



5. MULTI-USE PONDS FOR SUSTAINABLE DELTA LIVELIHOODS

The Living Deltas Hub research has integrated the quantification of delta pondscapes, water quality monitoring and citizen science data on their importance to communities to promote their economic potential without compromising their climate, biodiversity and social significance. Ponds are ubiquitous, diverse multi-use features of Asian mega deltas underpinning livelihoods, economies, and natural-cultural heritage.



Foreign, Commonwealth & Development Office



Climate change & biodiversity



Science, research, technology



Trade & economic development

SUSTAINABLE DEVELOPMENT GOALS

2 ZERO HUNGER



3 GOOD HEALTH AND WELL-BEING



5 GENDER EQUALITY



6 CLEAN WATER AND SANITATION



10 REDUCED INEQUALITIES



12 RESPONSIBLE CONSUMPTION AND PRODUCTION



13 CLIMATE ACTION



14 LIFE BELOW WATER



15 LIFE ON LAND



17 PARTNERSHIPS FOR THE GOALS



Achievements

The Hub has achieved the first quantification of pondscapes across the study deltas, implemented a basin-wide water monitoring programme and linked this to monitoring of the socio-economic importance of ponds via community science and community engagement. Remote sensing and ground truthing activities have been established to understand the size of delta pondscapes across all four deltas and to better quantify them as potential resource capital for local livelihoods. Surveys of communities and farmers' unions have documented the impacts of climate change and pollution, with saltwater intrusion highlighted as a key driver for the abandonment of ponds. In response, the Hub has developed community-based monitoring strategies and kits to track parameters such as salinity. This transforms community anticipatory and adaptive capacities by ensuring they are able to monitor and assess the health of a critical local resource. This empowers communities to advocate for more sustainable approaches to pond use and take action themselves in ways that integrate pond health, livelihoods and socio-cultural significance.

Living Deltas Hub activities conducted in Ben Tre (Mekong) and Bali Island (India) demonstrate that women remain most vulnerable to environmental degradation and climate change events due to their reliance on economic activity derived from domesticity. As a result, women's health and hygiene are inherently linked to pond water quality with evidence highlighting their sensitivity to skin irritations, dysentery, elevated blood pressure and preeclampsia. Our community and pondscape monitoring will empower women to be advocates for their environment. Examples of this are demonstrated via women's committees in the Vietnamese deltas where participatory environmental mapping is taking place, along with our community science research on water quality. Community-led environmental monitoring will be built on pilot studies in Ben Tre and expand to include simple measures of salinity and faecal pollution to further enhance adaptive capacity and resilience to seasonal scale water quality change in ponds. This bottom up approach to agency will be reinforced by the Hub's wider aims of developing a delta wide, Government-led monitoring program.

Delta ponds take diverse forms from small homestead, multi-user community to large-scale commercial water bodies and are critically important for human health, culture and livelihoods, and present important opportunities for increasing biodiversity in these landscapes and economic growth through trade (Moorhouse et al, 2021). However, pond health faces significant threats. Aquaculture is a key economic development strategy across the Red River, Mekong and Ganges-Brahmaputra-Meghna deltas, but the expansion of industrial scale shrimp farming without proper regulation and enforcement, can deteriorate local ecosystems, jeopardize agricultural livelihoods, and reinforce social vulnerability by marginalising landless or small farmers. For example, Bangladesh aquaculture exporters have faced problems meeting international food quality and safety standards due to poor resource management^{1,2} (COMTRADE, 2017; FAO, 2012), while in 2016, damage and loss to the fisheries sector from cyclones amounted to more than US\$1.1B³ (FAO, 2018). Increasing salinity intrusion due to sea level rise and unpredictable monsoon rainfall not only threatens global freshwater aquaculture production (worth over US\$14.5B in Vietnam; US\$13.2B in India⁴ (OECD, 2021)), but also access to ponds for drinking and sanitation, threatening the health of ecosystems and people.

¹ <http://comtrade.un.org/db/>

² <http://www.fao.org/documents/card/en/c/ca9229en/>

³ <http://www.fao.org/3/I8656EN/i8656en.pdf>

⁴ https://www.oecd-ilibrary.org/agriculture-and-food/aquaculture-production/indicator/english_d00923d8-en

Interdisciplinary approaches

Our interdisciplinary research is the first of its kind in tropical delta ponds. It integrates science, social science and humanities to provide a holistic understanding of the impacts of climate change on ponds in delta socio-ecological systems and data to inform more sustainable pond use, c) local capacities to gather and use data on pond health. The novel integration of disciplines challenges the disciplinary boundaries that characterise research on ponds. This is critically important to generating knowledge and evidence that can support efforts to balance the economic, water quality, livelihoods and heritage roles of ponds in deltas.

Our innovative approach has highlighted the diverse uses of ponds (from household washing to aquaculture), and how changes or threats to ponds can impact livelihoods in different ways. For example, women rely on ponds for a range of domestic and economic use, but lack voice in pond management, highlighting the importance of integrating disciplinary perspectives on pond health, and building more inclusive and bottom-up approaches to monitoring and decision making. Working closely with communities and stakeholders has permitted knowledge exchange of the shared water management and local governance of ponds as a vital freshwater resource, and for this to inform our approach to monitoring and data gathering. Community engagement with pond users has captured the fragility and vulnerability of these resources over time, particularly to climate change and natural hazards, where ponds can be degraded in a matter of hours (e.g. cyclone Amphan in 2020 that made landfall on the Ganges-Brahmaputra-Meghna).

A novel multimedia approach has demonstrated the value of images, voices and video footage from across the three deltas in understanding and representing diverse pond uses (subsistence to intensive) and their roles in delta landscapes. This work will be linked to Hub research on creative representations to build a body of evidence that documents the importance of ponds to building more sustainable delta futures. By capturing and sharing in visual and other accessible forms, the roles ponds can play in sustainable, resilient and adaptive delta livelihoods, we will raise awareness of the significance of ponds for delta development and climate policies amongst key decision-makers and communities themselves.

Innovation

Our ongoing research in pond health and sustainability has and will provide research-led solutions to tackling the impacts of climate change and resource exploitation of ponds. We will provide local scale assessments, via low cost citizen science initiatives, of pond water quality. This is vital to understanding the heterogeneous landscapes of deltas, where the focus to date has also been on the large, riverine systems that dominate them. Bringing interdisciplinary research on ponds into dialogue with delta wide monitoring provides a unique opportunity to work across scales and place pond health more centrally in academic and policy understandings of deltas. This will be one of the first pond monitoring programmes of this scale, putting ponds on the agenda of delta Governments and other stakeholders by providing extensive data on pond health and multiple threats they face. We will also showcase the significance of their effective management for local and global markets (e.g., Resolution 120 in Vietnam), and present a low-cost community-led means to monitor pond health.

Delta communities, who often inherit Government top-down approaches to their land management in settings such as Vietnam, will be empowered through new capacities to gather and make sense of data on pond health. By being able to fully assess the health of ponds, farmers will be able to better increase the quality of their yields and longevity of their ponds. Other community members will be better equipped to advocate for pond use strategies that protect their social, cultural, and economic stakes in the different ponds on which their lives and livelihoods depend.

People involved in this work

Name	Gender	Discipline	Work Package	Institution	Country
Phil Barker	M	Community science, water quality	Delta Baselines	Lancaster University	UK
Tarun Bisht	M	Land classification, remote sensing	Delta Baselines	Newcastle University	UK
Niki Black	F	Creative representations	Delta Voices	Newcastle University	UK
Sourav Das	M	Coastal oceanography	Delta Baselines	Jadavpur University	IN
Tuhin Ghosh	M	Coastal geomorphology & disaster management	Delta baselines Delta-level interventions	Jadavpur University	IN
Chris Hackney	M	Coastal & fluvial morphodynamics	Delta Baselines	Newcastle University	UK
Andrew Henderson	M	Water quality, pollutants	Delta baselines	Newcastle University	UK
Andy Large	M	Water quality, land use change	Delta Baselines	Newcastle University	UK
Suzanne McGowan	F	Freshwater science	Delta Baselines	University of Nottingham	UK
Heather Moorhouse	F	Community science, water quality	Delta Baselines	Lancaster University	UK
Do Thu Nga	F	Water quality modelling	Delta Baselines	VAST	VN
Phong Nguyen Tinh	M	Ecosystem services	Delta baselines	Hoasen University	VN
Lan Nguyen Thi Ngoc	F	Participatory research; community science	Delta voices Delta-level interventions	WARECOD	VN
Ashraf Opel	M	Development	External research partner	WATERAID	BN
Virginia Panizzo	F	Water quality	Delta baselines	University of Nottingham	UK
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