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Artificial Intelligence as a driver for the sustainable development Application to disaster risk reduction

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Why is disaster risk reduction important ?

DRR FACTS

\$1.4 trillion in damage

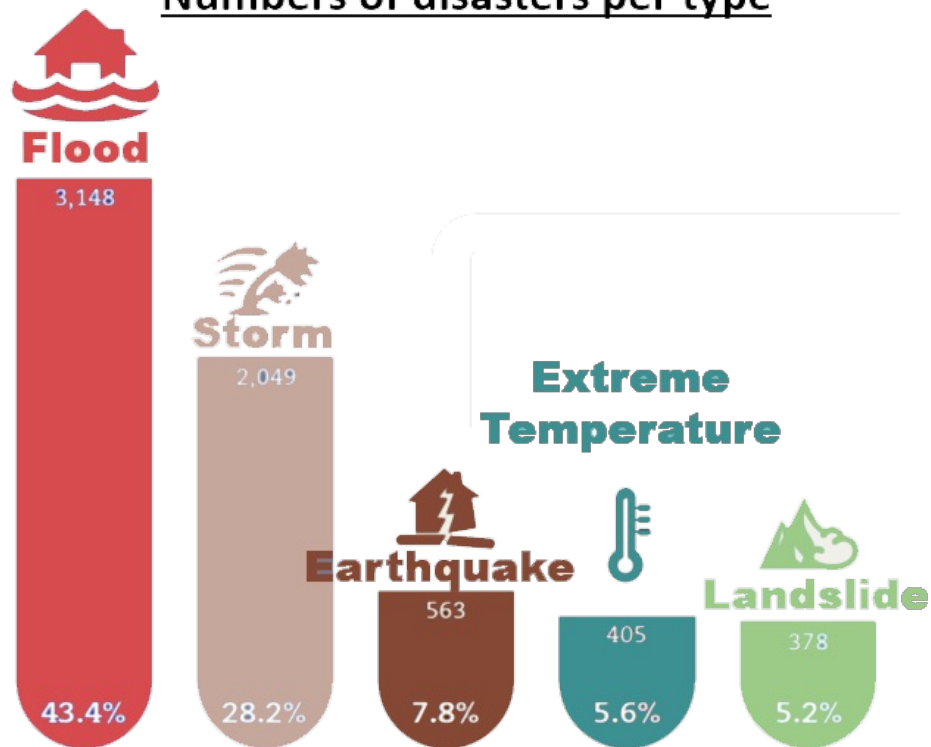
affected 4.4 billion people injured worldwide

From 1998 to 2017, natural hazards caused:

claimed 1.3 million lives

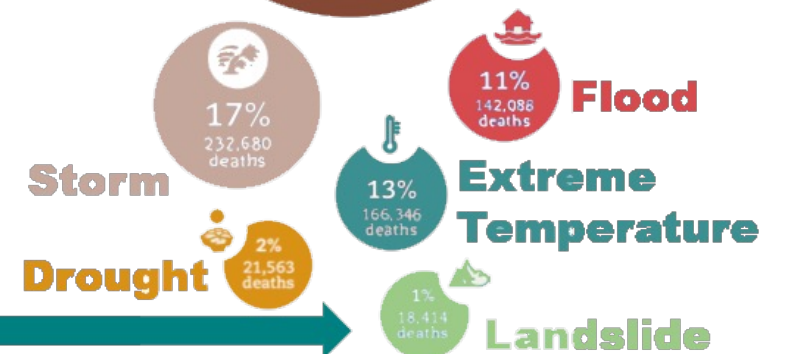
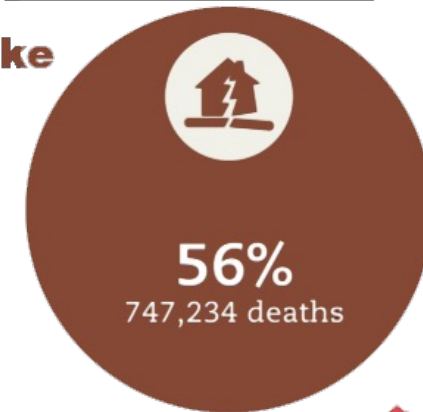
Earthquakes account for more than half of the fatalities

Numbers of disasters per type



Number of deaths

Earthquake



UNESCO's approach to DRR

- At the interface of a wide mandate - Natural and Social Sciences, Education, Culture, and Communication and Information, UNESCO takes a **multi-hazard, multi-disciplinary and multi-stakeholder participatory approach**.
- **8 cross-cutting thematic**
- UNESCO explores **both conventional and innovative solutions** for effective preparedness and response.
- **UNESCO's priority areas:** Africa, gender, SIDS, youth.



UNESCO DRR Activities around the globe

Europe

- ✓ Issue Based Coalition for Environment and Climate Change
- ✓ OPERANDUM (Nature based solution for DRR) in 7 countries
- ✓ RURITAGE (Rural Regeneration) in 6 countries
- ✓ SHELTER (Culture Heritage DRR) in 10 countries
- ✓ The Portuguese Sea and Atmosphere Institute (IPMA) as Tsunami Service Provider (TSP)
- ✓ Collective community management approach and capacity building activities in 6 countries

Arab

- ✓ Science and Technology Advisory Group for DRR
- ✓ Nature-based solution for natural hazards
- ✓ Atlas on Natural Hazards: A tool for socio-ecological system resilience in the Arab States
- ✓ Urgent Interventions to Build Socio-Ecological System Resilience to Natural Hazards in MENA region

ASIA and Pacific

- ✓ U-INSPIRE: young professional platform for DRR
- ✓ Science and Technology Advisory Group for DRR
- ✓ Disaster Risk Reduction and Management Training in Nepal
- ✓ International Workshop for Disaster Risk Reduction Knowledge Service in China
- ✓ Monsoon School on Urban Floods in India
- ✓ The South China Sea Tsunami Advisory Centre (SCSTAC)
- ✓ Landslide Early Virtual Observatories in Nepal

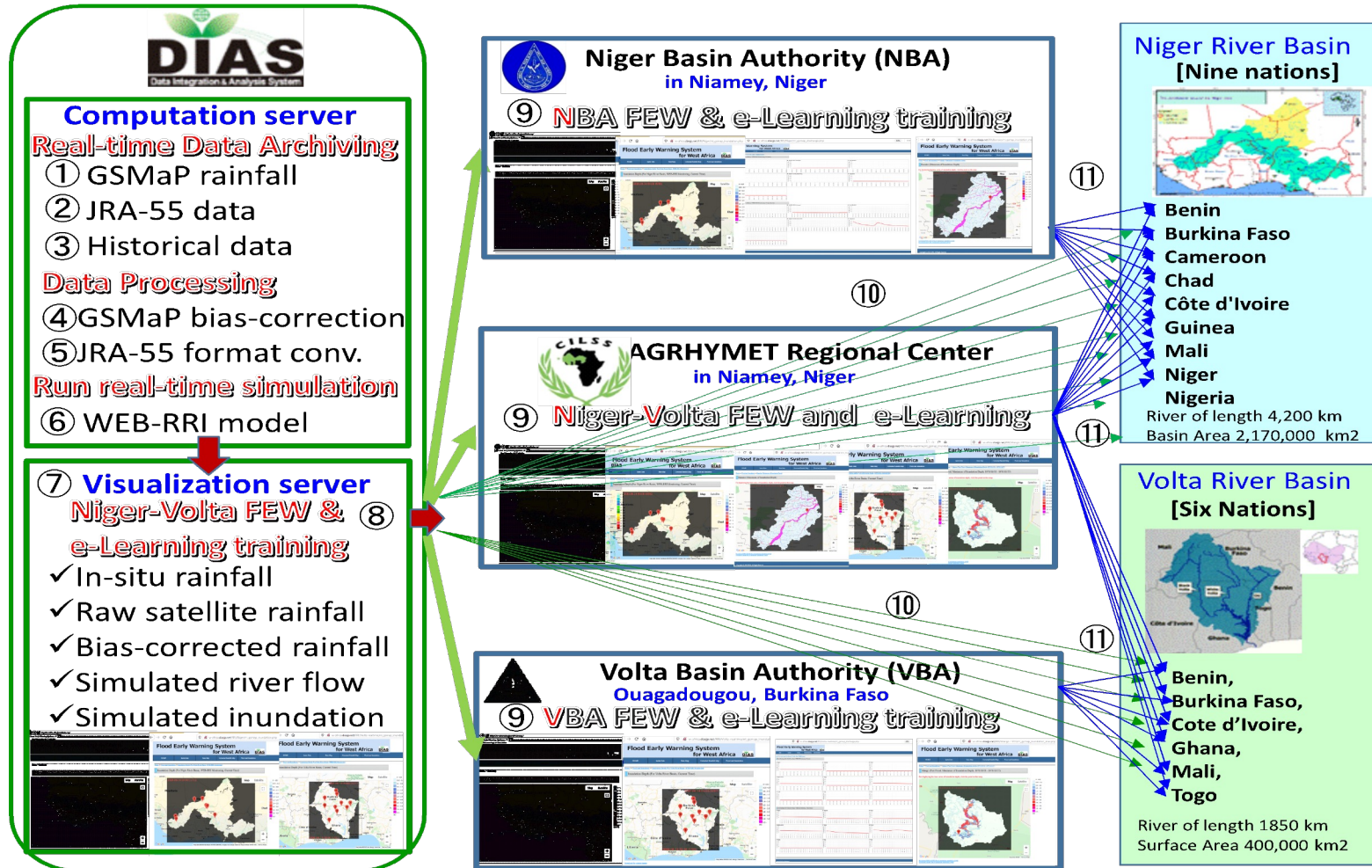
Latin America and Caribbean

- ✓ Decision support by Bayesian Model
- ✓ Science and Technology Advisory Group for DRR
- ✓ PRERADE (Risk governance) in Mexico
- ✓ Earthquake DRR in Lac5 (Built) in 5 countries
- ✓ VISUS (School) in Haiti, Peru, Dominican republic
- ✓ CARIDIMA Youth Platform: young professional network on DRR and CC in Caribbean SIDS)
- ✓ Guidelines for developing a National Strategy for DRR in the Caribbean Culture Sector
- ✓ Workshop on Climate Impacts & Vulnerabilities in Guyana
- ✓ Tsunami inundation and evacuation maps in 6 countries

Africa

- ✓ AI Chatbot and SMS analysis for DRR in East Africa (STEDPEA)
- ✓ Social Media analysis by AI in East Africa
- ✓ Flood risk management in West Africa
- ✓ Post Hurricane Idai flood risk management (Southern Africa)
- ✓ Earthquake early warning system in Ghana
- ✓ Integrated DRR courses in Ethiopia
- ✓ Enhancing Climate Services for Improved Water Resources Management in climate sensitive Regions
- ✓ Strengthening of evidence-based decision and policy making in Gambia

Early warning system: flood forecasting with AI



WADiRE- Africa Donor:
Ministry of Foreign Affairs
of Japan

Schematic diagram of the
flood early warning
system (FEWS) prototype
version 1.0 for West
Africa on Data Integration
and Analysis System
(DIAS).

Early warning system: flood forecasting with AI

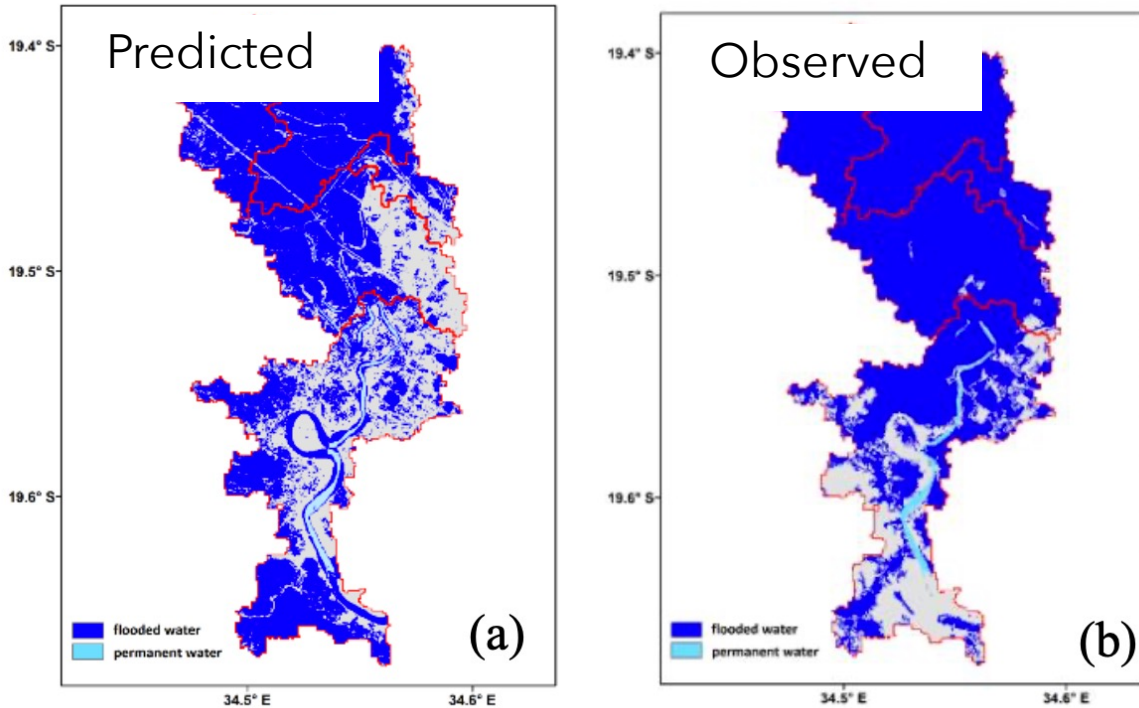
Artificial Intelligence is used to predict areas with a high likelihood of flooding in the next 24h



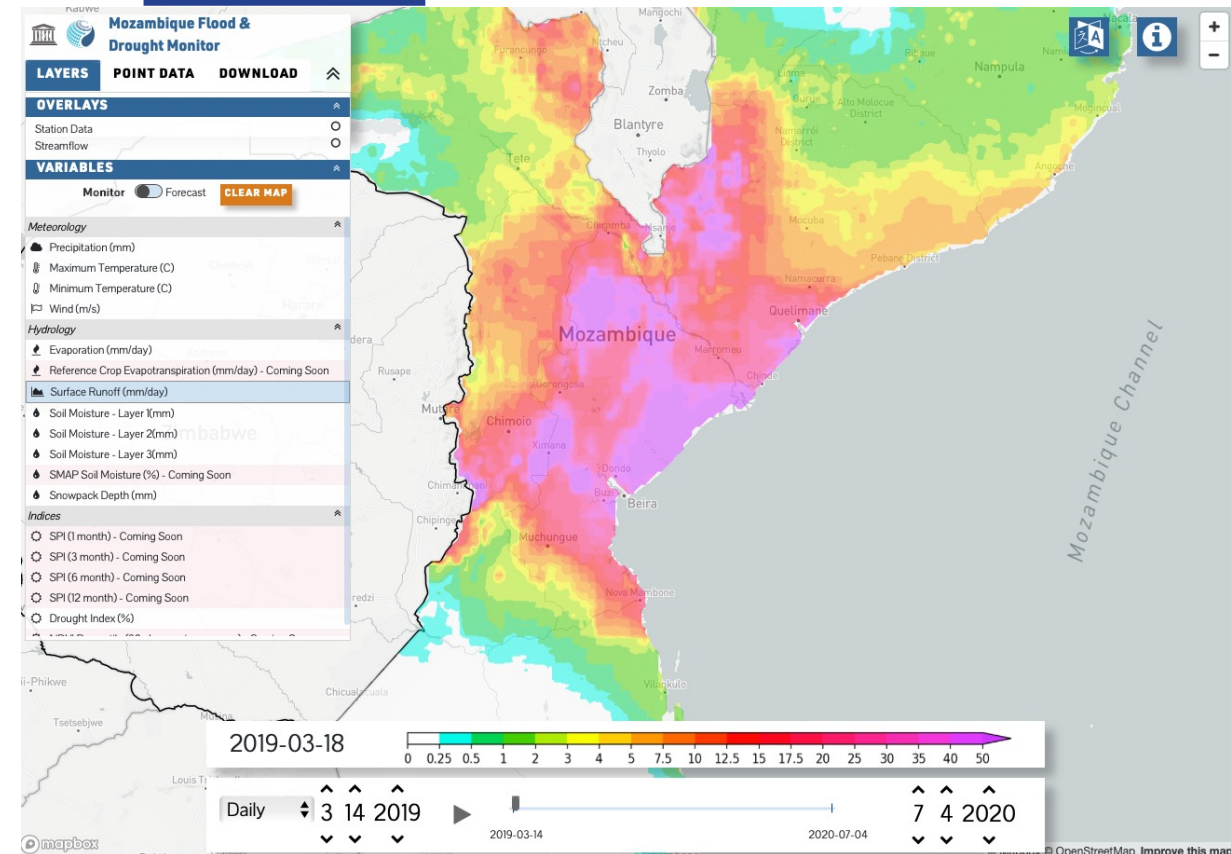
Be Resilient
BIOSPHERE RESERVES
CLIMATE CHANGE OBSERVATORIES



Government of Flanders



24-hour AI-based forecasts of inundated areas in the flood-prone areas of Mozambique



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Risk Governance: better risk communication with AI

Strengthening Disaster Prevention Approaches— STEDPEA

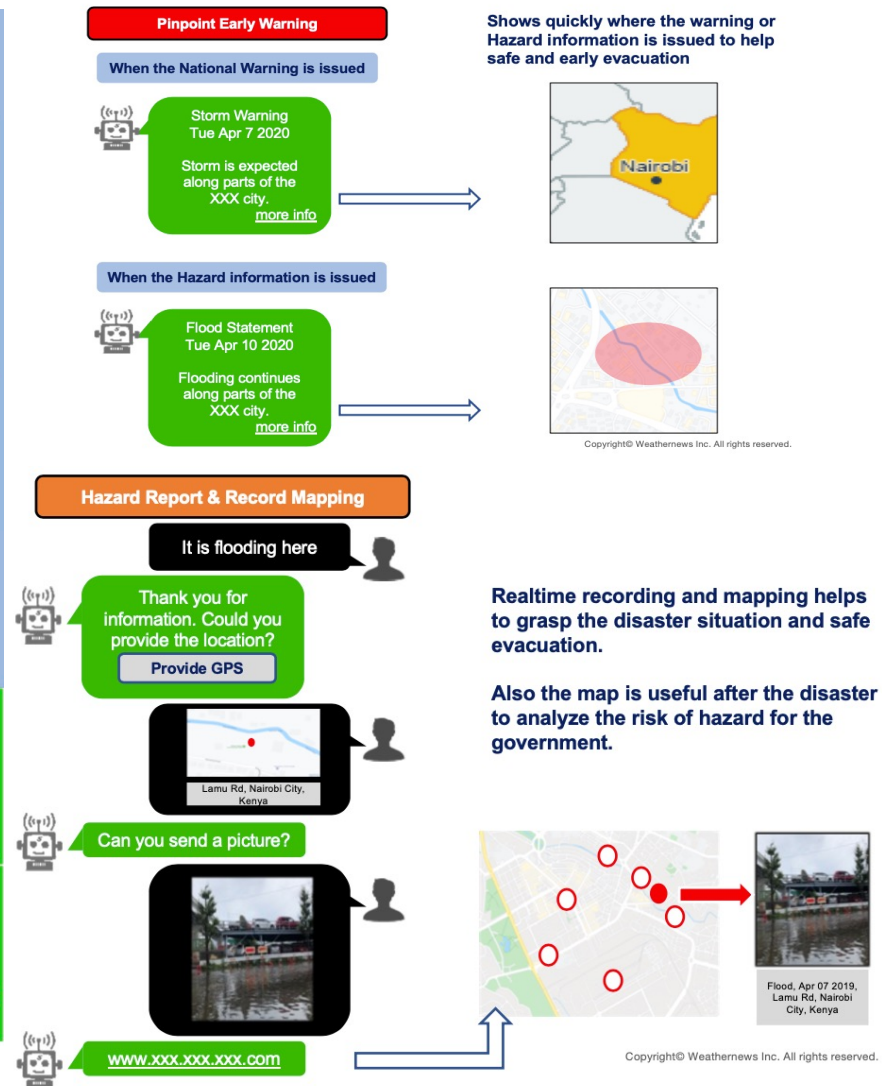
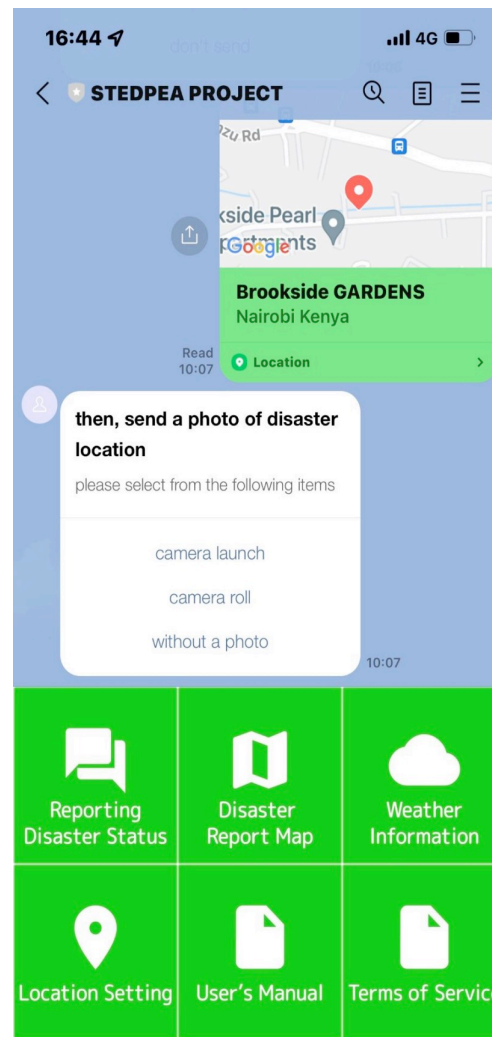
Donor: Ministry of Foreign Affairs of Japan

AI Chatbot (Mobile Applications)

In 5 countries (Kenya, Rwanda, South Sudan, Tanzania and Uganda)

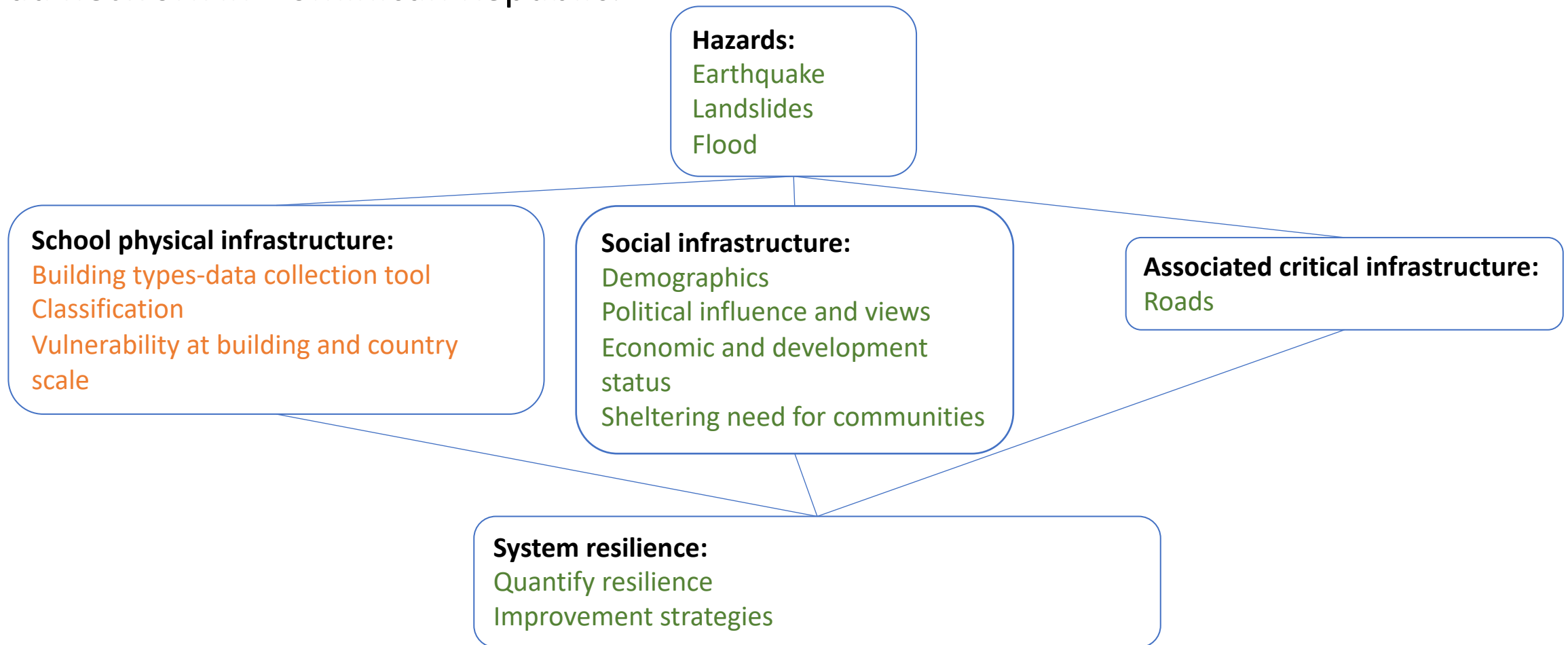
AI chatbot enable sharing information on disasters and connecting communities to expedite relief efforts during disasters.

- **Optimize the communication** between government and citizen
- **Share the information** of supplies and evacuation immediately
- **Grasp the situation** of damage/recovery accurately for both side



School Safety: Using AI for optimized investment decision making

Development of the modeling framework of hazard resilience of integrated school system and road network in Dominican Republic.



Other examples of AI application in the Natural Sciences Sector



Using low cost, low power AI devices

Using low cost, low power AI devices: TinyML

Sound

Keyword Spotting



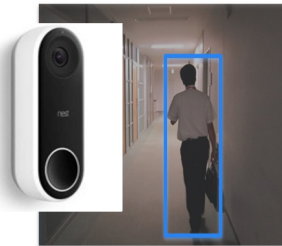
Vibration

Motion & biometric



Vision

Image Spot



Tiny machine learning (TinyML) is a fast-growing field of machine learning, capable of performing **on-device sensor data analytics** at extremely **low power consumption** and **with low-cost devices**. It does not require an internet connection, making it ideal for remote/rural areas.



TinyML can be used to detect wildfires and floods using sound.

System designed by The Abdus Salam International Centre for Theoretical Physics (ICTP)

ROCKNET

Since 2019, UNESCO and IFPEN have been developing a mobile application using artificial intelligence to promote geosciences to the general public and contribute to the dissemination of knowledge in this field.

RockNet is inspired by PlantNet.

A free application for PC and smartphone, RockNet will allow a user to identify the nature of the rock they have photographed.



For the educational world

- ✓ A modern and fun educational tool: new deep learning approach: patent application in December 2019
- ✓ Organise an inter-university challenge for image collection

For the general public

- ✓ Dissemination of a geological culture, based on from the everyday environment

For geoparks

- ✓ Artificial intelligence can be specialised on a geographical area
- ✓ Promote geo-tourism and enhance natural heritage
- ✓ Mobilise local communities to collect images



How TinyML be applied to Disaster Risk Reduction?



Some ideas how TinyML can be used for disaster risk reduction

Monitoring and detection of natural phenomenon; wildfire, drought flood, earthquake, landslide

Health monitoring of building/infrastructure (small vibration of the structure to identify the vulnerability of buildings)

Using TinyML with drone

Changing risk perception (changing people's behavior to take action/evacuate)

Thank you

*Investing 1 \$ in disaster risk reduction can save up to 15 \$
in avoided losses and reconstruction*



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United Nations
Educational, Scientific
and Cultural Organization