

CLIMATE CHANGE and LOCAL GOVERNMENT



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CLIMATE CHANGE and Local Government Institutions in India

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Introduction

Climate change has emerged as perhaps the most critical as well as complex environmental problem and the most life-threatening issue of the 21st century. Therefore, one of the issues highlighted under the Sustainable Development Goals of UN is urgent action to combat climate change and its impacts: "Climate change is now affecting every country on every continent. It is disrupting national economy and affecting lives, costing people, communities and countries dearly today and even more tomorrow"[i].

Despite so much attention being focused on this issue during the last two decades, credible solutions are still not in sight. In this situation all avenues of tackling climate change should be explored so that the best possible contribution can be made to this task with greatest urgency. This paper examines the role of



Panchayati raj institutions (democratically elected village councils) in India from the point of view of mitigation as well as adaptation to climate change.

In the first part of this paper we present an overview of the problem of climate change and the response of the international community to it. Next we present the strength and weaknesses of panchayati raj in India. The third part examines how the response to climate change can be strengthened with closer and better informed involvement of panchayati raj and how in the process panchayati raj has new opportunities of emerging stronger and acquiring even higher relevance. In the concluding section of this paper, we specifically examine the role of panchayati raj in some specific contexts of climate change adaptation and mitigation – floods, droughts, heat waves, agriculture, forestry, water and renewable energy.

I. Life Threatening Climate Change

It is widely and increasingly realised now that climate change caused by abnormally high concentrations of carbon dioxide , nitrous oxide , methane and other greenhouse gases can badly disrupt known life patterns of human beings and other forms of life within a few decades (certainly within this century). Already this is seen to be an important factor in extreme heat conditions, other extreme weather events and disasters.



There is also fairly wide agreement now that the rise of global temperature related largely to climate change has to be somehow controlled at not beyond 2°C level.

It has been rightly pointed out, among others by representatives of island nations, that even a 2°C in temperature will cause fairly large-scale disruption in several life-sustaining activities apart from leading to the loss of vast low-lying areas (related to rise in sea- level) and worsening 'natural' disasters.

So ideally we should have aimed at a target of 1.5°C instead of 2°C. But the sad reality is that even the target of 2°C is appearing very difficult today. So reducing the limit to 1.5°C is not considered realistic.

But it is important to at least achieve this 2°C target, because various projections show that beyond 2°C, the earth's natural processes begin to break down and cause more warming. Massive amounts of warming gases stored in the Siberian permafrost can melt and get released in the atmosphere. Humid rainforests can lose their humidity and begin to burn down, again releasing stored warming gases. Beyond such 'tipping points' the situation can get out of hand.



But at present are we on the path of achieving at least 2°C target? The Lancet Commission on Health and Climate Change (LCHCC) after examining a lot of latest data has concluded recently (2015), “High-end emission projection scenarios show global average warming of 2.6°-4.8°C by the end of the century with all their regional amplification and attendant impacts.”[ii]

Further this report (June 2015) with access to latest data says, “GHG concentrations in the atmosphere are continuing to rise at a rate that is incompatible with limiting warming to 2°C in the coming 35 years (by 2050) and which exceeds the IPCC’s ‘worst case scenario’. We are on track for a global average temperature rise of more than 4°C above the pre-industrial temperatures in the next 85 years, at which point global temperatures will still be increasing by roughly 0.7°C per decade (due to the lag in reaching equilibrium). This distribution will not be even: the so called polar amplification phenomena might cause temperatures in parts of the Arctic to increase by 11°C in this time-frame.”[iii]

The United Nations Secretary General’s High-Level Panel on Global Sustainability (UNSHPGS) also made an equally disturbing observation in its report(2012)- “In its Emissions Gap Report of year 2010, the United Nations Environment Programme concluded that the currently forecast 2020 emission levels were consistent with pathways that would lead to a likely temperature increase of between 2.5° to 5° Celsius by the end of the 21st century.”[iv]

The fact that the world’s leading experts see current GHG emission levels and increases as going beyond the “worst case scenarios” and certainly much beyond the 2°C limit is deeply disturbing. This implies that current life patterns are likely

to be very badly disrupted, unless very significant and massive reductions can be achieved in the very near future, and then this trend can be maintained.[v]

Counting carbon dioxide levels from 1870, the rise so far has been little over 0.8°C. With global emissions increasing by about 50 billion tonnes a year, how many more years will it require to reach the 2°Celsius limit? 25 years? 20 years? What after that?

At this stage the likelihood increases of non-linear, highly disruptive and catastrophic changes. As the LCHCC Report cited above says, "As we proceed rapidly towards 4° Celsius warming by the end of the century, the likelihood of crossing thresholds and tipping points rises, threatening further warming and accelerated sea-level rise. Second, small risks can interact to produce larger-than-expected chances of catastrophic outcomes, especially if they are correlated. Such impacts (and their interactions) are unlikely to be trivial and could be sufficient to trigger a discontinuity in long-term progression of humanity."

Total carbon dioxide emissions since 1870 are estimated to be around 1500 billion tonnes. For 2° Celsius limit these have to be kept below 2900 billion tonnes. At present these emissions are increasing at about 50 billion tonnes in a year. Reducing this is very important, but what has been the recent record?

The UNSHPGS Report quoted above says, "Despite the adoption of the United Nations Framework Convention on Climate Change and its Kyoto Protocol, annual global carbon dioxide emissions from fuel combustion grew by about 38% between 1990 and 2009, with the rate of growth faster after 2000 than in the 1990s." This shows a glaring failure of world leadership when faced with the most urgent life-saving tasks.

To what extent is climate change already with us? These reports inform that each of the last three decades was successively warmer than any preceding decade since 1850. 2014 was the hottest year on record. Arctic sea ice is disappearing at a rate of up to 50,000 square kms. per year. The Antarctic ice sheet is now losing 159 billion tonnes of ice each year, and sea levels are rising inexorably. "After only 0.8°C warming, many anticipated threats have already become real-world impacts."

The 12th Plan document (2012) pointed out that to some extent the impacts of climate change are already visible in India and particularly in rural India. This document said, "Periods prior to 1997 can be considered normal, but warming has increased at an accelerating pace since then. The Eleventh Plan period contained the two warmest years (2010 and 2009) ever recorded since 1900.

Even the coolest year (2008) during the five years (2007-12) was the 13th warmest in the last 110 years.”

More specifically in the context of agriculture a recent document document said, “The climate challenge facing agriculture needs to be taken seriously. Available data shows a distinct trend towards both drier and warmer weather, particularly during the last three Plan periods (1997-2012). Each of the last three Plan periods has recorded lower mean rainfall and higher rainfall variability compared to the immediately previous period.”[vi].

II. Panchayati Raj in India

One out of every nine persons in the world live in rural India. Panchayati Raj is the constitutionally sanctioned system of rural decentralization that exists all over rural India. Clearly rural India and also panchayati raj have a big role in worldwide efforts to tackle climate change. The 3-tier system of panchayati raj provides opportunities of decentralized planning and action at various levels including district, block and village level. Panchayati Raj also provides for the participation of all adults in consultation and decision making in the form of gram sabhas (an assembly of all adults in one or more villages or ward sabha (an assembly of all adults in a village hamlet).

However the effectiveness of panchayati raj differs in various parts of India ranging from well-established and effective in Kerala to a state of reluctance to hand over real functions and powers to panchayati raj, as seen in states like Uttar Pradesh. While on the one hand special provisions exist to ensure better participation of economically and social weaker sections (like dalits) as well as women, at the same time in some places repeated efforts are made to check or retard an effective role for weaker sections and women. In many places political leaders and bureaucrats are reluctant to give effective control (as well as financial support) of important functions to panchayats. Training opportunities for elected representatives of Panchayati Raj institutions exist but often these do not equip them adequately for innovative development initiatives. Desirable norms of financial discipline and transparency are often violated.

Some weaknesses of Panchayati Raj Institutions (PRIs) however should not stand in the way of these being assigned and accepting a wider role in adaptation to and mitigation of climate change. Rather this should be an opportunity of delegating more functions and accompanying resources to PRIs while at the same time improving the capacity of PRIs to accept new responsibilities and challenges.

III. Why Closer Involvement of PRIs with Climate Change is important

In any planning for adaptation to climate change, it is of the greatest importance that rural people living in diverse conditions are strengthened to face new challenges keeping in view their specific conditions. Solutions should be local. People's suggestions which take into account location-specific details should get due attention in the planning for their villages and hamlets. Similarly when planning for climate change mitigation or the reduction of greenhouse gas emissions, the chances of success increase if people's location specific suggestions have a greater chance of being properly considered and adopted.

Hence if local self-government institutions can be involved in climate change adaptation and mitigation, then chances of success at the grassroots level are significantly increased. Therefore PRIs in India should have a very important role in climate change adaptation and mitigation, while at the same time efforts should be made to improve the capacity of PRIs to do justice to this role and the accompanying responsibilities.

Under the United Nations Framework Convention on Climate Change (UNFCCC) commitment already exists (the Green Climate Fund or GCF) for raising \$ 100 billion a year as new and additional funding per annum from developed countries to support mitigation and adaptation work in developing countries. This fund is supposed to grow rapidly till it reaches the projected amount by year 2020.

However there is as yet no certainty that this commitment will be kept, as industrialised countries have been seen to be more and more reluctant donors. There is no doubt, however, that for funding at this or higher levels an honest, well planned, transparent utilization in developing countries is badly needed.

As already stated one out of 9 people in the world live in rural India. Rural India is expected to suffer much from the projected climate change. PRIs exist all over rural India. Hence it is likely and also well justified that substantial extra funding should be available for an effective and significant role of PRIs in adaptation to and mitigation of climate change. At the same time, there is considerable need for strengthening of the capacity of the PRIs. While improving training of PRI representatives, more specifically there is need for incorporating climate change and its mitigation and adaptation aspects. There are some associations and organizations which seek to organize and mobilize PRI representatives on issues of high social relevance. Such organizations can also take up climate change related issues with a sense of urgency.

IV. Specific Contexts of PRI – Action on Climate Change

With better training and information, PRIs can play very important role in significant areas of climate change regarding adaptation and mitigation. Here we will examine seven such areas – agriculture, droughts, heat waves, floods, forestry, water and renewable energy. However to be more effective the helpful role of PRIs needs to be backed at a wider level by supportive policies of state and union governments.

(a) Agriculture

Overall warming trends as well as erratic weather behavior can disturb well-established cropping cycles. Thus rainfall at unexpected and unwelcome times may result in maintaining average rainfall for the year, but can be very disruptive for farmers.

India's agriculture is based mainly on small farmers, owning about 2 to 5 acres of land. These farmers have been experiencing a crisis situation for several years linked to increasing costs of cultivation, ecologically destructive farming practices and decline of government support. This has led to increasing the indebtedness of farmers. Climate change related problems coming on top of these already existing serious problems can be very disruptive. This situation can be seen today clearly in many villages of Bundelkhand region, apart from other areas.

In this situation PRIs can play a very helpful role in reducing costs and risks of farmers. Learning from past mistakes, costly and ecologically destructive technologies based on high doses of chemical fertilizers and pesticides have proved very harmful for sustainable livelihoods of farmers. Therefore it is important to have farm technologies which are eco-friendly and low-cost, based as much as possible on better utilization of local resources which are available free in and around villages. Such organic farming is low-cost as well as self-reliant and will prevent farmers from getting indebted even if weather is not favourable.

Another way of minimizing risk is to grow a carefully selected mixture of many food crops in such a way that food needs are met satisfactorily and also some cash income is generated round the year from limited sale of diverse food crops (instead of placing too much reliance on bumper harvest of just one crop).

Panchayats can be very helpful in this by providing many-sided support. Panchayats can ensure some irrigation support to all farmers. Watershed development which conserves water and moisture while increasing greenery can

provide the base for organic farming. PRIs can help in collection of diverse seed varieties of various crops so that these are available easily to farmers at very low cost or on exchange basis. Panchayats can also help in setting up of seed banks.

Panchayats can be better equipped financially to purchase some of the healthy organic farm produce of local farmers to meet the needs of all nutrition programmes (mid-day meals, ICDS or anganwadis and nutrition programmes for destitute and elderly people) as well as public distribution programmes. Thus healthy local food will be consumed and transport costs of obtaining food from other areas can be avoided.

In this way food security can be ensured to a substantial extent despite the increasing uncertainty relating to weather.

The benefit of mixed farming system and low cost farming is that even in adverse weather conditions the farmer's losses and risks can be minimized and indebtedness is avoided. There is no overwhelming feeling of hopelessness. Still panchayats can look out for more vulnerable farmers and extend helping hand to them to avoid extreme distress. Such help is best provided within the village and not from distant officials. Such timely help can check extreme distress and suicidal tendencies among adversely affected farm households.

Moving from industrial agriculture with emphasis on chemical fertilizers, pesticides and over-mechanization to organic farming with much lesser mechanization will not only be less costly, it will also help to check climate change by reducing GHG emissions significantly.

A 2007 study for the Intergovernmental Panel on Climate Change estimates that if world agriculture adopted best practices to increase soil organic matter content, it could mitigate 6 to 9 billion tonnes of carbon dioxide equivalent per year by 2030.

At a recent seminar organized by Farmers' Forum, one of the speakers Mukesh Anand of the National Institute of Public Finance and Policy said, "The use of diesel in Indian agriculture is much higher than its use in the industry." He further said that from 1998-99 to 2007-08 fossil fuel intensity in farming including indirect use, increased more than three times from 0.020639 to 0.065810.5 Hence by moving towards organic and low mechanization farming, fossil fuel consumption and hence greenhouse gas emissions can reduce significantly. Panchayats which achieve significant reduction of GHG emissions should be amply rewarded with financial resources which in turn can motivate panchayats to take up more

constructive work relating to climate change.

Panchayats can also help in the spread of useful innovations (like Mangal turbine to lift water without any diesel) which can help to reduce GHG emissions along with reducing costs for farmers.

The experience of most farmers in India has been that crop insurance schemes have never been implemented properly and adequately. Panchayats can take better care of farmers' interests and negotiate for better crop insurance schemes helped by favourable policies of union and state governments.

In times of increasingly erratic weather, farm research has to be much more decentralized so that farming decisions can be taken quickly in response to changing weather situations. Also there should be a base of rich knowledge of bio-diversity supported by collection of diversity of seeds so that seeds suitable for various weather conditions are available right there at the village level at little or no cost. This cannot be achieved by individual farmers alone and for this the help of panchayats will be extremely valuable.

Dr. R.H. Richaria, former director of Central Rice Research Institute (CRRI, Cuttack) and one of the foremost rice scientists of the world, later prepared a plan for improving rice production based on a highly de-centralized approach which is relevant for other crops also. He proposed setting up of rice adaptive centres and local gene camps with the close involvement of experienced farmers with a keen interest in diverse seed varieties. This plan emphasises working with the farmers with their own rice varieties about which they themselves know enough, so that they feel at home, employing simple field techniques in terms of the latest production technology.

Advocating a highly decentralised approach with involvement of farmers, the eminent scientist said, "It is suggested that rural adaptive rice centres (to be known as farmers rice centres (Kisani Dhan Kendra) may be established, as many as possible, all over the country. Invariably I found in rice areas some rice growers taking keen interest in their local rice varieties and as they are very much absorbed in them they have all praise for them, so much so that they trace back the history of individual rice varieties to their ancestry with their utility. Such selected and devoted rice farmers will be put in charge of the centres. I also observed that some of them would identify their rice varieties in their own way (not in terms of the modern knowledge of Botany) which amount to thousands. This inherent and intuitional faculty of farmers in selection and maintenance of thousands of rice cultivars, gradually being accumulated and descended down for unknown

centuries, ever since the rice first originated, must be preserved and exploited for the advantage of the present generation and to ensure the safety of those still unborn. The adaptive rice centres will be the custodian of all local rice cultivars in respective localities, assembled immediately, supplemented, if necessary, by the already available materials of the locality at different research centres. They will be maintained under their natural habitat to safeguard the future.

An important responsibility of these centres will be to save the invaluable diversity of rice varieties. As Dr. Richaria stated, "It may be of interest to record that during our survey in the Chhattisgarh area we came across rice growers in the remote areas, maintaining a large collection of rice varieties, year after year, associated with local customs. This also explains how thousands of varieties are being descended down for centuries. Naturally such collections served as 'Local treasuries', but in the absence of an organisation to encourage such private endeavours, the valuable varieties are fast disappearing."

Of course by now the bio-diversity has declined greatly but if enough efforts are not made to conserve these now, then all may be lost in the near future. Also panchayats can obtain lost local varieties from national or state gene banks so that farmers can grow these seeds and multiply them on their own.

Dr. Richaria had also given invaluable suggestions for rapid seed multiplication using clonal propagation technology which will be very useful to cope with adverse weather conditions such as floods and droughts to get adequate seeds of those varieties which are more suited to difficult weather conditions.

In a book on this technology titled 'Rice in abundance for all times through rice clones, a possible one grain revolution - a genetic forecast'[vii] Dr. Richaria explained the following important benefits of this technology.

"Investigations have conclusively established the superiority in grain production of vegetatively propagated plants (clones) over normal seed plants in respect of environmental stress and drought, comparatively non-lodging habit, resistance to diseases, pest, floods and salinity, ultimately to produce more grains per unit area."

"There is no other field technology which can allow seed multiplication so rapidly than this method which enables a single paddy grain or a single stubble, multiplied to obtain over forty quintals of grains within ten to eleven months (January to November) depending on the variety utilized and resources made available."

In practical terms what exactly is this technology of clonal propagation? The answer is best given in the words of Dr. Richaria himself, "paddy grains are picked up and put for germination in an earthen pot. They germinate and begin to grow, with two grains. The same two seedlings throw out tillers, after about 10 to 12 days, depending on the season. The tillers can be separated when they are fairly strong, about 20 days after, by carefully detaching them one by one by finger nails preferably by thumb's nail or by a sharp scalpel or razor blade. The separated tillers should be immediately transferred back in the earthen pot which is to be well manured with enough moisture. The individual tillers grow and again produce tillers in varying numbers, every about 15 days after. The process of separation is repeated at intervals, depending on the growth and development of tillers, till the normal time of transplanting reaches in July-August. It is observed that the period of separation (intervals) is very much reduced i.e. the rate of growth is very much accelerated during June-July. Any number of clones can be raised and multiplied from a single seedling or a few of them (if a beginning is made fairly early, say February when the winter temperature begins to rise) transplanted in July-August to cover an acre of rice field and a full crop of rice harvested by November to obtain a huge quantity of pure seeds, as stated in some cases, recorded later.

In this manner, pure seeds can be multiplied by this clonal propagation technology, described above and a normal crop of rice can be raised during the following season from seeds (obtained from the clones) which give higher production than the yields obtained from seed to seed crop. This is mainly because the grains, obtained from clones are fully matured healthy and filled up with the least percentage of chaffy grains. This is also due to physiological efficiency of the tiller plants.

This technology has special use in flood-prone area. At times rice fields get submerged due to floods at an early growth of the crop with the result that replanting is necessary, but in the absence of normal seedlings the rice-fields remain vacant. In such a situation the aged seedlings from the unaffected rice fields in the neighborhood or from any other source can be utilized as a source of clones. Further, continues Dr. Richaria, it has been demonstrated that the rice clones resist water submergence. They can therefore, be utilised in flood prone areas for which special nurseries may be raised and aged seedlings may be utilized as a source of clones.

Such technologies and approaches can greatly increase the ability of farmers to cope with adverse weather conditions, includes very sudden and unexpected adverse weather. Farmers do not have to depend on outside sources, but can use

such self-reliant methods to obtain good crops in very adverse weather conditions.

(b) Drought

The possibility of droughts including more prolonged and recurring droughts is likely to increase in times of climate change. Panchayats can help in reducing the damage and distress related to this by proper planning. Protection from drought can be achieved to some extent by careful water and moisture conservation as well as by planting more trees including fruit and fodder trees in and around the village as well as by improved maintenance of pastures.

Panchayat can implement the National Rural Employment Guarantee Act properly to ensure that adequate water and moisture conservation work is taken up for protection from drought. During difficult times of climate change the importance of rural employment works has increased to provide livelihood support to people. At the same time care should be taken to ensure that useful assets are created particularly for drought proofing.

Panchayats can make an important contribution by making available to farmers drought resistant seeds. Panchayats can maintain grain banks to ensure food security to most vulnerable households.

In tribal areas panchayats can play an important role in ensuring access of tribal communities to forests for obtaining several kinds of nutritious foods which are used in normal times as well but become particularly important to keep away hunger during the drought years.

If panchayats are well supported by state and union governments and if they have adequate resources, then they can succeed in reducing mass distress and forced migration at the time of droughts.

(c) Heat Waves

Along with drought the intensity and frequency of heat waves is also likely to increase during times of climate change and global warming. As the recent tragic experience of Andhra Pradesh and Telengana revealed, hundreds of heat wave deaths can take place within a few days.

The 3-tier panchayati raj system can work at various levels to reduce the risk of heat wave deaths. Working hours of those toiling in the open can be changed to reduce their exposure to heat wave. Special arrangements for ensuring drinking

water to the elderly people living alone or with small children (for example parents of migrant workers) can be made by panchayats. Cool drinking water can be arranged in well shaded places near the main road or path.

In the smaller towns the block panchayat and district level PRIs can provide cool shelters with adequate supplies of cold water where visitors from villages or other places can rest for some time particularly during the scorching afternoons. Near busy places and particularly where daily wage workers gather almost everyday, arrangements for shade and cold water should be made.

District hospitals, community and primary health centres should be well equipped to provide prompt and free health care to all heat wave victims. By taking these simple steps, the PRIs can help to significantly reduce the risk of heat wave deaths.

(d) Floods

In the past flood protection has been mainly concerned with structural protection works like dams and embankments. However despite massive investments in these, the areas affected by floods has shown an overall increasing trend. We need to learn from past mistakes as bigger floods are likely to be unleashed in times of climate change, partly due to the increasing likelihood of heavy rain being concentrated in a shorter span of time. There have been several recent examples of unprecedented heavy rain being concentrated in a very short span, for example in Uttarakhand and Kashmir.

As opposed to a mainly structural approach to flood control, panchayats can take into account many sided aspects of flood control as well better preparedness to face floods including flood rescue work. Panchayats in flood prone villages should maintain boats, storage of dry ready-to-eat food, seed banks as well as prepare well for health and sanitation during floods.

The key-word in flood regulation, management and relief should be 'community-based' effort work undertaken for community's welfare with the close and continuing participation of the community. Efforts should be made to encourage the communities to have a wider outlook on floods, instead of thinking more of their own hamlets or clusters. In this way the divide on the two sides of embankments can also be bridged to the extent possible. Special efforts should be made to involve women and elderly people in such consultations. The elderly have much to contribute in terms of traditional adaptation/survival strategies and their memories of earlier days. Disaster/flood Management Committees should be organised in flood-prone villages.

The guiding principle in flood-prone areas should be to try to live with floods rather than try to entirely stop flood flows. 'Living with floods' is a broad concept which includes (i) trying to increase the possibility that floods are moderate rather than severe, and (ii) adopting a whole range of preparatory and protective measures to ensure that the damage from floods to agriculture, animals, housing, health etc. can be minimised and (iii) trying to ensure (by improving drainage) that flood water flows away easily and quickly.

Perhaps the most crucial aspect of flood-management is improved drainage so that floods can pass quickly and prolonged waterlogging can be avoided. Improved drainage in all development and infrastructure works including roads, highways, canals, railway lines should get top priority. Areas of drainage congestion should be identified and work on improving drainage at these points should be prioritised. Communities should be given responsibility (backed with adequate budgets) for local drainage improvement efforts.

(e) Forests

Preventing deforestation and promoting afforestation with mixed, indigenous species of trees, emphasizing broad leaf species, helps to reduce GHG emissions and check climate change. Panchayats which achieve significant success in this on sustainable basis should be properly rewarded (of course the rewards should reach the people who make this success possible). This effort should be linked to improving sustainable livelihoods of people, particularly those from tribal communities. This includes particularly livelihoods relating to collection and processing of non-timber forest produce as well as afforestation work.

When tribals need land for livelihood but land use priority is for trees rather than agriculture, tribals can be given land on the condition that this will be used mainly for growing mixed indigenous trees but the non-timber produce will be used entirely for their livelihood.

The forest departments should work closely with panchayats and people to integrate livelihood and environment objectives.

(f) Water

Panchayats should mobilize rural communities to ensure that all people respect the need for long term conservation and protection of water sources as well as equal distribution. Tanks and other water sources should be well maintained.

Repair and renovation of traditional water sources should get high priority. Highly water intensive crops should not be allowed in areas of water scarcity. All activities which deplete water rapidly or pollute water sources and damage river flow should face strong action from Panchayats who should have adequate powers to protect the most basic resource of water. If there is conflict between two panchayats, PRIs at higher level should be able to resolve this conflict.

Water conservation is the basis of improving tree cover which is so important for controlling GHG emissions. Water scarcity, depleted aquifers and lowering water table were becoming a problem even earlier but climate change is likely to become a further aggravating factor. This re-emphasises the need for justice, caution and discipline in all issues relating to water. All this cannot be administered from a long distance from the village. PRIs are in a much better position to plan and implement water policies based on local conditions as well as the principles of justice, equality and sustainability.

(g) Renewable Energy

Replacement of fossil fuel (largely coal, oil and gas) based electricity and diesel generator sets etc. by renewable energy sources is the most important avenue of reducing GHG emissions and checking climate change.

In India thousands of remote villages particularly in hilly and desert areas are still not covered by wider electricity grids. This is partly because of the higher expenses involved in covering remote villages. However in a much larger number of villages connected to grids, actual connections have not reached significant sections of the village population. Poorer families and hamlets are less covered. Even in most other well-connected villages, electricity supply is often very erratic.

Hence there is very significant scope for rural de-centralised renewable energy system in India. Depending on location- specific factors, one village or Panchayat may use one or more renewable energy systems most suitable for its needs. The various renewable energy sources include solar energy, wind energy, micro-hydel, water mills, bio-mass and bio-gas.

An important role of Panchayats can be to prepare renewable energy plans based on local conditions and potential. With some training, many rural youth can get highly creative livelihoods in this emerging area. The Barefoot College has pioneered the concept of 'barefoot solar engineers' (including many women engineers). Barefoot solar engineers trained here have already lighted up hundreds

of villages, including those in very remote areas. Similarly we can plan for barefoot engineers for other renewable energy sources.

Already path-breaking work has been done by an innovator Mangal Singh of Lalitpur district who has obtained a patent for his device called Mangal turbine. This device helps to lift water from rivulets, canals etc. for irrigation or other purposes without using diesel or electricity.

This technology is described by Mangal Singh in the following words, - "The water wheel turbine machine consists of a water wheel which is firmly mounted on a steel shaft and supports on two bearing blocks fixed on foundation supports. The shaft is coupled with a suitable gearbox through universal couplings for stepping up speed of rotation. Output shaft of the gear box is coupled on one end with a centrifugal pump for lifting water and the other end is mounted with a suitable pulley for deriving power for operating any machine. Design of the water wheel turbine is simple. It is available in different size to meet the varying requirements. Operation of water Wheel Turbine Pump-cum-P.T.O. Machine is very easy as anyone can operate the machine by opening the wooden or steel gate valve, the machine is stopped by stopping the flow of water through the gate."

Thus apart from lifting water the Mangal turbine can also be used for several additional tasks. In the words of Mangal Singh, "This is used for pumping water from the rivulets and water streams on which it is installed. The machine can be used for several rural works such as operating atta chakki, sugarcane, crushing, threshing and winnowing, oil expelling, chaff cutting, etc. The machine provides a clean alternative (non-conventional) source of energy in remote rural areas for increasing agricultural productivity, income and employment". By linking it to a generator, this machine can also provide electricity.[viii]

It has been estimated that if one unit of Mangal Turbine runs for 11 hours in a day, then it saves 44 litres of diesel in a day (on the basis of use of 4 litre diesel per hour by 25 HP diesel pump). Again assuming irrigation by MT on 190 days in a year, a single unit of MT can save 8360 litres (44×190) in a typical year. Over a lifetime of 15 years one unit of MT can potentially save 125400 litres (8360 x15). In terms of greenhouse gas emissions (using assumption made in US Environment Protection Agency fact sheet) this works out to 335 tonnes. This estimate by Dr. Jai Shankar Singh is made on the basis of the assumption that one unit of MT will lift water from a stream which is equivalent to 25 HP diesel pump set and irrigate a command area of 50 ha.

Reduction in diesel consumption and related GHG emissions can further increase significantly to the extent that the M.T. is used also (in addition to water lifting) for processing of various farm produce and other work.

Such innovative work to provide relief and benefits to villagers while at the same time reducing GHG emissions should be encouraged.

If panchayats can take up the work of renewable energy promotion in a significant way, this will help to prepare pathways for future rural development with very significant reductions in GHG emissions.

Conclusion

With adequate support, resources and training, PRIs in India can play a very important role in climate change adaptation and reducing GHG emissions in rural areas.

In a recent research paper Dr Edwin S. Martin et.al noted about the important role of local government units (LGUs)⁷, "Since LGUs are at the forefront in responding to the ill effects of natural catastrophes, part of their huge responsibility is to act as the main driver determining how the system of response and preparation will be undertaken in order to provide adequate and timely response when faced by disaster. Solid coordination and cooperation between the national government and the LGUs must exist and the kind of relationship that should exist must foster a scaled-up relief and rehabilitation effort which is a crucial part in making their communities resilient."

In another paper Prof. Edmund S. Tayao similarly emphasises the joint importance of roles of national and local governments, but also adds that the responsibility and resources of the local government should not be encroached on.[ix] To quote, "...Giving substantial work or responsibility to the LGU affords flexibility needed to respond when the need arises especially in urgent incidents like disasters. This entails having the mandate, the right or adequate amount of authority, including capacity at the local level. There is a long list of supposed mandates that turn out to be just "assignments" hastily given by the national to the LGUs that capacity is all but constrained. There is always a question of having enough resources and if it covers enough jurisdiction. The national government must know its role and concentrate on it. The same is expected of the LGU. Only when there are limitations that the national level should assist the local and as much as possible not take over...the LGU should have all the resources and mobilization needed

that there should be enough leeway for it to make all plans a reality.”

Notes and References:

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