Terms of Reference – Libya Flood Management (Remote)
19-10-2023

The DRRS programme is looking for experts to provide *remote support* for an assignment in Libya on flood risk management for the World Bank. The assignment will start asap and will most likely run until mid/end November. The teamleader position has already been filled. Please find all the required expertise in the descriptions below.

If you are interested please share your CV with drrs@rvo.nl before Monday 23rd of October COB (CEST).

1. **Characterization of the Flood Event** – based on remote sensing and desk top analyses
   a. Calculate flood characteristics based on catchment characteristics, including return intervals for different magnitude floods
   b. Characterize the magnitude of the storm event (including hyetographs, hourly for 1 - 3 day as possible)
   c. Calculate the characteristics of the breach parameters and flood wave resulting from the failure of both dams (magnitude, velocity, etc.)
   d. Calculate the spatial extent of the flood event along with the inundation depth and duration
   e. Evaluate the potential benefits of flood forecasting, including improved lead times, and emergency preparedness measures
   f. Identify alternative solutions to increase resilience of downstream communities and assets exposed to floods to events of similar magnitude
   g. Estimate cost estimates associated with alternative solutions to increase resilience of downstream communities and assets exposed to floods
   h. Outline principles of "Building Back Better" and potential options for integrating application of the principles of ensuring "Room for the River"
   Expertise Required: hydrologist, flood management specialist

2. **Potential Failure Mode of the Dams** – based on remote sensing and desk top analyses
   a. Confirm design parameters for both dams and appurtenant structures (including spillway and outlet capacity curves), original design flood and safety freeboard,
   b. Calculate the volume-height relation for both reservoirs
   c. Assess hydrographs at the upstream dam site and compare with the design flood
   d. Identify potential failure modes for both dams
   e. Estimate the original construction costs for both dams based on their characteristics
   f. Estimate the replacement costs estimates for both dams
   Expertise Required: dam engineer

3. **Visualisation of the Dam Failures and Resulting Flood Event** – using modeling, artificial reality and animation techniques
   a. Prepare animated visualization of the storm event, the resulting reservoir filling, failure of both dams, the flood wave, and subsequent inundation area
   Expertise Required: hydrologist or flood management specialist, animator, designer

4. **A) Remote Detection and National Dam Inventory** – based on remote sensing
   a. Prepare an inventory of all dams in the country using remote sensing machine learning techniques
   b. Provide details on the characteristics of all dams and catchments based on remote sensing

c. Map potential inundation areas resulting from potential dam failures using remote sensing techniques
   d. Estimate the potential downstream population and assets at risk in the case of potential failure of upstream dams based on remote sensing
   e. Prepare a prioritized list of dams for further physical inspection based on above analysis of potential downstream consequences

Expertise Required: Remote sensing expert, machine learning expert, dam engineer / water resource specialist

4. **B) National Rapid Dam Assessment** – based on the above, and subject to this being activated, we can elaborate further as needed
   a. Carry out physical inspection of prioritized dams identified in above activity, if and as when conditions allow

Expertise Required: dam engineer, electro-mechanical engineer, geologist / geotechnical specialist, hydrologist,