

Visualizing climate science and making it understandable to policy makers and the wider public: Atlases and other visual tools

Session Climate Change Risk and Vulnerability Assessment in Mountainous Regions

Björn Alfthan, GRID-Arendal

## Outline of presentation

- 1. GRID-Arendal who we are / what we do
- 2. Communicating science to policy makers through maps and graphics
  - State of the Environment Atlases
  - Himalayan Climate and Water Atlas
  - Outreach and Dissemination: looking beyond the product
- 3. Ideas for Andean glacier "Atlas" or similar products

## 1. GRID-Arendal

- Established by Norway Government 1989 to support UNEP and UN environment agenda
- Mission: To support environmentally sustainable development through UNEP and other partners by communicating information that strengthens environmental management capacity and motivates decision-makers to act.
- Today's portfolio not limited to UNEP and includes projects funded through UNEP, GEF, EU (H2020), etc..
- We take complex scientific information and turn it into material that is used in decision-making by political leaders, policy makers and the general population.
- This information comes in many forms: graphic reports, photographs, videos, social media and other innovative forms of communications.

# GRID-Arendal – 30 employees, 13 nationalities



## GRID-Arendal's Communications & Capacity Building – some examples



JE CARBO



UNEP Rapid Response Assessments – getting emerging global environmental issues rapidly onto agendas (supporting UN Security Council resolutions; UNEP conventions and UN Environment Assembly Resolutions)

## Capacity Building on State of Environment Reporting -

supporting countries on regular reporting of the state of their environment e.g. through Atlases







Providing a holistic understanding of current environmental and climate issues in an accessible way for policy makers, providing evidence-based policy recommendations

## **GRID-Arendal's Mountain Portfolio**

Himalayan Climate Change Adaptation Programme (HICAP) **(On-going)** In collaboration with ICIMOD, Centre for Climate and Environment Research Oslo (CICERO) and about 20 regional and local partners





(On-going) A series of UNEP Adaptation Outlooks for Mountain Regions which examine key climate risks for mountain regions, analyses adaptation policies and the extent to which they apply or are specific to mountain regions, and identifies existing gaps in policies to address key risks. In collaboration with UNEP-Vienna and regional mountain centres (CONDESAN, RMCCA) East Africa Community)





(new) Global Mountain Waste Management Outlook – will highlight waste issues and problems specific to mountain environments and identify opportunities for finance and investments. In Collaboration with UNEP-Vienna

## 2. Communicating Science to Policy Makers

Complex environmental data will not help guide sound environmental policy making if no one reads it!

		1	1
Addition of the st www.sciencednuct.com	2 U. Salanian et al. / Waled and Plannary Charge 10 (2001) - 4	© Submess and / Odda and Flancing Charge W (1997) 7-4 1	0. Deleners et al. / Global and Planney Change 42 (200) 1-4 1
ScienceDirect Galaxies and States States	Sociation principue da giusier' den ser apple to regarda devicements. Ol de a company devicements of apple and apple and apple and apple and apple and apple appl	As example from the European App Education basic superior of these proceeds. After a formational time of reading transition of the second seco	6 is call IP, but is much location the softent advances or evolution and hint; up or held not common (brych) et al. 2005. To produce a systematic of a globaric bandley (other et al., 2005).
Historical and Holocene glacier-climate variations: General concepts and overview	meine moverkate neges maar he taken into annahmise (Blacher) and Blacke, 1975; Cabi- anan et al., 1995; Zang et al., 2008); Blackson, rokens or trans the immediate "vertract" (B) Soch fange scenario who beyond the manor of the states of al., 1996; Zang et al., 2008);	in the case of far year 2005 - unspec of modelses a problem in starty regions. Insprovements in during the only of the part control, if the momentum, the start of the part control, if the momentum, the start of the part control, if the momentum, the start of the part control, if the momentum of the start of the	Afferent montains areas is tighly vanishe. It depends on the presentation of the methods montain the star of the star of the star of the star with construct GMA lackage advances, which may have derived the earlier advances which may have derived the earlier advances and diversits derived and the star between advances and the star of the sta
O. Solomina *, W. Haeberli <sup>b</sup> , C. Kull <sup>1,a</sup> , G. Wiles <sup>d</sup> <sup>1</sup> Status finder of Source Internet/Computer K6. Menore Rest.	Instructure Holesone variability and never Hadry involution duration comparisons (i.e., structure and energy discusses in the discrete section of the energy discrete section of the discrete section of the discrete section of the energy discrete section of the discrete section of the discrete section of the energy discrete section of the discrete section of the discrete section of the energy discrete section of the discrete section of the discrete section of the energy discrete section of the discrete section of the discrete section of the energy discrete section of the discrete section	about 2 or P5 per year. For a full generativ adjustment to the dimension conditions or 2009-2005, some generative provided the opportunity to car the areas dating of the targets and ice manyins world mapper a further referst of a lifetomet or more addition of the manufact conditions of the advance of the	Includes of North America, This potential loss of faculations. Indext, in some region such as Sweden internetismentalistic difficult of the set also free planel (data in and X-communications in presentational of the planelineatic eccentrations in series enables and the limit and communication of the second
<sup>10</sup> Department of Company, of Junck, Neurosciand <sup>10</sup> (NEE) Secondario Payor Of Secondario Secondario <sup>10</sup> department of Uniting of Watering Factors (10) Available units of L Network (20)	(4) The comparison of modern glutter retreet with fer Bidecome [patter without provides improve hadgeneral information for our advanceding of some in what of the out of the second second provides and the second in the second second second second second second second second in the second second second second second second second second second secon	the current waterser of 2001, new placetus world and trensien of placetus. The use of more application of a properties That is used to be application of the second start and appendix and appendix the started damping from a "wire" entities". In proceedings of the trensit of the second started damping from a "wire" entities" in the second started damping from the "wire" entities".	In ground for retroit of gluciers in the farty thickness and the absence detring the Norgheid (Neur and Johan, NW) (their fails are in 1 line Norgheid orbital finning (their finding of all status in 1 lines) weiner builts of detrimine the All status in 1 lines weiner builts of detrimine the All status in 1 lines weiner builts of detrimine the All status in 1 lines weiner builts of detrimine the All status in 1 lines weiner builts of detrimine the All status in 1 lines weiner builts of detrimine the All status in 1 lines weiner builts of detrimine the All status in 1 lines weiner builts of detrimine the All status in 1 lines and a status weiner built and all status in 1 lines and a status weiner builts of the detrimine the All status in 1 lines weiner builts of detrimine the All status in 1 lines weiner built and all status in 1 lines and a status weiner built and all status in 1 lines and a status weiner built and all status in 1 lines and a status weiner built and all status in 1 lines and a status weiner built and all status in 1 lines and a status weiner built and all status in 1 lines and a status weiner built and all status in 1 lines and a status weiner built and all status in 1 lines and a status weiner built and all status in 1 lines and a status weiner built and all status in 1 lines and all status weiner builts and all status and all status and all status weiner built and all status and all status and all status weiner built and all status and all status and all status weiner built and all status and all status and all status weiner built and all status and all status and all status weiner built and all status and all status and all status weiner built and all status and all status and all status weiner built and all status and all status and all status weiner built and all status and all status and all status and all status weiner built and all status and all status and all status and all status and all status weiner built and all status and all status and all status weiner built and all status and a
servels glacies, silones, Billiones, ratiotum	in the firsty to Mol Delocere than at for end of the 20th control. Mon periodel, however, the mesons for add behavior are eliberts of the systeme for add behavior are eliberts of the systeme	playin heigh are flan now instructingly becoming decoupled loss must halone and deviations atrue spheric matchine. These dimensions with for a spheric matchine. These dimensions with for	Nuchers: Howinphers. However the reduced length of glocover of the Southers: Howinphers in g. Non Zochuka and Panagania is in distributed with a constant accurate a south of a statistical south of a statistical south of the south of the south of the south of the Southers Howinghers and a statistical south of the south of the Southers Howinghers and a statistical south of the south of the Southers Howinghers and the south of the south of the Southers Howinghers and the south of the south of the Southers Howinghers and the south of the south of the Southers Howinghers and the south of the south of the Southers Howinghers and the southers and the south of the Southers Howinghers and the southers and the south of the southers and the southers and the south of the Southers Howinghers and the sout
This specific house purvises an evention of means that housing house purposes are method houses in the house of house and and house house without house hous	<ul> <li>and plantify finds the facility of additional debug and plantify finds the facility of additional first end of a second response of the facility of additional first end of additional fi</li></ul>	The method of the second secon	In additional to the same cases, aggregate a parameter on the forces of the same cases aggregate a parameter on the forces of the same for additional to the same cases of the same of the forces of the same for additional to the same for additional to the forces of the same for additional to the same for additional to the same of the same for additional to the same for additional to the same of the same for additional to the same for additional to the same of the same for additional to the same for additional to the same of the same for additional to the same for additional to the same of the same for additional to the same for additional to the same of the same for additional to the same for additional to the same of the same for additional to the same for additional
spiner - appendix 1 yeb x401 (Messien Sourch appendix - Spiner Source and weak) are finded as the spiner of the spiner spiner of the spiner spiner of the spiner	generations: Weak and accounts the achievabulantiage instances of the second s	Inter submissing of modes, classes, places inductions of a comparison of place insights in thickneights and comparison of place insights in thickneights and comparison of place insights and the submission of the comparison of place insights in the submission of the comparison of place insights and the submission of the submission of the submission of the submission of the submission of the submission of the submission of spaceline places and submission of the submission of the submission of the submission of the submission of the submission of the submission of the submission of the submission of the submission of the submission of the submission of the submission of the submission of the submission of the submission of the submission of th	concerns ofter global parters to caudi-based global internetion of the complete same of the complete same of the complete same of the complete same of the dense of the complete same of the complete same of the complete same of the complete same of the dense of the complete same of the complete same of the complete same of the complete same of the dense of the complete same of the complete same of the complete same of the dense of the complete same of the complete same of the complete same of the complete same same of the complete same same of the complete same same the dense of the complete same same same to a sense in a same interprete same in the complete same same to a same interprete same same interprete same same interprete same interprete same interprete same same same interprete same interprete same same same interprete same interprete same interprete same same same interprete same interprete same interprete same same same interprete same same same same same same same sam
Assuming the improvements that the picket-window of approximation provide an interventional structures or appropriate of the distance points. Follower have a structure of the distance points. Follower have a structure of the distance points of the distance of the distance of the distance points of the distance of the distance of the distance of the distance of the distance of the distance of the distance of the distance of the distance of the distance of the distance of the distance of the distance of the	men charge 10 is upfore enoding a source balance tare of the composer tables and a source balance processing of the composer tables and a source balance of the source processing of the composer tables and the source of the composer of the processing of composer tables and the source of the composer of the processing of charges, 61 to specify a source of the composer of the source of charges, 61 to specify a source of the composer of the source of charges, 61 to specify a source of the composer of the source of the composer of the composer of the composer of the composer of the source of the composer of the source of the composer o	Inter given length theory were reversity and a re- production (Cohen, 2014). Choice and Datasets 2024. Investing the physical comparison were investigation in the line community (Cohen, 2024). Choice and the cohen and the recommension (Cohenama, 2024) and equivalence in the community (Cohenama, 2024). Choice and the resonance of the software in the standard line in the standard line of the software in the standard line in the standard line of the software in the standard line in the standard line of the software in the standard line in the standard line of the software in the standard line in the standard line of the standard line in the standard line of the standard line of the standard line of the standard line of the standard line of standard line of	crystelly, of the class rules for register involved production of the class rules and rule rule involved product product the class rules rules and rules
Temponding under fand aller hillingerande all (2 Kell) Kellster, este for anne 2007 Heres 63: A Fright stored to 1010 specifies 2007 2001 1010 stored 2007 2	obarge and (i) device comparises with kinetical to Later Quartersey, 1961, pre-babatefsel manys of strateffsel, Comparison with the historical and Later Quarterse placest watering has however cannot be assembling the canase and possible have of the commapointy shrinking canase and possible fames of the commapointy shrinking	Negori el., 2005, 2004 his invest. Glaser Brienes, trens en a substratuf per el merg andiscross: regional cleade autoritornemal reconstructions: (a.g. Sachusa and Witche, 2001). Thus morth- to, y Sachusa and Witche, 2001. Thus morth-	2011) (datae vasities in kyleid di ost de eor ay correspondent et di, 1979) and differen para ol for intrije of parate es occip, for annel is ide comparent es plantas ches estis differen parate is de trinigi of plant discussione de lass Holesen (Chang et al, 2004). discussione de lass Holesen (Chang et al, 2004).
<ol> <li>Difference of all / Edited and Plansing Charge W (2008) 1-9</li> </ol>	(i) Summer et al. / Oddal and Plannery Change Nr (2006 ) - 4 7 7	4 D. Silomes et al. / Gible and Planney Charge 10 (2010) 7-9	(2) Solumbra et al Oblind and Plannery Change 40 (2006) 7-0
<text><text><text><text><text></text></text></text></text></text>	<page-header><text><text><text><section-header><list-item><list-item><list-item><list-item><list-item><list-item><list-item><list-item><list-item><list-item><list-item><list-item><list-item><list-item><list-item><list-item><list-item><list-item><list-item><list-item><list-item><list-item><list-item><list-item><list-item><list-item><list-item></list-item></list-item></list-item></list-item></list-item></list-item></list-item></list-item></list-item></list-item></list-item></list-item></list-item></list-item></list-item></list-item></list-item></list-item></list-item></list-item></list-item></list-item></list-item></list-item></list-item></list-item></list-item></section-header></text></text></text></page-header>	<text><text><text><text><text><text></text></text></text></text></text></text>	<text><text><text><text><list-item><list-item><list-item><list-item><list-item><list-item><list-item><list-item><list-item><list-item><list-item><list-item><list-item><list-item><list-item><list-item><list-item><list-item><list-item><list-item><list-item><list-item><list-item><list-item><list-item><list-item><list-item><list-item><list-item><list-item><list-item><list-item><list-item></list-item></list-item></list-item></list-item></list-item></list-item></list-item></list-item></list-item></list-item></list-item></list-item></list-item></list-item></list-item></list-item></list-item></list-item></list-item></list-item></list-item></list-item></list-item></list-item></list-item></list-item></list-item></list-item></list-item></list-item></list-item></list-item></list-item></text></text></text></text>

- Scientific Journals are written as communication within the scientific community
- Science in this form may reach very few policy makers and citizens.
- Condensing into a non-technical policy brief is helpful, but this still assumes that audience has an active interest in the subject

#### 2. Communicating Science to Policy Makers – some approaches we use



**INFOGRAPHICS:** 

People can relate deforestation to the size of football pitches 2. Communicating Science to Policy Makers - some approaches we use



Water footprint of Asian countries, 2011

#### 2. Communicating Science to Policy Makers



#### **INFOGRAPHICS:**

Food produced and food wasted on your plate <u>Maps</u> make environmental science and environmental issues accessible to policy makers and the public.

Mountains and highlands in Africa are crucial sources for many of Africa's great rivers.



Cartography gives us the freedom to integrate and include not only geo-referenced data but:

- Local information e.g. interviews/workshops
- Investigative journalism
- Other "grey" / non-academic sources of information

Adding multiple layers can build a story that is engaging and visual



# Seeing is believing, and remembering

"Before and After Satellite Images" commonly used in our Atlas work



Overcomes the "shifting baseline" and failure to notice gradual change over time







## Seeing is believing, and remembering



Fritz Müller and Erwin Schneider took this photo of Imja Glacier, Nepal, in 1950s

Alton Byers took photos in the same location in present day



Illustrations as communication tools, an example here illustrating the benefits of ecosystem-based adaptation approaches



Water-specific Atlas: process and lessons from developing the Himalayan Climate and Water Atlas (late 2015)



The Himalayan Climate and Water Atlas is a product of the

Himalayan Climate Change Adaptation Programme (HICAP)

HICAP is funded by Govnts. Norway and Sweden and involves ICIMOD, GRID-Arendal, CICERO and about 20 regional and local partners

## HICAP: Interdisciplinary adaptation research

- What are the potential impacts (positive and negative) of change, and how can the capacity to monitor them be enhanced?
- What are the vulnerabilities and adaptive capacities of human and natural systems in the Hindu Kush Himalayan region?
- What evidence of potential risks and opportunities can be provided to decision makers in order to increase the adaptive capacity of mountain people, particularly women?

#### **Programme Components**

- 1. Water Availability and Demand Scenarios
- 2. Climate Change Scenarios
- 3. Ecosystem Services
- 4. Food Security
- 5. Vulnerability and Adaptation
- 6. Women and Gender in Adaptation
- 7. Communication and outreach

Over 2012 to 2014, work under Component 1 (Water Availability and Demand) and 2 (Climate Change Scenarios) had managed to generate a wealth of academic articles and technical reports:



# Included a Nature Climate Change article:

Lutz, AF et al. (2014) 'Consistent increase in High Asia's runoff due to increasing glacier melt and precipitation.' Nature Climate Change 4: 587–592

Article was considered a high "success" and got significant attention in the media and in academic circles – but what next?

Could we make this info more accessible to policy makers and the general public? Focus of the Atlas is on 5 major river basins which have their source in the Hindu Kush Himalayas: Indus, Ganges, Brahmaputra, Salween, Mekong



# Includes projections of glacial extent to 2050



There has been an almost worldwide recession of glaciers since the last ice age, including within the Himatayas.<sup>56</sup> Most Himatayan glaciers have both retreated and lost mass since the mid-sph century, with some exceptions in the Karakaram and northwestern Himatayas.

Most models project substantial glacial mass and area lesses in the coming decades for most parts of the Hindu Kush Himalayas.<sup>30</sup> At the upper river basis scale, the holds, Brahmaputta, Gangea, Salw een and Makong are projected to lose considerable glacial area by 2054.<sup>10</sup> The greatest relative reductions in glacial area are likely to be for the Salwean ( $-4_{24}$  to -97 k) and Makong (-39to -640 k), as their current glacial areas are the smallest. For the Indus basin, a change in glacier actent ranging from -20 to -20 k is projected. Although the Indus basis shows the smallest decrease in percentage because it has the largest



glaciated area, the absolute less is likely to be the greatest in this basin. Changes in glacier area in the Ganges and Brahmaputra basins show similar trends (-35% to -45%).

Even the glaciers in the highest mountains of the world will not escape the effects of climate change. For example, even if today's level of emissions are greatly reduced, glaclers within the Everest region (Dudh Koshi basin, Nepal) are projected to lose between, on average, 39% of their ice by 2050 and around 83% by 2100. For extreme RCPs, the average loss is projected to be much higher. Temperature increases will be the most important determining factor driving glacial mass loss in this region." As temperatures rise, more glaciated area will be exposed to above zero temperatures. These warmer temperatures will cause the glaciers to melt and will also mean that more precipitation will fail as rain rather than snow, resulting in maiting ice not being replanished.



Combines text, historical photographs and graphics and stories from the ground





### Changing growing seasons in the upper Indus valley

Tor H Aase, CICERO, Norway & Sher Ahmed, Mountain Agricultural Research Centre, Gilgit-Baltistan, Pakistan



Mild weather does not necessarily imply a longer growing season in the upper indus valley. The winter of 2014 was particularly mild in the Hindu Kush mountains, raising optimism among farmers along the Sal river in Gligit, Pakistan of an early spring and a long growing season with rich harvests. Gligit is a semi-arid cool region where summer cultivation is dependent on gravity-fed irrigation. Irrigation canals divert water from streams that originate in the high mountains and ultimately feed into the indus river. Because precipitation is modest in the settled valleys, water discharge in streams is conditioned by snow melt in the higher reaches. Irrigation water is particularly important in spring when summer wheat is sown. An early spring allows for a second crop of malze after the wheat is harvested in June. while a late spring may cause damage to ripening maize, which should be harvested before frost nights occur in November.

Contrary to expectations of good crops, 2014 turned out to be a particularly difficult year. The mild winter brought cloudy weather in March and April, which prevented sunshine from melting the snow in the high mountains. The snow melt started two weeks later than usual and the wheat sowing had to be postponed accordingly. Some farmers harvested green wheat and used it for livestock fodder in order to allow for an autumn malze crop, while others faced damage to their maize in late autumn. Indeed, several years of late snow melt has motivated many farmers to grow wheat for fodder and buy flour for consumption from the market. Villagers increasingly prefer to make bread using high-quality wheat flour brought to Gligit from Punjab via the Karakoram Highway, while the locally grown wheat is given to livestock.

The mild winter of 2014 had another effect on local livelihoods. Historically, villagers have collected firewood from the Sai river, which has been more or less sufficient for a full year. Winter avalanches cut down trees in the high mountains, which are brought to downstream villages by the spring floods. The mild winter decreased avalanche activity in the mountains and less branches and logs flowed down the river. The decreased amount of firewood available for household use was compensated for by an increase in the use of gas and kerosene.

Farmers in the Hindu Kush have learnt that there is not necessarily a correlation between temperature and the length of the growing season, and that the timely availability of water must also be taken into account.

#### What did the Atlas bring (so far)

- Extended "lifetime" / second-wind to the research findings. Re-packaging!
- Presented findings in a much more holistic way than any one scientific publication could; paints a regional understanding of change
- Forced the scientists involved to think about the broader implications of their work
- Generated interest beyond academic circles
  - Wide media coverage and more interest *within the* region than before
  - National TV coverage
- Interest from regions and NGOs not seen before:
  - Offers of national launches of the Atlas by other organisations (e.g. Pakistan, India)
  - Invitations for policy dialogues with regional governments
- Long shelf life of material available for presentations/lobbying/etc.
- Provides ICIMOD (as regional intergovernmental organisation) a tool to initiate discussions on future water-related work and addressing needs

#### Lessons learned and designing for IMPACT

- Know your key messages before you start and what you policies/decisions you want to influence
  - Keeps it targeted and manageable (fatigue with heavy "brick" publications)
  - Addresses real needs
  - Avoids/limits temptation of scientists to put in their "favourite" graphs or pet projects/issues
- Ownership: get it right from the beginning
  - National and/or local ownership (depending on target audience) is key to getting the "product" out there
  - Will extends lifetime of findings, create further discussions, local launches
- Have an outreach strategy/plan (relevant from large projects down to individual products)
  - Assuming you have a "great" product isn't enough
  - Concerted effort needed at getting the product out
  - E.g. through well-timed, high-profile launch, engaging media/press packages, through social media channels, etc. etc.
- Design for spin-off products for further outreach:
  - Flexibility to pull out elements of the Atlas e.g. for presentations etc.

In Conclusion:

 GRID-Arendal is interested in further discussing possibilities and scope for an water-related Atlas (or similar product) depending on interests and needs of UNESCO and other partners. Possibility to bring UNEP into discussion too.

Thankyou!

Contact: Björn Alfthan

Please visit <u>http://www.grida.no/publications/</u> to access the Himalayan Atlas and other publications