







DIVECHA CENTRE

Sensitization of Policy Makers and Administrators on Climate Change and its Impacts on the Mountain Ecosystem

(A Technical Report)

At Hotel Holiday Home (HHH), Shimla Organized By

State Centre on Climate Change (SCCC) Under the aegis of Himachal Pradesh Council for Science, Technology & Environment (HIMCOSTE), Shimla, Himachal Pradesh

In Collaboration With

Divecha Centre for Climate Change (DCCC) Indian Institute of Science (IISc), Bangalore, Karnataka

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INTRODUCTION

Background

Mountain systems are particularly sensitive to climate changes. Small changes in climate can produce significant regional or larger-scale effects. In particular, marginal environments are under high stress. Small changes in water availability, floods, droughts, landslides, and late frosts can have drastic effects on agriculture and livelihoods.

Possible Changes in a Typical Mountain Ecosystem:

- A warmer climate will cause lower-elevation habitats to move into higher zones encroaching on alpine and sub-alpine habitats.
- High-elevation plants and animals will lose habitat area due to increase in temperature and snow melts. Rising temperatures thus increase the possibility of disappearance of these high elevated plants and animals.
- Rising temperatures may cause mountain snow to melt earlier and faster in spring shifting the timing and distribution of runoff. This in turn affects the availability of freshwater for natural systems and for human uses and hydropower generation in the state. Earlier melting leads to drier conditions with increased fire frequency and its intensity.
- Glaciers around the world have been shrinking. Retreating glaciers decrease the reliability of water flow and change natural habitat distribution pattern around river coasts.

Rationale from the Himalayan Perspective:

The impact of climate change is most seriously felt in Himalayan Regions because later belongs to the most vulnerable ecosystems and lives of the people are closely intervened with the natural resources base, as most of rural population is dependent on agriculture and animal husbandry. Any change in the natural resources of the region due to climate change will have for reaching repercussions. H.P faces an urgent need to adapt to the expected impacts of its global phenomenon. These includes threats from glacier retreat, extreme weather events, changes in food production and security, water stress, increased drought and floods, increased incidences of vector borne diseases. Thus, the environment has become a focused issue in the State for which Government of Himachal Pradesh has taken many initiatives to protect the environment. Some of the climate induced changes observed in the context of the mountain environment in Himachal Pradesh are as:

- Declining snow fall.
- Drying up of perennial streams.
- Temperate belt has shifted upward.
- Productivity of apple has been adversely affected.
- Rabi seasons has been shifted and shortened.
- The incidences of diseases and pests have become more severe.

In order to address these issues arising out of the climatic variations, it is very important to sensitize the different organs of the Government about the climate change. To begin with a one-day workshop on "Sensitization of Policy Makers and Administrators on Climate Change and its Impacts on the Mountain Ecosystem" was held on 30th June, 2022 at Hotel Holiday Home, Shimla, organized jointly by State Climate Change Centre (CCC) under the aegis of Himachal Pradesh Council for Science Technology and Environment, Shimla and the Divecha Centre for Climate Change, Indian Institute of Science (IISc) Bangalore. The workshop was organized to discuss about the current and future scenario of climate change in Himalayan region and throughout the world. This workshop indeed was a great success and administrators including policy makers attended the workshop enthusiastically giving their personal perceptions and inputs regarding climate change.

INAUGURAL SESSION

At the outset of workshop, Dr. S.S. Randhawa, Principal Scientific Officer, HIMCOSTE welcomed all the dignitaries on dias including Sh. Lalit Jain, Director (Env. Sci. & Tech). cum Member Secretary (HIMCOSTE), Shimla; Dr. Anil Kulkarni Distinguished Scientist, Divecha Centre for Climate Change, Indian Institute of Science (IISc) Bangalore; Dr. Krishnan Raghavan, Director, Indian Institute of Tropical Meteorology (IITM), Pune and Executive Director, Centre for Climate Change Research, IITM, Pune; Sh. Apoorv Devgan, Member Secretary, H.P. State Pollution Control Board, (HPSPCB), Shimla; Dr. J.C. Rana, Country Director, Alliance of Biodiversity International and CIAT, New Delhi; and Sh. Satpal Dhiman, Addl. Secretary (Env. Sci. & Tech.) cum Joint Member Secretary HIMCOSTE, Shimla.



The one-day sensitization workshop was chaired by Sh. Prabodh Saxena, IAS Addl. Chief Secretary (Finance, Planning, Economics & Statistics, Personnel and Env., Sci. & Tech., Govt. H.P.) The workshop began with the lightening of the lamp by the dignitaries followed by the felicitation of the Chief Guest and other dignitaries.





The opening remarks for the workshop were given by Sh. Lalit Jain, Director (Env., Sci. & Tech.) cum Member Secretary (HIMCOSTE), In opening remarks, Sh. Lalit Jain welcomed all the dignitaries and esteemed participants of the workshop apprised that Climate Change is an issue that affects all of us in our day today life in one-way or the other. It is common knowledge that rain and snow has



decreased considerably over the years, whereas incidence of pests and diseases of crops have increased. Various weeds that were lying silent in our forests have become invasive and spread considerably everywhere. Our rivers and streams once perennial and ever flowing have been reduced to small seasonal nullahs. Undoubtedly, glaciers have retreated in most areas and snowmelt in our rivers has reduced. He further said that the climate change would bring disaster more frequently, so now it is the time that we must take necessary actions to combat climate change for future sustainable development. He said our whole economy is now going to be dependent on climate change and agriculture sector which is facing biggest impact, therefore, it is the time to bring necessary policy changes to mitigate the impacts of climate change. The diversified techniques in agriculture and better irrigation practices should be brought out for the climate resilient agriculture. There must be inputs regarding structure development to prevent floods, landslides and after affects planning & response.

Dr. Anil Kulkarni, Distinguished Scientist, Divecha Centre for Climate Change, Indian Institute of Science (IISc) Bangalore, gave an overview of the workshop. He highlighted about the four themes of workshop and said that there will be discussions on potential opportunities and risks associated



with the new lake formation causing flash floods and landslides due to collapse of hanging glaciers. He gave his insights on the importance of cryosphere and said that the mountain communities have faced huge climate change impacts. Himalayan ecology has been fragile and glaciers are receding affecting the sustainability of mountains. Dr Kulkarni informed that there is a decrease in the snowfall and reduction of effective duration of winter has been observed in Pir Panjal Himalayan Ranges. Besides this, trends of temperature are not uniform over the NWH Region and annual temperature has risen by 1.6°C in the last century with winter warming. On the other hand, most of the Himalayan glaciers in the Western Himalayan Region are receding as per the studies carried out. A slight shift has also been observed in the winter precipitation indicating more area under

seasonal snow cover during the month February to April in comparison to peak winter months. This shift may affect the discharge dependability in the downstream areas as the snowfall during this period may not sustain for a longer time

Sh. Satpal Dhiman, Addl. Secretary (Env.,

change, workshop was held in two technical sessions discussed in detail.

Sci. & Tech.) cum Joint Member Secretary HIMCOSTE, Shimla, extended the vote of thanks to the dignitaries present on the and the off dias. The climate change at present scenario is a big reality which cannot be ignored, and to address all the issues and challenges associated with climate

TECHNICAL SESSION-I

Speaker 1: Dr. Krishnan Raghavan (FASc, FNA Director, Indian Institute of Tropical Meteorology (IITM), Pune and Executive Director, Centre for Climate Change Research, IITM, Pune)

Krishnan Raghavan delivered a talk on "Understanding the Influence of Climate Change in Hindu Kush Himalayas". He highlighted that the 2020 was the warmest year and combined heating influence of greenhouse gases due to human activity has warmed



the climate at a rate that is unprecedented in at least last 200 years according to the Assessment



Report of IPCC. With every increment of global warming, changes are getting larger in terms of temperature, precipitation, and soil mixture. Annual mean surface-air-temperature in the HKH increased at a rate of about 0.1 °C per decade during 1901-2014, with a faster rate of warming of about 0.2 °C per decade during 1951-2014. Future projections under various CMIP5 scenarios suggest warming of the HKH region in the range of 2.6-4.6 °C by the end of the 21st century. HKH glaciers & rivers are key water resources for Asian countries but the winter warming has accelerated at a faster rate resulting in snowline elevation rise. He said that the water cycle has also changed, dry region will get drier and wet region will get wetter due to climate change and this leads to agricultural droughts as soil will go moisture deficit and there will be agricultural loss. He discussed that improving Prediction Potential of Precipitation in the HKH and Third Pole through Enhancing Early Warning Systems-Observations, Data Assimilation, High-resolution models, and linking Research to Operations & Applications that could help in combating climate change.

Speaker 2: Dr. Anil Kulkarni (Distinguished Scientist, Divecha Centre for Climate Change, Indian Institute of Science (IISc) Bangalore)

Dr. Anil Kulkarni discussed on the "Himalayan Water Resources Under Warm Climate" to explain about the severity of climate change in Himalayan region particularly the water resources. He said annual variations have been observed in snow cover during winter and summer seasons that is Glacier Mass Balance has been altered resulting in low altitude glaciers losing mass at higher rate. In Himachal, Ravi and Parbati basins have starting melting snow in middle of winter. Springs, forest fires have also increased snow melt and simultaneously deposition of black carbon on snow

is affecting snow melting and reducing albedo of snow, thus vulnerability of mountain streams likely to effect because of early melting of snow. He highlighted the findings of his studies that the 2.6°C rise in temperature would result glaciers to lose 79% of ice by the end of the century in H.P and runoff from glaciers will increase in 2050. Moreover, trans boundary



issues of water sharing among nations in Himalayan region are also critical that can also enhance

climate induced crisis such as GLOFs and landslide hazards. Dr. Kulkarni stressed on the point that winter snowmelt will change the runoff seasonally, influencing hydropower plants profitability and agricultural practices. He also suggested in his talk the methods to reduce the impacts of climate change on ecosystem.

TECHNICAL SESSION-II

Speaker 1: Dr. J.C. Rana (Country Director, Alliance of Biodiversity International and CIAT, New Delhi) and Dr. Lal Singh (Director, Himalayan Research Group (HRG), Shimla)

Dr. J.C. Rana and Dr. Lal Singh jointly presented their views on "Mainstreaming agro biodiversity-an integrated approach to improve nutrition, livelihoods, ecosystem services and reduce climate vulnerability". Both the speakers deliberated on the present crisis of malnutrition, climate change, biodiversity



loss & environmental degradation. Speakers also suggested about the digital technologies, regenerative agriculture, precision breeding and accelerating crop improvements for the benefit of farmers because food systems and landscapes sustain the planet, drive prosperity, and nourish people. They did awareness about research-based solutions for communities and institutions for sustainably harnessing agricultural biodiversity to improve and safeguard people's lives in a climate crisis. In their talk, they discussed about mainstreaming agro biodiversity by combating the challenges of agro biodiversity and promoting native crops such as Amaranth (*Amaranthus hypocondriacus*), Buckwheat (*Fagopyrum esculentum, F. tataricum*), Red Rice (*Oryza sativa*), Barley (*Hordeum vulgare*), Kidney Bean (*Phaseolus vulgaris*) etc. in Himachal to improve nutrition, livelihoods, ecosystem services to reduce climate vulnerability.

Speakers highlighted that in the present scenario, there is a complete shift from native crops to cash crops which has resulted in accelerated usage of inorganic inputs and PDS food resulting in health disorders. In this changing climate scenario, there is a need is to grow selected nutritious target crops ensuring health security along with market linkages.

Speakers mentioned the use of improved agricultural support systems, institutional frameworks and partnerships that would support crop diversity on farm, supply of diversified seeds of target crops from CSK and NBPGR and local custodian farmers, adaptive management of crop diversity for resilient agriculture and improved livelihoods. They shared the strategies and policies for sustainable conservation and use of crop diversity including access and benefit sharing along with detailed business plan developed for native crops farmer enterprise in development of value chain enterprise of mountain farmers.

Speaker 2: Ms. Trishla (Ph. D. Scholar) Indian Council of Forestry Research and Education (ICFRE), Dehradun

Ms. Trishla on behalf of Dr. R.S. Rawat presented the talk on "REDD⁺ Mechanism for Climate Change, Mitigation and Adaptation in Forest Sector in the Himalayan Region". Some of the key highlights of her talk are that atmospheric warming >1.5°C has already occurred in some regions and 20-40% of the global



population lives in regions that have already warmed by more than 1.5°C. According to IPCC records, land is acting like a tremendous carbon sink and several land-based climate solutions can reduce emissions and/or remove carbon from the atmosphere by curbing deforestation and forest degradation. Afforestation and reforestation have the greatest carbon removal potential, followed by enhancing soil carbon and using bioenergy combined with carbon capture and storage, a process that uses biomass for energy and then captures and stores its carbon before it is released back into the atmosphere. Ms. Trishla apprised about the seven REDD⁺ Safeguards (Cancun Safeguards) for transparent and effective structures of national forest governance to facilitate the implementation of REDD⁺ programme in the country in conformity with relevant decisions of UNFCCC and the national legislative and policy framework for conservation and improvement of forests and the environment. She also discussed about the salient features of National REDD⁺ Strategy 2018, covering all the REDD⁺ activities (reducing emissions from deforestation, reducing emissions from forest degradation, conservation of forest carbon stocks, sustainable management of forest

and enhancement of forest carbon stocks). She also presented an implementation roadmap for establishment of an NGC-REDD⁺ coordinating and guiding REDD⁺ Cell in the State Forest Departments for addressing different REDD⁺ activities like deforestation, degradation, Conservation, SMF, Enhancement of C stocks for the conservation of environment.

Speaker 3: Sh. Apoorv Devgan, IAS (Member Secretary, H.P. State Pollution Control Board (HPSPCB), Shimla)

Sh. Apoorv Devgan gave a presentation on "Climate change, Water & Lessons from Israel Visit". He started the presentation by playing a video based on water crisis management practice adopted in Israel. The distinguished speaker presented some learning's from



Israel water management ways that are relevant to India also. He discussed some of the learning's from Israel water crisis management and informed that about 90% of the water is recycled in Israel and there is penalty over wastage of a single drop of water because water is an asset it must be conserved and utilized properly at any level. He discussed about the water diplomacy, water laws, water governance, water authority council, river rehabilitation authorities, water supply and sewerage treatment, unique technologies for water quality detection and monitoring. Water resources cannot be used for own uses only there are water regulations and policies for water storage. Techniques have been developed for the efficient extraction of ground water, water storage, development of agriculture sector and removal of water pollution. Water metering is very accurate in Israel including advanced wireless metering system. He also deliberated that there is lack of proper vision and proper planning for water uses, lack of water task forces, dynamic pressure regulating devices, irregular demands of water in India also.

He said leveraging on advanced technologies, good governance, cooperation, smart pricing can lead to better management of water resources in Himachal also leading to curb climate change related adverse effects on the environment.

Speaker 4: Dr. S.S. Randhawa (Principal Scientific Officer, HIMCOSTE) Shimla

Dr. Randhawa delivered his talk on "Cryospheric Studies carried out in Himachal Himalaya -An overview". He presented the distribution of clean & debris covered glaciers in Satluj, Chenab, Ravi, and Beas along with the status of Glacial Lake Outbursts Floods (GLOFs) in Himachal Pradesh including the adjoining Tibetan Himalayan Region. Dr.



Randhawa suggested actions in view of the National Guidelines Management of GLOFs and Landslide Lake Outburst Floods (LLOFs).

Esteemed speaker said that the preparation of an inventory of glacial/landslide lakes through remote sensing and GIS and prioritization of lakes according to the GLOF/LLOF risk assessment framework is necessary for hazard & risk mapping of potentially dangerous lakes in downstream areas. He said proper monitoring, risk reduction and mitigation measures such as early warning system, awareness and preparedness, capacity development, disaster response, research and development, regulation and enforcement, action plan and implementation are the suggestive measures to combat climate change.

Dr. Randhawa said like climate change is a global phenomenon, but efforts can be made to reduce atmospheric temperatures by way of afforestation at micro level and introducing other environmental checks such as reducing GHGs emissions, reduction of black carbon deposition level over the mountains by replacing fossil fuel and smart transport systems. Regular monitoring of glaciers at intervals to have a strong database.

CLOSING REMARKS

The closing remarks were put forward by Sh. Prabodh Saxena, Addl. Chief Secretary (Finance, Planning, Economics & Statistics, Personnel and Env. Sci & Tech.), Govt. H.P. He appreciated the efforts made by the two organizations i.e., the State Centre on Climate Change and the Divecha Center for Climate Change of IISc Bangalore for organizing the Sensitization

Workshop for the Policy Makers and Administrators to know about the Impacts of Climate change in the Mountain Ecosystem. He appreciated the efforts made by the Centre in bringing brilliant Scientists who are working on various facets of Climate Change, who had sensitized us on this vital issue of importance that needs great attention as far as the Mountain States in the Indian Sub-continent are concerned. He further said that every day



in the media we read about the climate change, extreme weather events, and the receding snow glaciers which feeds most of the perennial rivers in Northern India that either originate from Himachal Himalaya or passes through. Simultaneously, we are also warned about the effects of the rising temperature or the climate change effects on the snow and glaciers in the entire Himalayan Region. Millions of people throughout the world are deeply concerned about what is happening to our planet? What is now well known is that emission of greenhouse gases associated with industrialization and strong economic growth is causing global warming at a rate that has become alarming and unsustainable.

He addressed that the understanding issue of climate change is very important to each citizen of the society and said that biggest crisis of world at current time is the climate change which is a big horror. He gave directions about organizing a short outreach program to capture entire dynamics and train the trainers from different institutions to present the scenario of climate change to the public and stressed that there is need to have good research in this sector which can be done at HIMCOSTE and DEST. He discussed about the scenario of other countries like Israel and China on issues of climate change and said we must learn lessons from others. He addressed about two things that is mitigation and action to preserve the status of agriculture and hydropower in Himachal. He concluded his address with the remark there should be mainstreaming of climate change into polices and Govt. agenda for which the line departments should take necessary actions for combating climate change into their planning process.

PANEL DISCUSSIONS

In the panel discussion session, all the Chairs, speaker's made final remark and their suggestions for the way forward in Himachal Pradesh with reference to climate change. The key were Dr. Anil Kulkarni, Sh. Apoorv Devgan, Dr. Krishnan Raghavan, Mrs. Preeti Bhandari, IFS (Dy. Conservator of Forests, Finance, CAMPA/Ecotourism/SFDA), Dr. J.C. Rana, Sh. Lalit Jain, and Sh. Satpal Dhiman were the panelist for discussion on critical issues of climate change. A detailed discussion was done at the concluding session of the workshop and the various possibilities were suggested to have minimal impact on environment due to climate change. Several aspects of climate change were discussed and a way forward of sustainable development was suggested eliminating all environment degrading activities like prohibiting use of single use plastic and reducing black carbon emission into the atmosphere and adoption of better water conserving practices/techniques.



- Dr. Krishnan Raghavan concluded that the talks delivered by speakers in technical session-I and technical-II emphasize the need to conserve the natural resources in the Himalayan region to prevent the climate change. He discussed about the key ingredients of action plan that could be formulated for climate change prevention.
- Dr. Anil Kulkarni discussed about mainstreaming the climate change and a scientific idea must be developed because snow fall, temperature rise, snow melt, forest fire, precipitation

all is linked. Some idea can be implemented on ground in H.P. as snow cover monitoring model is already there, we can predict the rate of snow melt. The scientific ideas and research need to be explored and included into the policy decisions like 90% research has been done and 10% is the policy decisions. Inputs on climate change related issues and educational tools to train the trainers like in ISRO will help in climate change mitigation. One more little step is necessary to come into policy decisions and administrative purposes.

- Mrs. Preeti Bhandari said all Govt. departments in one or other form are working to achieve a common motive that is to serve community and to conserve nature and environment. There can be convergence among Govt. departments to achieve the common motive of climate change. Sensitization is necessary for the general public also because no one is going to understand the complexity happening due to climate change. She said there must be multi-sectoral approach to make common man understand about the climate change. Educational research plays a big role at local level and now environment is also the part of school education as well. Like Forest department has so many schemes to preserve the environment like *Vidhyarthi Van Mitra*, School Nursery etc. If we don't act now, coming generations would go into curse. We need to develop a common action plan to act upon and it must be essential part of all departments in the state.
- Sh. Lalit Jain in his concluding remarks said that with this workshop, it has now become the responsibility of the nodal department to have the environmental memorandum like financial memorandum. There must be a clear-cut policy on climate change because there is no time of thinking and debating on climate change, we need to take a strict action. In state universities and colleges, awareness programs on climate change must be introduced and essay, poster competitions must be conducted on climate change at school level. Environmental clearance for the projects from the nodal department onwards would have visible impacts on climate change.
- Dr. JC Rana discussed that the action plan regarding climate change must be replicated by all line departments for mainstreaming the climate change. He suggested that the critical review is necessary to amend the actions. Global solution is individual awareness and focused actions towards climate change.

Sh. Satpal Dhiman said that the climate change is a big reality. He also gave the post scenario 2050 about climate change, how extreme weather events will be going to affect the common man because still we don't have any technology to prevent glacier melting. He highlighted that we need to understand at ground level about good practices and road maps to address the all drivers of climate change. Life must be made livable to all on this planet.

MAJOR RECOMMENDATIONS

- Some of the major recommendations emerged out of the deliberations and discussions during the workshop are:
- SCCC of the HIMCOSTE and the Divecha Centre for Climate Change shall evolve a mechanism for the outreach program to the society in a joint mode to create awareness about the climate change and its various impacts on the mountain ecosystem. This should be taken should be in the campaign mode and SCCC in consultation with Divecha Centre for Climate Change will carry forward this on priority.
- H.P. State Centre on Climate Change (SCCC), Divecha Centre for Climate Change (DCCC) and Indian Institute of Climate Change (IITM) will explore possibilities for further research avenues in climate change depending upon the funding provisions available with either of the institutions and take up further in joint mode.
- Mainstreaming climate change adaptation into policy-making, budgeting, implementation, and monitoring processes at all different levels.
- High altitude regions of Himachal Pradesh are expected to experience higher rise in temperature than the global mean and low altitude therefore special attention is need to understand the climate change of Himalaya.
- Winter snowmelt can reduce soil moisture in spring and summer seasons, increasing forest fire incidences. Therefore, improvement in forest fire management strategy is needed.
- Winter snow melt may lead to early drying of mountain springs. Therefore, spring rejuvenation plan needs to be developed.
- Retreating glaciers and early melting of snow can change the runoff pattern of mountain streams. Therefore, improvement in small hydropower development strategy and plant design is needed.
- Retreating glaciers can cause formation of new glacier lakes and expansion of existing

ones. Therefore, vulnerability assessment of each lake is needed.

• Climate change expected to increase frequency of heavy precipitation which will lead to flash floods. Therefore, early warning system and flood management strategy needs to be strengthened.

Species inhabiting alpine regions have very narrow corridor to move and will get extinct if appropriate measures are not taken. These high valued species especially orchids need to be conserved in their natural habitat. Therefore, such vulnerable alpine tops need to be identified and protected from anthropogenic activities. Also, seeds and propagule should be conserved ex situ so that as and when needed species can be reintroduced. Agriculture productive system is going to change due to poor chilling such as apple, European pears, cherry, and many other valuable medicinal plants. Also, agriculture crops are facing weather uncertainties such severe drought, water logging, heat stress, etc. Therefore, crops diversification with more number of crops and varieties suitable to different regions need to be evaluated for cultivation. Breeding programs needs to revisit and redesign keeping in view the climate change scenarios down the line 25-30 years.

Overemphasis on the cultivation of cash crops replacing native crops and varieties leading to narrow genetic base, making communities more vulnerable to climate change impacts, thus native crops and varieties that are suitable to local conditions and have wide range of variability need to be evaluated and promoted in special niche areas. Himachal state has many such micro niche areas and crops such as red rice, rajmash, buckwheat, amaranth, horse gram and many more which can enhance farmers ability to cope with climate change and can ensure livelihoods and nutrition.

Vote of Thanks

Dr. SS Randhawa, Principal Scientific Officer extended Vote of Thanks to Chief Guest, all the Chairs and distinguished Speakers, print and electronic media, social media, Himachal Tourism for providing logistics support and all the HINMCOSTE staff to make this workshop a great success.

Annexure-1



	TECHNICALS	FSSION-I
	Chain Sh Dugued Theline IAS (Director I	Dural Development & Development Pai)
	Co Chair: Dr. Anil Kulkarni (Disting	nished Scientist USc. Bangalore)
	Rannorteur: Dr. Pooja Kohli Mr. Hari	sh Bharti and Ms. Neba Thakur
	Kapportur. Dr. 100ja Kolin, Nr. 11a	
11:45-12:30 PM	"Understanding the Influence of Climate Change in Hindu Kush Himalayas"	Dr. Krishnan Raghavan, FASc, FNA Acting Director, Indian Institute of Tropical Meteorology (IITM), Pune Executive Director, Centre for Climate Change Research (CCCR), IITM, Pune
12:30-01:15 PM	Himalayan Water Resources Under Warm Climate	Dr. Anil Kulkarni Distinguished Scientist, Indian Institute of Science (IISc), Bangalore
01:15-02:00 PM	Lunch Break	
	TECHNICAL SI	ESSION-II
Chair: N	Irs. Preeti Bhandari, IFS (Dy. Conservator of	Forests, Finance, CAMPA/Ecotourism/SFDA)
	Co-Chair: Dr. Krishnan Ra	ghavan, FASc, FNA
	Acting Director, Indian Institute of Trop Executive Director, Centre for Climate Cha	ical Meteorology (IITM), Pune, nge Research (CCCR), IITM, Pune
	Democrateron De Devie Kelli Marcile	
	Kapporteur. Dr. Pooja Konii, Mrs. Monik	a Chauman and Mis. I amini Thaku
02:00-02:45 PM	Mainstreaming Agro-biodiversity- An	Dr. J.C. Rana
	Integrated Approach to Improve Nutrition, Livelihoods, Ecosystem Services to Reduce Climate Vulnerability.	Country Director, Alliance of Biodiversity International and CIAT, Region- Asia, India Office, NASC Complex, Pusa Campus, New Delhi
		Dr. Lal Singh Director, Himalayan Research Group (HRG), Shimla
02:45-03:30 PM	Mechanism for Climate Change: Mitigation and Adaptation in the Forest Sectors	Dr. R.S. Rawat Scientist-E, Indian Council of Forestry Research and Education (ICFRE), Dehradun
03:30-04:00 PM	Experience sharing from Israel visit and its relevance to Himachal Pradesh	Sh. Apoorv Devgan, IAS Member Secretary, H.P. State Pollution Control Board (HPSPCB), Shimla
04:00-04:15PM	Closing Remarks	Sh. Prabodh Saxena, IAS Addl. Chief Secretary, Finance, S&T, GoHP
	PANEL DISCUSSIONS AN	ND WAY FORWARD
	Chair: Sh. Apoory Devgan, IAS (N	(ember Secretary, HPSPCB)
	Panelist: 1. Sh. Lalit Jain 2. Sh. Satpa	1 Dhiman 3, Dr. Anil Kulkami
	4. Dr. Krishnan Raghavan 5. J Rapporteur: Dr. Pooja Kohli, Mrs. Monik	Dr. J.C. Rana 6. Dr. R.S. Rawat a Chauhan and Ms. Yamini Thakur
04:15-04:30 PM	Observations on the Himalayan Cryosphere in Himachal Pradesh and Climate Induced Hazards	Dr. S.S. Randhawa d Principal Scientific Officer, HIMCOSTE, Shimla
04:30-05:00 PM	Panel Discussions	Sh. Lalit Jain, Sh. Apoorv Devgan, Sh. Satpal Dhiman, Dr. Anil Kulkarni, Dr. Krishnan Raghavan, Dr. J.C. Rana, Dr. R.S. Rawat
05:00-05:05 PM	Vote of Thanks	Dr. S.S. Randhawa Principal Scientific Officer. HIMCOSTE Shimla

Photo Gallery

























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List of Stakeholders

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Media Coverage













Himachal _____

Climate change issue poses major challenge to mountain ecosystem June 30, 2022 09:32 PM



SHIMLA: As the Climate Change issues are of global concern, they pose a major challenge to our mountain environment as the mountain ecosystem is highly vulnerable and sensitive to the climatic variations. Mountains have a special role in showing the effects of climate change. The Himalayan ecosystem has 51 million people who practice hill agriculture and whose vulnerability is expected to increase on account of climate change. The rapid development over the years has also adversely affected the Environment & Ecology of the Himalayan Region as a whole. Scientists also believe that the rise in temperature coupled with environmental degradation would also result in the rapid depletion of glaciers, an important reservoir of freshwater available to us.



🐣 NEWS LIFESTYLE OPINION BUSINESS ENVIRONMENT CONTACT ENGLISH HINDI

Fast thawing of snow leading to new lake formation in Himalayas

🗂 june 30, 2022 🔺 admin 🔹 O Comments

The Environmental studies are indicating alarming trend in changing the course of glacial bodies, thawing snow cover rapidly and formations of new glacial likely to further affect the Himalayan hydrology. This was stated by Prof. Anil Kulkarni, distinguished Scientist, Indian Institute of Science, Bangalore in a workshop on Climate Change and Mountain Ecosystems held in Shimla today. He said that due to climate change, the snow rivers of Himachal are changing rapidly and many lakes are forming due to the movement of glaciers and fast thawing of glacial bodies. He said that if the ongoing trends would not reversed by adopting mitigating Environmental challenge and carbon emissions remained uncheck may loom large challenges in the near future. The formation of new glacial lakes inside the glacier could cause of heavy devastation and destruction. Stressing to devise green technologies, industries and sustainable development he said that it is there is dire need to find new means to avoid disaster as Himalayas are reservoir of invaluable treasure of drinking water to two third of world population. Pro . Kulkarni said that today there is a need that the water of these snow lakes . Many advance countries of the world are already engaged in taping this water from these snow lake. He said that this would make life better for the people if water preserved in the Himalayan regions, inform of snow lake and glacial bodies lakes could be used to generate electricity etc. He said that exploring such possibilities it could eliminate frequent floods along such rivers. Kulkarni said that











हिमालयी क्षेत्र में 79 से 87 प्रतिशत

तपने लगे पहाड़, तेजी से पिघल रहे ग्लेशियर, भूकंप की आवृत्ति भी बढ़ी शामला में जलवायु परिवर्तन के परिणामों को लेकर वैज्ञानिकों ने जताई चिंता

अमर उजाला व्यूरो

तिम्मला। देश में जलवामु परिवर्तन को में हो रस है। स्टोशियर पियल के हैं और प्रसाड तपने जा रहे हैं। पुरुष को आवृत्ति भी लगातार बहते जा रही है। अगर कवजलानों पर ध्यान नहीं दिया जब को रेड में जलवामु परिवर्तन के ता तो देश में जाववार घोरमान क एकंडर परिणम सामने आ सकते है। जीवार को जलवायु घरिवर्तन भ्विशियर 79 घोमदी बर्फराइन हो के चलरे प्रिस्त में संबर्धतारण को आएंगे। 2050 में श्वीलयारी के लहर जीत निभारण पर एक पिस्तने को गति सहौगी और मिल्लेस कर्यावाल हुई। इसमें दिमाखल में ये और सिल्ट्रेगे। मिल्लेस आर्थवाला हुई। इसमें

अमरउजाला

लेकर जीते निर्पारण पर एक दिवसील सर्वशाल रहा असी हिमाबल से अंगेर सिक्सरों आप कोर सिक्सरों भा उक्सरत के वैक्रानियों और उक्सरत के विकास रही भारतीय दिनाय सरक्षा निरित्स की आप अपना ने सक्स भारतीय दिनाय सरक्षा निर्देशक की आप अपना ने सक्स भारतीय दिनाय स्वाध्या निर्देशक की आप स्वाध्या भा स्वाध्या (आईआइसस) निर्वाध्या सेटर जावा नारपाला में स्वाध्या भा स्वाध्या आप क्रम्डराज्य स्वाध्या ने जावां। नारपाला की स्वाध्या की बाताक का जावल कुसलाओं ने जावां। नारपाला की स्वाध्या की बाताक का जावल के सिर्ध के खाड़ का सिक्सरा में स्वीती की स्वाध्या कि निधायल में सर्दियों के खढ़ का किसराल स्वाध्या प्राप्त स्वाध्या के स्वाध्या की बाताक का जावल के स्वाध्या की स्वाध्या की स्वाध्या की स्वाध्या कि निधायल में सर्दियों के खढ़ का किसराल स्वाध्या प्राप्त स्वाध्या है, उस बाति का लायाना में 2.6 दिया

हिमाचल में भीआज से एकल उपयोग प्लास्टिक पर प्रतिबंध िप्राप्ता । हिमालन में जान से एकहा उपहेल प्रात्मिक स्थापिक सर प्रतिकार है इसमें रियर्थ, गुभ्मों में गांगे शारितक दिला, आदाकरिंग दिक, केडी स्टिक, प्रतासिक के हरे, राजबंद में निर्वापन को कुने परिस्थित अधीकरिक, प्रतः क्यू कर दि रियर्थ, रोज हिम्लीय की कर के द्वार प्रारंभ की प्रतिकार प्रतः क्यू के का रियर्थ, रोडाएँ, रिवर्गन, विक्री और उपबोध पर भी प्रतिकार नग का है। युद्धे

बोले, क्रियाक्लापों पर ध्यान न दिया तो सामने आ सकते हैं भयंकर परिणाम प्रकृतिक संसाधनों का राज्य है, लेकिन विकास के नाम पर पताड़ों

का सीना उलने किया जा रहा है। वैज्ञानिकों का कहना है कि रलेशिवर लगातार पिचल रहे हैं। अपर हम जलवायु परिवर्तन के बुरे परिणामों से वचना चाहते हैं तो हमें अपने क्रियाकलापी पर ध्यान देना होग्या। प्रदेश क्रिमाचल

पीबांगिकी एवं पर्यावरण परिषद के निदेशक लहिता जैम ने कहा कि जिस रफतार में श्लीयल जामिंग हो रही है, उसके भयंकर परिणाम हो

विज्ञान

तापमान बढ़ने के कारण वर्ष 2050 तक पेयजत संकट की चुनौती बढ़ेगी; जलवायु परिवर्तन व पर्वतीय पारिस्थितिकी तंत्र पर कार्यशाला का आयोजन



लाः जलवायु परिवर्तन को लेकर आयोजित कार्यसाला के वीरान जपस्थित प्रतिभागी व (इनसेट में) कार्यसाला के दौरान मंच पर उपस्थित अधिकारी। (भाग

तिमाल, 30 वृत्र (कुलदीप): हिमालयी क्षेत्र में 29 से 87 फोसटे स्वीतावर्धे के पिपलने का सतता बढ़ गया है। यानी इस अर्थीय में यदि वियालयी क्षेत्र का तापमाट 26 डिग्री तक बढ़ता का रोडियर दिनी के रियोद के स्वित्य स्वीति वियोदाओं य है तो राजिर 27 प्रसेसनी देती तापसा के 4.1 हिंग्री तक बढ़ने की स्थिति में रेलिंगराठ प्रसास का पंरताय की स्वीपित कले हुए यह माल दिवेचा वल पिपल बारगे। सम्रोहद सित्रा द वीता का प्रथम कलता

टकी

नमा धगित भी मा

ग्लेशियरों के पिघलने का बढ़ा खतरा कि तापमान बढ़ने के कारण म्लेसियरों को फिपलनी इस रफ्तार के कारण वर्ष 2050 तक चेयजन संकट जैसी स्थिति पैदा हो सकती है। अतिरिका संबट जेना रियात पर्या हो सकता है। जोता को मुख्य सांबन प्रयोगगा, तिवात एव प्रीयोगिकी प्रथाध सबसेना ने कहा कि जलवायू परिवर्तन को लेकर हिमालनी राज्य मिलकर रीडानिक डाटावेस तैयार कर रहे हैं। उन्होंने कहा कि मीसम में आए इस बदलाव

तथा कर था है। उन्दों कहा कि मौसम में आए इस बरणम के कारल कृषि केमें में 51 मिलन पाट है। उन्दोंने कहा कि पहाई को में 51 मिलन सोलन कीम कही के पहाई को में 51 मिलन सोलन कीम कही है तथा मौसम परिलदेन से उनको परेतमी का समल करना पढ़ रहा है। उन्दोंने कहा कि तिमापल प्रदेश सारका रिवेषक कहा से भाष्य भी सेवलम्जे अर्दातीलों केमिलन पेस करियाता में लिए गए निर्भेष एवं मुझालें भीम पेस आरस कर्म को प्रयास करोगी। हिमकोस्ट के मुझा वैद्वतिक क. प्रयास करोगी। हिमकोस्ट के मुझा वैद्वतिक त्यास एस. रेपला ने विमालयों कीम पिस सिंग मिलास्यन रिसर्थ पुत्र सिलस के का. लाल सिंह ने भी जलावाषु परिवर्तन के मुदे पर अपने विधास संक्रा किए। हिमायल प्रदेश राज्य उद्युपा निर्मवेज्य बोर्ड तिमलता के सरस्या सर्विक अपूर्व देवान ने अंगी इन्यराल यात्र तथा जलावाषु परिवर्तन को लेक इजरायल यात्रा तथा जलवायु परिवर्तन को किए गए आध्यपन पर अपने विचार सांझा



हिमालयी क्षेत्र में 2050 तक बढ़ जाएगा दो डिग्री सेल्सियस तापमान, पिघलेंगे ग्लेशियर

यादवेन्द्र शर्मा, शिमला

पर्यावरण प्रदुषित करने की मानवीय भूल, प्रकृति का अवैज्ञानिक व अतिरिक्त दोहन, बढता प्रदुषण और ग्लोबल वार्मिंग जैसे कारणों से हिमालयी क्षेत्र में अधिकतम तापमान वर्ष 2050 तक सामान्य से दो डिग्री सेल्सियस तक बढ जाएगा। इससे ग्लेशियर पिघल जाएंगे, जो नदियों में पानी को बढाकर बाढ का कारण बन आपदा ला सकते हैं। यह बात जलवायु परिवर्तन पर आयोजित एक राष्ट्रीय कार्यशाला के दौरान मुख्य वक्ता इंडियन इंस्टीट्यूट आफ साइंस बेंगलुरु के विज्ञानी डा. अनिल कुलकर्णी ने कही।

शिमला में आयोजित हुई इस कार्यशाला में डा. अनिल ने कहा कि विज्ञानियों ने आगामी तीन दशक तक ग्लेशियरों को



लोगों को जागरुक करने की जरूरत। फाइल

पिघलने से बचाने के लिए उचित प्रबंध करने की आवश्यकता जताई है, जिससे बर्फीले क्षेत्रों में लगातार बढ रहा तापमान कम किया जा सके। वर्ष 2007 में शोध में यह गलत तथ्य सामने आया कि वर्ष 2030 में तापमान बढने के कारण ग्लेशियर पुरी तरह पिघल जाएंगे। बाद में किए गए शोध में विज्ञानियों ने वर्ष 2050 के लिए खतरे की स्थिति बताई है।

विज्ञान एवं प्रौद्योगिकी विभाग के अतिरिक्त मुख्य सचिव प्रबोध सक्सेना ने कहा कि पर्यावरण के प्रति स्कुलों व कालेजों में विद्यार्थियों और लोगों को जागरूकता किया जाए। इसके लिए 10 साल की कार्ययोजना तैयार की जाए।

ज्यादा तेजी से बढ रहा न्युनतम तापमान : भारतीय उष्ण कटिबंधीय मौसम विज्ञान संस्थान पुणे के निदेशक डा. आर कष्णन ने कहा कि ग्लोबल वामिंग का असर साफ दिख रहा है कि दिन की अपेक्षा रात का तापमान यानी न्यूनतम तापमान ज्यादा तेजी से बढ़ रहा है। न्यूनतम तापमान ज्यादा प्रभावित कर रहा है। बीते पांच वर्षों के दौरान इसमें खासकर हिमालयी क्षेत्र में ज्यादा वृद्धि हुई है। पश्चिमी हिमालय की बर्फ पिघलने से नदियों का 95 प्रतिशत पानी पाकिस्तान को चला जाता है।

10 साल की कार्ययोजना बने : पर्यावरण

Climate change may necessitate Indus treaty re-negotiation: Expert

Loss of glacial mass on Indian side higher than that on Indus basin in Pak

PRATIRINA CHAUHAN

SHIMLA, IOLVI

The growing impact of climate change could necessitate re-negotiation of the Indus Water Treaty between India and Pakistan due to faster glacial melting in the Sathui, Beas and Ravi basins in Eastern Himalayas from where India receives 30 per cent of its water share.

Prof Anil V Kulkarni, distinguished scientist from the Divecha Centre for Climate Change of the Indian Institute of Science (IISc), Bangalore, threw a word of caution with regard to India's water share declining considerably due to differential glacier loss on the Eastern and Western sides of the Himalayas on account of climate change by the end of this century. This, in turn, could majorly influ-



ence water sharing, he added. "The issue of re-negotiat-

ing the Indus water Treaty signed between India and Pakistan in September 1960 could arise as the loss of glacial mass on the Indian side of the Himalayas will be 85 per cent as compared to slower glacial melting of only 37 per cent in the Indus hasin on the Pakistan side," he elaborated while discussing the issue of Climate Change and Himalayan Water Security here.

on the Indian side is higher of 2.6 degrees Celsius rise in

than on the Western side. towards Pakistan." he elaborated. He added there was no understanding and studies of glaciers when the treaty was signed. So this factor was not accounted for.

Citing the glacier loss projection based on rise in temperature and accelerated hydro power plants and agrimelting, he revealed that 55 per cent of the glaciers in the Satluj basin would disappear by 2050 while 97 per cent would vanish by 2090.

He said studies had The Eastern river mass loss revealed that if there is a rise

temperature then the glaciers in various river basins in Himachal will lose 79 percent of their ice. Similarly, in case there is rise of 4.1 degrees Celsius increase in temperature then the glaciers in Himachal will lose 37 per cent of ice.

Dr Kulkarni said that faster melting due to climate change will result in flaster run off from glaciers till 2025 and then reduce in Himachal, which is important from the point of view of hydro-power generation. "Winter snow melt and glacter loss will change the run off seasonality, influencing cultural practices," he elaborated while discussing the longterm impacts of climate change and rising temperatures.

He also warned that the retreading glaciers could enhance the risk from glacial lakes and landslide hazard.



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