



Schweizerische Eidgenossenschaft
Confédération suisse
Confederazione Svizzera
Confederaziun svizra

Eidgenössisches Departement für auswärtige Angelegenheiten EDA
Swiss Agency for Development and Cooperation SDC



強
韌
性

革
新

伝
統



UNDERSTANDING RISK
GLOBAL FORUM 2024

TRADITION • INNOVATION • RESILIENCE

Trapped in mountain valleys: an event analysis of the 2022 monsoon floods in the Swat Valley, Pakistan

Speakers:

Christoph Lehmann, Lehmann Hydrologie - Wasserbau

Muhammad Shafique, University of Peshawar

Naraya Carrasco, GFDRR

Qaisar Imran, NDMA Pakistan

Matthias Bachmann, SDC



Schweizerische Eidgenossenschaft
Confédération suisse
Confederazione Svizzera
Confederaziun svizra

Swiss Agency for Development
and Cooperation SDC





Schweizerische Eidgenossenschaft
Confédération suisse
Confederazione Svizzera
Confederaziun svizra

Eidgenössisches Departement für auswärtige Angelegenheiten EDA
Swiss Agency for Development and Cooperation SDC



2022 Flood Event Swat Valley





After SDC's rapid response:

Analysis of the 2022 floods in Swat Valley.

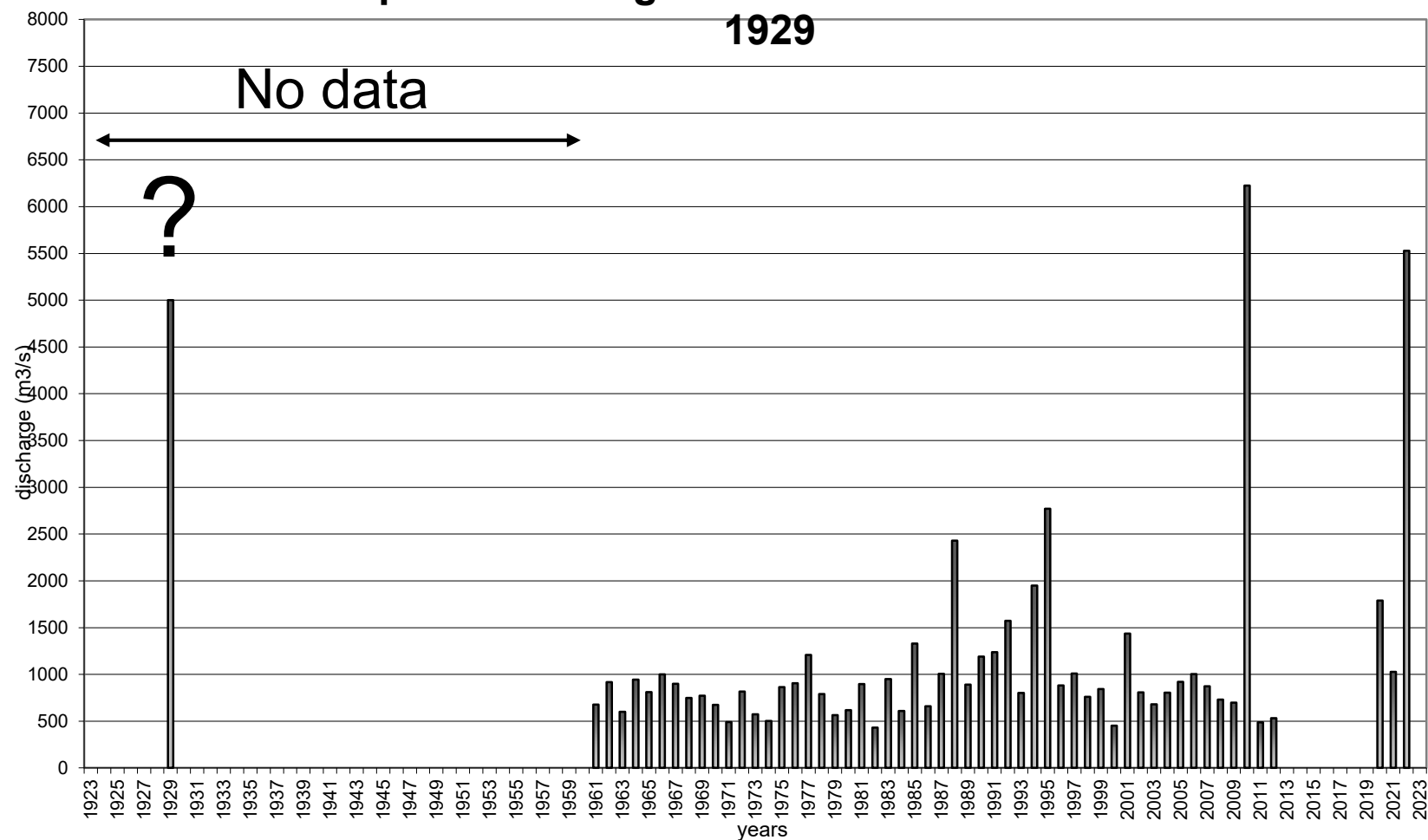
1. What processes are involved ?
2. How were damages caused ?
3. Is there a residual risk ?
4. Recommend DRR measures?

→ Learn from the event





Annual peak discharge Chaktara 1961 - 2022 incl. flood





The flood of 2010 had a great influence on the flood of 2022

Mankyal (2009)





Mankyal (2011, after the flood of 2010)



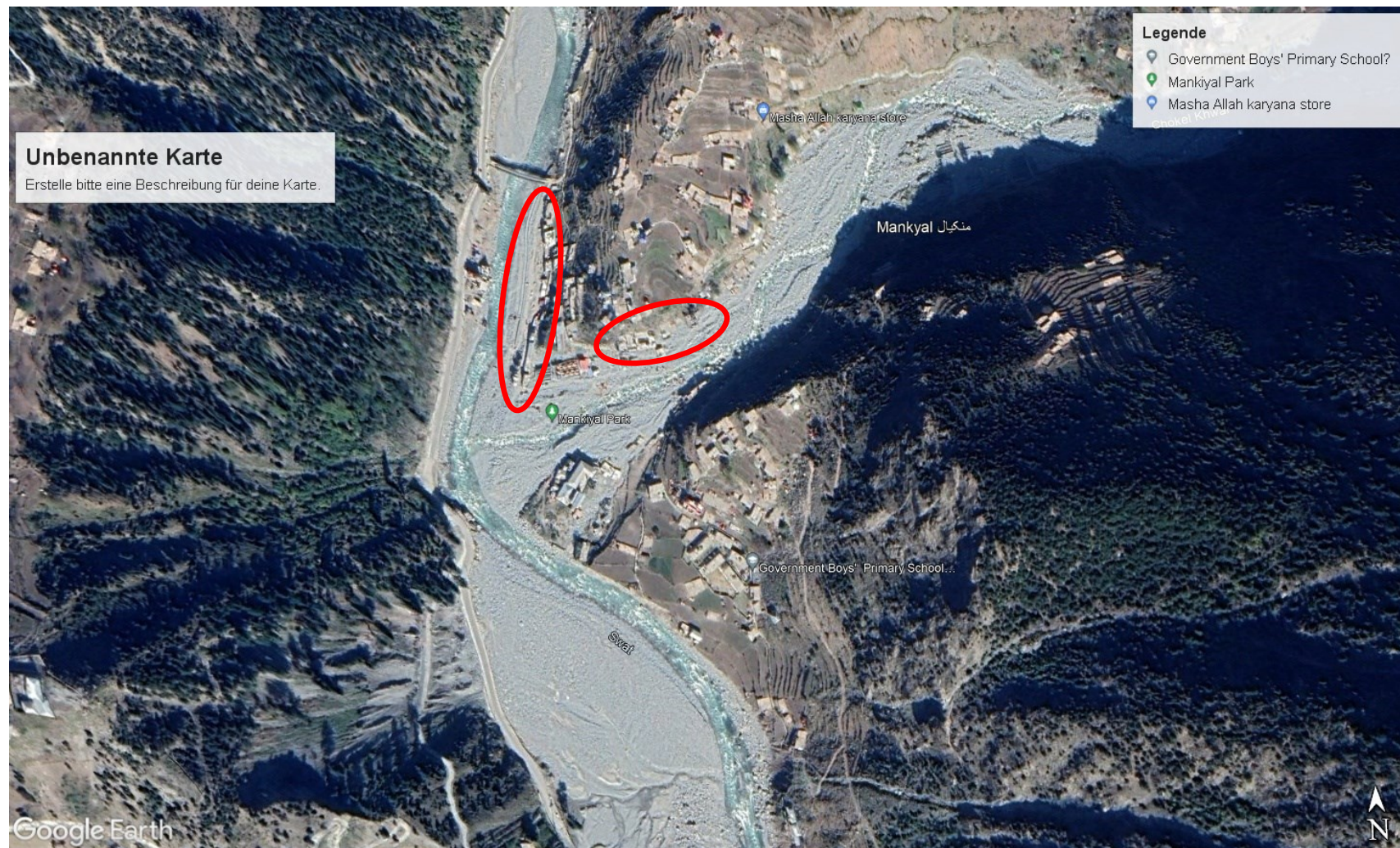


Mankyal (2017)



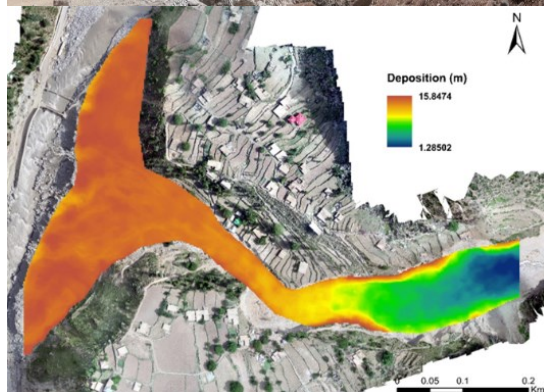


Mankyal (after the flood of 2022)





Debris flows were responsible for high sediment inputs in 2022



300'000 m³



Aryani debris flow



Debris flows have dammed the Swat river at different places

Temporal dams:

- Lakes
- Sediments deposited
- Flooded settlements and fields.

Aryani debris flow





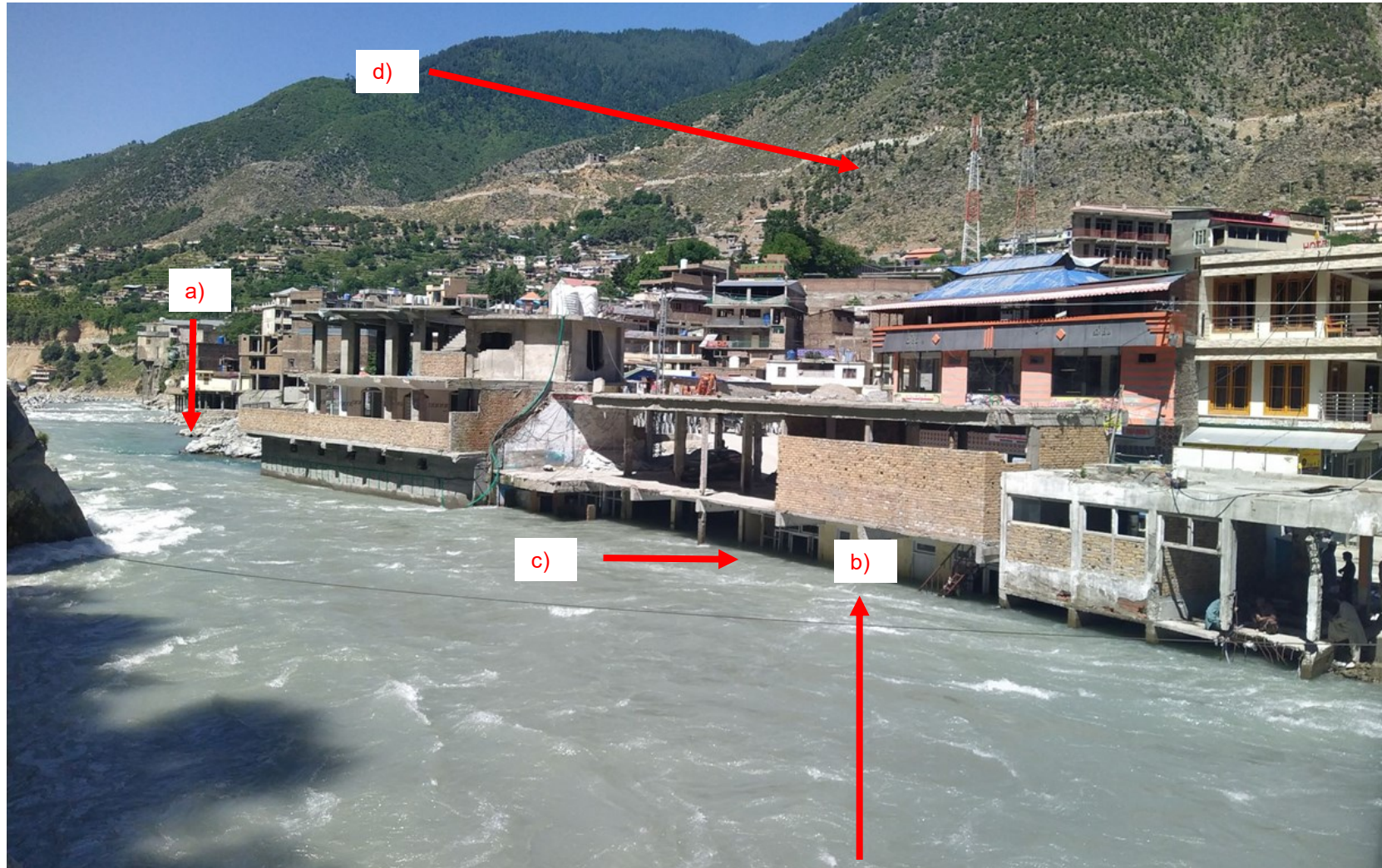
Riverbed aggradation (Bahrain, February 2004)



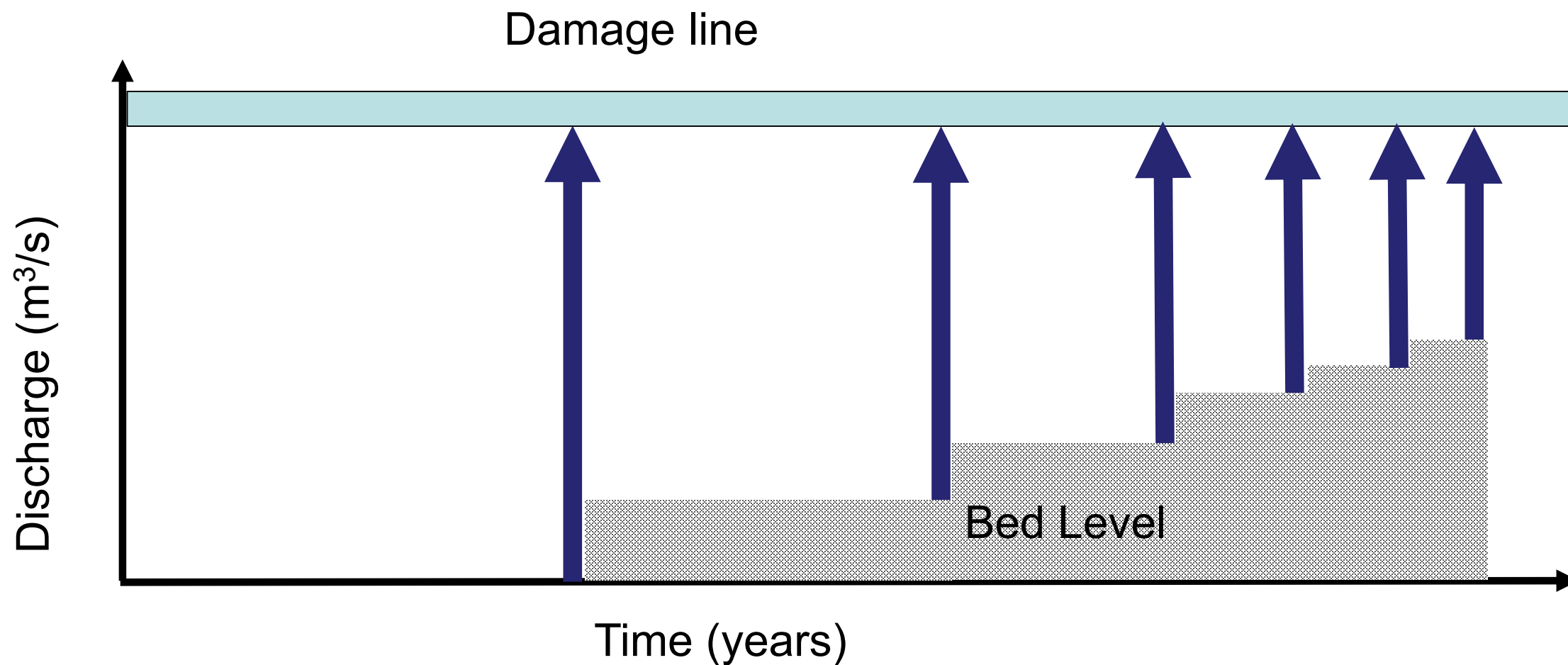
- a) Reference point "rock"
- b) Riverbed before Floods 2010 and 2022
- c) First floor
- d) Forested landscape



Riverbed aggradation (Bahrain, 06.06.2023)



- a) Reference point "rock"
- b) Riverbed aggradation.
- c) First floor
- d) Forest degradation and deforestation





A high percentage of damage was caused by the "human-nature conflict"



(Kalam before 2010)



A high percentage of damage was caused by the "human-nature conflict"



(Kalam June 2023)



A high percentage of damage was caused by the "human-nature conflict"

- 2010: buildings destroyed
- Buildings were rebuilt until 2022
- After the flood of 2022, the buildings will be rebuilt on the same site.

("North-West Frontier Province Rivers Protection Ordinance 2001")



(Bahrain June 2023)



Residual Risk is very high (Bahrain June 2023)



Riverbed aggradation

Bank erosion



Conclusions

1. The event of 2022 was too big to be controlled by human
2. The 2010 flood influenced the 2022 flood (river bed aggradation, erosion)
3. Spatial conflict between human and nature
4. Potential risk of damage has increased
5. Data is missing



Schweizerische Eidgenossenschaft
Confédération suisse
Confederazione Svizzera
Confederaziun svizra

Eidgenössisches Departement für auswärtige Angelegenheiten EDA
Swiss Agency for Development and Cooperation SDC



5. Some Recommendations...



Capacity development and exchange of knowledge on different levels





Multiple Hazard Risk mapping





Network of hydromet stations





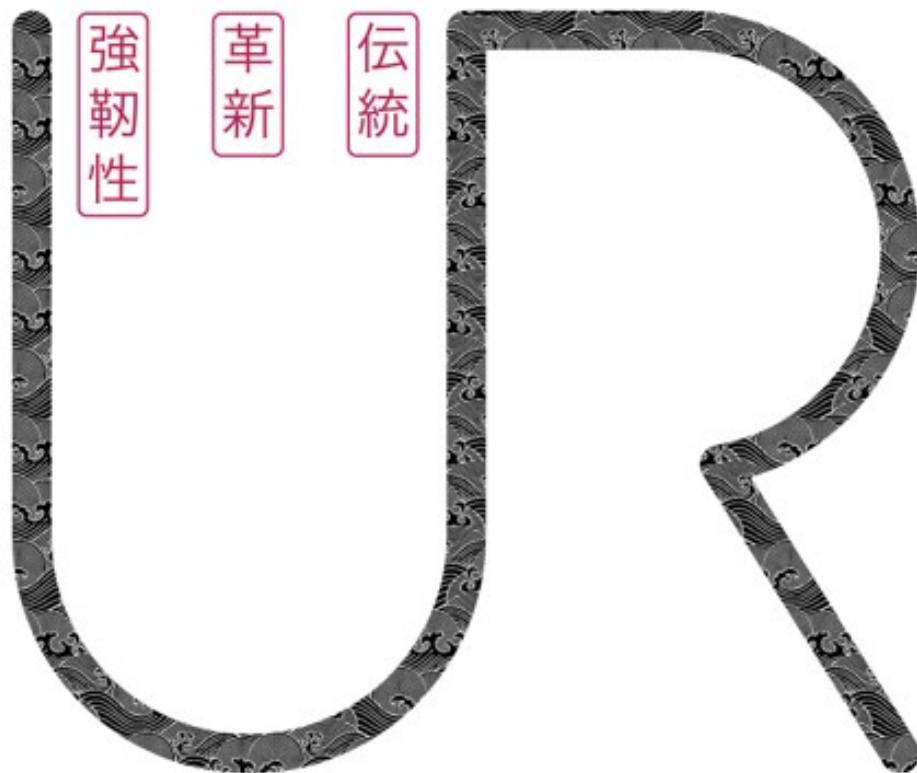
Coordination in river management





Sustainable forest management and afforestation





TRADITION • INNOVATION • RESILIENCE



Thank you !

Christoph Lehmann

hydrologie@solnet.ch

Download the report:

www.eda.admin.ch/deza/en/home/sdc/publications.html



Schweizerische Eidgenossenschaft
Confédération suisse
Confederazione Svizzera
Confederaziun svizra

Swiss Agency for Development
and Cooperation SDC