



Australia Awards

BANTEAY CHHMAR'S WATER RESOURCES:

Climate Change Impacts and Sustainable Management Strategies

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Institute of Technology of Cambodia (ITC)

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PROJECT CORE TEAM:

- **Ms. Sdok Soksreymeng** (Water Quality Expert)
- **Dr. Heng Sokchhay** (Hydrological Modeling Expert)
- **Dr. Ros Sayumphu** (Communication Expert)
- **Dr. Kuok Fidero** (Environmental Specialist)
- **Mr. Hong Reaksmeay** (Policy Development Specialist)

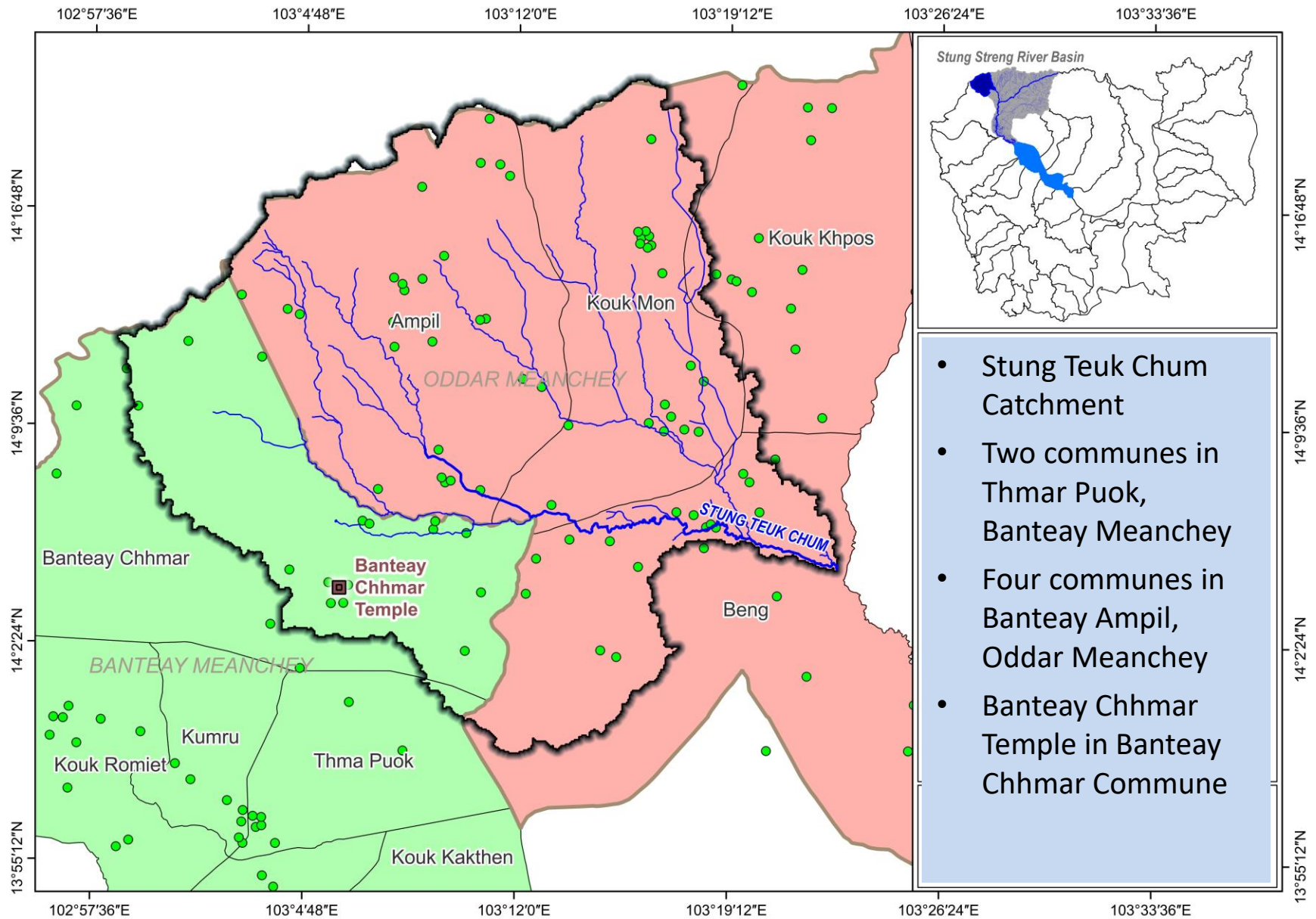


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2. Stung Teuk Chum Catchment
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5. Exploring the ancient hydraulic genius
6. Key issues and challenges
7. Water resources management framework
8. Contributions of the project



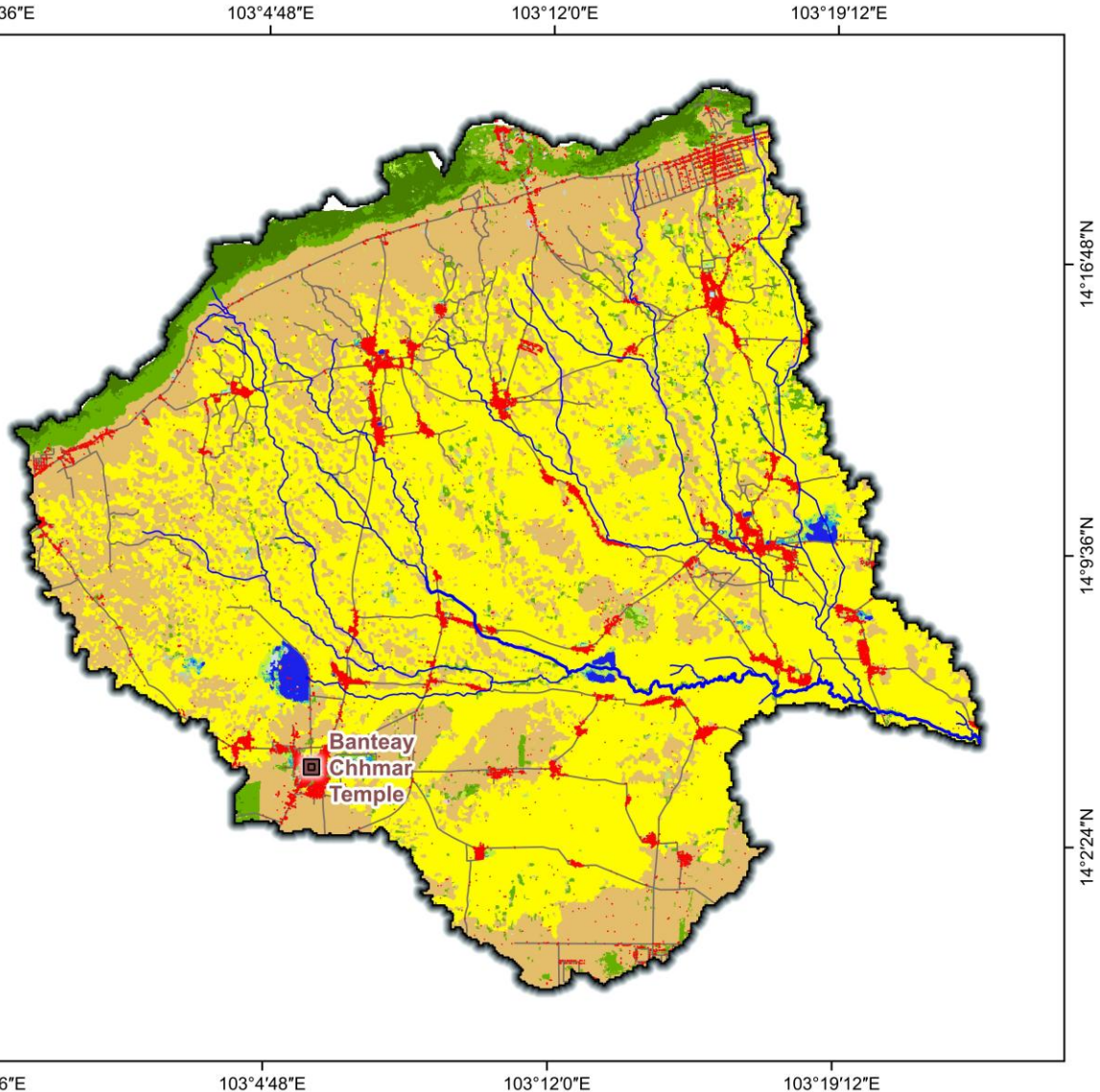
★ 1. ADMINISTRATION AND RIVER CATCHMENT



★ 2. STUNG TEUK CHUM CATCHMENT

Socioeconomics and Physical Landforms

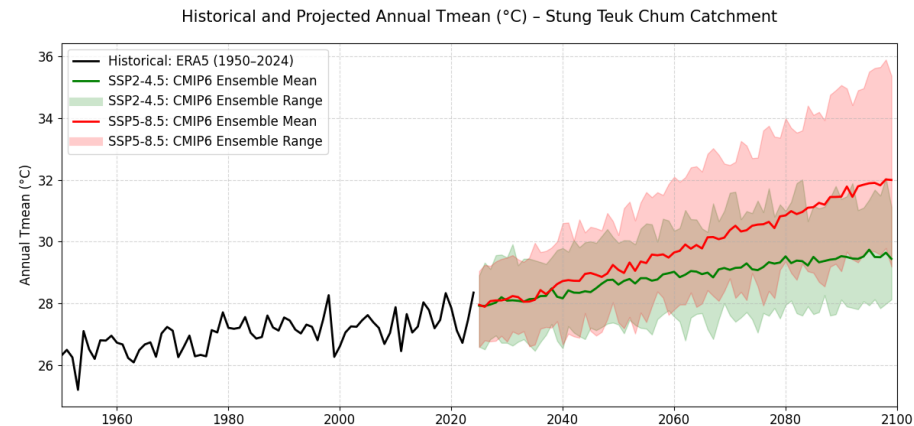
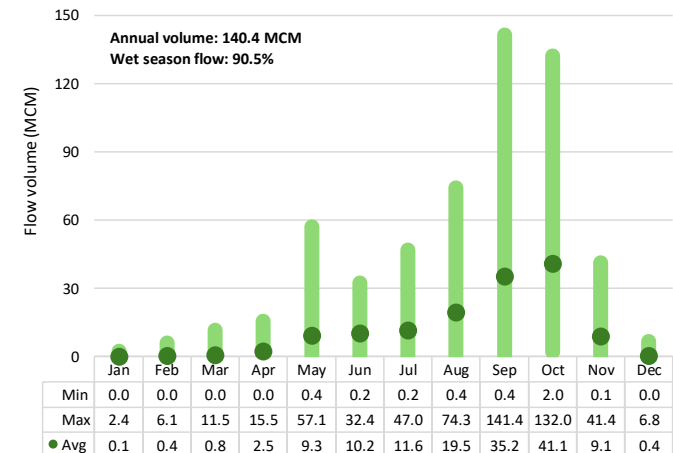
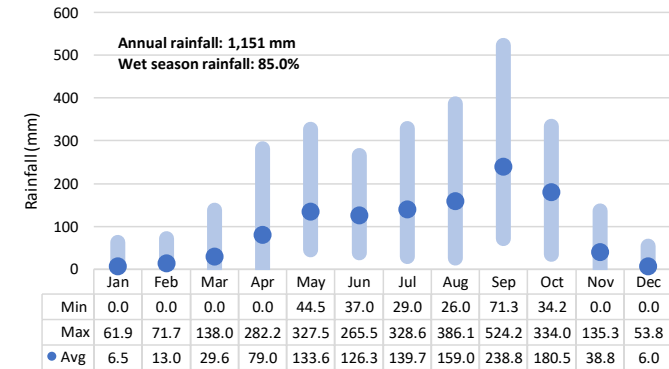
- **Number of villages:** 89
- **Number of families:** 18,769
- **Population:** 68,590 people
- **Farmer:** 45% of population
- **Pond water user:** 55% of family
- **Piped water coverage:** 14% of household
- **Access to latrines:** 77% of family
- **Electricity coverage:** 88% of household
- **Rice and croplands:** 88%
- **Forest:** 7.4%
- **Low fertility soil:** 91%
- **Ground elevation:** 65 m amsl



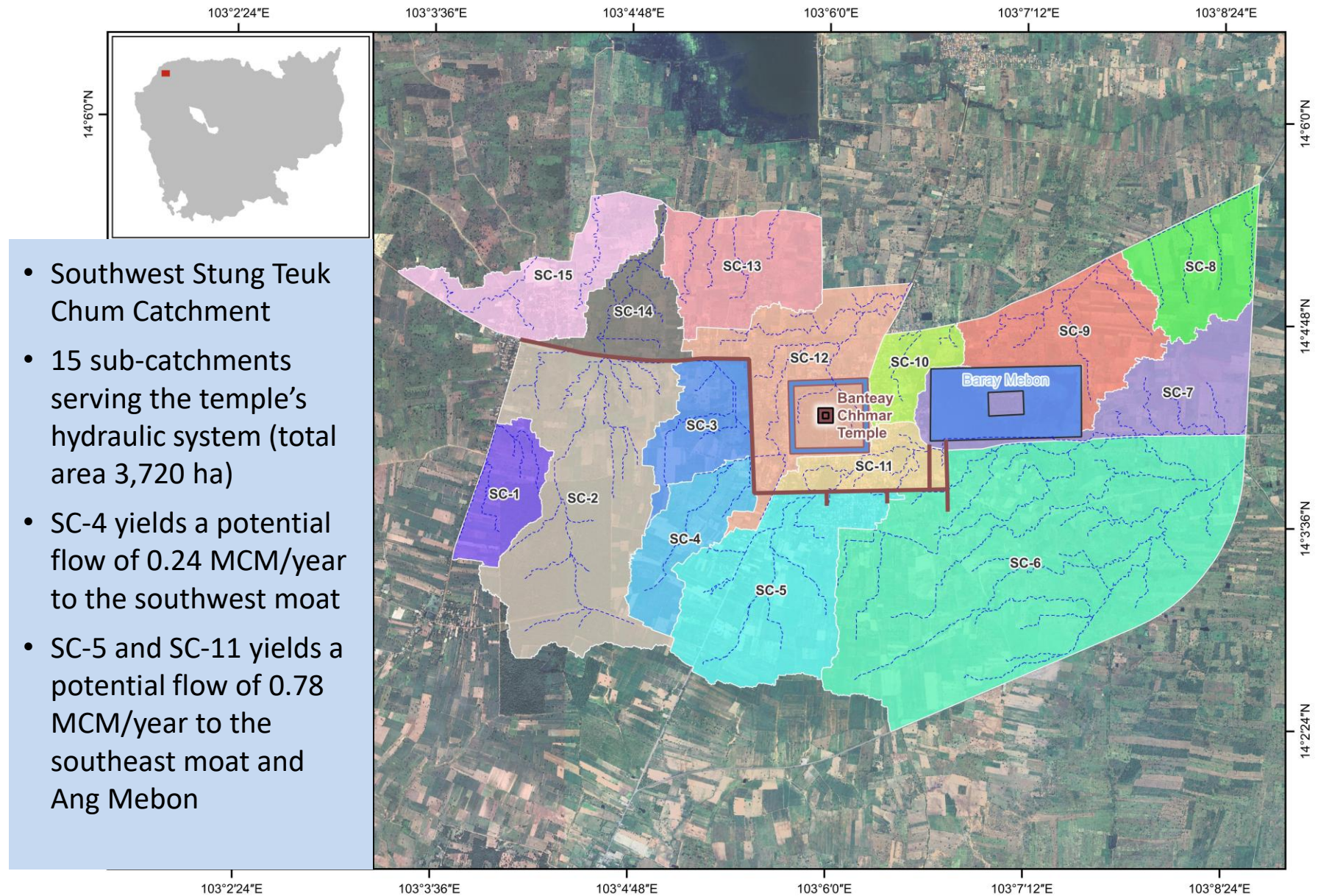
★ 2. STUNG TEUK CHUM CATCHMENT

Water and Climate Change

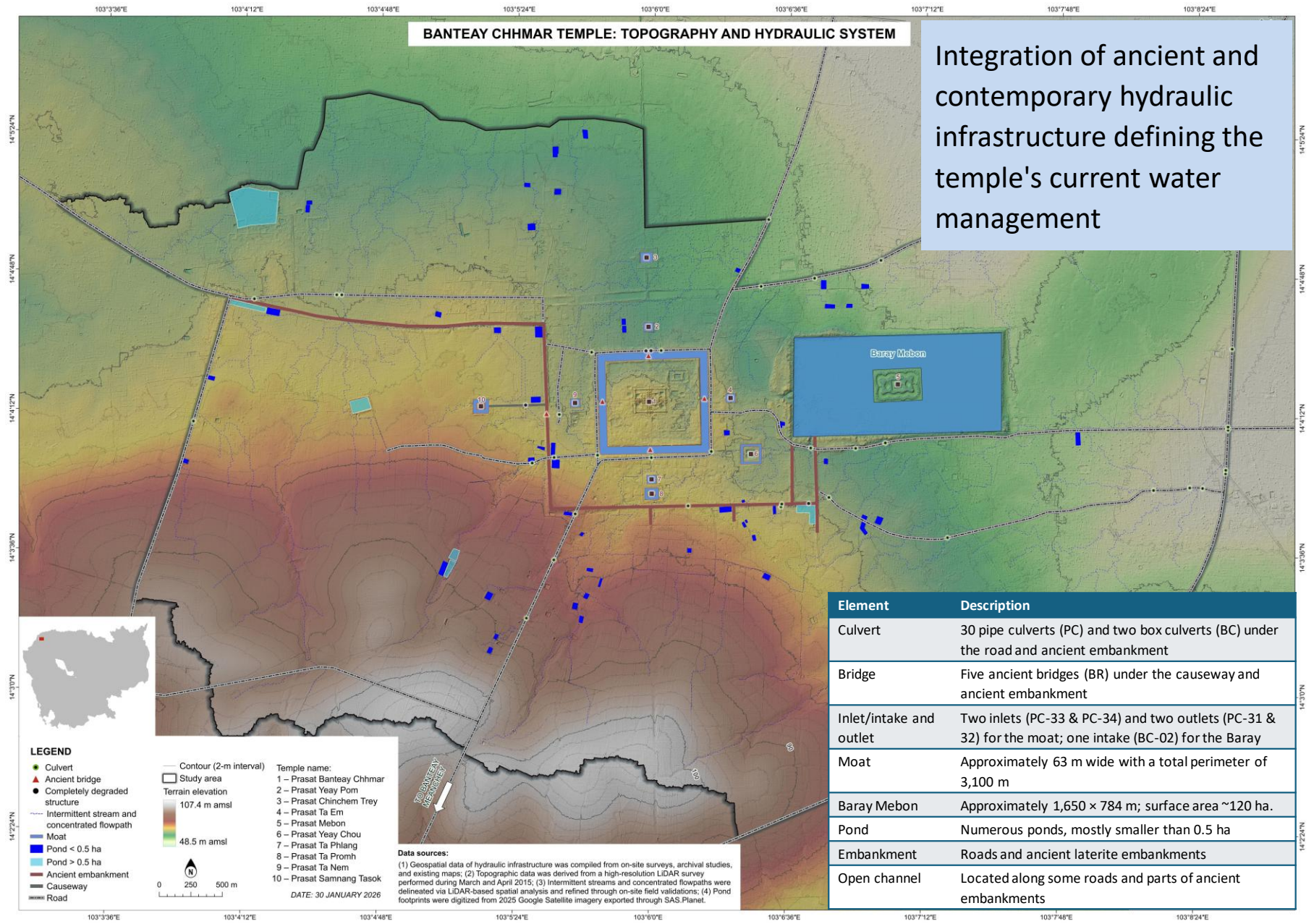
- **Rainfall:** 1,151 mm/year
- **Stream flow:** 140 MCM/year
- **Domestic water demand:** 1.5 – 2.5 MCM/year
- **Irrigation water demand:** 476 MCM/year (wet season rice)
- **Rainfall (1950–2024):** high inter-annual variability
- **Rainfall (2025–2100):** increase +0.4 to +0.5 mm/year
- **Temperature (1950–2024):** increased by +1.22 °C since 1950
- **Temperature (2025–2100):** increase +0.057 °C/year (high scenario)



★ 3. HYDROLOGICAL SYSTEM OF THE BANTEAY CHHMAR TEMPLE COMPLEX

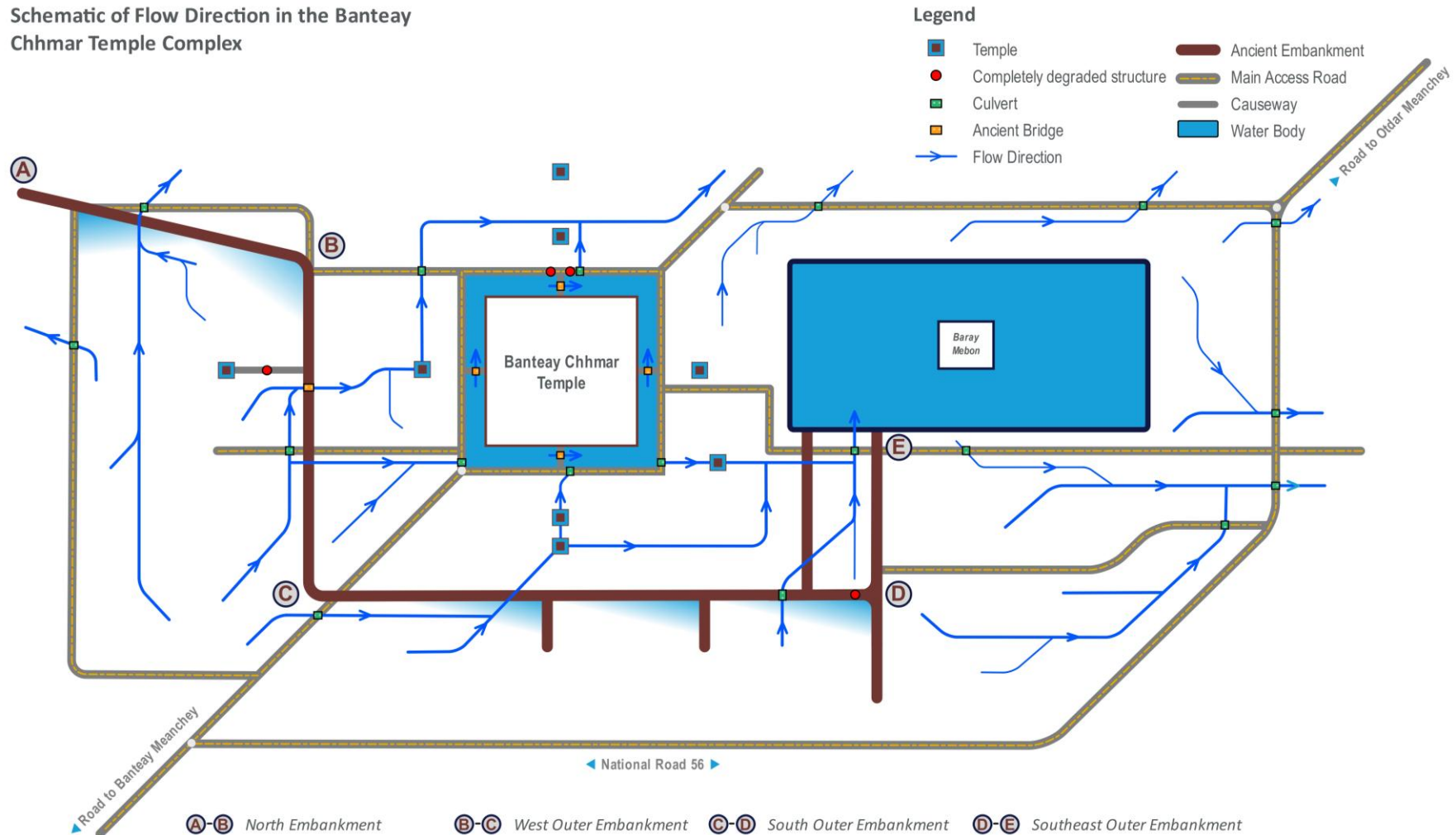


★ 3. HYDROLOGICAL SYSTEM OF THE BANTEAY CHHMAR TEMPLE COMPLEX



★ 4. HYDRAULIC SYSTEM OF THE BANTEAY CHHMAR TEMPLE COMPLEX

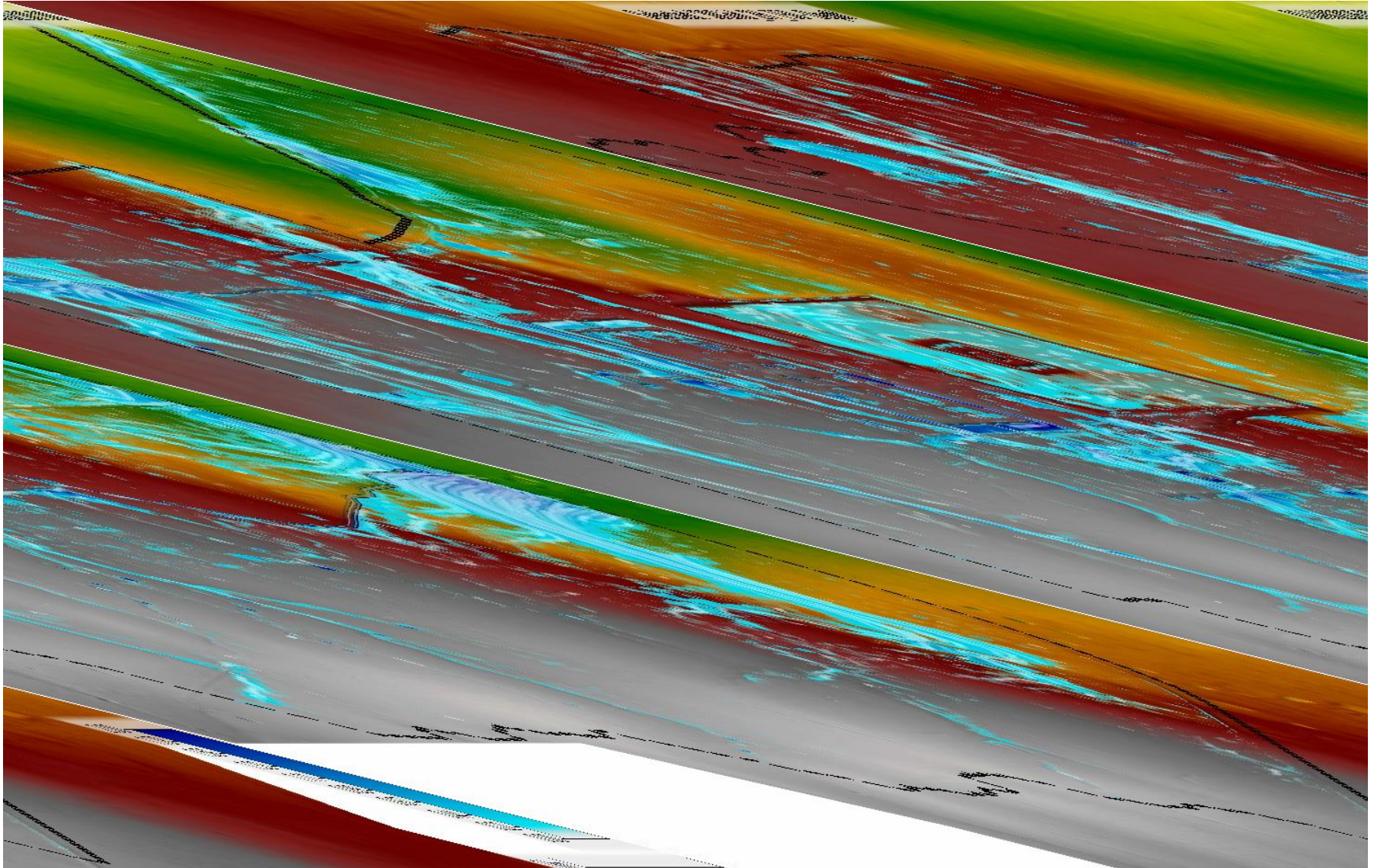
Schematic of Flow Direction in the Banteay Chhmar Temple Complex



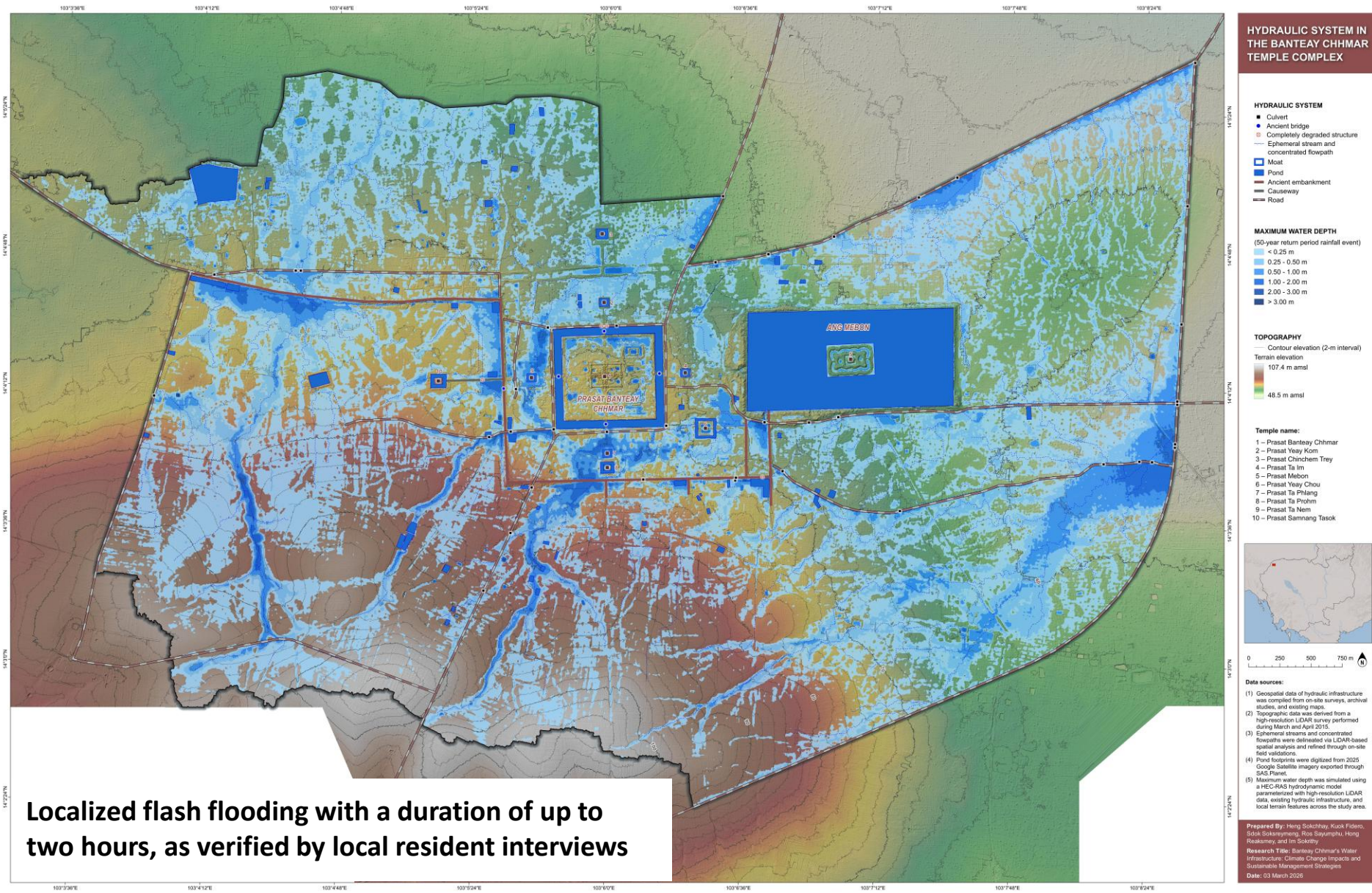
A simplified schematic of the integrated ancient hydraulic network and contemporary infrastructure

★ 4. HYDRAULIC SYSTEM OF THE BANTEAY CHHMAR TEMPLE COMPLEX

Refining hydraulic connectivity through advanced hydrodynamic modeling in HEC-RAS

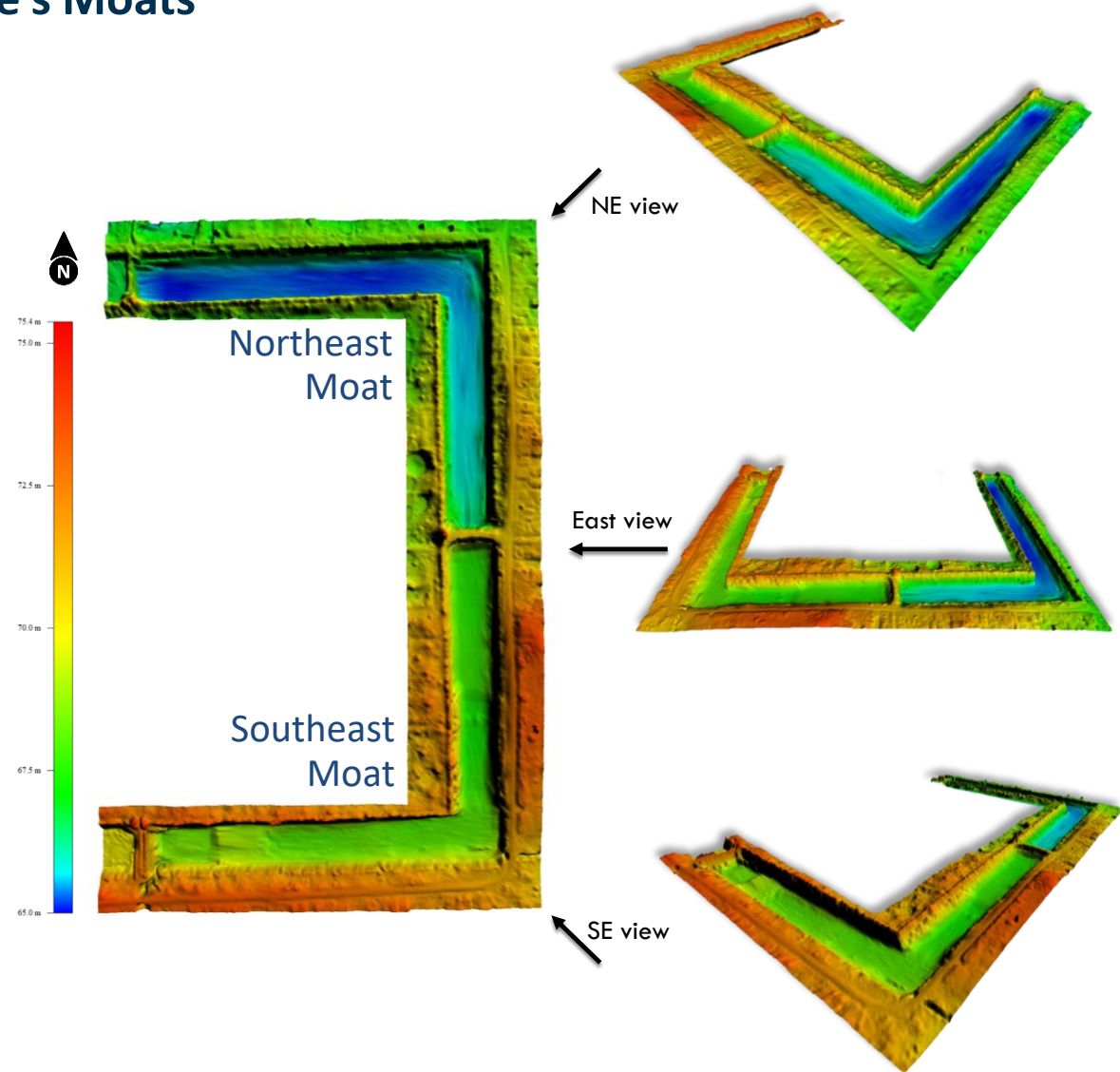


★ 4. HYDRAULIC SYSTEM OF THE BANTEAY CHHMAR TEMPLE COMPLEX



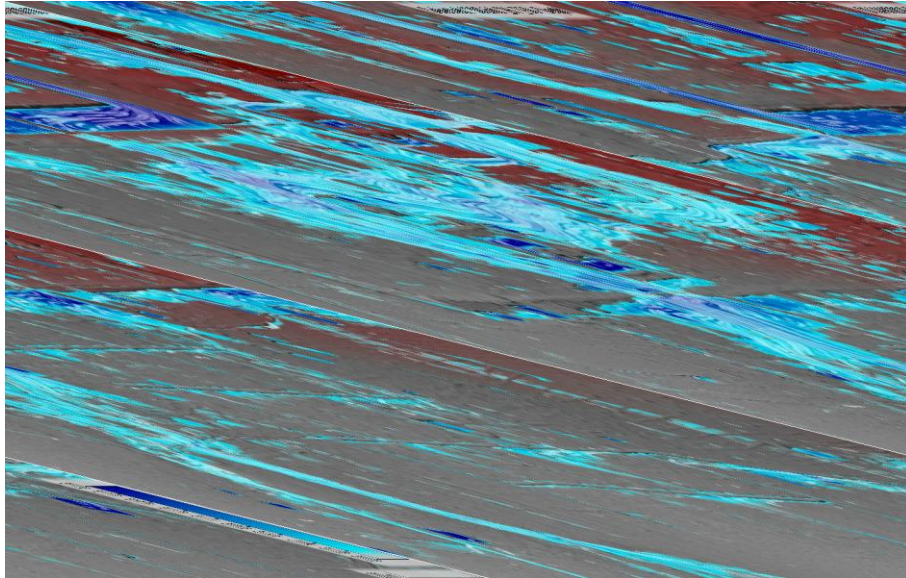
★ 5. EXPLORING THE ANCIENT HYDRAULIC GENIUS

Bathymetry of the Temple's Moats



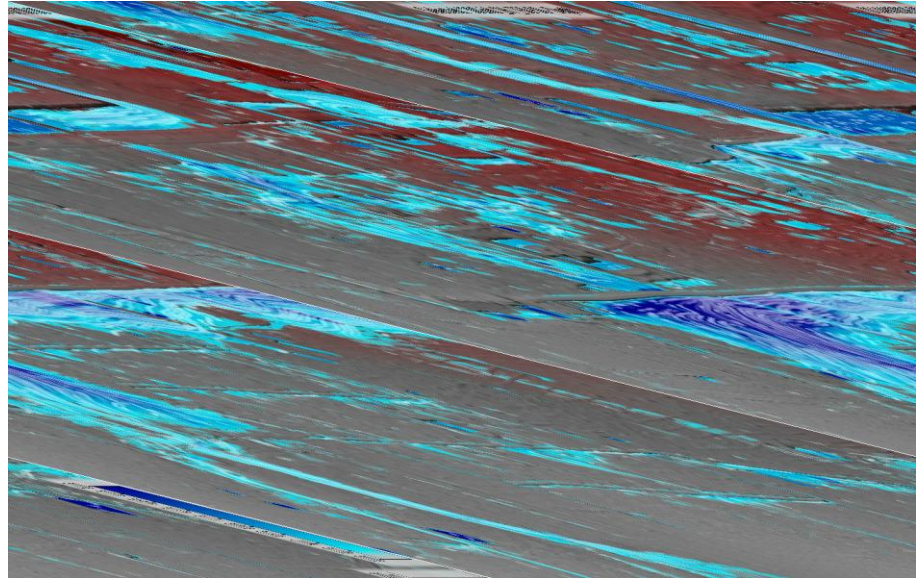
★ 5. EXPLORING THE ANCIENT HYDRAULIC GENIUS

Hydraulic Conditions: Present vs. Ancient



Present conditions:

1. Eroded embankment
2. No drainage facility
3. Flow overtopping
4. Flash flooding (2 h)



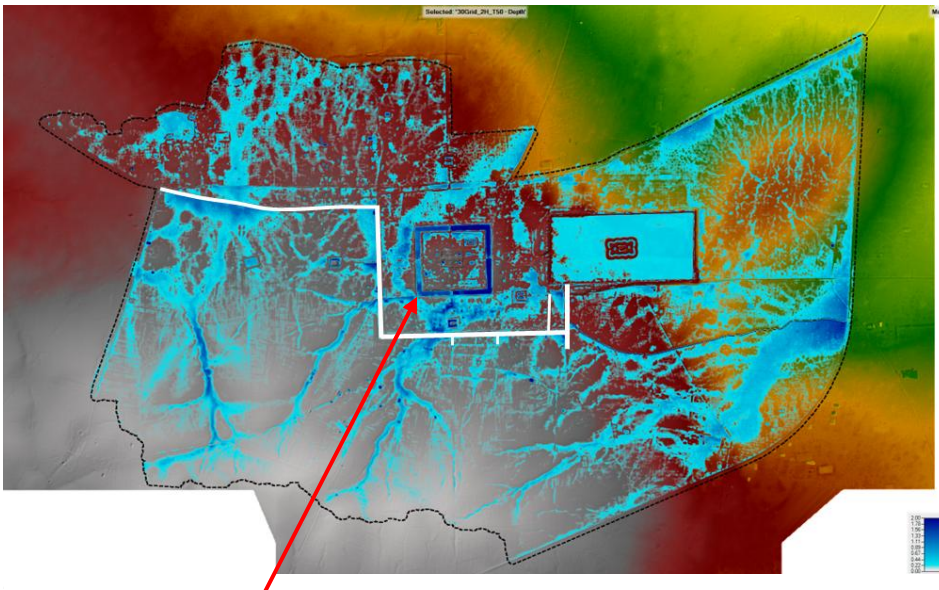
Ancient conditions:

1. Original embankment
2. Bridge as intake facility
3. No flow overtopping
4. No flash flooding

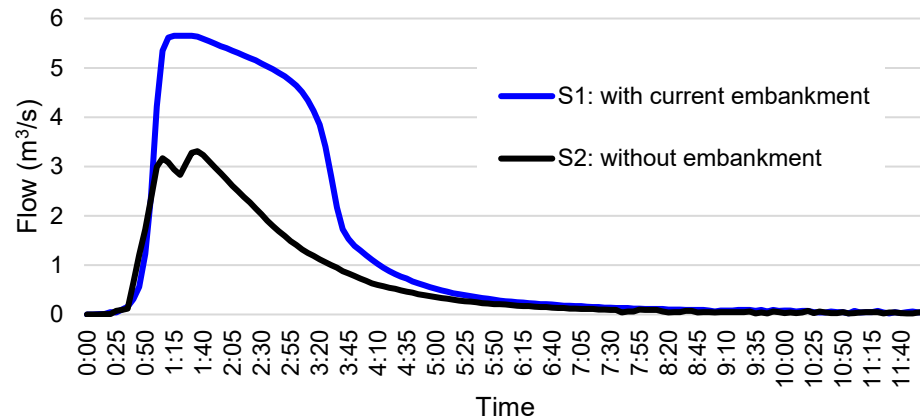
★ 5. EXPLORING THE ANCIENT HYDRAULIC GENIUS

Hydraulic Impacts of Ancient Embankments

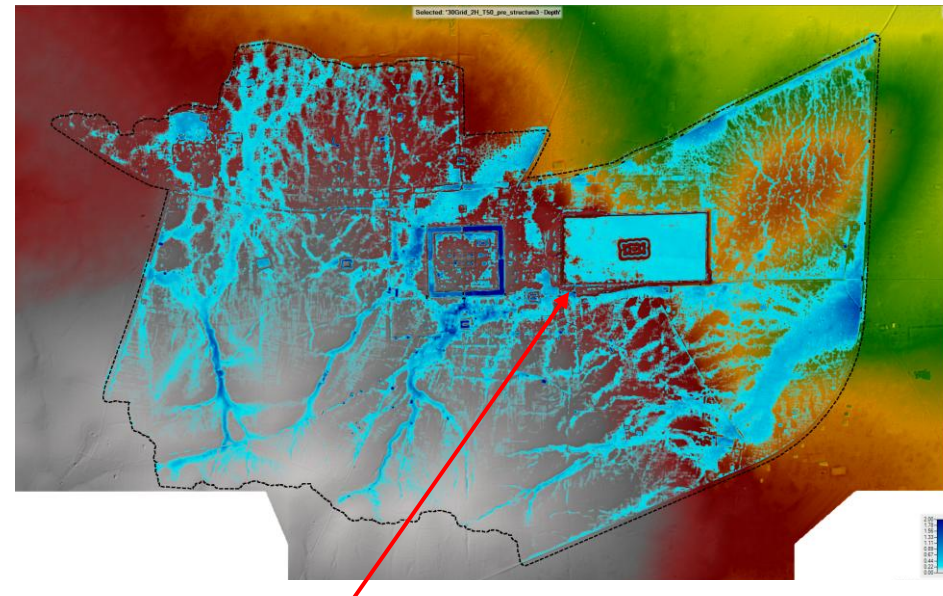
Constructed the embankment



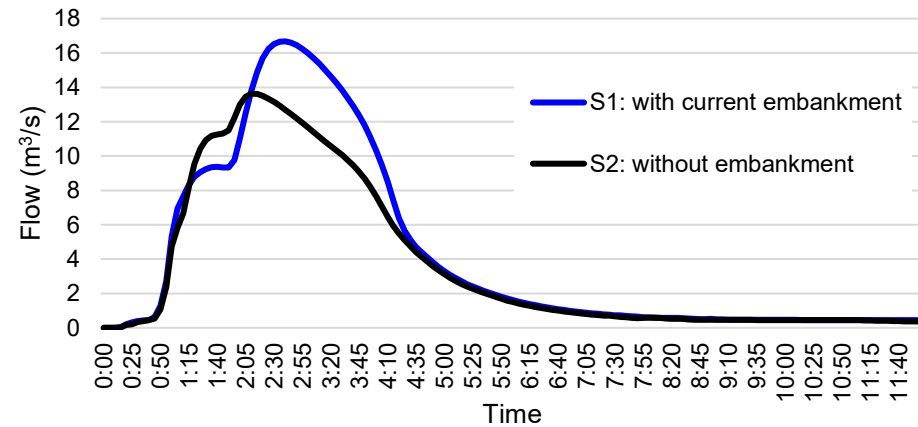
Flow into the southwest moat



Did not construct the embankment



Flow into Ang Mebon

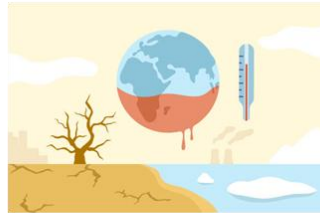


★ 6. KEY ISSUES AND CHALLENGES



Water Insecurity & Imbalance

- **High vulnerability:** About 70% of the population relies on unimproved, open-water sources, leaving them exposed to seasonal shortages and contamination.
- **Massive deficit:** Annual irrigation demand (476 MCM) far exceeds the average annual catchment yield (140.4 MCM).
- **Aquifer stress:** Groundwater storage is declining at a rate of -1.922 mm/month, indicating that extraction is outpacing natural recharge.



Climate Change & Environmental Shifts

- **Temperature rise:** The region has warmed by $+1.22$ °C since 1950, with future projections suggesting intensified heat and "flash drought" risks.
- **Deforestation:** Forest cover plummeted from 47% (2000) to 7% (2023), accelerating soil erosion and siltation of ancient water structures.



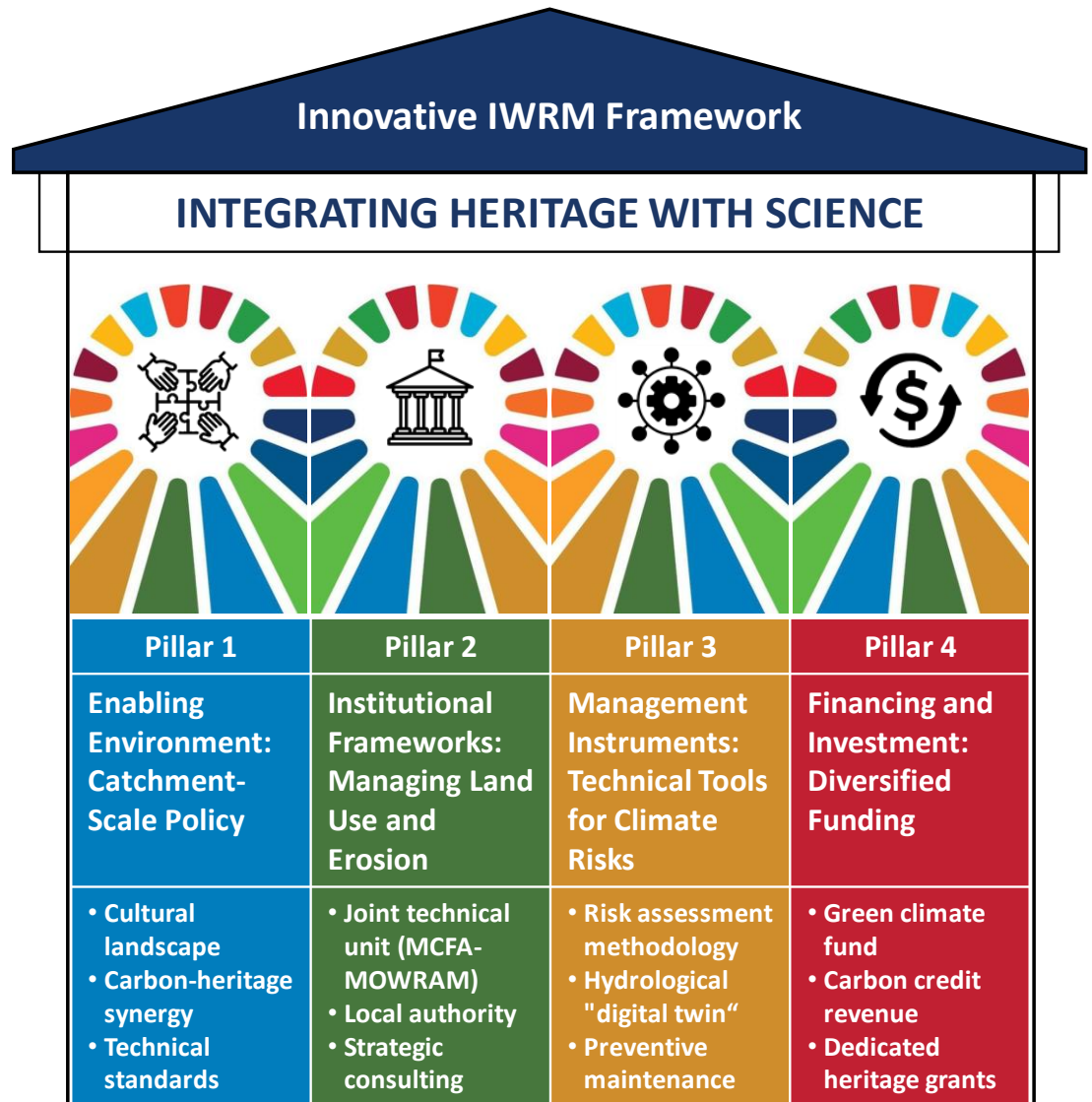
Hydraulic System Deficiency

- **Overflow and embankment failure:** Flash flooding occurs due to hydraulic bottlenecks at undersized or missing culverts and compromised sections of the embankment
- **Operational constraints (lack of control structures):** All current hydraulic elements are ungated, restricting active flow regulation and emergency isolation during extreme events.

★ 7. WATER RESOURCES MANAGEMENT FRAMEWORK

Integrated Approach To Achieve A More Sustainable Future

- ❖ **GWP:** Implements IWRM principle to bridge governance, technology, and finance
- ❖ **UNESCO:** Combines ancient water wisdom with modern data to manage climate risks
- ❖ **ICCROM:** Uses risk assessment method to identify water-related threats to ancient masonry and foundations
- ❖ **ICOMOS:** Views water systems as "Cultural Landscapes," active assets for community resilience rather than just relics

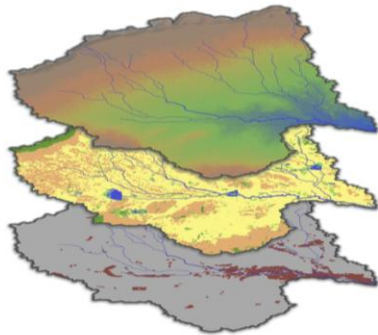


★ 8. CONTRIBUTIONS OF THE PROJECT

1. **Map Poster:** A visual mapping tool for local communities and relevant authorities to communicate flood risks and management planning
2. **Stung Teuk Chum Catchment Profile:** Consolidation of fragmented data and technical information to establish a baseline for integrated water resources management and future research
3. **Peer-reviewed Publications:** Journal manuscripts to broader share study findings with the wider scientific community
4. **New datasets:** To foster future investigation and research within the basin

Study Report:

BANTEAY CHHMAR'S STUNG TEUK CHUM CATCHMENT PROFILE



January 2026



BANTEAY CHHMAR TEMPLE
METEOROLOGICAL
STATION

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ប្រាសាទបន្ទាយច្បារ

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