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POLICY BRIEF
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Urgency to Strengthen Science-informed Decision Making in Disaster Risk Management in India

Key Suggestions:

- ***Acknowledge*** the fact that the present disaster management institutional policy and practices in India, although build on science and technology at its core, haven't been able to harness the full potential of it by establishing innovative and effective institutional mechanisms which would facilitate real time and long term coordination between scientists/experts, policy makers and practitioners.

- ***Analyze*** some of the critical institutional constraints, as well as opportunities. which would be essential to facilitate, build and strengthen a culture of demand for and uptake of scientific evidence in disaster management.

- ***Augment*** the existing institutional mechanisms and other initiatives outlined in the Disaster Management Policy (2009), Science, Technology and Innovation Policy (2013) and the National Action Plan for Climate Change (NAPCC, 2010) and similar policies and action plans at the state level.

- ***Adapt*** to the changing needs and demands of various stakeholders and constituencies by making this entire effort more inclusive, demand-driven and cost effective.

- ***Act*** through collective and multi-level coordination and partnership in order to ensure accountability of action and to avoid the traditional passing-the-buck approach during disasters and emergency situations.

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What we face?

Loss and damage in the recent Himalayan floods and landslides have been certainly unprecedented and the only indicator, as of now, has been the constantly increasing number of human lives lost and those still missing. Gory scenes of the disaster, mostly from the holy shrine of Kedarnath, the epicenter of the disaster, and the growing confusion and anger of those still unsure about the fate of their loved ones have become the central point of debate and discussion. Hitherto un-considered and least debated issue of accountability for a disater, both political and administrative, has been the substance of these high-amplitude discussions. The traditional passing-the-buck approach and prolonged indulgence in blame games are certainly not going to address the immediate humanitarian needs of the affected communities and the death and destruction they are passing through at this point in time. Efforts to gain political brownie points over the rescue and relief works are quite unexpected and insensitive in these periods of human suffering and humanitarian crisis.

The scale of the damage, both to lives, ecosystems and critical infrastructures, is so extensive that it has been described as the 'Himalayan Tsunami'. The Himalayan region is one of the most vulnerable regions in the Indian sub-continent and the level of exposure is further accentuated because the livelihood systems and major economic sectors in these regions are highly sensitive to climatic variability, including extremes (both weather and climate). This being the time of the year when tens of thousands of pilgrims and tourists flock to Uttarakhand for the *Char Dham Yatra* (the most revered Hindu pilgrimage of Journey of Four Holy Shrines of Gangotri, Yamunotri, Kedarnath and Badrinath), the losses are far too higher. There number has dramatically increased in recent years; from 362,757 in 1990 to 925,998 in 2012. And, going by the trend, it has been projected to cross more than one million in 2013 (Sacred Yatra, 2013)[1].

1 Sacred Yatra, 2013, Available at http://www.sacredyatra.com/badrinath-pilgrimage-stats.html

Photo: Communities trying to rebuild their lives and assets in the aftermath of a tornado in Rajkanika, in coastal Kendrapara, along the Bay of Bengal in Odisha, India, 31st March 2009, Source: Author

More importantly, major development investments and priorities, mostly around 600 proposed small and large hydro-electric power projects, are promoted without taking into account the ecological sensitivity as well as carrying capacity of the region. The Government of Uttarakhand which vehemently opposed the Central Government's Eco-sensitive Zoning Notification for Gomukh and Uttarkashi in April 2013[2] has now realized the urgency to have such regulations in place and is working on the proposals for six eco-sensitive zones.[3]

All those associated with and responsible for disaster management, from the district through to the national level, have been describing the rainfall intensity of more than 610 mm in just 60 hours as something which is 'unexpected', 'abnormal', 'unprecedented' and 'never witnessed before' in the Himalayan region. And thus, least could be done in terms of disaster preparedness measures to face a disaster of such scale and intensity.

"All this talk is of no significance. Few hundred or thousand trained people cannot handle any disaster of this magnitude. This is a similar situation as we had seen in the tsunami. Even the Centre does not have the mechanism to deal with a disaster covering 38,000 square miles."

- Mr, Vijaya Bahuguna
Chief Minister of Uttarakhand
Source: Times of India, 22 June 2013
http://timesofindia.indiatimes.com/india/Uttarakhand-CM-admits-lapses-in-disaster-management/articleshow/20709802.cms

What We Know?

Scientific evidence categorically point to an increase in the scale and intensity of such weather and climate extremes and more importantly there has been a significant increase in the level of exposure of people and assets to these extremes. The Intergovernmental Panel on Climate Change (IPCC, 2012)'s report on *Managing the Risks to Extreme Events and Disasters to Advance Climate Change* (SREX)[4] analyses the emerging disaster risk context at the intersection of such weather and climate extremes, vulnerability and exposure of the population, their livelihoods, infrastructures and the entire economy to such extremes. It presents a series of empirical evidence and future projections on the increasing trends of such extreme-weather episodes of temperature and precipitation in many part of South Asia and attaches a *high confidence* to increase in economic losses. An 'outreach' event , specifically focusing on South Asia, was organized in New Delhi (2 and 3 May 2012) and was aptly titled '*What can we learn from the IPCC Special Report?*' A cross-section of stakeholders, from disaster management authorities through to scientists and policy makers and the media, participated in these two days of enthusiastic discussions and workshop deliberations.[5]

At the country level India has undertaken a series of scientific assessments and action plans to deal with such climate extremes through planning, coordination, investments and capacity development. The 4x4 Assessment Report, prepared by the Indian Network for Climate Change Assessment (MoEF, 2010)[6] comprising of scientists and experts from twenty premier institutes in India, assesses the likely impacts of climate change on four key sectors of the Indian economy (Agriculture, Water, Natural Ecosystems and Biodiversity & Health) across four climate-sensitive regions (the Himalayan region, the Western Ghats, the Coastal Area and the North-East Region).

India's National Action Plan on Climate Change (NAPCC, 2008)[7], prepared under the specially constituted Prime Ministers' Council on Climate Change, lays out in detail the government's emphasis on and commitment to a multi-pronged, long term and integrated strategy to deal with climate change challenges and opportunities across sectors. The NAPCC lays out a comprehensive set of missions which would facilitate '*a directional shift in the development pathway that promotes development objectives while also yielding co-benefits for addressing climate change effectively*.'

[2] The Hindu, April 26 2013, Available at: http://www.thehindu.com/todays-paper/tp-national/uttarakhand-upset-over-ecosensitive-zone/article4655728.ece
[3] Business Standard, 24 June 2013. Available at: http://www.businessstandard.com/article/current-affairs/uttarakhand-gears-up-for-eco-sensitive-zones-113062400735_1.html
[4] Intergovernmental Panel on Climate Change (IPCC). Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation. Summary for policymakers (The SREX Report). Cambridge and New York: Cambridge University Press, 2012. Available at: http://ipcc-wg2.gov/SREX/report/
[5] CDKN, 2012 http://cdkn.org/2012/05/ipcc-srex-outreach-event-delhi-2-3-may-2012/
[6] MoEF, 2010, Climate Change & India: A 4X4 Assessment, Available at: http://www.moef.nic.in/downloads/public-information/fin-rpt-incca.pdf
[7] National Action Plan on Climate Change (NAPCC,2010), Government of India. Available at: http://pmindia.gov.in/climate_change_english.pdf

"What happened in Uttarakhand..was like an earthquake without any warning. The IMD (India Meteorological Department) had only talked about heavy rain, but no one anticipated such huge flash floods. We are now looking at implementing a precise weather forecasting system for the region."

- M. Shashidhar Reddy
NDMA vice chairman
Source: DNA, 23 June 2013
http://www.dnaindia.com/india/1851919/report-man-s-folly-compounded-nature-s-wrath-national-disaster-management-authority-on-uttarakhand

Of the eight National Missions under NAPCC, that of the National Mission on Strategic Knowledge for Climate Change (NMSKCC)[8] was established with an objective to '*build a vibrant and dynamic knowledge system that would inform and support national action for responding effectively to the objective of ecologically sustainable development*'. NMSKCC was launched with the broad objective of mapping the knowledge and data resources relevant to climate change and positioning of a data sharing policy framework for building strategic knowledge among the various arms of the Government.

What We Realized?

It identifies a set of ten 'constraints' that limit at present the ability of the national knowledge system to deliver the required and expected outcomes for effective response. Two of the following constraints underscore the key challenges associated with the creation and amplification of a proposed strategic knowledge system in India:

A. Poor connectivity between and within knowledge generating communities and user communities at various levels and
B. Lack of a systemic institutional mechanism for collating, synthesizing and delivering knowledge products for decision-making.[9]

The Uttarakhand State Climate Change Action Plan (USCCAP)[10], which has been revised as recently as July 2012, and aptly christened *'Turing Crisis into Opportunity,'* has Disaster Management as one of the priority sectors and outlines a set of twenty initiatives *"to build adaptive resilience and reduce vulnerability across communities and sectors'*. More importantly 'capacity building for effective planning' tops the list. The plan also identifies 'improving scientific knowledge and evidence base and understanding of climate change and its impacts' as one of the key interventions for Disaster Management and presents an budget outlay of INR 5000 Lakhs (approximately USD 9 million) over a period of 5 years.

Analyses and findings from a very recent report of the World Bank and the Potsdam Institute for Climate Impact Research and Climate Analytics (PIK), *Turn Down the Heat: Climate Extremes, Regional Impacts, and the Case for Resilience*,[11] further corroborates the scientific evidence on scenarios of 2°C and 4 °C temperature rise and its impacts across geographies and sectors. An increase of approximately 10% in the inter-seasonal variability in the Indian summer monsoon is predicated under the 4°C scenario.

Apart from the vast array of scientific research across disciplines and institutes in the country, the Government of India has also established strategic partnership with institutes of international repute for joint research and capacity building in climate science research, including its impacts and ways through which adaptation and mitigation measures could be designed and implemented across sectors. The Global Research Council (GRC),[12] Ministry of Earth Sciences-NERC (UK) Collaboration, INDO-NOAA Partnership and the Belmont Forum[13] are some of the thematic research collaborations.

The Himalayan Tsunami has been the focus of many discussions in the media (print, electronic as well as social media), and most of these forums are overflowing with analyses, view-points and recommendations. Unfortunately one element which has been missing, or rather less-debated and least explored, is the role of science and the need to further strengthen science-policy-practice interface to deal with such weather extremes in extremely vulnerable regions of India.

[8] Mission Document, National Mission on Strategic Knowledge for Climate Change, Ministry of Science & Technology, Government of India, New Delhi, July 2010 Available at: http://www.dst.gov.in/scientific-programme/NMSKCC_July_2010.pdf
[9] *ibid.*
[10] Available at: http://www.uttarakhandforest.org/Data/SC_Revised_UAPCC_27june12.pdf
[11] Available at: http://www-wds.worldbank.org/external/default/WDSContentServer/WDSP/IB/2013/06/14/000445729_20130614145941/Rendered/PDF/784240WP0Full00D0CONF0to0June19090L.pdf
[12] http://globalresearchcouncil.org/
[13] http://globalresearchcouncil.org/

"There is no country in the world that is as vulnerable, on so many dimensions, to climate change as India is. This makes it imperative for us to have sound evidence-based assessments on the impact of climate change."

– Mr. Jairam Ramesh
Minister of Environment & Forests, Government of India, while releasing the 4x4 Assessment report in New Delhi, 17 November 2010
Source:
http://delhigreens.com/2010/11/17/another-leap-india-releases-4x4-assessment-report-on-climate-change-impacts/#sthash.Vk3Scmvw.dpuf

Uncertainties and complexities associated with such weather forecasts or local climate models and future projections very often limit the capacity of decision makers to assimilate the information and to act accordingly. But efforts also being made to objectively decipher and quantify the information through terminologies of confidence (from very high confidence through to very low confidence) and likelihood (from virtually certain to exceptionally unlikely).

With such a rich repertoire of scientific evidence and a dense network of scientific institutes, scientists and experts, why are we not able to translate them into real time and specific actionable agendas? The underlying issue has always been highlighted through the institutional challenges and constraints around the traditional and rather artificial dichotomy of knowledge producers and knowledge users. Scientific knowledge produced might not always be useful and similarly the required policy-relevant scientific evidence might not be produced by scientists and researchers. A new group of 'knowledge brokers' works to bridge these gaps through translation of knowledge and mediation of boundaries and help facilitate effective channels of communication and coordination among scientists, policy makers and practitioners for evidence-informed decision making and real time action.

Science and technology is at core of India's Disaster Management Policy (2009) and this is reflected loud and clear in its Vision '*to build a safe and disaster resilient India by developing a holistic, proactive, multi-disaster oriented and technology driven strategy through a culture of prevention, mitigation, preparedness and response*' (NDMA, 2009).[14] Multi-sectoral synergy has been identified as one of the key approaches and adequate emphasis has been laid on Knowledge Management (Section 11).

Sub-section 11.2.1 on Synergetic Application of Science and Technology spells out the way forward as:

'*The Ministries of Science & Technology and Earth Science and the other concerned Department of the GoI, in consultation with the NDMA, will identify the specific needs and disciplines for research and also designate domain-specific institutions depending on their expertise and knowledge base.*'

Similarly, identification of needs and promotion of research has been widely covered under Research and Development (Section 12). According to it :
'*A core group of experts from scientific institutions has already been set up by the NDMA to identify broad research needs in disaster risk reduction* (Sub-section 12.3.1).

Categorical emphasis on a 'technology driven strategy' reflects India's longstanding efforts around and commitment to promote the use of science and technology for its overall economic growth and well-being of its citizens. India's Science and Technology Policy (2003) recognizes that '*knowledge has become a source of economic might and power*' and, among others, it sets the objective 'to integrate scientific knowledge with insights from other disciplines, and ensure fullest involvement of scientists and technologists in national governance so that the spirit and methods of scientific enquiry permeate deeply into all areas of public policy making' (DST, 2003)[15]. One of the key policy objectives of the S&T Policy is '*to encourage research and application for forecasting, prevention and mitigation of natural hazards, particularly, floods, cyclones, earthquakes, drought and landslides.*'[16]

[14] NDMA, 2009. Disaster Management Policy
15 DST, 2003, Science and Technology Policy 2003, Department of Science & Technology, Government of India
[16] *ibid*

"Our scholarship and research must be informed by a keen awareness of our basic social and economic realities. Given the limited resources that we, as a nation, are able to devote to scientific research, it is imperative that we give priority to meeting those challenges which are fundamental to the transformation of our economy."

- Honorable Prime Minister of India in his address to the 100th Indian Science Congress, 3rd January 2013, Kolkata
Source:
http://pib.nic.in/newsite/erelease.aspx?relid=91317

Similarly the Science Advisory Council to the Prime Minister in its Vision Document *"India as a Global Leader in Science"* (2010) recommends 'science at the heart of national development strategy' and 'proper use of science' through interdisciplinary solutions to some of the most complex problems that India faces (SAC-PM, 2010)[17].

A definitive step in this direction was the establishment of the National Knowledge Commission (NKC, 2005-2008). The overall objective of the NKC was to '*enable the development of a vibrant knowledge based society*' which 'entails both a radical improvement in existing systems of knowledge, and creating avenues for generating new forms of knowledge.' The Commission, in its recommendation to the Prime Minister on 28th November 2006 [18], identified the followings as major causes for the crisis in Indian research:

A. *Lack of interaction*: There is very rigid compartmentalization of natural and social sciences; as a result there is little or no interaction between researchers in natural sciences and social sciences.
B. *Lack of long term vision*: Research topics of long term relevance and importance are not taken up as support tends to be for the duration of 3 to 5 years because of our planning process.
C. *Lack of differential remuneration*: The principle of differential remuneration based on performance and output is not followed to reward those who perform well and chastise those who do not.
D. *Lack of scientific methods*: Current teaching methodologies at school, college and university level do not inculcate scientific temper in the students.

To address some of these institutional bottlenecks, the Commission recommended to set up a National Science and Social Science Foundation (NS3F) '*which will look at all knowledge as one seamless entity*'.[19]

Similarly the NMSKCC suggested few initiatives and strategies such as establishment of knowledge networks and Public-Private Partnerships (PPPs) in the areas on adaptation and mitigation technologies. But the Sub-Group on Environment and Climate Change of the Planning Commission's Working Group on Environment and Climate Change recommends reorganizing some of the Missions in the NAPCC by having separate Policy Thrust Areas instead. It is in line with this understanding the Sub-Group recommends that:

'*Strategic Knowledge Mission is likely to remain peripheral and is not likely to attract adequate funding through this window. It is better to mainstream development of green technology and research into other aspects of climate change into the main programs of the Scientific Departments, like earth sciences, space, S&T, agriculture, health, biotechnology etc., which are likely to attract substantial funding during the Twelfth Five Year Plan. It can be monitored as a policy thrust area under the Prime Minister's Council on Climate Change*'.[20]

India's recently launched Science, Technology and Innovation Policy (2013)[21], which, among others, sets a target to increase R&D expenditure to 2% of gross domestic product (GDP), lays out a broad framework to build and foster '*an ecosystem of innovation*' across sector with an overarching policy goal to '*accelerate the pace of discovery, diffusion and delivery of science-led solutions for serving the aspirational goals of India for faster, sustainable and inclusive growth*'.

[17] SAC-PM, 2010, *India as a Global Leader in Science* Vision Document prepared by the Science Advisory Council to the Prime Minister, Department of Science and Technology, Government of India
[18] http://knowledgecommission.gov.in/recommendations/science&technology.asp
[19] *Ibid*
[20] http://planningcommission.nic.in/aboutus/committee/wrkgrp12/enf/wg_climate3001.pdf
[21] http://www.dst.gov.in/sti-policy-eng.pdf

Inadequate emphasis on and investments in such critical sectors of knowledge creation, collaboration, coordination and concerted action, especially in the field of disaster risk assessment and management, has been one of key underlying reasons which limit the design and implementation of effective preparedness measures and real-time response strategies. The Comptroller and Auditor General (CAG) of India categorically identifies and underscores many such existing institutional gaps in its recent Audit Report on Disaster Preparedness in India, which was tabled in the Indian Parliament on 23rd April 2013. In its concluding remarks, the CAG notes that:

'*IMD, ISRO and other agencies had established early warning systems for tsunami, cyclones, etc. However, we found that due to lack of monitoring and timely inputs from all participants, most projects regarding the dissemination of data to stakeholders were still incomplete. In many cases, the equipment procured for these projects were lying uninstalled.*'[22]

What Next ….

What is apparent from the above is that we have the availability of and accessibility to a plethora of science-based empirical evidence and projections on weather extremes and the geographical regions and populations most at-risk to such extremes. We have also some of the best policy instruments in place to harness the benefits of science and technology through decisions and actions which are scientifically robust, socially accepted and cost-effective in nature. But all these opportunities haven't been successfully translated in to the required actions on the ground which would save loss of lives and damages to the economy and society. India loses, annually, around 2% of its GDP and up to 12 percent of central government revenues to natural disasters (Lester and Gurenko, 2003). Loss and damage, including non-economic losses, in the recent Himalayan Tsunami will further amplify the cost to the country and its people. More importantly, systematic erosion of the development gains would put significant development challenges and governance constraints.

This indeed is a classic case of 'knowing better and losing even more' (White, Kates and Burton, 2001).

The recent report of the Scientific and Technical Advisory Group (STAG) of the UNISDR presents a series of Case Studies to demonstrate the way science is being *useful* in disaster risk reduction strategies and actions. The STAG aims to show, by 2015, 'that science is consistently *used* in disaster risk reduction' and, among others, recommends to 'promote knowledge to action' through 'greater priority on sharing and disseminating scientific information and translating it into practical methods that can readily be integrated into policies, regulations and implementation plans concerning disaster risk reduction' (Southgate et al., 2013).

It is in this background that there is an urgency to further build and strengthen science-informed decision in disaster management in India by:

A. ***Acknowledging*** the fact that the present disaster management institutional policy and practices, although build on science and technology at its core, haven't been able to harness the full potential of it by establishing innovative and effective institutional mechanisms which would facilitate real time and long term coordination between scientists/experts, policy makers and practitioners.

B. ***Analyzing*** some of the critical institutional constraints, as well as opportunities, which would be essential to facilitate, build and strengthen a culture of demand for and uptake of scientific evidence in disaster management. Broad-based consultation and inputs from knowledge producers, brokers and users would help us to better understand and revisit the ways the science of disaster risk is linked to the policies and practices of disaster risk management.

[22] http://saiindia.gov.in/english/home/Our_Products/Audit_Report/Government_Wise/union_audit/recent_reports/union_performance/2013/Civil/Report_5/exe-sum.pdf

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Lester, R, and Gurenko, E. 2003. *Financing Rapid Onset Natural Disaster Losses in India: A Risk Management Approach.* World Bank, Report No. 26844 IN, August 2003.

Southgate RJ, Roth C, Schneider J, Shi P, Onishi T, Wenger D, Amman W, Ogallo L, Beddington J, Murray V. 2013 *Using Science for Disaster Risk Reduction.* www.preventionweb.net/go/scitech/

White, G.F, R.W. Kates and Burton, I. 2001. Knowing better and losing even more: the use of knowledge in hazards management, *Environmental Hazards*, Vol: 3, pp. 81-92.

This would help in revising and reorganizing, if need be, some of our approaches to scientific research as well as decision making processes. Coordination among and leadership of the Ministry of Earth Sciences, Ministry of Science & Technology and the National Disaster Management Authority (NDMA) is essential to facilitate the process and ensure its long term sustainability.

C. *Augmenting* the existing institutional mechanisms and other initiatives outlined in the Disaster Management Policy (2009), Science, Technology and Innovation Policy (2013) and the National Action Plan for Climate Change (NAPCC, 2010) and similar policies and action plans at the state level. The identified actions and agendas could be implemented and monitored through existing platforms such as the National Platform for Disaster Risk Reduction (NPDRR) and other initiatives like that of India Disaster Resource Network (IDRN), India Disaster Knowledge Network (IDKN) and Indian Network for Climate Change Assessment (INCCA). These efforts would immensely benefit from a very recent UK-India joint coordination framework for '*strategic and technical cooperation on evidence informed healthcare policy and practice*.' Such strategic alliances around evidence-informed disaster management policy could be initiated through an inter-ministerial coordination mechanism as well as cooperation with donors and other agencies such as the United Nation Office for Disaster Risk Reduction (UNISDR).

D. *Adapting* to the changing needs and demands of various stakeholders and constituencies by making this entire effort more inclusive, demand-driven and cost effective. It in this context that the participation and role of the private sector would add value to this through innovation, partnership, leadership and ownership. Adapting a systematic dialogue and long-term collaborative mode of knowledge production is essential to overcome the pitfalls of a supply-demand approach. This would further enhance demand for and uptake of scientific evidence in decision making and policy implementation.

E. *Acting* through collective and multilevel coordination and partnerships in order to ensure accountability of action and to avoid the traditional passing-the-buck approach during disasters and emergency situations. Learning from actions through monitoring and evaluation of impacts would further help refine the approach.

[2]: [h]ttps://www.gov.uk/government/world-location-news/uk-and-india-to-work-together-on-evidence-informed-healthcare-policy-and-practice