Smart Laboratory for Clean Rivers in India - An Indo-Danish Collaboration

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Abstract : Climate change and anthropogenic stress have severely affected ecosystems all over the globe. Indian rivers are under immense pressure, facing challenges like pollution, encroachment, extreme fluctuation in the flow regime, local ignorance and lack of coordination between stakeholders. To counter all these issues a holistic river rejuvenation plan is needed that tests, innovates and implements sustainable solutions in the river space for sustainable river management. Smart Laboratory for Clean Rivers (SLCR) an Indo-Danish collaboration project, provides a living lab setup that brings all the stakeholders (government agencies, academic and industrial partners and locals) together to engage, learn, co-creating and experiment for a clean and sustainable river that last for ages. Just like every mega project requires piloting, SLCR has opted for a small catchment of the Varuna River, located in the Middle Ganga Basin in India. Considering the integrated approach of river rejuvenation, SLCR embraces various techniques and upgrades for rejuvenation. Likely, maintaining flow in the channel in the lean period, Managed Aquifer Recharge (MAR) is a proven technology. In SLCR, Floa-TEM high-resolution lithological data is used in MAR models to have better decision-making for MAR structures nearby of the river to enhance the river aquifer exchanges. Furthermore, the concerns of quality in the river are a big issue. A city like Varanasi which is located in the last stretch of the river, generates almost 260 MLD of domestic waste in the catchment. The existing STP system is working at full efficiency. Instead of installing a new STP for the future, SLCR is upgrading those STPs with an IoT-based system that optimizes according to the nutrient load and energy consumption. SLCR also advocate nature-based solutions like a reed bed for the drains having less flow. In search of micropollutants, SLCR uses fingerprint analysis involves employing advanced techniques like chromatography and mass spectrometry to create unique chemical profiles. However, rejuvenation attempts cannot be possible without involving the entire catchment. A holistic water management plan that includes storm management, water harvesting structure to efficiently manage the flow of water in the catchment and installation of several buffer zones to restrict pollutants entering into the river. Similarly, carbon (emission and sequestration) is also an important parameter for the catchment. By adopting eco-friendly practices, a ripple effect positively influences the catchment's water dynamics and aids in the revival of river systems. SLCR has adopted 4 villages to make them carbon-neutral and water-positive. Moreover, for the 24×7 monitoring of the river and the catchment, robust IoT devices are going to be installed to observe, river and groundwater quality, groundwater level, river discharge and carbon emission in the catchment and ultimately provide fuel for the data analytics. In its completion, SLCR will provide a river restoration manual, which will strategise the detailed plan and way of implementation for stakeholders. Lastly, the entire process is planned in such a way that will be managed by local administrations and stakeholders equipped with capacity-building activity. This holistic approach makes SLCR unique in the field of river rejuvenation.

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