

Summary of the SwedCOLD workshop "Strategies & Adaptation to a Changing Climate"

SwedCOLD organized a workshop during the annual meeting in Göteborg June 15, 2023. The workshop title was "Strategies & Adaptation to a Changing Climate".

The workshop was hosted by Maria Bartsch, Svenska kraftnät, and chaired by Claes-Olof Brandesten.

There were four presentations given during the workshop by:

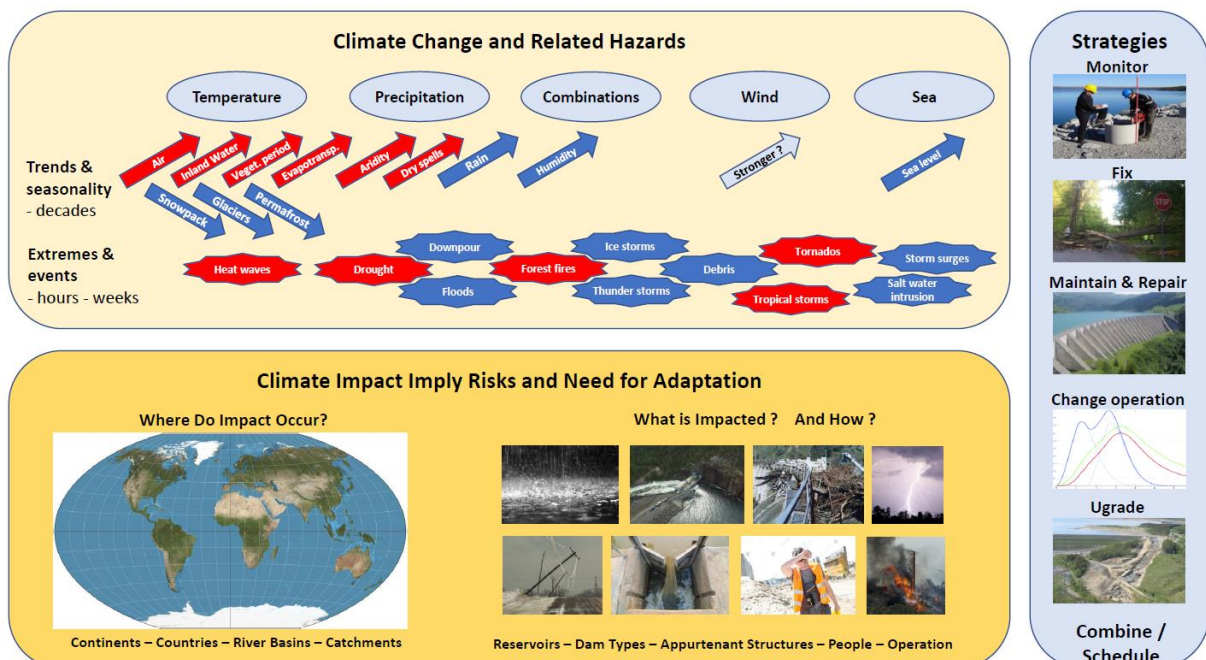
- Markus Möller, ICOLD Committee on Climate Change, Thüringer Fernwasserversorgung.
- Tarun Agarwal, YWS Circle, Haryana Irrigation & Water Resource Dept., New Delhi.
- Zoran Micovic, British Columbia Hydro.
- Saturo Ueda & Kimberly Nicole Clark, The World Bank.

Thereby different perspectives were given on the climate change issue.

The titles of the presentations were:

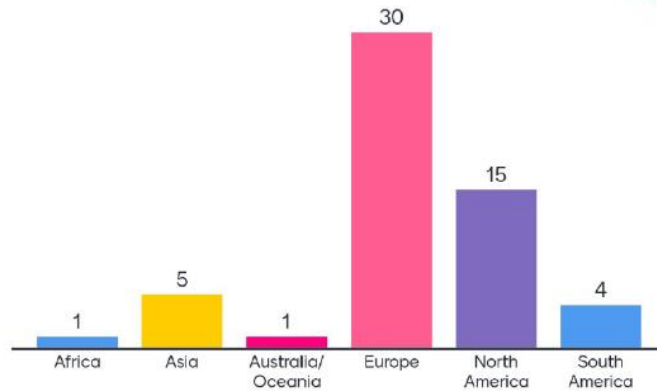
- Dams and adaptation to climate change: Opportunities and challenges.
- Climate change impact on water security of India.
- Overview on strategies and adaptation to climate change in North America.
- Strategies on adaptation to a changing climate.

After a brief welcome by Maria Bartsch an introduction was made by C-O Brandesten containing a conceptual image of the workshop according to below.

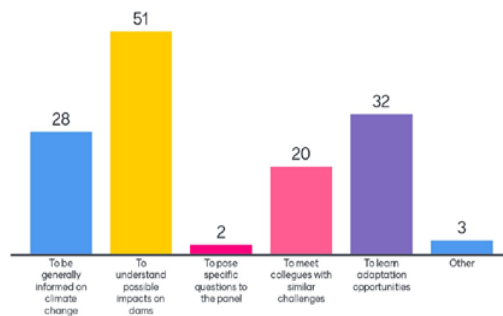


The introduction also included live polls to the workshop participants, according to the images below.

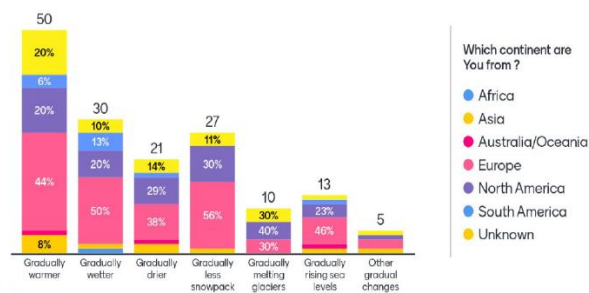
Which continent are You from ?



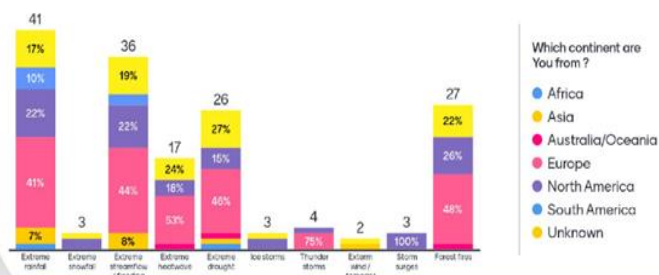
Why are You attending this workshop ?



What would be the most important GRADUAL climate change impact in Your country ?



What would be the most important EXTREME climate change impact in Your country ?



All continents were represented and most of the participants were from Europe (30) followed by North America (15), Asia (5), South America (4), Africa (1) and Australia/Oceania (1).

The reason for attending the workshop was in descending order (more than one answer was possible)

- To understand possible impacts on dams (51).
- To learn adaptation opportunities (32).
- To be generally informed on climate change (28).
- To meet colleagues with similar challenges (20).

On the question “What would be the most important **gradual** climate change impact in your country” a segmentation of the answers was made regarding continent. The descending order was:

- Gradually warmer (50).
- Gradually wetter (30).
- Gradually less snowpack (27).
- Gradually drier (21).
- Gradually rising sea levels (13).
- Gradually melting glaciers (10).

Most of the gradual changes are relevant in all the continents as answered by the participant, except for gradually melting glaciers, which were mentioned for three of the continents.

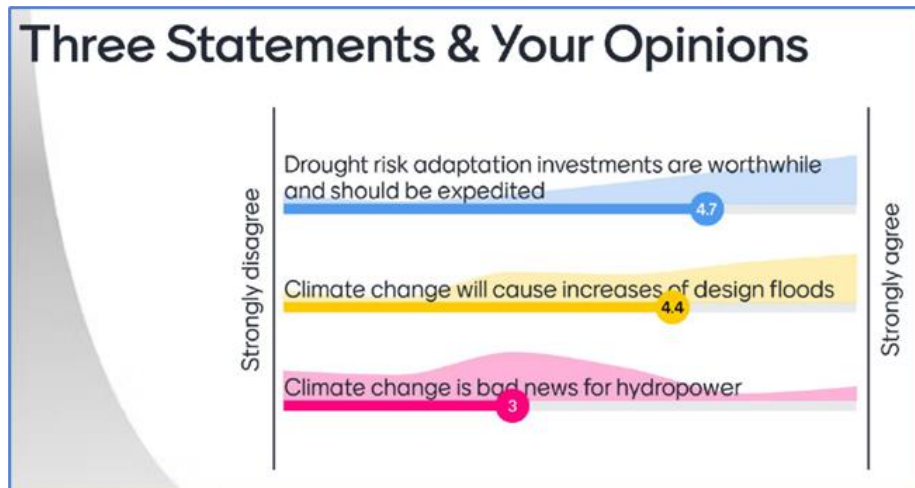
On the question “What would be the most important **extreme** climate change impact in your country” a segmentation of the answers was made regarding continent. The descending order was:

- Extreme rainfall (41).
- Extreme streamflow/flooding (36).
- Forest fires (27).
- Extreme drought (26).
- Extreme heatwave (17).
- Thunder storms (4).
- Ice storms (3).
- Extreme wind/tornados (2).

Also, here many of the extreme climate changes are relevant in most of the continents. There is a coupling between several of the changes that was mentioned in the question, which was also noted in the discussion during the workshop as regards extreme heatwaves and forest fires. A similar coupling would also be relevant for extreme rainfall and extreme streamflow/flooding.

In the presentation given by **Markus Möller** titled “Dams and adaptation to climate change: Opportunities and challenges” three hypothesis or statements were posed for the participants to respond upon. The presentation was organized discussing these hypotheses and the conclusions drawn was:

- Drought risk adaptation investments are worthwhile and should be expedited – affirmative!
- Climate change will cause increases of design floods – the hypothesis will be true for many localities and might be false at many others.
- Climate change is bad news for hydropower – is clearly dependent on the sites location.



And finally, and conversely – hydropower is good news for climate change adaptation, as hydropower is vital in transitioning to the new energy system.

In the presentation “Climate change impact on water security of India” by **Tarun Agarwal**, on behalf of Devendra Kumar Sharma, an analysis of precipitation and temperature in the near and far future in India was given. The overarching question was on future water security, and the overall conclusion was: With the increasing global warming, losses or damages are becoming very difficult to avoid. Adaptation strategies do not prevent all losses and damages even though they are implemented effectively. Implementation of adaptive measures depend upon capacity and effectiveness of governance and decision making processes. Overall findings of the study highlight the need to implement adaptive/mitigation strategies ensuring the water security of India.

Zoran Micovic gave a presentation on “Overview on strategies and adaption to climate change in North America”, focusing on flood hazards and methods for design flood determination with regard to climate change. Three conclusions were made

- It appears that currently no dam owner or regulator has a structured or scientifically defensible way to describe climate change effects on extreme floods (i.e., dam design floods).
- Climate change effects are likely contained within large uncertainty associated with extreme (design) flood estimates
- Recognize general direction of the effects and large uncertainty, and use adaptive design/management whenever possible.

The last presentation was given by **Kimberly Lyon** and **Saturo Ueda** on “Strategies on adaptation to a changing climate”, where the important role of dams for water storage for many different purposes was underpinned. And, as the need for water storage will increase dams will be important parts of water storage systems. Aging dams need to be retrofitted and possibly reoperated taking into consideration climate and hydrological change. The World Bank is developing guidelines to this extent, where focus is on both structural and non-structural measures.



At the end of the workshop a panel discussion was conducted around the following topics:

- Hazards and impacts.
- Adaptation and opportunities.
- Methodologies % strategies.
- Future & co-operation.

The following was noted and summarized:

Climate change impacts may affect dam safety in different ways, directly towards the dam and its function, but also indirectly by changing the operating environment.

Considering the purpose of the reservoir climate change may also impact water quality aspects, which may affect the use of the water, such as for drinking, irrigation, and industrial needs.

Intense rainfall, sometimes together with intense snowmelt, may cause inflows that may challenge the spillway and attenuation capacity. Upgrading may be needed in the future.

But more ordinary inflows may together with other circumstances caused by climate change, such as thermal expansion in concrete and mechanical installations leading to jammed gates, or, forest fires or downpours affecting accessibility to the site, impose increased risks for the dam.

Regarding the safety of existing dams, it is important to focus on the present and solve today's problem. But also, to identify future risks also regarding climate change. Checklists may be used not to miss possible risks. It may be advisable to analyse identified risks in the ordinary risk management framework you have set up.

New technology may improve long-term forecasting of weather, which may lead to opportunities to act in advance by adapting the reservoir operation.

Considering instances where runoff may decrease or be more erratic, it may be necessary to make the use of the water more efficient. This may involve improved irrigation technologies, crops with low water demand, using tap water responsibly, etc.

Water storage is and will be of great need in the future. Dams will be a key element to this.

New ToR for the TC Y on Climate Change is presently under development.

Claes-Olof Brandesten

July 7, 2023