



Looking across Eco Regions, Forward

The main manifestations of climate change, which directly impact marginalized communities in the different eco-regions as were evident from the five studies and subsequent workshops, are:

- excess rainfall, deficit rainfall, uneven distribution- including very sudden downpour, long dry-spells in between rains, absence of spring rain, very late monsoon, early exit of monsoon, frequency of flooding, frequency of cyclone
- rise in temperature, decrease in number of days of winter, glaciers melting rise in surface temperature
- increase in occurrence of lightning and number of deaths due to lightning,
- rise of sea level , increase in salinity of water etc.

The Mountainous regions of the Himalayas are impacted by events induced by overall changes in temperatures like glacial retreat and changes triggered by developmental activities and seismic activity like earthquakes.

In the Coastal Eco-Regions in eastern and western Coast, rise of sea level and rise in sea temperatures adversely affecting livelihood of small scale artisanal fisher folk.

In the Forest Eco-systems in the Eastern Ghats, livelihood practices which are till today almost fully dependent on the different components of a forest ecosystem itself have become vulnerable to climate change and socio economic factors.

The Semi-Arid regions in the Deccan is mainly concerned about the erratic and unpredictable rainfall, increase in periods of heavy or dry spells and heating impacting pastoralists and small farmer communities.

The Urban Settlements in Bangalore City are subjected to higher temperatures and heat waves and increased incidence of flooding, spread of vector borne diseases like Chikungunya and dengue.

Variables in Vulnerability

A key variable of Vulnerability to climate is **location**. High altitude areas, low areas, hilly region, coastal, arid region, forest region, all have differing vulnerabilities and a specific default vulnerability. Similarly, another variable is related to **occupation** - shifting cultivators, hill cultivators, marginal farmers, large farmers, pastoralist, fishing communities all have occupation specific vulnerabilities. Finally there is vulnerability which relates to **regeneration**, most of it which can be related directly to rainfall fluctuation, temperature fluctuations etc. These include sprouting of seeds, reproductive growth, growth of trees or fish spawning etc.

Another variable of vulnerability is **secondary impacts or chain effects**. This refers to vulnerabilities not directly due to climate, but because of down the chain effects. One example of this was given in the coastal study, where the preference for a particular fish, which was depleting in one area due to rise in temperature, increase in price, which makes it attractive for non-traditional fishermen, which may then be the main cause of depletion. Many of the impacts of modernisation are exacerbated by climate change e.g., increasing temperatures necessitates more frequent irrigation. Or the chain impact by chemicals from agriculture leach into the ground water, and reaching the coastal regions impacting mangroves, which then increase vulnerability in these areas.

Vulnerability is also based on **socio-cultural practices** – types of clothes one wears, whether one eats millet or rice, whether you go for cash crops or subsistence farming, the level and kind of aspiration. These determine the coping mechanisms. Traditionally one would go to the tamarind trees and pluck some leaves or forage for tubers and live for a day. But now the skill of traditional coping methods is lost, and in times of distress, one borrows money.

Vulnerability of increasing **tipping points** is another variable. For example the increase in pollution or climate change may have small effects on the fish production, but they reach a tipping point and then any incident like a leak, or a sudden effluent from a industry, can destroy marine life or habitat dramatically, or when the crop fail the lower production of fish cannot sustain the lower reverine population, leading to large scale migration.

Disaster proneness is another variable as some areas are prone to cyclones, cloud burst etc.

Table 1: Vulnerability Across eco-systems

Eco-system	Climate Change induced Vulnerabilities	Impact on marginalized communities	
		Livelihoods	Others factors
Himalayan mountainous region	<p>Higher Altitude</p> <ul style="list-style-type: none"> • Glacial Retreat <p>Mid Altitude</p> <ul style="list-style-type: none"> • Carbon neutral settlements reducing • Change in pattern of precipitation • disturbance of sowing-harvest cycles <p>Low Altitude</p> <ul style="list-style-type: none"> • Changes in micro-climate 	<ul style="list-style-type: none"> • Communities dependent on natural resources affected • Agriculture predominant areas highly vulnerable • Valley agriculture and horticulture affected • Quick Chilling • Exotic fruits- Kiwi • Citrus fruits replaced apple • Grasslands/graze-lands reduced • Increased pest attacks in cereals • More urbanization and physical development • HE project tunnels 	<ul style="list-style-type: none"> • Changing dynamics of higher dense forests & low density populations • Protected areas in higher altitude vulnerable • Rapid urbanization (63 urban settlements) • Loss of biodiversity • Monoculture • Invasive Species- Lantana Camara • Reduced cattle population
Arid and Semi-arid region	<ul style="list-style-type: none"> • Higher run off and erosion in black soil due to high intense rainfall • Prolonged dry spells resulting in crop failure • Grazing areas shrinking • Loss of biodiversity • Changes in migratory routes 	<ul style="list-style-type: none"> • Agro- pastoralists more vulnerable • Traditional pastoralists shifting to other livelihood options • Other communities opting for pastoralism 	<ul style="list-style-type: none"> • Soil moisture stress in alluvial soil • Over-exploitation • Imperfect drainage - Soil salinity and Soil moisture stress in alluvial soil • Poor access to drinking water

Coastal eco-system	<ul style="list-style-type: none"> • Increase in sea temperatures • Rise in sea level • Increase in flooding and cyclones in the eastern coast 	<ul style="list-style-type: none"> • Decrease in fish catch and more expensive fishing trips • Loss of beach space for auxiliary fishing activities • Shifting to other forms of livelihood options • At risk due to cyclones and related disturbances 	<ul style="list-style-type: none"> • Industrial pollution • Loss of mangroves • Development of coastal infrastructure
Forest eco-	<ul style="list-style-type: none"> • Erratic and seasonal fluctuations in monsoon pattern 	<ul style="list-style-type: none"> • Loss of access to forest resources • Shifting agricultural cycle 	<ul style="list-style-type: none"> • Faulty forest development
Urban eco-system	<ul style="list-style-type: none"> • Flooding, water logging • Spread of vector borne diseases like Chikungunya and dengue 	<ul style="list-style-type: none"> • Living in low lying areas • Poor quality housing - mud (dampened) floors 	<ul style="list-style-type: none"> • Skewed urban development policy • Reckless urbanisation

Adaptation & response

Many of the coping mechanisms listed by the studies like expanding land under cultivation, changing of cropping pattern are short term fixes. These need to be continually updated, as after some time circumstances change. The traditional farmer's response is currently based on the Almanac. He develops his practice around festivals which are based on the seasons. But with increasing variability, the knowledge system would have to be adapted.

Village level institutions, which are more tuned to other activities like cultural activities, organising functions, and running schemes for poverty alleviation or distributing land will also need to develop capabilities to assist knowledge and capacity development in changing climate and adaptation options. Culturally disaster preparedness calls for other skills like drills of evacuation, skills for swimming, climbing, survival etc. We need to look at the livelihoods of people in each region and how they will be impacted and then what would be the adaptive options. The other area is health

impacts.

Most adaptation options seem to look at the pastoral traditional system. Will it be future proof? What would be the livelihoods of the future that we need to bring into the adaptation programme? What would the policy have to look like? What are the short term urgent measures that we need to get going on? In the long term we need to consider future scenarios of increased population, increased migration to cities, shift of livelihood from land to services, urban areas etc.

Having outlined the vulnerabilities, policy measures and adaptive measures, we need to examine the mandate for reflecting peoples' perceptions and voices. What are the fora that represent the vulnerabilities for example the National Fishworkers Federation would represent the traditional fishers? How would we then get them to incorporate the climate perspective in their actions and in their representations at the Policy level?

For example: 60 to 70% of agriculture is rainfed and clearly the rainfed agriculture will be the most vulnerable especially since 60 to 70% of the land held in the area are by small and marginal farmers. Yet when it comes to policy, the Prime Minister keeps talking about a second green revolution. We all know that the second green revolution will come in the irrigated areas. We need to highlight the second brown revolution in the drought areas. We need to work with water resource conservation and rejuvenation, this is one area we know is going to be impacted by climate change - a problem we have caused by over exploitation, and lastly since urbanisation is going on regardless, we need an action plan for the cities. What would we do for heat islands and for water?

While accepting that vulnerability is eco-specific (due to location in a particular ecosystem), it is important to understand vulnerability caused due to non-climatic factors (like the dominant development paradigm) and those caused by climate change as distinct, but at the same acting upon each other. The danger inherent in bundling vulnerability (both climatic and non-climatic) as climate change induced will take us away from questioning the dominant development paradigm, which is the root of causing both climate change and increasing the vulnerability of communities already greatly affected by the dominant development model.

The studies also revealed adaptive measures already being taken by the community, even if they were not consciously climate-change inspired. They then connected the learning from the vulnerability studies to the broader level of policy making, as well to empower the vulnerable to strengthen their adaptive capabilities.

This has some fundamental implications in connecting vulnerability and adaptation strategies to the overall policy and long term strategies for a low carbon path.

Eco-system	Adaptive measures practiced	Policy implications	Way forward
Himalayan mountain region	Shifting of crops to higher levels, change in crops and migration to semi-urban settlements.	Early warning systems	Climate proofing of highly sensitive Himalayan region
Semi-arid – livestock and small ruminant system	Shifting away from pastoralism	A shift away from dairy centric livestock policy	Local production geared to local consumption pattern, local breeds
Coastal eco-system	Movement towards deep sea fishing, which small fisherman cannot do	Close working relationship between fishing community and fishery scientists	Developing sustainable fishing practices
Forest eco-system	Moving away from forest-based livelihood strategies	Re-design forest development programmes to take into account livelihood needs and community rights under Forest Act.	Low carbon farming and community regulated resource usage.
Urban eco-system (Bangalore)	Short term adaptation techniques to minimise climate risk	Housing rights and urban redesign and infrastructure	Image the metropolis and urban space differently

The Way Forward

Each of the studies in this volume have pointed to some kind of “pre-existing conditions” for vulnerabilities. The climate related events throw up challenges connected to the rehabilitation. Many have suggested an insurance based risk reduction mechanism, reminding us of insurance companies who keep denying compensation on health on the pretext of pre-existing conditions, or act of God. As far as climate is concerned, we have had warning signs since 1972 and policy has been slow in its response. The right to proper and dignified rehabilitation needs to be unequivocal.

All the studies have shown that the poor are more vulnerable to the impacts of climate change. However it is not poverty by itself that makes them vulnerable. Modern development has systematically make inroads into the natural resources that people in the different eco-regions have depended upon.

Post modern development that is related to the development of services and

knowledge industry offers the promise of “decarbonisation”, but it does export its emissions, and mineral based and fossil fuel dependent industry based needs are imported – a process that is likely to be accelerated with the CDM picking up the low hanging carbon development projects.

In the climate discourse there is a lot of discussion on low carbon pathways, not so much on the development threshold. This development threshold is however not the same of the “take-off stage” concept in conventional economics after which benefits of growth start trickling down. Trickle down, if at all, has taken place at the cost of high carbon emission. Thus in a climate changing world, development threshold growth will have to be targeted so as to cause the minimum possible carbon emission. Thus the low hanging fruit within development should go to those who are below the development threshold. And since the climate is already changing policy should be in favour of those activities which also provide adaptation co-benefits to the most vulnerable.

Even in a targeted approach, the development path chosen must be such that it a) does not exacerbate traditional livelihoods which poor people have been engaging in and b) works towards a new modernism which intensifies low-carbon and decentralized and equity based options. The low development pathway is not just tinkering at the margins but transformative systems and ways of doing and transformative process.

Thus post modern development would need to be based on intensifying decentralized local oriented economic systems.

In the absence of any international agreed emission agreements or carbon budgets in place that will determine India’s share in global carbon space it is difficult to chart a unilateral and autonomous low carbon path.

Rural Industrialization: a suggested transformative strategy

- distributed, networked rural enterprises
- localized/decentralized production and distribution systems (with DDG power if required)
- adding value to rural resources (plant/animal/ mineral) for finished/semi-processed products
- local/regional markets
- create rural jobs, improve rural incomes, improve rural-urban terms of trade
- new skills and knowledge base in rural areas

However, in the backdrop of Governments commitment to reduce emissions by 20-25 percent from 2005 levels by 2050, certain possibilities are open in key sectors like energy, industry, transport, forests and urban design. **The principle underlying alternate low carbon pathway is not only to do different things, but do things differently.** A focus on rural industrialisation is the key to this. One needs to focus on the vast pool of literate youth who are no longer looking to their farms for livelihoods. Creating decentralized hubs of production centres

that create value addition at the local level for local distribution and consumption is the key.

To enable this production models which favour megascale There are enough of examples of successful ventures at the local level.

Large projects are the result of centralized decision making, far removed from the arena where the competing demands for resources are played out. These naturally result in disastrous large projects that play havoc with local communities, local economies and local cultures.

Focussing on the needs, rights and aspirations of the marginalised majority will mean to do things differently to make accessible energy, infrastructure and capacity building to have this happen. This makes the low carbon path possible and sustainable, but within a context of connectedness with larger realities of consumption and resource allocations.

Doing different things implies understanding the interconnectedness of things, and acting according to such interconnectedness – whether it be of resources, livelihoods and technologies; whether it be of economics, culture and politics; or whether it be of spirituality, ecology or cosmology.

Environmentally sustainable development can only be achieved with equitable development. Therefore just as the debate on the global level is focusing on the fact that one cannot address the climate crisis without addressing the question of equity, same thing applies within the country. **We cannot address the issue of low carbon pathway without addressing the question of equitable development.** Therefore movements cannot just be talking about sustainable development, cannot just be talking about social justice, climate but must be interlinked to bring about the transformations.

To conclude, what is required is integrated movements for sustainable development, for social justice and for equity.