SWISS NGO DRR PLATFORM

Water & Disasters:
Integrated floods management
Acting locally, linking beyond

Potential and limits of science and technology related to Meteorology

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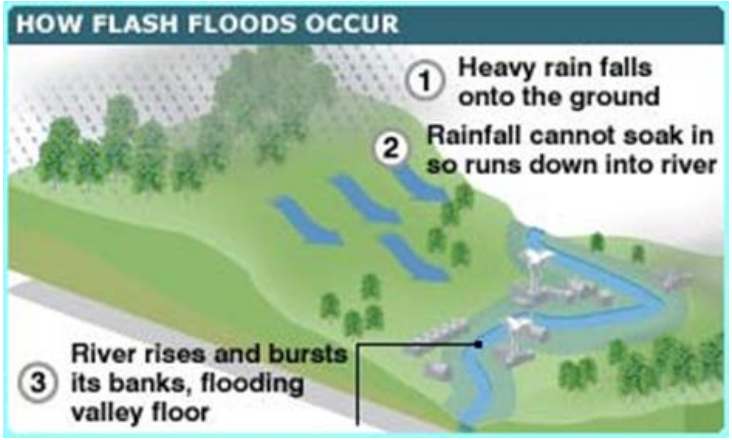
Outline

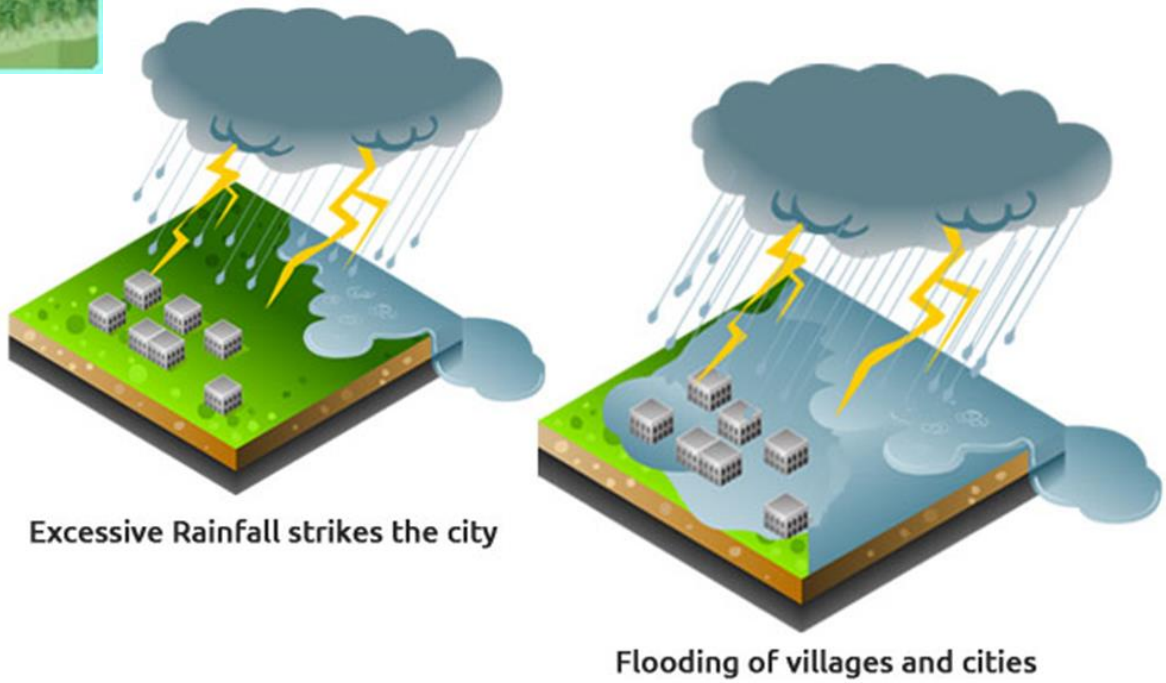
- Meteorology and DRR
- Rain vs. Floods and Flash Floods
- Climate change and flood risk
- Uncertainty in weather and floods forecasts
- Early warning systems
- Disaster risk reduction: from early warnings to climate resilience

Rain comes from the sky…



We focus on when/were/how much it will rain

…floods are on the earth



Where meteorology can help DDR

Hazard assessment from climatological records and past disaster history

Early weather warning helps to reduce exposure and risks

Rain and floods

Large scale events:

Monsoon, hurricane/typhoon

Floods

Small scale events:

Low moving heavy

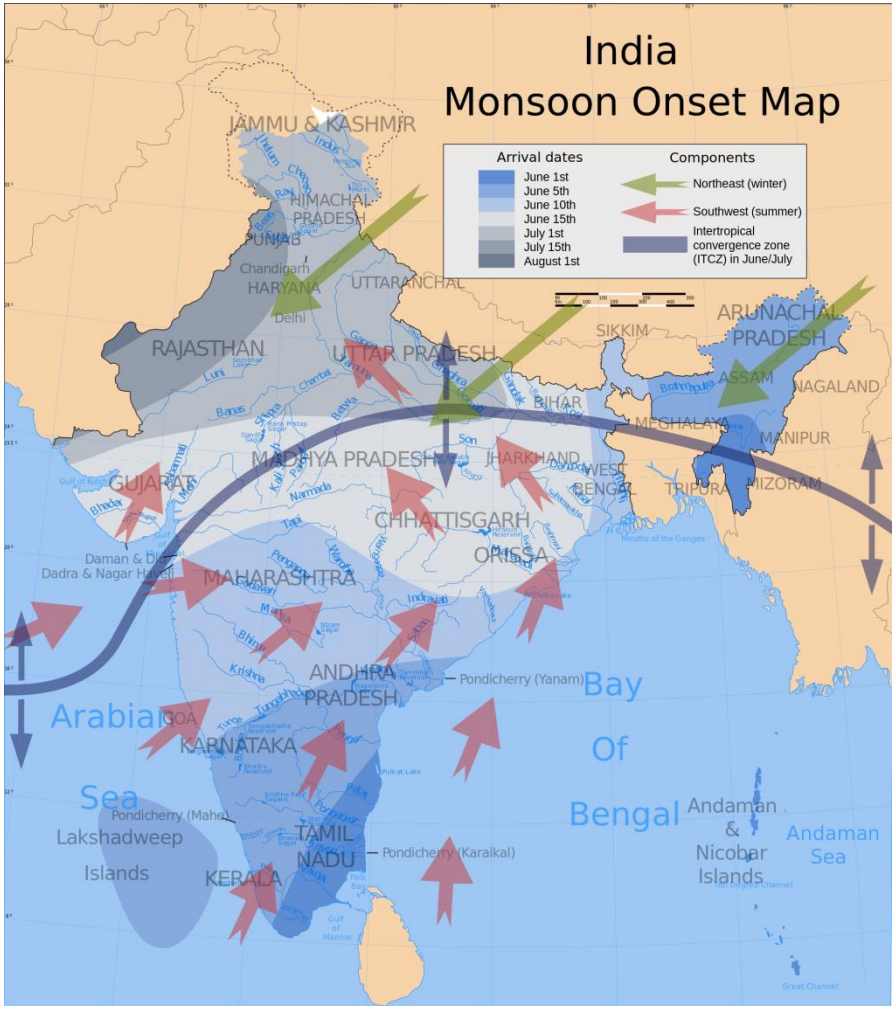
Thunderstorms

Flash Floods

Large scale rainfall

Seasonally rainfall like the monsoons show some typical pattern in space and time

Flood tendency assessment



Thunderstorm forecast

- In tropical regions heavy rainfall is mostly produced by severe thunderstorms.
- The precise forecast of thunderstorms is possible only for very short time
- The resulting flash floods depend strongly on the exact position, duration and intensity of the heavy rainfall.

Typical values for the rain events

Meteorological Events	Large scale	Small scale
Dimension	10’000-100’000 km2	10-100 km2
Lifetime	Several days	Few hours
Forecast space/time resolution	Fair - good	Only short term
Climatology	Usually fair	At best fair
Onset speed	Slow - Moderate	Rapid
Warning lead time	1-5 days	1-3 hours
Predictability	Fair - Good	Poor - Fair
Early warning system	Significant improvements	Challenging

Hazard assessment from the past

In order to quantify the hazards there are several data sources:

1. Climatological and hydrological records and analysis.
   In developing countries the meteorological information are often quite sparse, less reliable or only short length.
2. Past events history and records.
   This information is mostly impact oriented and includes the local vulnerability and exposure.

Future hazards

- The use of past information supposes a recurrence of the events for a specific place.

- Nevertheless there are often never before observed extreme events at several places.

The combination of past records, modelling and geographical information

⇩

hazard maps

Flood risk and climate change

Climate change effects:

- Increase of severe events frequency, particularly flash floods. Already observed in several part of the world in the last years.
- Modification of the precipitation patterns compared to the past observations (i.e. the monsoon): rare or never before recorded events.

↓

Increase of the flood risk

Climate change adaptation and flood risk reduction

Adaptation includes:

- Vulnerability reduction against floods and flash floods with adequate measure thanks to hazard maps.
- Exposure reduction with adequate early warning systems:
  timely warnings help to evacuate people, livestock and to take measures to reduce the damages.

Uncertainty of forecasts

- Meteorological forecast uncertainty refers to the limits of predictability imposed by the chaotic behavior of the atmosphere

- Impact forecast uncertainty must integrate factors related to exposure and vulnerability to assist in the quantification of risk.

Effective Early Warning System involves

1

National to local governments disaster risk management supported by disaster risk reduction plans, legislation and coordination mechanisms

2

COORDINATION AMONG NATIONAL MINISTRIES, AGENCIES & SERVICES

- Meteorological
- Hydrological
- Geological
- Marine
- Health, Agriculture, Environment, (etc.)…

5 feedback

warnings 3

preventive actions

warnings 3

5 feedback

4

Community Preparedness

3 warnings

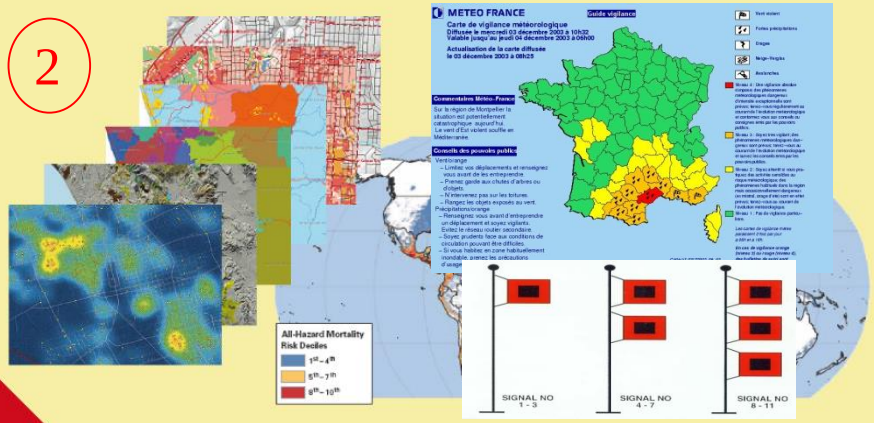
feedback 5

Early warning systems requires wide coordination and cooperation at several levels

1

Hazard Data and Forecasts

2



Risk Information

Coordination and Collaborations

Communication and Dissemination Mechanisms

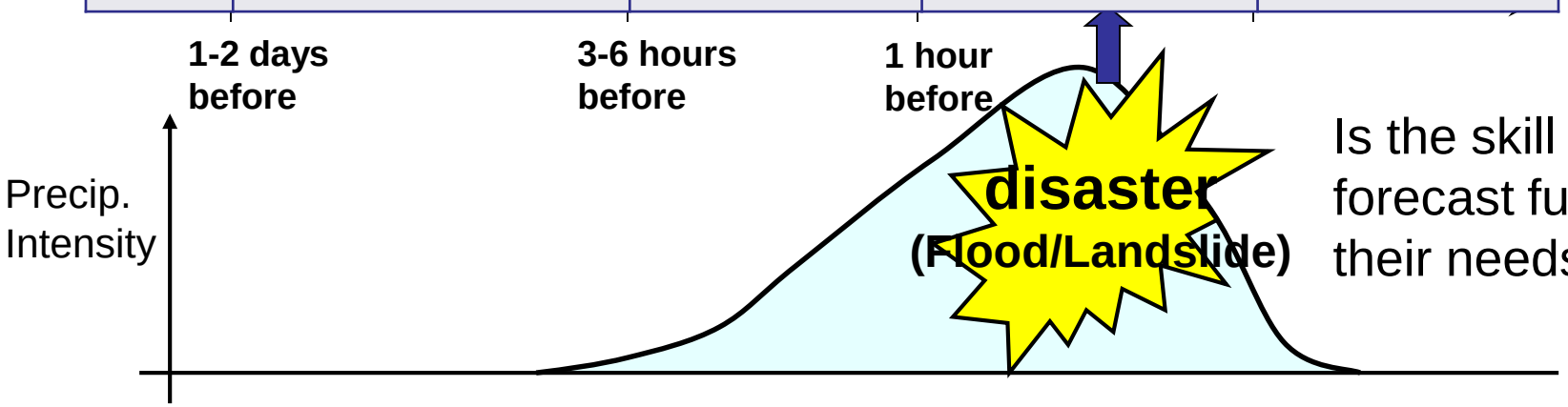
3

4

Preparedness and Early Response

Forecast leads to a “call to action”

Meteorological Information	**Outlook**	**Watch**	**Warning**	**Cancel warning**
Local Government	Stand by	Ready to take action	Action for disaster prevention	Action for recovery
Citzen	Keep in mind	Preparation	Evacuation	Back to normal (recovery)



Is the skill of the forecast fulfilling their needs?

Courtesy, Shingo Yamada JMA

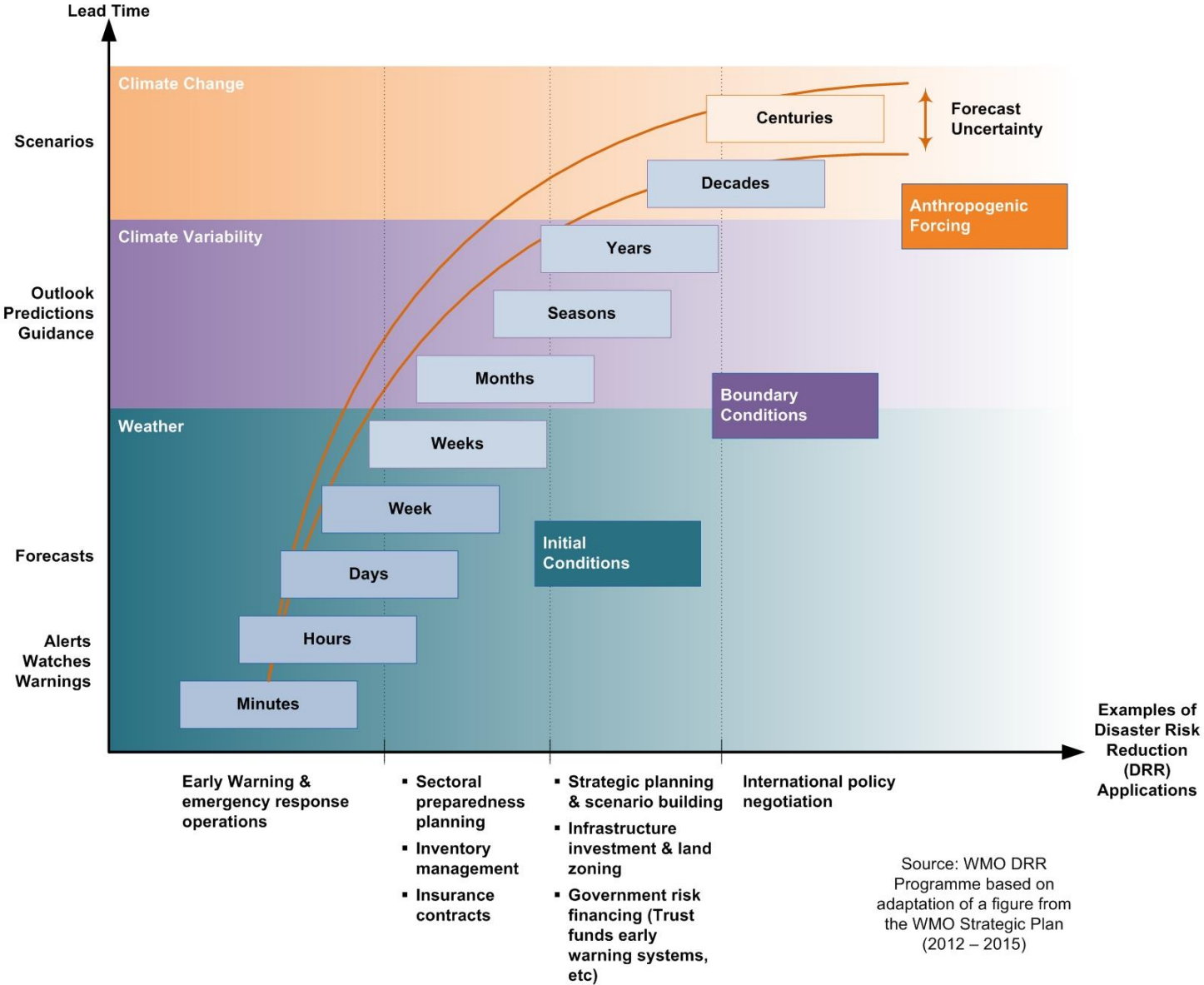
Uncertainty management

There can be a significant amount of uncertainty in issuing warnings:

- There is always a balance between providing a forecast or warning with long lead time versus obtaining accuracy, so that the warning is credible.
- Very early lead time -> less accuracy and credibility in the forecast.
- Late or no warning -> catastrophic losses.

Usually better an early over-warning than a late or under-warning.

Disaster risk reduction:
From early warnings to climate resilience



Source: WMO DRR Programme based on adaptation of a figure from the WMO Strategic Plan (2012 – 2015)

Conclusions

- Weather forecasts and climatological informations can contribute to DRR
- They need to arrive on time to the decision makers
- Collaborative decision making are necessary among all involved stakeholders.
- Everybody must know how to behave and handle in each situation

Thank You