

Developing engagement in river basin management to support improved climate mitigation and adaptation

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Rivers are the life force of many of our societies. Throughout history, access to river water has provided a basis for human development. Rivers and their extended basins are also home to rich and complex ecosystems. These systems have both intrinsic value and value in providing significant ecosystem services to the societies who inhabit them. Key human uses of rivers over centuries have included water supply, navigation, sanitation, wastewater disposal and energy production; uses which sit alongside rivers' aesthetic, cultural, recreational and food production value to societies. The ways that river basins have been developed and populated has also led to people understanding not only the life-giving force of rivers, but their life-taking force—the force exhibited when rivers fill and flood or dry-out in a manner too violent for surrounding inhabitants.

Rivers and the societies living around them have thus been managed with an understanding of such climate and related river flow variability. Human ingenuity over thousands of years has led to attempts to control many rivers and tame their flows to allow for greater and more productive human development. This includes the building of tens of thousands of dams, weirs, locks, aqueducts, drainage and irrigation canals, and storm and wastewater systems in cities. Technical expertise systems, coupled with sophisticated governance have been developed to manage these infrastructures and the water within them. Such development has indeed been very productive and provided a basis for sedentary populations to grow and prosper around the world. It is also such development and its associated population growth that has led in large part to the greenhouse gas emissions causing global warming and climate change. Rivers, and how we have lived with them and managed them, have therefore been an enormous contributor to the 'Anthropocene'; the era where the human impact on earth can be seen as a geological phenomenon.

As we look to the future, rivers and the societies who rely on them can be seen to be at the heart of how we can more effectively mitigate and adapt to changing climates. How development occurs from now on will either add to the acceleration of climate change or efforts to reduce it.

Within the current development paradigm, hydropower, river water cooled nuclear power or river-based navigation may support certain lower carbon intensive futures, when compared, for example, to fossil fuel production and on-road transport. The current systems of canalised and segmented river systems also provide a certain level of control to managers to distribute water in more optimal manners for climate change mitigation and adaptation objectives. Yet, such structural development paradigms also come with negative attributes for adapting to and mitigating climate change. In particular, they often have irreversible impacts on river ecosystems and livelihoods of people who depend on particular types of ecosystems and ecosystem services, such as flood-based agriculture or fish availability. Such structural management systems can also heighten the risks of loss and damage for communities from extreme events in multiple ways. One mechanism being that such infrastructure leads to development in areas such as flood plains where residents assume that the infrastructure provides adequate protection—the reality being that if either the infrastructure fails or the design