

Initiative for the Future of Great Rivers

The importance of the long term for understanding the role of rivers in the adaptation of societies to climate change

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The historic background for contributing to the creation of tomorrow's river landscapes (...and limiting risks)

River landscapes are the palimpsests of history that result from the combined action of natural (geomorphological history, hydrological processes, etc.) and human factors ("cultural landscapes" composed of networks of urban and village structures, settlements and hydraulic structures such as canals, dikes and dams, since at least the 3rd millennium BC in the Middle East, port installations and bridges, etc.). These natural and human factors interact. In other words, man acts on river dynamics to develop waterways, by diverting flows or by blocking them. On the contrary, demographic dynamics mirror river dynamics. We are far from the simple opposition between nature and culture.

Rivers and especially the great rivers along which populations have settled (at distances dictated by flood risks!) since they became sedentarised (first in the Middle East, in the Fertile Crescent, as from the Neolithic period, around 13,000 years BC) are marked by the unique evidence of these interrelations between human beings and their environment.

However, these river landscapes undergo constant change (ongoing and in the future). There is no "definitive" map of river landscapes. The example of the Gargar in southwest Iran sheds interesting light on this aspect. Although it appears to be a river at present, a tributary of the Karun, with 55 km long meanders and its capacity to gouge incisions and capture wadis, it seems that it is the result of an ancient monumental irrigation system, the Masrukan, whose origins date back to the beginning of the Sassanid period, in about 300 A.D.

The interrelations between human beings and rivers are constant, but they are also dynamic and the river landscapes of today, however indicative and instructive they are for installing new urban centres, new districts or new industrial zones (such as a new terminal), for example outside floodable areas, are not simple "fossils" that have crossed the ages. We must take heed of them.

History teaches us that **our current needs are not all those of yesterday ... and will not be all of those of tomorrow**. Certain irreversible modern developments (concreting of banks, nuclear power plant cooling systems, etc.) must be replaced, if possible, by **evolutive structures**.

The history of these relations between human beings and rivers is based on recent memory, **though this must be regularly refreshed** (exhibitions, schools, etc.), on the study of textual and photographic documentation, and also on the study of place names (research). However, for the oldest periods, archaeologists gain understanding through the **prism of modes** of territorial occupation, by using methods such as intensive field surveys and site catchment analyses that make it possible to establish maps of ancient

settlement patterns and analyse them. To do this they now use new tools such as geographic information systems (GIS) and geophysical surveys that are used to identify paleomeanders and constructions invisible on the surface.

The historic approach used to understand the complexity of climate change and the factors involved in this change

History can be seen as a powerful **safety barrier against over-simplistic ideas**. The complexity of situations: **no single cause**, such as a climatic episode, for the desertion of a region; nor is **there a single fixed rationality through time in the uses and practices of riverine populations**, which may be Western and contemporary (for example, religious uses (ancient and current) exist that appear to contradict more “rational” uses as seen through modern Western eyes; thus people resettle on areas known to be floodable); and lastly, **situations do not evolve linearly without it being possible to return to a previous situation (provided such a possibility exists)**. Furthermore, history has shown that we do not (or should not) proceed always from technical simplicity to industrial complexity.

- Paleoenvironmental and geoarchaeological studies allow elucidating, over long periods of time, the paleogeographic evolution of sites in alluvial plains and building models of former landscapes and environments from which we can sometimes learn: constructions on stilts, buffer zones, etc.). These studies also help us to better understand the temporal variability of the hydrological events of a site and its vulnerability to flooding.

Historic depth provides valuable insight on current upheavals, learning from past uses, and gives hope

The history of the interrelations between human beings and rivers requires investigation to learn from the experience of bygone populations and the management of available resources and their implementation through time, in the same way as lessons can be learned from the experience of traditional societies living close to rivers. This type of approach highlights the risks to which the neighbouring populations are prone and their responses for adapting to them. It also shows that the hostility of an environment increases the **inventiveness of human beings** to exploit the least potential identified, by taking care not to reach the threshold of exhaustion of available resources.

There is a **considerable wealth of adaptive techniques**

In an arid environment, these involve the system of distributing water in oases, and local millennial systems used for the abstraction, diversion, storage, and distribution of water, and for flood protection. They also involve maintaining traditional (small scale) irrigated agriculture to conserve subsistence farming and reduce the rural exodus to urban centres, and crops adapted to flooding and flood subsidence in flood plains.

In wetland areas, account must be taken of drainage ditches, dike systems, the development of banks, etc.

Furthermore, the synergy between resources and types of crop (pluvial/flood and subsidence) should be conserved insofar as possible by local actors with experience and good knowledge of their environment.

Understanding in the long term of adaptation processes, economic systems of subsistence and the social and cultural aspects of the life of neighbouring populations and, in particular, of the reasons why environments and societies change, should inspire us and fuel thought on the social impact of risks and climate change.

Why not fill with water certain forgotten canals that contributed to making life easier for the populations of arid areas? History has shown that the *qanats*, *foggaras* or *falaj*, underground drainage galleries very frequent in the arid areas of the Near and Middle East, can easily be reactivated after having been forgotten for several centuries.

The marshes in the delta of the Tigris and Euphrates in southern Iraq were drained during the war between Iran and Iraq (95% of the territory was drained in less than two years, 250,000 inhabitants at the beginning of the 1990s) with the risk that their ecosystems and their “marsh civilisation” would disappear definitively along with its habitat of reeds used for weaving, thatching and making boats caulked with bitumen (Wilfred Thesiger), and its agro-pastoral economy based on fishing. However, the deliberate replenishing of the marshes with water (United Nations Environment Programme: UNEP) shows that a palustrine ecosystem can be gradually reconstituted (with the return of the population capable of reclaiming its territory) provided that care is taken to ensure that dam construction programmes upstream are controlled.

Consequences

. Increase interdisciplinary research

- On paleoclimatology since the Holocene era and also on recent climatic history in order to evaluate the intensity and impact of climatic variations on human societies (so that they can be taken into account in future development and management plans);
 - On fluvial dynamics (hydrology, research on paleomeanders and the history of rivers, etc.) and Holocene geomorphological dynamics relating to geo-archaeology, from the local to the watershed scale;
 - On the importance of anthropic impacts on the current and past functioning of river systems at different scales (including in terms of fish abundance, the exploitation of alluvial land, etc.); full impact studies on the construction of dams and monitoring to prevent, limit and offset adverse effects;
 - That combines surface archaeological and geophysical surveys applied to rivers;
 - On the history of the settlements of river banks and the practices of neighbouring populations (archaeological and historic sources, including on clay tablets with cuneiform script, ethnographic sources, etc.), by widening spatial and chronological scales, the only method that allows evaluating the pertinence of observations and thus their interpretations;
- On land liable to have been cultivated before the construction of new dams (quality of land, risk of salinization, etc.) and the importance of aquifers and their capacity to recharge (if not over-exploited!).

. Refresh memory of the past by

- Teaching it
- Comparing current experiences and practices of riverside populations with former ones
- Highlight good practices

. *Study successful experiences and use them to propose varied responses adapted to different environments.*