

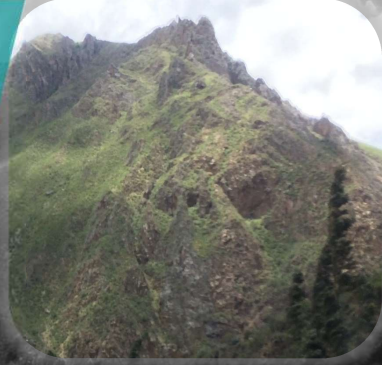
Universität  
Zürich


## The potential impact of climate variability on siltation of Andean reservoirs.

*Case of study: Cañete river, Peru.*


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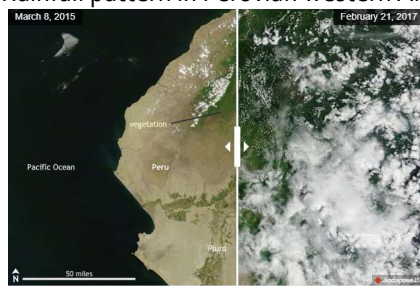


May 5th, 2020



## Climate variability and Peruvian economy

Rainfall pattern in Peruvian western Andes presents a high variability.



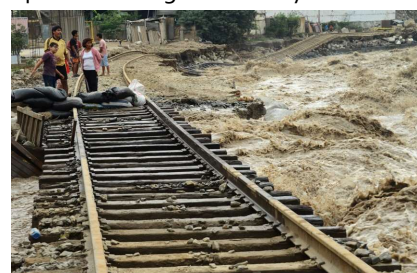
### Peru Floods Highlight Challenge of a Warming Planet Says UN

22 MARCH, 2017 BY FLOODLIST NEWS IN AMERICAS NEWS · 1 COMMENT

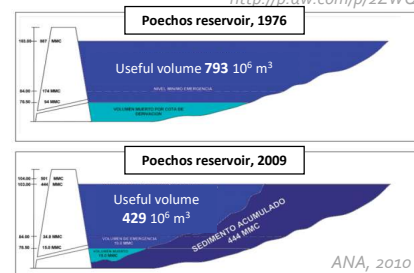
The United Nations Special Representative of the Secretary-General for Disaster Risk Reduction, Mr. Robert Glasser, said yesterday that current flood disaster in Peru highlights the challenges of a warming



Floodlist, 2017

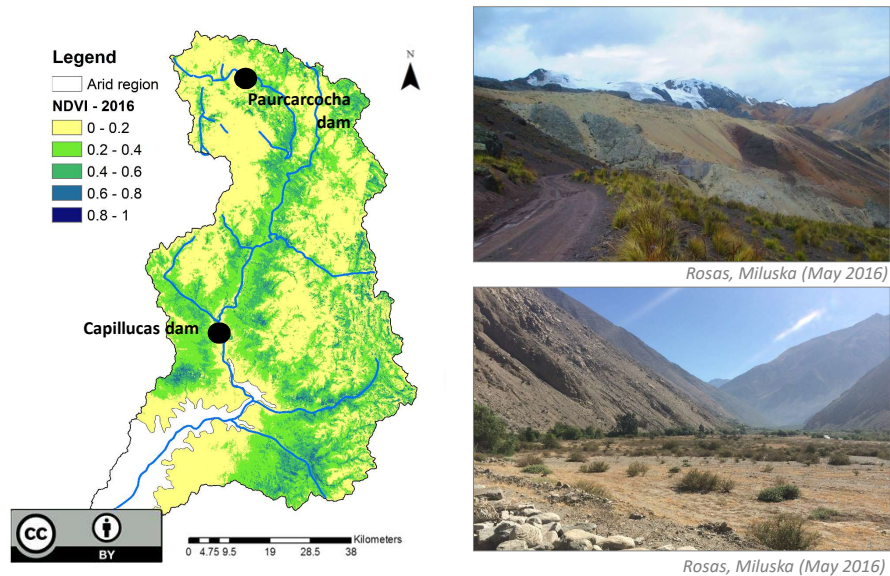


<http://p.dw.com/p/2ZWQs>



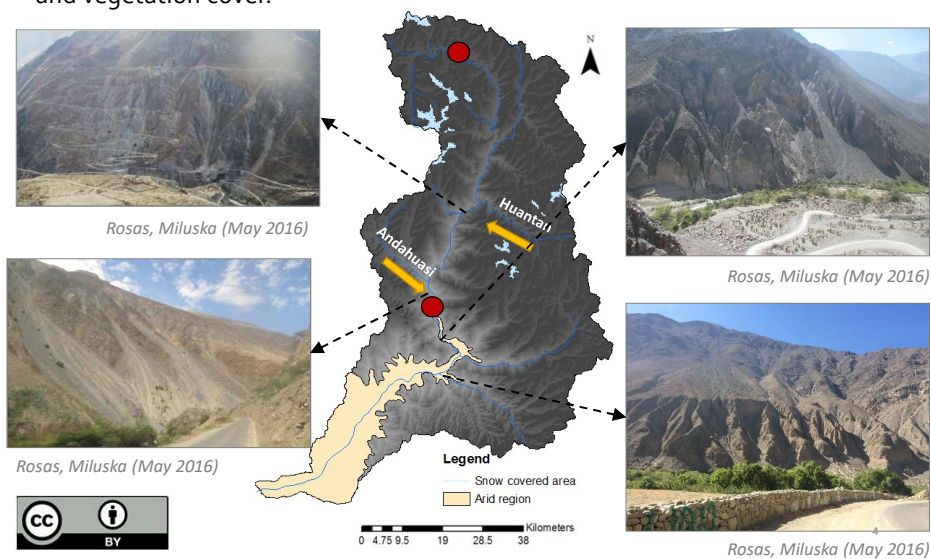
## Cañete basin as a case study

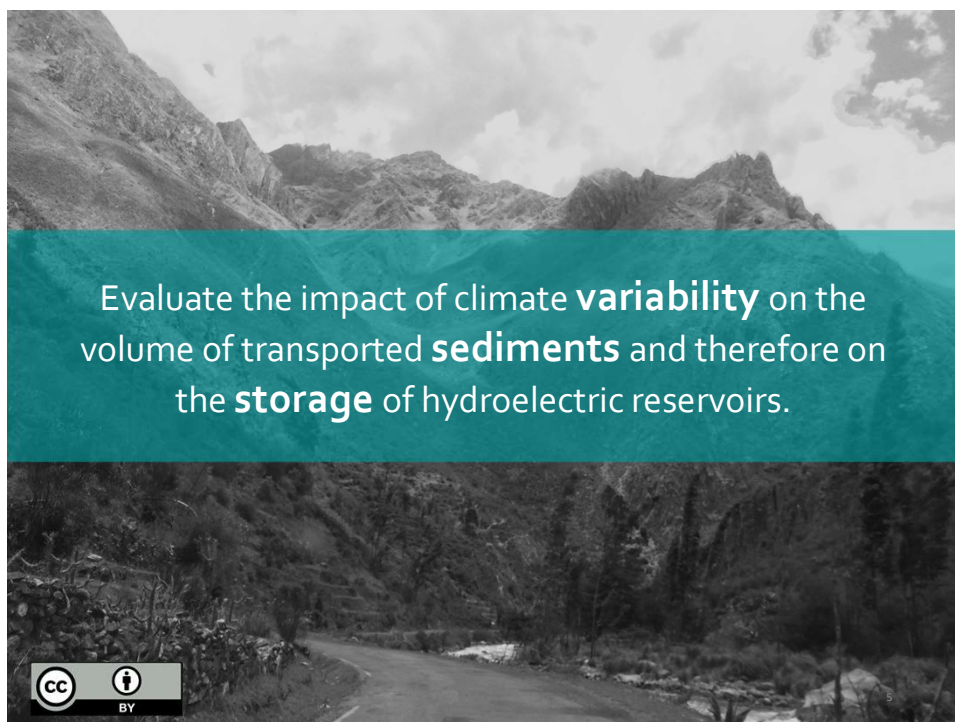
Cañete basin (6000 km<sup>2</sup>) is located in the Coastal range of the Andes



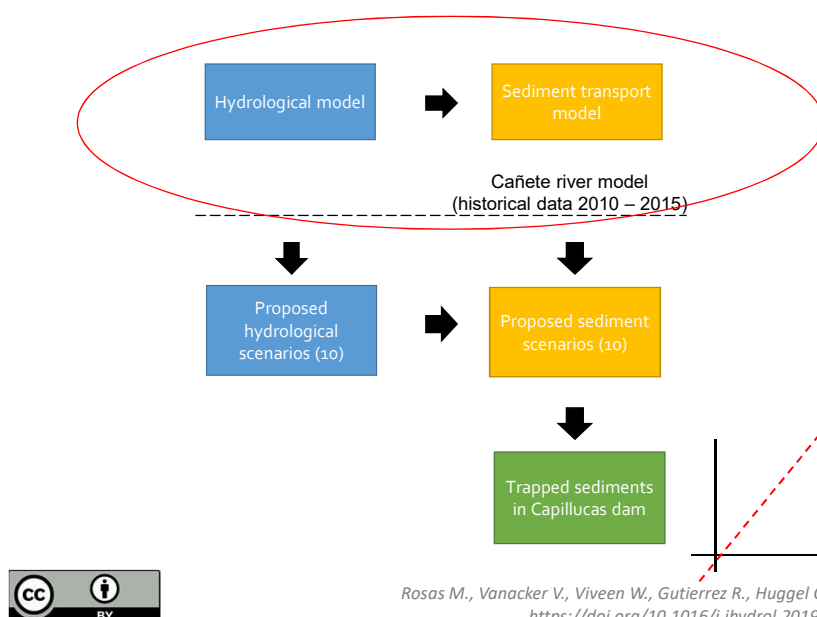
## Natural hazards: gully erosion, flash floods and landslides

High geomorphic activity within the basin, controlled by climatic variability and vegetation cover.





## What is the plan??



Rosas M., Vanacker V., Viveen W., Gutierrez R., Huggel C. (2020)  
<https://doi.org/10.1016/j.jhydrol.2019.124396>

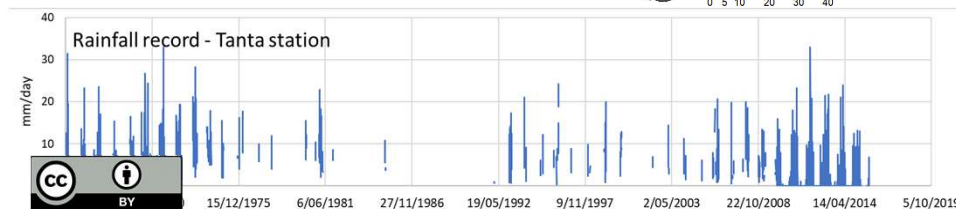
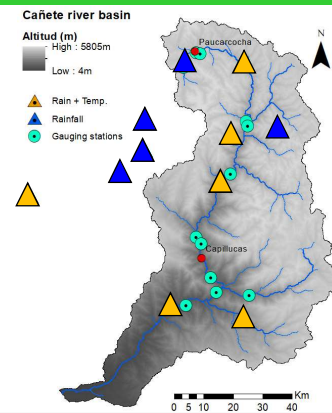


## Scarcity of meteorological data

The basin is monitored by 11 rainfall stations, 7 temperature stations and 13 flow measurement station.

Sub-optimal spatial distribution of weather and gauging stations

The data collected after the year 2010 was used to built the hydrological model.



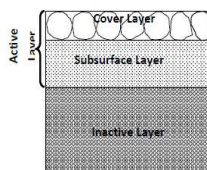
## The sediment transport model describes suspended sediments and bed load

- Transport function: Ackers&White

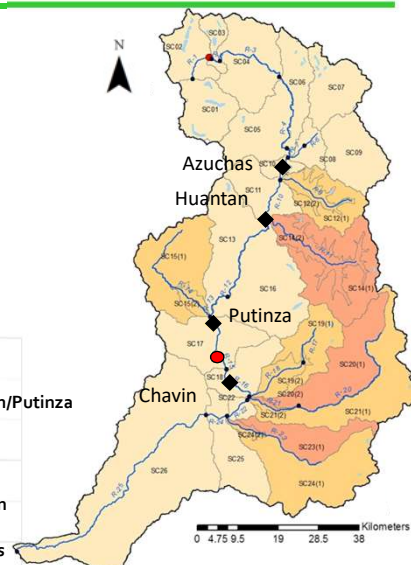
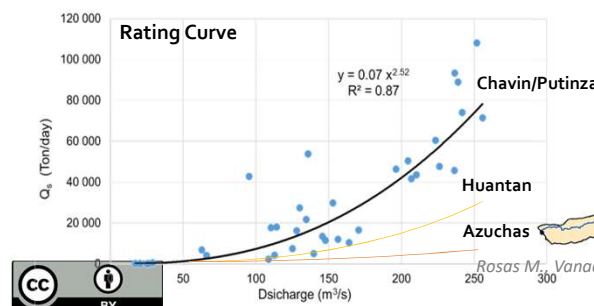
$$X = \frac{SD}{h} \left( \frac{V}{v^*} \right)^n G_{gr}$$

X: sediment flux  
D: particle  $\phi$   
h, V: flow depth and velocity  
v\*: friction velocity  
G<sub>gr</sub>: parameter of transport

- Sorting Method: Thomas (Ex5)



Main input: 2465 suspended sediments samples collected (1998 to 2001)



Rosas M., Vanacker V., Viveen W., Gutierrez R., Huggel C. (2020) <https://doi.org/10.1016/j.jhydrol.2019.124396>

## Ten rainfall scenarios were proposed

Scenarios correspond to increasing and decreasing rainfall intensities in the region.

### Proposed rainfall changes:

[ + 5% ] [ + 8% ]

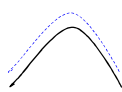
[ + 10% ] [ + 15% ]

[ - 17% ] UZH, 2016

### Proposed rainfall patterns:

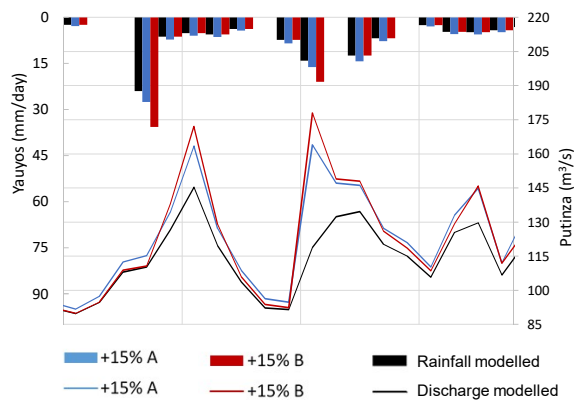
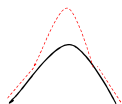
#### Pattern A:

Uniform  
increase/decrease  
of rainfall amounts



#### Pattern B:

Increase/decrease  
of rainfall intensity  
(peaks).



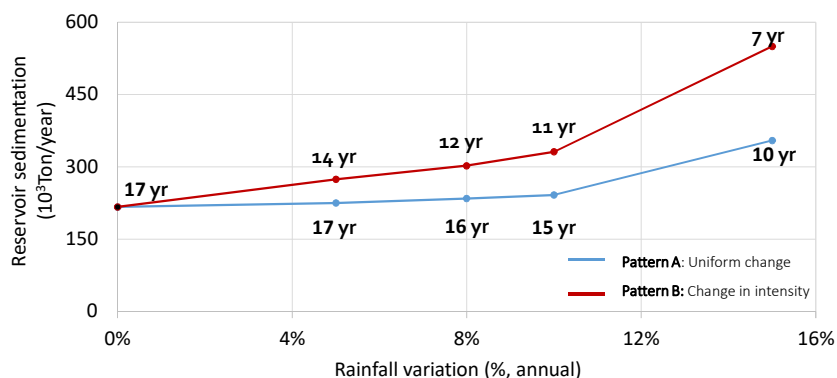
Rosas M., Vanacker V., Viveen W., Gutierrez R., Huggel C. (2020)  
<https://doi.org/10.1016/j.jhydrol.2019.124396>



## Hydroelectric reservoirs could be silting up more rapidly than anticipated

The amount of sediments trapped shows an exponential performance related to the rainfall variation.

The impact on reservoir lifespan is strong with a 10% increase in rainfall intensity during storm events.



Rosas M., Vanacker V., Viveen W., Gutierrez R., Huggel C. (2020)  
<https://doi.org/10.1016/j.jhydrol.2019.124396>

### Scenario B+15% :

Capillucas dam can reach his total storage **10** years before expected life span.



## Questions ... Comments ... Suggestions ...?



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