cannot be excluded that these techniques could and would be used for more controversial purposes. In addition, it will become clear, presumably through jurisprudence on the matter, the extent to which subconscious manipulation itself amounts to harm, even when it is used ‘for the better.’

Indeed, any behavior manipulation would violate the fundamental right under Article 10 FRC, the freedom of thought, conscience and religion: how should a person, under the influence of such manipulation, ‘exercise their freedom to change religion or belief and freedom, either alone or in community with others and in public or in private, to manifest religion or belief, in worship, teaching, practice and observance’²³? In addition, biometric categorisation that employs criteria excluded as justifiable reasons of discrimination under Art. 21 and 23 FRC would form the basis of exactly such discrimination.

The prohibition of AI use for social scoring was originally specifically addressed to public administration²⁴, but has been extended to a general prohibition, meaning that private parties, such as religious or other societies will be unable to use social scoring, either. It may appear a violation of rights to religious freedom and freedom of conscience etc. to prohibit such social scoring, given that they are entities upholding moral and ethical values. However, the prohibition is subject to limits itself, as it does not prohibit social scoring altogether and absolutely, but only if the consequences are unrelated or unjustified or disproportionate to the persons’ social behaviour or its gravity. There will be a lot of work required on the part of public

22 Van de Sloot, *Regulating Synthetic Society*, p. 149.

23 Art. 10 FRC.

24 Art. 5 (1) lit. c) of the Commission Proposal for a Regulation laying down harmonised rules on Artificial Intelligence (Artificial Intelligence Act) 21 April 2021 (COM(2021) 206 final), see fn. 16.

administrations and courts to make this prohibition, as well as its limits, sufficiently specific.

There are a number of further prohibitions, coupled with limited exceptions for criminal prosecution. Germany had suggested more prohibitions, such as on the use of ‘robo-judges,’ whilst the assessment of future delinquency and systematic workplace surveillance have been added according to Germany’s wishes.

2. High-Risk AI: risk control, upholding of fundamental rights

Chapter III of the AI Act regulates and severely restricts the use and deployment of ‘high risk’ AI, imposing strict requirements on its use. In the following, the concept of ‘high-risk’-AI will be developed, at least as far as it appears relevant to public administration (a). After this the requirements and restrictions on the use of high-risk AI will be explored (b). In addition, there are provisions on ‘Notifying authorities and notified bodies’ (Chapter III section 4 AI Act) and ‘Standards, conformity assessment, certificates, registration’ (Chapter III section 5 AI Act) regarding high-risk AI, which will only be touched upon, and only where relevant to AI use in public administration is concerned (not regarding the setting up of AI surveillance authorities and procedures).

a) Types of High-Risk AI Systems

aa) AI as product or safety component of a product covered by EU harmonisation

Under Art. 6 (1) AI Act, an AI system shall be considered to be high-risk where both of the following conditions are fulfilled:

‘(a) the AI system is intended to be used as a safety component of a product, or the AI system is itself a product, covered by the Union harmonisation legislation listed in Annex I;

(b) the product whose safety component pursuant to point (a) is the AI system, or the AI system itself as a product, is required to undergo a third-party conformity assessment, with a view to the placing on the market or the putting into service of that product pursuant to the Union harmonisation legislation listed in Annex I.’

In the public administration context, relevant AI systems under Art. 6 (1) AI Act, ie systems that are either a product or safety component of a product already subject to an EU conformity assessment, may, for instance, include

- high-risk AI systems in machinery (No. 1)²⁵, as far as they are used by public entities,
- lifts and safety components for lifts (No. 4)²⁶, namely in public buildings,
- radio equipment (No. 6)²⁷, where radio stations are public,
- personal protective equipment (No. 9)²⁸, e.g. regarding police and rescue operations
- appliances burning gaseous fuels (No. 10)²⁹,
- medical devices (No 11 of Annex I)³⁰, namely in public hospitals, such as an AI application for robot-assisted surgery.
- *in vitro* diagnostic medical devices (No 12. of Annex I)³¹ in public hospitals,
- civil aviation security (No 13)³²,
- rail systems (No 17)³³, where they are public, etc.

25 Under Directive 2006/42/EC of the European Parliament and of the Council of 17 May 2006 on machinery, and amending Directive 95/16/EC, OJ L 157, 9.6.2006, p. 24.

26 Directive 2014/33/EU of the European Parliament and of the Council of 26 February 2014 on the harmonisation of the laws of the Member States relating to lifts and safety components for lifts, OJ L 96, 29.3.2014, p. 251.

27 Directive 2014/53/EU of the European Parliament and of the Council of 16 April 2014 on the harmonisation of the laws of the Member States relating to the making available on the market of radio equipment and repealing Directive 1999/5/EC, OJ L 153, 22.5.2014, p. 62.

28 Regulation (EU) 2016/425 of the European Parliament and of the Council of 9 March 2016 on personal protective equipment and repealing Council Directive 89/686/EEC, OJ L 81, 31.3.2016, p. 51.

29 Regulation (EU) 2016/426 of the European Parliament and of the Council of 9 March 2016 on appliances burning gaseous fuels and repealing Directive 2009/142/EC, OJ L 81, 31.3.2016, p. 99.

30 Harmonised by Regulation (EU) 2017/745 of the European Parliament and of the Council of 5 April 2017 on medical devices, amending Directive 2001/83/EC, Regulation (EC) No 178/2002 and Regulation (EC) No 1223/2009 and repealing Council Directives 90/385/EEC and 93/42/EEC, OJ L 117, 5.5.2017, p. 1.

31 Regulation (EU) 2017/746 of the European Parliament and of the Council of 5 April 2017 on *in vitro* diagnostic medical devices and repealing Directive 98/79/EC and Commission Decision 2010/227/EU, OJ L 117, 5.5.2017, p. 176.

32 Regulation (EC) No 300/2008 of the European Parliament and of the Council of 11 March 2008 on common rules in the field of civil aviation security and repealing Regulation (EC) No 2320/2002, OJ L 97, 9.4.2008, p. 72.

33 Directive (EU) 2016/797 of the European Parliament and of the Council of 11 May 2016 on the interoperability of the rail system within the European Union, OJ L 138, 26.5.2016, p. 44.

Equally, further products which are subject to harmonisation are listed in Annex I, and may be used by public entities.

bb) Further AI Systems listed as high-risk

Art. 6 (2) of the AI Act adds the reference to AI systems listed in Annex III (which provides a regularly evaluated and amendable list³⁴). Such Annex-III-listed systems shall equally be considered high-risk and include, with relevance to public administration:

- *Biometrics* (Annex III No. 1) are regarded as highly risky (if not prohibited, see above), namely remote *biometric identification* systems unless intended to be used for the sole purpose to confirm that a specific natural person is the person he or she claims to be, as well as AI systems intended to be used for *biometric categorisation*, according to sensitive or protected attributes or characteristics based on the inference of those attributes or characteristics, and AI systems intended to be used for *emotion recognition*.
- *Critical infrastructure* (Annex III No. 2) includes facilities, typically provided by public administration, which everyone needs to use, leaving no choice as to whether to expose oneself to AI or not. Here high risk AI systems are those intended to be used as *safety components* in the management and operation of critical digital infrastructure, road traffic, or in the supply of water, gas, heating or electricity.
- *Education and vocational training* (Annex III No. 3) are equally very sensitive areas, and provided by the state, or under the supervision of the state. Accordingly, AI systems intended to be used to determine *access or admission* or to assign natural persons to educational and vocational training institutions fall into the ‘high risk’ category, as well as AI systems intended to be used to *evaluate learning outcomes*; or to be used for the purpose of *assessing the appropriate level* of education that an individual will receive or will be able to access. Equally, AI systems intended to be used for *monitoring and detecting prohibited behaviour* of students during tests in the context of or within educational and vocational training institutions are high risk.
- The same applies in the – public or private – *employment* sphere, namely employment, workers’ management and access to self-employment (Annex III No. 4): AI systems in *recruitment or selection* of natural persons, to

34 For amendment see Art. 112 of the AI Act.

analyse and filter job applications, and to evaluate candidates are classed as high risk; this also applies to public service employment. Equally, AI use within the employment relationship is classed as high risk, namely if intended to be used to make *decisions affecting terms, promotion or termination* of work-related relationships, or to allocate tasks based on individual behaviour or personal traits or characteristics or to monitor and evaluate the performance and behaviour of persons in such relationships.

- The relevance for public administration is particularly obvious with regard to *access to and enjoyment of essential public services and benefits*, which is also classed as high-risk (Annex III No. 5, together with essential private services): This includes AI systems intended to be used by public authorities or on behalf of public authorities to evaluate the *eligibility* of natural persons for essential public assistance benefits and services, including healthcare services, as well as to grant, reduce, revoke, or reclaim such benefits and services (a), or AI systems intended to evaluate and classify emergency calls by natural persons or to be used to dispatch, or to establish priority in the dispatching of, emergency first response services, including by police, firefighters and medical aid, as well as of emergency healthcare patient triage systems (d).
- *Migration, asylum and border control management* is a specific, highly sensitive area of public administration, where public debate at times appears to neglect that illegal migrants, too, remain holders of fundamental rights. Where AI use is accepted by law in this area, it is thus classed as high risk use (Annex III No. 7), namely if AI systems are intended to be used by or on behalf of competent public authorities or by Union institutions, bodies, offices or agencies as polygraphs or similar tools (a), or to assess a risk, including a security risk, a risk of irregular migration, or a health risk, posed by a natural person who intends to enter or who has entered into the territory of a Member State (b), or to assist competent public authorities for the examination of applications for asylum, visa or residence permits and for associated complaints with regard to the eligibility of the natural persons applying for a status, including related assessments of the reliability of evidence (c), or, finally, for the purpose of detecting, recognising or identifying natural persons, with the exception of the verification of travel documents (d).

Following the intricate classification of high-risk AI in Annex III, Art. 6 (3) AI Act provides for an across-the-board *de minimis* exception to which the classification is subjected. An Annex-III-AI system shall not be considered to be high-risk where *'it does not pose a significant risk of harm to the health, safety*

or fundamental rights of natural persons, including by not materially influencing the outcome of decision making? This exception is made more specific by a list of four criteria, which share the feature of a decisive involvement of human control, namely if the AI system is intended to

- perform a narrow procedural task (a),
- improve the result of a previously completed human activity (b),
- detect decision-making patterns or deviations from prior decision-making patterns, if it is not meant to replace or influence the previously completed human assessment, without proper human review (c), or
- perform a preparatory task to an assessment relevant for the purposes of the use cases listed in Annex III, such as biometrics as far as permitted, safety components in the management and operation of critical infrastructure or in education and vocational training (d).

Art. 6 (3) AI Act then provides for a counter-exception, overriding the *de minimis* exceptions where the AI system performs profiling of natural persons.

Art. 6 AI Act, with all its complexity, including exception and counter-exception, and references to articles and annexes rather than content, does not make it easy to apply in administrative practice. Still, the principal practices classified as ‘high risk’ appear ones obviously risky for human rights and data protection, or indeed human dignity, requiring safeguards to ensure that human beings are not treated as mere objects. The clarity is to some extent obscured by the across-the-board *de minimis* rule, which is then narrowed down again by the counter-exception regarding AI profiling. In order to secure respect for human rights it may thus be advisable to interpret *de minimis* narrowly, and rather apply the requirements for high risk AI use in public administration wherever there may be an effect, even if small, on human rights.

b) Requirements for High-Risk AI systems

aa) Overview

High-risk AI, regardless of whether it is a stand-alone system, or whether it is part of a product, must meet specific requirements under the AI Act, in order to control the risk attached to them, aiming both at protection by design *a priori*, before market presentation, and after deployment. The risk may pertain namely to health or safety or to the impairment of further fundamental rights (privacy, data protection, freedom of occupation and property, non-discrimination etc.).

Requirements for high-risk AI systems are laid down, first, in Section 2 of Chapter III of the AI Act (Art. 8 et seq.). Article 8 (1) of the AI Act demands that high-risk AI systems shall comply with the requirements laid down Section 2, taking into account their intended purpose as well as the generally acknowledged state of the art on AI and AI-related technologies. Article 8 (2) of the AI Act deals with requirements regarding products containing an AI system, stating that the requirements of the AI Act as well as requirements of other EU harmonisation legislation³⁵ apply; providers of such products shall be responsible for ensuring that they are fully compliant. In order to ensure consistency, avoid duplication and minimise additional burdens, providers are given a choice of integrating the necessary AI-related testing and reporting processes, information and documentation into the documentation and procedures required under other EU harmonisation legislation. Section 3 of Chapter III states further obligations of providers and deployers of high-risk AI systems and other parties. The manufacturer and the provider of the product are each responsible for compliance with these rules, which should be understood, *inter alia*, as safeguards against self-learning AI systems that go rogue.³⁶

bb) Risk management system

The first specific requirement for high-risk systems is having a risk management system (Article 9 of the AI Act), which shall be established, implemented, documented and maintained (Art. 9 (1) AI Act). It shall be understood as a continuous iterative process planned and run throughout the entire lifecycle of a high-risk AI system, requiring regular systematic review and updating and comprising an identification and analysis of known and foreseeable risks (Art. 9 (1) AI Act). The risk management system shall comprise four steps, namely:

- *identification* and analysis of the known and the reasonably foreseeable risks to health, safety or fundamental rights when in regular use (a);
- the estimation and *evaluation* of the risks that may emerge when the high-risk AI system is used in accordance with its *intended purpose*, and under conditions of reasonably foreseeable misuse (b);

35 Listed in Section A of Annex I.

36 Cf. Preamble No 48 of the Commission Draft and No 73 of the final version of the AI Act.

- the *evaluation of other risks* possibly arising, based on the analysis of data gathered from the post-market monitoring system referred to in Article 72 (c) AI Act;
- the *adoption of* appropriate and targeted risk management *measures* designed to address the risks identified (d).

These four steps – risk identification, intended-purpose-use evaluation, other risk evaluation, adoption of measures – appear relatively far-reaching at a first glance. This may raise concerns that the risk management obligation is so onerous as to constitute a competitive disadvantage for AI use in the EU. The risk management system requirements are, however, limited in the following paragraph, Art. 9 (3) AI Act, to those risks ‘which may be reasonably mitigated or eliminated through the development or design of the high-risk AI system, or the provision of adequate technical information.’ If a serious risk cannot be mitigated, however, this should mean the AI system is prohibited altogether, presumably falling under Art. 5 AI Act (the scope of which may need to be extended). The further paragraphs then specify some requirements regarding the risk management system (Art. 9 (4) et seq. AI Act), requiring consideration of the AI Act requirements, further restricting the elimination or reduction of risks to doing what is ‘technically feasible through adequate design and development’ of the high-risk AI system, considering risk elimination and reduction by providing information and training to deployers, and reducing the residual risk to what is deemed ‘acceptable’ (without specifying what that is supposed to mean).

cc) Data and Data Governance

Secondly, Article 10 AI Act sets out requirements with regard to data and data governance. The data used for training or testing AI shall be developed on the basis of data sets that meet the quality criteria referred to in the following paragraphs (2 to 5), subjecting data sets to data governance and management practices ‘appropriate for the intended purpose of the high-risk AI system.’ Those include measures to make sure data meet certain scientific quality criteria e.g. regarding their origin and validity. What is particularly important regarding non-discrimination is the examination of data ‘in view of possible biases that are likely to affect the health and safety of persons, have a negative impact on fundamental rights or lead to discrimination prohibited under Union law, especially where data outputs influence inputs for future operations’ (Art. 10 (2) lit. h and g).

dd) Documentation and Recording, Transparency obligations

Third, documentation prior to and during the lifetime of a high-risk system is required. Article 11 AI Act imposes technical documentation duties regarding high-risk AI systems, to be drawn up before the system is placed on the market or put into service and kept up-to date. When training models, data should be kept on the design choices, data collection and relevant data preparation, which should include an examination in view of possible biases and the identification of any possible data gaps or shortcomings. The technical documentation is to prove compliance with the requirements of Art. 8 et seq. AI Act, namely to national competent authorities and notified bodies, with the minimum specified in Annex IV. There are simplified documentation requirements for SMEs, including start-ups – not for public administration. During use, Article 12 requires High-risk AI systems to technically allow for the automatic recording of events (logs) over the lifetime of the system, in order to be able to monitor the operation of high-risk AI systems referred to in Art. 26 (5) AI Act. In addition, Art. 13 AI Act imposes duties of transparency and requires the provision of information by providers to deployers of high-risk AI systems, who should be enabled ‘to interpret a system’s output and use it appropriately,’ ‘with a view to achieving compliance with the relevant obligations of the provider and deployer.’

ee) Human oversight

Fourth, and catering for fears of a ‘Terminator’ scenario, Art. 14 demands effective human oversight by natural persons during the period in which high-risk AI systems are in use. Human oversight is meant to prevent or minimise the risks to health, safety or fundamental rights that may emerge when a high-risk AI system is used in accordance with its intended purpose or under conditions of reasonably foreseeable misuse. The following paragraphs detail the oversight measures, which shall be commensurate with the risks, level of autonomy and context of use of the high-risk AI system, namely ‘measures identified and built, when technically feasible, into the high-risk AI system’ by the provider before it is placed on the market or put into service (a) or measures that are appropriate to be implemented by the deployer (b). This in particular should constitute a safeguard against self-learning AI systems, preventing them from going rogue.³⁷ Still, all will

37 Cf. Preamble No 48 of the Commission Draft and No 73 of the final version of the AI Act.

depend on the choice and control of persons to oversee the system, and whether or not they perform their tasks, or profit or take pleasure from experimenting with its getting out of control for their own purposes and possibly with a hybris that they themselves may still be able to exercise control. Civil servants may appear particularly trustworthy here, but, e.g., the organisation of reliable oversight with more than one person appears crucial in civil service, too.

ff) Accuracy, Robustness and Cybersecurity

Fifth, Article 15 requires accuracy, robustness and cybersecurity of high-risk AI systems throughout their lifecycle. This is to be achieved by involving expertise of relevant stakeholders and organisations such as metrology and benchmarking authorities, encouraging the development of benchmarks and measurement methodologies, declared in the accompanying instructions of use. Paragraphs (4) and (5) of Art. 15 deal with resilience regarding errors, faults or inconsistencies, calling for technical and organisational measures, for instance technical redundancy solutions, which may include backup or fail-safe plans. The risk of possibly biased outputs influencing input for future operations (feedback loops) in learning AI systems shall be avoided by developing AI in such a way as to eliminate or reduce this risk as far as possible and as to ensure that any such feedback loops are duly addressed with appropriate mitigation measures. In addition, high-risk AI systems need to be resilient against attempts by unauthorised third parties to alter their use, outputs or performance by exploiting system vulnerabilities. The technical solutions aiming to ensure the cybersecurity of high-risk AI systems shall be ‘appropriate to the relevant circumstances and the risks’, whatever that is to mean exactly, and shall include measures to prevent, detect, respond to, resolve and control attacks trying to manipulate the training data set (data poisoning), or pre-trained components used in training (model poisoning), inputs designed to cause the AI model to make a mistake (adversarial examples or model evasion), confidentiality attacks or model flaws. The use of such wide legal concepts affects legal certainty and requires fleshing out by public administration and case law.

gg) Further Obligations of Providers

Providers have to ensure that their high-risk AI systems are compliant with the various requirements, have a quality management system in place, draw up the technical documentation, keep logs, do a conformity assessment, take the necessary corrective actions when a breach is established, and inform the supervisory authorities thereof. Section 3/Art. 16 et seq. of the AI Act state these obligations of providers of high-risk AI systems and other parties, namely to

- ensure compliance with section 2 (Art. 16 (a)) AI Act,
- indicate their name, registered trade name or registered trade mark, the address at which they can be contacted Art. 16 (b) AI Act,
- have a quality management system – on top of the risk management system – in place (Art. 16 (c) and Art. 17 AI Act (specifying the details of such quality management)),
- keep the documentation, in particular to allow for checks and surveillance by the national authorities, namely technical documentation and the documentation concerning the quality management system et al. (Art. 16 (d) and Art. 18 AI Act),
- keep the logs automatically generated by their high-risk AI systems (Art. 16 (e) and Article 19 AI Act),
- ensure that the high-risk AI system undergoes the relevant conformity assessment procedure as referred to in Article 43, prior to its being placed on the market or put into service, Art. 16 (f) AI Act,
- comply with the registration obligations referred to in Art. 49(1), Art. 16 (i) AI Act,
- take the necessary corrective actions and provide information as required in Article 20, Art. 16 (j) AI Act,
- demonstrate the conformity of the high-risk AI system with the requirements set out in Section 2 upon request of the national competent authority, Art. 16 (k), 21 AI Act, and
- ensure that the high-risk AI system complies with accessibility requirements laid down in EU law³⁸, Art. 16 (l) AI Act.

These obligations seem to offer a dense package of safeguards for high-risk systems, applying at the beginning of the supply chain, with providers. What is remarkable here is that researchers, engaged in system development, and producers do not appear to be addressed, meaning that, in cases where

38 Directives (EU) 2016/2102 and (EU) 2019/882.

an AI system is not provided to potential deployers, or is not imported from outside the EU (see hh)), it does not need to meet the requirements of these sections. This may support innovation, making sure that conceptual research can be conducted freely to start with, and may be a wise move in regulation of such a new and heretofore unregulated area where updates to the legal framework will be required in any case, potentially requiring restrictions at source, too. In addition, since regulating research may not fall under the EU internal market legislative competence, this will be an area left to Member States' Regulation.

hh) Obligations of Importers, Distributors etc.

Apart from AI providers, other persons and undertakings involved with AI are included among those obliged to ensure that AI be 'trustworthy'. Along the value chain this first applies to importers, who are subject to various verification duties under Art. 23 (1) AI Act, to ensure that the system is in conformity with the AI Act. This mainly amounts to verifying that the provider has fulfilled all obligations under the AI Act, such as verifying that the relevant conformity assessment procedure³⁹ has been carried out by the provider of the high-risk AI system (a), the provider has drawn up the technical documentation in accordance with Article 11 and Annex IV(b), etc. (see gg)). In addition, there are also obligations imposed on importers to notify any suspected non-conformity or falsification, giving the importer's name, registered trade name or registered trade mark, plus their address, and to keep documentation and present it to the authorities upon request. Similar obligations apply to distributors under Art. 24 AI Act.

In order to exclude any gaps in the obligations of persons or undertakings handling AI, Art. 25 AI Act imposes further responsibilities along the AI value chain, essentially considering any distributor, importer, deployer or other third-party as a provider of a high-risk AI system, and subject to the obligations of the provider under Art. 16, in any circumstances potentially limiting the responsibility of another under para (2), for instance, if they put their name or trademark on a high-risk AI system already placed on the market or put into service (Art. 25 (1)(a) AI Act) or make modifications (b, c).

39 Referred to in Article 43.

ii) Obligations of Deployers of High-Risk AI Systems – with respect to Public Administration

Obligations of deployers of high-risk AI systems are particularly relevant here, as public administration authorities will probably mainly appear in the role of a deployer of AI, not as a provider (although interesting questions may arise if public funding goes into research producing AI systems). Deployer obligations are imposed by Art. 26 AI Act. These duties rest on public administration in the role of a deployer, as well as on any other, but there are some specifically relevant for public bodies.

First, deployers of high-risk AI systems shall take appropriate technical and organisational measures to ensure they use such systems in accordance with the instructions for use accompanying the systems. Second, addressing fears of a ‘Terminator’ scenario, there is a strict requirement of human oversight: deployers shall assign human oversight to natural persons who have the necessary competence, training and authority, as well as the necessary support (Art. 26 (2) AI Act).

Third, Art. 26 (3) AI Act addresses any concurrent obligations, as well as deployer’s freedom of self-organisation, stating that the duties of ensuring use according to instructions and human oversight are without prejudice to other deployer obligations under EU or national law on the one hand and to the deployer’s freedom to organise its own resources and activities for the purpose of implementing the human oversight measures indicated by the provider on the other. The latter is particularly relevant for public administration where there is a constitutional autonomy of public entities, as in Germany - namely the federal states’ and the municipalities’ autonomy, which might be affected if this exception did not exist.

There are further duties on high-risk AI deployers, namely regarding the quality of input data (para (4)) and the monitoring of the operation of the system, coupled with duties of information, namely to inform providers or to pass on documentation. Where high-risk AI deployers have reason to consider that the use of the system in line with the instructions may result in that AI system presenting a risk to persons’ health or safety, or to fundamental rights, they shall inform the provider or distributor and the relevant market surveillance authority, and shall suspend the use of that system. Where deployers have identified a serious incident, they shall also immediately inform the provider, and then the importer or distributor and the relevant market surveillance authorities of that incident (para (5)). In addition to the general documentation duties, deployers of high-risk AI systems shall keep the logs automatically generated by that high-risk AI system

to the extent such logs are under their control, for at least six months, unless provided otherwise in particular in EU data protection law, namely the GDPR⁴⁰ (para. (6)). Regarding the civil service, if deploying high-risk AI, public administration entities, too, must inform their civil servants and other workforce, like other employers, before putting a high-risk AI system into service or using it at the workplace, both workers' representatives and the affected workers themselves (para (7)).

Public authorities also have additional obligations under Art. 26 (8) AI Act if they deploy high-risk AI systems⁴¹: deployers that are public authorities, or Union institutions, bodies, offices or agencies shall comply with registration obligations⁴², meaning that they must register their selected system's use in the EU database⁴³ before putting it into service or using it. They should only use (and register their use) if the system is already registered by the provider: Art. 26 (8) demands that, when public deployers find that the high-risk AI system that they envisage using has not been registered in the EU database⁴⁴, they shall not use that system and shall inform the provider or the distributor.

Another obligation particularly relevant to public entities under the rule of law and human dignity protection is data protection. This is already catered for by the GDPR as mentioned above⁴⁵, but the obligation to carry out a data protection assessment is specifically mentioned for deployers of high-risk AI systems in Art. 26 (9) AI Act: deployers of high-risk AI systems shall use the information provided under the transparency obligation on AI providers under Art. 13 AI Act in order to comply with their obligation to carry out a data protection impact assessment under the GDPR⁴⁶.

jj) Fundamental Rights Impact Assessment

Regarding AI with a high risk for human rights protection, there are further specific obligations for public administration, whether bodies governed by

40 GDPR, see fn. 4.

41 I.e. those listed in Annex III, with the exception of high-risk AI systems listed in point 2 of Annex III, Art. 49 (3) AI Act.

42 Referred to in Article 49.

43 Database referred to in Article 71.

44 Database referred to in Article 71.

45 See above A., F.IV.

46 GDPR see above fn. 4. The same applies under Article 27 of Directive (EU) 2016/680 on data protection in criminal prosecution.

public law or entities organized under private law but performing public services. This expressly includes an impact assessment regarding the human rights impact:

Article 27

Fundamental rights impact assessment for high-risk AI systems

1. Prior to deploying a high-risk AI system referred to in Article 6(2), with the exception of high-risk AI systems intended to be used in the area listed in point 2 of Annex III, deployers that are bodies governed by public law, or are private entities providing public services, and deployers of high-risk AI systems referred to in points 5 (b) and (c) of Annex III, shall perform an assessment of the impact on fundamental rights that the use of such system may produce. For that purpose, deployers shall perform an assessment consisting of:

- (a) a description of the deployer's processes in which the high-risk AI system will be used in line with its intended purpose;
- (b) a description of the period of time within which, and the frequency with which, each high-risk AI system is intended to be used;
- (c) the categories of natural persons and groups likely to be affected by its use in the specific context;
- (d) the specific risks of harm likely to have an impact on the categories of natural persons or groups of persons identified pursuant to point (c) of this paragraph, taking into account the information given by the provider pursuant to Article 13;
- (e) a description of the implementation of human oversight measures, according to the instructions for use;
- (f) the measures to be taken in the case of the materialisation of those risks, including the arrangements for internal governance and complaint mechanisms.

2. The obligation laid down in paragraph 1 applies to the first use of the high-risk AI system. The deployer may, in similar cases, rely on previously conducted fundamental rights impact assessments or existing impact assessments carried out by provider. If, during the use of the high-risk AI system, the deployer considers that any of the elements listed in paragraph 1 has changed or is no longer up to date, the deployer shall take the necessary steps to update the information.

3. Once the assessment referred to in paragraph 1 of this Article has been performed, the deployer shall notify the market surveillance authority of its results, submitting the filled-out template referred to in paragraph 5 of this Article as part of the notification. In the case referred to in Article 46(1), deployers may be exempt from that obligation to notify.

4. *If any of the obligations laid down in this Article is already met through the data protection impact assessment conducted pursuant to Article 35 of Regulation (EU) 2016/679 or Article 27 of Directive (EU) 2016/680, the fundamental rights impact assessment referred to in paragraph 1 of this Article shall complement that data protection impact assessment.*

5. *The AI Office shall develop a template for a questionnaire, including through an automated tool, to facilitate deployers in complying with their obligations under this Article in a simplified manner.*

This provision marks an attempt to leave no stone unturned before public entities deploy AI, whilst facilitating its use after the first time of its being put into service. Certainly this raises the hurdles for using AI at all in the public service, but, at the same time, it may help to maintain public awareness of risks attached to AI use, in particular to human rights protection central to liberal democracies..

kk) Conformity Assessment prior to Use

A conformity assessment prior to use is prescribed in Art. 43 AI Act, among the standards, applying to high-risk AI. Depending on the type of AI system, the conformity assessment may be undertaken by providers of the AI system themselves (Art. 43 (1)(a)/Annex VI); otherwise participation of a notified body is required (Art. 43 (1) (b)/Annex VII). Importers of high-risk AI systems have to ensure that the appropriate conformity assessment procedure has been carried out by the provider of that AI system, that the provider has drawn up the required technical documentation and that the system bears the required conformity marking etc. Equally, distributors have to verify that the system bears the required conformity markings, that it is accompanied by the requisite documentation and instruction of use, and that the provider and the importer of the system have complied with their obligations under sections 2 and 3.

Conformity refers to the AI Act and, where applicable, also to EU legislation other than the AI Act. The conformity assessment aims to demonstrate that the AI system meets the mandatory requirements for trustworthy AI (in terms of data quality, documentation and record keeping, transparency and provision of information to users, human oversight, robustness, accuracy and cybersecurity (Chapter III Section 2, Art. 9 et seq.). The relevant process involves four steps:

Step 1: Development of AI-System

Step 2: Conformity Assessment

Step 3: Registration

Step 4: Declaration of conformity, CE-label.

Only after these four steps are concluded a high-risk AI system may be placed on the market, and only then will it be available – and lawful to use – for bodies of public administration.

II) Assessment of High-risk AI requirements

The requirements for provision and deployment of high-risk AI presented in the above seem very far-reaching, as befits the potential risk to human rights protection, human dignity in particular, and liberal democracy. At the same time, research even with high risk potential is left free from restrictions as such, which leaves the potential for innovation untouched.

The obligations under this risk-based approach appear more procedural than substantive. In spite of allowing for free research, one also needs to consider who will be driving innovation, and whether they can cope with the burdens under the risk-based approach. As van de Sloot points out:

It may stifle innovation. Because of the administrative and bureaucratic costs, it will most likely be larger corporations rather than innovative start-ups that can uphold these rules and because these bigger parties prefer safety. Risk-based regulation is open and vague; parties do not get clear guidance from the regulator on what is and what is not allowed. Strict rules often boost rather than stifle innovation, because companies know within which boundaries they can operate and can thus make stable long-term investments.⁴⁷

Still, given that technological progress in the field of AI occurs every day it is very difficult, if not impossible, to fix on specific substantive requirements, and thus appears wise to keep them rather general and focus on procedural ones. This leaves a lot of responsibility with providers and deployers of systems, but also leaves technologies largely free to evolve. Future regulation may be based on the results of documentation and recording, enabling legislation to be more specific. It is still a step forward as opposed to leaving the direction and risk control entirely to providers and deployers. As van de Sloot states:

⁴⁷ Van de Sloot, *Regulating Synthetic Society*, p. 153.

‘The evaluation of potential risks is initially left up to private organisations, only later to be assessed by a regulatory [authority] or court. It is known that this generally means that the ‘good guys’ will err on the safe side, while it will be the ‘bad guys’ who look for loopholes in the measures to exploit in a business-friendly way. More generally, the goal of impact assessments, under the AI Act, the GDPR and other EU data instruments, is that risks will be identified and that if these risks cannot be adequately mitigated, the project is cancelled. In practice, however, such decisions are seldom made; certain applications that are in essence problematic (from a substantive perspective) are commonly legitimised by adopting additional procedural safeguards.’⁴⁸

Whilst this appears plausible per se it may store up problems for later on, if a subsequent first attempt at substantive legislation makes the wrong choices in substantive requirements. Accordingly, to avoid the risk of stifling innovation at that stage, it may be better from the start to involve the innovating side – preferably the ‘good guys’ – in developing the substantive requirements in due course, rather than doing either nothing or the wrong thing. In this regard, some more substantive rules, such as permissible defenses for wrong results, could arguably have been included, combining the risk-based procedural and the substantive approach.⁴⁹

3. General-purpose AI (GPAI)

‘General-purpose AI model’ means, according to Art. 2 (63) AI Act, an AI model that displays significant generality and is capable of competently performing a wide range of distinct tasks regardless of the way the model is placed on the market. A GPAI model can be integrated into a variety of downstream systems or applications. Such an AI model may be trained with a large amount of data using self-supervision at scale. A ‘general-purpose AI system’ means an AI system which is based on such a general-purpose AI model and which has the capability to serve a variety of purposes, both for direct use as well as for integration in other AI systems (Art. 2 No 66 AI Act). A well-known example is ChatGPT.

GPAI is regulated in a separate chapter, Chapter V, of the AI Act (Art. 51 et seq.). General-purpose AI models, regardless of risk level, must offer technical documentation, usage guidelines, adhere to copyright laws, and disclose summaries of their training data. Providers of free and open license GPAI have fewer requirements unless they present systemic risks. All GPAI providers with systemic risks, whether open or closed, must conduct model

48 Van de Sloot, *Regulating Synthetic Society*, p. 153.

49 As suggested by van de Sloot, *Regulating Synthetic Society*, p. 154.

assessments, adversarial testing, report serious incidents, and ensure cybersecurity measures (Art. 53 et seq. AI Act). In addition, GPAI must fulfil the additional requirements depending on their risk level.

GPAI models that are used for research, development or prototyping activities before they are placed on the market are not covered by the AI Act.

4. Limited-Risk AI: Reveal Yourself - Transparency

The AI Act acknowledges that not all AI necessarily poses a risk, let alone a high risk. Therefore, it largely exempts AI systems which do not lead to a significant risk of harm to the legal interests protected in the AI Act, namely because they do not materially influence the substance or outcome of decision-making or do not harm protected interests substantially. Under Preamble No 53 this is namely the case where the AI system

- is intended to perform a narrow procedural task, such as an AI system that transforms unstructured data into structured data, an AI system that classifies incoming documents into categories or an AI system that is used to detect duplicates among a large number of applications,
- provides only an additional layer to a human activity, such as AI systems that are intended to improve the language used in previously drafted documents,
- is intended to detect decision-making patterns or deviations from prior decision-making patterns, following a previously completed human assessment which it is not meant to replace or influence, without proper human review, such as smart solutions for file handling, which include various functions from indexing, searching, text and speech processing or linking data to other data sources,
- is used for translation of initial documents.

There are several categories of limited-risk AI which accordingly not subject to the main compliance provisions of the AI Act, but merely to transparency rules (Art. 50 AI Act): in short such AI must still reveal itself. „Chatbots“, recognition systems or biometric categorisation systems are thus not per se illegal or subject to onerous use conditions, but it must be obvious to the users that they are dealing with AI. For this, the information of AI use shall be provided to the natural persons concerned in a clear and distinguishable manner at the latest at the time of the first interaction or exposure (Art. 50 (5) AI Act). Namely this applies to limited-risk AI

which is intended to interact directly with natural persons (Art. 50 (1) AI Act). This means, for instance, that should humanoid robots become truly indistinguishable from humans, they should let natural persons

with whom they interact know that they are non-human, for example, when used for hospitality purposes.⁵⁰ The transparency obligations to interacting users serve the purpose that users may consciously decide whether they want to continue using the application. Such a disclosure obligation also applies to AI use by public administration. Here the question arises as to whether public administration may make it obligatory to use AI in order to eg submit an application for a public service, or for citizens to perform a duty to the public. One issue will be inclusion, as it cannot be expected of all users that they are able to use AI systems so far, but a person rejecting AI use remains a citizen who must be able to interact with public administration. This may limit the options for public administration to introduce AI in its processes.

Regarding AI systems that generate or manipulate content, the origin of the content must be disclosed (Art. 50 (2) AI Act):

‘Providers of AI systems generating synthetic audio, image, video or text content, shall ensure that the outputs of the AI system are marked in a machine-readable format and detectable as artificially generated or manipulated. Providers shall ensure their technical solutions are effective, interoperable, robust and reliable as far as this is technically feasible, taking into account the specificities and limitations of various types of content, the costs of implementation and the generally acknowledged state of the art, as may be reflected in relevant technical standards. ...’

This provision has raised concerns as to whether it is not so wide as to be impracticable:

The provision seems to cover all manipulated content; however, the problem is that, depending on the definition of manipulation, any communication technology distorts reality: video services have built-in tools that smoothen skin tones, audio services automatically filter out treble and so forth. Some experts estimate that, in five years, more than 90 per cent of all online content will be manipulated in some form. Importantly, the AI Act also refers to manipulated content about objects, places and events. Would this provision consequently also apply to a smiley-faced sun?⁵¹

It will remain to be seen whether this concern proves correct, and legal application may have to cater for the issue by a narrow interpretation of concepts. In addition, given that the AI Act is a first attempt at regulating AI, it seems likely that there will be amendments soon, as new issues will arise which have not been covered, and any provisions proving impracticable may be reviewed. In order to win public trust in ‘trustworthy AI’ as the AI Act aims to do, doing more may appear better than doing too little.

50 Van de Sloot, *Regulating Synthetic Society*, p. 151.

51 Van de Sloot, *Regulating Synthetic Society*, p. 152.

The aim of winning trust may also offer the answer to the question as to whom the disclosure obligation would be addressed, the general public, the person depicted or the platform on which it was posted?⁵² Creating trust would require as much transparency as possible, so the addressee should be the general public: knowledge appears better than a vague feeling that something may be manipulated. Here, however, the transparency obligation appears to fall short of what is needed for trust: people may wish to not only know, or able to find out, that there was manipulation, but what exactly has been manipulated. Such information would involve further issues, namely of data protection, freedom of art, business secrets etc., which have not been addressed here.⁵³

The same applies to AI in emotion recognition and biometric categorization (Art. 50 (3) AI Act):

'Deployers of an emotion recognition system or a biometric categorisation system shall inform the natural persons exposed thereto of the operation of the system, and shall process the personal data in accordance with EU data protection law, namely the GDPR⁵⁴ (Art. 50 (2) AI Act). This obligation shall not apply to AI systems used for biometric categorisation and emotion recognition, which are permitted by law to detect, prevent or investigate criminal offences, subject to appropriate safeguards for the rights and freedoms of third parties, and in accordance with Union law.'

Transparency is also obligatory regarding deep fakes, etc., unless exceptions apply (Art. 50 (4) AI Act):

*'Deployers of an AI system that generates or manipulates image, audio or video content constituting a deep fake, shall disclose that the content has been artificially generated or manipulated. ...
Deployers of an AI system that generates or manipulates text which is published with the purpose of informing the public on matters of public interest shall disclose that the text has been artificially generated or manipulated. This obligation shall not apply where the use is authorised by law to detect, prevent, investigate or prosecute criminal offences or where the AI-generated content has undergone a process of human review or editorial control and where a natural or legal person holds editorial responsibility for the publication of the content.'*

Apart from criminal prosecution, the last category will be most relevant to public administration. Here the exception of human review of the AI-generated content will often apply, however, in mass procedures without any

52 Van de Sloot, *Regulating Synthetic Society*, p. 152.

53 Cf. Van de Sloot, *Regulating Synthetic Society*, p. 152.

54 GDPR, fn. 4, and Regulation (EU) 2018/1725 and Directive (EU) 2016/680.

discretion to be exercised text-generating AI may well be used – with the transparency requirement.

4. Minimal-Risk AI: Permitted with no restrictions

Minimal-Risk AI appears in every-day-use of IT and encompasses the large majority of AI systems. It includes namely AI-supported video games or spam filters. Usually the use of such minimal-risk AI is free of charge. It poses only a minimal or no risk to citizens' rights or public security, and thus requires no licensing, but only obligatory disclosure. Namely spam filters will also be used in public administration.

V. Sanctions

Sanctions are provided in Art. 99 et seq. AI Act. Given the limited criminal prosecution competences of the EU, as well as the limited resources for any relevant prosecution authorities, these sanctions are administered by Member States, and may be administered against civil service staff in cases of violation as well. Civil service violations of AI Act rules may often, due to the danger of public administration violations and the role of public administration as a model, be regarded as grave. Containing risks stemming from AI will depend on measures taken by liberal democracies themselves, in order to preserve their very nature.

G. Regulatory Gaps and Shortcomings: Some Conclusions

The AI Act is treading on largely unexplored legislative ground, although the risk-based approach has been tried and tested before. There still remains a lot to explore, namely the fleshing out of indeterminate concepts, such as 'physical or psychological harm', 'materially distorting a person's behaviour' or 'unfavourable treatment'.⁵⁵ The annexes will certainly be helpful to reduce legal uncertainty there, as well as case law from other areas. Still, AI-specific terminology and concepts remain in flux, and the challenge of making sense of them will be on legal practice and public administration now.

Similarly, it remains to be seen whether concerns on the AI Act being too restrictive, imposing too far-reaching duties of transparency,⁵⁶ too one-

55 Examples from van de Sloot, *Regulating Synthetic Society*, p. 149.

56 Above IV.4.

rous burdens of quality and risk management,⁵⁷ prove correct. For the time being, legal applications may have to cater for the issue by a wider or narrower interpretation of concepts in line with the aims of the AI Act. In addition, given that the AI Act is a first attempt at regulating AI, it seems likely that there will be amendments soon, as new issues will arise which have not been covered, and any provisions proving impracticable may be reviewed. In order to win public trust in ‘trustworthy AI’, as the AI Act aims to do, doing more may appear better than doing too little. At the current stage it is still too early to offer a considered view as to whether the AI Act is too restrictive for innovation or too lenient regarding fundamental rights.

The Commission’s professed aims in presenting its proposal were, in line with the overall aim of offering ‘trustworthy AI’, to ‘guarantee the safety and fundamental rights of people and businesses, while strengthening investment and innovation across EU countries’⁵⁸ As stated above, relevant fundamental rights include protection of personal data and privacy (Art. 7/8 FRC), intellectual property rights (Art. 17 (2) FRC), and non-discrimination, in particular on grounds such as sex, race, colour, ethnic or social origin, genetic features, language, religion or belief, political or any other opinion, membership of a national minority, property, birth, disability, age or sexual orientation (Art. 21 FRC). Apart from the prohibition of unacceptably risky AI, the AI Act, with its risk-based approach, rather invokes procedural than substantive measures, which amounts to setting guardrails on AI use, in particular in public administration. Still, Member States, being fully and directly bound by fundamental rights, may use the leeway given in this respect by the silence of the AI Act in order to add to the requirements on AI use in public administration. The enforcement of fundamental rights by substantive guardrails coming from a firm legal framework is still largely missing.

Another shortcoming of the AI Act may be the lack of (open?) alignment with the Council of Europe Framework Convention on Artificial Intelligence⁵⁹, which, however, carries a later date than the AI Act. The

57 Above III.2.b).

58 European Commission webpage, Shaping Europe’s digital future/AI Act, <https://digital-strategy.ec.europa.eu/en/policies/regulatory-framework-ai>.

59 The Council of Europe Framework Convention on Artificial Intelligence and Human Rights, Democracy and the Rule of Law was adopted on 17 May 2024 by the Committee of Ministers of the Council of Europe at its 133th Session held in Strasbourg, and was opened for signature on the occasion of the Conference of Ministers of Justice in Vilnius (Lithuania) on 5 September 2024, see the Council of Europe’s Committee on Artificial Intelligence (CAI) website at <https://www.coe.int/en/web/artificial-intelligence/cai>.

Council of Europe Convention is not even mentioned in the AI Act although it was elaborated in parallel, and although all EU Member States are also members of the Council of Europe. It appears to share the risk based approach, being ‘based on the severity and likelihood of a negative impact on human rights, democracy and the rule of law by AI systems’. How far the Convention may supplement or require amendments of the EU AI Act must be left to a later piece of research.

In terms of transparency and accessibility of the law, the AI Act leaves a lot to be wished for. The Annexes may be helpful, however, at the same time the technique of referencing to other provisions and annexes, used instead of reiterating content, has been carried very far from a user’s perspective, namely from the perspective of lawyers in practice and administration to apply the AI Act. Parts of it, in particular the chapter on high-risk AI,⁶⁰ are hardly readable or understandable to anyone but legal experts with technical knowledge. Legally the referrals may make the Act coherent by avoiding any inconsistencies. Still, more legibility might improve its transparency and effectiveness. After all, it is meant to be applied, and to shape public perception of AI in the EU. From this perspective less legal perfection and more accessibility to the wider public, be they deployers or subjected to AI use, would have been preferable.

Lastly, the AI Act’s risk-based approach results in an outsourcing of monitoring the fulfilment of AI requirements. The assessment of the results of the precautions based only on a risk-based regulation will to a considerable extent be left such private players and their documentation and communication. Will such private players, often including large, non-EU companies, act responsibly, or are they going to use their power just because they can, neglecting human rights, rule of law and democracy if they happen to stand in their way? Notwithstanding this, it is arguably still the EU and the states, rather than profit-driven companies wishing to market AI, that are better equipped to balance the various interests of freedom of business and of research in the possibilities of AI, against fundamental rights, democracy and the rule of law, at least as soon as the technology has evolved more.

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*John van de Pas*¹

Citizens in the Smart City. Applied Social Physics and the need for Deliberation

Summary: Smart Cities span the globe. To make modern city life sustainable, comfortable and efficient the internet of things is rolled out across the built environment, its data fed into analytical systems and transformed into profiles that allow for personalized services. By presenting the data on dashboards, decision making by city officials is supported; application in automated decision making makes city management more effective and efficient. In the smart city this profiling-and-managing process can truly be beneficial. In some cases, however, quite the opposite is the case. The application of smart city technology should therefore be subject to open deliberation among citizens, instead of left to engineers and bureaucrats.

This chapter is based on an ongoing literature research project on the aspect of citizen agency in information technology driven environments. The outcomes of this qualitative research project is applied to lectures and presentations in my role as a senior lecturer in Information Management at Saxion University. I would like to express my gratitude to my fellow researcher dr. Detlef Wagenaar for topical discussions and textual feedback.

Keywords: Smart City, Decision making, Dashboards, Citizen empowerment, Democratic Deliberation.

1 John van de Pas (MA, BiCT) is a senior researcher and lecturer of Information Management at Saxion University of Applied Sciences in The Netherlands. He has published several papers on privacy, information systems and smart cities. At the moment he is focused on tensions between public values and IT environments. Contact: j.h.vandepas@saxion.nl.

In 2013 Anthony Townsend published his book on Smart Cities. Townsend described the upcoming concept that was by then past its nativity, as follows:

Smart cities are places where information technology is wielded to address problems old and new. In the past, buildings and infrastructure shunted the flow of people and goods in rigid, predetermined ways. But smart cities can adapt on the fly, by pulling readings from vast arrays of sensors, feeding that data into software that can see the big picture, and taking action [...] Sometimes, these interventions on our behalf will go unnoticed by humans, behind the scenes within the wires and walls of the city. But at other times, they'll get right in our face, to help us solve our shared problems by urging each of us to make choices for the greater good of all.²

Two aspects are relevant in this description: the role of massive data harvesting to make decisions, and the fact that these decisions may be explicit, but could also be unnoticed by humans, with a reference to the 'greater good of all'. The merger of physical and digital environments constitutes a *good city*. And even today the concept is alive and kicking. Smart cities are everywhere.

Smart City and New Public Management

The Smart City concept cannot be seen as disconnected from the central drivers of the information technology (IT) sector in general. In short, IT promises to deliver faster and better services at lower costs. This premise of efficiency fits neatly within the narrative of New Public Management (NPM), a world view making waves since the early nineteen eighties, that provided struggling governments in the face of financial breakdown with a simple and readily available solution: Performance Based Budgeting. And although this way of looking at the world is held responsible for some less than beneficial side effects on both societies and public management³, it still is the prevailing model for public management in Western Societies today. The underlying philosophy of this rational approach can be summarized as: 'Data Tells All'⁴, and its application has caused the breakthrough of a technological approach that has taken control of decision making in

2 Townsend, Smart cities: big data, civic hackers, and the quest for a new utopia First edition (2013) xii.

3 Mauro/Cinquini/Pianezzi, New Public Management between reality and illusion: Analysing the validity of performance-based budgeting, The British Accounting Review 2021, 100825.

4 Mayer-Schönberger/Cukier, Big data: a revolution that will transform how we live, work and think 1. publ (2013).

general. The width and depth of this rationality may be discerned in a 2022 review article on ‘Social Physics’ in *Physics Reports*, which sums up the current state of the art in the use of physics methods to study topics that are ‘at the heart of human societies’⁵, and the application in real life society. The subjects range from traffic flows, networks, collaboration between humans and machines, communities and migration to climate change and city dynamics. In 148 pages of summing up of methods and algorithms that allow for the transformation of societal phenomena into a positivist analysis, the writers conclude that the future for social physics is bright, and physicists studying societal phenomena are a force to be reckoned with.

This notion is echoed by Matheus et Al. in *Data Science Empowering the Public: Data-Driven Dashboards for Transparent and Accountable Decision-Making in Smart Cities*. Their opening statement breathes the same faith in the exactitude of data-based decision making:

*Data science is an essential area for governments, as they collect a lot of data in various areas (geographical, traffic, social security, energy, etc.) that can be combined or enriched with data from smart devices and other sources such as discussion forums, social media, and private sector data [...] The making of sound decisions depends on the use of high-quality data [...]. Data might be an enabler for creating new innovative applications to improve public values like security, safety, transparency and accountability.*⁶

So here we have a hopeful image of the application of physics to social aspects, and the improvement of public values - the tech-savvy viewpoint of making the world a better place. The culmination of that approach may be never more profound than in the application of dashboards as interfaces for the smart city.

Dashboards as interfaces to real life environments

The appeal of dashboards to management and the general public as well is not hard to grasp at all. A long range of movies and popular culture has driven home the idea of the all-seeing entity that presents its highly convincing world view in a profound and undeniable way. Communication via dashboards is very pervasive indeed – and the message they convey is that in a messy and uncertain environment, with endless variation and

5 Jusup et al, Social physics, *Physics Reports* 2022, 1–148.

6 Matheus/Janssen/Maheshwari, Data science empowering the public: Data-driven dashboards for transparent and accountable decision-making in smart cities, *Government Information Quarterly* 2020, 101284 (1).

differences, it is possible to end up with an encompassing and total truth of the world and all that is in it. The simplicity of a nice overview on monitors, esthetically appealing to the superficial view, shows that the entire environment can truly be grasped. From that point on it is not a big mental leap to the notion that overview of what has been grasped by sensors and translated by algorithms will eventually solve ‘the most political of all questions,’ as Bentham quoted Juvenal in his *Panopticon*: *quis custodiet ipso custodes?*⁷

In actual fact the custodian nowadays is not the (wo)man behind the desk, but the algorithmic entity that was built by programmers to rationalize the outcomes of the decisions that will later be made with reference to the data gathered. No data means no output on the smart city dashboards, and what is not captured is not merely overlooked: it truly does not exist in the digital environment of switches and valves, lovingly strewn across the decision makers’ interface. The digital twin, culminating this development to its – for now – most advanced form, has a truly mind-blowing effect on this development. Where the difference between ‘reality’ and ‘representation’ on the smart city dashboard is a matter of belief, the digital twin promises to replicate the entire physical environment in a virtual platform, to make management of the tiniest deviation from the established norm to an information event in its own sense, an order to be executed forthwith, instead of what it is, a data point to be considered and acted upon according to a human decision makers discretion.

Dashboards are often put forward as a part of ‘open government’ efforts, that allow citizens to take part in, and comment on, public policy making. The aforementioned Matheus et Al. aim to understand and support the implementation in such a way that *both* the public-private partnership that develops dashboards for city management may benefit, but also the citizens of the city thus managed. They arrive at the notion that a dashboard *in itself* may not be an instrument that changes things in the actual environment:

Our findings show that the introduction of dashboards might be useless if their introduction is not accompanied with organizational changes. Dashboards should not only be used to communicate with the public, but also to gain feedback from them and to stimulate interaction. Finding new insights or detecting corruption is useless if there are no means to deal with the feedback or to further investigate by legitimate agencies. Formal authorities that can hold organizations accountable need to be involved or created. Engagement in dashboards, with citizens having the opportunity to provide data and discuss results, plays a crucial role in achieving the benefits. Furthermore, a

7 Bentham, *Panopticon*, or, the inspection-house (2008) 15.

*bad-designed dashboard might result in misunderstanding of data and can affect the public's trust in the government.*⁸

The eroding effect on public trust in government they point out, as ultimate outcomes of such a process-oriented versus an result-oriented way of perceiving the world can be seen in some of the great scandals of our time. Foremost the ongoing Dutch Childcare Benefits scandal, that at this moment in time will cost at least an estimated 8 bn euros to repair and has not led to a satisfying solution yet. And more recently the British Post Office Scandal; both cases involving blind faith in obviously faulty readouts from systems that were held to be truthful. And although it is tempting to blame the IT firms that provided the rickety software, in these cases a closer look at the cultural environment in which this kind of ‘unthinking’ could take root seems obvious. The general obsession with efficiency that dictates focus on process execution and ignores outcomes that are contrary to the stated goals, might have led to a strain on public values that are also at stake.

The power question

In the early days of the internet, it was perceived by the general public and media alike as a global village with room for every differing opinion, a place free from oppression by any authority, opening connections between scattered and isolated free thinking individuals in areas where their life styles or choices were frowned upon or suppressed. That the breakthrough of the internet and its breakdown of temporal and locative barriers, could also potentially open the door for concentration of power on an unprecedented scale, was a notion less often heard in those early days⁹, but concerns about the turn internet took since social and tech platforms took control instead of the self-regulated early communities, gave rise to a rich corpus of texts discussing the negative side-effects¹⁰. In the actual world even ‘tech barons’ are sometimes prone to express doubts, as Mark Zuckerberg responded to a congress hearing committee in 2018: *I think the big mistake that we've made*

8 Matheus/Janssen/Maheshwari, *Government Information Quarterly* 2020, 101284 (8).

9 Donk, *Orwell in Athens: a perspective on informatization and democracy (Informatization developments and the public sector 1995)*.

10 Lanier, *You are not a gadget: a manifesto* 1st Vintage Books ed (2011); Morozov, *To save everything, click here: the folly of technological solutionism* (2013); O’Neil, *Weapons of math destruction: how big data increases inequality and threatens democracy* (2016); Zuboff, *The age of surveillance capitalism: the fight for a human future at the new frontier of power* (2019).

looking back on this is viewing our responsibility as just building tools, rather than viewing our whole responsibility as making sure that those tools are used for good.¹¹

This moment of reflective insight (or should we call it epiphany?), echoes in the closing statements of the *Social Physics* review mentioned earlier. The writers finish off their overview with an epilogue, titled ‘keeping the discussion open,’ which contains an important caveat and a plea for physicists to heed the calls of qualitative science:

We started our exposé arguing that physics has played a fundamental role in the modern movement towards multidisciplinary. However, physicists entering multidisciplinary research have a bad reputation for their imperious attitude: “Step aside! We’ll show you how it’s done. [...]”

[A] physicist’s strength lies in putting quantitative methods to good use, be it rigorous data analyses or complex numerical simulations.[...] Seeking inputs from experts is absolutely crucial in this stage because intuition and common sense cannot replace expert knowledge, and may easily lead to simplistic and naive hypotheses or assumptions. Accordingly, before quantitative methods are employed, physicists for the most part need to be on the receiving end of the dialogue with their multidisciplinary collaborators.¹²

Perhaps the most chilling description of what is happening to society in a networked environment without this dialogue taking place, is drawn by Niall Ferguson in his book on the history of networks and global power, as he mentions the vulnerability of networks in his final chapters under the heading ‘Facing Cyberia’:

We are all [...] interconnected [...]. Like the financial network, our social, commercial and infrastructural networks are under constant attack from fools and knaves, and there is very little indeed what we can do to deter them. The best we can do is to design and build our networks so that they can withstand the ravages of Cyberia. That means resisting the temptation to build complexity when [...] simplicity is a better option. Above all, it means understanding the structures of the networks we create.¹³

In how far we may be able to understand the structures of the networks, and acting according to our best interests after careful consideration of the pros and cons is possible, remains to be seen. In the light of the fact of life that power play has effectively dodged effective regulatory interventions in the

11 OV, Testimony of Mark Zuckerberg, Chair & CEO of Facebook Inc., Hearing before the United States Senate Committee on the judiciary and the United States Senate Committee on commerce, science and transportation, 10.04.2018.

12 Jusup et al, *Physics Reports* 2022, 1–148 (123).

13 Ferguson, *The square and the tower: networks, hierarchies and the struggle for global power* (2017) 411.

past three decades, leaving us with the emergence of a scarcely regulated truly global oligopoly of ‘Big Tech,’ having too much faith in the effectiveness of (self-)regulation by and of the sector might not be warranted, as Zuboff explains in her opening chapter ‘Home or Exile in the Digital Future’¹⁴. Such is the tempting lure of applying technology as simple solutions to hard societal questions and wicked problems, that it has become nigh impossible to think of other options than the application of ‘technological solutionism’¹⁵ – a notion already put forward by Neil Postman in 1992 as he minted the term ‘Technopoly’ for this world view¹⁶. Asking the Large Language Models to come up with a solution and accepting that as words of wisdom is just one path that can be followed. For those convinced that there should be more to thinking about application of technology than embracing it at first sight, and should be the outcome of deliberations made by those subjected to the technology itself, the need for a different way of exchanging viewpoints in environments with multiple stakeholders is evident.

Stakeholder engagement is by no means self-evident, however, as can be seen in the research project by Anouk Geenen, who defended her PhD thesis (2023) on democratic deliberation in the smart city. During her research she stumbled upon the limited accessibility for citizen engagement a thoroughly technologically mediated environment.

*I found that the digital context in which much of this research took place, provided a barrier for citizen engagement.*¹⁷

A thought to keep in the back of our minds, perhaps, when discussing citizen empowerment in a smart city environment?

A way out? Socio-Technological controversies in Deliberation

In 2019 Shoshanna Zuboff published her widely acclaimed book on the surveillance economy, in which she makes the case that the way information technology and digitization have transformed the world, has taken a rather problematic turn. In her closing chapters she states that there are many questions that are relevant to those trying to grasp the significance of

14 Zuboff, The age of surveillance capitalism: the fight for a human future at the new frontier of power (2019) 3–24.

15 Morozov, To save everything, click here: the folly of technological solutionism (2013).

16 Postman, Technopoly: the surrender of culture to technology 1st ed (1992).

17 Geenen, Constructive controversies : Redesigning democratic debate and ethical deliberation in the smart city. PhD, University of Twente (2023) 150.

what is actually going on behind the scenes of the world wide technology deployment we are witnessing on a daily basis. The unregulated application of information analysis and subsequent decision making on individuals, with possibly and actually extreme negative effects, should in her view be considered as a political question, that echoes the era of the ‘robber barons’ of the late nineteenth century. As she rightfully states: even those extremely powerful organizations were eventually brought under the rule of law; albeit not without a long and hard struggle. For that it is essential that the current state of affairs is not seen as inevitable.¹⁸

This is where Geenen’s insights fit in: she points towards one possible approach to escape out of the clutches of technological inevitability. In order to enhance the public values of democracy, deliberation and consultation should be part of the ongoing conversation between citizens, as opposed to the single-minded emphasis on efficiency and frictionless processes of organizations and corporations. And while cities are multi stakeholder environments per se, the mapping of controversies will prove to be more sustainable and fruitful than simply adding up viewpoints in a process oriented frictionless setting. Geenen: *Since controversies highlight friction between values and as such reveal what is at stake, they are promising, holistic concepts when discussing tensions in a multistakeholder setting. Although the potential of controversies has been recognized decades ago [...], ways to effectively exploit this potential are scarce.*¹⁹

Scarce, but not non-existent. The simplicity of tech solutionism²⁰, putting forward governance, or identifying the owner of data and calling those in charge of data to answer for the actions of their organizations relying on some authority, will most likely be a feeble attempt in a networked world with myriads of parties that have shown themselves more than capable of derailing any regulatory framework when it is put in place. It is as she states in her final sentence: *this thesis provided an alternative to the top-down, institutional approach that focuses on safeguarding a singular public value, and demonstrated how a purposeful examination and explication of the controversy at hand through means of design, promotes a bottom-up, democratic approach that*

18 Zuboff, The age of surveillance capitalism: the fight for a human future at the new frontier of power (2019) 520–525.

19 Geenen, Constructive controversies: Redesigning democratic debate and ethical deliberation in the smart city 53.

20 Morozov, To save everything, click here: the folly of technological solutionism (2013).

emphasizes the diversity and nuance of public's values.²¹ In other words: there is an alternative.

In order for *societies* to be democratic, this exact human condition should be taken into account, and made as a central starting point of the development of mechanisms that produce 'public values' (plural) like trust, reciprocity, caring and empowerment. It puts the question of how to relate to these aspects of life, both on a personal, professional and societal level, squarely on our own plate. The questions we need to ask in open deliberations should provide the democratic institutions we hold dear with the backing of a civic voice that claims citizen rights in a digitized environment. Those sorts of questions are essentially cultural, as they dwell on the threshold between the positivist outlook on society in general and the view that puts the human experience central to any attempt to grasp the meaning of life in the physical, digitally enhanced world. To prevent Ferguson's *Cyberia* from taking over completely there is no alternative.

In the words of Zuboff: *Be the Friction*.

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21 Geenen, Constructive controversies : Redesigning democratic debate and ethical deliberation in the smart city 154.

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*Radu-Ioan Popa*¹

Human – Artificial Intelligence interaction at the workplace

A social science glimpse into today's challenges and tomorrow's expectations

Summary: Nowadays, more than ever our society is challenged with the rapid and constant technology evolution, new trends appearing by the day. Following this framework, human – machine interaction has left many questions unanswered, underlining a top priority for human centricity approach, for building social-technic systems with regard towards human user variables, for ethics and diversity protection, and the list can be expanded further. The present chapter endeavor explores briefly, in a social science keynote, various stances of human challenges in relation with artificial intelligence, smart systems, devices and new technology at work, following up to date research, human variables and organizational sectors. As a general view, studying the interaction between the user and the technology advances solicits new research steps and further comprehensive studies in a world that many a time focuses more frequent on the technological or marketing aspect of every new developed device, sometimes leaving aside, addressing partially and not fully understanding the human variables, that are involved inside the equation.

Keywords: human centricity, artificial intelligence, organizational sector, innovation, social view.

1 Assoc. Prof. Dr. Radu-Ioan Popa is part of the Department of Social Work, Journalism, Public Relations and Sociology team, at “Lucian Blaga” University of Sibiu, Romania. His main research interests and publications focus on the human resources management and human-artificial intelligence interactions. He is also an Honorary Fellow at Munich University of Applied Sciences, Germany. Contact: radu.popa@ulbsibiu.ro.

A. General premises

I. New realities at work

A simple scan and search inside the major scholarly literature databases, especially in recent years, can present quite a generous range of research articles on the new trends in technology and artificial intelligence (AI), in various organizational sectors. Yet the search results focus more on the technical aspects, developing prototypes and planning future implementation, cost control and production efficiency while articles exploring human dimensions with regard to AI or any other smart systems are rather scarce and heterogenous in results and perspectives. Supplementary, concept clarification and theory based patterns are clearly needed in order to stimulate a more unitary and consolidated area of definitions, guidelines and paradigms, which in turn can explain better human user interaction with new technology at work, device management and learning associated with employee development, personnel training at work with regard to skills, individual and organizational performance, values and ethical principles, well-being preservation and so on.

The new technology reality is here now, either the Internet of Things (IoT) or the Internet of Medical Things (IoMT), the Industry 5.0 (European Commission et al., 2021) or Society 5.0 (Deguchi et al., 2020) just to mention a few examples, coexist, are constantly evolving and interacting, developing a new sense of work and organizational habitat. The setting is not yet complete and technology should be bound to focus more on the human topic, from a centrality point of view, even if at present the tech discourse, generally speaking, advocates for human user objective principle. Aside from the renowned and widely circulated concept of AI, the organizational domain contains several other numerous smart technologies such as virtual reality (VR), augmented reality (AR), mixed reality (MR) which impact the development of work, level of performance, job design, employee training and skill resources and so on. From this perspective, certain authors mentioned the concept of human artificial intelligence (HAI) or human centered artificial intelligence (HCAI), which allow the completion of simple AI with a human centered approach, where developing tech smart systems for the future will require human user values, perspectives, conditions and context (Shneiderman, 2020a; 2020b; 2021; Yang et al. 2021). In other words, at job and organizational level, the human factor should dictate primarily the use of technological systems, their development and implementation beyond simple performance or task related optimization. Concepts like well-being, discrimination, procedure or distributive justice,

diversity, integration, communication, training, perceptions and attitudes need to be taken into account when researching and adapting technology to the human user and not the other way around. Some authors already placed these socio-technical dimensions into discussion through their studies, which encompass the long awaited stance and dialogue between the individual's work related position and the use of technology adaptation (Boada, Maestre, and Genís 2021; Giermindl et al. 2022; Dwivedi et al. 2023; Heyder, Passlack, and Posegga 2023; Popa, 2023). Moreover, placing the new technology at work in relation with principles of transparency, accountability, privacy, security, fairness, justice, sustainability, responsibility, autonomy or humanity may help shape the fundamentals of sociotechnical theory with focus on sociomateriality (Heyder, Passlack, and Posegga 2023).

The new reality at work when interacting with smart technology, either is AI or VR, a virtual simulator or intelligent training station, a device or a different reality procedure, implies the human factor as a vector for either promotion or resistance to such logistics and resources. As such it is important that future research, projects or activities should focus more at work on the human variable with all its challenges, needs, motivations, principles and perspectives with regard to new work technology systems.

II. Organizational sectors and technology development

Present trends of using smart tech at work are commonly centered around the industrial sector, IT and communications areas. On an extended note, the academic research literature mentions more, such as medical, military, education, training, transportation and entertainment areas, which make use of a wide range of applications and intelligent systems, from various applications, sensors, displays, human-machine interaction devices to AI technologies and different types of reality (Zhu, Fan & Zhang, 2019; Sharma, Yadav & Chopra, 2020; Pogan & Popa, 2020b; Martin, Lilic & Martinez, 2022; Lomborg, 2022; Popa & Pogan, 2022).

Organizations alike, whether a hospital, company, school, communication or media center, place nonetheless the employee in relation more and more with intelligent systems, devices and technology on a daily base. Quite frequently, without even realizing it, people at work use, rely on, develop or train with such systems. Even if people themselves are the beneficiaries of technology improvement at the job site, we yet need to ask whether it is time to go beyond the marketing and technical objectives and immerse into deeper comprehension and research of human variables, human values, human principles and well-being at the workplace? To give a short example for thought: picture an employee that works completely remote and online,

thanks to technology, being present in virtual teams and virtual meetings, holding the full hourly work schedule just with a computer, and a virtual assistant as colleague most of the time. At first glance, costs are reduced, performance is reached, task is conducted and so on, but what about the social side of the job or work itself if any? To what degree is the human-machine total interaction healthy and efficient at work? While technology gives way for simplifying tasks, is it influencing the user to do things in a certain way? Is the user actually adapting to the technology while it should be the other way around?

In recent years, the debate over technology development in organizations has taken more interest in addressing human centered challenges and principles at work, an approach still in pioneer times. Moreover, there is a constant concern that if the regulating bodies lose the momentum and delay generating up to date policies, procedures, principles and views or fail to understand them with regard to the rapid advances of technology on the work market, it will be more difficult to reach and fully comprehend them as time goes by.

Table 1 contains just a few examples of technology driven applications at work, in various sectors of the organizational domain.

Table 1. Organizational sectors and new technology applications

Organizational sector	New technology applications
Industry	<ul style="list-style-type: none"> - Intelligent assistive systems - Workplace and task design - Simulation and evaluation - Human-robot collaboration - Visual documentation - Prototype development - Mass production - Cybersecurity - Training platforms
Health	<ul style="list-style-type: none"> - Neurotechnical interfaces - Surgery - Prosthetics - Assistive devices - Neural networks
Education	<ul style="list-style-type: none"> - Assistive training - Language development - Data networks

Organizational sector	New technology applications
Communication	<ul style="list-style-type: none"> <li>– Data management <li>– Networking <li>– Data security <li>– Big data <li>– Data analytics

As observed, the potential and impact of these applications is limitless, with infinite resources and potential developments in numerous activity areas. The employees tasks and work itself are constantly undergoing a process of transformation, changing under the terms of performance, efficiency, cost reduction and technology advances. In this regard, in 2020, the Organisation for Economic Co-operation and Development underlined several principles which should be adopted when using AI in a specific system, among which some refer to: human centered values, fairness, transparency, sustainable and inclusive development, well-being, security and safety, accountability (OECD, 2020). From this point onwards stakeholders, policy makers and any regulating organization should envisage and shape a work market in which the new technology dynamics follows legal and regulatory frameworks, reduces risks of negative outcomes, combats discrimination, and protects human rights and well-being of employees. These next steps in regulating the labor market and organizational sectors with regard to new systems, will have to cover not only the AI topic but all the new technical developments that shape work, tasks, job environments, organizational culture and climate as well as the work force. So far AI has been more prominent due to its overwhelming publicity and interesting outcomes, somehow on occasions overshadowing the rest of technological advances such as virtual realities, data networks and intelligent robotics just to name a few. On the medium and long term, AI has the potential to become the focal point that integrates and binds the other technologies together, given the fact that information or data constitutes the basis of any process, device, platform, invention or innovation. But until then, research in organizations is bound to explore all aspects of technology evolution and revolution in order to provide an exact and efficient analysis, response and regulations to the matter. In 2019, Hudson presented several AI impacts on major areas such as economy, politics, people, society for the future, outlining that from an economic perspective, three scenarios can be depicted, ranging from a traditional model to an all technology control setting (Hudson, 2019). Oberson (2019) also concluded that if policy makers and regulating bodies will not elaborate on more analysis, solutions and developing strategies, the economy as it is will likely see tax and social security contributions

fail, it will witness first hand unemployment rise and growing demand for financial support, alongside steep consumption reduction at a generalized level. In other words, a human centricity approach on future needs and demands when dealing with AI, can prevent the risk of inequality escalation due to tech revolution which does not encompass human variables.

The debate is ongoing still, whether AI will enhance labor markets, improve work and work life of employees or on the opposite it will diminish it, replacing present structures and mechanisms with new types of work approaches that require extended and profound comprehension. In the future, the work domain may import new and challenging stances with a direct impact on the society known today, affecting not only jobs, daily activities or simple tasks but entire organizational structures, global markets, attitudes and behaviors towards its own core principles and functionalities.

B. Social views on technical innovation in organizations

Innovation has always captured the imagination and motivation of people wanting to create, develop and improve work, tasks, machines and processes, aiming at a better product quality, higher levels of performance and utility, quicker services or better use of resources at hand. The technical innovation underwent the same path as the research and technological development, transforming the workplace, work environment and relations, work culture and climate. At the same time, innovation implies to navigate in uncharted areas, which from a social science point of view raises several awareness over human behavior, belief and action towards the unknown.

Strictly, observing the organizational sector, the introduction of new technology has always been met with a wide variety of perceptions and behaviors among employees, ranging from enthusiasm, curiosity and engagement all the way to resistance, avoidance and refusal. At work, same as in life, people seek a sense of certainty and prediction, stability and clarity in their daily tasks and career. Now, when a new technology is introduced, certain variables will determine how employees will react to it in terms of perceptions, attitudes, behaviors and usage, as follows, just to mention a few: the degree of interaction with the new mechanism, the level of understanding with regard to its functions, the degree of clarity in explaining the purpose of implementing it, the previous and constant experience with tech presence, the exposure time, the impact on the employee work related tasks. In the case of AI or any new smart technology, employees have met the implementation with some degree of caution, in terms of risks, costs and gains. Probably, the new technology being in its prime and still developing,

answers are not yet easy to find regarding the issue. In an interesting study, Hudson (2019) has shown there is a polarization phenomenon concerning people's views about the presence and impact of robots for example, from opposition to favoring them. As one of the major results and key insights, the same author highlighted a certain profile of users in terms of older age, less education, women, unskilled manual workers or rural areas residence to adopt a less approving attitude in relation with robots while those holding expertise positions or exercising leadership roles, as well as younger people and prosperous ones have a tendency towards approval (Hudson, 2019). In another study, Pogan and Popa (2020a) underlined the importance of employee usage and experience level with various smart devices, which may lead to reserved attitudes and fears at the workplace if misunderstood, unclear perceived usefulness if not explained, and to a variety of negative perceptions that can challenge work adaptability. At work, as well as in daily activities a paradox can be noticed: even if employees already use a wide range of smart gadgets (e.g. phone, watch, applications, game consoles, smart TV etc.), when it comes to AI or any new tech development considered more consistent, such as AR, VR, robots or intelligent training stations, there is an interesting degree of resistance, avoidance or unfamiliarity sense, giving the fact that all mentioned devices use the same technical base, concept and background. One potential explanation may reside in the lack of experience and knowledge related to such technologies and their low level of direct contact usage in the act of work for the standard employee, alongside the novelty character which no one can fully explain or predict. Another explanation may refer to the user degree of understanding on how these systems work, learn and interact, which at the moment lack the needed clarity, certainty or security assurances. Job tasks and objectives require stability, transparency, predictability and awareness in order to ensure performance, job security and task engagement. Working with AI solicits the employee to rely on an exclusive new and undocumented technology which has not yet prove its full efficiency, risk control, positive or negative outcomes. Therefore it is normal for people in their jobs to be reluctant when dealing with a new tech innovation, including AI. In spite of continuous endeavors, AI remains unclear, with concept debates and complexity limitations, at times with unstable functionalities and risks, a sense of opacity and non-transparency and difficult apprehension (Duberry, 2022).

These variables make the user – AI interaction at the workplace quite challenging, uncertain and conflicting at times. There is yet a lot more to discover concerning the utility and application of AI at work and human user impact, with regard to ethical and moral principles, practical and human rights implications, diversity and risk control.

C. Conclusion

At present, the work sectors and industries are more focused on the technical and economical outcomes of intelligent innovations, leaving aside the human user variables which should represent the core element for any development in this areas and at this level. Going through the debate, human – smart technology interaction is at a starting point, already showing polarization and challenging issues which need to be addressed in the future. There are no guidelines, no secret recipes or road maps to manage the new incoming tech rapid developments. To make things complicated, technology does not waste time, it embarks on a multi-channel path, manifesting a turbulent evolution. In the end, one may wonder: who is being left behind or aside?

In this light of recent developments and transformations, human centricity should be addressed quickly and clearly in the present equation, alongside detailed and specific regulations, while adapting technology to the human user and not the other way around at work and the daily life.

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*Attila Németh*¹, *Michel Linnenbank*², *Mijneke Roeland*³,
*Anouk Visser*⁴

Modelling the societal value of probation in the Netherlands using large data sets

Summary:

In this paper we present a framework to map the social costs and benefits of the Dutch probation services and present the initial results of a social cost benefit analysis using large data sets. The social benefits of the Dutch probation services seem to add up to about double the costs of probation. Even though there is still a margin of uncertainty in the analysis, and the social benefits of the probation services' impact on the probationer's environment and avoided victims are not yet included, it can already be concluded that the benefits of the Dutch probation services exceed the costs.

Keywords: Social Cost Benefit Analysis, Probation, Large data sets

A. Introduction

The Dutch probation services, consisting of three organisations, namely: the Dutch Probation Foundation, the Salvation Army Youth Protection & Probation and Addiction and Probation Service Mental Healthcare and Substance Abuse Treatment (SVG), work in a society that increasingly demands an understanding of the effectiveness of policies and the associated costs and benefits of public investments. Over the years, there has been an increasing

1 Dr. ir. Attila Németh is Professor(/Lector) Modelling Societal Impact at Saxion University of Applied Sciences, Saxion, The Netherlands. Contact: a.a.nemeth@saxion.nl

2 Michel Linnenbank MSc. is a senior researcher at the Research group Modelling Societal Impact at Saxion University of Applied Sciences, Saxion, The Netherlands

3 Mijneke Roeland MSc. is a researcher at the Research group Modelling Societal Impact at Saxion University of Applied Sciences, Saxion, The Netherlands

4 Anouk Visser MSc. is a senior researcher at the Research group Modelling Societal Impact at Saxion University of Applied Sciences, Saxion, The Netherlands

insight into the effects of probation work. However, there is still no overall insight into the societal value of probation in the Netherlands.

In the context of Dutch crime policy, Van Velthoven (2008) indicated that a social cost-benefit analysis (SCBA) can answer the question of whether an investment contributes to social welfare by listing all the positive and negative effects of efforts. In doing so, an SCBA compares the societal benefits with the costs of efforts regarding crime policy.

The Anglo-Saxon literature is more developed than the Dutch literature, in the early zeros there were already overviews of cost-benefit analyses surrounding crime policies (Aos *et al.*, 2001; Farrell *et al.*, 2005; Aos *et al.*, 2006). A more recent article by Manning *et al.* (2018) presents a similar framework towards a cost-benefit analysis tool, focusing on crime policy in general, however with a narrower focus regarding the possible effects.

In the Netherlands, SCBA is increasingly used within the security domain to measure the impact of policies on society (Koopmans *et al.*, 2023). For example, Versantvoort *et al.* (2005) has prepared an initial analysis and calculation model to identify the costs and benefits of judicial interventions. Furthermore, several cost-benefit analyses have been carried out for more specific issues. De Wit *et al.* (2016) conducted a study on the costs and benefits of alcohol use and De Koning *et al.* (2016) conducted a review of the costs and benefits of the social (re-)integration of both adult and juvenile (ex-)prisoners. Focusing on addiction rehabilitation, Bakker *et al.* (2013) and Broekhuizen and Wonderen (2015) obtained initial insights into recidivism reduction and a number of associated potentially avoided costs based on existing datasets.

However, a comprehensive SCBA focusing on probation work in the Netherlands is still lacking. Given the annual costs of approximately 200-250 million euros per year and the societal demand for accountability, it is relevant to conduct such an analysis. Moreover, the results could provide insights into how the probation service can serve probationers and society even better. The latter requires insight in how added value for society can be increased. Furthermore, the results of such an analysis provide insight into which parties benefit to what extent.

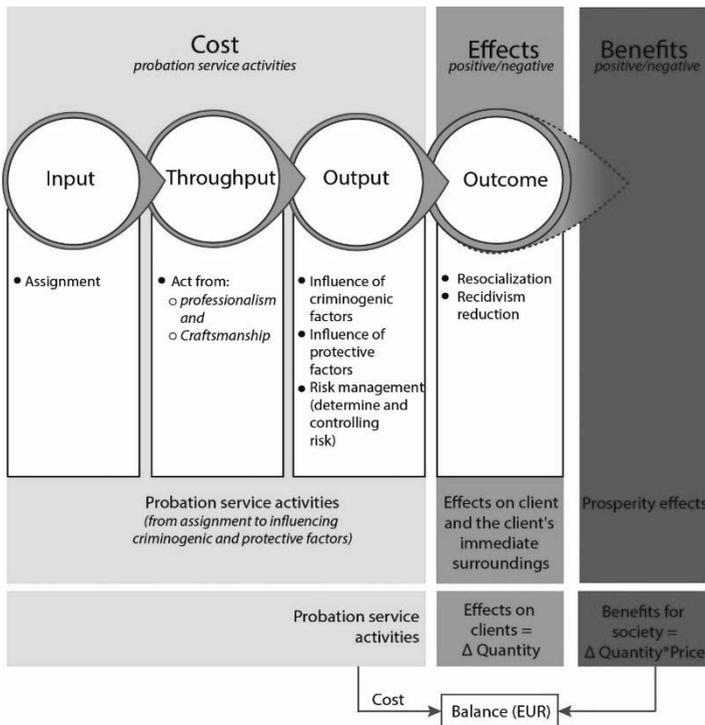
In this study we focus on answering the question how the societal value of the Dutch probation services in the Netherlands can be determined and present initial results.

B. Research method

1. Social cost-benefit analysis

The framework of a SCBA forms the starting point of this study (figure 1). This framework requires the identification of the (1) activities of Dutch probation services, (2) direct effects on probationers, (avoided) victims and both their environments, and (3) how these translate into benefits for society. The input, throughput and output components are determined by the work of the probation services (1). The outcome consists of effects resulting from the work of the probation services and correspond to the concept of effects (2) commonly used in a SCBA setting. Finally, benefits (3) are the various resulting societal benefits.

Figure 1: SCBA framework for probation



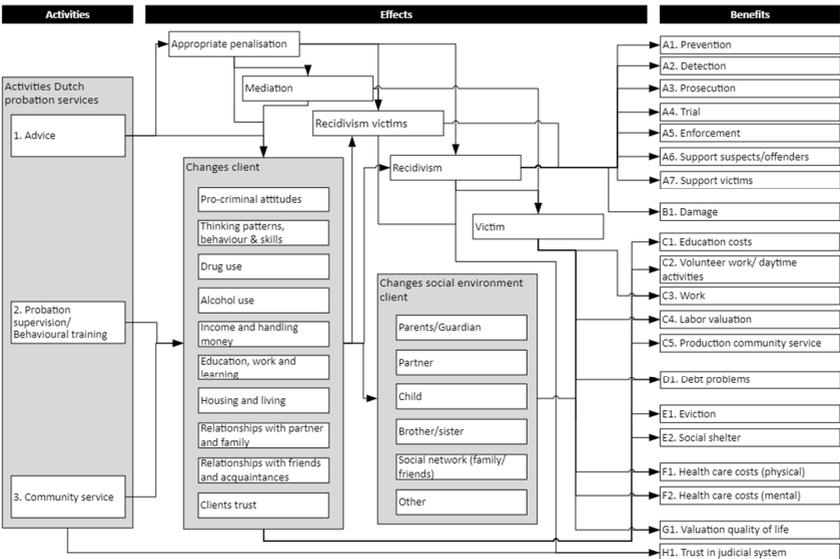
II. Construction of qualitative causal model

To further develop the framework presented in Figure 1, several interviews and focus groups were held with professionals working in and around the probation services. Literature research was also conducted on the costs, effects and societal benefits of probation work. The primary focus was on possible benefits (positive and negative) and their underlying possible effects. Possible relationships and dependencies between variables were also examined. It is important to note that benefits and effects can be both positive and negative.

Based on the initial results, a list of possible effects, side effects and benefits was compiled. Using this list, several causal diagrams were created to arrive at simplified rationales. These rationales were tested through additional literature reviews, focus group sessions with professionals and several expert meetings with researchers and professionals.

The result of this work is a qualitative causal model for a SCBA of the Dutch probation services (see figure 2).

Figure 2: Qualitative causal model for a SCBA of the Dutch probation services.



III. Quantification and monetization causal model

For all the different effects and benefits we developed a quantification method. Using data from the Dutch probation services combined with Microdata of Statistics Netherlands, supplemented with data from other relevant sources and literature, we were able to analyze changes in time surrounding probationers to quantify a large number of the effects and benefits. For the items for which we did not have data we based the quantification on values found in literature or expert judgement.

For now, we assume that (1) 10% of the observed changes can be related to probation activities and (2) a three to five year period encompassing the influence of probation activities. Also, two aspects that require further research are: (1) to what extent are the (observed) changes the result of the effort of probation services and (2) how many years can certain changes be attributed to the probation services. In our ongoing research we are working on this using a developed typology of probationers (Visser *et al.*, 2022).

In addition, for each benefit we indicate how we translate it into euros (monetize). This allows us to calculate the magnitude of the benefits in euro's, but more importantly to make them comparable to the costs incurred (See Németh *et al.*, 2022).

IV. Research population

The study population consists of all probationers with an active involvement in 2016 (N=83,794). Active involvement means that the probation was actively working on the relevant assignment for the client. The duration of involvement of probation supervision, community service and behavioral interventions is defined here as from the date of program creation to the actual end date of the program and/or end date of the assignment/program combination in the case of derivative assignments. For early intervention, supervision, and forensic care placements, the end date was taken because these assignments do not explicitly target behavior change over a specific period of time and can therefore be seen as a "snapshot" for this study. An active involvement by probation services includes the following trajectories:

- All early assistance visits;
- All prepared pre-sentence and other advisory reports for the judicial authorities;
- All supervision trajectories (with date first face to face contact);
- All community services work penalties (with date first work day);

- All behavioral trainings (with date first meeting);
- All completed placements in forensic care.

Assignments for which the probation department made an effort, but which did not result in actual commitment, are not included.

We want to use an as recent as possible population, with the requirement that we can follow people for at least three years. Since the probation data and most Statistics Netherlands data are available until 2020 at the time of this research, we chose 2016 as base year. This allows us to look back-and forward in time. In this study, we consider the group as a homogeneous group.

C. Framework social cost-benefit analysis

I. Work of probation services

The work of the probation service is divided into three types of work in Figure 2:

- (1) Preparing pre-sentence and other advisory reports for the judicial authorities;
- (2) Implementing supervision measures or special conditions imposed by the court or the public prosecutor and executing behavioral interventions;
- (3) Implementation of community service work.

This division of probation work is a simplification of reality. In practice, it is more nuanced. The probation service decides which activities or combination of activities is most desirable and possible based on their assignment and the context of the probationer.

II. Effects

The activities of the probation services can result in changes in the behavior and the lives of probationers (Figure 2). Starting point for identifying relevant items with the purpose of a SCBA and the underlying causal model is the classification used in the risk assessment tool (abbreviation RISc) (Hildebrand *et al.*, 2014) of the Dutch probation services. The RISc includes items on procriminal attitudes, thinking patterns, behavior and skills, drug and alcohol use, income and coping, education, work and learning, housing and living, relationships with partner/family/friends, and emotional well-being.

A change in these areas of life can lead to a change in criminal behavior (Bol, 1995; Wermink et al., 2009; Wartna et al., 2016).

In addition, a large number of other individuals directly or indirectly are impacted by probation work. Probationers can have parents/guardians, (former) partner(s) and child(ren), as well as other family members and members in their social network in or their vicinity (Figure 2). Moreover, the work of the probation service may also affect (avoided) victims and their possible parents/guardians, (ex-)partner(s), children, family and social network (Figure 2).

In this first phase of the SCBA of the Dutch probation services, the focus is on the effects among probationers themselves.

III. Societal benefits

The identified social benefits are categorized into eight groups: A. Security costs, B. Damage, C. Participation, D. Debts, E. Housing, F. Health, G. Quality of life, and H. Trust in judicial system. Although these categories are considered separately, we expect that the benefits may interact in reality (for detailed justification see Németh *et al.* (2022)):

- A. Security costs consist of avoided costs in the areas of prevention, detection, prosecution, trials, execution of penalties, support for suspects/offenders, and support for victims. CBS microdata is used to measure changes in the severity and frequency of criminal behavior.
- B. Damage comprises of avoided damages resulting from property offenses and vandalism. The underlying assumption is that probation interventions lead to a change in criminal behavior, thus preventing the damage costs. CBS microdata is used to estimate changes in severity and frequency of criminal behavior.
- C. Participation encompasses the sum of extra costs for education, increased formal and informal productivity, the added value of improved quality of labor, and the production achieved within community service. The assumption here is that probation helps clients in: finding and maintaining employment, pursuing education or engaging in volunteer work. Thereby creating a meaningful and stable daily routine for clients and added societal value. Changes in participation are estimated using CBS microdata, data from the Dutch probation services and literature.
- D. Debts is based on the assumption that probation can assist clients with debt problems, for example by teaching financial skills or aiding in debt repayment through financial management assistance or connecting probationers with organizations that can help them further. This trans-

lates to reduced societal costs related to debt issues. Changes in debts are estimated using CBS microdata and literature.

- E. Housing encompasses avoided costs related to avoided evictions and avoided use of social shelters. It is assumed that there will be less use of social shelters due to reduced recidivism, less incarceration leading to social shelter, and potential encouragement for individuals to (temporarily) reside in social shelters to address housing issues. Furthermore, it is assumed that assistance with debt issues will result in fewer forced evictions with associated societal costs. These benefits are mapped using literature.
- F. Health is divided into physical health and mental health. Physical health of probationers is improved by reducing addiction issues, reducing recidivism and new prison sentences, and promoting physical activity by probationers. Mental health is improved by providing professional mental help. Initially, healthcare costs may rise, but in the long term, this can lead to stabilization of health related costs and possibly even decrease the costs. This benefit is based on literature and expert judgement.
- G. Quality of life is a category that requires further investigation. It is a non-financial benefit that is about what value society places on a more pleasant life for various stakeholders (including society itself).
- H. Trust in judicial system is based on the idea that by providing appropriate guidance leading to a reduction in recidivism, a positive effect on the amount of societal trust in the legal system is achieved. An increase in this trust should positively influence economic confidence, stimulating economic growth.

D. Results

At €507 million (see Table 1), the benefits are significantly greater than the annual costs of the three probation organizations (€217 million in 2016 (Ministerie van Financiën, 2022)). Despite a margin of uncertainty and the current exclusion of benefits related to the probationer's environment and avoided victims, it can be concluded that the societal benefits of probation in the Netherlands outweigh the costs. Additional benefits are anticipated for the probationers' environment and avoided victims.

Table 1: Total benefits from probation in million euro's (rounded to €0.5 million)*.

Benefits	Probation client	Parents/guardian	Partner	Children	Family	Social network	(avoided) victims	Parents/guardian	Partner	Children	Family	Social network	Total
A1. Avoided prevention costs	135,5												135,5
A2. Avoided detection costs	51												51
A3. Avoided prosecution costs	15												15
A4. Avoided costs for trial	9												9
A5. Avoided costs for enforcement	99												99
A6. Avoided costs for support suspects/offenders	22,5												22,5
A7. Avoided costs for support victims	2												2
B1. Avoided damage	5,5												5,5
C1. Extra education costs	-6		X	X									-6
C2. Increase volunteer work/daytime activities	2	X	X				X	X	X				2
C3. Increase work	41,5	X	X	X	X		X	X	X	X	X		41,5
C4. Increase labor valuation	1		X	X									1
C5. Production community service	31												31
D1. Debts	0,5	X	X	X			X	X	X	X			0,5
E1. Avoided evictions	0						X						0
E2. Avoided social shelters	2,5						X						2,5
F1. Avoided health care costs (physical)	0,5	X	X	X			X	X	X				0,5
F2. Avoided health care costs (mental)	22,5	X	X	X			X	X	X	X			22,5
G1. Valuation quality of life	PM	X	X	X	X	X	X	X	X	X	X	X	PM
H1. Trust in judicial system	71	X	X	X	X	X	X	X	X	X	X	X	71
Total €	507	X	X	X	X	X	X	X	X	X	X	X	507

E. Conclusion

We presented a framework which can be used to determine the benefits of probation. Large data sets such as described in Németh *et al.* (2022) help quantify the benefits together with effect sizes described in the literature.

The analysis shows that it is plausible that the avoided security costs cover the costs of probation. In addition to this, a whole range of other societal benefits linked to probationers are achieved by the activities of the probation. For example, the added value of the increased productivity by probationers, the guidance to work by the probation service as well as the added value of community service also yielding significant societal benefits. In addition, we also expect significant societal benefits around

avoided health care costs and the contribution of probation to the trust in the judicial system appears to provide large societal value.

F. Reflection

I. General

This analysis provides a good first indication of the benefits directly related to probationers. But this indication deserves further refinement. First, because for the purpose of this initial SCBA we consider the group of probationers as a homogeneous group, while they actually consist of different types of subgroups with each their own risks, needs and problems, each of these subgroups might also have a different focus in their probation supervision and different (social) effects might be achieved. Furthermore, for some benefits we have not yet been able to do a data analysis, resulting in having to rely on key figures found in literature and expert judgement. As a result, for a number of benefits, the margins of uncertainty are still large. Moreover, for those elements where we have been able to perform a data analysis, the match between the existing available data and what we ideally would like to have in terms of data is not always optimal. Therefore, we have deliberately chosen to be on the conservative side with the calculations.

Furthermore, we had to make several estimates that ideally require solid justification. This requires further research. These include the share of the probation service in the (observed) changes and the number of years that certain changes can be attributed to the probation service (as in e.g. the work and health measures). In our ongoing research we elaborate this further linked to a drafted typology of probationers (Visser *et al.*, 2022).

II. Additional income

In this study we have only quantified the benefits that are directly linked to the probationer, except for the benefit of trust in the judicial system. Besides the benefits directly related to the probationer, a large number of benefits can also be expected around the environment of probationers and around (avoided) victims and their environment. In particular, we expect that the benefits around avoided victims of serious crimes can be significant. For example, we expect significant avoided reductions in their added value concerning work and avoided health costs. The price tags of these benefits are large, and combined with a large number of years over which these

effects occur, would most likely result in large societal benefits if prevented. Furthermore, the long-term impact on the social network of probationers including children is also expected to yield benefits of significant magnitude. Therefore, it is expected that these benefits could significantly increase the estimated size of the benefit-cost ratio of the Dutch probation services.

III. Cohort

Because processing times and activities can vary widely from one probationer to another, it is not straightforward to compare the benefits around all probationers from 2016 to the annual costs of probation. We assume here that an appropriate approach is to assume that the benefits of a cohort can be compared to that year's costs. To properly determine the comparison between costs and benefits, it is important to make an analysis at subgroup level. This allows us to look at what the activities and associated costs are at the subgroup level and compare them to the expected effects and benefits at the subgroup level.

IV. More value added

The constructed framework and its quantification and monetization provide insight into pathways along which societal benefits are generated. This insight can be used to determine how to generate additional added value. For example, this study has shown that guidance to work, despite the small numbers of probationers who go from unemployed to employed, produces a lot of added value. It is conceivable that if more attention is paid to this aspect, this can lead to a significant increase in social added value. We also see that a change in criminal behavior leads to large societal benefits. De Vries *et al.* (2015) show that focusing on youth and young adults early on (i.e., the group up to age 25) can lead to a significant reduction in criminal behavior (13%). Involving the probation service earlier in this group could therefore possibly provide much additional social added value. The examples mentioned above are only initial ideas as a result of this research. The next step is a systematic analysis of possible options on how more social added value could be realized. Moreover, it is interesting to look at the justice chain as a whole, perhaps even combined with the chains around health care and social work, to see if more social added value can be realized for this target group.

G. Accountability and acknowledgements

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Evita Grigorovica¹, Andreta Slavinska, and Guntis Bahs

Digital Monitoring of Skills for Better Healthcare Management in Europe

Summary: The healthcare industry is increasingly faced with the need to adapt to rapid technological advances and changing patient needs while providing high-quality healthcare and minimising patient harm risks. The aim of this article is to advocate for the implementation of a skills digital monitoring system within the healthcare sector to enhance the overall quality of care, ensure patient safety, optimise healthcare workforce performance, and ensure that the competencies of workforce align with current and emerging healthcare demands. Implementation of this novel skills digital monitoring system is expected to minimise medical errors and enhance patient outcomes, standardise care quality and reduce healthcare costs by preventing avoidable complications, as well as facilitate robust public health responses and enable a culture of continuous professional improvement. Ultimately, this would contribute to a more sustainable, efficient, and patient-centred healthcare system, empowering healthcare providers to meet current challenges and future demands effectively. This article discusses the preliminary benefits of skills digital monitoring system, outlines the principles of its implementation, considers the impact on stakeholders, identifies possible challenges, and also evaluates applicable practices at both nationally and across Europe.

Keywords: skills monitoring, health quality, patient safety, healthcare institutions, healthcare systems.

Quality of Healthcare

According to World Health Organization, quality health services are effective (providing evidence-based healthcare services to those who need them),

¹ Mg.oec. E.Grigorovica is Head of the Project Group at Medical Education Technology Centre, Riga Stradiņš University. She works with innovation and development projects in higher education and her research interests focus on management of human capital in healthcare to improve the quality of patient care. Contact: Evita.Grigoroviva@rsu.lv

safe (avoiding harm to people for whom the care is intended), and people-centred (providing care that responds to individual preferences, needs and values) (WHO, 2019). The Committee on Quality of Health Care in America, in the report “*Crossing the Quality Chasm: A New Health System for the 21st Century*,” recommends six aims for improvement – safety, effectiveness, patient-centeredness, timeliness, efficiency, and equity (Committee on Quality of Health Care in America, 2001). To provide quality health-care, the WHO has also identified indicators characterising health services. Health services must be timely – reducing waiting times and sometimes harmful delays, equitable – providing care that does not vary in quality on account of gender, ethnicity, geographic location, and socio-economic status, integrated – providing care that makes available the full range of health services throughout the life course, and efficient – maximising the benefit of available resources and avoiding waste (WHO, 2019). Efforts to provide high-quality services are based on various factors of the health care system, like effective management of the system, institutions, and processes and also a skilled and competent healthcare workforce. Additionally, funding mechanisms that support and promote quality care, as well as information systems that consistently monitor and adapt to the changing environment and the challenges of industry, are critical to the health care system, along with accessible and safe medicines, devices, and technologies, and well-equipped healthcare facilities.

Quality is the main characterising factor of the healthcare system, and as World Health Organization (WHO), World Bank (WB), and Organisation for Economic Co-operation and Development (OECD) have emphasised, “quality does not come automatically; it requires planning, and should be a clearly identified priority of universal health coverage, along with access, coverage and financial protection” (WHO, OECD, WB, 2018). Therefore, quality should be built into health systems through a number of steps, such as: 1) transparency and continuous learning and improvement; 2) people-centredness and involvement of people and communities; 3) reliable quality metrics and continuous monitoring and evaluation; 4) skilled, motivated and sufficient workforce; 5) leadership and culture of continuous quality improvement (WHO, OECD, WB, 2018). These fundamental elements form the cornerstone for policies and practices aimed at the continuous enhancement of healthcare quality. However, maintaining quality should be the collective responsibility, involving government, institutions, different stakeholders, and society.

Challenges of Health Care Quality

Although there is widespread agreement on the importance of quality in healthcare and clear directions identified where most improvement must be developed, and despite awareness of adverse effects, errors and unsafe practices continue to occur at a high rate. Many obstacles can prevent these improvements from being consistently applied across various healthcare settings. Additionally, inadequate implementation of quality measures can lead to patient harm, including medical errors, delayed treatments, and increased infections, which underscores the critical need for vigilance and improvement. Differences in resources and priorities can also cause uneven results in implementing these measures.

Up to 80% of harm can be avoided regarding the harm in primary and ambulatory settings (Slawomirski, Auraen, and Klazinga, 2017) and up to 50% of overall harm is preventable (Panagioti et al., 2019). Due to unsafe care 1 in every 10 patients is harmed in healthcare leading to more than 3 million deaths each year (Slawomirski, Klazinga, 2020). Each year, 5.7 – m 8.4 million deaths are attributed to poor quality care in low- and middle-income countries (LMICs), which represents up to 15% of overall deaths in these countries (WHO, 2020). As WHO has summarised, some of the most common sources of patient harm are **medication errors** (affects 1 out of every 30 patients in health care), **surgical errors** (10% of preventable patient harm in health care was reported in surgical settings), **healthcare-associated infections** (health care-associated infections result in extended duration of hospital stays, long-standing disability, increased antimicrobial resistance, additional financial burden on patients, families and health systems, and avoidable deaths), **sepsis** (23.6% of sepsis cases in hospitals were found to be health care associated, and approximately 24.4% of those lost their lives), **diagnostic errors** (occur in 5–20% of physician–patient encounters), and **unsafe transfusion and injection practices and Patient misidentification as well** (WHO, 2023).

Regardless of the nature of patient harm, a significant proportion of these incidents can be attributed to gaps in the professional qualifications and skills of the healthcare workforce. In a study examining the factors causing harm in primary care, 72.9% of the identified errors were classified as process errors, and 26.1% as knowledge/skill errors, and of these knowledge/skill errors 41.5% were associated with patient harm (Hoffmann et al., 2008).

As outlined in the OECD report "Economics of Patient Safety" the economic burden resulting from harm to patients can amount to up to 15% for state hospitals (Slawomirski, Auraen, and Klazinga, 2017). This under-

scores the urgent need for enhanced training and continuous professional development within the sector. To address this, healthcare systems must develop robust mechanisms to track and monitor the professional skills of their workforce continuously. Implementing such systems will enable timely identification of skill deficiencies and the need for additional training, ensuring that healthcare professionals are well-equipped with the necessary knowledge and competencies. Regular assessment and updating of training programs are essential to keep pace with the evolving demands of healthcare provision, thereby bridging the skill gaps and elevating the overall standard of care delivered to patients.

Consequently, when healthcare institutions fail to ensure safe care, it incurs additional expenses that paradoxically reduce the funding available for healthcare provision. These additional costs often arise from the need to manage complications, provide prolonged treatment, and handle legal repercussions, all of which could have been avoided with better safety practices. This not only strains the financial resources of healthcare facilities but also diverts funds away from critical areas such as patient care, staff training, and infrastructure improvements.

The WHO also notes that investments in promoting patient safety can lead to financial savings, as evidenced by estimates showing that costs associated with medical errors amount to approximately \$42 billion annually, excluding lost wages, productivity, or healthcare expenses, collectively comprising nearly 1% of global health expenditures (WHO, 2019).

Ultimately, the financial burden of inadequate safety measures can compromise the quality of care patients receive and undermine the efficiency of the healthcare system as a whole. Therefore, investing in preventive measures and improving safety protocols is essential for both patient well-being and the financial health of healthcare institutions. As indicated in the report "Patient Safety 2030", reducing harm requires the development of an integrated systemic approach that includes fostering a culture of safety, placing patients and healthcare staff at the centre of all intervention measures, as well as implementing evidence-based policies (Yu et al., 2016).

Furthermore, an evidence-based policy aligns with human capital management, as the costs that healthcare institutions spend on reducing harm caused to patients would be more meaningfully invested in improving healthcare quality, primarily by investing in the institution's human capital, developing the skills of healthcare staff, ensuring systematic human capital development, and making data-driven decisions, thereby also reducing risks to patient safety.

Skills Framework

Facing the shortcomings of the healthcare system and directions for improvement, United Nations (UN) in 2015 identified one of the Sustainable Development Goals by 2030: to ensure a healthy life and promote well-being for all at all ages (Goal No.3), with tasks outlined such as: 1) achieving universal health coverage, including protection against financial risks, access to quality essential healthcare services, and access to safe, effective, quality, and affordable essential medicines and vaccines for all (No. 3.8); and 2) substantially increasing health financing and the recruitment, development, training, and retention of healthcare workforce in developing countries, especially the least developed countries and small island developing states (3.c), with indicators such as healthcare service coverage and density and distribution of healthcare workers (United Nations, 2015). In 2016 European Commission published the “SKILLS AGENDA FOR EUROPE,” a call to **join forces** in a collective action. This agenda covered actions to ensure that people have the **right skills for jobs**, tools, and initiatives to **support people** in their lifelong learning pathways, and a framework to **unlock investments** in skills (European Commission, 2016). WHO suggests improving skill mix composition and considering opportunities to strengthen the skills and employment agenda within countries (WHO, 2016). OECD Skills Strategy calls to **develop relevant skills over the life course, use skills effectively in work and society, and strengthen the governance of skills systems** (OECD, 2019). Misalignment between the supply and demand for skills in the health workforce contributes to various forms of skills mismatches, over- or under-qualification, skills gaps, and labour shortages. Addressing the skills mismatch challenge in the health workforce can improve healthcare provision and limit these negative economic effects, therefore, the OECD have developed the framework based on variety of data to conduct skills anticipation exercises for the health workforce (OECD, 2022). For skills anticipation exercises to be effective in addressing skills gaps in the health workforce, they must successfully translate into policy. Skills intelligence can be used to provide guidance for education and training policy decisions (like determining intake in health education programmes, defining course content, or providing informed career guidance), to provide the basis to update occupational standards, on-the-job training, retraining, and upskilling courses, and to provide guidance for migration policy (OECD, 2022).

In Working for Health Progression Model WHO suggests: 1) bolstering workforce governance mechanisms and functions, data driven decision-making and long-term workforce planning capacity; 2) building institutional

capacity for the education of the existing and future workforce; 3) maximising the health, economic, and social impact of the workforce through tools, infrastructure, and systems and support, which enable it to be effective and efficient (WHO, 2022).

Investments in healthcare workforce education is not only a strategic component in improving service delivery but also a crucial factor in reducing medical errors and enhancing patient safety. Continual education and skill enhancement are vital in maintaining workforce relevance and efficacy. The outlined documents emphasise the creation of lifelong learning opportunities, the expansion of access to training, as well as structured systems to ensure continuous management of competence of healthcare workforce. These initiatives aim to keep the healthcare workforce abreast of emerging health challenges and innovative treatment modalities. To systematically improve healthcare outcomes, there is a recognised push towards developing robust skills management and monitoring systems. These systems should be designed to continuously track and assess the competencies of healthcare personnel, facilitating targeted interventions to address identified gaps. Such systems would not only help align workforce capabilities with health system needs but also aid in strategic workforce planning and policy-making.

Skills Digital Monitoring System

Upon closer examination of the healthcare sector, it becomes evident that the demand for employment in this field is expected to increase in most countries. This growth is driven by an aging population, technological advancements, and an expanding recognition of the need for comprehensive healthcare services. Consequently, there will be a greater need for skilled healthcare professionals to meet the rising demand for medical and wellness services. This trend underscores the importance of investing in healthcare education and training programs to prepare a workforce capable of handling the evolving challenges. Additionally, it highlights the opportunity for healthcare systems to innovate and improve skills systems to accommodate this anticipated surge in employment. Given this dynamic environment, the skill set acquired by healthcare professionals at graduation is often insufficient to sustain them throughout their careers. Consequently, it is crucial to explore how the quality of healthcare can be enhanced alongside these developments during whole work life of healthcare professionals.

To address this issue, authors of this article have conducted extensive research into the development of a skills management system. Since 2018,

the group of authors developed an innovative skills monitoring system specifically tailored for institutions of higher education in healthcare. This skills monitoring system facilitates transparent management of student skills in alignment with the curriculum in higher education (Slavinska et al., 2021). During prior investigations, the authors have also encountered a notable absence of evidence regarding the practical implementation of any skills monitoring systems within healthcare institutions (Grigorovica et al., 2022). Therefore, building on this foundation and recognising the potential applications of such a system within the healthcare sector, the authors now advocate for the expansion of this system to encompass broader healthcare settings. This proposal aims to enhance the transparency and efficacy of skills management across the sector, ensuring that healthcare professionals' competencies are continually aligned with evolving industry standards and patient care requirements from undergraduate studies to lifelong learning.

Investing in ongoing education and training is crucial, and healthcare professionals must have access to continual learning opportunities to stay abreast of the latest medical advances and technological breakthroughs. This not only ensures their competencies remain current but also directly contributes to the overall quality of care provided to patients. Furthermore, fostering a culture of proactive professional development within healthcare institutions can lead to more innovative and effective healthcare solutions. By prioritizing the development of human capital in the healthcare sector, not only standard of patient care can be improved, but also the resilience and adaptability of healthcare systems.

However, it is essential to be aware that investments in human capital must be targeted, and professional development programs and the achieved results must be meaningful. Therefore, a certain structure must be created, within which it is possible to monitor the current situation, identify needs and plan future actions. Based on the analysis, the authors propose to create a skills digital monitoring system in the healthcare sector for managing the skills of healthcare professionals.

The skills monitoring system proposed by the authors collects detailed data on the specific skills and proficiency levels of the existing workforce within healthcare institutions. This system forms the core of skills monitoring by creating comprehensive skills portfolios at both the individual and institutional levels. Such detailed skills information provides a solid foundation for data-driven decision-making in various management areas, including investments, strategic planning, human resources, and funding allocation. Effective management of healthcare institutions, supported by this system, leads to improved quality of care and enhanced patient safety. Additionally, the system facilitates dialogue and collaboration with other

stakeholders in the healthcare sector at both national and international levels, fostering a more integrated and efficient approach to healthcare delivery (Fig.1).



Fig.1: Skills Monitoring System for Healthcare Sector.

The integration of a skills monitoring system within the healthcare sector would be paramount to ensure that these educational investments are effectively translated into improved practice. Such a system would provide a structured and systematic approach to assess and enhance the competencies of healthcare professionals continuously. By regularly evaluating the skills of healthcare workers, institutions can identify gaps in knowledge and areas requiring further development, thereby tailoring training programs more precisely to the needs of their staff.

Implementing this kind of monitoring would not only help maintain high standards of patient care but also promote a culture of continuous professional improvement. It encourages healthcare providers to engage in life-

long learning and adapt to rapidly changing medical landscapes. Additionally, a robust skills monitoring system can serve as a feedback mechanism for healthcare institutions to adjust their operational and clinical approaches based on real-time data about workforce capabilities. Ultimately, the establishment of such a system is crucial for ensuring that healthcare professionals are not only well-prepared to handle current medical challenges but are also equipped to tackle future developments. This proactive approach would significantly contribute to the sustainability and efficiency of healthcare services, benefiting patients, practitioners, and healthcare systems alike.

Principles of Skills Digital Monitoring System

For a practical and effective digital skills monitoring system in the healthcare industry, the authors propose several key principles to ensure it is both comprehensive and adaptable.

Assessment of current skills and requirements: assessment of the existing skills of all healthcare professionals within the organisation must be conducted and evaluate the current and future skills required, considering upcoming technological advancements and shifts in medical practices. This dual assessment helps in identifying specific gaps and the areas where updates or improvements are necessary.

Development of an institutional skills framework: a detailed skills framework must be developed that outlines essential competencies for various roles within the healthcare sector. This framework should be developed in collaboration with clinical experts, educational institutions, and regulatory bodies to ensure it meets industry standards and covers all critical areas of healthcare provision.

Implementation of regular skills refreshments and assessments: implementation of regular and systematic assessments using a variety of methods such as simulations, practical exams, peer reviews, and self-assessments. These assessments should be designed to be non-disruptive and integrated into the daily routine as much as possible to encourage compliance and reduce burden.

Continuous learning and development opportunities: linkage of the outcomes of the skills assessments to tailored training programs that address identified gaps. This could involve online courses, workshops, seminars, and on-the-job training. Ensure these opportunities are accessible and aligned with the workers' schedules and professional commitments.

Real-time feedback and reporting: a real-time feedback mechanism establishment that allows healthcare professionals to receive immediate in-

sights into their performance. This system should also enable managers and educators to track progress over time and adjust training programs as needed.

Integration with HR and professional development: Integration of the skills monitoring system with human resources and professional development plans. This integration helps in career planning, succession planning, and enhances motivation among healthcare workers by showing clear pathways for advancement and skill acquisition.

Technology utilization: utilization of technology to facilitate the tracking and management of the skills digital monitoring system. Linkage between skills monitoring system and other IT systems of institution, like patient reporting systems, must be established, to use data analytics to analyse current gaps, trends, predict future skills needs, and provide a scalable solution that can adapt as the organization grows and evolves.

Regulatory compliance and updates: regularly update the skills monitoring system is needed to comply with new healthcare regulations and standards. And engaging with regulatory bodies can ensure that the system remains relevant and effective in improving healthcare quality and patient safety.

By following these principles, healthcare institutions can develop a robust skills digital monitoring system that not only enhances individual performance but also elevates the overall quality of care provided to patients.

Impact of Skills Digital Monitoring System

Integrating skills digital monitoring system in the healthcare sector offers a myriad of benefits across various stakeholders. In this concept paper authors have identified stakeholders who would gain from enhanced training and competency evaluation mechanisms, though their specific benefits might differ based on their roles and interests:

Healthcare professionals: 1) skills enhancement – regular skills assessment helps healthcare professionals identify and rectify gaps in their knowledge and abilities, ensuring their skills remain up-to-date with current medical practices and technologies; 2) career development – A structured system offers clear pathways for professional advancement, motivating employees to engage in continuous learning and achieve higher credentials; 3) job satisfaction – increased competence can lead to higher confidence and job satisfaction, reducing professional burnout and improving overall work-life quality.

Healthcare institutions: 1) improved patient care – enhanced skills lead directly to better patient care outcomes. A more competent workforce can provide more accurate diagnoses, fewer errors, and improved patient handling; 2) regulatory compliance – institutions can ensure compliance with regulatory standards by maintaining a workforce that meets all professional and accreditation requirements; 3) reduced costs – by minimizing errors and improving efficiency, organizations can reduce the costs associated with malpractice and inefficiencies.

Patients: 1) increased safety – patients receive care from a workforce that is continually assessed and updated in their practices, reducing the risk of medical errors and complications; 2) better service – improved skills among healthcare providers mean better customer service for patients, leading to improved patient experience and satisfaction; 3) trust in healthcare systems – knowing that healthcare providers are regularly assessed and trained enhances patient trust in the healthcare system.

Educational and training institutions: 1) curriculum relevance – feedback from ongoing skills assessments can inform educational providers about the evolving needs of the healthcare sector, allowing them to tailor their curricula accordingly; 2) partnership opportunities – educational institutions may find more opportunities for collaboration with healthcare institutions, such as customized training programs and continuing education courses.

Policy makers and regulatory bodies: 1) standardized care: helps in standardizing practices across different regions and institutions, ensuring a uniform level of care and expertise; 2) evidence-based policymaking – access to detailed data on workforce competencies can guide policy decisions, workforce planning, and resource allocation more effectively; 3) healthcare innovation – regular upskilling can accelerate the adoption of innovative practices and technologies in healthcare, fostering a more dynamic and responsive healthcare environment.

Insurance providers: 1) reduced risk – a better-trained healthcare workforce means fewer claims due to errors and omissions, lowering risk and potentially reducing insurance costs; 2) partner in health management – insurance companies can work with healthcare providers to ensure that ongoing training leads to better preventive care and health management strategies.

By considering these perspectives, it becomes clear that a skills digital monitoring system is a strategic investment that significantly enhances operational efficiency, safety, and satisfaction across the healthcare ecosystem. This system not only supports individual growth and organizational effec-

tiveness but also fundamentally improves the quality of healthcare delivered to patients.

Challenges of Skills Digital Monitoring System

Developing and integrating skills monitoring system in the healthcare sector may involve also several challenges that must be navigated carefully to ensure its success and effectiveness. Authors have highlighted these potential challenges:

Resource allocation: 1) financial constraints – establishing the comprehensive skills monitoring system requires substantial initial and ongoing investments in technology, training, and personnel. Healthcare institutions may face financial constraints that limit their ability to implement such systems; 2) time constraints – healthcare professionals already face significant demands on their time. Finding additional time for training and assessments can be challenging without overburdening staff.

Technological integration: 1) complexity of implementation – integrating new technologies with existing systems can be technically challenging. Ensuring compatibility and interoperability between different software and hardware components is essential; 2) data management – effective skills monitoring systems generate large volumes of data that must be securely managed and analysed. Ensuring data integrity and protection against breaches is crucial and as well as to provide personnel resources with appropriate competence for data analysis.

Cultural resistance: 1) change management – resistance to change is common in any organization. Some healthcare professionals might view continuous assessment as punitive or as an added stressor rather than a beneficial tool; 2) engagement issues – motivating staff to actively participate in regular skills assessment and training can be difficult, particularly if the benefits are not immediately apparent or communicated effectively.

Regulatory and compliance issues: 1) meeting standards – aligning the skills monitoring system with various regulatory standards and legal requirements can be complex. Healthcare is a highly regulated field, and any new system must comply with all relevant laws and guidelines; 2) privacy concerns – handling personal and performance-related data raises significant privacy issues. The system must ensure compliance with laws like GDPR in Europe, HIPAA in the United States, and other local privacy laws.

Scalability and flexibility: 1) adapting to growth – the system must be scalable to accommodate the growth of the healthcare organization and the ever-evolving nature of healthcare demands and technology; 2) flexibility:

the system should be flexible enough to adapt to different specialties and changing healthcare practices without requiring major overhauls.

Training and support: 1) effective training – ensuring that all users are adequately trained to use the new system is vital. Poor training can lead to underutilization or misuse of the system; 2) ongoing support – continuous support and troubleshooting are necessary to address any issues that arise during the use of the system. This includes technical support for IT systems and educational support for users.

Addressing these challenges requires a well-thought-out plan that includes stakeholder engagement, careful resource management, and a clear understanding of the intended outcomes and benefits of the skills monitoring system. Effective communication, robust project management, and a commitment to continuous improvement are essential to overcoming these obstacles and ensuring the system achieves its goals.

Potential of Skills Digital Monitoring System

National Level

Integrating the skills monitoring system across all state healthcare institutions and connecting all data in a unified national system would bring substantial benefits at the national level. These benefits encompass improvements in healthcare quality, operational efficiency, and strategic planning, as authors have outlined below:

Standardization of healthcare quality: 1) uniform standards – a national system would help standardize skills and competencies across regions, ensuring that all patients receive the same high quality of care, regardless of their geographic location; 2) reduced disparities – this uniformity helps in reducing healthcare disparities by ensuring that rural and underserved areas receive the same level of skilled care as urban centres.

Enhanced public health management: 1) proactive responses – with centralized data on the skills and capabilities of the healthcare workforce, the system can quickly identify areas with skill shortages and deploy additional resources proactively during public health emergencies or outbreaks; 2) data-driven decisions – policymakers can use the aggregated data to make informed decisions about healthcare strategies, workforce planning, and resource allocation based on actual needs and trends identified through the system.

Increased healthcare efficiency: 1) optimized resource use – by identifying skills surpluses and deficits, the system can help in optimally allocat-

ing healthcare professionals where they are most needed, thereby enhancing the overall efficiency of the healthcare system; 2) cost efficiency – improved skills and reduced medical errors lead to lower healthcare costs related to corrective treatments and malpractice claims.

Improved training and development: 1) targeted training programs – 1) a national skills database would enable the identification of common skills gaps and the development of targeted training programs, improving the overall competence of the healthcare workforce; 2) continuous professional development – facilitates ongoing education and professional development, ensuring that healthcare workers remain competent in the latest medical practices and technologies.

Enhanced research and development: 1) research opportunities – the comprehensive data collected can be a valuable resource for academic and clinical research, providing insights that can drive innovations in medical care and training; 2) evidence-based practice – enables a more systematic approach to implementing evidence-based practices across the healthcare system, enhancing treatment outcomes.

Greater accountability and transparency: 1) accountability in healthcare – with clear data on the skills and training of healthcare providers, patients can be assured of the competency of the professionals treating them, leading to greater trust in the healthcare system; 2) transparent operations – regular public reporting on workforce competencies and institutional performance based on these competencies can increase transparency and motivate institutions to maintain high standards.

Long-term healthcare improvements: 1) strategic health planning – long-term data trends allow for better strategic planning for future healthcare needs, including addressing aging populations or the rising prevalence of certain diseases; 2) sustainability – by ensuring a well-trained and adaptively skilled workforce, the healthcare system becomes more resilient and sustainable, capable of meeting the challenges of the future.

The integration of a skills monitoring system on a national level thus not only improves the quality of individual patient care but also enhances the strategic capability of the healthcare system as a whole, fostering a robust, responsive, and equitable healthcare environment.

International Level

Integrating skills monitoring system across all European healthcare institutions with data linked in a unified European system could have profound benefits on an international level. According to the authors, such an initiative would leverage the power of standardization, collaboration, and

data-driven decision-making, enhancing healthcare across the continent in several key ways:

Standardization of healthcare competencies: 1) harmonized standards – a Europe-wide system would ensure that healthcare professionals across different countries adhere to the same high standards of care, reducing variability in treatment outcomes and increasing the overall quality of healthcare services; 2) easier credential recognition – facilitates the process of credential recognition across countries, making it easier for healthcare professionals to work in different European nations, thus promoting workforce mobility.

Enhanced collaboration and benchmarking: 1) cross-border learning – institutions can learn from one another by comparing performance and sharing best practices on a continental scale. This would foster innovation and the spread of effective healthcare solutions across borders; 2) benchmarking – enables benchmarking against best practices and performance metrics, encouraging hospitals and clinics to strive for higher care standards and operational efficiency.

Data-driven public health initiatives: 1) coordinated public health response – in the event of a public health crisis, such as a pandemic, a Europe-wide system provides the data needed for coordinated responses, ensuring resources are efficiently allocated based on actual workforce capabilities; 2) surveillance and early warning – the system could function as part of a larger surveillance network, providing early warnings about emerging health challenges that require a collective response.

Improved healthcare policy making: 1) informed policy decisions – policymakers can use the insights gained from comprehensive data analytics to craft policies that better address the needs of the European population and tackle disparities in healthcare access and quality; 2) long-term planning – supports strategic planning and foresight activities by providing data on trends in healthcare competencies and needs, helping Europe prepare for future healthcare challenges.

Research and innovation: 1) rich data resource – 1) the system would create a vast pool of data that can be utilized for academic research, leading to innovations in medical training, patient care, and health system management; 2) clinical trials and studies – facilitates multinational clinical trials and studies by providing a framework for quickly identifying institutions and professionals who meet specific research criteria.

Economic benefits: 1) cost efficiency – by reducing redundancies and enhancing care quality, the system can lead to significant savings in healthcare costs across Europe; 2) economic integration – further integrates the

European economic area through the healthcare sector, strengthening the single market.

Patient-centric benefits: 1) increased patient mobility – patients can be more confident when seeking treatment across borders, as a unified system assures them of consistent care quality no matter where they go in Europe; 2) empowered patients – transparency in healthcare provider skills and standards empowers patients to make informed decisions about their healthcare options.

Implementing such a system would not only strengthen individual nations' healthcare systems but also transform the way healthcare is delivered across Europe. It would enable a more unified approach to healthcare, enhancing the capacity to manage common challenges and benefitting from shared knowledge and resources.

Conclusion

In this concept paper, the authors propose a novel skills digital monitoring system for the healthcare sector. The integration of skills digital monitoring system within the healthcare sector represents a transformative advancement towards enhancing the overall quality of care, ensuring patient safety, and optimising healthcare workforce performance. Such proactive management of skills helps in addressing the direct correlation between healthcare workforce capability and patient outcomes, significantly reducing the incidence of medical errors and the associated healthcare costs. By instituting a framework for ongoing professional development, healthcare institutions not only safeguard patient well-being but also foster a culture of continuous improvement and learning. The broad-scale implementation of this system could standardise care quality, facilitate robust public health responses, and enhance the efficiency of healthcare services across regions. Moreover, the aggregation of data on a national or even European level would provide invaluable insights for policy-making, strategic planning, and fostering innovation within the sector.

Ultimately, a skills digital monitoring system is not just an investment in the healthcare workforce; it is an indispensable strategy for future-proofing healthcare systems against the complexities of emerging health challenges. It ensures that healthcare professionals are not only well-prepared to manage current needs but are also equipped to adapt to future demands, thus securing a resilient, responsive, and high-performing healthcare system. This integrated approach promises substantial benefits for patients, practitioners, and healthcare systems alike, paving the way for a more sustainable,

efficient, and patient-centred healthcare landscape, therefor authors invite stakeholders within the healthcare sector to engage in a collaborative discussion and reach a consensus on the initial practical steps for the targeted monitoring of healthcare workforce skills.

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*Marc Stauch*¹

The online delivery of public services, digital identity and data protection: lessons from the UK?

A. Introduction

Over the last twenty years, it has become common for goods and services to be provided via digital transactions that take place online. This also applies to the provision of public services by government departments and other central or local authorities. As such transactions do not take place face-to-face, a crucial element in their execution is that one party can trust that the other party is who they claim to be in terms of the characteristics required in the situation: From the perspective of the public service provider, the recipient should therefore fulfil the eligibility criteria for the use of a particular service. In the private context, they must fulfil relevant legal hurdles (e.g. a minimum age) in order to benefit from the good and have the means to pay for it.

Initially, the approach to identity verification in both the private and public sector was primarily functional and driven by the respective platform or service provider². The citizen/user chooses a username and password when setting up an account and provides further data on their relevant attributes (e.g. delivery address and payment details if purchasing goods). These were then stored by the provider, which enabled the user to log in to their account at a later date by resubmitting the login details they had used during initial registration.

This compartmentalised approach in principle allowed the same person to have different surface identities in the form of pseudonymous credentials with different services (e.g. a Facebook account, a Google account, etc.)³. The disadvantage was duplication and inconvenience for users (who had to

1 Leibniz Universität Hannover. Dr. jur. (Göttingen), M.A. (Oxon.). This paper is based upon research that was carried out as part of the BMWK-Schaufenster-Projekt, SDIKA: <https://www.sdika.de/>. The author would like to thank Professor Dr. Margrit Seckelmann and Professor Dr. Christiane Trüe LL.M. for their valuable support and insights.

2 Beduschi, A, 'Rethinking digital identity for post-COVID-19 societies: Data privacy and human rights considerations', *Data & Policy* (2021), 3: e15 (3).

3 Sedlmeir, J, et al, 'Digital Identities and Verifiable Credentials', *Bus Inf Syst Eng* (2021) 63(5):603, 604.

provide personal data each time they registered) and the risk of fraudulent impersonation, as users tended to reuse the same credentials (usernames and passwords) on multiple websites and services⁴. More recently, the private sector has developed innovative approaches to provide a high level of assurance that individuals making online transactions are who they claim to be, including in relation to their underlying, real identity (as a specific natural person). This was done by asking customers to provide more and more data at registration (often far beyond what is required for contract fulfilment) and by companies using the technical capabilities of cookies and electronic communications to track customers' online behaviour across different websites and services: The resulting profiles, augmented with further data from smart data analytics, are often very granular and, aside from being able to rely on the identity and creditworthiness of their customers, allow companies to predict their future choices and interests in order to conduct targeted marketing. In the case of some larger platforms, they have now also decided to offer customer identity assurance to other companies⁵.

These developments pose the question of how the public sector can best catch up. And to what extent should it try to imitate the resources of the private sector? *Prima facie*, it could be argued that the state, as a provider of public services that are funded by taxation and are free at the time of provision, has a particular interest in being more certain that each recipient is the natural person they claim to be and that they fulfil the eligibility criteria for the service. Indeed, the main guarantor of a person's identity has traditionally been their national government⁶. Its birth, marriage and death registers, identity cards and passports gave it a privileged role, as part of its record-keeping function, in conferring identities on its citizens and in issuing documents guaranteeing the citizen's identity to third parties (be they private individuals or foreign states).

At the same time, the idea of the state collecting extensive data on its citizens, revealed through their myriad digital transactions, raises significant privacy and data protection concerns, as there are fears that the data could be misused to cement the power of the "surveillance state". In Europe, with its strict data protection regulations, the issue is particularly sensitive. The intention to strengthen the rights of EU citizens in this area (including by

4 Ibid; Bitkom, 'Strengthening trust: Practical guide to digital identities, SSI & DLT', (2023) 6.

5 Schreier, N, Renwick, R, and Ehrke-Rabel, T, 'The Digital Avatar on a Blockchain: E-Identity, Anonymity and Human Dignity', *ALJ* 2021, 202-218 (<http://alj.uni-graz.at/index.php/alj/article/view/152>); Bitkom (ibid.) 7.

6 Centre on Regulation in Europe (CERRE), 'eIDAS 2.0: Digital Identity Services in the Platform Economy', 2022 Issue Paper, 9.

displacing the role of large US platforms as insurers of digital identities) was a key motivation for the 'eIDAS 2.0' regulation adopted in spring 2024⁷, which aims to provide an EU-wide approach to digital identity. At present, however, this remains a framework construct that requires a lot more implementing legislation, with some critics fearing that it could weaken rather than strengthen privacy⁸.

With the above in mind, it may be instructive to look at the recent experience of the UK, a country with a traditional aversion to centralised identity systems and strict data protection rules (as a legacy of its EU membership⁹), as it attempted to set up an online identity registration system for government services. This arguably reveals some of the inevitable compromises required of governments when deciding how best to design registration systems for access to their services.

The next part (B.) of this paper describes the relevant developments in the UK, namely the creation and subsequent failure of the 'GOV.UK Verify' scheme, which aimed to introduce a federated identity assurance approach (prioritising the protection of citizen data), and its replacement now with a more centralised ID database approach, 'GOV.UK One Login', which will act as part of a wider proposed framework for digital identities. The part C. assesses the impact of this change, in particular the move from an approach where data protection was inherent in the architecture to one that relies more heavily on rules of practice to achieve this goal: As will be discussed, one of the main motivations for this shift appears to be the desire to develop new forms of public service delivery. Part D. concludes by considering possible lessons for the eIDAS approach introduced by the EU, which (even more than the old 'UK Verify' approach) seeks to build data protection into the architecture of digital identity verification.

B. Recent Developments in the United Kingdom in the online Verification of Citizens

In the UK, responsibility for setting up systems that allow citizens to identify themselves online in order to access public services lies with Government

7 Regulation (EU) 2024/1183 of the European Parliament and of the Council of 11 April 2024 amending Regulation (EU) No 910/2014 as regards the establishment of the European framework for a digital identity.

8 CERRE, footnote 6, 16-17.

9 The GDPR continues to apply in the United Kingdom in a UK version under the Data Protection Act 2018.

Digital Services (GDS), which is part of the Cabinet Office¹⁰. The "Verify" system for public services ("UK Verify") introduced in 2016 has its origins in the change of government in 2010 to a Conservative-Liberal coalition: one of the new government's election promises was to abolish the introduction of national identity cards, which would be backed up by a central identity database¹¹. This policy had been supported by the previous Labour government, but was unpopular with the public due to concerns about data protection and state surveillance¹².

In developing a new way forward, the coalition drew on the 2008 "Crosby Report"¹³, which argued for a user-centred approach that prioritises the privacy interests of citizens over efficiency or other administrative interests of the state/public service providers. In this context, the report distinguishes between "identity management" and "identity assurance"; while the former is motivated by the concerns of the information owner, the latter aims "primarily to deliver a high levels of assurance for consumers [and] will address issues such as the amount and type of data stored and the degree to which this information is shared, differently to [an approach] inspired mainly by the needs of its owners"¹⁴.

Accordingly, UK Verify incorporated privacy/data protection into the design through a federated model where commercial trusted third parties acted as a buffer between the citizen (and their identity data) on the one hand and the government/public sector bodies in the role of service provider on the other. Specifically, under UK Verify, the government accredited several private companies that fulfilled the certification and security requirements to act as identity providers on behalf of citizens to the relevant public service provider: When the citizen registered online with a particular public authority, the system passed their registration details supporting their identity claim to one of the identity providers (chosen by the citizen); the latter then carried out the various data collection and checks to authenticate the citizen's claim¹⁵.

A 'double-blind' system operated here: firstly, public service providers would only receive a simple confirmation from the identity provider that the citizen's identity had been accepted, and would remain unaware of the

10 [<https://www.gov.uk/government/organisations/government-digital-service>].

11 Whitley, E, 'Trusted digital identity provision: GOV.UK Verify's federated approach', CGD policy paper 2018, 131; Center for Global Development, Washington, USA, 22.

12 Ibid.

13 Sir James Crosby, 'Challenges and opportunities in identity assurance', HM Treasury, 2008.

14 Ibid, para 1.7.

15 Whitley, footnote 11, 29 et seq.

nature of the data used to do so, or whether other public services had been accessed or used by the citizen. Secondly, in relation to the identity provider, they would receive the identity verification request from UK Verify's central 'hub' - in this process they would not know which specific government agency the request was made by, nor what type of public service the citizen was seeking to use¹⁶. By 2018, seven companies were authorised by the government to act as identity providers, including Experian, Barclays Bank and the Post Office¹⁷. These companies themselves were bound by a strict governance framework to ensure the necessary data security and to comply with all applicable data protection principles when processing citizen data for the purpose of their identification¹⁸.

Another privacy-friendly feature of UK Verify, derived from the 'risk-based' approach of the Crosby report, was the authorisation of graduated levels of identity assurance, with "each level provid[ing] an increasing level of confidence that the applicant's claimed identity is their real identity": At the fourth and highest level, the user "is required to provide further evidence and is subjected to additional and specific processes, including the use of biometrics, to further protect the identity from impersonation or fabrication"¹⁹. In contrast, less evidence would be required for the identity provider to return a positive confirmation for the lower levels. In this way, the use of personal data was reduced where this was not justified by the importance of avoiding false positive identification in individual cases²⁰.

Unfortunately, as it turned out, UK Verify was unable in practice to impress either its citizen users or government agencies as a viable approach. In particular, too many false negatives were consistently returned, i.e. not enough true claims were confirmed with a positive verification. In 2019, the verification success rate was 48% compared to a forecast of 90% in 2015²¹. In this context, the system does not appear to have been sufficiently calibrated to resolve surface discrepancies between the registration data submitted by the citizen and their data from previous transactions (including data from government agencies) against which it was cross-checked. In addition, some

16 Ibid; Glick, B, 'Do we really want a single digital identity system to access government services?', *Computer Weekly* (17 September 2021).

17 Whitley, footnote 11, 32.

18 Ibid, 53; Among other things, they were obliged to keep citizens' data for audit purposes only and to store it in a separate secure database: Ibid, 36.

19 Ibid, 25.

20 Ibid.

21 UK National Audit Office, 'The challenges in implementing digital change', Report HC 575 (July 2021), 20.

types of identity verification were excluded from the scheme from the outset, e.g. for companies or when, for example, a tax advisor wanted to act as the representative of his client²².

This was frustrating for users who spent time entering their details into the system only to be refused verification. Furthermore, despite central government's intention for all government departments to use UK Verify, there was no mandatory requirement to do so. In practice, several departments, such as HM Revenue and Customs (in managing the online receipt of tax returns), preferred to stick with their own bespoke systems, further discouraging citizens who were able to use far fewer public services than intended. The result was low uptake, with the system attracting less than a sixth of the predicted 25 million users by 2020²³. The lack of profitability for the accredited commercial identity providers (who were paid according to the number of successful verifications) in turn led to the majority withdrawing from the system, with only two remaining by 2019²⁴.

UK Verify's failure to meet its performance targets, coupled with its high cost (in total, the government invested over £200 million in developing the system²⁵), drew criticism from the House of Commons Audit Committee in 2019²⁶, and it was decided to discontinue support for the programme. Due to the Covid pandemic and to give GDS more time to develop a replacement, funding was then continued until April 2023, but it has now been discontinued. The system's successor, known as GOV.UK One Login ("UK One Login"), was introduced and has been in beta form since August 2022²⁷.

The underlying architecture of UK One Login represents a significant change compared to UK Verify. In particular, it removes the approach of using private organisations to carry out the identity verification process and act as an identity data buffer. Instead, when a citizen uses the UK One Login portal, their registration data will be submitted directly to the relevant government agency to verify their identity claim (based on the data they submit): For example, if they have provided their driving licence number, this will be sent to the Department for Transport to check against their

22 Ibid.

23 Trendall, S, 'What next for GOV.UK Verify?' Public Technology Net (15 May 2020).

24 Ibid.

25 Glick, B, 'Government to impose new digital identity system across all Gov.uk services', Computer Weekly (15 February 2021).

26 House of Commons, Public Accounts Committee, 'Accessing public services through the Government's Verify digital system' (HC 1748, May 2019).

27 [<https://gds.blog.gov.uk/2023/06/24/gov-uk-one-login-june-2023-update/>].

records²⁸. At the same time, the UK One login hub will request further data from other government departments to generate knowledge-based questions to test the citizen's claim: for example, it might ask HM Revenue and Customs to disclose the last amount of tax paid by the citizen in question and then ask the latter to provide the correct figure²⁹. Once the citizen has successfully passed these tests, they will be given a UK One login account which they can use to log in to other government services in the future. At this later stage, they will no longer have to go through an identity check, i.e. it is a "once-only" system³⁰.

According to GDS, UK One Login was already successfully used by over 1.5 million users to verify their identity in 2023³¹. Here, central government has also learnt from the mistake it made with UK Verify by explicitly asking all government departments to switch to the new identity verification system (and shut down their own systems)³². The government is currently bringing forward delegated legislation authorising government departments to share data for identity verification purposes as the basis of the system³³. Moreover, it plans in the future to use the citizen data it holds in various departments to provide identity services to private organisations themselves: This will happen as an aspect of the wider UK Digital Identity Framework (which also applies to the private sector)³⁴.

C. Balancing Data Protection and the Provision of Public Services

As we have seen, the main difference in architectural design between UK Verify and UK One Login is that the use of private commercial companies has been removed from the latter system. As mentioned earlier, the reason for this design was very much centred around data protection: Citizens

28 UK Cabinet Office, 'Government response to the consultation on draft legislation to support digital identity verification' (23 May 2023).

29 Ibid.

30 This means that if a citizen has already submitted relevant data (proving their eligibility for a particular service) to a public authority, they will not have to do so again when accessing a similar public service within the UK One Login system.

31 [<https://www.gov.uk/government/news/15-million-people-already-benefiting-from-reform-of-government-services-online>].

32 Glick, footnote 25.

33 The Digital Government (Disclosure of Information) (Identity Verification Services) Regulations 2023, made under the Digital Economy Act 2017.

34 UK Information Commissioner's Office, 'Response to the Government's Digital Identity and Attributes Consultation' (13 February 2021).

could be assured that their identity and other data was not collected in a central database when using government services online, but that aspects of identity data were managed separately, independent of the state. In contrast, UK One Login stores the identity data submitted to it (plus confirmation from the relevant government department the citizen wished to access, that it matches their records). Over time, as more and more citizens use the system, this will enable GDS as an operator to build an increasingly complete database that matches individuals and their characteristics with the public services they access³⁵.

In response to data protection concerns, GDS has emphasised that the use of UK One Login will remain optional. For those citizens who are unwilling or unable to use it, the government will continue to offer alternative analogue means of identification³⁶. This concession seems essential to ensure inclusivity and non-discrimination, which are themselves important public service objectives. Even so, a large-scale access campaign is underway to enable people without a passport or conventional ID to physically register for UK One Login at their nearest post office³⁷. In this context, it appears that GDS hopes that a significant majority of UK citizens will use the new system, not only to realise efficiency savings (and justify the cost of setting up the system), but - as further discussed below - to lay the foundations for a new way of delivering public services.

At the same time, proponents of the new system insist that it continues to take privacy and data protection seriously, in particular at the level of norms and standards. Thus, UK One Login (like UK Verify before it) is underpinned by a strict legal framework set out in the Code of Practice for public authorities sharing data for the provision of public services under the Digital Economy Act 2017³⁸. Among other things, the Code refers to the need to comply with data protection rules under the UK GDPR as well as the Data Sharing Code published by the Information Commissioner's Office³⁹. In addition, UK One Login maintains UK Verify's "Levels of Assurance" approach as reflected in the GDS Good Practice Guides on identity

35 Glick, footnote 16.

36 *Ibid.*

37 [<https://gds.blog.gov.uk/2023/08/30/the-new-in-person-identity-check-for-gov-uk-one-login/>].

38 [<https://www.gov.uk/government/publications/digital-economy-act-2017-part-5-codes-of-practice/>].

39 *Ibid.*, Para 1.1, 7-9.

verification⁴⁰. In this context, emphasis is placed on the principle of data minimisation, i.e. no more identity data is processed than is necessary to meet the relevant level of assurance. This approach is also enshrined in the proposed broader framework for digital identities (which also applies to identity verification in the private sector) currently being put forward by the UK Department for Digital, Culture and Media⁴¹.

However, the point remains that under the new architecture, all data sharing will be managed by government bodies; here, any limitation on data use will depend on the self-restraint of the government itself. Given the UK's strong legal framework, this is currently something it wishes to exercise. But of course the political climate may change, and then there is a risk of a slide towards greater data profiling, including for surveillance, which would be less likely if private organisations also remained part of the system: Thus, if the government were to put pressure on a commercial provider to disclose its data, the matter could well end up in court, giving a judge the opportunity to consider the competing interests at stake.

Ultimately, it seems that the UK government believes that this reduction in data protection at the level of design is a price worth paying. In particular, as indicated above, a key motivation for government is the potential to develop a more sophisticated, data-driven model of public service delivery. This is recognised at the outset of the Government's response to the 2023 consultation on the Digital Identity Review, in which it commits to "transform the delivery of public services so that they are easier to use, connected, secure and offer better value for money to the taxpayer"⁴². In fact, this approach of greater data collection in the interests of improved public provision has a longer tradition⁴³, and has previously fuelled debates about the extent to which it risks contributing to a 'surveillance state' as opposed to a 'service state'⁴⁴.

Interestingly, the proactive use of citizen data to improve service delivery was recently strongly endorsed by the United Nations in its 2022 eGovern-

40 [<https://www.gov.uk/government/publications/identity-proofing-and-verification-of-an-individual/how-to-prove-and-verify-someones-identity>].

41 [<https://www.gov.uk/government/publications/the-uk-digital-identity-and-attributes-trust-framework/the-uk-digital-identity-and-attributes-trust-framework>].

42 Footnote 28, 'Executive Summary', 5.

43 Roy, J, 'Digital government and service delivery: An examination of performance and prospects' (2017) Canadian Public Administration-administration Publique Du Canada.

44 Miriam B. Lips, A et al 'Managing Citizen Identity Information in E-Government Service Relationships in the UK', (2009) Public Management Review, 11:6, 833-856.

ment Survey⁴⁵. There, the UN recommended that states make greater use of 'disaggregated' as well as 'longitudinal' data to identify their most vulnerable citizens and ensure they are not excluded from the benefits of digital services⁴⁶. This suggests that it regards the collection of detailed data that tracks individual use of public services over time as something desirable, enabling states to gain the necessary insights into the characteristics of those who need extra support.

Arguably, these developments also pose questions for the current EU approach to digital identity which, in its endeavour to technically integrate strong data protection into the way citizens interact with public (and private) service providers, could prevent or at least complicate the use of citizens' data for better public service delivery. This issue will be briefly addressed in the concluding part of this article.

D. Lessons for the Digitally Mediated Delivery of Public Services in Europe?

If the above argument - namely the need to balance data protection against the benefits of better public services - is correct, there appear to be interesting implications for the European Union's current 'digital wallet' initiative contained in the eIDAS 2.0 Regulation. As noted in part A., this framework is subject to ongoing technical development, as well as the development of detailed normative standards (to be set out in further EU implementing acts)⁴⁷. However, while important details thus remain to be finalised⁴⁸, the initiative's avowed aim (more so even than the former UK Verify approach) is to make data protection part of the system design. In particular, through a complex architecture that utilises either a distributed ledger or public key infrastructure⁴⁹, the EU-citizen wallet holder should be able to decide for themselves which data they want to pass on for identity or attribute verifi-

45 UN, DESA, 'E-Government Survey 2022: the Future of Digital Government', New York 2022.

46 Ibid, at 138-39.

47 Reutner, J, et al, 'Sichere digitale Identitäten in der 'Brieftasche'?' *Verwaltung & Management*, 30 (2024), 206-217.

48 Heeger, V, 'Digitale Identitäten: Endspurt für die eIDAS-Verordnung', *Tagesspiegel Background: Digitalisierung & KI* (7 November 2023).

49 Bitkom, footnote 4; Schwalm, S, Albrecht, D, Alamillo, I, 'eIDAS 2.0: Challenges, perspectives and proposals to avoid contradictions between eIDAS 2.0 and SSI', *Open Identity Summit 2022*, Bonn: Gesellschaft für Informatik.

cation when interacting with a particular service - an example of so-called "Self-Sovereign Identity" (SSI)⁵⁰.

According to its proponents, the advantage of the SSI approach is that it replicates for the online environment the dynamics that existed in traditional analogue proof of identity scenarios: in these cases too, in many contexts, the person concerned had the choice of which documents to disclose to the other party, e.g. passport, driving licence or health card. SSI even goes a step further by allowing the wallet holder to disclose the minimum data required for the transaction in question⁵¹. In order to prove their age (e.g. to buy alcohol), they would therefore not have to present documents that also contain other data - such as their name and date of birth, as noted on their health card, but simply a cryptographically verified certificate in their digital wallet from the competent authority that they are over eighteen years old - known as a "zero-knowledge proof"⁵².

However, the question arises as to how this fits in with the endeavour to provide public services in a joined-up and citizen-responsive way. In the context of the eIDAS 2.0 legislative process, this seems to have been little discussed. However, a digital wallet that gives the user self-sovereign technical control over the data they disclose could well have a negative impact in this respect. The user can, of course, agree to allow the exchange of data between the public services they use in return for a more personalised service. On the other hand, they can choose not to. The risk here is that disadvantaged groups who lack the necessary trust in state actors will exclude themselves - the very groups that would potentially benefit most from improved services.

For its part, the German government appears ambivalent about the impact of the eIDAS 2.0 legislation on digital identity verification⁵³. It is currently funding a number of projects aimed at developing and testing use cases in which citizens on the one hand and public and private service providers on the other have a clear benefit (and therefore incentives) for

50 ENISA, 'Digital Identity: Leveraging the Self-Sovereign Identity (SSI) Concept to Build Trust', European Union Agency for Cybersecurity (January 2022).

51 Allen, C: [<https://github.com/WebOfTrustInfo/self-sovereign-identity/blob/master/self-sovereign-identity-principles.md>].

52 Allende Lopez, M, et al, 'Self-Sovereign-Identity, the Future of Identity: Self-sovereignty, Digital Wallets, and Blockchain', LACChain Global Alliance digital identity working group (2020), 30.

53 Answer of the Federal Government to the minor interpellation of the CDU/CSU parliamentary group - printed matter 20/8040 - Status of implementation of the eIDAS 2.0 Regulation (01.09.2023); Bundestag - Wissenschaftliche Dienste, 'Zur Umsetzung der eIDAS-VO 2.0 und der Einführung der europäischen Brieftasche für die Digitale Identität', WD 3 - 3000 - 073/24 (21.08.2024).

using digital wallets⁵⁴. Some, but not all, will use the decentralised digital identity architecture favoured by the EU⁵⁵. In doing so, as the UK experience suggests, it may be helpful to recognise the trade-off between data protection and other policy objectives: A lower, but for most purposes still high, level of data protection (anchored in standards rather than technical design) may be the price to pay for developing plausible and useful public service use cases.

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54 BMWK, 'Schaufensterprogramm, 'sichere digitale Identitäten'; see also ENISA, footnote 50, 24.

55 The project, SDIKA (Secure Digital Identities Karlsruhe), is designed to dispense with the DLT approach by using a separate open source SDI-X adapter solution: [<https://digitale-identitaeten.de/portfolio/sdika/>].

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