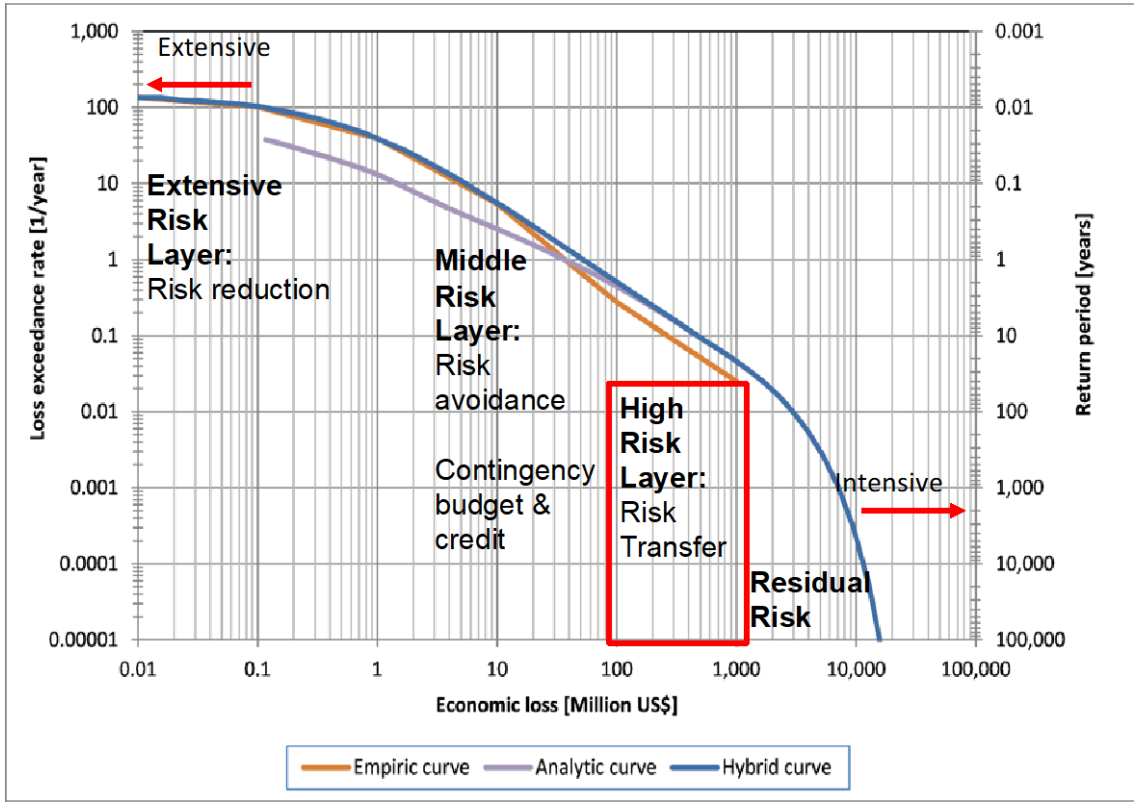
Climate adaptation from space

- In relation to DRM the first step to adaptation is Understanding Risk
- This leads to the definition of the most appropriate adaptation action

Measuring Risk

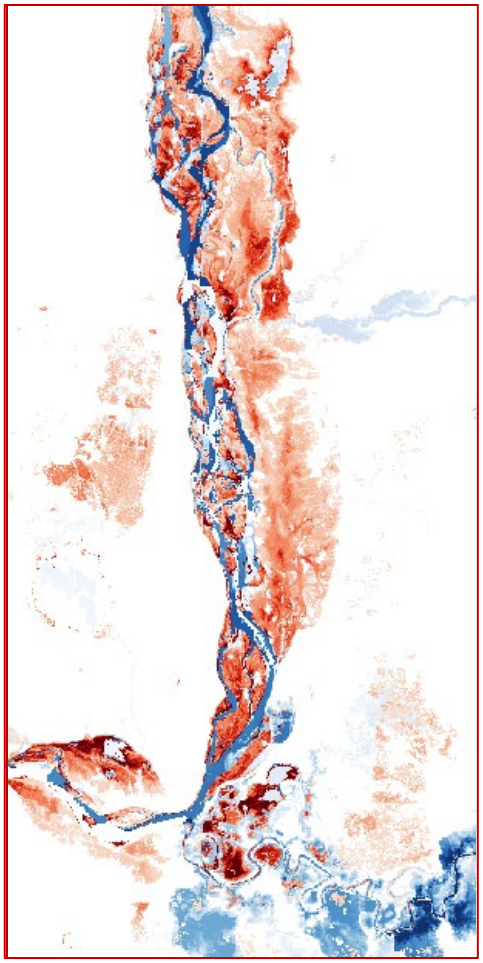


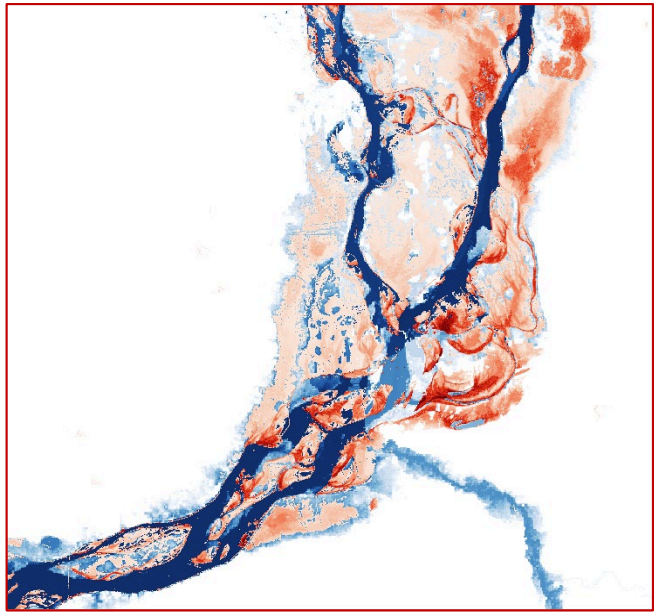
Climate adaptation from space

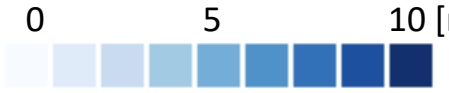
EO data support nowadays all aspects of RA

- **Hazard model cal/val**
- Exposure Identification and Modelling
- Vulnerability assessment
- Damage assessment
- Policy monitoring

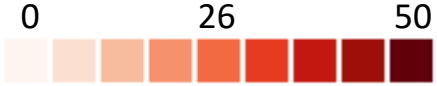
Validation of the Flood Models







--> Modeled Hazard Map



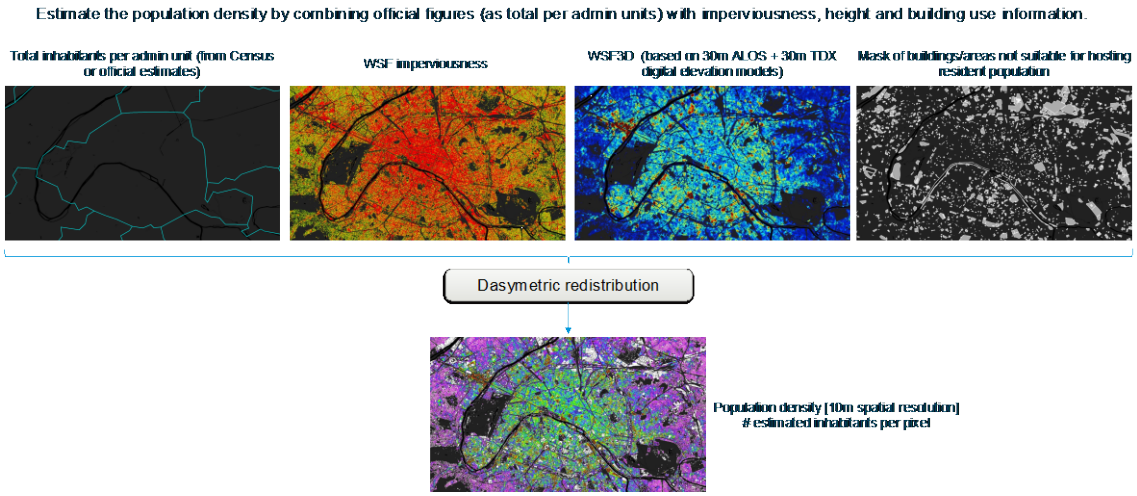
--> S1 Flood Frequency Map

Climate adaptation from space

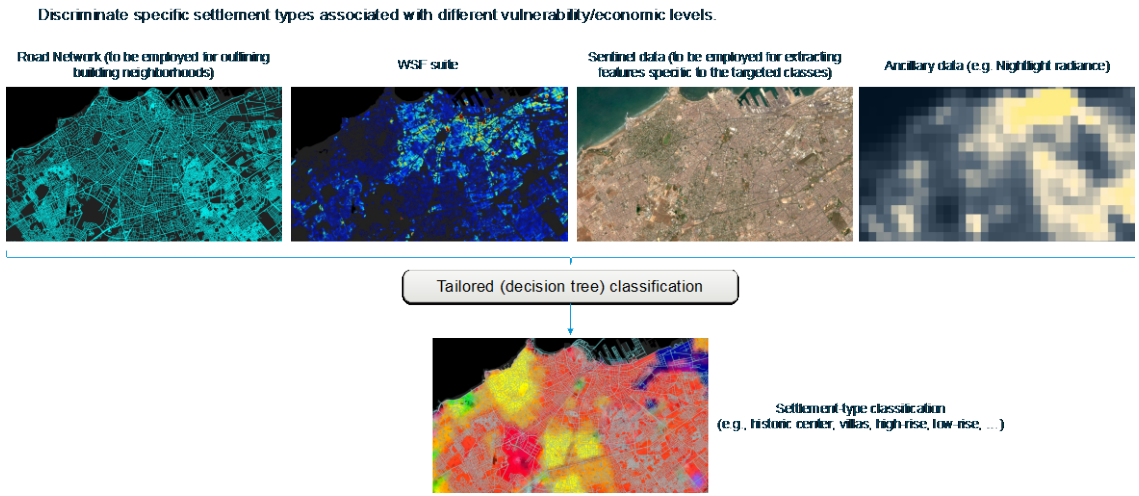
EO data support nowadays all aspects of RA

- Hazard model cal/val
- **Exposure Identification and Modelling**
- **Vulnerability assessment**
- Damage assessment
- Policy monitoring

Example for Population



Example for Building assets, vulnerability classification



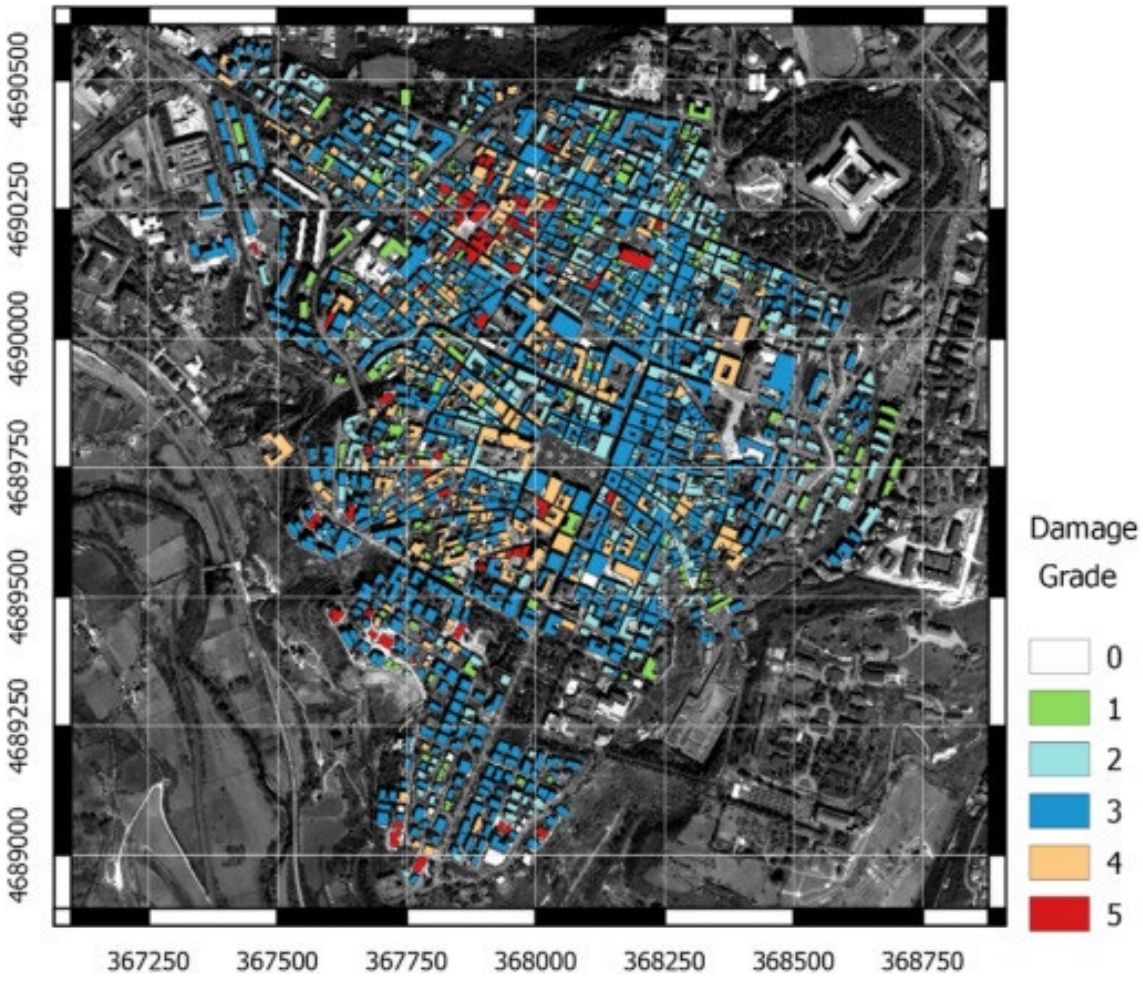
Courtesy of DLR (Esch & Marconcini)

Climate adaptation from space

EO data support nowadays all aspects of RA

- Hazard model cal/val
- Exposure Identification and Modelling
- Vulnerability assessment
- **Damage assessment**
- Policy monitoring

Example of a grading map



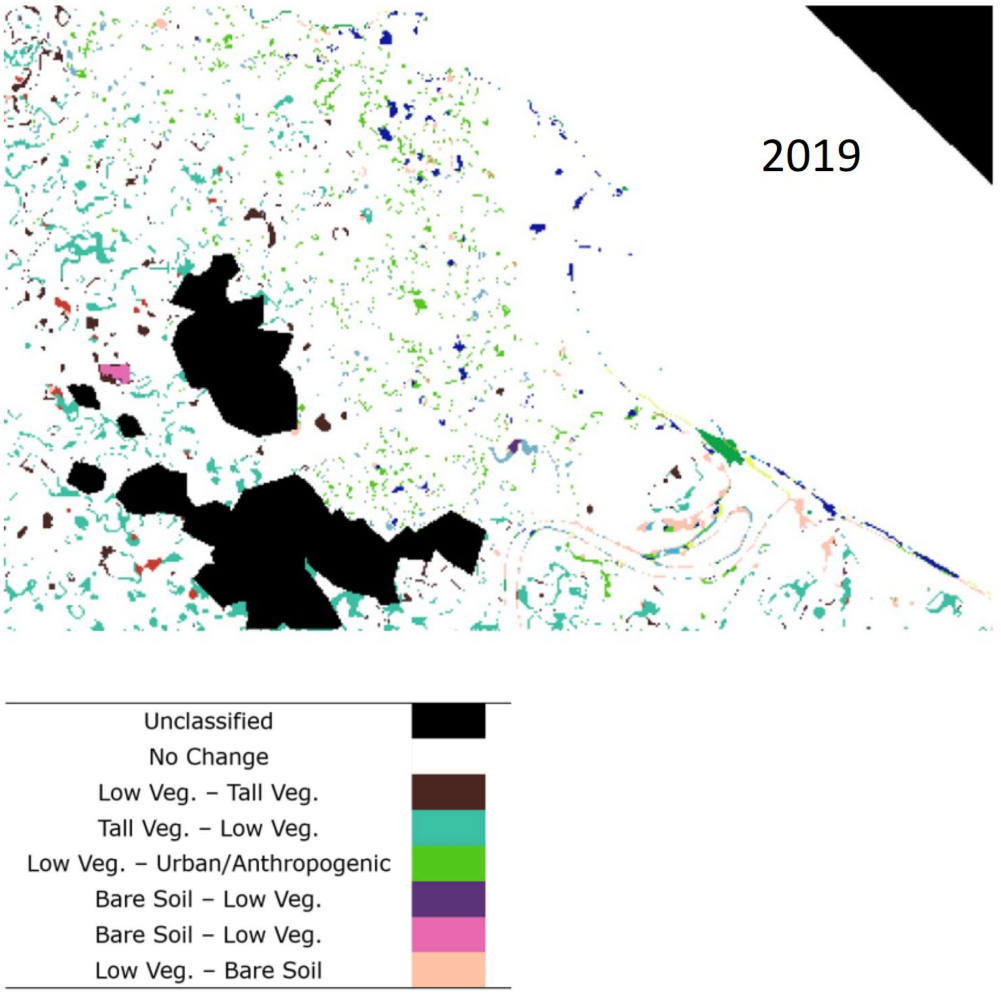
R. Anniballe, F. Noto, T. Scalia, C. Bignami, S. Stramondo, M. Chini, N. Pierdicca: Earthquake damage mapping: An overall assessment of ground surveys and VHR image change detection after L'Aquila 2009 earthquake, Remote Sensing of Environment, Volume 210, 2018, Pages 166-178, ISSN 0034-4257, https://doi.org/10.1016/j.rse.2018.03.004.

Climate adaptation from space

EO data support nowadays all aspects of RA

- Hazard model cal/val
- Exposure Identification and Modelling
- Vulnerability assessment
- Damage assessment
- **Policy monitoring**

Example recovery Monitoring



De Giorgi, A.; Solarna, D.; Moser, G.; Tapete, D.; Cigna, F.; Boni, G.; **Rudari, R.**; Serpico, S.B.; Pisani, A.R.; Montuori, A.; et al. Monitoring the Recovery after 2016 Hurricane Matthew in Haiti via Markovian Multitemporal Region-Based Modeling. Remote Sens. 2021, 13, 3509. https://doi.org/10.3390/rs13173509

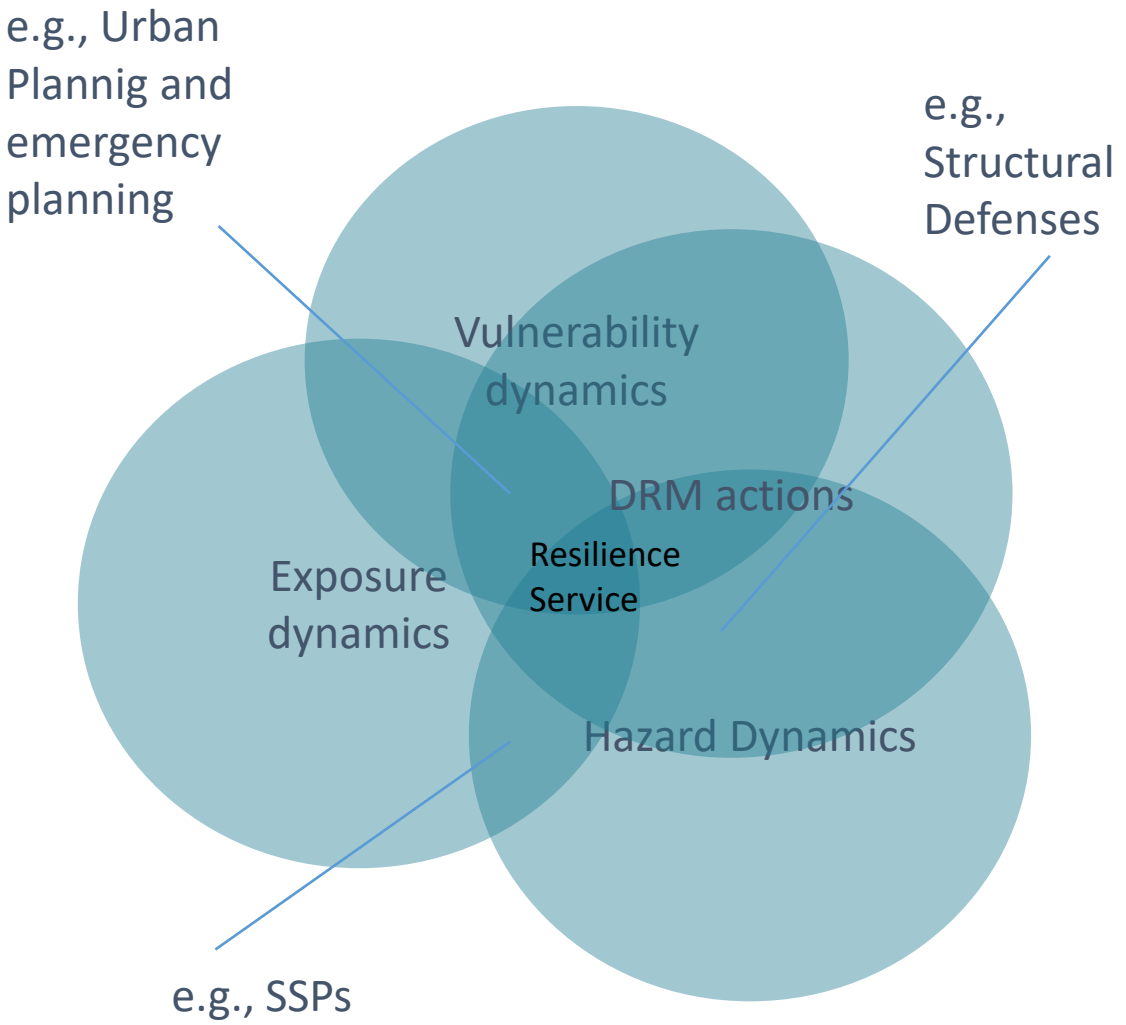
Climate adaptation from space

Risk Assessment and Adaptation: a shift in paradigm

- Retroaction

The concept of resilience service

a fully dynamic and retroactive approach



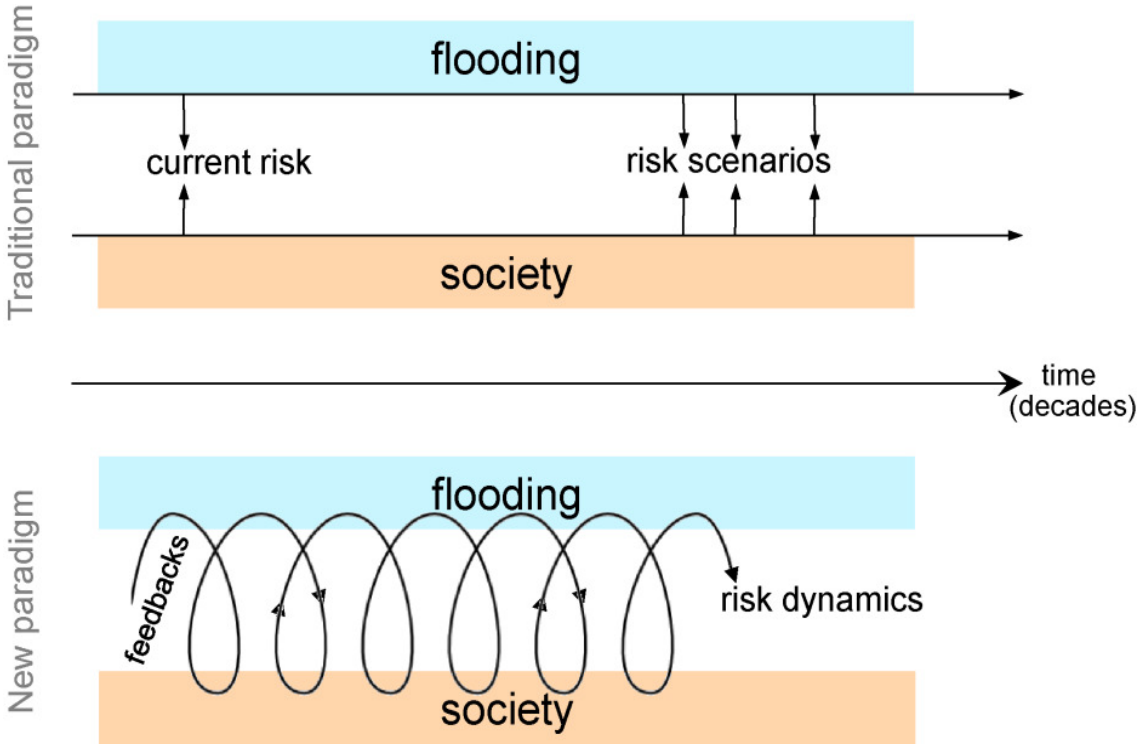
Climate adaptation from space

Risk Assessment and Adaptation: a shift in paradigm

- A fully dynamic system

Resilience service

Changing the paradigm



Debates—Perspectives on socio-hydrology: Capturing feedbacks between physical and social processes

Water Resources Research, Volume: 51, Issue: 6, Pages: 4770-4781, First published: 28 April 2015, DOI: (10.1002/2014WR016416)

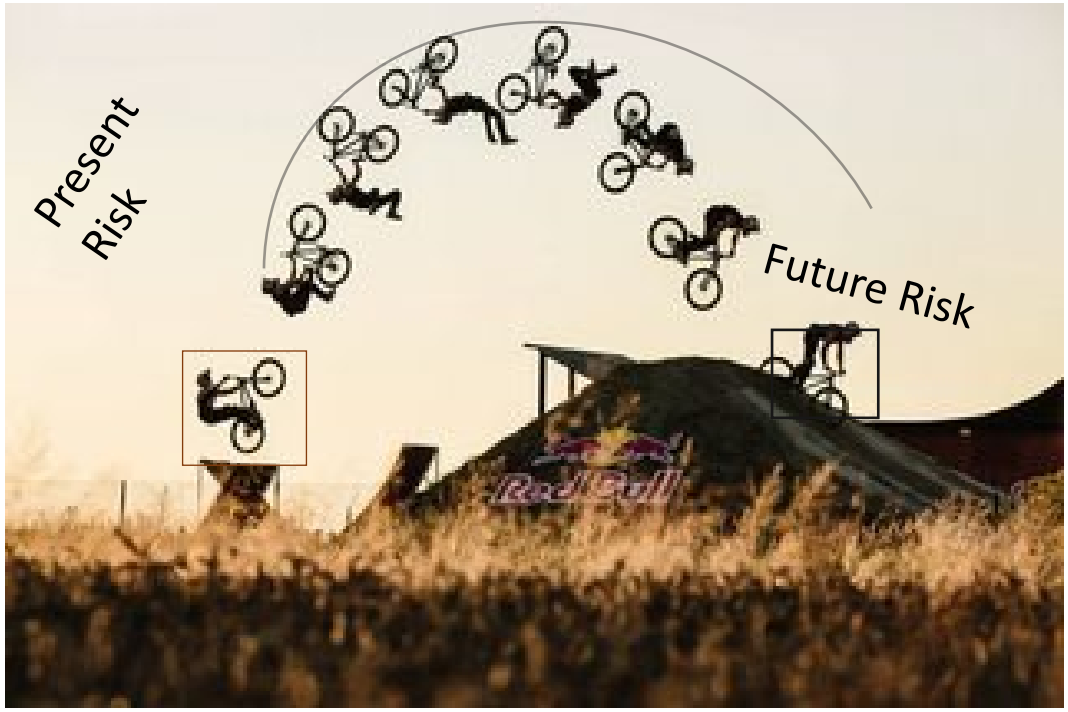
Climate adaptation from space

Risk Assessment and Adaptation: a shift in paradigm

- Now we evaluate risk snapshots at different times

Resilience service

Changing the paradigm



Climate adaptation from space

Risk Assessment and Adaptation: a shift in paradigm

- Evaluating a **risk pathway** and not a risk condition

Resilience service

Changing the paradigm

Climate adaptation from space

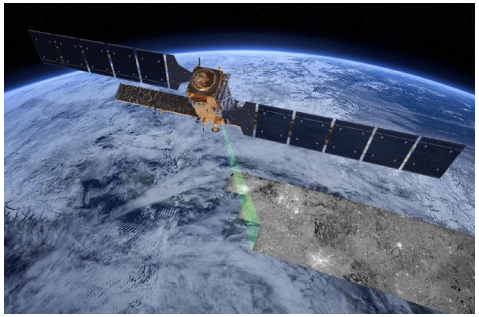
Risk Assessment and Adaptation: a shift in paradigm

- Observations from space are the most powerful means to **observe Risk dynamics over large areas**

Enablers for the use of EO data in DRFR and CCA Context

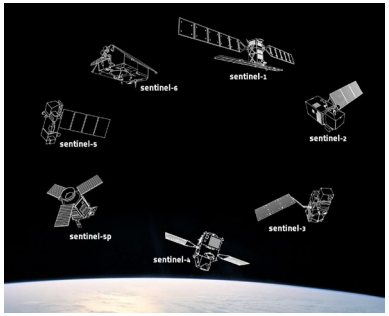
Open Access

Systematic



Computing Power

Automation



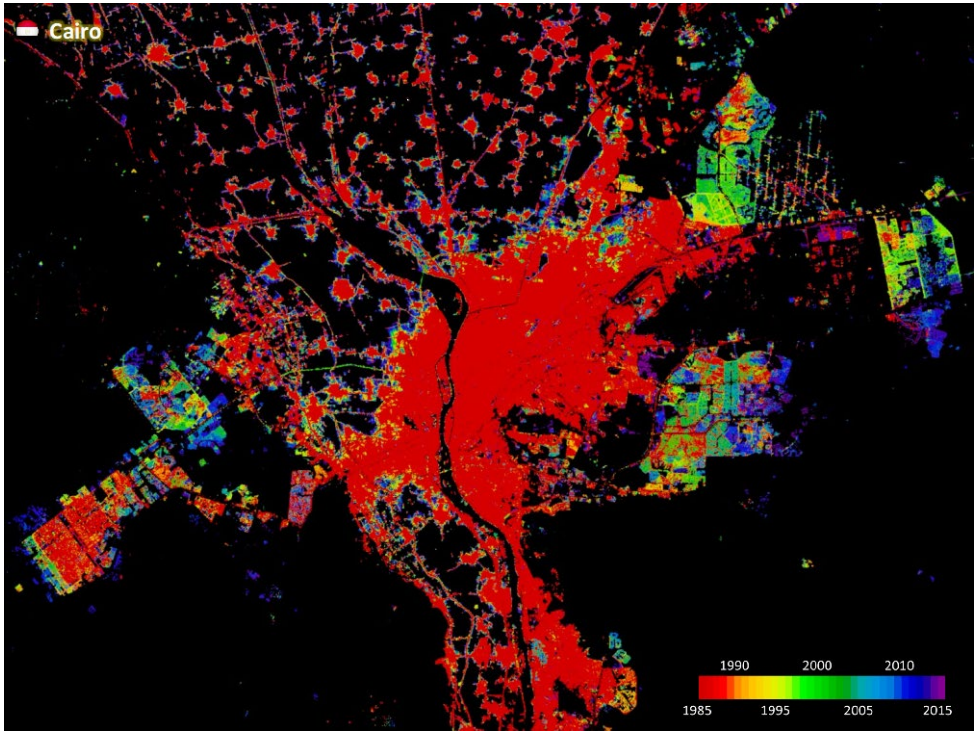
Multilpe constellations

Climate adaptation from space

Example of EO data to drive dynamic evaluation of risk:

- Observing Exposure dynamics, Urbanization, population density changes

Exposure Dynamics



Courtesy of DLR (Esch & Marconcini)

Climate adaptation from space

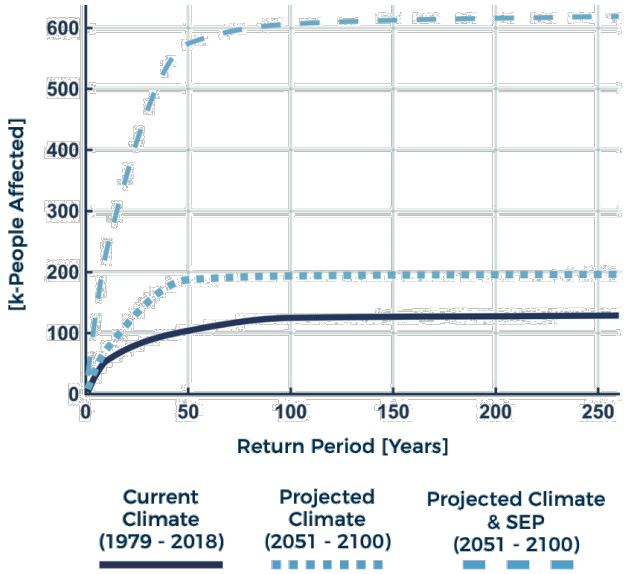
Example of EO data to drive dynamic evaluation of risk:

- Population growth modelling calibrated on EO estimates
- Effect on Risk assessment and modelling

Northern part of Dar es Salaam, current population density

Northern part of Dar es Salaam, 2050 projection of population density

Population PML - Fig. F07



Climate adaptation from space

Conclusions:

- EO will be even more important in DRR & CCA Applications
- Models will come with new needs that we must satisfy

New Needs

New Challenges

New Opportunities