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Original Research Article

River Culture: an eco-social approach to mitigate the biological and cultural diversity crisis in riverscapes

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ABSTRACT

We introduce here the term "River Culture" to delineate an eco-social approach to mitigate the biological and cultural diversity crisis in riverscapes. It is based on the insight that current environmental change endangers both, biological and cultural diversities in rivers and their basins, and those activities to improve ecosystem functions, biodiversity and capacity of the biological species to evolve will have a similarly positive effect on human cultural diversity. "River Culture" has two dimensions, including (a) the influence of the biophysical setting of rivers (specifically, their pulsating flow regimes and their biological features) on the expression of elements of human culture in general and (b) the aspect of "learning from the river" for the development of technologies and management options that are targeted to maintain and improve ecosystem functions and diversity in a more sustainable way. The River Culture approach, as given in this concept and discussion paper, is preliminarily based on five tenets: (1) Reset values and priorities in riverscape management in favor of human wellbeing and a harmonious coexistence of man and riverscape; (2) Live in the rhythm of the waters, i.e. adapt management options in accordance with the hydrological dynamics rather than fighting against them; (3) Transform traditional use of rivers into modern cultural activities and management options; (4) 'Ecosystem bionics': by copying survival strategies of flood-pulse adapted

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organisms novel forms of human use can be developed; (5) Make the catchment (river basin) the geographical base unit for all kinds of political decisions in landscape management.

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1. Introduction: interactions between cultural use and ecological state of the global riverscape

Riverscapes can be regarded as an interface of aquatic and terrestrial conditions, strongly controlled by complex interactions of many factors: hydrology, sediment transfer, soil-vegetation dynamics, bio-geochemical processes, and other biotic interactions, and finally by land use and pollution. The natural ecosystem functions are today described as "ecosystem services" that are useful for human beings. In the case of river-floodplain-systems, they include water, means of transport, shelter from enemies, wood, fish and other food resources, open, easily colonized space and fertile plains that can be used for agriculture and livestock and their functions for transboundary trade. Moreover, they provide cultural services such as esthetic inspiration for art and design, spiritual experience and sense of place associated with the identity of an individual, a community, or a society (Daniel et al., 2012).

River valleys (Riverscapes, Allan, 2004) have been used by human beings since the earliest day of humanity. Fluvial-palustrine corridors across the Sahara can explain the migration of early modern humans to the north and out of Africa 120,000 years ago (Osborne et al., 2008). There is strong evidence that pulsing ecosystems were the first sites where agriculture took place, as shown, e.g. in the wetlands of the Sahara and the Sahel, where early farmers domesticated pearl millet between 4500 and 2800 years BP (Manning et al., 2011; Ozainne et al., 2014). The cradles of most known historical empires were in floodplains, being in Mesopotamia or in Egypt, and the spread of Roman and Viking empires benefited from river courses.

The early development of cultures has always been linked to specific technologies to use natural resources. It requires learning from the nature, how to exploit a resource the best way, and to know the best moment to use them. The rhythm of the waters, of floods and droughts, has become an impulse generator for the organization of the annually changing cultural activities, specifically the biological "hot spots and hot moments" such as fish migrations into or out of the floodplains (Junk et al., 1996; Wantzen and Junk, 2006; Krause et al., 2015) or the onset of the falling water period as a starting point for drawdown agriculture and farming in floodplains in early societies. In many places of the world, riverine fish have been revered as symbols of divine power by indigenous communities that relied on their environment for survival (Gupta et al., 2015).

The types of used resources also helped to structure social groups, e.g. a separation of genders and generations between fishing and hunting by boat (men), pottery with clay from riverine sediment deposits (women), and angling (children), as it is still found, e.g. at the Cuiabá River, Brazil (Oliveira and Nogueira, 2000; Neuburger and Da Silva, 2011). Thus, evolution of biological species traits and of cultural activities in and around rivers is triggered by the same engine, the flood pulse (Fig. 1, Junk and Wantzen, 2004).

Moreover, rivers and the natural phenomena linked to them have a very strong value in spiritualism and religion. The personalization of water as the source of life, and of floods as sources of fertility in floodplains or as an intimidating, destructive force may be the reason why so many rivers have been and still are considered divinities in many countries. Hinduism in India is a very strong example how rivers may become central elements of religious and social life (Alley, 2012) – and how a purely utilitarian policy may impair these structures. Losses of significant cultural ecosystem services may exacerbate social conflicts (Daniel et al., 2012).

Rivers and floods are metaphors for constant change, for the unification of constructive and destructive forces that have driven philosophers since Heraklit's "panta rhei"; and the esthetic values of sinuous meanders, rounded pebbles, or mirroring water surfaces imbued painters and sculptors. The rhythm of running water is at the same time monotonous and highly diverse, and has inspired musicians to compose pieces such as Smetana's *Vltava* (The Moldau), or much of J.S. Bach's diverse work. All these technological and the spiritual linkages of human beings to rivers have contributed to diverse forms of culture. As stated by Irene Klaver (2012), *Cultural diversity, as recognized by UNESCO, is a driving force of development, not only in generating economic growth but also as a means of leading a more fulfilling intellectual, emotional, moral and*

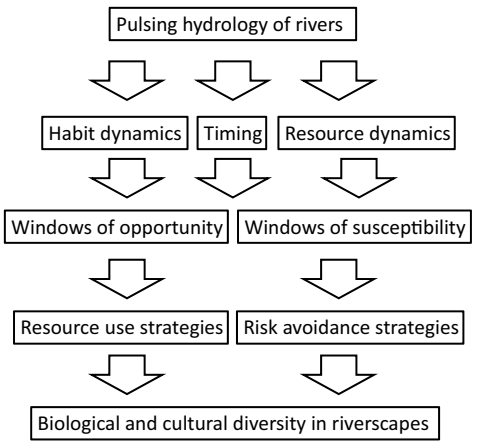

Fig. 1. A pulsing hydrology sets up the stage for both, evolution of biological and cultural diversity.

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