Water for a Good Government: Andean Infrastructures in Guaman Poma de Ayala's Chronicle (1615)

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Recently, pre-Incaic water infrastructures in the Andean highlands have become the focus of policy makers and conservators, as water security is severely threatened under conditions of global warming.[1] The art of keeping water available for fields, livestock, and people during long droughts has a millennia-long tradition in the Andes. Water as a scarce resource determines the Andean societies in such a great scale that one could call the water infrastructure, a la Marcel Mauss, a *fait total social*. It is certainly interesting to examine Andean water infrastructure and its usability today through the lens of technological history—and is perhaps even essential for its survival. However, such an approach is insufficient for understanding "Indigenous infrastructure" as a complex interaction of various immaterial and material elements. The transmission of this infrastructural knowledge in the literal sense of a "culture" (lat. colere: to cultivate, maintain, preserve) is a part of this infrastructure, which I show in this paper by considering a Peruvian colonial-era text from the 17th century.

In 1615, Guaman Poma de Ayala, an Indigenous scholar from Huamanca[2] in the then Viceroyalty of Peru finished his chronicle and treaty of good governance for

1 The conclusion of the authors regarding the efficiency of the Indigenous infrastructure for today's demands is positive: "We combined hydrological monitoring and tracer experiments to characterize the hydrological functioning of a 1,400-year-old infiltration enhancement system developed by pre-Inca cultures to cope with climate variability in the Peruvian Andes. Our results confirm that the system effectively enhances hillslope infiltration to reach downslope springs. We estimate a mean residence time of 45 d, with a range between 2 weeks and 8 months, which shows that the system can be used to increase water availability at the community scale during the dry season." Boris Ochoa Tocachi, Juan Bardales, et al., "Potential Contributions of Pre-Inca-Infiltration infrastructure to Peruvian water security," *Nature Sustainability* 2 (July 2019): 584–593, 590.

2 Guaman Poma de Ayala, an Indigenous scholar in colonial service, claims to be of noble Andean descent: On his father's side from the dynasty of the Yarovilca Allauca Huánuco, on his mother's side from the Inca dynasty. Cf. Rolena Adorno, "Waman Puma: El autor y su obra," in *Felipe Guamán Poma de Ayala: Nueva crónica y buen gobierno,* eds. John V. Murra, Rolena Adorno, and Jorge L. Urioste (Madrid: Historia-16, 1987): XVII–XLVII.

the Spanish King Felipe III, *El Primer nueva corónica i Buen Gobierno*.[3] The explicit goal of the chronicle, conceived as a letter, is to fundamentally reform colonial government, including all of its institutions from state administration to the provisioning of household communities, in order to guarantee the survival and good life in an Andean understanding of the concept of individuals and communities in the colonial sphere. The reform that the king is suggested to set in motion includes the transformation of infrastructures in a near-modern understanding of the term: water supply, communication routes, transportation infrastructure, food supply, mining, and welfare. A good Andean government, announced by the title, differs from the Spanish colonial government, precisely and decisively, in terms of its infrastructures.

I would like to examine this Indigenous text published in Spanish as a complex demand for infrastructural restitution. From a literary studies' perspective, such an investigation cannot be complete without considering the nature of the text and its meaning-bearing structures as part of infrastructural knowledge. The guiding questions of this paper then are: How do textual infrastructures (in the broadest sense)—grammars, semiotics, logics—connect to imaginaries of material infrastructure? This question leads to related questions like whether textual substructures that are normative or meaning-making can usefully be studied as infrastructures, and what would be the added analytical value of such a conceptual extension to textual structures. Since the immaterial codes of texts form the infrastructure for understanding material infrastructures yet to be built, both concepts are equally significant parts of a fundamental sociocultural concern, namely imagining infrastructures of a good life in the midst of a decades-long experience of catastrophe during the early Spanish colonial period. Heuristically, this article assumes a notion of infrastructure that is not preconceived as modern. Thus, it does not ask, for example, how "irrigation infrastructure" (a modern term) is described, but rather by what means water reaches people, animals, and fields at the necessary rate. In this regard, the infrastructure question becomes open-ended: what elements need to be considered, how do they interact, or how do things favour or hinder each other when it comes to water supply? What are the cultural foundations (writing systems, spiritual texts, legislation) that turn the natural element of water into a culturally diverse and complex phenomenon for human and social life?

This paper is exploratory in both theoretical and interpretive terms and therefore cannot yet offer an infrastructural analysis of the entire text by Guaman Poma.

3 I use the facsimile online edition of Guaman Poma de Ayala, *El Primer nueva corónica I buen Gobierno*, Lima 1615, provided by the Danish Royal Library with a critical apparatus by Rolena Adorno, John Murra and Jorge L. Urioste Macchi: http://www5.kb.dk/permalink/2006/poma/ (last accessed 11 July 2022). English translation by Roland Hamilton: *Guaman Poma de Ayala, First New Chronicle and Good Government, 1615* (Austin: University of Texas Press, 2010).

In the first part I outline the particular temporality and socio-cosmic sphere of water in the Andes that Guaman Poma portrays in his claim for the restitution of irrigation culture. He refers to hybrid cultural registers and epistemes that, roughly speaking, combine pre-Columbian-Andean and colonial-Spanish notions of infrastructure in terms of a complex symbolic-material substructure for living well.[4] The Andean water infrastructure stands paradigmatically for a decentralized common good economy that is built, maintained, and used autonomously by household communities (ayllus) against a centralized power, be it an Inca or a Spanish usurper.

The Large Temporal and Cultural Scale of Water Infrastructure

The practical and theoretical knowledge of artificial irrigation, which is at least 1500 years old, has been preserved materially and immaterially to some extent until today in the driest and highest regions of the Andes. Drawing canals that route springs into many paths over the mountain slopes, much like the digging of ridges for agriculture, is a very early cultural achievement in the history of mankind, which Guaman Poma situates in his chronicle in 'the second age of humans' and in a time even before the invention of weaving and house building.[5] The Inca calendar, described in detail, is ordered according to the economic cycles of water (rainy seasons, maintenance of canals and irrigation of plantations), the central element of Andean cosmology.[6] Half of the year has abundant rainfall and in the other half, peaking in November, drought prevails. These water cycles are also reflected in the night sky, forming the astronomical part of what Sherbondy calls the Andean "hydrology of the universe."[7] The Milky Way, visible in the Andes from the southern hemisphere, is called "mayú," meaning "river." From this "river" a "llama," a dark-cloud constellation, drinks during the watery season and disappears behind the horizon during the dry season. Water is a precious and scarce commodity, humanly manipulated in many rites and invocations, that must be channelled, cleaned, distributed, and

4 "Living well" is a current translation of the Andean and Amazonian concepts of "buen vivir" (*sumaq kawsay* in Quechua), which have recently returned to medial awareness with occurrence of Indigenous environmental and other resistance movements in South America. Cf. Alberto Acosta and Mateo Martínez Abarca, "Buen Vivir: An Alternative Perspective from the Peoples of the Global South to the Crisis of Capitalist Modernity," *The Climate Crisis: South African and Global Democratic Eco-Socialist Alternatives*, ed. Vishwas Satgar (Johannesburg: Wits University Press, 2018): 131–147.

5 The second human age is the period of the "Huari runa," as Guaman Puma classifies them. See *Nueva corónica*, 54.

6 Jeannette Sherbondy, *Agua, Riego y Árboles: Ancestros y Poder en el Cuzco de los Incas*, (Lima: Sociedad Geográfica, 2017) 47.

7 Sherbondy, *Agua, Riego, y Árboles*, 47.

kept available even during dry seasons, not least by means of offerings and technological irrigation channels. The dry months of October and November in Guaman Poma's chapter on the annual time count can therefore be read as an instruction for the preservation of this conjoined immaterial-material and sacred-worldly infrastructure complex.

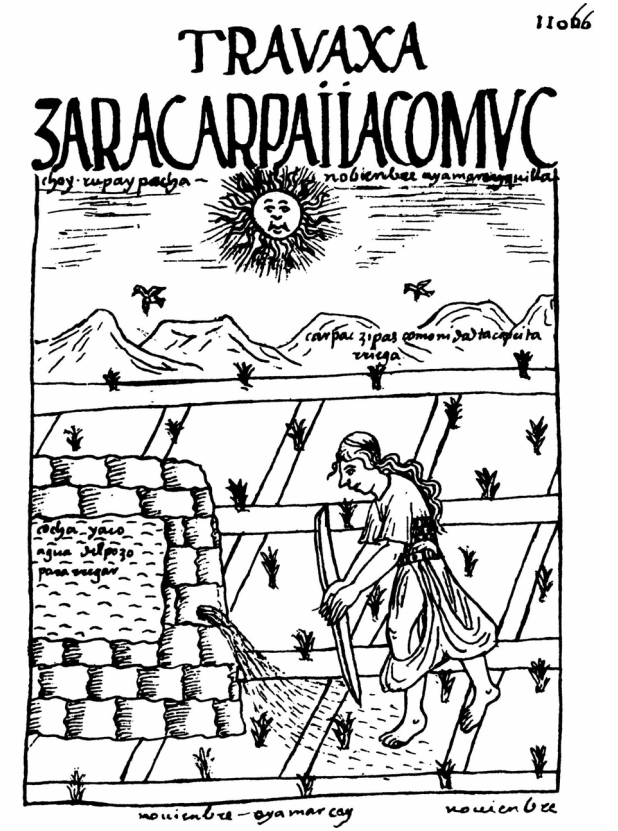
The great detail and wide space in the chronicle devoted to water management contrasts with the Spaniards' harmful misuse of this precious resource of life. During and after the conquest, it becomes clear to Indigenous observers cited in the *Nueva corónica* that the Spaniards do not know how to handle water, nor do they understand its value. Only those who can dig and redistribute watercourses are considered cultural heroes, even divinities. When Francisco Pizarro was observed carrying water in jars and canisters with his soldiers it became obvious that the Spaniards were neither gods nor leaders.[8] To the great displeasure of the Indigenous people, they diverted water for their *encomiendas*[9] without respecting water rights, cleaning and maintenance practices, or seasonal rhythms. Sherbondy's ethno-archaeological research on pre-Incaic hydrology has shown how social structure is produced, regulated, and stabilized by irrigation infrastructure: A household community, *ayllu*,[10] is defined as a water and sewer stewardship community whose ancestry passed down in myths. As the common good of an *ayllu*, its construction, maintenance, cleanup, and use rely on proportionate and rotating community services called "minka." The infra- and supra-structural social system implied here is responsible for and conditioned by the *asequias*, stone irrigation canals fed by rivers, wells, ponds, and lagoons from which they are diverted. Guaman Poma reports that they had been built at the dawn of humanity, "con tanto travajo." The irrigation system is not the canals alone, but an ensemble of *pata* (passage), *chacra* (field), and *larca* (irrigation canal).

8 "They perform no miracles nor do they […] produce rivers and springs in areas, that need water. When they travel through arid regions, they carry water with them in jars and gourds." Juan de Betanzos, *Narrative of the Inca*, trans. and eds. Roland Hamilton and Dana Buchanan, from the *Palma de Mallorca* Manuscript [1550s] (Austin: University of Texas Press), 248.

9 *Encomienda* is a Spanish colonial juridical term referring to the privilege awarded by the king to colonists for military achievements. It includes the right to collect labor and tribute from up to 200 Indigenous people. In return, the king obliged the *encomenderos* to guarantee the Christian mission among the laborers. Although the privilege did not include a title to land property, it was *de facto* interpreted as such within a very short time.

10 The smallest household units are called ayllus, "grupos que comparten un sentido de parentesco, de compartir antepasados comunes y de originarse en las mismas fuentes de aguas. Esta es la unidad que da al individuo andino su identidad étnica principal" ("groups that share a sense of kinship, of sharing common ancestors and originating from the same water sources. This is the unity that gives the Andean individual his or her primary ethnic identity." (Author's translation)). Sherbondy, *Agua, Riego, y Árboles*, 44.

Figure 1: "Work: zara carpai iaco mucchoy rupay pacha": "Watering corn, lack of water, heating the earth" (Author's translation). The caption indicates the climatic conditions of water shortage and heat, and the ritual and technical tasks that must be performed during this time. In the text on the following page, Guaman Poma explains that the young woman is in charge of the communal fields, which she irrigates with water from the lagoon, collected in a container made of stones and distributed to the irrigation channels through an opening.



Guaman Poma: *Nueva corónica y buen gobierno* (c. 1615) Zara Carpai p. 1162 [1172] [11]

11 Royal Danish Library, GKS 2232 kvart: Guaman Poma, Nueva corónica y buen gobierno (c. 1615), p. 1162 [1172]], URL digital facsimile: https://poma.kb.dk/permalink/2006/poma/1172/en/text/.

The times and rhythms, the responsibilities, and rights and duties for maintaining the *asequias* are so indispensable to the functioning of this infrastructure that this assemblage can be understood as intangible infrastructure of irrigation, including the unwritten or knotted laws and customs. Legally derived from pre-Inca customary law, water and land use rights and duties are inherited together, never alone as in Spanish law. The handling of water is regulated in the "*ordenanzas*," which are older than the Inca Empire. As Guaman Poma writes,

> mandó los señores rreys Yngas guardar el costumbre y ley de que no meneasen todas las dichas secyas, agua de rregar. Las dichas sementeras hasta los pastos de ganados rregauan en los altos y quebrados, sauiendo que no auían de poder aquella que tanta gente la edeficaron.[12]

> Thereupon the Inca kings ordered the custom and the law to be upheld, that one must not touch all said water ditches and the water for irrigation. The said seed fields, even the pastures for the cattle, were irrigated on the heights and in the ravines, for they knew that they had no power over them, for so many people had built them. (Author's translation)

The sacredness and commonality of irrigation infrastructures is derived from the immeasurable labor of so many people over whom not even the Inca ruler can "claim power" ("no auían de poder"). In a sense, construction and maintenance are located temporarily and epistemically as a popular megaproject beyond individual systems of governance or even ownership. Built and preserved by uncountable numbers of people since time immemorial, the Inca—and as Poma argues, the Spanish king as a successor—are only humble custodians of the decentralized and autonomous maintenance[13] of this complex infrastructure, which is for the benefit of all in times past, present and future. Sustainability, as presented here, is bound to a myth of a collective origin and unalienable communitarian autonomy. Above all, the supply of water for the poorest must be guaranteed: A "silquiwa," water judge, is employed to guard the canals, drive away the cattle and watch over the fair distribution of water to the poor. No cattle and no human being, it is said, may touch the canals. In case of transgression, correspondingly heavy penalties without appeal are due: "Y ací puso una pena cin apelación sentencia que ninguna persona lo dañe ni menee ninguna piedra y que ningún ganado entre en las dichas asecyas." ("And so he passed a judgment

12 Guaman Poma, *Nueva corónica*, 944 [958].

13 A central hydraulic administration did not exist in the Inca Empire, much less before. Sherbondy points out that water supply was the core of self-sufficiency and autonomy of the individual villages and ayllús. See Sherbondy, *Agua, Riego, y Árboles*, 117.

against which no appeal was possible, and a sentence that no man should damage it, nor move a stone, that no herd-animal should enter the said water ditches").[14]

The Spaniards asserted their loyalty to the Andean water management rules. Guaman Poma notes, however, that Francisco de Toledo and the Spanish king both, at first, accepted these rules and then broke them. From the disruption of one element in the water infrastructure, the text, like a chain, unfurls a litany of paratactically linked events, which Guaman translates into entangled Spanish-Indigenous loss and decay on every level of existential conditions:

> Y ací no se a guardado esta ley. Y ací se pierde todas las sementeras por falta de agua. Desto pierde los yndios sus haziendas y pierde su quinto rreal su Magestad y pierde la santa madre yglecia el diesmo que le deue. Y ací en este tienpo los españoles sueltan sus bestias y rreguas de mula o ganados y pasen las cabras, obejas y hazen grandes daños. Y se sacan las dichas aguas y se quiebran las asecyas que no se pueden aderesar con nengún dinero. Y la poca agua sólo quitan a los yndios pobres. Y ací se ausentan los yndios de sus pueblos.[15]

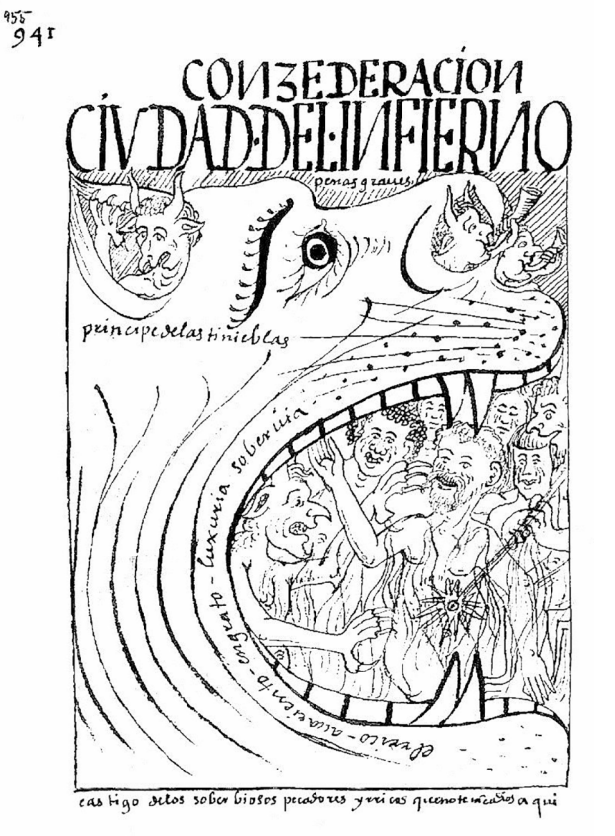
> And so, this law has not been followed. And therefore, all the seed fields are lost for lack of water. Thus the Indians lose their possessions, and His Majesty loses the royal fifth, and the Holy Mother Church loses the tithes that are owed to her. And so, at this present time, the Spaniards are letting their domestic animals and mules or herds of cattle roam free, and the goats and sheep are grazing and causing great damage. And the said waters dry up, and the ditches decay, that no sum of money can put them in order. And the little water is taken away from the poor Indians. And that is why they move away from their villages. (Author's translation)

The customary legal infrastructure of water management underlies and preconditions every single element of the communities' survival—the Andean one as well as the Spanish church and aristocracy, both rich or poor—because of their interdependencies. The disrupted order brings about social stress, including the whole ecological system like fields, cattle, sheep, and goats. The temporal, demographic, spatial and functional large scale of the infrastructure, as can be seen here, cannot be restored monetarily, since simply everything depends on it and the dimensions of the dependent elements are incommensurable. It is therefore no wonder that the transgressors of this law are located in the chapter on hell, a hell populated by "man-eating" priests, *encomenderos*, and thieves. The "City of Hell" illustrates the atmosphere down there.

14 Guaman Poma, *Nueva corónica*, 944 [958].

15 Guaman Poma, *Nueva corónica*, 944 [958].

Figure 2: The "City of Hell."



Guaman Poma Nueva corónica y buen gobierno (c. 1615) Ciudad del Infierno p. 941 [955][16]

The impact of the colonization of the former Inca Empire (*Tawantinsuyu*) by the Spanish was devastating, especially in terms of water supply. In the second part of the *Nueva corónica*, "La Conquista," Guaman Poma exposes the dysfunctional effects on coexistence, and indeed on the very survival of the entire colonial society in all its segments. The problems of the colonial government become legible as problems of its understanding of infrastructures: violence, negligence, material destruction,

16 Royal Danish Library, GKS 2232 kvart: Guaman Poma, Nueva corónica y buen gobierno (c. 1615), p.941 [955], URL digital facsimile: https://poma.kb.dk/permalink/2006/poma/955/en/text/.

exploitation, dispossession, abuse, enslavement through economic and political administrative structures that serve solely to increase the wealth of the crown, leading to the flight, loss of identity, suicide, and mass dying of the Indigenous population.

The book on the Conquest (pp. 370–437), in which all these grievances are listed, is framed in the text by the chapters on the pre-Columbian Inca government (pp. 342–369) and the "good government" after the Conquest (pp. 438–490). It is thus embedded in the order of the text between the report on the good Andean order, which for Guaman Poma had been paradigmatically realized during the reign of Tupac Inca Yupanqui (1471–1490). Tupac Inca Yupanqui supplies a model for the Spanish king regarding the areas of responsibility that are incumbent upon him and the means and functions that are available to him among the officials. The chapter on the Inca government is accordingly divided into the areas of the following infrastructures: the jurisdiction in the *Tawantinsuyu*, the provincial administrators, the post runners on the Inca roads, the surveyors, measurers and boundary stone setters, the administrators of the Inca roads, the bridge administrators, the bookkeepers, tax collectors and accountants, and finally the 16-member council of the Inca in Cusco. The ultimate goal is to establish material and moral justice throughout the empire and in each community, down to each *ayllu*. Guaman Poma reports that the highly respected surveyors and boundary setters (*sayua ch'iqta suyuyoq*[17]) had to divide the fields, irrigation canals, plantations, pastures, livestock, and mineral resources among the inhabitants, especially with regards to the care of the poor (sick, old, widows, orphans, travellers) in such a way that each individual would be granted equal resources for housing, clothing, food, and feasts. The listing of these basics in relation to a description of the functions of government is not arbitrary in its order. Guaman Poma emphasizes that the order of tasks and things follows an ancient ancestral classification order that underlies the coding and recording systems of the knotted cords (*quipú*) and calculating machine (*yupana*). The quechua verb "kamay," to order things (in knots, calendars, communities), means "to provide life."

17 Guaman Poma , *Nueva Corónica*, 353 [355].

Spatial and Temporal Coding Systems: Knotted Cords and Water Lines

Figures 3 + 4: The typography (left) of the manuscript, dedicated to the social order in the Inca state, imitates the coding system of the quipú (right) with its horizontally and vertically aligned text lines. Guaman Poma points out that the counting and writing systems of the Latin script and the knotted cords are to be considered equivalent to each other. Social order, counting, measuring, and equitable distribution of resources are linked in this texture. The extent to which this texture also denotes a water infrastructure knowledge will be explored in this final part.

Guaman Poma Nueva corónica y buen gobierno (c. 1615), Escritura quipú, p. 195 [19] and Quipucamayoc, p. 360 [362][18]

18 Royal Danish Library, GKS 2232 kvart: Guaman Poma, Nueva corónica y buen gobierno (c. 1615), p.196 [197], URL digital facsimile: https://poma.kb.dk/permalink/2006/poma/197/en/text/ ; Royal Danish Library, GKS 2232 kvart: Guaman Poma, Nueva corónica y buen gobierno (c. 1615), p.360 [362], URL digital facsimile: https://poma.kb.dk/permalink/2006/poma/362/en/text/.

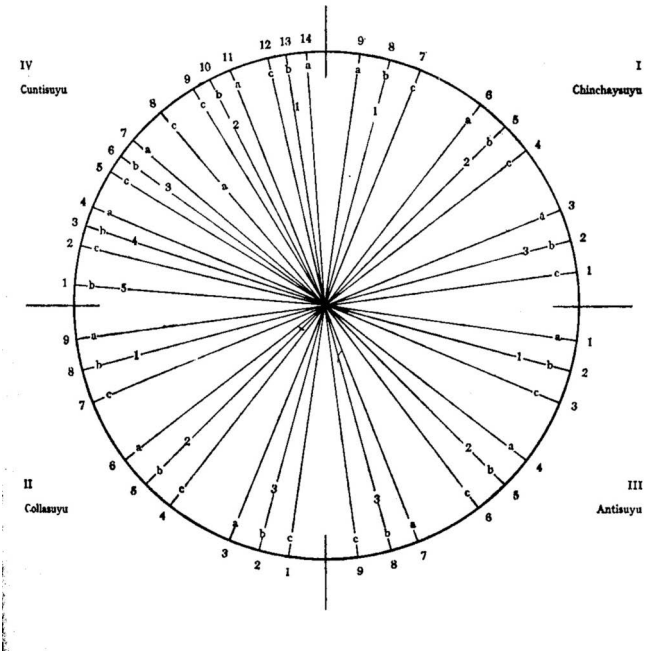
The basis of living well, according to Guaman Poma, lies in the precision of data collection and knowledge transmission. The main accountant, shown above, brings together all available data[19] of the entire Andean region in Cusco. All Andean peoples tell their origin from Lake Titicaca, thus both a cultural and cosmic founding history have their origins in the water. The foundation of the political node of Cusco is also linked to water: Cinche Roca is remembered as the founder of Cusco because he created the drainage canals that made the entire valley of Cusco cultivable and protected from floods: "Era él quién drenó las aguas del lago o pantano que ocupaba la zona central del Cuzco, permitiendo la construcción de la plaza Aucaypata, hoy día plaza de armas." ("It was he who drained the waters of the lake or swamp that occupied the central area of Cuzco, allowing the construction of the Aucaypata square, today the Plaza de Armas.")[20] He also channeled the Huatanay River, which allowed cultivation of the area and better control of floods. The territorial order of the Tawantinsuyu and the social, political and economic division is based, as Zuidema, Rostworowski and Sherbondy have shown, on "*ceques*," subterranean water lines radiating towards the Cusco node and on which 41 sacred places ("*huacas*") are topologically recorded, springs that function as if "nodes" on a circularly laid out *quipu*.

The diagonals imaginarily drawn by two water lines "Ceques" divide the "Four Realms" *Tawantinsuyu* into its four regions Chinchaysuyu, Andesuyu, Contisuyu and Collasuyu. The Inca nobility divides along the lines and binary division into upper and lower moiety (*Hanan* and *Hurin*, mountain and water) their obligations and claims to water and territories. This radial collective mental infrastructure of water lines and *quipu* serves as orientation for the political, social, religious, and economic order, whose material basis is in turn the equitable distribution of water resources.

19 This includes demographic, legal, military data, crop products, resources, labor services, and more. To the order of node counting from left to right and top to bottom: The most valuable agricultural products, weapons are placed on top. In the census, on the first thread were the men over sixty years old, on the second mature men from fifty, the third over forty years old, always ten-year-old groups to still children. In the same order they counted women of all ages. Thinner threads on the same strand indicated the number of widows. Garcilaso de la Vega El Inca, *Comentarios reales de los Incas* (Lisbon : Pedro Crasbeeck Printshop, 1609): Chap. VIII, 136.

20 Sherbondy, *Agua, Riego,y Árboles*, 123.

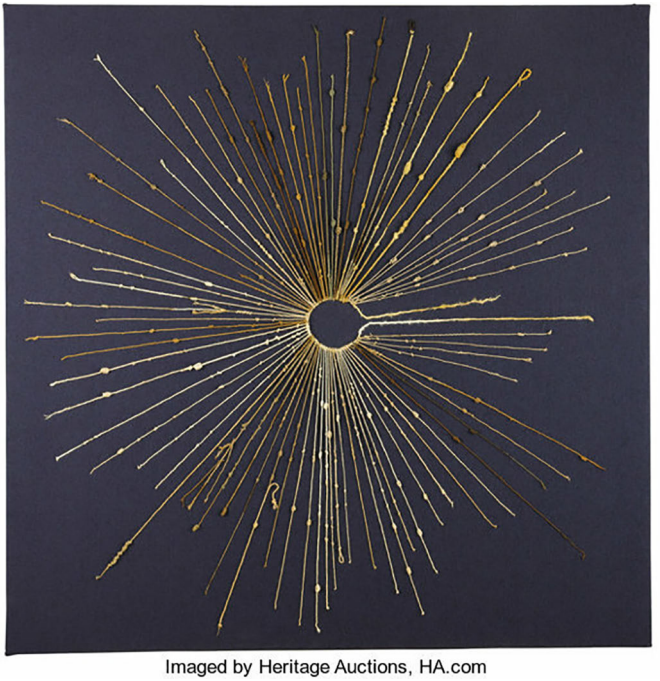
Figure 5: Ceques del Cusco, 1964.



Tom Zuidema.[21]

21 Tom Zuidema, 1964. *The Ceque System of Cuzco. The Social Organisation of the Capital of the Inca* (Leiden: Brill), 2.

Figure 6: The 41 ceques and huacas represent imaginary cords and knots that run through the entire valley of Cusco and whose extension also divides the administration of the entire empire. The 41 ceques correspond to the 41 weeks in the Inca calendar, which Guaman Poma, however, no longer lists.



Quipú circular, © Heritage Auction.[22]

Conclusion

In this article I aimed to test if "infrastructure" can serve as a key term to understand what the inter-cultural confrontation during conquest and colonial times entailed in the Viceroyalty of Peru. Indeed, it allows for insights into the articulations and interfaces, the frictions and catalysts between such different material and immaterial cultural systems like customary law, cosmology, scripture, irrigation systems, communication, and spirituality. "Infrastructure" turns out to be thought provoking, even if—or maybe because—it is a term heavily charged with assumptions

22 Heritage Auction Fine Art, Quipú circular, https://fineart.ha.com/itm/textiles/quipu-inca-ad-1430-1530-cotton-camelid-fibers-diameter-34-1-2-in-at-break-point-the-present-example-has-been-di/a/643-47254.s?ic4=GalleryView-Thumbnail-071515.

about "modernity." The idea that colonization was technically civilizing the American Indigenous population came up as early as the Spanish implemented their administrative headquarters and ruled over the distribution of all resources. Guaman Poma asks, how "civilizing" this administration really is, if it leads to the destruction of fields, animals, and people. The basic question concerning the generative function of infrastructure, "What is it good for?" is answered in opposite ways by Guaman Poma and the Spanish crown, as his texts shows. For the Andean population it meant for "buen vivir" of all the communities independently of individual governments and rulers. For the Spanish, any exploitation of resources, including water, was to augment the wealth of the Spanish crown. Value systems, myths, ritual calendar rhythms, rights and duties, are strongly tied to the different outcomes, including or excluding parts of the population, which become visible during the conquest. The typographic design of the text written in Latin letters as if they were knotted cords is already a representation of Andean infrastructure knowledge and coding, which, analogous to the political-economic order in its radial and knotting systematics, refers to imaginary water lines.[23] The concern for precision in the counting and measuring system, forming physical and mental irrigation landscapes as *quipu* knots, serves the concern for distributive justice, which, as has been shown in Guaman Poma's lore, produces and sustains a water infrastructure knowledge that is decentralized, communal and intangible, as it dates back to unthinkable times in human history (the second age of man) and is based on innumerable labor contributions by the population. This large-scale dimension in construction, ownership, management, and maintenance has precisely the consequence that the dominion over the water can never be withdrawn from common ownership and use. The punishments to be expected are painted (to Christian ears) in hellish scenarios that bloom for anyone who so much as touches the sacred water rights, the water calendar order, or the material water infrastructure. The detailed description of the consequences of destruction, which occurred everywhere as a result of the conquest, makes clear how little Guaman Poma trusts the king's cultural understanding of the importance of water to good government. The centrality of irrigation systems can thus not be understood without its cultural environments, informing and granting the communitarian purpose of water infrastructure. The hope to make use of Andean irrigation

23 "Este complejo sistema de organización compuesto por ceques y huacas, hacía las veces de un gran quipu que con sus 'cuerdas y nudos' cubría toda la ciudad. El culto de cada uno de los 348 lugares se encontraba a cargo de un grupo social, el cual debía ser practicado según el calendario ritual. Estas líneas también fueron referencias para delimitar la propiedad de las tierras de los ayllus cusqueños." María Rostworowski, *Los Incas. Obras Completas*, Vol. IX, (Lima : Instituto de Estudios Peruanos, 2001), 113. See further : Pedro de Villagómez (1585–1617), "La naturaleza Pan-Andina del Sistema de Ceques," in *Batan Grande y la Unidad Cosmológica en los Andes Centrales Prehistóricos* 21, ed. Emilio Choy (2001): 31–45.

knowledge for future droughts might be fruitful only in this holistic understanding of infrastructure.