Legislators' Dialogue

CLIMATE CHANGE ADAPTATION: Implications of Climate change on agriculture and disaster risk reduction in Arunachal Pradesh

Integrated Mountain Initiative

22 June 2018

Auditorium, Arunachal Pradesh Legislative Assembly, Itanagar

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Executive summary of the event

Climate Change is one of the biggest challenges faced today and has a direct impact on the livelihood of communities. This concern is especially central to mountain/hill communities who rely heavily on natural recourses and farming activities. Studies have further shown that with the rapid increase of greenhouse gases such as carbon dioxide, methane and nitrous oxide in the atmosphere has led to a rise in global temperatures leading to other changes in global climates, such as erratic rains, floods and cyclones.

These changes in global climate will have even more adverse effects on the Indian Himalayan region which with the melting of glaciers, floods, erratic rains and disasters are the first to face the impacts of climate change. Hence this issue is of high significance to Himalayan states such as Arunachal Pradesh where agriculture is the primary source of the economy and contributes 43% to the state GDP. About 80% of the rural population is dependent on agriculture and about 62% of the total working population is engaged in agriculture.

Besides recognizing the importance of agriculture, the Arunachal Pradesh State Action Plan on Climate Change observed that the state is prone to a variety of natural disasters such as earthquakes, cloud bursts, landslides, flash floods, and forest fires. To reduce the effects of disaster in the state, the government has formulated a policy, known as the Arunachal Disaster Management Policy.15 The aim of the Policy is to establish necessary systems, resources, and guiding principles to reduce vulnerability from various hazards and respond to them in an appropriate manner.

The legislator's dialogue on implications of climate change on agriculture and disaster risk reduction in Arunachal Pradesh was held on 22nd June, 2011 and organized by IMI and Sustainable Development Forum Arunachal Pradesh (SDFA) in collaboration with Indian Himalayan Climate Adaptation Programme (IHCAP). The dialogue was also followed by a session on Promotion of Bamboo in Arunachal Pradesh.

The session was graced by the Hon. Chief Minister of Arunachal Pradesh Sh. Pema Khandu, Dy Chief Minister of Arunachal Pradesh. Sh Chowna Mein and Hon speaker of Arunachal Pradesh and Sh.T.Norbu Thongdok. The session saw in

attendance other key dignitaries and legislators of Arunachal State Assembly consisting of over 100 participants.

The introductory speech given by Shri. Ramesh Negi, IAS (Rtd.) Vice President, IMI & Former CS, Government of Arunachal Pradesh (GoAP) introduced the relevance of the dialogue noting climate change as an important issue of discussion. The growing vulnerability of the hill population with the increasing weather unpredictability leading to disasters, landslides and livelihood threats were also introduced as focus areas of concern. The context of the dialogue was further shared by Shri. Sushil Ramola, President, IMI who spoke of the constraints of mountain states, and the genesis of IMI's vision and mission to develop frameworks for sustainable mountain development in the Indian Himalayan Region. Hence highlighting the urgency on the need for a consensus on a pan Indian Himalayan voice.

The sessions that followed then focused on the studies of good practices, emerging issues and potentials of Arunachal Pradesh with speakers bringing into focus state specific issues. Shri. GN Sinha, Advisor, Sustainable Development, and former PCCF, GoAP provided an overview of the *Impact of Climate Change on Agriculture and Disaster in Arunachal Pradesh*. This was followed by the presentation by Shri Gomar Basar, Asst Registrar, Rajiv Gandhi University on a case study on Combating Climate Change- a Success Story in Spring/Stream Water Rejuvenation, highlighting the problems posed by depletion of natural springs in the region.

After focused presentations were made on region specific issues, Dr. Shirish Sinha, Deputy Head, Swiss Development Cooperation (SDC) gave an international overview and introduced SDC's mandate on climate change and environment and their work and broad objectives of the Indian Himalayas Climate Adaptation Programme (IHCAP) initiated in 2012 in collaboration with the Department of Science and Technology (DST), Government of India (GoI).

To derive the main objective of this session the Members of Legislative Assembly and key participants of the Legislators Dialogue were divided into 10 groups based on constituencies falling under similar agro-climatic zones. The discussions focused on putting together ideas, observations, and different experiences in each constituency starting from the grassroot (all of which are discussed in detail in the sections below).

Another key theme discussed was on the *Promotion of Bamboo.* The context for which was provided by Shri. Ramesh Negi. He provided the basic fact sheet on the status of bamboo in Arunachal Pradesh whilst indicating the possibility of an economy centred on it. Identifying key challenges and points of intervention for the promotion of bamboo, he reiterated the need to achieve equity of benefits for local communities from the policy changes and intervention undertaken. This point was further validated by Dr. L.R Bhuyan, Systematic Botanist, GoAP who presented on the state of bamboo and the possibilities for the promotion of its products in the state and discussed how various bamboo products could contribute to the bamboo economy envisioned in the state.

Way Forward-

Shri P.D. Rai summarized the presentations and deliberations on both the sessions on the key points discussed, recommendations provided, and the way forward.

- He mooted the idea of developing and forwarding a proposal to the ongoing 15th Fiance Commission on setting up a financial mechanism that defines the flow of funds to both grassroots and urban and local bodies, and to the governments in the Indian Himalayan states.
- The need to introduce new and alternative ideas and solutions into the State Action Plan on climate Change while affirming the states to tap funds from NABARD, Green Climate Fund, and National Adaptation Fund.
- Development and planning of smart cities and smart villages backed by inclusive and conclusive data and studies.
- Lastly, with the change in legislation, he stressed on the need to exploit the opportunities for an economy centred on bamboo.

Shri. Satya Gopal, Chief Secretary, GoAP in

conclusion acknowledged the importance of the dialogue and further stated the potential of the state and the way forward-

- He stressed on incentivizing the irrigation sector to ween away current trend of farmers practicing the primitive form of cultivation.
- He emphasized on opportunities for better land management practices, and improved cultivation through agro-forestry, horticulture, and encouraging alternate household activities.
- He pointed out the need for taking corrective measures to preserve streams from drying up, rejuvenation of spring/stream water through rainwater harvesting methods, and developing a policy on catchment area development.
- On disaster management, he highlighted out that the success of state disaster management plan would depend on integration of panchayati raj institutions and urban local bodies in disaster risk planning and management, and in augmenting capacity building programmes.
- Lastly, he mentioned the potential of advocating policy changes through the DoNER's High Level Committee constituted to oversee the proper management of water resources of the North Eastern Region.

In conclusion to the session, Shri Chowna Mein, Hon'ble Dy. Chief Minister, Arunachal Pradesh appreciated IMI's initiative of organizing the event as this would enable the MLAs in further understanding the importance of mitigating climate change. He mentioned the work initiated by Arunachal Pradesh in preparing the State Action Plan on Climate Change (SAPCC), one of the first few Indian states to have prepared it, in line with the National Action Plan on Climate Change, and further suggested key areas to be adopted to address the issue.

Finally, the key address by Shri Pema Khandu, Hon'ble Chief Minister, Arunachal Pradesh addressed the relevant issues surrounding the theme of the dialogue. He also pointed that the failure of governments to implement suggestion and finding brought out in these meetings would dilute the efforts put into organising such events. He asserted the need to go beyond highlighting issues to identifying solutions for dealing with sectorial issues in forestry, urbanization, agriculture, and water management. He concluded the session by calling upon IMI and SDC to work closely with the Government of Arunachal Pradesh to increase the state's capability to adapt to the challenges posed by climate change; further suggesting another workshop aimed at taking the recommendations forward.

'Impact of Climate Change on Agriculture and Disaster in Arunachal Pradesh'- a Presentation

Shri. GN Sinha, Advisor, Sustainable Development, & Former PCCF, GoAP

Key points

- Increase in seasonal rainfall (10-12%) of the normal over last 100 years in W-coast, N-Andhra & Northwest India. Decrease in seasonal rainfall (-%) in east Madhya Pradesh, Northeast India, parts of Gujarat & Kerala.
- Future climate projections in India
  - » Max. temperature - **Increase** by 2-4°C by 2025 in regions above 25°N
  - » Min. temperature – **Increase** up to 4°C all over the country and may exceed 4°C over southern peninsula, NE India and some parts of Punjab, Haryana and Bihar
  - » Monsoon rainfall – **Marginal changes** in monsoon months (June-Sept) and **large changes** during non-monsoon months
  - » Number of rainy days – **Decrease** in the number of rainy days over major part of the country
  - » Extreme rainfall events – **Overall** increase in the rainy day intensity by 1-4 mm per day except for small areas in NW India
  - » Cyclonic storms – **Increase** in frequency and intensity of cyclonic storms
- Climate change in the Northeast
  - » An estimated 3.5 million ha of land in the region is under rain-fed rice cultivation which accounts for 30% of the total area under cultivation
  - » Study revealed that the number of drought weeks during monsoon months showed an increasing trend in the region to the tune of about 25%
  - » Productivity of *kharif* crops was reduced by 20-30% depending upon the severity of drought and type of crops grown by the farmers
  - » *Khasi* mandarin grown in the NE region of India is the worst sufferer of climate change. While there are many factors for citrus decline, shift in climatic behavior are seen as major factor of declining its growth and productivity.
  - » The crops like peach, plum etc. which require low chilling are also showing the sign of decline in productivity, fruit fly in guava is becoming alarming due to hot and humid condition.
- Climate change in Arunachal Pradesh
  - » Director of the Central Research Institute for Dry Land Agriculture (CRIDA),Hyderabad revealed that 16 districts of all the eight northeastern states were among the recently identified 100 most climate-vulnerable districts of the country.
  - » West Kameng and East Siang of Arunachal Pradesh, were also identified as prone to climate change effects
  - » A survey on climate change infer that climate change can result in impediments for some traditional practices especially Paddy cum Fish culture in the Apatani Plateau of Arunachal Pradesh.
- On shifting cultivation – issues and recommendations
  - » Policy approach to deal with shifting cultivation aims to replace it with permanent forms of land use as per the availability and suitability of land.
  - » Converting the Shifting Cultivation affected areas into commercial horticulture production sites, and wean away the shifting cultivators by assisting them in establishing commercial horticulture gardens as means of livelihood.

» Identify and promote horticulture specific Best Management Practices (BMP) which minimize clearing of vegetations/ forests for area expansion and also minimize GHGs, and at the same time promote the simultaneous goals of productivity, sustainability, adaptability and abatement.

- Sustainable Agriculture Mission – Proposed by the Dept. of Agriculture

» Integrated efforts for enhanced productivity in Jhum areas

» Terraced rice cultivation/area expansion by land development

» Creation of assured irrigation in settled cultivation areas

» Promotion of scientific planning and cropping pattern to improve the yield per hectare

» Integrated crop management (ICM)

» Use of high temperature tolerant varieties, Rain Water Harvesting, Crop diversification etc.

» Continuation of the traditional organic farming

» Ecologically sustainable and economically viable diversification of agriculture

- On disasters

» Increasing population pressure and unscientific means of construction activities made unsteady growth and degraded the ecosystem of the State while Human activities in natural environment for economic up-gradation have reached to an alarming stage.

» The North East Region, as a whole, and the State of Arunachal, in particular, is expected to be highly prone to the consequences of the climate change because of its geo-ecological fragility.

» Need to sensitize the general population, policymakers, planners and political leaders on the impacts of climate change and its relation to disasters.

» Emphasis be made to study the effect of climate change on the frequency and intensity of rainfall, glacial lakes outburst flood, which are responsible for landslides.

» Another important field of research is to study the historical landslides and their causes, particularly with respect to the climate at that time. It will help in understanding the causes of landslides, systematic planning of developmental activities and managing landslide affected areas to maintain environmental balance.

Presentation on 'Combating Climate Change - A Success Story in Spring/Stream Water Rejuvenation'

Shri. GomarBasar, Asst. Registrar, Rajiv Gandhi University

- Project undertaken at Basar, West Siang District in the year 2008.
- Rapid drying of 3 important rivers; Kidi, Hie& Bam Hile) and its tributaries/ streams in Basar serious threat to irrigation of rice cultivation and orchards.
- It also caused serious threat to availability of potable water supply.
- In the year 2009, the EB-Project Nature, erstwhile Environment Protection Group (EPG) decided to organize a river expedition and make an impact assessment to combat water scarcity and drying of streams (Pic 2).
- The study revealed that Soi Village was most vulnerable being located at higher hill area where drinking water supply used to dry up in winter months.
- The project decided to dig 1000 rainwater harvesting pits of 2000 litres capacity at hill side to artificially-recharge entire watershed and revive the drying streams.
- Also revive the forest denuded by shifting cultivation
- Recharge pit digging was initiated in 2011 resulting in immediate recharge of catchment area during the monsoon (Pic 3)
- In 2013, it was observed that presence of water pits led to increase in numbers of wild animals, especially Barking Deer. Scarcity of food led to eating of tree barks in large scale at project site in year 2014. Carnivores like Leopard, Bear and wild dogs started to thrive.
- The project initiated a micro- Bio-Resource Mission in year 2015 to identify rare herbal plants eaten by wild animals, raise seedlings and re-plant it in forest to secure food for wild animals and also to conserve the native rare plants of the area for future use. 5000 seedlings of 13 species raised in 2015.

Abandoned water tank, Soi Village, Basar (2008)

1st expedition held to assess

Recharge pit digging and recharge of catchment area

Bio-resource plantation

- First bio-resource plantation was done on 5th June, 2017 on World Environment Day (Pic 4). 1000 saplings of 7 species of herbal plants eaten by deer, wild boars etc.
- Outcomes of the project after ten years
  - » Drying of water during winter months have stopped in the village.
  - » Secured the future potable water supply to the village.
  - » Raised scope for reviving abandoned water resource catchment fields and declined.
  - » Orchards have flourished as water condition continues to improve further.
  - » Change in green cover in catchment area
- Since 2017, the Gumin Rwgo Kwlaju (GRK), an apex social organization in Basar is replicating the successful model in 26 villages to protect streams of the area from drying.
- GRK has tied up with grow-trees.com, a Delhi based organization to plant 50,000 native tree species in all GRK villages to further the bio-resource mission
- Recommendations
  - » To mitigate drying of rivers and streams in the state, govt. may launch a special programme on spring/stream rejuvenation by harvesting rainwater to revive all drying streams and secure future drinking and irrigation water supply in all vulnerable areas of the state.

2008

2018

2008

2018

Issues Discussed and Recommendations/Action Points Raised by Members of Legislative Assembly

Group 1

Key points discussed

- Water scarcity and the drying up of water resources
- Mass jhum cultivation and the slow loss of traditional crops
- Population explosion, climate change and utilization of natural resources

Recommendations and action points

- Government of Arunachal Pradeshmust legislate a policy to combat the issue of climate change
- Construct check dams and recharge pits to rejuvenate the open water and natural resources
- Along with land terracing there is a need to push for bio-compost and vermi compost
- Encouraging horticulture in jhum cultivated area, and push to shade loving crops – cardamom, beetle leaves, coffee etc
- Chief Minister's smart villages need to be made climate resilient villages
- Ensure project implementing agencies do an audit/environment impact assessment of their work
- Provide resettlement of villages from mountain or hill top to foothill areas to tackle issues of water scarcity
- Mass sensitization and incentivization of local communities to combat climate change
- Local level climate adaptation plan for local populations
- Develop strategies to control and manage population and the utilization of natural resources

Group 2

Key points discussed

- Deforestation and the impact of climate change on agriculture
- Judgement passed by the Supreme Court in 1996 to close forest based industries: impact on local communities, business, and agriculture. It led to massive deforestation of forest areas to increase agriculture lands. There was a gradual raise in temperature in foothill areas to 40^0C during peak summer months
- Changes in rainfall pattern - erratic rainfall leading to cloud bursts which has led to soil erosion. The increase in soil erosion has further lead to increase in floods and further leading to soil erosion. This process has resulted in the loss of cultivable lands. Shifting of villages as a result of this has led to deforestation. This cyclical pattern is seen in the foothill regions
- Erratic rainfall has resulted in drying up of water resource and this has had an impact on wetland rice cultivation
- Horticulture cultivation has seen a decline in production due to change in water pattern and increase in plant diseases

Recommendations and action points

- Horticulture to be well prepared to tackle the issue of plant disease brought about by climate change and focus on awareness of new diseases to farmers, while equipping themselves with modern agriculture/ horticultural practices
- Drip or micro irrigation systems should be emphasized upon
- Taking into account harsh monsoon and the destruction of roads during the rainy seasons, construction agencies – Public Works Department& Rural Works Department should ensure construction of elevated roads so

that food grains can reach the remote areas/ villages

Group 3

Key points discussed

- Community raising concerns/issues about climate change and the resultant impact on the environment and eco-system services.
- Decline of forest cover from 82% to 80% due to rapid urbanization.
- Water bodies/wetlands in Arunachal Pradesh – around 1100 of them with an area of over 500 hectares and above identified by the Northeast Space Application Centre (NASC) Shillong.
- Jhum cultivation: AP has an estimated area of one lakh hectares asjhum land and 94000 families are practicing this form of agriculture.

Recommendations and action points

- Facilitate the approval of the project submitted to the state government for onward submission to the Minister of Environment, Forest & Climate Change (MoEF&CC) to develop 5 wetlands in Arunachal Pradesh under the Green India Mission undertaken by the Government of India (GoI).
- Facilitate fund support for rehabilitation of degraded jhum lands.
- Facilitate funding support for revising the State Action Plan on Climate Change (SAPCC) and activities to be undertaken.
- Facilitate funding support to cover activities beyond improving and increase the quality of land, as currently instructed by the Minister for Environment, Forest & Climate Change.
- Help promote eco-tourism

Group 4

Key points discussed

- Changes in climatic patterns and water security
- Change in water availability in streams and rivers - drying up during winters and excessive flooding during monsoon season. This is a direct result of deforestation.
- India State of Forest Report 2017 corroborates the reduction of 190 sq. km of forest cover during 2015-2017.

Recommendations and action points

- Wean away the farmers from shifting cultivation by providing incentives for settled agriculture such as provision of irrigation facilities.
- Enhance the fund under Compensatory Afforestation Fund Management and Planning (CAMPA)
- Enhance the fund under Integrated Watershed Management Programme (IWMP) or any other programme related to conservation of soil water and forest.

Group 5

Key points discussed

- Preservation of natural resources
- Integrated agriculture and horticulture development

Recommendations and action points

- Preserve natural resources by making guidelines for plantation of trees, and rules for people on areas for construction of houses/ buildings.
- Maintain a check on illegal felling of trees and business revolving around it.
- Conserve water resources and invest in rain water harvesting in specific areas after baseline research studies.
- Provision of natural water storage and ensure provision of drinking water.
- Provision of piped water via government policy
- Promote integrated agricultural and horticultural development to curb the practice of jhum cultivation.
- Facilitate/strengthen government policies to track leases given out on turn key projects.
- Enhance market linkages

Group 6

Key points discussed

- Interrelationship between water and forest
- Conservation of water bodies
- Interrelationship between water and wildfire
- Budget session 2017-2018:Catchment Area Protection Policy in progress

Recommendations and action points

- Make the Catchment Area Protection Policy into an Act in the coming session and convince the Central Government to take it up.
- Provide alternatives for jhum cultivation by enhancing investment for cash crops cultivation.
- Green infrastructure projects: Pradhan Mantri Gram Sadak Yojana projects need to take into account the environmental problems – destruction of forest areas, siltation, etc without proper plans to dispose the soil from the lands cleared. Policy changes to incorporate the cost and plans to tackle the issues.

Group 7

Key points discussed

- Natural disasters faced by the state of Arunachal Pradesh.

Recommendations and action points

- Mechanisms to deal with disaster in the state – funds and guidelines.
- Need to have a State Emergency Operation Centre (SEOC) at state and district level.
- Funds to manage the damage and for mitigation.
- Need to prepare a Disaster Management Plan (DMP) for the entire state as well for all the districts.
- Enhance and strengthen the State Disaster Response Force (SDRF).
- Development needs to take into account the socioeconomic conditions of populations at risk.

Group 8

Key points discussed

- Horticulture and water management

Recommendations and action points

- Enhance and support horticulture in the state
- Invest on water management and irrigation channels strengthen agriculture and horticulture activities.

Group 9

Key points discussed

- Declining quality of forest
- Decline in soil quality and issue of erosion
- Decline in water availability
- Poor yield and high water demand, conventional cropping pattern, dominance of mono cropping.
- Decline of orchards area and quality of fruits
- Fisheries – potential but not much effort taken to promote it.

Recommendations and action points

- Consolidated policy on rejuvenation, preservation and management of water resources through water harvesting management techniques; adopt watershed approach – check dams, land terracing etc.
- Implement spring shed projects to rejuvenate dying springs for irrigation.
- Use micro irrigation in high density horticulture crops; drip irrigation to be promoted and funding can be initiated through NABARD and/ or micro irrigation fund.
- Proper Catchment Area Treatment (PCAT) plan before any hydroelectric project is commissioned – The plan to be implemented through people's participation.
- Initiate change in cropping pattern after proper assessment of soil and water quality and availability to ascertain high water use.

- Utilize International and National Fund on climate change - NABARD is the implementing agency.
  - » Green Climate Fund
  - » UN Adaptation Fund for climate change
  - » National Adaptation Fund grant support
- Sustainable Management of Forest – Bamboo growth seasons checked for replenishment of harvested area.

Group 10

Key points discussed

- Attitude to climate change and adaptation to the changes
  - » Not afforestation but treatment to the scarcity of water (plantation of pines in the past has led to depletion of water resources).
  - » Management of water resources: compare water availability before1970s and present times across different areas in AP, despite not having specific irrigation channels then, water was still available.

Recommendations and action points

- Relook our attitudes and approach – policy and programmes, to the idea of conservation of the environment and its resources.

Group 11

Key points discussed

- Change in climatic patterns have resulted in introduction of new fruits and cash crops– for example oranges and jackfruits in high altitudes.
- Shifting cultivation
- Water security and glacial melting

Recommendations and action points

- Develop strategies and guidelines to generate awareness on climate change, explain the impact of the phenomenon on local populations.
- With the decrease in rainfall and the drying up of streams, legislation for treatment of catchment areas is needed.
- Shifting and jhum cultivation need alternative agri and allied sectors measures/programmes
- Issues of silting needs attention and treatment measures need to be adopted.
- Cross-departmental work and action plan for climate change needs to be developed between forest, water and agriculture & allied sector department.

Key Comments following the group discussions

Key comments by Shri Tapir Gao, Party President, BJP

- There is an imaginary concept to tackle the impact of climate change on agriculture for the state of Arunachal Pradesh by emulating a policy followed in Switzerland where the country's landmass is classified into horticulture, agriculture and human settlement areas/cities.
- Adapting the concept in Arunachal Pradesh could be initiated by involving the local population to classify the landmass as community forest land where it remains untouched by private/government agencies, agriculture land used only for cultivation, horticultural land to be used for the purpose assigned, and classified future concept for down settlements, districts, industrial areas.
- This concept can work only if the government and the people has a policy vision to adopt such ideas keeping in mind the future impacts of climate change on agriculture and disasters.

Key comments by Shri. Ninong Ering, Hon'ble MP (LS), Arunachal Pradesh

- No matter how many discussions are held on issues pertaining to climate change, the ultimate goal is to come up with solutions to tackle it. Focus needs to be on that.
- The mountain agenda and the focus on the Indian Himalayas has gained traction in the national, regional and even international level with the help of MPs from the mountain states and IMI's efforts.
- The issues and concerns of afforestation, water conservation and preservation of catchment areas, and spring rejuvenation has been constantly raised in the Parliament.
- While sectoral issues have been discussed at length, esp. jhum cultivation, efforts needs to be strengthened on protecting the forest area, and building measures to manage water security in the state. This requires a concerted effort of the state and central government, and IMI could play a big role in facilitating it by working closely with the legislators.
- Technical experts, members, and academics need to include all the issues discussed in policies, while focusing the work on climate change adaptation.

Key comments by Shri. T Norbu Thondok, Hon. Speaker, Arunachal Pradesh

- The number of people who understand climate change and its impacts in the state is limited. The general awareness of the communities especially in the rural areas is low, and hence there is a need to inform the local population about the phenomenon. A climate change awareness campaign must be launched where everyone in the state participate and enhance their knowledge of climate change.
- Climate change as a subject needs be incorporated in the school syllabus to augment the knowledge of school children.
- Jhum cultivation is not a viable and feasible form of cultivation in present times with increase in population and utilization of natural resources. This form of agriculture has resulted in growing number of forest fires in the state.
- Conservation efforts in the state needs to be boosted. Traditional age-old practices such as hunting needs to be controlled and/or regulated.
- Agriculture scientists with their technical inputs needs to be more involved in the affairs of the state agriculture programmes.
- In disaster risk reduction, the efforts are more concentrated in damage management. We need to focus on the prevention efforts and have our infrastructure and facilities to tackle the risks posed by hazards and natural calamities.
- To tackle the issue of forest fires, villagers need to be trained how to deal with this hazard.

Context Setting: Promotion of Bamboo

Shri. Ramesh Negi, Vice President, IMI & Former CS, Government of Arunachal Pradesh

Key Points

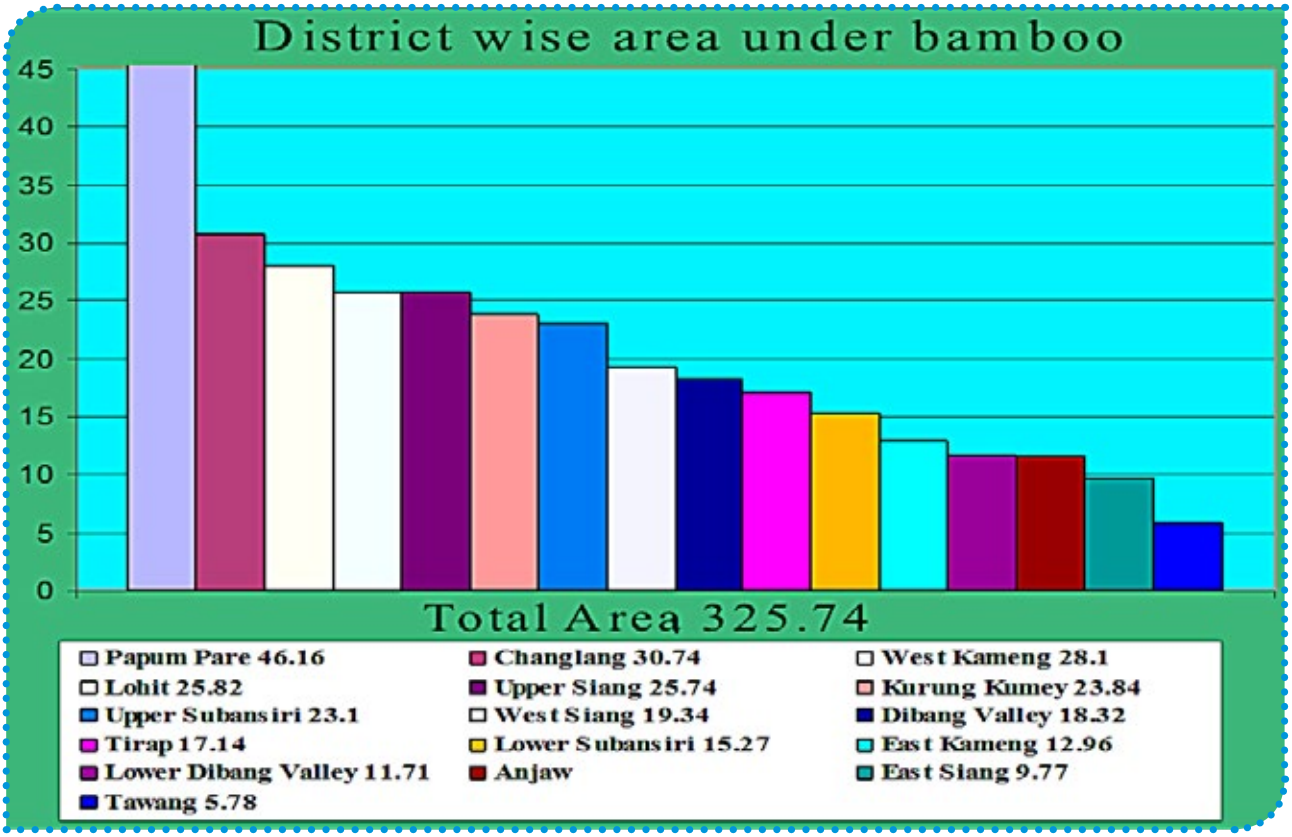
- With the recent passing of the Indian Forest (Amendment) Bill, the bamboo is no longer a tree but classified as grass. It does not require transit permit which was earlier required under the law. Through his private member bill introduced in the Lok Sabha in 2013, Shri. PD Rai, Hon'ble MP (LS) of Sikkim and Councilor IMI, introduced this change.
- Basic facts on bamboo in Arunachal Pradesh
  - » 125 indigenous species of bamboo in India, and out of which more than 50% is found in the Northeast, with Arunachal Pradesh having the third highest bamboo growing area of around 15000 sq. kms (20-26% of the forest area).
  - » 10% of total area of the country under bamboo cultivation is in AP.
  - » Area wise, AP has high concentration of bamboo plantation but there are issues of quality.
  - » 2015 – 2017 there has been 6% decline
- National Bamboo Mission launched in 2006-2007 to increase the bamboo growing area and develop region specific strategies for marketing.
- In AP, 104 nurseries have been set up, 400 farmers have been trained, 800 functionaries related to this sector are registered and 11 marketing places have been set up.
- Challenges
  - » Need to be culturally promoted where the low economic section of the society in rural areas avail the opportunities.
  - » Institutional building to make it economically viable - Institutions with focus on design of products.
  - » Interface of local knowledge, new design institution, and integration with the industry demands.
  - » Adequate human resource development
  - » Making the bamboo economy lucrative for the younger generation.
  - » Skill building – education curriculum, schools etc.
- Ensure economic decentralization to achieve equity of benefits for local communities from the bamboo economy.

Presentation on 'State of Bamboo and Promotion of its Products in Arunachal Pradesh'

Dr LR Bhuyan, Systemaic Botanist, GoAP

Key points of discussion:

- Graph of pure cultivated bamboo patches areas of Arunachal Pradesh (sq.km)



Source: NE-SAC-SFRI report-2007

- Prospect of bamboo shoot as livelihood
  - » The bamboo shoot is a young culm that is harvested at the time it appears above the soil surface, or shortly after. The culm is encased in a thin, hard, protective sheath. It is fully formed and ready to grow rapidly into a woody culm.
  - » The bamboo shoot has high nutritional value and low fat content, and is a good source of fibre. Most bamboo species produce shoots that can be consumed fresh or in processed form. In Arunachal Pradesh, all the tribal widely use bamboo shoots as vegetable, pickle and as food.
  - » It has a very large market in all city/ towns of Arunachal and modern techniques have developed the products with high value addition and may be a source of good income in rural areas.
- Scopes: Major component that can be implemented in the state
  - » Common Facility Centre (CFC)
  - » Setting up of Bamboo Shoot Processing units
  - » Post-harvest Bamboo Treatment Plant
  - » Bamboo Museum
  - » Bamboo Based Eco-tourism
  - » Human Resource Development
  - » Bamboo Festival/Buyers sellers meet/ exhibition, training &exposure, etc
  - » Bamboo Bazar
  - » Retail outlet for finished products

- » Up-gradation of existing bamboo based industries
- » Proper roads for bamboo extraction
- » Design development& market linkage studies
- » Maintenance and expansion of existing stock
- » Planting of best quality bamboos (pilot project)
- » Bamboo plantation under forest and non-forest areas
- » Research and development (survey and documentation)
- » Provision of subsidized tool kits to village artisan
- » Fuels - 2G CNG bio-fuel, 2G bio-ethanol fuel [2G Ethanol (Ethyl alcohol) is extracted from different parts of bamboo and other grasses]

- Recently the Govt. of Arunachal Pradesh has signed MoU with Chimpolis and Numaligarh Refinery Limited (NRL), Assam.
- Constraints in growth of bamboo sector
  - » As per factory requirements, raw materials are not available near industrial buffer zones and most of the bamboo distribution areas are inaccessible hilly terrains that are difficult for extraction and transportation.
  - » Cultivated and superior quality bamboos are generally procured from local people of the particular areas and cost per bamboo is higher (Rs.150-200/culm).
  - » Labour wages are generally higher (Rs.200-300/day) as compared to other parts of the country which discourages the growth of bamboo sector in the state.
  - » In hilly states of North Eastern Region of India, transportation bottle neck is the major constraint in growth of bamboo based industries.
  - » With the recent legislation converting bamboo from forest product to agricultural product as grass, new policies are needed to address the challenges and take advantage of bamboo as an economic resource.
- Key challenges
  - » Absence of hi-tech bamboo industry and transportation bottle neck.
  - » Bamboo as a substitute to timber is yet to be realized by the people in the State due to availability of wood timber.
  - » Lack of highly skilled man power in bamboo technology.
  - » High cost of bamboo culms leads to higher production cost of finished products.

Summarization of the discussions

Shri. PD Rai, Hon'ble MP (LS), Sikkim and Councillor, IMI

Policies will need to focus on the adaptation aspect while trying to make communities more resilient to the changes brought about by climate change and extreme events.

- The 15th Finance Commission has already initiated its work and will be presenting the final report to the Government of India in October 2019. Having a good understanding of the impact of the 13th and 14th Finance Commission on the flow of funds to both grassroots and urban and local bodies, and to the government, the Indian Himalayan states, with the help of IMI could work together to set up a financial structure proposal. IMI along with other agencies can help, by way of building an argument that may be necessary to position the mountain states in the IHR before the 15th Finance Commission.
- Issues presented today which include effects of jhum cultivation, decrease in productivity of crops, management of water scarcity and security through pipes or traditional channels, etc points to the need to address challenges from a holistic level. Alternative ideas and solutions are required, and this needs to be built into the SAPCC. The documents also needs to be revisited and reworked to incorporate the inputs from the grassroots, presented by the legislators. SDC can play a role in putting up a mechanism to look into the set of issues highlighted, and find better ways to obtain data.
- How should the state of Arunachal Pradesh take up more project through funds from NABARD, Green Climate Fund, and National Adaptation Fund? The State Government needs to take this matter up with the Central Government.
- The question of the smart city or smart village requires a holistic approach keeping in mind the change in rainfall pattern of the region, fire hazards etc. Urban models need to be designed and built based on the coherent data observed and collected.
- The Niti Aayog along with Minister of Statistics and Programme Implementation (MoSPI) are building what are known as indicators to incorporate the Sustainable Development Goals (SDGs) in planning. Each state will have to look at the indicators and identify ways to put them in the development plans, and the centre will monitor how states are working towards achieving the 17 goals and the 169 targets. Sikkim is trying to legislate the *Sikkim Wellbeing of Generations Bill 2017*and embed the entire process of looking at every item of government development plans within the lens of the SDG.
- With the change in legislation, the economy around the bamboo has huge potential as bamboo plants can now be considered as a bio-economic resource and sold as a product, except for those in the forest areas. Farmers would no longer need the permission of the forest department, and will save the costs involved in obtaining permits.
- With the reconstitution of the bamboo mission has been reconstituted under the ministry, the amount of outlay is significant for Arunachal Pradesh with it bamboo resource base. The presentation has indicated that over 5 lakhs of the population is dependent on bamboo, thus signifying the important role of the plant on the people's livelihoods. Time has come for the Arunachal Pradesh to exploit the opportunities that are now going to present itself with the change in policy and regulatory system. It is time for entrepreneurs to initiate start-ups and take advantage of the business ecosystem that could evolve around bamboo.

Annexure 1

Address by Shri. Satya Gopal, Chief Secretary, Arunachal Pradesh

It is my profound privilege to participate in this so very important event on Legislators' Dialogue on ***'Implications of Climate Change on Agriculture and Disaster Risk Reduction in Arunachal Pradesh'*** *organised by Integrated Mountain Initiative in collaboration with Swiss Agency for Development and Cooperation.*

In fact, this is the third very important initiative organized under the chairmanship of our visionary Chief Minister. The first one was 'Dream Change State Conclave on Shaping a New Development Discourse of Arunachal Pradesh. The said conclave touched upon 6 thematic policy areas and the recommendation of the said conclave have formed the soul of this year's path-breaking, people-oriented budget of 2018-19. This was followed by a conclave on 'Agriculture and Allied Sectors in Arunachal Pradesh' on 18 and 19 May 2018. During the two day deliberations we have developed a blueprint for addressing unscientific practice of shifting cultivation and promoting climate resilient agriculture. Today we are organizing yet another very important Legislators' Dialogue on ***'Implications of Climate Change on Agriculture and Disaster Risk Reduction in Arunachal Pradesh****. All the groups constituted today have come out with very important and pertinent recommendations after serious deliberations. And on behalf of Hon'ble Chief Minister and Hon'ble Dy Chief Minister, I can assure that these recommendations will definitely be taken into account while formulating the policy interventions in the government level for issues pertaining to climate change.*

India has a long history and tradition of harmonious co-existence between man and nature. Flora and fauna has been a part of our culture and livelihood since time immemorial. We have inherited a culture that calls our planet earth 'Mother Earth'. Much before the climate change debate began, our Father of the Nation, Mahatma Gandhiji had prophetically once said that we should act as trustees and use natural resources wisely, and it is our moral responsibility to ensure and bequeath to the future generations a healthy planet. This may be considered a primer for modern day's debate on climate change.

Mountain range constitutes headquarters of one of the largest trans-boundary river systems of the planet that sustains 1.3 billion people dependent primarily on subsistence agriculture in South Asia. A variety of changes have emerged in traditional resource use structure mainly in response to population growth and resulted in rapid urbanization of Himalayan Region in the recent past. These changes have exerted accentuated pressure on local subsistence economy through depletion of land, water, biodiversity and forest resources collapsing with conventional production system. The economic globalization has further increased the vulnerability of mountain communities to environmental risk to exploitation of natural resources even in remote and inaccessible areas. This is likely to sharpen the poverty imbalances between highlands and lowlands. Changing climatic conditions have stressed the Himalayan ecosystem to higher mean annual temperatures and melting glaciers and snow, and altered the precipitation patterns. Climate change has resulted in decreased agriculture production, frequent crop failures, loss of rural livelihood, and consequent decline in community food purchasing power. It is today understood that community based forest management systems help increase carbon stock. For example, participatory forest management such as Joint Forest Management in India, Community Based Natural Resource Management in Bhutan, and Community Forestry and Lease Hold Forestry in Nepal are well known success stories in the regeneration of degraded forests in and fixation of carbon in biomass. This will provide the mountain people with opportunity of getting involved in global carbon credit process and enhancing the quality of life through reduction of poverty, improvement of livelihood and reforestation of ecosystem services.

Agriculture is sensitive to the short term changes in weather, and is also sensitive to seasonal, annual and long term gradations in climate change. Studies

by Indian Agriculture Research Institutes and others indicate that every 1% centigrade rise in temperature reduces production by 4-5 million tons. Pathogens and insect population are strongly dependent on temperature and humidity, and changes in these parameters may change their population dynamics. Other impacts on agricultural and related sectors include lower yields from dairy cattle and decline in fish breeding,migration and harvest. Global reports also indicate a loss of 10-40% loss in crop production by 2100.The India's State of Forest Report 2017 that there is a reduction of 190 sq. kms of forest cover in Arunachal Pradesh from 2015-2017. The reason for reduction of forest cover is attributed to shifting cultivation. The shifting cultivation is done out of compulsion due to lack of sufficient incentives for establishing permanently settled agriculture. Out of 25 lakh hectares of cultivable land in the state about 3.5 lakh hectares are under agricultural and horticultural crops. Out of 3.5 lakh hectares, only 15% area is under freshwater irrigation and the remaining 85% area is either under rain-fed, settled or shifting cultivation. There is thus a need for incentivization under the irrigation sector to weed away the term of farmers from primitive practice of shifting cultivation. The state has formulated its state irrigation plan to bring in an area of 7 lakhs hectares under assured irrigation by internalia including complementary watershed management activities at an estimated cost of 17700 crores. Due to shifting cultivation in Arunachal Pradesh, lot of virgin forest areas are being lost. Special emphasis should be given on such lands for better land management by introducing improved cultivation in slow plants through agro-forestry, horticulture, and encouraging other household activities.

Major impact of climate change in the context of Arunachal Pradesh can also be felt on water security. We are witnessing the impact in terms of water scarcity as our rivers and streams are drying up rapidly. Immediate steps to mitigate drying of streams have to be taken for solving the problem of drinking water supply to our people. A report from PHED reveals that drinking water supply for more than 700 habitations have been affected due to drying of steams. This situation is alarming and there is a need for taking corrective measures to save the streams from drying up. A policy on catchment area development has to be adopted and rejuvenation of spring/stream water through rainwater harvesting methods by creating check dams on a large scale etc., needs to be taken up in all the affected areas by launching special and focused schemes on water conservation. In this regard, the success story explained by Shri. Gomar Basar has to be kept in view. The Chinese government's plan in diverting the Siangpo Brahmaputra River is a matter of grave concern for Arunachal Pradesh, Assam and Bangladesh. As per the report of the Central Water Commission, if Siangpo River is diverted, then the flow pattern of Siang River which is the main stem of Brahmaputra River would be greatly affected. Hence mitigative plans are the need of the hour to address this problem as well.

The Disaster Management Act of 2005 paved the way by providing a detailed action plan and appropriate institutional structure. Following the establishment of National Disaster Management Authority, Arunachal Pradesh like other states constituted a State Disaster Management Authority in 2011. As per the directives of Hon'ble Prime Minister's Council on Climate Change, Arunachal Pradesh like other states also prepared the State Action Plan on Climate Change. To achieve successful and comprehensive state disaster plans, two things are essential; firstly, integrating the panchayati raj institutions and urban local bodies in disaster risk planning and management, and augmenting the capacity by training individuals. Their roles in post disaster management are still under-utilized. These representative bodies could play a significant role not only in disaster risk planning, but also by catalysing social mobilizations and tapping the traditional wisdom of local communities Therefore, regular capacity building programmes should be organised for them.

Bamboo resource is another outstanding strength of Arunachal. About 9.3% of the geographical area of the state is covered under 76 species of bamboo. Wild varieties of bamboo spread over the entire state at different altitudes are suitable for multipurpose use. We should advocate for conservation as well as improvement of bamboo productivity in farm and forestry sector in the state. Bamboo should be promoted as a clean construction material and also in cottage and handicraft industries. We should also stress on the need for improved infrastructure

and availability of improved tool and facilities along with skill development training for bamboo farmers in the state. A common facility centre may be established for bamboo based industries along with incubation facilities in each district, and also provide hand holding support to the farmers for proper market linkages. We are going to submit a composite proposal on bamboo promotion and establishment of bamboo processing industries Stage 1 in Arunachal Pradesh at an estimated cost of about 60 crores to Niti Aayog for consideration and approval.

The recent resolutions of the Government of India represents a quantum jump in our aspirations in climate change actions starting with manifold skilling up of our renewable energy targets to the programmes on smart cities, cleaning of rivers, and Swachh Bharat Mission. These initiatives have demonstrated unparalled vision and strong political initiatives of the Government of India. This commitment is echoed in India's action in climate change adaptation with setting up of its own National Adaptation Fund. I can only assure that the Government of Arunachal Pradesh will definitely submit a proposal to be funded under the said National Adaptation Fund. It is also heartening to note that under the Act East Policy of the Govt. of India and the direction of the Hon'ble Prime Minister, the DoNER ministry has constituted a High Level Committee under the chairmanship of Vice Chairman, Niti Aayog for proper management of water resources of the Northeastern Region. I am also a member of the said committee. The Committee is also supposed to suggest policy interventions and actionable measures required for optimally harvesting the water resources for accelerating inclusive development process in the Northeast Region. The final recommendations of the said Committee are going to be submitted shortly which will go a long way in formulating and implementing an integrated cohesive policy on flood plain zoning, flood forecasting, modernization of anti-erosion works, effective watershed planning, and soil conservation etc. It is important to note that a proper understanding of the methodology of addressing threat of climate change by political executives, senior government officers, and members of the local community will go a long way in implementing adaptation measures for insulating human civilization and natural resources from the threat of climate change.

I would like to say that, at this juncture that our dynamic and visionary Hon'ble Chief Minister is very much aware of these serious and alarming problems being pushed by the threat of climate change. And accordingly he has exhorted and requested all the officials of the Government of Arunachal Pradesh, and all the citizens of the state to come together as a member of Team Arunachal and make all efforts to preserve and conserve our nature and address and redress all the problems associated with climate change. Thus, it is high time that you all realize our bounded duties and responsibilities, and take a pledge today as a member of Team Arunachal under the illustrious and spirited leadership of our Hon'ble Chief Minister, and a member of Team India under the visionary, vigorous, and dynamic leadership of our Hon'ble Prime Minister that we all as a team will make relentless efforts. And we will leave no stones unturned whatsoever for achieving the mission and vision of New Arunachal and a New India, which will be absolutely eco-sensitive, eco-friendly, organic, carbon neutral and green.

Jai Arunachal!

Jai Hind!

Address by Guest of Honour: Shri. Chowna Mein, Hon'ble Dy. Chief Minister, Arunachal Pradesh

It gives me immense pleasure to participate in this Legislators' Meet on ***'Implications of Climate Change on Agriculture and Disaster Risk Reduction in Arunachal Pradesh'****.*

I would like to laud Integrated Mountain Initiative (IMI) for organizing this all important Meet at Itanagar today. Orientation programs such as these would go a long way in sensitizing climate change issues not only in our State but in all the Mountain States.

This event will enable the Hon'ble Members of the State Legislative Assembly to appreciate the imperatives of mitigating climate change and desirable action to be taken to evolve sound and robust legislative policies and sensitization of grassroots people about the dangers of climate change.

It is in this context that this event will prove beneficial for insulating us in the North-East as well as rest of the Mountain States in the Country from the harmful effects of climate change.

Although today's program is largely in the context of Arunachal Pradesh, I would like to dwell in the larger perspective.

India possesses a distinct identity, not only because of its geography, history and culture, but also because of the great diversity of its natural ecosystems. The panorama of Indian biological diversity is much wider, as it comes under the twelve Mega Bio-diversity Hotspots in the world.

Due to its unique Bio-Geography, the great Himalayan region has profound effect on the climate of the subcontinent. And owing to anthropogenic activities the global climate has changed in the last few decades. The climate of the subcontinent has also adversely affected the biological resources of the country along with that of the Himalayan region.

Climate change is emerging as a major global issue and will undoubtedly be a significant pre-occupation of India's external negotiations and domestic bargains in the foreseeable future. Given the many complex challenges that climate change possess, responding to it will involve restructuring economies and ways of life, mobilising new technologies, creating innovative system of finance and perhaps even new political arrangement and institutions.

The Indian Himalayan States (IHS) shares a common vulnerability profile due to the extent of socio-geographical resemblance, exposing them the similar risk and challenges. They suffer from the low adoptive capacity due to geographical location, remoteness of mountain communities, connectivity challenges and limited reach to government extension services at the community level.

Climate change is projected to have severe adverse effects on India's development as it compounds the pressure on natural resources and the environment associated with rapid urbanization, industrialization and economic growth. The sectors that have the highest vulnerability to their impacts are water resources, coastal ecosystems, biodiversity and agricultural productivity.

Keeping these facts in mind, it is imperative that we as citizens and as responsible Legislators, should start viewing Climate Change as a key area and formulate policies to mitigate it in the right direction to see that our future generations doesn't bear the brunt of it. We at least owe this bare minimum to them.

Having heard the previous speakers and learned resource persons, I understand that in different areas where climate change would impact the country most is the following major sectors:

1. ***Water***
2. ***Coastal Areas***
3. ***Agriculture***
4. ***Precipitation***
5. ***Biodiversity***
6. ***Health***
7. ***Increased Temperature and Extreme Events***

Acknowledging the effects of Climate Change as an important issue, I feel proud to mention that Arunachal Pradesh, in the line of National Action Plan on Climate Change (NAPCC), was one of the first few Indian states which prepared its State Action Plan on Climate Change (SAPCC) by identifying sectors, key climate change related issues impacting these sectors, and strategies/ programs required to address the adaptation needs emerging from these issues.

I am of the opinion that the Indian Himalayan States (HIS) need to enhance the experience sharing and adopt good practice collectively to deal with natural resource management challenges, which cut across the region.

I suggest the following key areas should be adopted to address this all important issue:

1) ***Sharing climate information and good practices**: There is a requirement for a knowledge network specifically for the Indian Himalayan Region to collage the multiple Government/Non-Government adaptation initiatives in the region, and assist with the visualisation and adaptation pathway for a particular risk, for example, droughts or forest fires. This network will need to be complemented by a strong engagement process, which the State Climate Change Cell can facilitate. While updating the State Action Plan on Climate Change, neighbouring Indian Himalayan States may share their experiences related to policy, fiscal and interventions adopted and planned under their Action Plans.*

2) ***Inter-State capacity-building and sensitization**: There is a necessity for a de-centralised approach to capacity building by linking IHS institutions (universities) with International/Regional think tanks. They should be able to distinguish between development and adaptation projects, identify co-benefits and assess resource requirements. Approaches to loss and damage due to adverse impact of climate change and slow onset events also need to be developed in a coordinated manner.*

3) ***Joint Project Proposal**: It would be relevant to explore the possibility of joint adaptation projects/programs with a few Indian Himalayan States coming together to address issues on mutual interest.*

4) ***High Level Political Leadership**: It is important to set up a high-level coordination mechanism with political leadership and endorsement. On the lines of Prime Minister's Council on Climate Change, the States should also constitute the Chief Minister's Council on Climate Change for providing guidance to develop plans and programs to mitigate climate change where experts from various relevant fields should be included. I would urge upon our Hon'ble Chief Minister to kindly consider this.*

5) ***Indian Himalayan Region specific vulnerability and adaptation Portal**: Having a portal of this kind would be useful to initiate a process that can prepare an inventory of the completed and on-going adaptation projects at various locations in the region. This would be easily accessible to the key stakeholders in the region. Such a portal can deepen the public-private interface and assist in providing a common framework on vulnerability assessment and adaptation.*

No matter what happens in international negotiations, India will have to address the growing challenges arising out of changing climate.

The challenge of climate change calls for extraordinary vision, leadership, compassion and wisdom.

I am hopeful that this event will lead to a sound understanding of different facets of Climate Change and its implications on different sectors and possible actions by the Government and people to offset its harmful effects in the medium and long term.

Let us all pledge ourselves today to the cause of Climate Change for a better tomorrow.

I also wish all the participants and learned resource persons for a very productive Session – II of this event.

With these few words I would like to conclude.

Thank you,

Jai Hind, Jai Arunachal

Address by Chief Guest: Shri. Pema Khandu, Hon'ble Chief Minister, Arunachal Pradesh

*In this one day session, **Implications of Climate Change on Agriculture and Disaster Risk Reduction in Arunachal Pradesh**, we have had many discussions on the relevant issues, and have had fruitful deliberations throughout the day. You might be thinking that the audience today is less in number, but this is only because we specifically sent out invites to our legislators and officers for this conclave.*

First of all, I would like to thank IMI and its leaders, Mr. Sushil along with other dignitaries who are members of SDFA, for taking the initiative to organize this conclave. Also, I would like to thank our members from SDC and IHCAP. This one day event organized on the issue of Climate change "was very much the need of the hour".The conclave today has been organized especially for the purpose of sharing information and ideas of legislators who have been attending meetings organized by IMI in various states. The summits organized by IMI, as stated by the President, Mr. Sushil Ramola has shown how IMI started and has been working in the Himalayan region. In 2012, I also got the opportunity to attend one of the summits held in Sikkim on the invitation of Mr. PD Rai, when I was the Minister of Tourism. Since then, we have been actively participating in activities organized by IMI every year. In 2015, IMI hosted Sustainable Mountain Development Summit (SMDS) in Arunachal wherein discussions on disaster management pointed to the need for government to take serious note on policy formulation and implementation. If the government fails to implement the suggestions and findings brought out in these meetings, the effort put into organizing such events becomes irrelevant. Hence this issue of climate change must be brought up in the election which is to take place in the next eight months. And with the support of the public and our Hon'ble Prime Minister, I have full faith that in the coming 2019 elections, the government will be re-elected, and we will be able to implement all relevant discussions that have taken place with full enforcement post the elections of 2019. IMI has my word for this.

Today, the participation by Hon'ble MLAs and ministers was successful, and I believe the important points must be noted by IMI members and the committee. These points will then be carried forward and further discussed. We must need to shift our perspective from just identifying problems to providing solutions, and problem solving, while recognizing that we ourselves are also the part of the problem to climate change. Hence, the focus should be on problem solving.

For better results, we hope to work with SDC and the IHCAP through IMI. The Govt of Arunachal and its officers can sit together to organize a special workshop on how to take the recommendations forward. We could collectively work on the SAPCC to increase our adaptation to climate change, and most importantly to create awareness with local communities. For instance, Shri. Basar work on managing water scarcity through community participation presents a good example and also the significance in involving communities on any discourse relating to climate change.

The Paris Agreement of 2015 was also signed by our Hon'ble PM, Narendra Modi and this conclave has been organized in the lines of the Paris protocol, which states that every country should adopt a climate change mechanism. I have full faith that in the coming days that Arunachal Pradesh will significantly contribute to problem-solving within the climate change discourse. We have immense potential in the state taking into account our vast forest area. However, we need to focus on the planning process. We see that there is rampant development without taking the environment into consideration, and this has led severe impacts of climate change. We are all to blame for this. Climate change is bigger than all of us and requires

the collective effort of everybody on Earth to work together. Within our state, we need to work together and identify ways to combat climate change.

The Government of India's National Adaptation Fund for Climate Change has not been sanction for Arunachal Pradesh. Hence, we need the knowledge and expertise to avail the benefits and project funds related to climate change such as the Green Climate Fund. Our Deputy Chief Minister has also stated in his budget announcement that a climate change expert will be added in the Chief Minister's advisory council.

There is a general assumption that excessive rainfall in an area would mean surplus water. It will be incorrect to assume this, as every year rivers and streams have been decreasing and about 700 streams have dried up till date. The Public Health Engineering Department will look into all these issues and will work towards a bill in the coming term to address the issue of water scarcity.

While today we have discussed problems experienced under the two themes, I request IMI and SDC to organize another conclave which will be based on providing solutions to the issues raised. I assure that the planning process will slowly start to focus on issues from grassroots to district level. Finally, I would like to reiterate that this conclave has been very important in drawing out the serious issues, and I would like to thank IMI and everyone who has participated.

Finally, AP is the third largest producer of bamboo in the country and has great potential and market. We need to empower our youth with entrepreneur skills. We also need to identify and address the gaps lacking behind in terms of skill development. The importance of bamboo has been recognized by the Hon'ble PM, and he has also passed a bill on the development on bamboo and the bamboo mission. We hope that communities living in bamboo producing areas benefit from this scheme.

Thank You!

Note: The speech was translated from Hindi to English, and the editor has structured the sentences to provide the most accurate interpretation.

ANNEXURE II

LEGISLATORS' DIALOGUE
22ND JUNE 2018

CLIMATE CHANGE ADAPTATION

IMPLICATIONS OF CLIMATE CHANGE ON AGRICULTURE AND DISASTER RISK REDUCTION IN ARUNACHAL PRADESH

Venue: Auditorium, Arunachal Pradesh Legislative Assembly, Itanagar

SESSION – I (10:00 – 1:30 P.M)	
10:00	Arrival of Chief Guest
10:05 – 10:10	Welcome Address: Sh. Ramesh Negi,Vice President, IMI & Former CS, GoAP
10:10 – 10:20	Context Setting: Sh. Sushil Ramola, President, IMI
10:20 – 10:30	*Impact of climate change on Agriculture and Disaster in Arunachal Pradesh*: Sh. GN Sinha , Advisor, Sustainable Development, GoAP & Former PCCF, GoAP
10:30 – 10:35	*Combating climate change - A success story in spring/stream water rejuvenation*: Sh. Gomar Basar, Asst. Registrar, RGU
10:35 – 10:45	*Climate Change in Arunachal Pradesh*: Dr. Mandira Kala, Head of Research, PRS Legislative Research, New Delhi
10:45 – 10:55	*Towards Climate Resilient Arunachal Pradesh*: Dr. Shirish Sinha, Deputy Head, Swiss Development Cooperation, India
10:55 – 11:10	Tea Break
11:10 – 12:40	Discussion on issues of Climate Change in the context of Agriculture and Disaster Risk Reduction: Moderated by Sh.T. Norbu Thongdok, Hon. Speaker, Arunachal Pradesh and Sh. PD Rai, Hon. MP (Lok Sabha) Sikkim & Councillor, IMI
12:40 – 12:50	Summarization: Sh. PD Rai, Hon. MP (Lok Sabha) Sikkim & Councillor, IMI
12:50 – 01:00	Address by Sh. Satya Gopal, Chief Secy. , GoAP
01:00 – 01:10	Address by Guest of Honour: Sh. Chowna Mein, Hon. Dy. Chief Minister, Arunachal Pradesh
01:10 – 01:25	Address by Chief Guest: Sh. Pema Khandu, Hon. Chief Minister, Arunachal Pradesh
01:25 – 01:30	Vote of Thanks: Smt. Fantry Mein Jaswal, Secy. IMI& Chairperson, SDFA
01:30 – 02:30	Lunch

PROMOTION OF BAMBOO IN ARUNACHAL PRADESH

SESSION – II (2:30 – 4:30 P.M)	
02:30 – 02:37	Context Setting: Sh. Ramesh Negi, Vice President, IMI & Former CS, GoAP
02:37 – 02:47	State of bamboo and promotion of its products in Arunachal Pradesh: • Dr. G. Murtem, Mission Director, State Bamboo Mission • Sh. RK Taj, Scientist, Environment & Forestry • Dr. LR Bhuyan, Systemaic Botanist, GoAP
02:47 – 04:15	Discussion On Promotion of Bamboo in AP: Moderated by Sh. T. Norbu Thongdok, Hon. Speaker, Arunachal Pradesh and Sh. PD Rai, Hon. MP (Lok Sabha) & Councillor IMI
04:15 – 04:25	Summarization: Sh. PD Rai, Hon. MP (Lok Sabha) Sikkim & Councillor, IMI
04:25 – 04:30	Vote of Thanks: Smt. Shaifali Sharma, Executive Director, IMI
04:30 –	High Tea

ANNEXURE III

Sl.NO	NAME	DESIGNATION	CONTACT NO/Email ID	Signature
1	Sri Deba Poyom	SO	9436044466	
2.	Smti Sentos Risi (Ilang)	S.O.	9436896824	
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4.	Smt. K.T. G[illegible]	JAF, C.Change Dept of Env & Forests	8794407427	
(5)	Takum Ozi	OSD.	8974764884	
(6)	K. L. Dhimole	Technical Advisor Com of Ac. P.I.	9971071335	
(7)	MUSTAFA ALI KHAN	TEAM LEADER IHCAP, SDC	9213975028	
(8)	DIVYA MOHAN	Science Policy Officer IHCAP, SDC	9911143357	
(9)	Alop Lego	CE (SIDM) PWD	9436050018	
10.	Bidol Tayeng	Secy (DM/GM) AH	9436042922	
11	MIMUM TAYENG	SECY (AGRI/HORTI)	9436895209	
12	YESHI WANGMO RINGU	SECY (FIN/CUL AFF)	9436040018	22/6/2018
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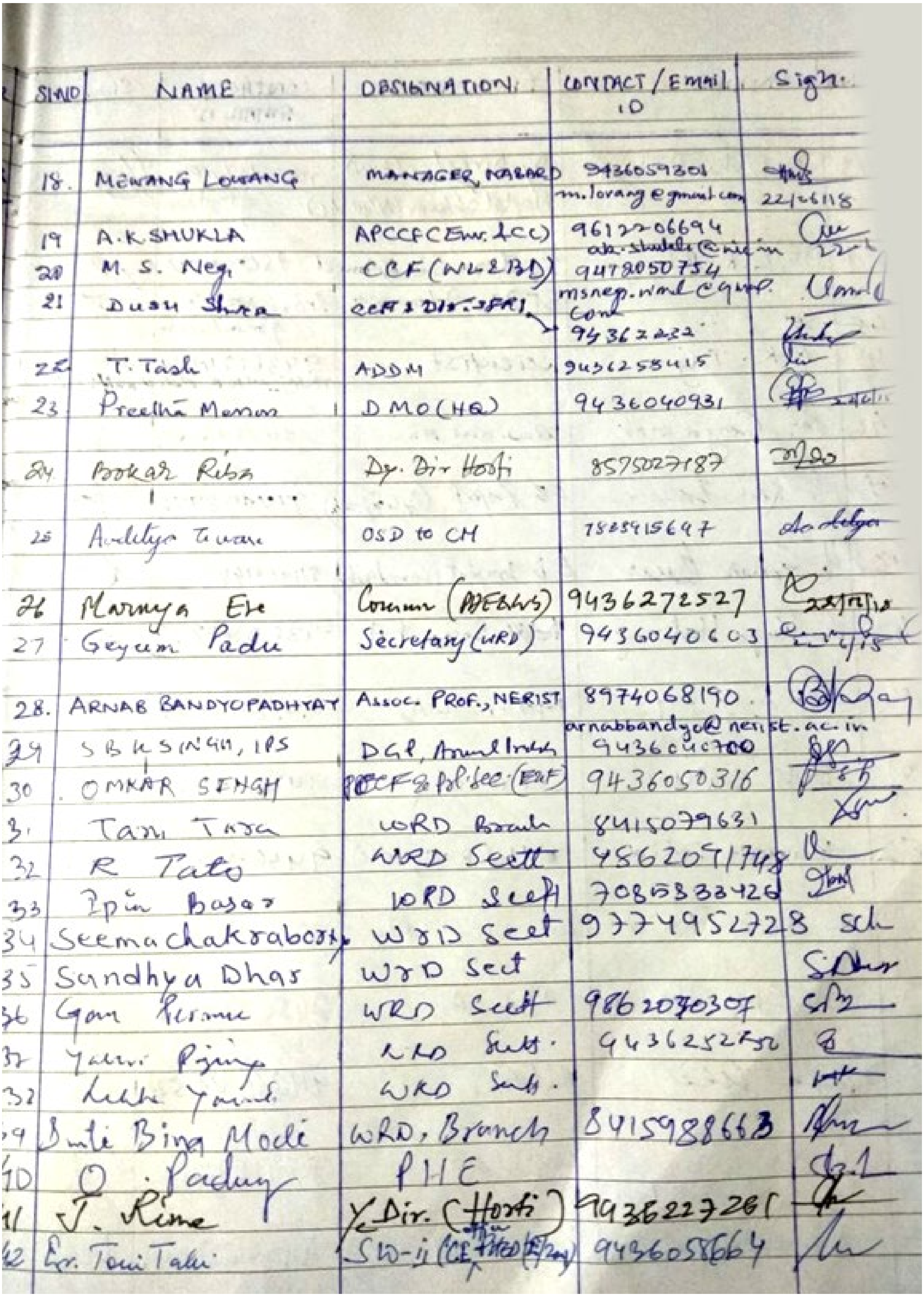
17.	Dr. GYANENDRA MANI	GM, NABARD	9869742427 gyanendra.mani@nabard.org	



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18.	MEWANG LOWANG	MANAGER, NABARD	9436059301 m.lovang@gmail.com	22/6/18
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22	T. Tash	ADDM	9436258415	[illegible]
23	Preetha Menon	DMO (HQ)	9436040931	[illegible]
24	Bokar Riba	Dy. Dir Horti	8575027187	[illegible]
25	Aditya Tiwari	OSD to CM	7085415647	[illegible]
26	Marnya Ete	Commr (WRD)	9436272527	[illegible]
27	Geyum Padu	Secretary (WRD)	9436040603	[illegible]
28.	ARNAB BANDYOPADHYAY	Assoc. PROF., NERIST	8974068190 arnabbandyo@nerist.ac.in	[illegible]
29	S B K SINGH, IPS	DGP, Arunachal	9436040700	[illegible]
30	OMKAR SINGH	PCCF & Pr. Sec. (E&F)	9436050316	[illegible]
31	Tam Tara	WRD Branch	8415079631	[illegible]
32	R Tato	WRD Sectt	9862091748	[illegible]
33	Ipin Basar	WRD Sectt	7085833426	[illegible]
34	Seema Chakraborty	WRD Sect	9774952728	[illegible]
35	Sandhya Dhar	WRD Sect		[illegible]
36	Gam Perme	WRD Sectt	9862070307	[illegible]
37	Yalni Pijing	WRD Sectt.	94362528[illegible]	[illegible]
38	Likha Yami	WRD Sectt.		[illegible]
39	Bute Bina Modi	WRD, Branch	8415988663	[illegible]
40	O. Padung	PHE		[illegible]
41	J. Rime	Dy. Dir. (Horti)	9436227281	[illegible]
42	Er. Tomi Tali	SW-II (CE, WRD, E/Zone)	9436058664	[illegible]

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72	Ramesh Neg.	V.I.P. IMI	9205310231	
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75	Sri Kaya Bagang	MLA 9th C/Tejo	9436228595	
76	Sh. Lombo Tayeng	MLA 39th Mebo	8974066096	21/6
77	Shri Tapuk Taku	MLA, 10th Seppa	09436631258	
78	Shri NALONG MIZE	Secy, SBFA	9436053763	
79	Okit Palling	Member SDFA	83187187 4	
80	Takum Taring	Member, Geo Council	9862519859	
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53	LIKHA SAAYA	Parl. Secy. TPT.	09436041433	22.06.17
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56	Tobom Bam, (M.Sc, M.Phil.)	DHO (HQ)	9774135240	
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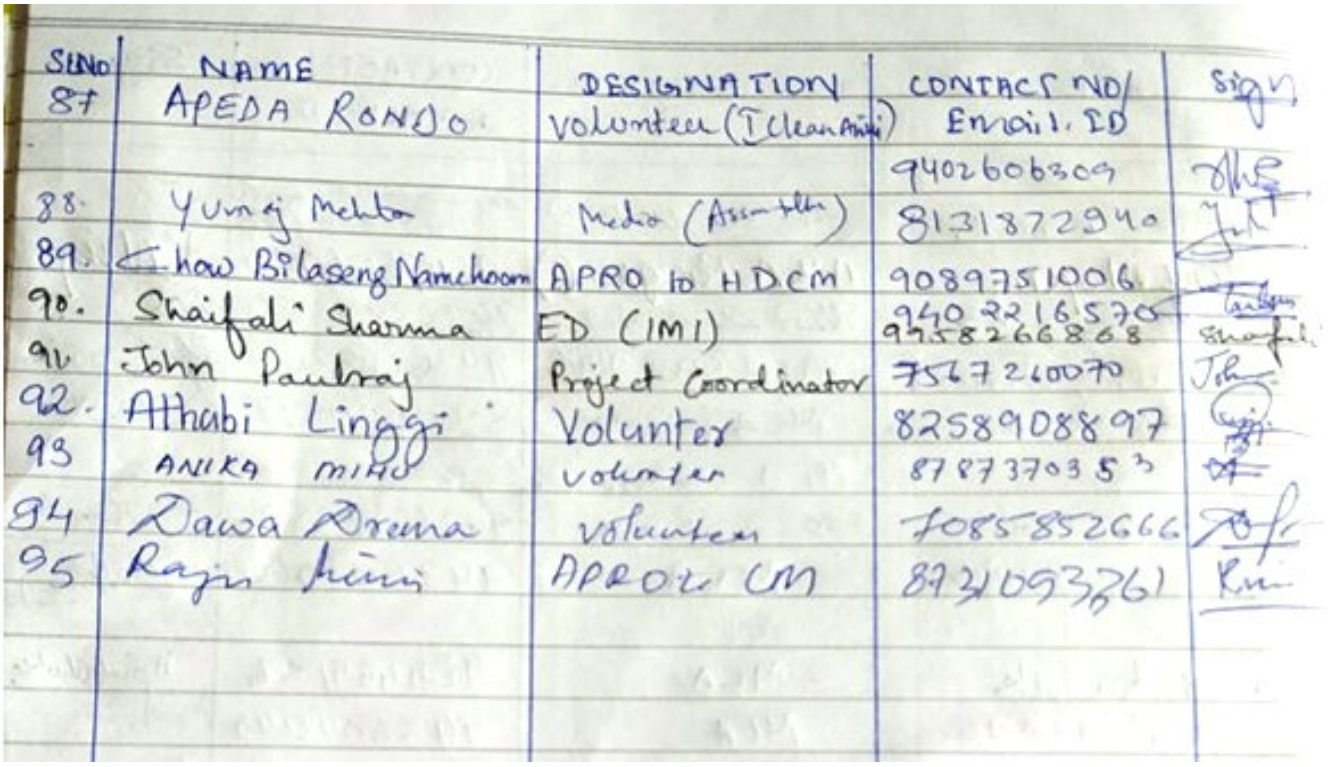

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92.	Athabi Linggi	Volunter	8258908897	
93	ANIKA MIHO	volunter	8787370353	
94	Dawa Drema	volunteer	7085852666	
95	Rajiv Kumi	APRO2 CM	8731093761	