



Summaries, Outcomes and Roadmap of ISFF

The Fifth International Symposium on Flash Floods in Wadi Systems (ISFF 2020)
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Wadi Basin Research Challenges

1- Meteorology

Climate prediction experiment (high resolution GCM data)
Extreme weather and climate change adaptation
Downscaling experiments with a regional numerical weather prediction model

3- Hydrology

Hydrological Modelling

6- Mitigation and Adaptation

7- Coastal issues: Beach Erosion and Human interventions

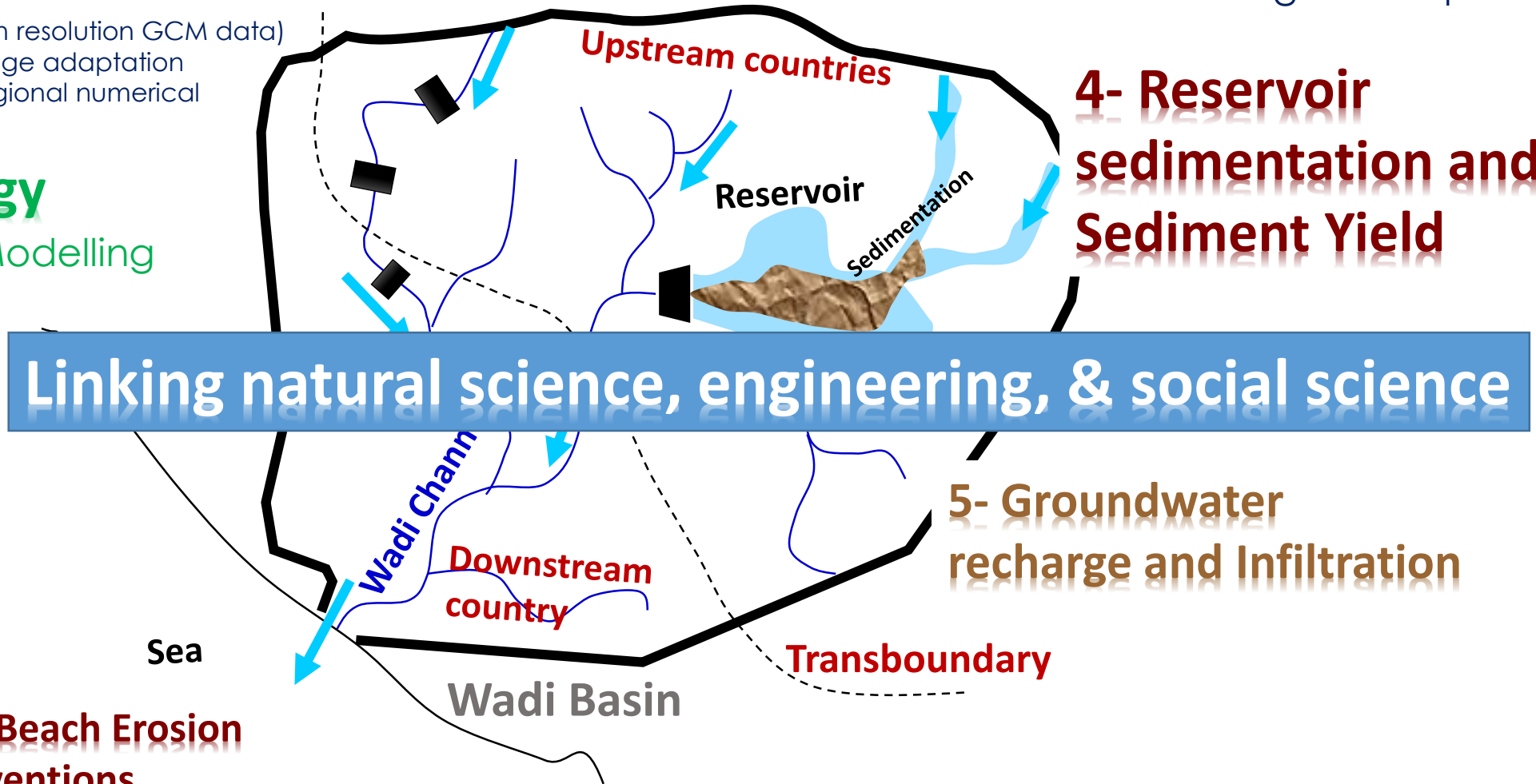
shoreline change
Relationship between shoreline change and recharge dam construction

2- Monitoring: Database, advanced monitoring techniques

4- Reservoir sedimentation and Sediment Yield

5- Groundwater recharge and Infiltration

8- Society and environment



Current achievements and future directions

🌐 Establishment of ISFF Network

- Annual series of meetings and discussions
- Capacity development training courses
- Exchanged of students and researchers
- Shared knowledge and promoting collaboration on WaFF disaster
- Evaluated of past research activities and national strategies (some countries /Questionnaire)
- Identify the research gaps and needs for integrated flash flood management
- Various case studies reports with hydrological modelling efforts
- Formation of bilateral collaboration projects with Oman and Egypt (UNESCO project)
- Publications (urban water, Springer DPRI series and special issue)

Floods in MENA region: From threat to opportunities

✦ Reservoir storage adaptation

From Prof. Dalila Loudyi

- Countries with a high variation in precipitation require a higher adaptive capacity (e.g. Morocco, Tunisia, Jordan, Oman) and decentralized reservoirs.

✦ New urban planning approaches

- New Urban Development Master Plans should integrate risk mapping:
- Harvesting integration in urban planning at buildings, local and regional levels.

- ✦ New hydro-meteorological stations in the different climatic areas of the region benefiting from ICT technologies in filling the gap of data scarcity and data sharing (sensors, radars, IoT, Big Data)

- ✦ New flood Early Warning System with ICT integration (AI)

Major Recommendation from past ISFF

- **Platform and public domain** for sharing data and information on wadi hydrology
- Impact of **climate change** on the variability of wadi hydrology
- Flood management with **sediment management**
 - Measurements, modelling and trapping techniques (**debris dams**).
 - Assessment of sediment transport and deposition during and after flash floods and **long-term accumulation/loses** in the reservoir
- Flood maps should be updated in hot spot regions (i.e. with rapid urbanization)
- Paradigm shift **from reactive to proactive approach in DRR**.
- Unified **regional early warning system** in the Arabian region
- Educational and awareness programs for **community based risk awareness and preparedness**.
- New methodologies.
 - Numerical modelling tools
 - Monitoring techniques with **steel plate impact sensors** and **camera**.
 - Estimation of paleo flood and morphological changes with **satellite data**⁵

Knowledge gap

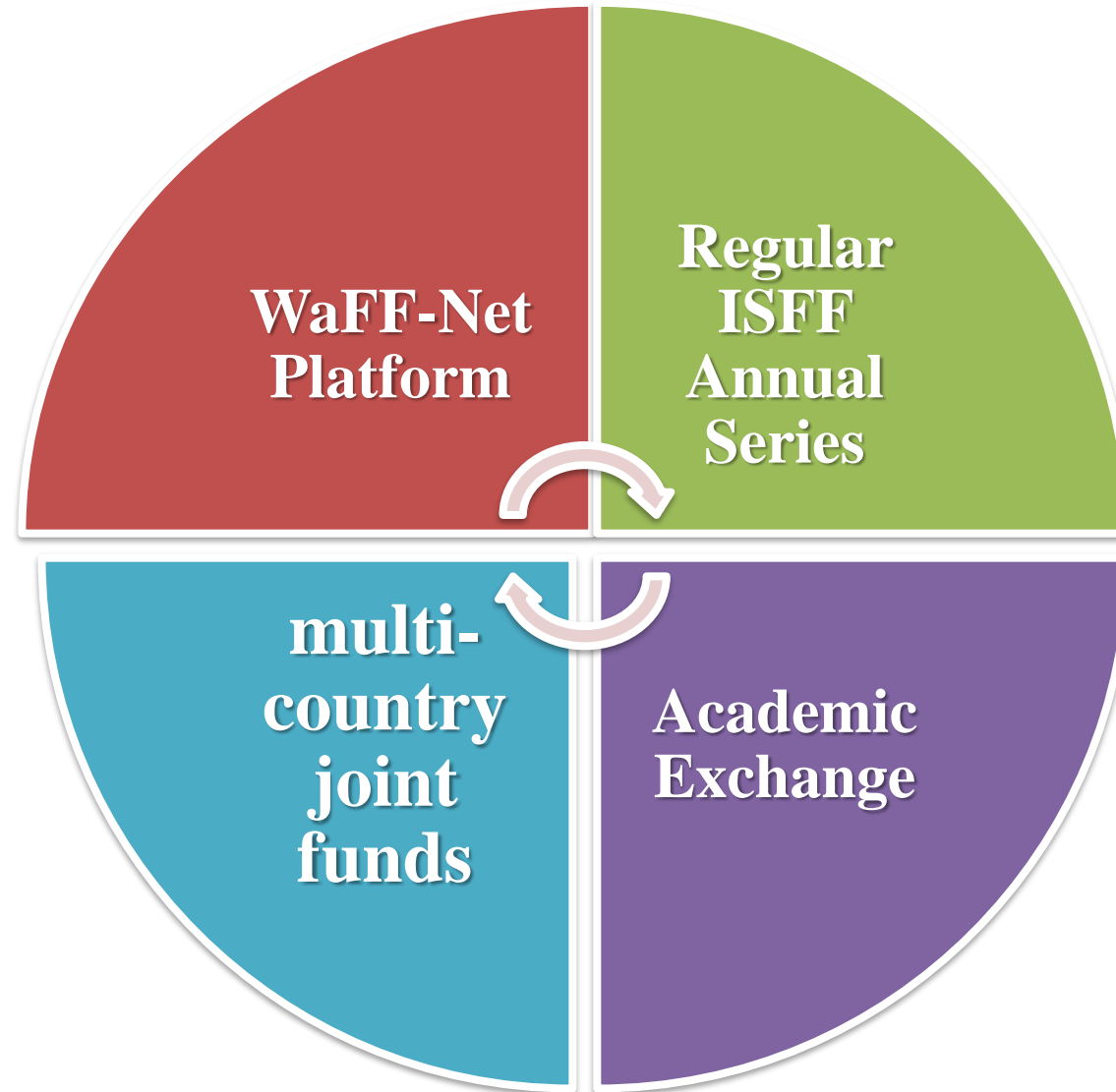
- Limited number of efficient and reliable rain gauges (with low density coverage) and poor runoff records
- Uncertainties in the rainfall from satellite data without bias correction of long-term calibration
- How to assess the impacts of climate change on cyclones and extreme rainfall in the arid region (Oman)?
- Groundwater uplifting in UAE (rising water tables, usually it was low, other country?)
- Clarify the interrelationship between drainage pattern, infiltration capacity and sedimentation (recovery)
- Key technologies for various data related to rainfall, runoff, water level, high-resolution DEM, and topography
- Construct/Updated IDF curves for a better water infrastructure conception and design
- Lack of preparedness to face flood disasters
- Limited methodological approach to characterize flood vulnerability assessment in MENA (flood risk integration in Urban planning (Index based approach,..etc)
- Need for a coherent set of policies to face the impact of flood disasters
- Lack of flood risk mapping is a key obstacle to the implementation of soft measures and urban growth
- Limited studies for cost-benefit analysis of implemented structural measures for flood control

Future Activities

- Intensive research groups from different countries (regional similarity IDF curves based on meteorological classifications)
- Multilateral/ regional guidelines: Develop MENA region standards
- We would like to started multi-lateral transdisciplinary project universities, government and companies.
- Four region specific pilot projects: Transfer knowledge to other target wadis with similar scientific questions.
- The flash flood issue is considered as multidisciplinary research that needs several disciplinary, innovative techniques and technology.
- The aim of such multi-lateral countries, Multi-disciplinary expertise of researchers and professionals from Japan, Europe, USA, and Egypt, Oman, Sudan, Morocco, Alegria, Tunisia, Jordan, Yemen, Saudi Arabia, UAE, ..in order to develop the sustainable system for flash floods integrated management including prediction, mitigation and water harvesting
- Disaster record Database from each countries
- Feedback to the government in your country: National approaches, standards and strategies (questionnaire for national master-plans)
- Create local national network

To develop **WaFF-Net** platform for Wadi Flash Flood disaster research outputs

To establish working groups from different research areas/ countries



Future Research Directions: ISFF Potential projects

ISFF Transboundary

Wadi Medjerda

Implementation of
development

ISFF Networking for Better Monitoring

South-South Project

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ISFF - UNESCO

Education and Training

Socio-Economic studies

ISFF – Publications Educational

Flash Flood Resilience

Community
involvement

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

Required Wadi Monitoring

- Reservoir Water Level
 - Interval Camera
- Reservoir Bathymetric Survey
 - Single Beam or Multi Beam Scanning
- Inflow turbidity
 - Automatic Turbidity Sensor
- Flow and river bed configuration
 - Interval Camera, Drone



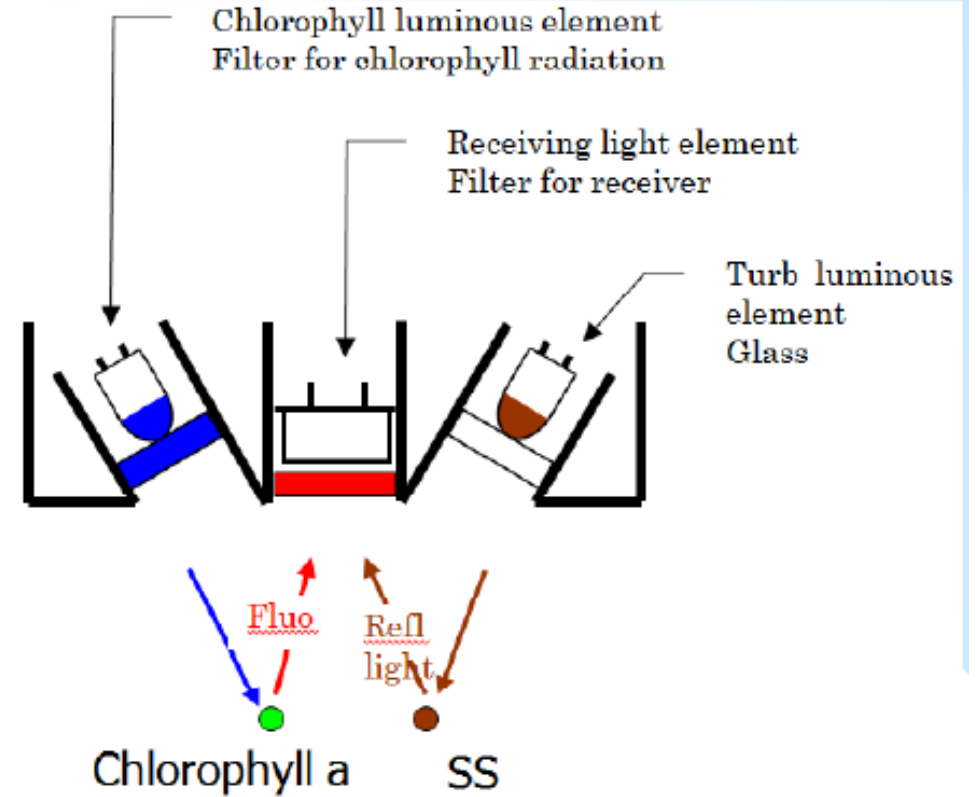
Time Lapse Camera



Automatic Turbidity Sensor with wiper INFINITY-Turbi ATU75W2-USB



Dimensions
 ø70mm × 280mm
 Weight
 Approx. 1.4kg in air



Medium density turbidity

High density turbidity

Principle

Infrared backscattering (LED) Backscattering
 (optical fiber) Semiconductor sensor Thermistor

Range

0 to 1,000FTU

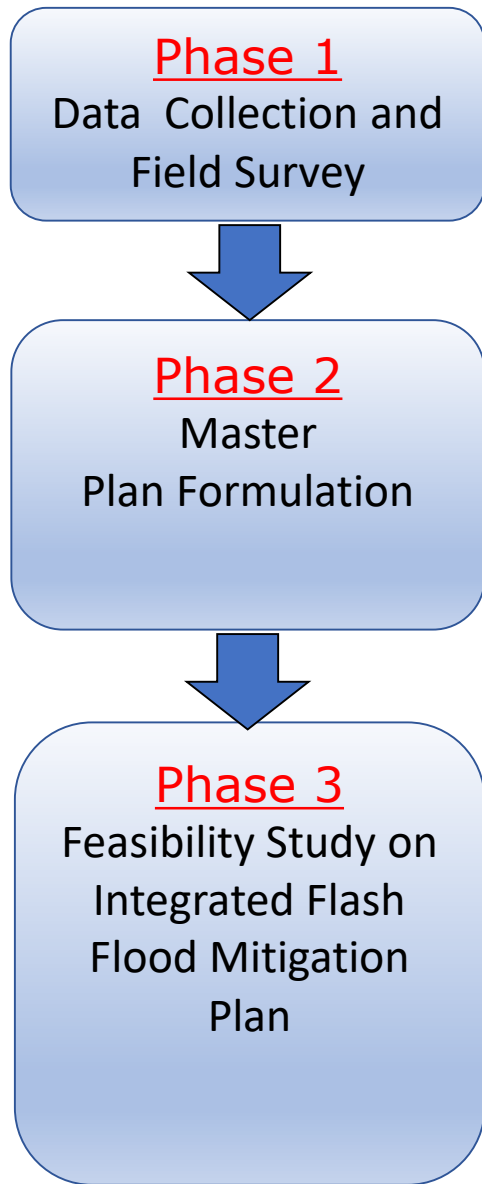
0 to 100,000ppm

Resolution

0.03FTU

2ppm

Potential Project in Petra: ODA-Project 1

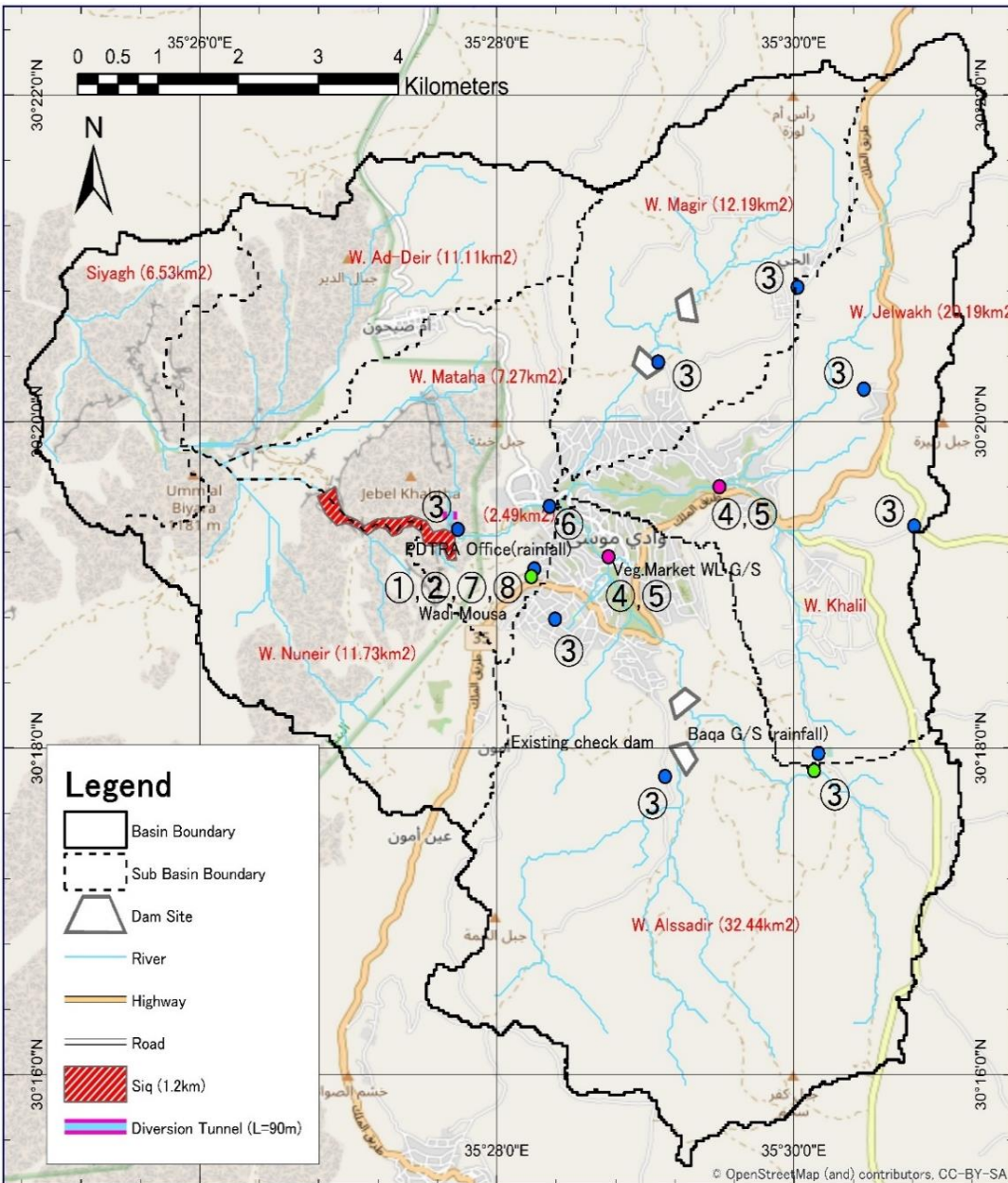


- Upgrade the existing EWS installed in W. Mousa watershed
- Propose suitable countermeasure to protect local residents and tourists who will visit Petra as well as urban areas in Wadi Mousa.
- Implement integrated sediment management in the Wadi system
- Enhance groundwater recharge for efficient water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

Possible Funding/ Resource Requirement

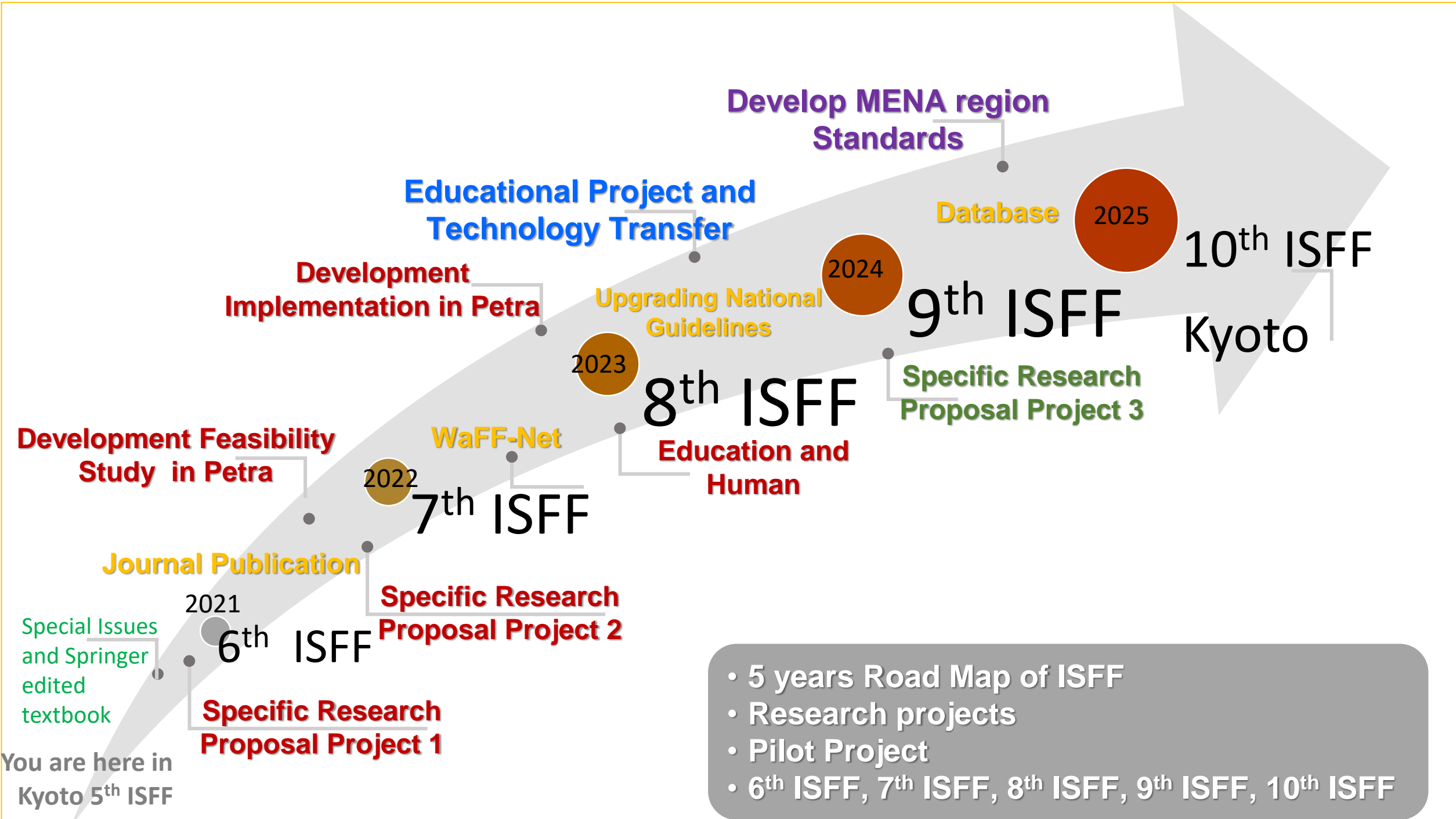
Further potentiality by each country to submit project for Organization Islamic Cooperation (OIS) funded by Islamic Development Bank (IDB), or world bank fund, and EU fund

Title of the project:

**1- Comparative Study for Flash Floods Extreme Events:
Humid and Arid Environments**

Flash Floods in Wadi System

2- “Disaster Risk Reduction and Water Harvesting in the Arab Region: Toward MENA REGION Manual on flood Forecasting and Warning”



- 5 years Road Map of ISFF
- Research projects
- Pilot Project
- 6th ISFF, 7th ISFF, 8th ISFF, 9th ISFF, 10th ISFF