

“Traditional approaches in the historical field of infrastructures often focus on the achievements of individual masterminds. But if one looks beyond individual pioneers, the emergence of corresponding expert cultures would appear to signal a much more essential and qualitatively significant leap.”

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Image Source: 'Landschaft mit Bergwerk', Herri met de Bles (1485/1510 – 1555), oil on wood, Inv.-Nr.: 55 - Alte Galerie, Schloss Eggenberg, Graz. Photography by Fondazione Bruno Kessler, LXII study week | environment and infrastructures from the early modern period to the present: challenges, knowledge and innovation, Sept. 2021, all rights reserved ©.



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Infrastructures and the environment: learning from long-term cycles. Reflexions from the early modern period to the present

Facilities for supply and disposal, transport, and communi-

cation often are so integrated into every aspect of everyday life that people often do not notice them at all. However, a large part of our lives depends on these anonymous services being readily available. We even tend to assume that infrastructures will constantly expand and improve their quality in the future. However, the reality is often quite different. On the one hand, existing systems often prove vulnerable to technical failures or critical human intervention. A closer look also re-veals that many infrastructures are not the result of coherent planning but somewhat of different or even contradictory interests. Moreover, historical examples from various periods demonstrate that integrated infrastructure systems are more complex to manage and deploy in the long run. On the other hand, the climate crisis and the rising awareness of the more general problem of the planet's sustainability have accentuated the need to rethink our lives and economic and social relations to build a more coherent balance between man and man and the environment.

All these challenges directly impact planning for the maintenance of existing or the construction of infrastructures, which almost regularly are the topic of significant political and social controversy. Well-known examples are the construction of new motorways, railway stations, or airports, the expansion of broadband, and the construction of new infrastructures due to international programs for the energy transition. Looking at this problem from a historical perspective allows us to demonstrate the mixed balance

sheets of infrastructure policies to this date. The construction of railway lines, roads, canals, or reservoirs violated individual or collective property rights and residents' interests. Furthermore, the supposedly unstoppable progress of modernity caused harmful and irreparable damages to the environment again and again. The almost passive social acceptance of these public interventions has ended over the past years or decades. By now, large strata of civil society claim to have a say in all these projects.

Against this background, the relationship between infrastructures and the environment has become the subject of an expanded historical science. Since the 1970s, environmental history has emerged on a wide scale internationally, marked by its strongly interdisciplinary cooperation and the involvement of numerous scholars from different backgrounds and nationalities committed to the study of the "history of the relations between human societies and the rest of nature on which they depend." During the said period, the history of technology has also changed profoundly, incorporating new research approaches such as the theory of social construction, the idea of actor-centered networks, and the multidisciplinary nature of science and technology studies. Furthermore, the dialogue between these disciplines has become increasingly intense concerning the debate on the Anthropocene. This geological concept defines the recent and man-made transformation of the planet, which has reached such an extent that it rivals some of the most significant forces in nature. Since its beginnings,

scientific and technical knowledge has played an essential role in studying environmental history, but that is not all. Today, international environmental studies have reached a new stage by way of the close integration of human and social science approaches on the one hand with the natural, medical, and technical science approaches on the other hand.

Moreover, the arsenal of its research work is also expanding in practical terms. For example, new technical instruments and procedures now make it possible to study climate change in earlier historical epochs. This change allows us to obtain further information regarding the social or even mental repercussions of these changes or the short-term effects of major natural disasters

The new approaches have made abundantly clear that both the interventions aimed at protecting natural resources and those created for their exploitation call forth the construction of infrastructures, so much so that we can refer to these contexts as envirotechnical systems. One of the sectors in which the relationship between infrastructure and the environment is closest is the energy sector. As early as preindustrial times, the supply and use of the primary energy sources required constructing complex transport and production structures. After that, technological developments associated with industrialization constituted a massive leap in scale in this respect. The infrastructures built in this process have favoured the rise of a very high

energy consumption model. The rising costs of dismantling these infrastructures and the economic sectors associated with them are among the main obstacles to overcoming fossil fuel-based production structures. Furthermore, the planning and construction of infrastructures have often been instrumental in avoiding or limiting the risks associated with major so-called natural disasters (earthquakes, floods, etc.). At the same time, we need to take into account that the malfunctioning or maintenance of infrastructure has in turn been the cause of disasters with high environmental and social costs (accidents at dams and nuclear power stations; air pollution and nuisances, etc.).

Although historical research on the environment and infrastructures has achieved noticeable in the past decades, several problems still need to be investigated in more detail. One of them is the international dimension of infrastructural projects. Thus, new technologies have often been greeted effusively and touted as peacemaking forces. Cross-border infra-structures had played a central role in building up a shared space in Europe, the beginnings of which leads back to the time before the political integration process started. This pertains, for example, to the construction of a European-wide system of modern motorways and the ideas of an integrated system of European railway lines. Although the social importance of these systems has increased considerably in recent years, this also holds for the vulnerability of infrastructure networks. Many security experts have expressed their fear about the dangers of

possible misuse and potential attacks on virtual networks. There also speak of a vulnerability paradox that runs as follows: The better networks function, the more dramatic the impact of disruptions when they occur. Against this background, the protection of “critical” infrastructures has become just as urgent a task as their expansion and maintenance.

But when did the story of infrastructures and their political and social impact really begin? There are several possible answers to this question which imply different methodological reflections. When looking into the history of ideas, one would probably have to start with the writers of utopias of the early modern period, who conceived of integrated, just, and fully supplied societies with a welter of infrastructural function systems. However, their visions of a stable future without material hardship or exclusion were miles away from what the people experienced at that time. When focusing on politics, the emergence of the modern state comes into sight, which propelled forward massive public investments into infrastructures. The founder of modern economic thought, Adam Smith, defended such a policy in his famous work on the “Wealth of Nations” from 1776. Here he postulates that it was the duty of the state to erect and maintain “those public institutions and those public works, which, though they may be in the highest degree advantageous to a great society, are, however, of such a nature that the profit could never repay the expenses to any individual or small number of individuals, and which it therefore

cannot be expected that any individual or small number of individuals should erect or maintain.” If we looked, alternatively, more closely into the era of enlightenment, this would highlight the call of its leading exponents for the free exchange of people, goods, and ideas giving rise to the concept of public net-works.

However, from the perspective of environmental history, the transition from the 18th to the 19th century marks the most decisive turning point. Using fossil fuels to power machines became a prerequisite for industrialization and the cultivation of nature according to human needs. But again, several caveats are necessary. Even the premachine age is known for its enormous interventions into the landscape. Thus, various communities rebuilt marsh-lands and coastal regions to protect the hinterlands against storms, floods, inundations, and the like. The mechanically intensified interventions eventually were based on the assumption which accepted no longer the defaults of nature. Finally, a history of infrastructures could start with the invention of new transport and communication facilities. This aspect reminds us of the new time regimes since the 14th century, indicated by the change from time schedules dominated by the churches to one that merchants developed. The same holds for the road and carriage system or to the postal service, which became part of integrated modern networks and infrastructures since the 16th century

Traditional approaches in the historical field of infrastructures often focus on the achievements of individual masterminds. But if one looks beyond individual pioneers, the emergence of corresponding expert cultures would appear to signal a much more essential and qualitatively significant leap. This remark refers to the groups of military and civil engineers and public planners and administrators, bankers and entrepreneurs, inventors and development engineers, building and civil engineering companies, or politicians on different levels of responsibility. Thus, historically, infrastructures can be best be understood as the result of negotiation and collective compromise processes. This setup means that studying the complex relationship between infrastructures and the environment requires finely-tuned interdisciplinary approaches. It will have to include both the humanities and the social sciences on the one hand and the more technical and natural sciences on the other hand. All of them will have to embark on close cooperation with experts in technical and economic questions to measure risks (economic, technological and actuarial ones) and improve social acceptance levels. Leaving out history means losing an essential dimension that can inform us about the potential political, social, and economic risks or other challenges in the planning and realisation of new infrastructures.

