NATURE-BASED SOLUTIONS FOR WATER IN THE PERI-URBAN

CASE STUDY BRIEF: INDIA, BIHAR

Water JPI

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NATWIP

ABSTRACT

This case study pertains to the recently adopted NBS, Jal-Jivan-Hariyali (Water-Life-Greenery) Mission. Also referred to here as JJH, in the eastern state of Bihar, India. This mission is a multi-stakeholder program under the state's Rural Development Department. Initiated in 2019, the JJH Mission involves NBS projects that have "green" technology-based and/or traditional knowledge-based components. Presently under the administrative control, this mission foresees gradual transfer of ownership to local communities through training and participation programs. These projects are in various stages of implementation at community-level in peri-urban and surrounding rural areas, highlighting the requirement of integrated approach for sustainable water solutions with the objective of climate sustenance. For assessment of the Mission, literature survey and field visits with interviews were done. The mission's projects are aimed at enhancing sustained access to clean water for direct and indirect human consumption as well as minimising geogenic contaminants of underground water resources. From local to regional scales, these initiatives assist, health, welfare, agriculture and allied economic activities. Modes of project implementation reveal gradual increase of community participation, with special emphasis on women empowerment, as evinced from their involvement in awareness and decision-making, implementation, and execution of small-scale business plans.

PURPOSE OF THE CASE STUDY

This case study sought to assess the sustainability of the Jal-Jeevan-Hariyali (JJH) Mission along environmental, social and economic dimensions. 'Jal-Jeevan-Hariyali' stands for Water-Life-Greenery, and hence represents an integrated approach to water management. This mission is being implemented since October 2019 across physical and socio-economic diversities of Bihar state. Bihar has an agro-based economy dependent on erratic monsoon rains, its 18 river basins and its huge reservoirs of groundwater. Its peri-urban population is dominated by pervasive social stratifications that influence, to a great extent, its economic activities. Within such environmental, social and economic diversities, targets sought by stakeholders, the existing barriers, results and scope of the innovative approaches implemented under JJH Mission were examined. This assessment covered all three parts of the NATWIP framework – Context, Process and Results.

AREA CHARACTERISATION

Country	India
Province	State of Bihar
GPS coordinates	between latitudes 24°20'10"N and 27°31'15"N and longitudes 83°19'50"E and 88°17'40"E

Pond constructed in a peri-urban locality to conserve rainwater

PHYSICAL CONTEXT

Local geography/ topography	Bihar is the second most populated state of India. Its economy is totally agro-based. The state is located in the alluvial floodplains of Himalayan and Peninsular rivers. It has 19 river basins and ground water resources extending up to 3 aquifers layers. A number of water bodies and trenches, constituting “Ahars” and “Pynes” respectively dot the urban and peri-urban areas. These have traditionally served to meet the general requirement of water in the dry season. Since the decades of the 60s, groundwater began to be used for drinking and cooking purpose. With the tapping of these aquifers under minor bore well irrigation policy, the older surface rain water storages fell into disrepair and disuse. Changing rainfall regime however, have now impacted surface flows of the seasonal streams. The aquifers, overlying the southern peninsular rocks are mostly shallow and have spatial variationsThe situation is worse in the peri-urban areas, where ahars- pynes, ponds (Pokhars) and wells have been encroached upon by the unplanned spread of habitations
Main water courses	Rivers Ganga, Gandak, Kosi, Sone, Punpun, Chanan are major water courses with several other perennial and seasonal tributaries.
Main soil types	Largely clayey soils with patches of sandy loam in north, and stony stretches in the south with intervening laterite patches.
Precipitation (monthly averages as well as climate change projections)	The climate is of monsoon type, with an annual average rainfall of 1,205 mm. Average number of rainy days is 52.5. Bihar gets more than 85% of its annual rainfall in the southwest monsoon season. The highest rainfall (33% of southwest monsoon rainfall) is received in July followed by August (28% of the southwest monsoon rainfall). The southwest monsoon season rainfall shows a significant decreasing trend, whereas monthly rainfall and annual rainfall do not show any significant increasing/ decreasing trend. On the whole, observed and projected climate change impacts include drought due to reduced rainfall in certain areas and flood due to heavy rainfall in others.
Critical infrastructure	Urban centres are bifurcated into municipal wards, but the peri-urban areas are bereft of the facilities of urban wards. Transportation networks are developed, with the east-west broad gauge railway route crossing the state. It is served by major National Highways, along with state highways.
Other relevant physical factors	The present year is witnessing complete dried up river beds even in the monsoon season, particularly in south Bihar due to high rainfall deficiency in the southern catchment areas.

SOCIO-ECONOMIC CONTEXT

Population	The total population of the state is estimated to be 128.3 million by 2022, with a population density of 1307 /Km2. The urban population constitutes just over 11.29% of the total population.
GPD/capita	Bihar's per capita GDP in 2020 was INR 50 555 (approx. 676 USD).
Economic status (i.e. low income, high income)	All the 3 income groups- high (e.g., landlords, businessmen), middle (e.g., Services) and low (e.g., daily wage labor) are represented, the latter mostly inhabiting the urban periphery. Sources of income are commercial, agricultural and transportation activities. Agriculture contributes to the largest labour force by occupation.
Other relevant socio-economic factors:	Bihars 's district headquarters form "break-o'-bulk" cities. Two occupations prominently thrive – agricultural marketing, and commercial activities. Bihar is a leading state in agricultural production based on organic farming and water conservation initiatives. Current state's rural policies have developed linkages between agrarian production, water management based on the local milieu, and capital generation. However, social stratification in terms of class and caste lines are ingrained in the thought processes of the inhabitants, so as to impact, to a great measure, the outcomes of proactive policy measures of the government.

OBJECTIVE OF THE NBS

The NBS Jal-Jeevan-Hariyali (Water-Life-Greenery) Mission addresses both water quality and quantity (shortage and excess) challenges. The Objectives of this State-driven Mission are:

- To ensure sustained access to clean water
- To address uncertainty of rainfall, deepening of ground water, frequent natural disasters (floods and drought)
- To mitigate pollution and contamination of water resources, and water management issues arising from lack of inter-sectoral coordination
- To promote mass adoption of NBS schemes as a green alternative to unsuitable technological interventions

POLICY AND GOVERNANCE CONTEXT

JJH Mission is under implementation in Peri-urban and rural areas of the State of Bihar, India. Launched in October 2019, this NBS Mission strives for retrieval of Man-Nature Synergy in peri-urban as well as rural areas. It connects closely to the National Water Policy 2012 which envisages a common integrated perspective in planning, management and use of water resources, having an environmentally sound basis, while keeping in view the human, social and economic needs. The policy recognizes safe water for drinking and sanitation as pre-emptive needs, while considering its importance in achieving food security, supporting livelihood, and ensuring equitable and sustainable development for all. Simultane-

ously, it acknowledges importance of water for sustenance of eco-system. The JJH Mission also aligns closely with other national level initiatives in the country, such as the National Water Mission's campaign called "Catch the Rain" which focuses on creation of Rain Water Harvesting Structures suitable to the climatic conditions and sub-soil strata, with people's active participation to ensure storage of rainwater.

The main implementation responsibility lies at the district level and the local level and the financial responsibility with the state government. The stakeholders involved are: (i) 12 Governmental departments, important being Water Resources, Public Health Engineering Department, Agriculture, Fisheries, Minor Irrigation, which are responsible for planning, implementation and monitoring work; (ii) the NGOs which are the intermediaries between policy planners and the beneficiaries; and, (iii) community members who, being beneficiaries, are trained in maintenance and monitoring of mission projects, and involved in executing business plans for sustainability of such projects.

ACTIONS

Actions envisioned and/or undertaken:
Environmental

- Identification and mapping of old water bodies and ponds
- Renovation and rejuvenation of water bodies
- Desilting of ponds
- Tree plantation
- Restoration and sustainable management of water bodies
- Adopting traditional water harvesting methods

Soil conservation through plantation initiatives in the peri-urban, for water retention in dry season

Social

- Engaging communities through rural employment programs and in decision-making process
- Involvement of women specially in plantation
- Participation of local stakeholders in planning and implementation
- Involvement of Panchayats (local village-level government machinery)
- Social Audit Mechanism so that people can voice their grievances also give suggestion
- Awareness campaign

Economic

- Financial investment primarily from the State government, though local participation is being encouraged in a big way

POTENTIAL (OR ACHIEVED) IMPACTS AND BENEFITS

Though the NBS has been under implementation for only 2 years, some positive impact is already being observed. These and other anticipated impacts are as follows:

Social:

- Strengthening of community engagement and involvement is being achieved
- Increased participation of community in decision-making processes
- Increase in community ownership of community assets
- Out-migration has decreased leading to domestic stability with increasing economic diversifications and employment opportunities, dependency on agriculture alone has decreased.

Environmental

- Ecosystems are being restored
- Increased surface water resources and soil moisture content are being observed
- There is a visible shift from mono- to multi-cropping agriculture
- Plantation activities have begun to minimize soil erosion
- Problem of heat wave has reduced due to increase in moisture levels of air at ground level

Economic

- Increase in total irrigated area is leading to increased agricultural production
- Increased productivity is resulting in higher income generation among farmers
- Projects under JJH Mission is actively contributing to Peri-urban income

SUSTAINABLE DEVELOPMENT GOALS AND/OR ANY OTHER WATER-RELATED DEVELOPMENT GOALS ADDRESSED

The NBS JJH Mission in Bihar addresses a number of important SDGS. First and foremost, SDG 6 (clean water and sanitation), mainly addressing (in order of priority) Target 6.5 (strengthening integrated water resources management through a statewide ecosystem-based approach); Target 6.6 (protect and restore water-related ecosystems through actions connecting water-greenery-life); Target 6.1 (facilitating equitable access to safe drinking water through rejuvenated drinking water sources); and Target 6.4 (by contributing to sustainable withdrawals of freshwater to address water scarcity). Second, it addresses SDG 13 (climate action), particularly Target 13.1 by strengthening resilience and adaptive capacity to climate-related hazards and natural disasters through integrated action as described above. Third, SDG 11 (sustainable cities and communities), particularly Target 11.7 (by supporting access to green and public spaces in the peri-urban areas through afforestation). Fourth, also addressed are SDG 3 (good health and wellbeing) by promoting healthier lives and well-being for local residents through increased and improved access to safe water and greenery; SDG 5 (gender equality) by ensuring women's full and effective participation in community-level activities under the JJH Mission; and SDG 16 (peace, justice and strong institutions) by promoting inclusive societies for sustainable development through community participation in environmental restoration and rejuvenation.

A renovated water channel (called 'pyne'), supplying irrigation water to agricultural fields in a peri-urban locality

LESSONS LEARNT

Key factors contributing to the emerging success of the JJH Mission are:

- A collective governmental approach towards adoption of proactive nature-based initiatives for sustained local development
- Synergy established between the major players of this mission- Policy planners, intermediaries, Implementers who also constitute the beneficiaries
- Recognition of traditional environmental conservation methods that are ingrained in the region's culture and revival of the same with suitable technological interventions

From this case study, the first lesson to emerge is that in order to sustainably address water-related challenges, it is useful to adopt an integrated approach that connects blue and green environmental dimensions together with people. Second, it is also important to consider and include the local knowledge base existing in the society regarding relevant context-specific technologies. Third, rainwater harvesting and collection of local runoff is an important NBS principle with immense potential to fulfil the water needs of urban and peri-urban spaces around. Fourth, engaging local communities, including women in NBS implementation can help in sustainable solutions.

TRANSFERABILITY OF RESULTS

The JJH Mission can be used elsewhere through upscaling. However, as physical and human diversities exist, appropriate responses from such NBS initiatives may require technological innovations as also suitable alterations in traditional practices sought to be revived.

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WHAT IS NATWIP?

NATWiP is an acronym for a project entitled: Nature-Based Solutions for Water Management in the Peri-Urban: Linking Ecological, Social and Economic Dimensions.

This is an EU-Cooperation project funded under the Water Joint Programming Initiative (JPI) Call 2018 and is led by an international consortium of scientists. The NATWiP team works towards promoting sustainable implementation of nature-based solutions to address water challenges in peri-urban areas.

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