Attachment 2

The University of Jordan

Simulate Flash Flood in the Dead Sea Basin under the GCMs/RCMs Projections: Building Resiliency for Flood Vulnerable Communities

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Executive summary

Dead Sea shores have been affected by seasonal flash floods due to torrential rain. The responses to such floods were substantially observed in different modes. We had sought a different type of flood risk controller rather than emergency response procedures set up by the government recently despite we believed those are not enough in risk management since the most successful programs are dynamic. We expect to be a regular response and make a novelty and original contribution to scientific research in this project and prepare the community for a flood beforehand. Here as scientists, we identify areas where the future climate project has higher risks for floods using the updated CORDEX and ERA climate projections, modeling the hydro-climate data using machine learning language, and then simulating future floods. This helps to investigate the effect of climate change on the runoff under CO_2 emissions scenarios, particularly the intense rainstorms during the upcoming years. However, the community and Civil Defense need to be informed, plan and be equipped with flood survival kits. This is our platform to establish resiliency for flood-vulnerable communities. Not to mention; the project focuses to engage the women sector from the NGOs and the Female Youth Departments amid Imlaih and Maeen Sub-Districts.

Project signing ceremony:

An agreement has been signed between University of Jordan and the Australian Embassy on 17/06/2020 to receive 34,000 $Aus.

Main Objective:

This project investigates changes in runoff within hydro-climatological study under climate change scenarios to achieve SDGs in Climate Change, gender equity and vulnerable communities' support.

Goal: the project analyzed the flood characteristics and simulated the future peaks under Global Climate Models projections.

Project Locations: Dead Sea, Wala wadi and Zarqa-Maeen Wadi

Projects Stages: Hydrological-Climate Modelling

First: the project constructed a model to understand the hydrological behaviour of Wala Vale and Zarqa-Maeen Wadi using Australian eWater Software (Source) to run hydrological models. The hydrogeological area has been selected, it includes the streams of Wala Wadi and Zarqa Maeen Wadi. Wala Dam and Zarqa-Maeen Dam will be considered in the hydrological study. The university has purchased the Source license. Parametrization and validation of rainfall-runoff models that describe the hydrological behaviour of Zarqa-Maeen and Wala Vales using the Australian hydrology platform of Source. Coupling of climate projections of CORDEX to hydrological models to examine changes in surface runoff under different climate models scenarios in Zarqa Maeen and Wala Vales within the Dead Sea Basin.

Table 4: Monthly CORDEX scenario runs (EUR-44 domain) used in the study

No.	GCM	RCM
1.	CORDEX Average	-
2.	CORDEX Ensemble	-
3.	CCCma-CanESM2 r1i1p1	SMHI-RCA4
4.	CNRM-CERFACS-CNRM-CM5 r1i1p1	SMHI-RCA4
5.	CNRM-CERFACS-CNRM-CM5 r1i1p1	CNRM-ALADIN53
6.	CSIRO-QCCCE-CSIRO-Mk3-6-0 r1i1p1	SMHI-RCA4
7.	ICHEC-EC-EARTH r12i1p1	SMHI-RCA4
8.	ICHEC-EC-EARTH r1i1p1	KNMI-RACMO22E
9.	ICHEC-EC-EARTH r3i1p1	DMI-HIRHAM5
10.	IPSL-IPSL-CM5A-MR r1i1p1	SMHI-RCA4
11.	MIROC-MIROC5 r1i1p1	SMHI-RCA4
12.	MOHC-HadGEM2-ES r1i1p1	SMHI-RCA4
13.	MOHC-HadGEM2-ES r1i1p1	KNMI-RACMO22E
14.	MPI-M-MPI-ESM-LR r1i1p1	SMHI-RCA4
15.	MPI-M-MPI-ESM-LR r1i1p1	MPI-CSC-REMO2009
16.	MPI-M-MPI-ESM-LR r2i1p1	MPI-CSC-REMO2009
17.	NCC-NorESM1-M r1i1p1	SMHI-RCA4
18.	NOAA-GFDL-GFDL-ESM2M r1i1p1	SMHI-RCA4

deadSea-subcatch250 (1)::Flow::Mean

360.319211743591

0.0571914856512125
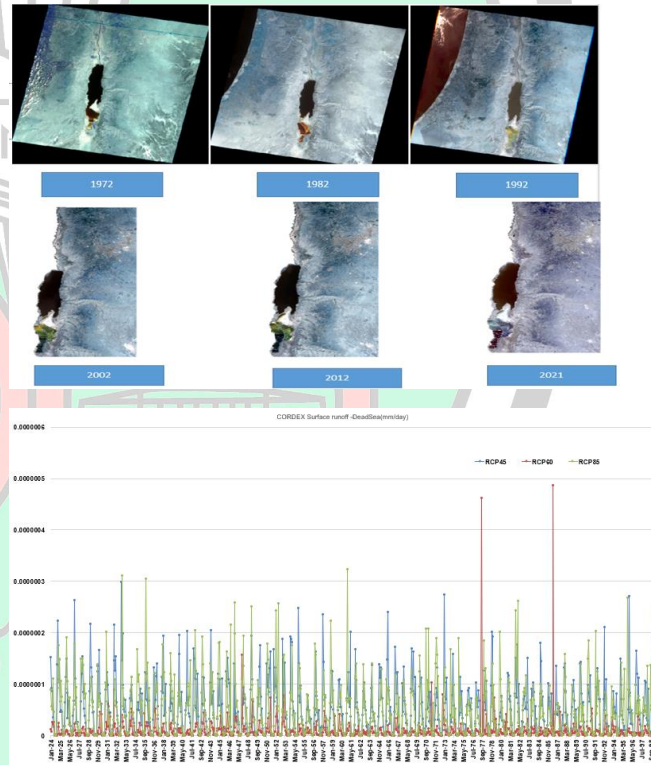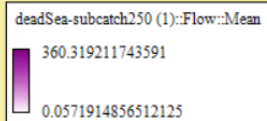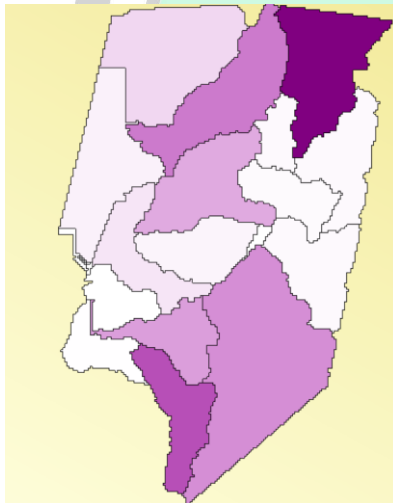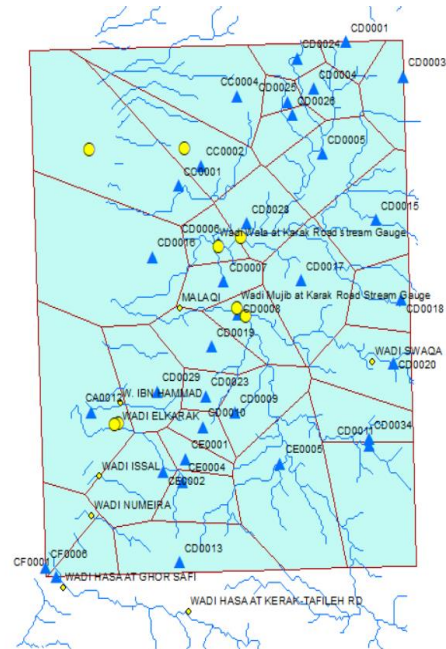
Second: A field visit to Wala Vale and Zarqa -Maen Dam on 22nd of September 2020

The team headed to Wala Dam to check the streams routes. The project representatives and accompanied NGO's went to Zarqa Maen Dam and investigated the weir and opening outlet. This helps to collect some data and the recorded daily readings. We have met the housewives and households to know-how they are handling with the seasonal flash floods. Yes, we had sought different type of flood risk controllers rather than emergency response procedures set up by the government recently.

Third: planting wooded trees along the flood risk region.

We went through government approvals by Ministry of Agriculture allowing us to re-planting a deforested land in Wadi Wala. This activity allows the most applicable low-cost building barriers for floods.

The activity took a place on 27th March 2022 and implemented by undergraduates from school of agriculture/University of Jordan, volunteers from Ministry of Agriculture/Madaba directorate, Nawafth for Training and Sustainable Development, Imlaih Young Women Association for Social Development and Maeen Young Women Forum. Location was selected upon the modelling results which shows the highest risk grids that are susceptible to floods, soil erosion and landslides (31.5392440° N, 35.7117824° E). Number of students that participated

in planting process was 114 and around 20 from other parties. The trees number were 198 in total including species: Quina, Cupressus, pine, Carob and Casuarina and 2 to 3 years old.

Planting wooded plants strategically will contribute creation more wooded areas which act as soaking up moisture and slowing down waters when overflow occurs. Also, rills and downstream paths due to flooding might increase the impact of landslides to locals which leads to higher death tolls. Therefore, planting trees delays the flood flow speed and hence reduce the impact of downstream erosive force.

Fourth: Flood Emergency kits distribution over Civil Defense of Madaba Governorate

To be prepared for any emergency about flood events and disasters. The emergency services may not be available during the first hours of flood. We should aware locals about how to be prepared and equipped and this might not be accomplished without Civil Defense. The kit includes:

- heavy-duty water-resistant backpack.

- Flashlight Battery-operated radio

- Torch

- Survival scissors

- a hygiene kit

- A complete first aid kit with basic surgery supplies for injuries emergency medical treatment.

- Pocket tissue Toiletries and sanitary supplies.

- Protective clothing, such as heavy-duty gloves and protective N-95 dust masks.

- Shelter Rain poncho

- Survival Whistle

- 12-Hour light sticks (3 per each)

- Protective reflector life Jacket

Distribution of flood kits to 5 representative Directorates:

- Civil Defense Thiban

- Civil Defense Maeen

- Civil Defense Dead Sea Martyrs

- Civil Defense imlaih

Fifth: Smart WiFi Weather Station with Remote Monitoring and Alerts

Station that monitors weather conditions with the brilliant, easy-to-read high contrast reverse PMVA color display. The weather station measures wind speed, wind direction, rainfall, outdoor temperature and humidity, soil moisture, solar radiation, and UV. The console also measures barometric pressure directly. This station is placed in the school of Agriculture front yard.

Publication:

Nivin Hasan*, Dr. Fayha Al-Shibli, Prof. Yang Dangkai*, Prof. Tan Yumin	Assessment on Main Indices to Decreasing of Dead Sea Surface Water Using Satellite Images and Timeseries Datasets Analysis.
International Conference on Space 2022 Islamabad, Pakistan	

Courses have been funded by the project:

Climate Change Mitigation via Removal of Atmospheric GHGs
Australian National University-Institute for Climate, Energy, and Disaster Solutions -Australia
Climate and Weather – Copernicus and EUMETSAT Earth observation and visualization data
Climate Extremes: Heatwaves, Changes in Ice Drought and Flood - Copernicus and EUMETSAT