

Building Disaster Resilience in Sub-Saharan Africa



This project is funded by the European Union

Multi-Hazard Risk Profiles: engaging science and DRR practitioners in modelling for probabilistic risk assessment

www.riskprofileundrr.org

Katarina Mouakkid Soltesova, UNDRR
Abidjan, 20 November 2019



UNDRR - CIMA Research Foundation
as part of the Programme:
Building Disaster Resilience to Natural Hazards in Sub-Saharan African Regions, Countries and Communities.

in collaboration with:



Multi-Hazard Risk Profiles for 16 Countries

ECCAS& ECOWAS: Rwanda, Gabon, Cameroon, Sao Tome and Principe & The Gambia, Ghana, Guinea-Bissau

1st release of draft risk profiles & country workshops in 2018

2nd release & engagement in 2019

13 countries, homogenization

3 countries In-depth integration of local datasets

Applications

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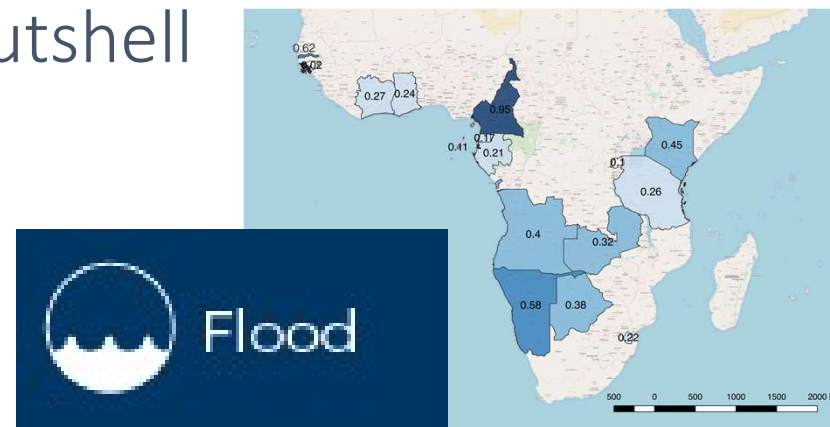


Multi-Hazard Risk Profiles in a nutshell

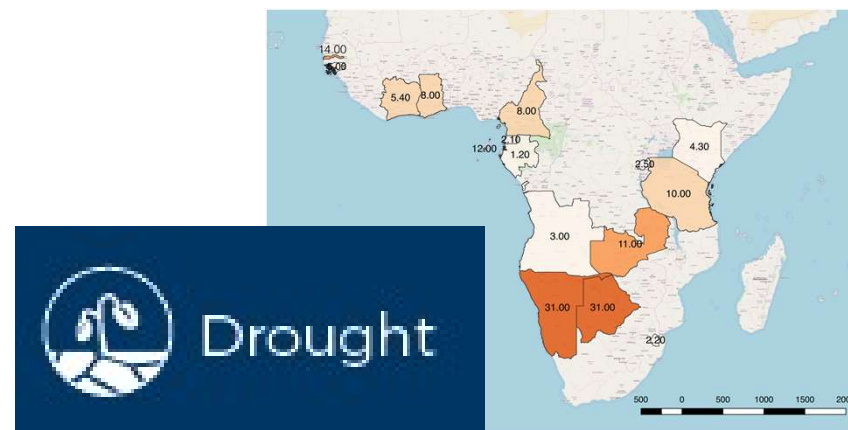
- Floods and Droughts
- Climate change and socio-economic projections
- Sendai-driven presentation of the results

The Country Risk Profiles provide a comprehensive view of hazard, risk and uncertainties for floods and droughts in a changing climate, with projections for the period 2050-2100.

The risk assessment considers a large number of possible scenarios, their likelihood, and associated impacts.

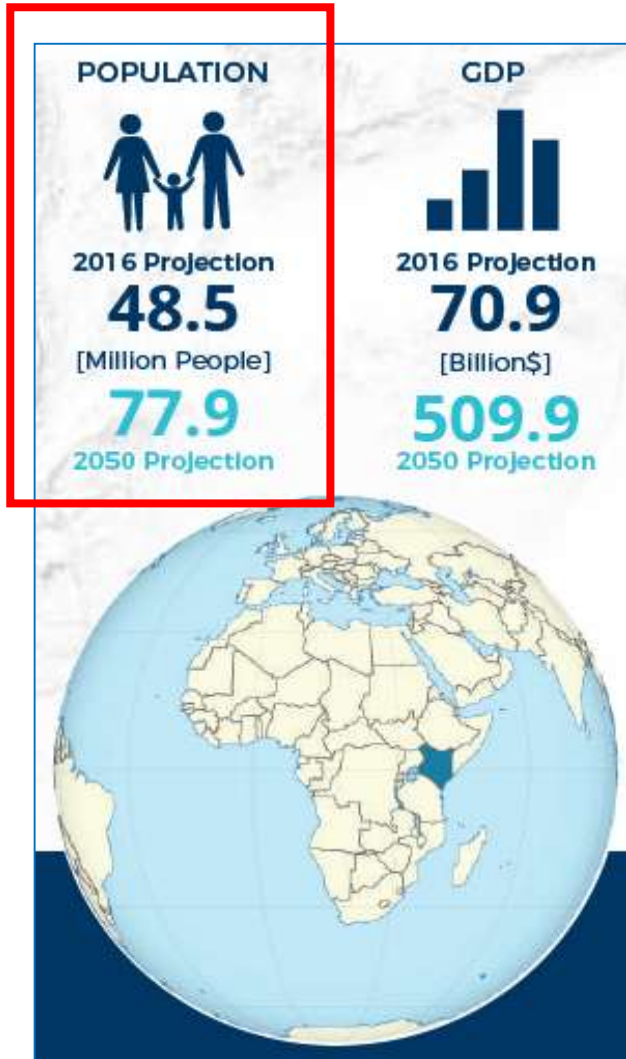


FLOOD: Average Number of affected people [B1] relative to the total country population (%)

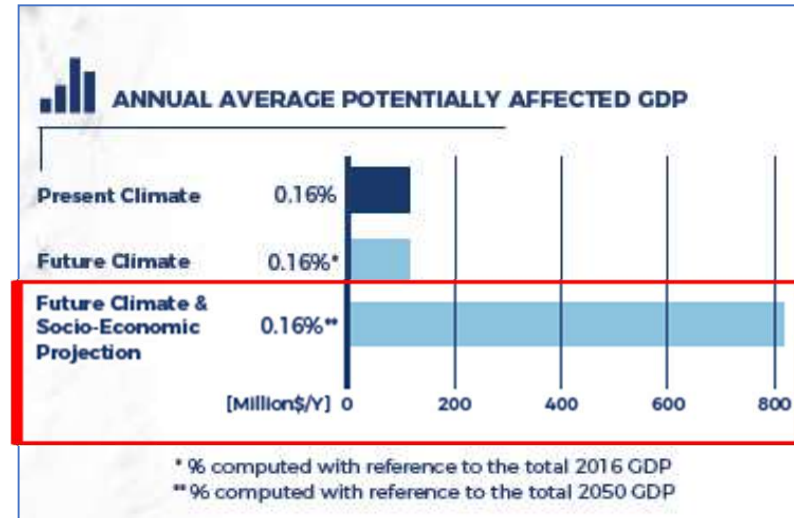


DROUGHT: Average Number of affected people [B1] relative to the total country population (%)

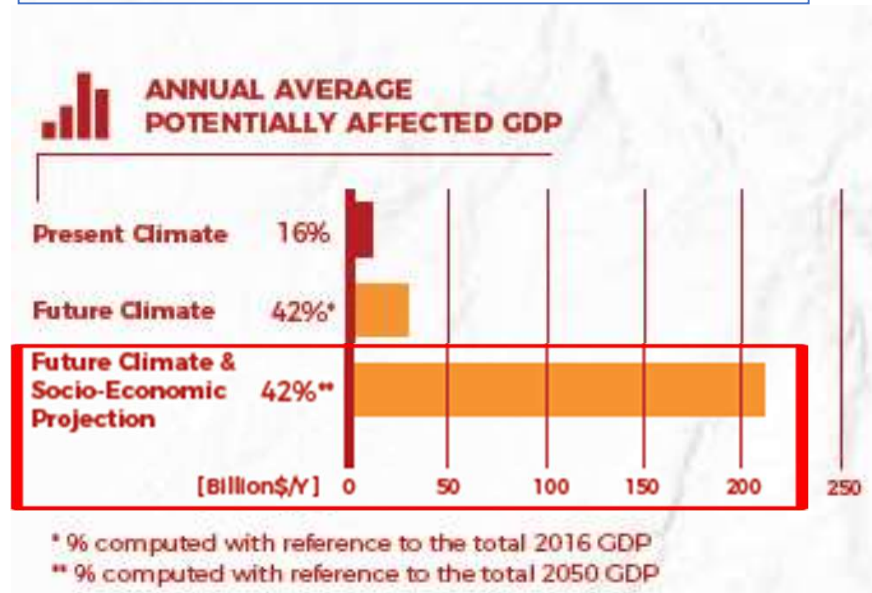
Taking into consideration present and future climate & socio-economic trends



FLOODS



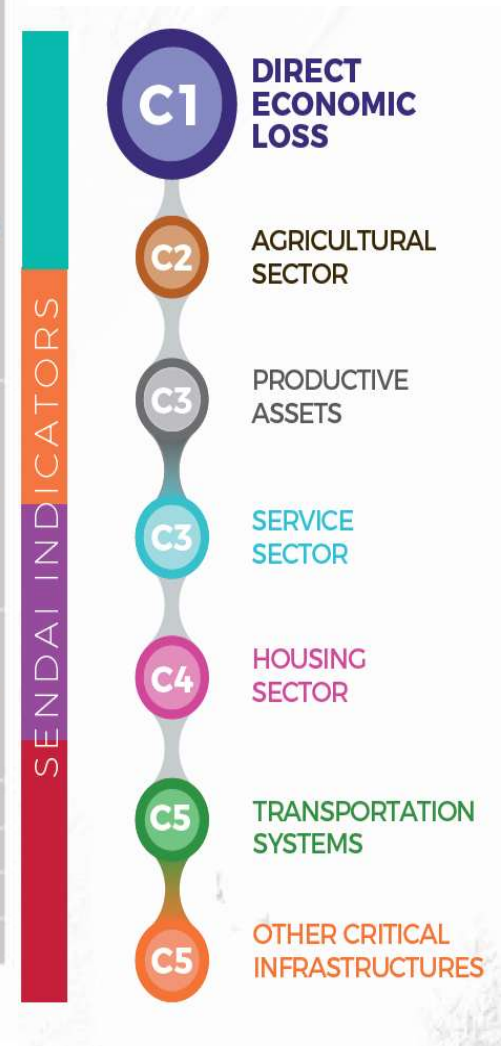
DROUGHTS



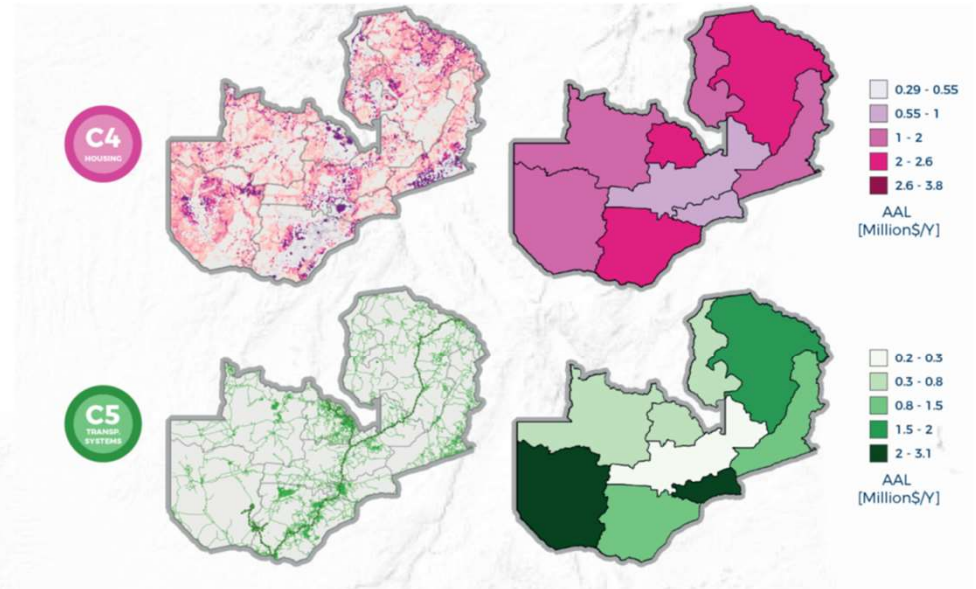
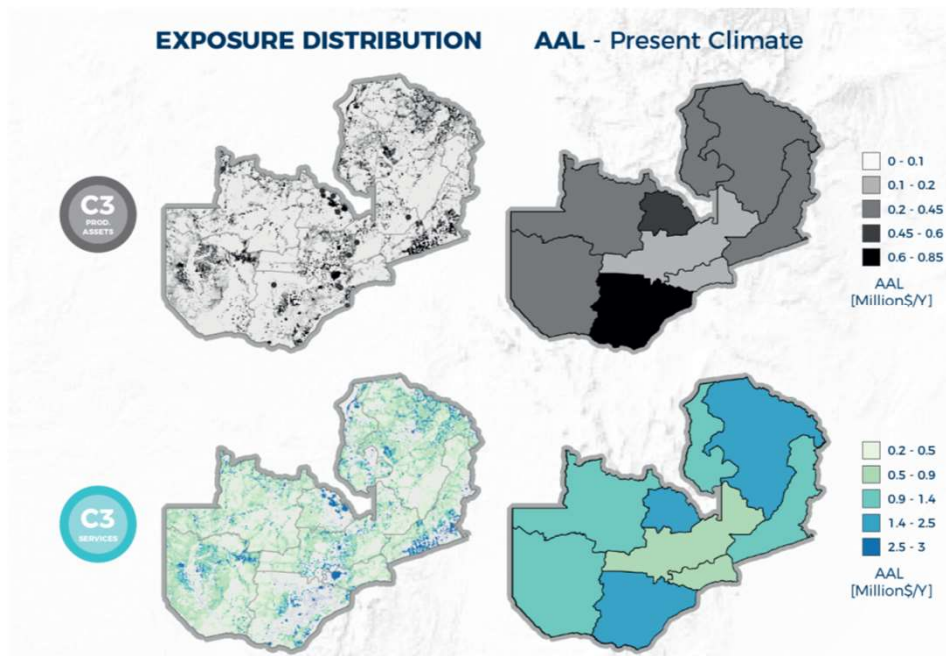
Sendai-driven presentation of the results: potentially affected population & direct economic losses

| | INDICATORS | | FLOOD | | | DROUGHT | | | RISK METRICS |
|--|--|--|--|----------------|----------------|-----------------|----------------|----------------|--|
| | | | P | F | SEp | P | F | SEp | |
| | | | Present Climate | Future Climate | Socio Economic | Present Climate | Future Climate | Socio Economic | |
| B1 Number of directly affected people C1 Direct economic loss attributed to disasters | | Number of directly affected people | Y | Y | Y | Y | Y | Y | Annual Average |
| | | C2 Direct agricultural loss (Crops) | Y | Y | | Y | Y | | AAL (Average Annual Loss) PML (Probable Maximum Loss) |
| | | C3 Direct economic losses to productive asset (Industrial Buildings + Energy Facilities) | Y | Y | | Y | Y | | |
| | | C3 Direct economic losses in service sector | Y | Y | | | | | |
| | | C4 Direct economic losses in housing sector | Y | Y | | | | | |
| | | C5 Direct economic losses to transportation systems (Roads + Railways) | Y | Y | | | | | |
| | | C5 Direct economic losses to other critical infrastructures (Health + Education Facilities) | Y | Y | | | | | |
| | D2 Number of destroyed or damaged health facilities | Y | Y | | | | | | |
| D1 Damage to critical infrastructure attributed to disasters | | D3 Number of destroyed or damaged educational facilities | Y | Y | | | | | Annual Average |
| | | D4 Number of other destroyed or damaged critical infrastructure units and facilities (Transportation systems) | Y | Y | | | | | |
| | | GDP of affected areas* | Y | Y | Y | Y | Y | Y | |
| Agricultural & Economic Indicators | | Number of potentially affected livestock units* | | | | Y | Y | | Annual Average |
| | | Number of working days lost* | | | | Y | Y | | |
| | Hazard Index | SPEI | Standardised Precipitation-Evapotranspiration Index* | | | | Y | Y | |
| SSMI | | Standardised Soil Moisture Index* | | | | Y | Y | | |
| SSFI | | Standardised StreamFlow Index* | | | | Y | Y | | |
| WCI | | Water Crowding Index* | | | | Y | Y | | |

* No official Sendai indicators

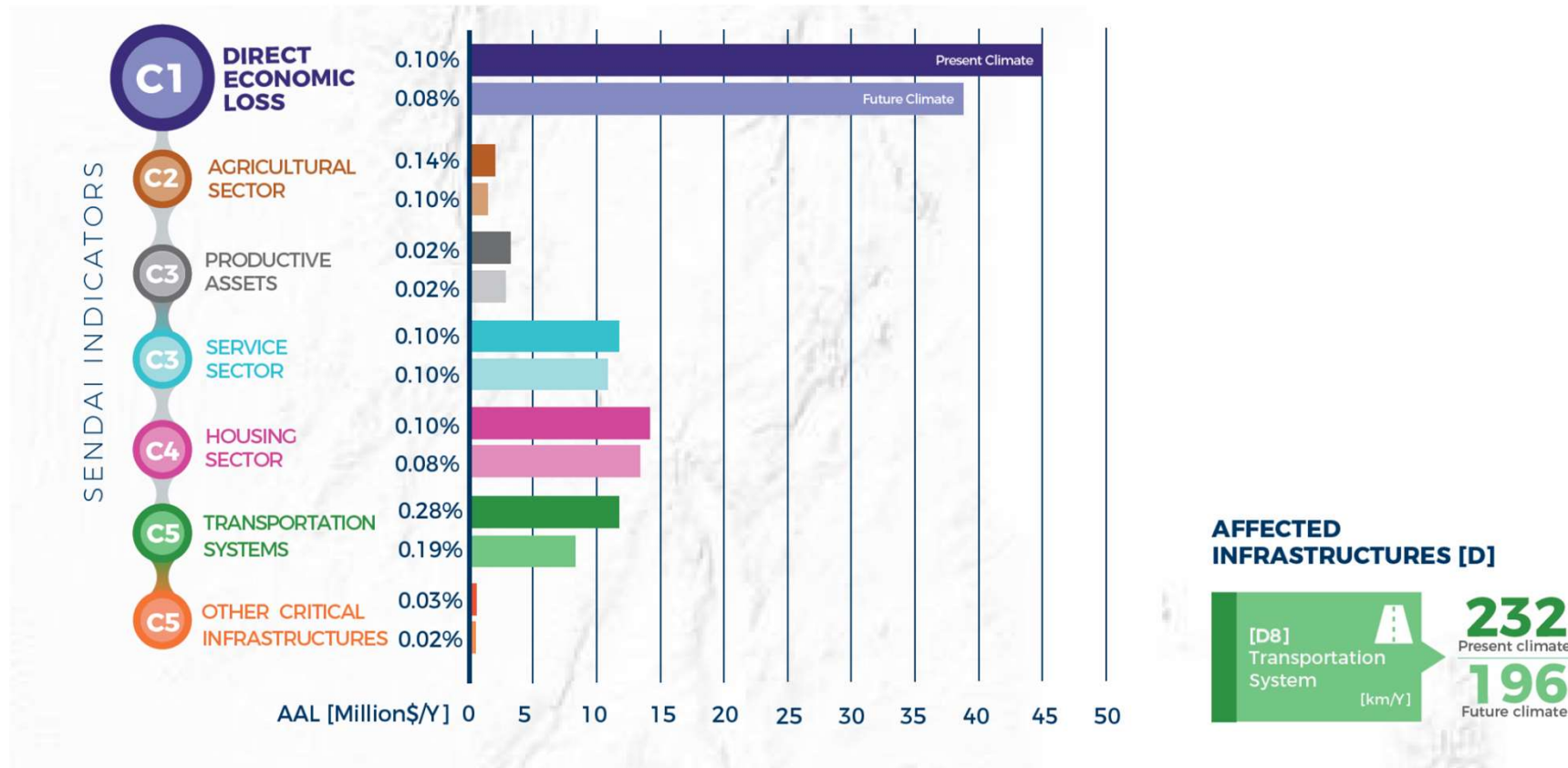


Annual Average Loss due to floods in the most sensitive sectors



Present exposure & AAL Present GDP and Climate

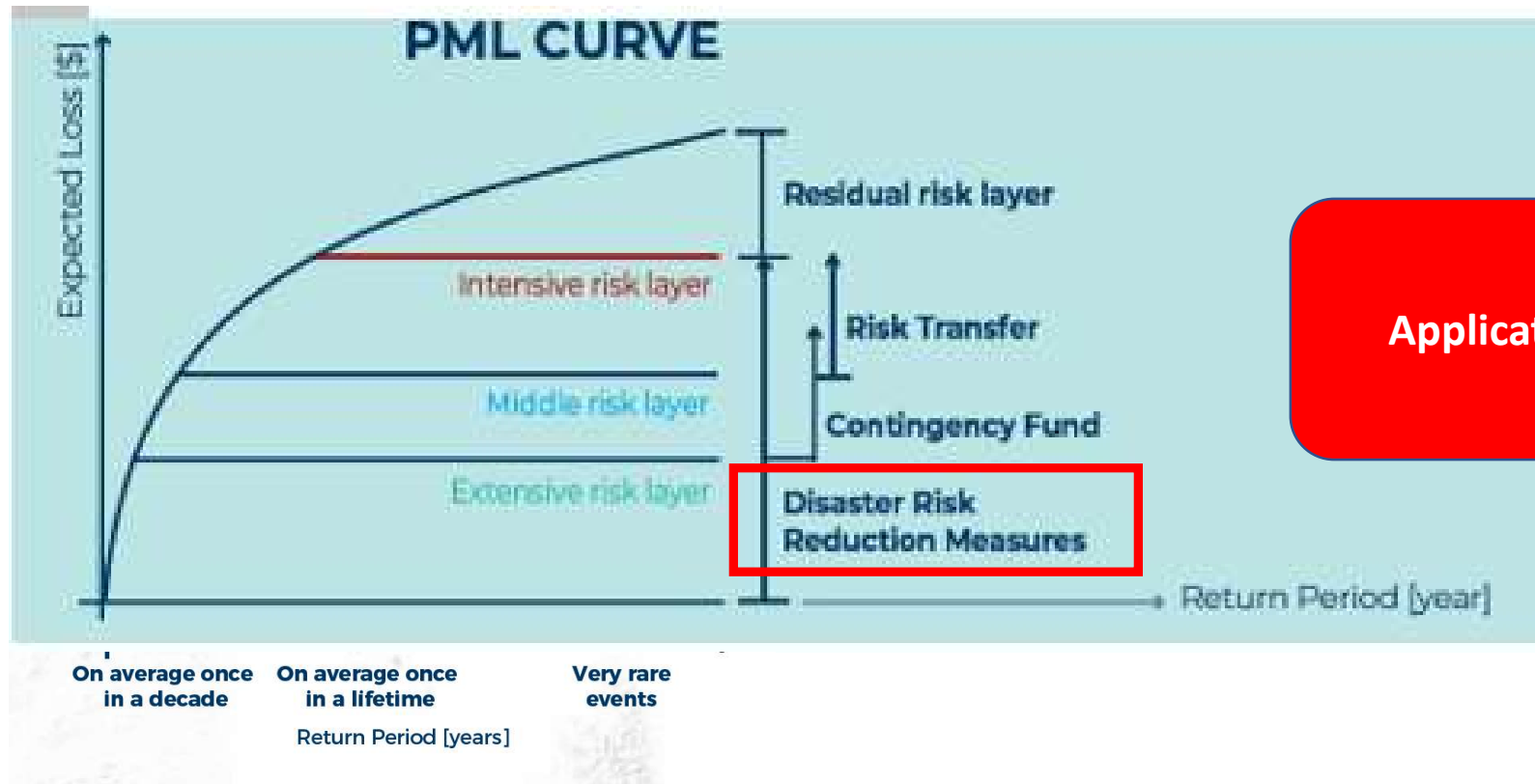
Risk Metrics: Average Annual Loss (AAL) example of direct economic losses



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Risk Metrics: Probable Maximum Loss (PML)

Expected loss, corresponding to a given likelihood

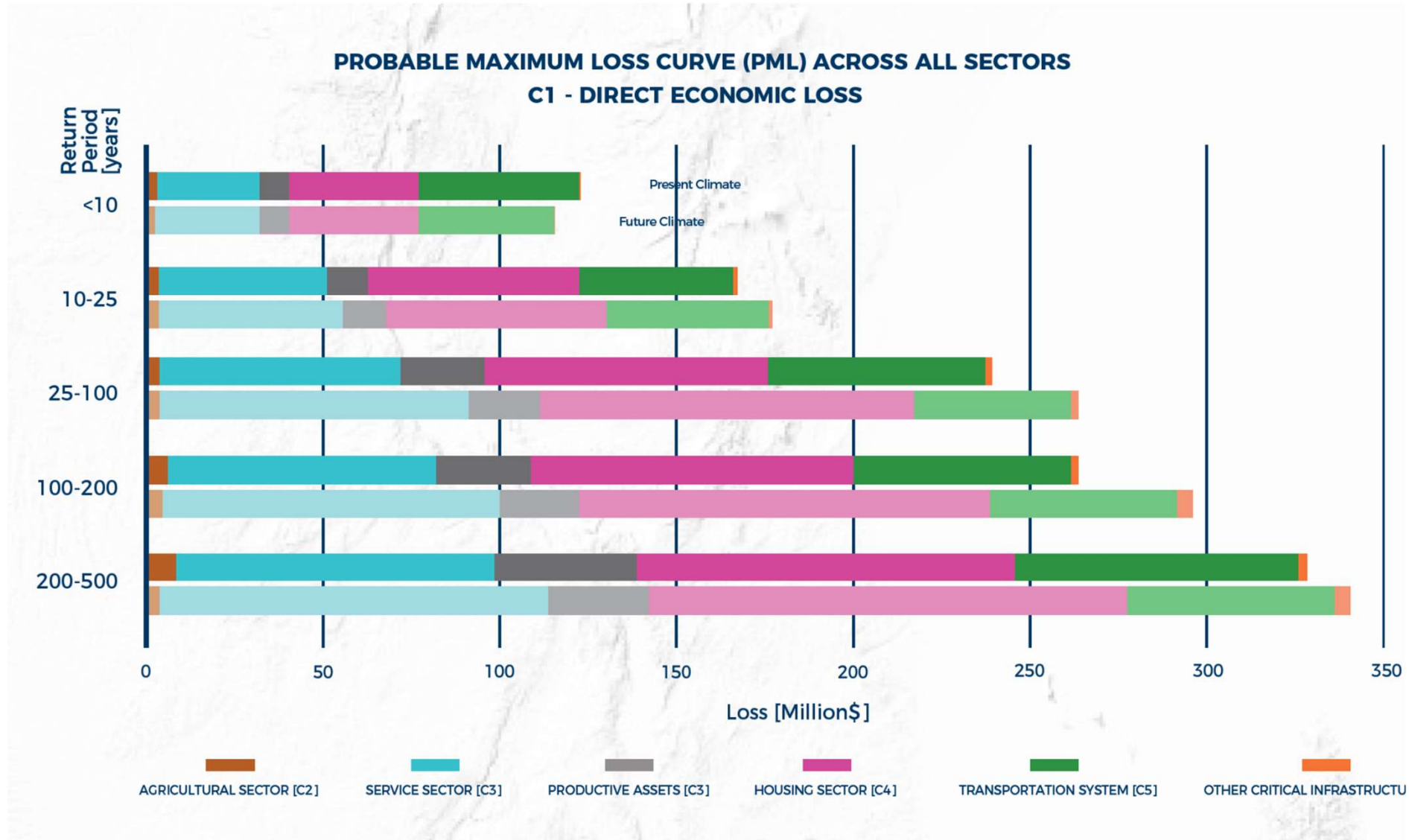


Applications

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PML sectoral distribution



Second Release 2019

3 countries:
In-depth integration of
local datasets

13 countries:
homogenization

Methodological homogenization

e.g. update of the road's classification and values based on workshop feedback

New global / regional data

e.g. Sentinel-2 Land use, OSM updates

Point by-hand modifications of hotspots

as highlighted by participants

New local data provided after national workshops

e.g. new admin boundaries, new critical infrastructures layers

Validation of assumption based on local knowledge

e.g. flood defenses

-Improved hazard modelling

-Integration of local datasets

-New risk metrics: further disaggregation for gender, age and disabilities

-Food security

-Process of national endorsement or validation

16 countries

Data requested from participants and DRM authorities during the national risk profiling workshops in 2019

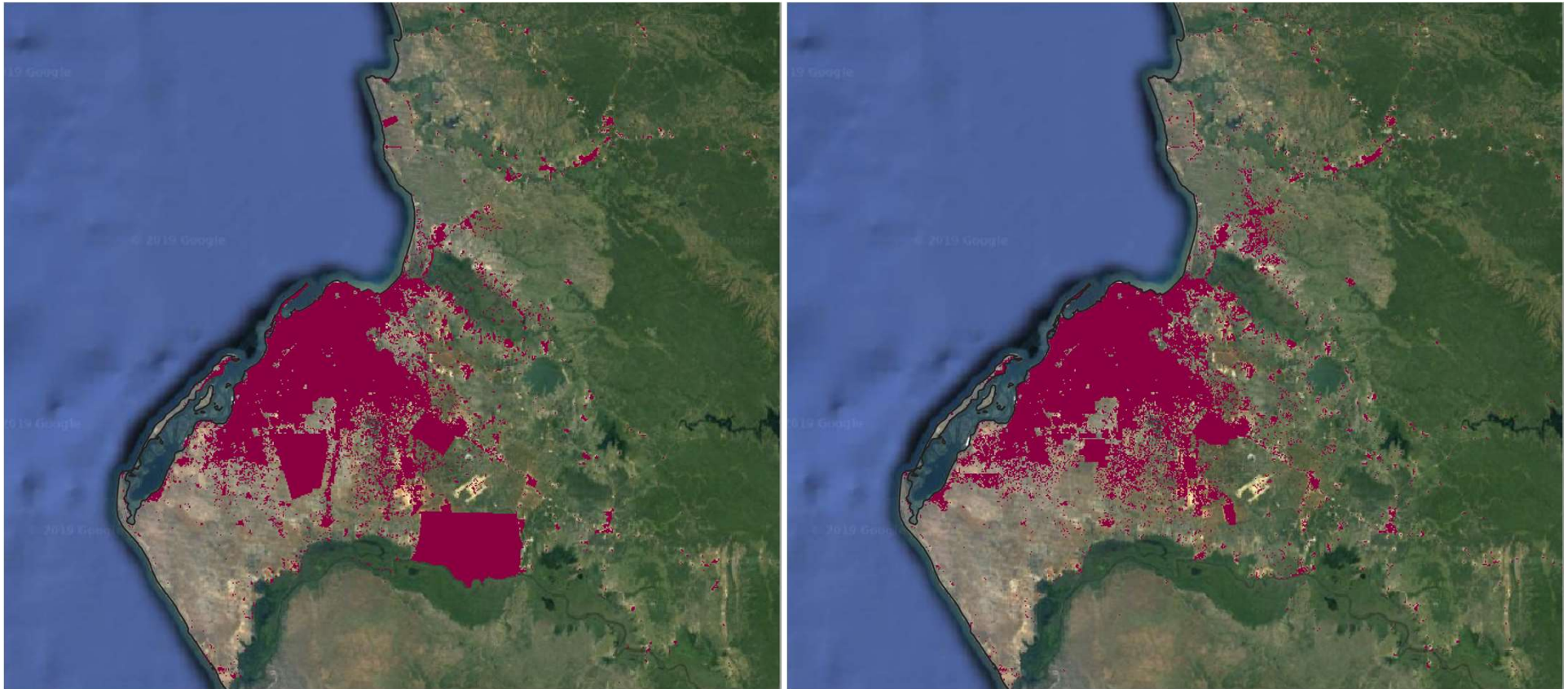
| | Desirable Information | Possible Formats | | |
|--------------------------|--|--|--|-------------------|
| | | Geographic layer with associated attribute table | Information provided through the corresponding section in the Survey | Table or document |
| | Official Country Boundaries | | | |
| Built-up | Building blocks or building footprints (possibly with attribute information see detailed methodology) | | | |
| | Statistical information on built-up area characterization | | | |
| Population | Population census polygons at sub-municipal scale with information on gender, age, minorities. | | | |
| | Population statistics (age distribution, gender, minorities at national or sub-national scale) | | | |
| GDP | Sector-specific gross domestic product | | | |
| | Local gross domestic product (e.g. regional, municipal) | | | |
| Agricultural production | Agricultural areas with associated type of crop, production cost and/or wholesale price in \$ per ton | | | |
| | Information on the growing cycle of each crop | | | |
| Critical infrastructures | Location of critical infrastructures (e.g. health, education, energy production) possibly with attribute information (see detailed methodology). | | | |
| | linear critical infrastructures (e.g. railways, roads, etc.) with hierarchy information | | | |
| | Statistical information on road characteristics (e.g. quote, paved/unpaved) and average construction costs in \$/km | | | |

DATASETS COLLECTED BY LOCAL EXPERTS – 3 countries : Angola, Tanzania, Zambia

| | | | |
|---|---|---|---|
| Admin: Official Country Boundaries & Official Political sub-district boundaries | | X | X |
| Hazard | | | |
| Daily rainfall for as many locations as possible (at least 10 years of observations) | | X | |
| Monthly rainfall for as many locations as possible (at least 10 years of observations) | | | X |
| min/max and average daily temperature for as many locations as possible | | X | X |
| Intensity-Duration-Frequency curves if available | | | |
| Model parameters and/or model output for climate models already used in the country (e.g., reanalysis) | | | |
| Daily discharges for as many locations as possible (at least 10 years of observations) | | X | X |
| Monthly discharges for as many locations as possible (at least 10 years of observations) | | X | X |
| Rating curves | | | |
| Vulnerability and Exposure | | | |
| Built -up: Building Blocks or building footprints (possible with attribute information) | | X | X |
| Built-up: Statistical information on built-up area characterization | x | | X |
| Population: census polygons at sub municipal scale with information on gender, age, minorities | x | X | X |
| Population statistics (age distribution, gender, minorities at sub-national scale) | x | X | X |
| GDP: Sector-specific gross domestic product | x | X | X |
| GDP: Local gross domestic product (e.g regional, municipal) | | | |
| Agricultural production: areas with associated type of crop | | | |
| ton | | | |
| Agricultural production: Information on the growing cycle | | | |
| Critical infrastructure: location, possibly with attribute information (e.g. road, railway, power lines, etc.) | | | |
| production) | | | |
| Linear critical infrastructures with hierarchy information (e.g. road, railway, power lines, etc.) | | | |
| Statistical info on road characteristics (e.g quote, paved/unpaved) | | | |

Data complemented and reviewed during a technical study visit:
Angola, Tanzania, Zambia
(National DRR Focal Points, GIS experts, representatives of the nat. statistical offices)

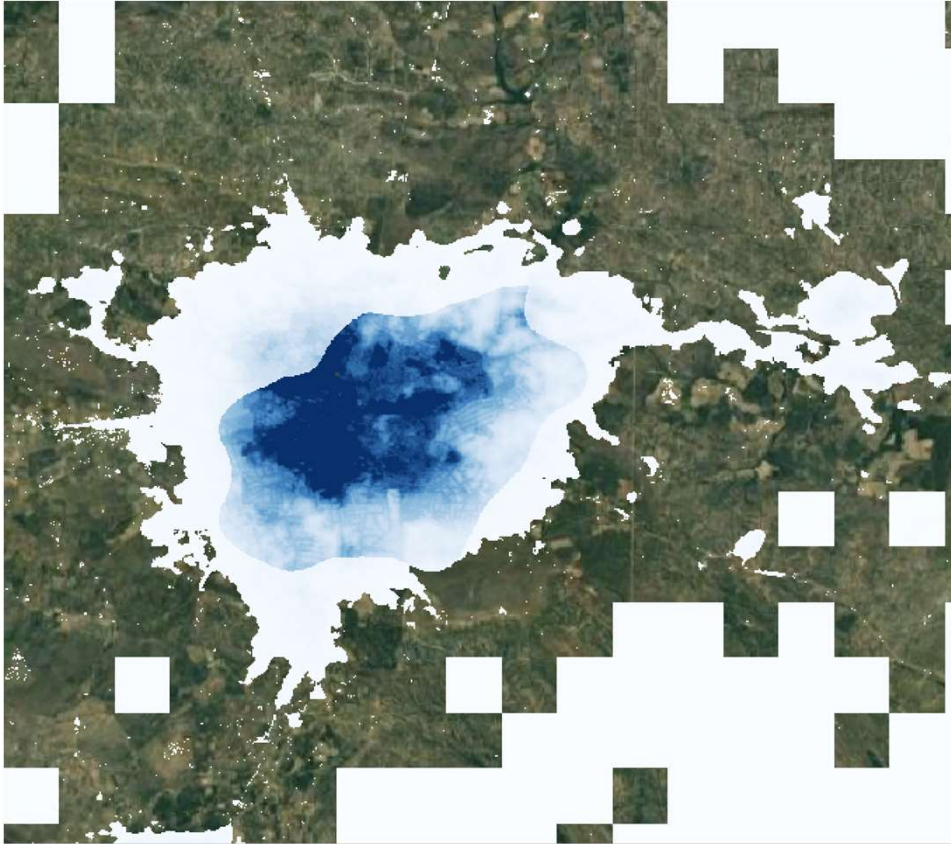
ANGOLA



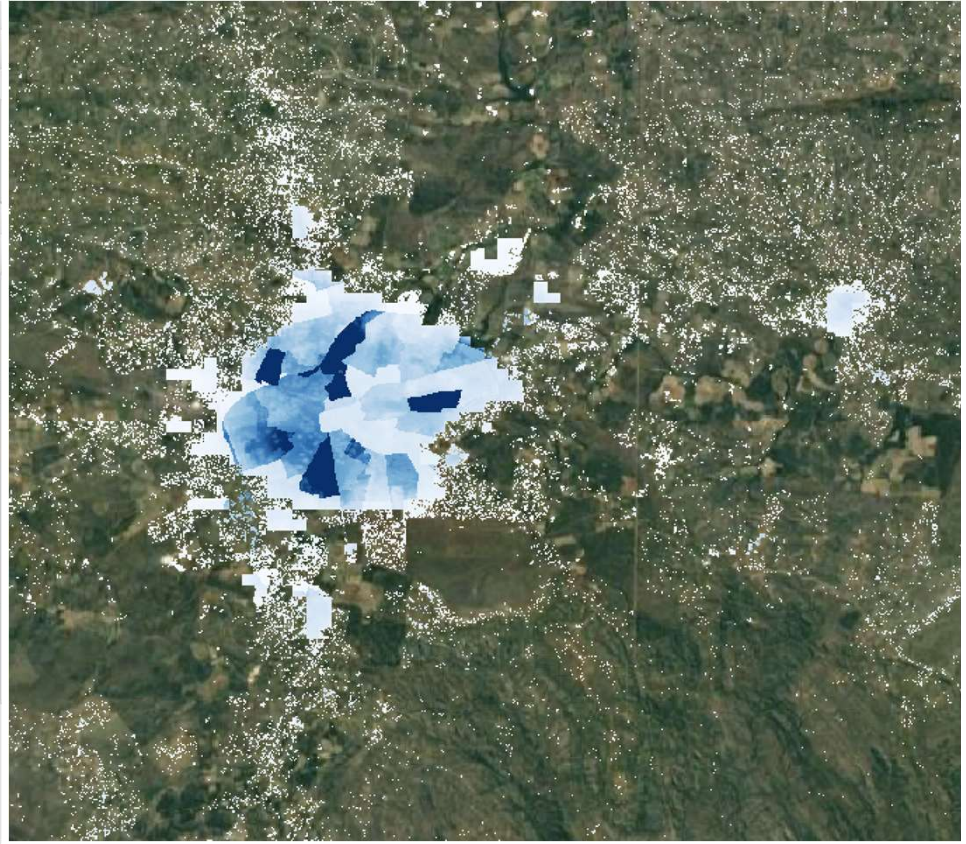
1° version of risk profiles:
Definition of an urbanization mask
(identification of settlements) using global
datasets

2° version of risk profiles:
Improvement of the urbanization mask
through the integration of a newly available
and more detailed global dataset

ZAMBIA

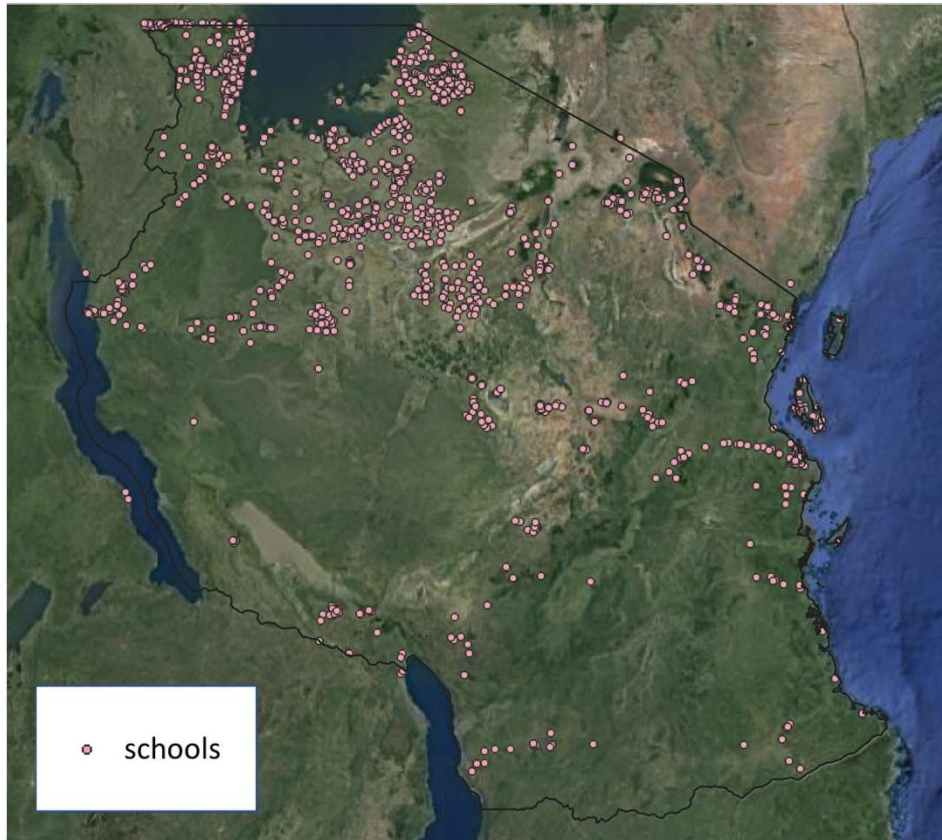


1° version of risk profiles:
Population distribution based on global datasets

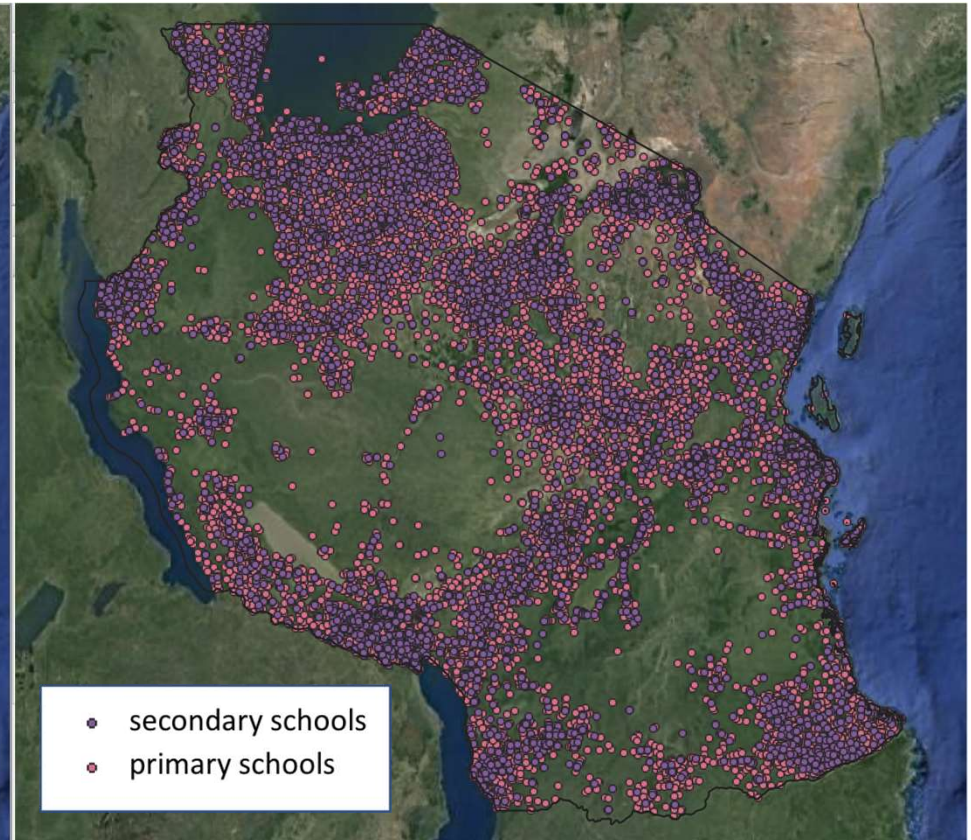


2° version of risk profiles:
Improvement of the **population distribution**
through the integration of local census data
and the use of the new urbanization mask

TANZANIA

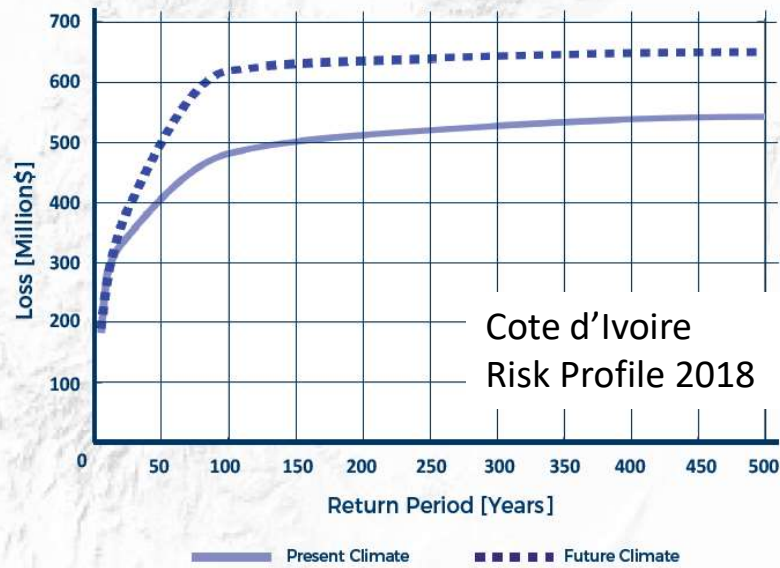


1° version of risk profiles:
Use of global dataset (OSM) for the
characterization of exposure: critical
infrastructures-schools

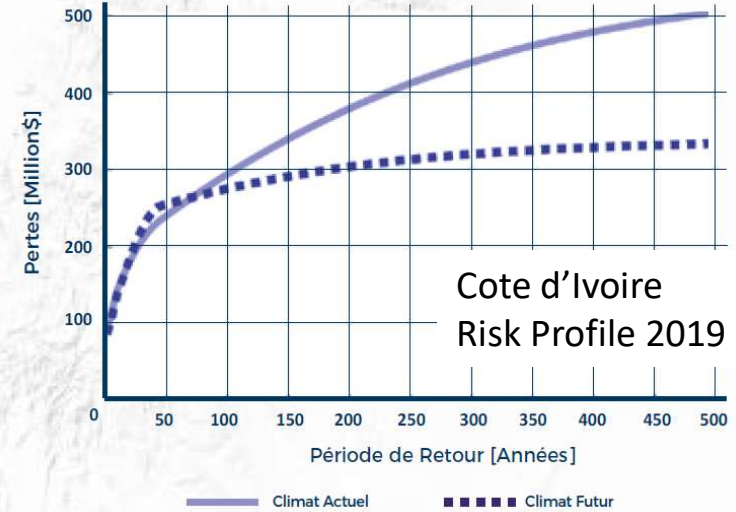


2° version of risk profiles:
Use of local datasets for the
characterization of exposure: critical
infrastructures-schools

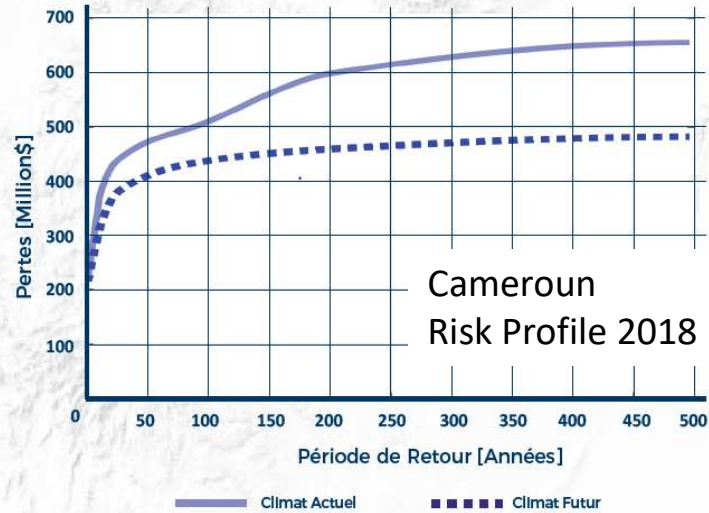
**PROBABLE MAXIMUM LOSS CURVE (PML)
C1 - DIRECT ECONOMIC LOSS**



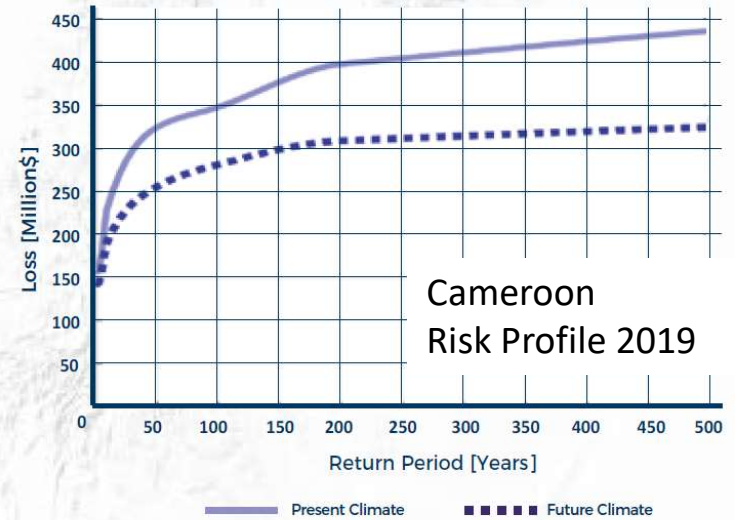
**COURBE DES PERTES MAXIMALES PROBABLES (PMP)
C1 - PERTES ÉCONOMIQUES DIRECTES**



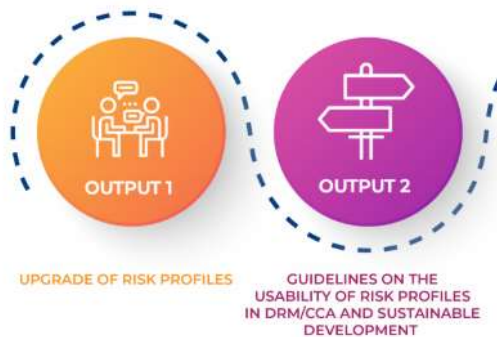
**COURBE DES PERTES MAXIMALES PROBABLES (PMP)
C1 - PERTES ÉCONOMIQUES DIRECTES**



**PROBABLE MAXIMUM LOSS CURVE (PML)
C1 - DIRECT ECONOMIC LOSS**



Applications of the results



1. Disaster Risk Reduction Strategies
2. Mainstreaming DRR
3. Preparedness and Emergency Response planning
4. Recovery Planning
5. Disaster Contingency Funds
6. Cost Benefit Analysis
7. Risk Communication
8. Education for Disaster Risk Reduction
9. Policy Coherence for Disaster Risk Reduction
10. Climate Change Adaptation (NDCs, NAPs)
11. National Development Plans
12. Land Use Planning

1/12 – Disaster Risk Reduction Strategies

Sendai: Target E

| n. | Key elements | Applicability of CRP | Relevance |
|----|--|---|-----------|
| 1 | <i>Having different timescale, with targets, indicators...</i> | Calculation of targets that fit within specific time frames | ■ |
| 2 | <i>Preventing the creation of risk</i> | Projections of the evolution of risk | ■ |
| 3 | <i>Reducing existing risk</i> | Provide a picture of major present risks | ■ |
| 4 | <i>Strengthening economic, social, health and environmental resilience</i> | Starting point for better understanding these dynamics at the national level | ■ |
| 5 | <i>Pr. 1, Understanding disaster risk</i> | Increase country's understanding of natural hazards interplays with various economic sectors and pop. growth | ■ |
| 6 | <i>Pr. 2, Strengthening disaster risk governance to manage disaster risk</i> | Support mainstream DRR and National Development Plan | ■ |
| 7 | <i>Pr. 3, Investing in disaster risk reduction for resilience</i> | Help coordinate disaster risk financing | ■ |
| 8 | <i>Pr. 4, Enhancing disaster preparedness for effective response</i> | Enhance response and preparedness mechanisms | ■ |
| 9 | <i>Promote policy coherence relevant to DRR</i> | Increased understanding can facilitate the discussion on development priorities | ■ |
| 10 | <i>Have mechanisms to follow up, periodically assess and publicly report on progress</i> | Use the current DRP as a monitoring tool from which to determine whether risk is being reduced | ■ |

Guidelines & practical workshops on the use of risk information, DRR strategy development



Merci.

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Katarina Mouakkid Soltesova, UNDRR ROA

Katarina.mouakkidsoltesova@un.org

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