



The Fifth
International Symposium on
Flash Floods in Wadi Systems

Outcomes of the Special Seminar on Flash Floods Risk at UNESCO World Heritage Sites (WHS)

Sameh Kantoush

WRRC, DPRI, Kyoto University



Purpose of the WHS Special Seminar

- This Special Seminar focuses on flash flood disaster at UNESCO World Heritage Sites in Middle East and North Africa Archaeological Wadis from scientific, engineering and implementation perspectives and discusses the potential project implementation in Petra.
- Past experiences and running projects by Kyoto University research group on disaster risk assessment for flood prone at UNESCO WHS as Petra and Valley of Kings, JICA efforts for flood DRR, and UNESCO projects are shared during the seminar.
- This seminar highlights the efforts of Petra Authority to reduce the flash flood risks. However, the implemented single management strategy is not enough.
- In collaboration with Nippon Koei and UNESCO three potential projects have been proposed for WHS in the MENA region.

World Heritage Sites in The Arab Region



Result Views

86	0	1	21	78	5	3	18
Properties	Transboundary	Delisted	In Danger	Cultural	Natural	Mixed	States Parties

Region: Arab States Display by: Country

Legend

Category of site

◆ Cultural site ● Natural site ● Mixed site

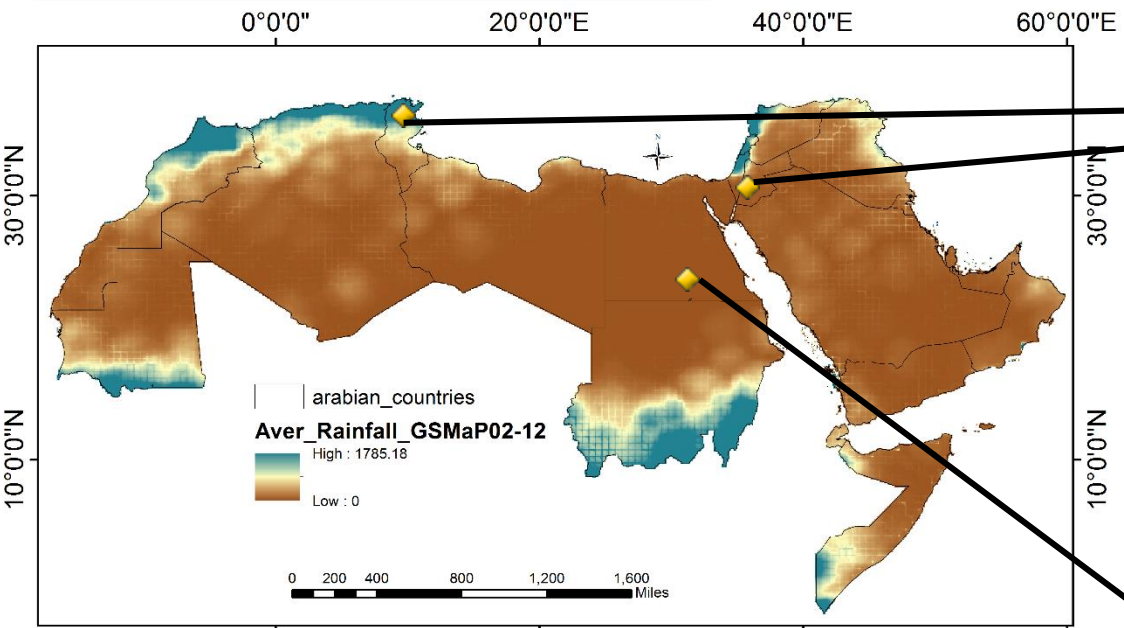
Site inscribed on the List of World Heritage in Danger

◆ Cultural site ● Natural site ● Mixed site

Source: World Heritage Center website

Flash flood risks in the World Heritage sites in the MENA region

Rainfall in the MENA Region



Damage examples at World Heritage sites

Petra (Jordan)

Carthage (Tunisia)

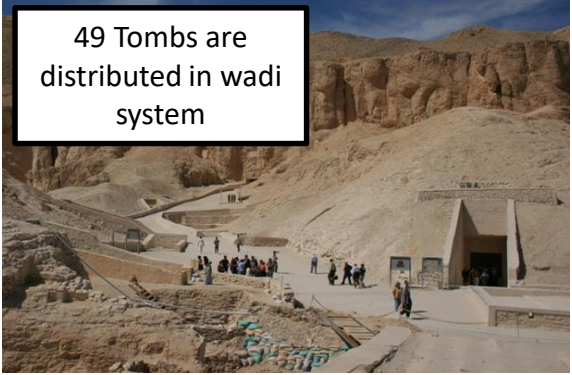
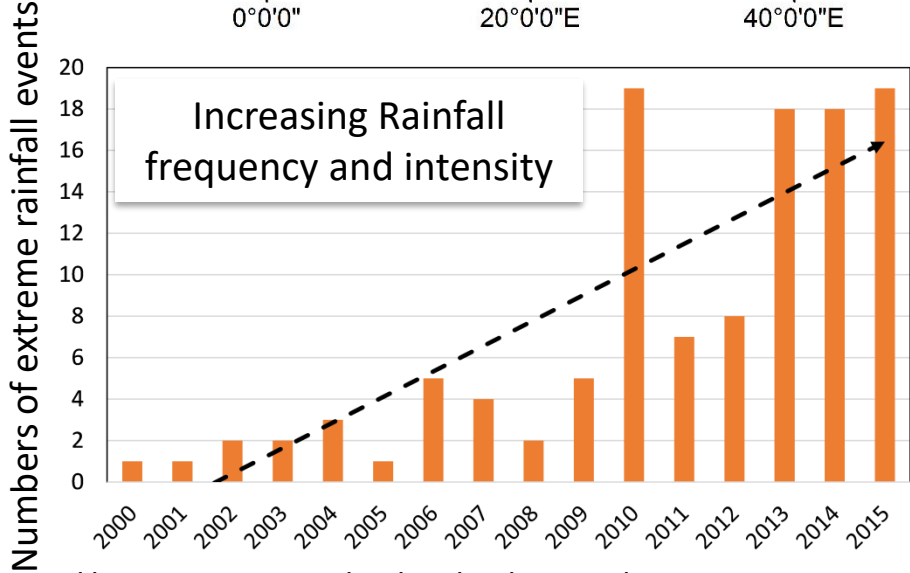
Flash Flood in 2018



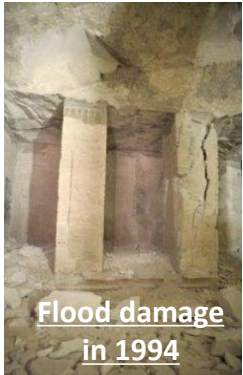
Affected tourists



Valley of Kings (Egypt)



49 Tombs are distributed in wadi system



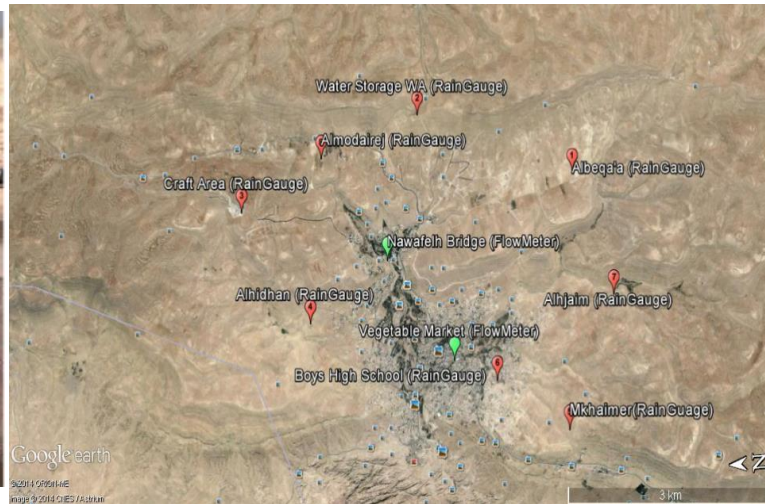
Flood damage in 1994



Urgent action needed for FF

What we discussed

- We discussed the current situation and issue to be solved in Petra
- Recent flood events on 2018 caused >3,000 tourists for evacuation
- Existing monitoring devices did not work during the event



- Develop EWS to increase: Accuracy; Reliability; Lead time for floods. Inclusion of other places with the EWS
- Developing the current administrative body
- Technology Transfer (structural and non-structural)

Technology Transfer from Japan

- (1) Technologies for meteorological and hydrological measurements and numerical analyses/ simulation
 - Rainfall radars, **3L-type water level sensors (Long-life, Less cost and Localized)** , Closed Circuit TV system, etc.
 - Interpretation technologies of satellite imagery
 - Flood forecasting with numerical simulation models
- (2) Structural measures
 - Comprehensive flood management and flood retarding measures **(flood retention dam, Cemented Sand and Gravel dam construction method: CSG)**
 - Countermeasures for sediment yield reduction
- (3) Non-structural measures
 - Flood forecasting and warning, and evacuation system
 - Hazard maps and risk maps
 - Community-based disaster management

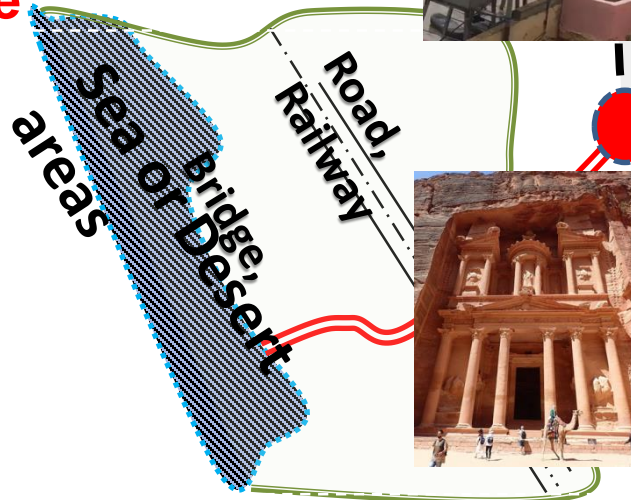
Objectives, Methodology and Outcomes

① Analysis of Historical Flood Records

→ Filling the gap of information shortage in the MENA Region

② Development of Rainfall – Runoff Model

→ Quantify flood risks and assessment of effects of counter-measure



Wadi basins including WHS

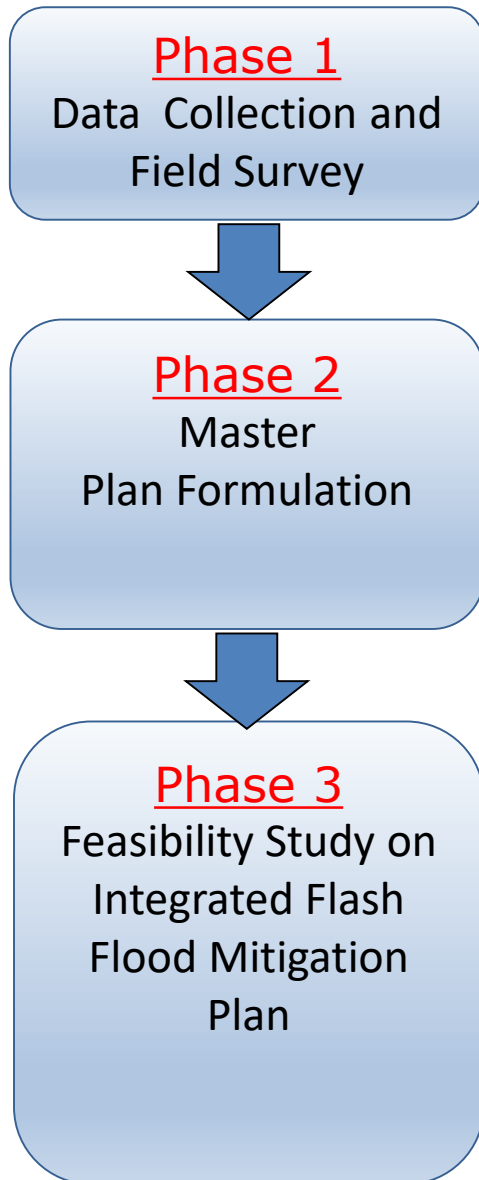
④ Development of sharing tool for Risk Information

→ Secure quick and overall information sharing network

⑤ The Fifth ISFF in Kyoto, Japan

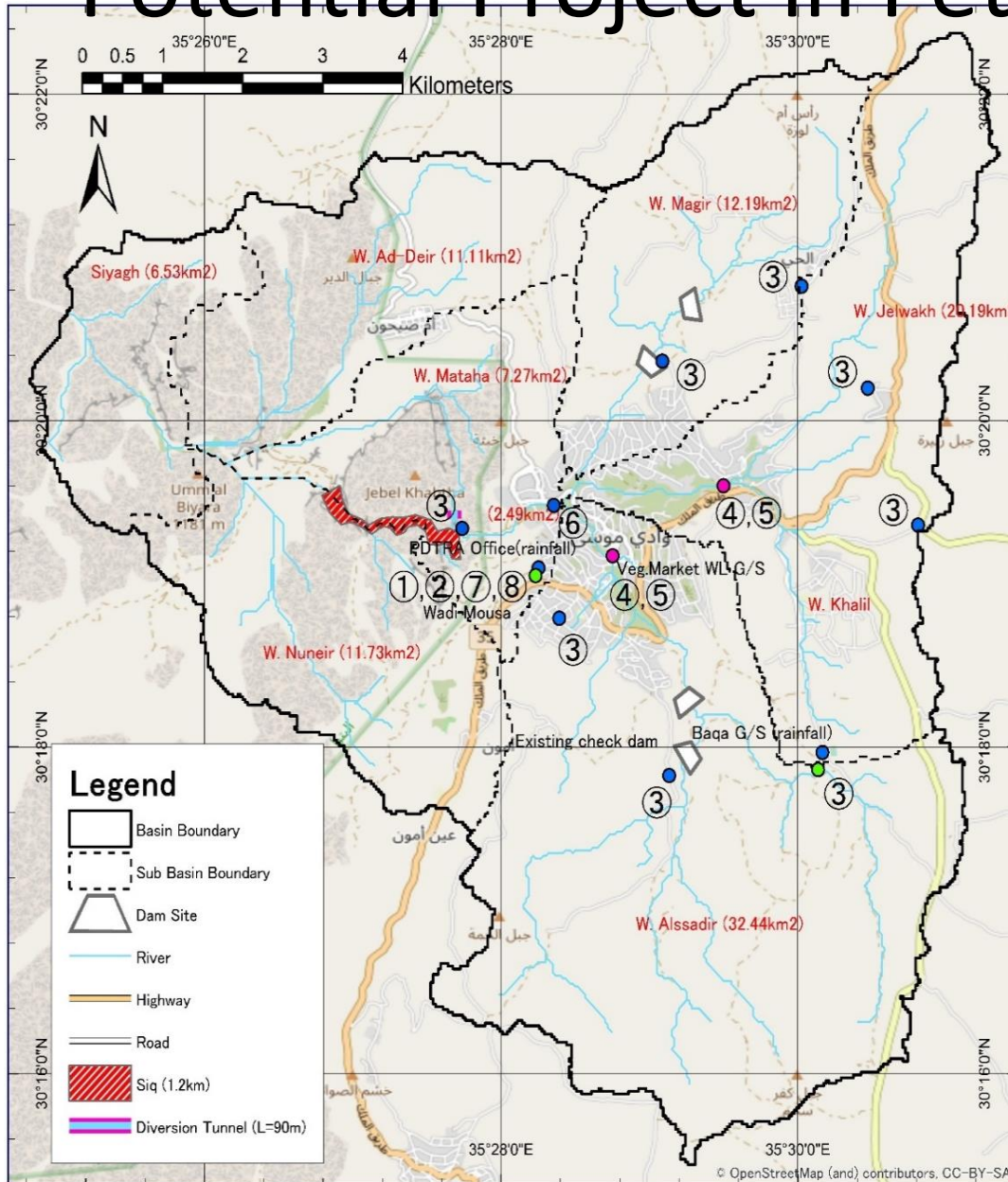
→ Sharing information among Researchers and Stakeholders to Promoting International Collaboration

Potential Project in Petra: ODA-Project 1



- Upgrade the existing EWS installed in W. Mousa watershed
- Propose suitable countermeasure to protect local residents and tourists who will visit Petra as well as urban areas in Wadi Mousa.
- Implement integrated sediment management in the Wadi system
- Enhance groundwater recharge for efficient water resources management

Potential Project in Petra: SDG Project 2



Type of Monitoring Facility

- ① Satellite remote sensing
- ② X-band rain radar
- ③ Ground rain gauge
- ④ Water level gauge
- ⑤ Flash flood impact gauge (Impact sensors)
- ⑥ ITV camera system
- ⑦ Early warning data analyzing system
- ⑧ Early warning transmission system with siren and ICT (area mail with mobile phone etc.)

Layout of Planned/Proposed Monitoring Stations

Proposed Project by UNESCO Cairo Office In collaboration with Kyoto University

