Environment and Development in a Sustainability Framework: An Exploration in the Context of Uttarakhand

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This paper is in three sections. Section I explores, albeit briefly, the concepts of sustainability, especially in its three forms of economic, social and environmental sustainability, and of sustainable development. In Section II the issue of the relationship between environment and development in the Himalayan state of Uttarakhand has been examined. The backdrop to this discussion is provided by (i) the traumatic events following the flash flood of June 2013; and (ii) the experience of rapid economic growth in the state during the last decade accompanied by widening mountain-plain divide. Section III explores some of the ways in which the concept of sustainable development may be operationalised. This is only a preliminary exercise and needs to be fleshed out in greater detail.

I

The relationship between environment and development has acquired considerable importance the world over since the 1970s. Two important events in 1972 – the UN Conference on the Human Environment, also known as the Stockholm Conference; and the publication of *Limits to Growth* – the first report to the Club of Rome – brought to the fore the consciousness that we live in a finite world which may be endangered if the twin issues of thoughtless exploitation of natural resources by the developed industrialised countries, and persistence of poverty in the developing countries are not seriously addressed. Among the 26 principles forming part of the Stockholm declaration[1] at the conclusion of the conference the following deserve special mention in the context of this paper:

- The natural resources of the earth, including the air, water, land, flora and fauna and especially representative samples of natural ecosystems, must be safeguarded for the benefit of present and future generations through careful planning or management, as appropriate
- The capacity of the earth to produce vital renewable resources must be maintained and, wherever practicable, restored or improved
- Man has a special responsibility to safeguard and wisely manage the heritage of wildlife and its habitat, which are now gravely imperilled by a combination of adverse factors.

Nature conservation, including wildlife, must therefore receive importance in planning for economic development

- The non-renewable resources of the earth must be employed in such a way as to guard against the danger of their future exhaustion and to ensure that benefits from such employment are shared by all mankind
- Economic and social development is essential for ensuring a favorable living and working environment for man and for creating conditions on earth that are necessary for the improvement of the quality of life
- Environmental deficiencies generated by the conditions of under-development and natural disasters pose grave problems and can best be remedied by accelerated development through the transfer of substantial quantities of financial and technological assistance as a supplement to the domestic effort of the developing countries and such timely assistance as may be required

According to the Club of Rome, *Limits to Growth* is a study about the future of our planet[2]. It was based on computer modeling of exponential economic and population growth with finite resource supplies. It produced computer simulations for alternative scenarios for different amounts of possibly available resources, different levels of agricultural productivity, birth control or environmental protection. Most scenarios resulted in an ongoing growth of population and of the economy until a turning point around 2030. The simulations showed that only drastic measures for environmental protection proved to be decisive for changing the behaviour of the system so that both world population and wealth could achieve stability and remain at a constant level. For this to happen strong political will was required to take necessary measures, which the countries of the world have not demonstrated as yet.

Within a decade of these two developments the concept of sustainable development became an important part of the discourse on environment and development. Much of the credit goes to the report of the World Commission on Environment and Development, generally known as the Brundtland Commission, which gave currency to the concept.[3] "One reason for its appeal" according to Barrett, Maler and Maskin (2014) "is that the alternative 'unsustainable development' is repugnant to anyone who thinks the continued existence of *Homo sapiens* is a realistic prospect. Another reason is that the concept can embrace a variety of 'worldviews'. But this, of course is also the problem with the concept. If it can mean almost anything, it will mean almost nothing. That is why so much effort has been devoted to understanding what it ought to mean." However, sustainability in the words of Pezzey and Toman (2002) "has proved a remarkably difficult concept to define and use precisely. Overlapping and conflicting definitions

rapidly proliferated. One result was that words such as “sustainability” and “sustainable” became common buzzwords—motherhood-and-apple-pie concepts mouthed approvingly by anyone from media moguls to multinational mining companies—that often meant nothing more than environmentally desirable, if that."

One of the most widely quoted definitions of 'sustainable development' is the one given by the Brundtland Commission: development that “meets the needs of the present without compromising the ability of future generations to meet their own needs”. This definition has two crucial elements – the notion of needs and the idea of inter-generation equity. Need from the environmental perspective may be distinguished from want (as used by economists) and greed[4]. In the economists conception the dividing line between need and want is rather blurred as wants can easily become, or made to become, needs. In many instances meeting needs involves trade-offs presenting difficult choices before a society, which are far from easy to resolve especially in democratic systems. Thus, for instance, the need for higher food production in a country with high levels of poverty may conflict with the need to protect soil fertility by minimising the use of chemical fertilizers, or individual families’ needs for firewood may conflict with the need to prevent erosion and conserve topsoil, or the need for electricity may result in high emission of green house gases causing acid rain on one hand and exacerbating climate change on the other. Then there is the question of whose needs have primacy: poor or rich people; people living in cities or in the countryside; the environment or the corporation; this generation or the next generation? When there has to be a trade off, whose needs should go first? Thus the concept of needs embodies a number of difficult moral and policy choices. Every society pursuing the path of sustainability has to resolve these issues in a manner that is not only in conformity with the idea of sustainability but also fair and equitable and acceptable to its members.

This concept of sustainability has been criticised on the ground that being defined vaguely in order to meet the needs of all stakeholders, it enables business to continue operations without being overly constrained by environmental concerns, while paying lip service to the needs of future generations, and being responsible for *un*sustainibility to a significant extent (Mckenzie, 2004: 2). The whole structure of modern capitalist economies is built on promoting consumerism, that is creating new wants leading to ever rising production and consumption. The pursuit of economic growth measured by GNP as the goal of development, on which there is remarkable consensus all over the world, does not admit the possibility of the process ever reaching finality or climax. According to Goodland (1995: 9) growth and development are distinct concepts: "Growth implies

quantitative physical or material increase; development implies qualitative improvement or at least change. Quantitative growth and qualitative improvement follow different laws. Our planet develops over time without growing. Our economy, a subsystem of the finite and nongrowing earth, must eventually adapt to a similar pattern of development without throughput growth." The notion of a limit to wants is therefore inherently antithetical to the idea of economic growth.[5] As a corrective the alternative notion of 'sustainable consumption', which has strong affinity with the idea of sustainable development, has acquired some currency. The Oslo Symposium on Sustainable Consumption, 1994 defines it as "the use of goods and services that respond to basic needs and bring a better quality of life, while minimising the use of natural resources, toxic materials and emissions of waste and pollutants over the life cycle, so as not to jeopardise the needs of future generations". It has been pointed out that "Underlying the current debate on sustainable consumption is a growing awareness that reforms in national economic policies are required to ensure that goods and services reflect environmental costs and so stimulate more sustainable production and consumption patterns..... There will be occasions when opportunities for economic growth conflict with moves towards sustainable consumption."[6] Sustainable consumption presupposes both an increase in the efficiency of consumption as well as a change in consumption patterns and reduction in consumption levels in richer countries. The first of these is referred to as weak sustainable consumption because it does not require a basic change in the pattern of consumption since technological improvements and efficiency can lead to reduction in resource consumption. It is only when a basic change in patterns and reduction of levels of consumption takes place that we can talk of strong or real progress towards sustainable consumption.

Analyses and expositions of sustainability generally recognise three aspects or domains: environmental, economic and social. Many people also include cultural sustainability as a fourth domain, although it could also be subsumed under social sustainability. The interrelationship between these three aspects or domains is commonly represented by one of two models. The first model features three concentric spheres. The innermost circle represents the economy; it is surrounded by the circle representing society with the environment forming the outermost circle (Figure 1). The implications of this manner of representation are twofold: (i) economic domain is nested in the social domain; and (ii) economic and social domain are both dependent on the health of the environmental domain. This model has recently been forcefully put forth by R. Costanza *et al* (2012). They argue that in order to create sustainable prosperity, improve human well-being and social equity while significantly reducing environmental risks and ecological scarcity "we are going to need a new vision of the economy and its relation to the rest of the world that is better adapted to the new conditions we face." They posit a model

of an economy based on the world-view and principles of ecological economics which includes the following ideas:

1) our material economy is embedded in society which is embedded in our ecological life-support system, and that we cannot understand or manage our economy without understanding the whole, interconnected system;
2) growth and development are not always linked and that true development must be defined in terms of the improvement of sustainable human well-being, not merely improvement in material consumption; and
3) balance of four basic types of assets (capital) are necessary for sustainable human well-being: built, human, social and natural capital (Costanza *et. al*., 2012: 4).

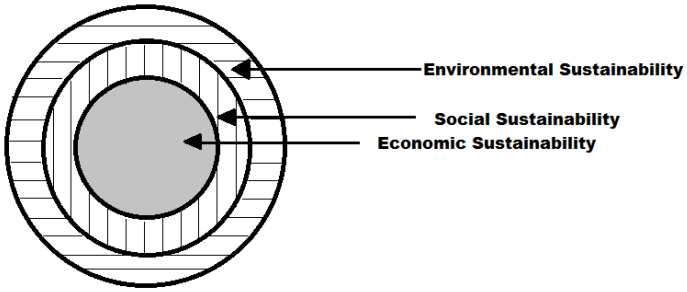

Fig.1

The second and more widely accepted model visualises these domains as three intersecting circles of equal size (Figure 2). The area in the centre common to the three circles represents the domain of sustainable development (see Mckenzie, 2004, 4-5). It is important to keep in mind that although both models relate to the inter-relationship of the three kinds of sustainability, the first does not go beyond the concept of sustainability in general, whereas the second includes the notion of sustainable development identified by the area of intersection of the three kinds of sustainability. In that sense it is more relevant to the discussion in this paper. From our point of view it would be relevant to understand the specific features of the three kinds of sustainability, so that a combination of the main elements of each may go into defining sustainable development.

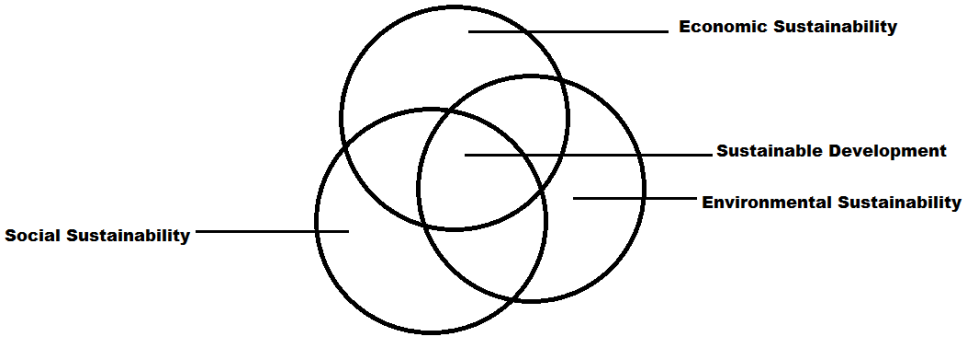

Fig.2

Goodland (1995: 3) has compared the three types of sustainability and summarised the distinctive features of each : social sustainability is promoted by values like cohesion, sodality, diversity, pluralism, cultural identity, compassion, tolerance, humility, love, forbearance etc. and is achieved by systematic community participation and strong civil society; economic sustainability implies 'maintenance of capital' or living off the interest while keeping capital stock intact, but what is needed is enlarging the concept of capital to include natural, social and human capital and adding the criteria of scale to the usual economic criteria of allocation and efficiency since it is scale that has posed a threat to natural capital; environmental sustainability seeks to improve human welfare by protecting natural capital – the source of raw materials – and the sink for wastes, implying that we must learn to live within the biophysical limits of our ecosystem leading to sustainable production and sustainable consumption. Environmental sustainability, according to Sutton (2004: 11) can be simply stated as "the ability to maintain the qualities that are valued in the physical environment." These qualities include human life, capabilities of the natural environment to maintain living conditions for all living beings such as clean water and air, and aspects of the environment that produce renewable resources such as water, timber, fish, solar energy etc. The aim of environmental sustainability is protection of life support systems ensuring survival of species, and maintenance of environmental quality. Economic sustainability ensures subsistence and equitable standard of living. Social sustainability results in capacity to solve social problems and ensure equitable quality of life. Morelli (2011) points out that a debate exists between supporters of a three-legged approach (i.e. simultaneously benefitting economy-society-environment) and those who view it as a

relationship between human society and nature. As a result the concept is open to individual political and philosophical interpretations as against a scientific definition.

The importance attached by the world community to sustainablity can be gauged from the fact that it is included as a part of the Millenium Development Goals (Goal 7) adopted in 2000. Targets laid down for achieving the goal by 2015 include: integrating the principles of sustainable development into country policies and programmes and reversing the loss of environmental resources; and reducing biodiversity loss. It is a different matter that we are still far from achieving the target less than one year away from the target date.

Sustainability is also a key concept for ecologists. According to one ecological definition it refers to "meeting human needs without compromising the health of ecosystems" (quoted by Morelli 2011: 23). Morelli, however prefers the prefix environmental over ecological, as it includes the interaction of humans with the ecosystem. Sutton (2004: 16-17) refers to ecologically sustainable development defined as "development that improves the total quality of life, both now and in the future, in a way that maintains the ecological processes on which life depends." Its objectives include: enhancing individual and community well-being while safeguarding the well-being of future generations; ensuring equity between and within generations; protecting biological diversity; and maintaining essential ecological processes and life support systems, all characteristics that are very similar to those of sustainable development. However, it needs to be recognised that the ecologists' concept has a strong scientific basis, and as such makes use of concepts that do not figure in the analysis of social scientists and policy-makers. To that extent it differs fundamentally from the social science and policy-based understanding of sustainability.[7] Morelli (2011: 23) has attempted to combine the environmental and ecological perspectives to claim that "environmental sustainability could be defined as a condition of balance, resilience, and interconnectedness that allows human society to satisfy its needs while neither exceeding the capacity of its supporting ecosystems to continue to regenerate the services necessary to meet those needs nor by our actions diminishing biological diversity." In the same vein Mulder and Van Den Bergh (2001) too have attempted to interpret economic sustainablity by using ecological ideas by claiming that "integrating sustainable development into environmental economics requires that the latter has to address ‘irreversibility’,

‘uncertainty’, and (non-linear) ‘dynamic feedback processes’, because these are key characteristics of the interaction between economic and ecological processes."

A strong egalitarian approach to the notion of sustainability has been adopted by Anand and Sen (2000) who have analysed economic sustainability from an ethical perspective. According to them the "demand of sustainability is a particular reflection of universality of claims – applied to the future generations *vis a vis* us." They go on to claim that "universalism also requires that in our anxiety to protect the future generations, we must not overlook the pressing claims of the less privileged today. A universalist approach cannot ignore the deprived people today in trying to prevent deprivation in the future" (p.2030). Carrying the argument further they assert that "sustainability cannot be left entirely to the market. The future is not adequately represented in the market – at least not the distant future – and there is no reason that ordinary market behavior will take care of whatever obligation we have to the future. Universalism demands that the state should serve as a trustee for the interests of future generations" (p.2034).

Summing up this brief review of sustainability and sustainable development we may say that though there is still considerable debate on the precise meaning of sustainable development, yet as Mulder and Van Den Bergh (2001) point out "a broad consensus exists that it means that economic activities should be consistent with: sustainable use of renewable natural resources, protection of ecosystem features and functions, preservation of biological diversity, a level of harmful emissions remaining below critical (assimilative) thresholds, and avoidance of irreversible damage to the environment and nature" (p. 111). And, we may add, it implies a qualitative change that goes beyond mere growth in quantitative economic terms and encompasses social and environmental dimensions while maintaning the integrity of the life sustaining processes of the ecosystem and ensuring inter-generation and intra-generation equality and at the same time protecting the interests of the deprived and vulnerable groups.

II

The issue of the relationship between environment and development and the urgent necessity of promoting sustainable development is of particular salience in mountain areas, especially the Himalayas, which have been variously characterised as the 'Third Pole' and a

'Water Tower' owing to the vast store of fresh water – third largest after the Antarctica and the Arctic – stored in its numerous glaciers numbering over 15,000. Its glaciers are the source of three large river basins – Indus in the west, Ganga in the central part and Brahmaputra in the east, which together are home to over 600 million people.[8]

The importance of striking a balance between environmental and development concerns, especially in mountain areas, has been recognised and underlined at the international level as well as the national level in India. Chapter 13, Para 1 of Agenda 21 titled "Managing Fragile Ecosystems: Sustainable Mountain Development", adopted at the UN Conference on Environment and Development, 1992 refers to the special need for sustainable mountain development, with the mountains being recognised as a fragile ecosystem. In the words of this document:

> Mountains are an important source of water, energy and biological diversity. Furthermore, they are a source of such key resources as minerals, forest products and agricultural products and of recreation. As a major ecosystem representing the complex and interrelated ecology of our planet, mountain environments are essential to the survival of the global ecosystem. Mountain ecosystems are, however, rapidly changing. They are susceptible to accelerated soil erosion, landslides and rapid loss of habitat and genetic diversity. On the human side, there is widespread poverty among mountain inhabitants and loss of indigenous knowledge. As a result, most global mountain areas are experiencing environmental degradation. Hence, the proper management of mountain resources and socio-economic development of the people deserves immediate action.

In India, it was realised as early as 1985 that the development of mountain areas had to be in conformity with their environment, even though development planning was largely articulated and practiced within the framework of economic growth. The *Report of the Working Group on Hill Area Development for the Seventh Five Year Plan, 1985-90* (June 1985: Para 2, p.2) acknowledged:

> ...development of the hilly areas in the country cannot be understood in isolation from the adjoining plains, with which their economy is closely inter-related. The hilly areas influence the climate of the plains, encysting the catchments and the watersheds of several major river systems that flow to the plain. They abound in forests, plants and mineral wealth as well as hydel energy resources. The experience of development planning during the period before the Fifth Plan has increasingly underlined the realisation that unless adequate programmes are evolved for conservation and proper utilisation of the resources of the hill areas, not only will the problems of these areas continue to remain unsolved, but the economy of the plains may also come to grief.

The Working Group then goes on to emphasise that "The ecological systems of both the hills and the plains must become sustainable in the long run. If the ecology of the hills is disrupted to meet

the short-term requirements of a growing population, the economy of the plains also will be disrupted." (Para 5)

The relationship between environment and development has come to acquire new, and urgent importance in the Himalayan state of Uttarakhand. The devastation and large scale loss of life and property and extensive damage to and destruction of physical infrastructure caused by the flash-flood of June 16-17 2013 – generally referred to as the *Himalayan Tsunami* – has provided an element of urgency to the issue. It is now being realised that though the cause of the tragedy was a natural event – excessive and continuous rainfall over a forty eight hour period – the large scale loss of human life and property and destruction of infrastructure like roads, bridges, water supply, irrigation channels, public buildings etc., that followed was largely due to human causes (Prakash, 2013). The northern belt of Uttarakhand bordering Tibet in the districts of Chamoli, Uttarkashi, Bageshwar and Pithoragarh received heavy to very heavy rainfall – in excess of 400 percent of normal – during June 16-17, 2013 due to the collision of two major weather systems – a western disturbance and the monsoon. According to a report of the National Institute of Disaster Management (Prakash, 2013):

> This heavy precipitation resulted into the swelling of rivers, both in the upstream as well as downstream areas. Besides the rain water, a huge quantity of water was probably released from melting of ice and glaciers due to high temperatures during the month of May and June. The water not only filled up the lakes and rivers that overflowed but also may have caused breaching of moraine dammed lakes in the upper reaches of the valley, particularly during the late evening on 16 June and on the next day i.e. 17 June 2013, killing about several hundred persons, thousands missing and trapping about a hundred thousand pilgrims. Numerous landslides also took place after these heavy rains and toe erosion of the slopes by the high velocity and volume of water loaded with sediments, stones, rocks and sand. The landslides and toe erosion by the river caused breaching of the roads / highways at many places and washed away several bridges (steel girder bridges, beam bridges, suspension/cable bridges). The Alaknanda and its tributary Mandakini occupied their flood ways and started flowing along the old courses where human habitation had come up with passage of time (when the river had abandoned this course and shifted its path to the east side). Thus, the furious river destroyed the buildings and other infrastructure that came in its way.

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Roads, bridges, buildings, hotels and guest houses etc. were allowed to be constructed on the flood-way of major Himalayan rivers in complete disregard of the fact that a major flood, not unknown in the high and mid-Himalayas, would cause heavy destruction (Kunwar, 2013).

The unfortunate incident of June 2013 leading to tragic loss of life and property on an unprecedented scale, recalls to mind the debate generated in the mid 70s and 80s on the Theory of Himalayan Environmental Degradation that was quite influential for a time. The theory is generally associated with the widely quoted work of Erik Eckholm (1976). The burden of the theory is that a vicious circle of degradation of the Himalayan resource base, mainly forests, has been set in motion by rapid increase in population. The massive deforestation in the Himalayas (estimated to be about the half of the forest area in Nepal between 1950 and 1980) results in (i) heavy water run-off and depletion of soil, (ii) increase in flooding and massive siltation in the plains, (iii) lower water levels and the drying up of springs and wells during the dry season, and (iv) rapid siltation of reservoirs and abrupt changes in the course of rivers. Its main assumptions came to be challenged at the end of the 80s, especially by Jack Ives and Bruno Messerli in *The Theory of Himalayan Degradation* published in 1989. Although the theory was initially propounded by Eckholm in the context of Nepal, Ives and Messerli pointed out that the Kumaun and Garhwal Himalaya (constituting a major part of present-day Uttarakhand) also appear to fall within the area affected by degradation, but with two additional components: (i) the excessive commercial cutting of mountain forests to meet the demand for timber mainly from the urban centres in the plain areas; and (ii) the extensive development of mountain roads, especially as a security response after the border war of 1962 with China. The theory tended to lay the blame for much of the degradation on the people of the Himalayas by emphasising rapid population growth on the one hand and poor agricultural practices like inappropriate construction and poor maintenance of terraces. Ives and Messerli argued that far from being a part of the problem, the local people were in fact the solution – repairing terraces and setting right the impact of heavy rains much quicker than natural processes.

Although the Theory of Himalayan Environmental Degradation is no longer accepted as a correct appreciation of the dilemma facing the Himalayan states, there are elements of it which appear to have seen a revival. For instance the magnitude of damage caused by the 2013 Uttarakhand disaster has been attributed to thoughtless and excessive interference, under the influence of short-term economic gain, with the environment. Thus roads, hotels, guest houses, shops, hydropower projects and other buildings were allowed to be constructed along the floodways of rivers, and the muck and debris from construction disposed of by dumping into

rivers. As a result river beds were raised adding to the threat of floods. Responsibility in this regard is not only that of the people, although they are not completely blameless, but to a large extent it lies with government agencies responsible for some of the large construction projects.

A recent study of forest degradation in the Himalayas (Baland, Das and Mookherjee, 2014) refers to three main hypotheses about factors driving environmental degradation in developing countries. One, the "Poverty-Environment Hypothesis" (which finds support in the Bruntland Commission report) asserts that the root cause of environmental problems is poverty; degradation occurs due to exploitation of common property resources by the poor. Hence solutions to environmental problems lie in eradicating or ameliorating poverty, which may be done either through faster economic growth or through state-sponsored anti-poverty programmes, or better still a combination of the two. In sharp contrast is the view that lays the blame for environmental problems on economic growth, which increases the demand for environmental resources. A third view that occupies the middle ground between these two extremes has been referred to as the "Environmental Kuznets Curve" which holds that in the initial stages of economic growth environmental problems tend to get worse; but after passing a certain threshold of per capita income they ease out. There are other views too that stress the importance of local institutions, community property rights and control and monitoring by local communities in preventing environmental, especially forest, degradation. On the basis of empirical examination of various factors generally identified for forest degradation in the Himalayas, the authors conclude: "Without some kind of effective government intervention, the future of Himalayan forests appear somewhat bleak. Forest degradation in this region is related to the unregulated extraction of firewood and fodder, which has led to an alarming decline in the quality and resistance of trees in the region (p.230)". They go on to assert:

> ..... it is unclear that local inhabitants perceive this degradation as an important problem, or that they are acting on it to self-regulate local collection activities. Local collective action among local inhabitants is conspicuous by its absence, in the absence of formal efforts by the state to grant rights to local forest user groups. This reason perhaps explains the irrelevance of local land inequality to matter as a determinant of firewood collection levels, contrary to a large and mainly theoretical literature emphasising the role of collective action. Part of the reason for lack of spontaneous collective action may be the negligible magnitude of the associated local externality. The relevant externality is therefore essentially non-local in nature, with forest degradation in the Himalayas. contributing to landslides, siltation, and floods, and possibly also climate change. These necessitate some kind of external state action (p.231).

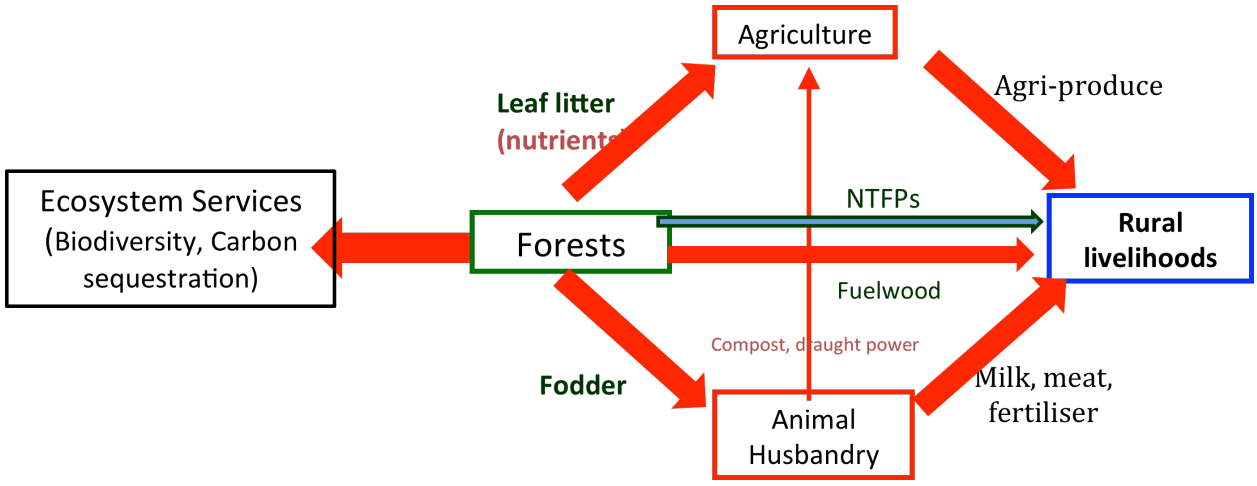
The tendency to put the blame on the local population for degradation has also acquired some support lately from people who have become concerned about the state of Himalayan forests. It is widely known that there is a strong symbiotic relation between agriculture and forests in the Himalayas. The health of the agrarian economy of the Himalayas is heavily dependent on the health of the forests. Forests provide a large numbers of goods and services for agriculture – nutrients that sustain agricultural productivity, fodder to feed draught and milch animals, farmyard manure for agricultural lands. Elaborating on the relation between forests and agriculture in central Himalaya (which includes Uttarakhand) Rajesh Thadani in an undated note writes:

> In the central Himalaya, the strongest component of this dependence is the relationship of the local people with a species of oak. Locally know as *banj*, botanists know this tree as *Quercus leucotrichophora*. This tree has been referred to as the *kalpavriksha* of the Himalaya, alluding to the mythical tree of heaven that fulfils every human desire. This tree is the primary source of fuelwood, animal fodder and fertilizer. *Banj* oak leaves are fed to cattle. This is especially important in winter when little else is available. *Banj* leaf litter is especially rich in nitrogen and when mixed with cowdung and composted produces an excellent fertilizer that sustains hill agriculture. Energy for cooking and heating is still primarily from fuelwood and the wood of this oak is considered among the best for burning due to its high density and good burning properties. The humus rich soils of *banj* forests aid infiltration of water and act as a giant sponge reducing water flow and erosion during periods of heavy rainfall.
>
> With increase in human population forests in general, and oak forests in particular, have suffered an inevitable decline. Chronic or repeated disturbance due to lopping of trees for fuelwood and fodder is today considered to be the chief cause of forest degradation and decline in the Himalaya.

Degradation of Himalayan forests today is not due to commercial exploitation but due to the people's need for products for subsistence – specifically fuelwood for cooking, leaf fodder for cattle and fallen leaves for making a compost fertilizer. People also deliberately set fire to forest floors in the belief that it promotes growth of grass during the rainy season. All these practices have an adverse impact on forest regeneration. Thadani (2014) has argued that even as forests in Uttarakhand Himalaya are severely threatened with degradation, there is no magic remedy for the problem. While better governance and stronger community involvement through local institutions can certainly help, ultimately better results can only be expected when communities are provided alternatives. These are likely to include assured availability of fodder which is known to reduce dependence on leaf fodder (not the best source of fodder) by as much as one-

fourth to one-third; providing alternatives to traditional cook stoves such as improved cook stoves and electric cook stoves (the latter combined with provision of reliable and regular power availability) which will help in significantly reducing fuelwood consumption per household; and supply of alternative fuels for cooking like LPG (which incidentally is the preferred cooking fuel for families that can afford it and in places where regular supply is available) and small bio-gas plants. Quoting a survey in some villages of Kumaon in Uttarakhand he reports that about one-third of the households used LPG, and when they were offered electricity coverage and improved cook stoves the proportion increased to 60 per cent. The problem, it should be clear, is not so much with the people as with the extremely limited options before them. If they are provided more and better options as well as the means to take advantage of them – whether through better livelihood opportunities promising enhanced incomes, or by providing subsidies for LPG and improved cook stoves or electricity consumption – they will surely respond, thereby reducing pressure on forests. In fact much of the expenditure on these items could be financed through a properly designed and implemented system of Payment for Ecosystem Services (PES). The time perhaps has come to seriously consider compensating the Himalayan areas for preserving their natural resources – mainly land, forests and water – in the interests of larger social good, especially the hundreds of millions living in the densely populated Gangetic plain. Figure 3 below provides a graphic representation of the dependence of the agrarian economy on forests.

Figure 3: Dependence of Himalayan Agrarian Economy on Forests



Source: Thadani (undated note)

Degradation of forests has resulted in the decline of the agrarian economy of the Himalayan areas of Uttarakhand. A worrying consequence of this decline has been increase in the incidence of migration, especially of young men, who are virtually forced out of the villages in search of employment. The relatively high levels of education in the state, and extremely limited opportunities of non-farm jobs, more specifically in the mountain districts, make it unattractive for the youth to stay on in the villages. The prospect of cultivating small family holdings, largely rain-fed, that barely meet subsistence needs and that too for only part of the year, is hardly attractive enough to keep the youth on the land. Cultivation then becomes the responsibility of women who are left behind when the men migrate. This only increases the burden and drudgery on women. In addition to cultivating small family holdings and taking care of household chores like cooking, cleaning, care of children etc, they also end up taking care of animals, collecting fodder and firewood often from long distances, and fetching water if there is no water source within the village. It is ironic that the rate of male out-migration seems to have increased in recent years, especially after the new state of Uttarakhand came into existence; Uttarakhand, it may be recalled, was created on the promise of development centred on the protection of natural resources – forests, land and water – and ensuring their benefits to the local population.

Evidence, though indirect, in support of the contention that migration of males has been on the rise in recent years is provided by the results of the 2011 census. This is apparent from two sets of figures: decadal rate of population growth during 1991-2001 and 2001-2011 and sex ratio (females per thousand males) in 2001 and 2011 (see Table 1). It may be pointed out that of the 13 districts in the state nine viz., Uttarkashi, Chamoli, Rudraprayag, Tehri Garhwal, Garhwal, Pithoragarh, Bageshwar, Almora and Champawat are predominantly mountainous while two Udham Singh Nagar and Hardwar lie entirely in the plains or lowlands. Two districts, Dehradun and Nainital, though predominently mountainous in terms of area have a large proportion of the population in the lowland areas. In Dehradun over 90 per cent of the population was estimated to reside in the lowland areas of Doon valley, while in Nainital the corresponding proportion was 65 per cent in 2001 according to the compilation of the Directorate of Economics & Statistics, Government of Uttarakhand.[9]

Table 1: Uttarakhand: Decadal Population Growth Rate, 1991-2001 & 2001-2011 and Sex Ratio 2001 & 2011

District/Uttarakhand	Population Growth Rate		Sex Ratio	
	1991-2001	2001-2011	2001	2011
Uttarkashi	23.07	11.75	941	959
Chamoli	13.87	5.60	1016	1021
Rudraprayag	13.43	4.14	1115	1120
Tehri Garhwal	16.24	1.93	1049	1078
Dehradun	25.00	32.48	887	992
Garhwal	3.91	-1.51	1106	1103
Pithoragarh	10.95	5.13	1031	1021
Bageshwar	9.28	5.13	1106	1093
Almora	3.67	-1.73	1145	1142
Champawat	17.60	15.49	1021	981
Nainital	32.72	25.20	906	933
Udham Singh Nagar	33.60	33.40	902	919
Hardwar	28.70	33.16	865	879
Uttarakhand	20.41	19.17	962	963

Source: Census 2011, Paper 1 of 2011: Provisional Population Totals, Uttarakhand

The data show a drastic decline in the population growth rate in all mountain districts between the two decadal periods. The only exception to this pattern is Champawat where the decline is relatively moderate. In two mountain districts, Garhwal and Almora the decadal rate of growth is negative, implying that these two districts actually had fewer people in 2011 than in 2001! This result has to be seen in the context of already very low population growth (less than 4 per cent) in these districts during the previous decade of 1991-2001. In the lowland districts of Udham Singh Nagar and Hardwar and in Dehradun, on the other hand population growth has been much higher at over 33 per cent during 2001-2011. While Hardwar and Dehradun have witnessed a significant increase in population growth during the second decade as compared to the first, in Udham Singh Nagar the growth has been consistently high in both periods. Only

Nainital does not conform to the general pattern. Population growth during 2001-2011 though still relatively high at over 25 per cent, is nevertheless much lower than the rate of about 33 per cent during the previous decade. Similarly, sex ratio (females per thousand males) has been much higher in all mountain districts relative to the lowland districts and the state average during both the decadal periods. The only exception in this case is Dehradun, which saw a fairly large improvement in the sex ratio in the second period as compared to the first, and the 2001-2011 figure was also higher than the state average. These two sets of data taken together lend support to the view that male migration from Uttarakhand has tended to increase in recent years.

It is ironic that migration is on the rise even as Uttarakhand became a separate state of the Indian Union in the year 2000 in response to a long-standing demand and a prolonged agitation in the early nineties fuelled by the widely held view among the people that the development needs of the mountain area were not adequately appreciated and addressed as long as they were a small part of a much larger state like Uttar Pradesh with a population in excess of 170 million, that had a different geography (lying in the vast Gangetic plain), economy, social structure and culture from that of the mountains. Failure to address the specific development needs of the area, it was claimed, led to control of its natural resources by outside forces, impoverishment of the local population, absence of gainful employment opportunities, leaving the local youth, who were in any case better educated than their counterparts in the rest of the state, with no option except to move out in search of employment. According to a popular saying in the area "the water and the youth of the mountains always flow downwards" (*Pahar ka paani aur pahar ki jawani neeche bah jate hain*). It is evident that if the diagnosis of the development problem of the mountain area while it was part of Uttar Pradesh was substantially correct, statehood has not been the panacea that was hoped for.

In terms of traditional measures of development, Uttarakhand has undoubtedly witnessed noteworthy progress after its creation as a separate state. Gross State Domestic Product (GSDP) and per capita income have both seen high rates of growth. Table 2 shows the year wise growth data for these two indicators from 2004-05 to 2013-14. It will be seen that GSDP has risen at very high rates during the entire period both in terms of current and constant prices. The growth has been especially high till 2009-10. Per Capita income growth also follows a similar pattern; it shows a rising trend till 2009-10 (with the exception of 2008-09), after which there has been a

Table 2: Uttarakhand –Economic Growth: 2004-05 to 2013-14

Year	% Growth of GSDP at Constant (2004-05) Prices	PCI at Constant (2004-05) Prices (Rs.)	% Growth of PCI-Constant (2004-05) Prices	PCI at Current Prices (Rs.)	% Growth of PCI-Current Prices
2004-05	----	24,726	----	24,726	----
2005-06	14.34	27,781	12.36	29,441	19.07
2006-07	13.58	30,644	10.38	35,111	19.26
2007-08	18.12	35,444	15.66	42,619	21.38
2008-09	12.65	38,621	8.96	50,657	18.86
2009-10	18.13	44,556	15.37	62,757	23.89
2010-11	10.02	48,525	8.18	73,819	17.63
2011-12(P)	9.35	52,266	7.71	84,724	14.77
2012-13(Q)	9.01	56,251	7.62	97,528	15.11
2013-14(A)	9.99	61,106	8.63	112,428	15.28

(P) Provisional estimate; (Q) Quick estimate; (A) Advance estimate.

Source: Government of Uttarakhand, Department of Planning, Directorate of Economics and Statistics (Report of 15 February 2014)

steady decline, though the rate of growth has remained high – about 15 per cent per year at current prices, and over 7.5 per cent per year at constant prices. The decline in growth rate in 2008-09 may have some relation to the general economic slowdown in the country in reaction to the global recession of 2008 or thereabout. The subsequent decline in rate of growth after 2009-10 is most probably due to the premature withdrawal in 2010 of the special investment package provided by the Government of India for industrial investments in Uttarakhand and Himachal Pradesh in 2003 for a period of ten years. It is well-known that as a result of that concession

there was considerable industrial investment in Uttarakhand, which powered the double-digit economic growth rate that is visible after 2004-05.

It may be mentioned that with the revision of the base year for GSDP data to 2004-05, as per the guidelines of the Central Statistical Organisation, comparable time-series data are avialable only from that year. Although GSDP figures for the years immediately after the formation of the state until 2004-05 are available, they are not strictly comparable as they are based on 1999-2000 as the base year. However, for the sake of information GSDP and per capita income growth rates for the period 2001-02 (the first full year after the formation of the State) to 2004-05 are provided in Table 3. These also show moderately high rates of growth, especially after 2001-02.

Table 3: Uttarakhand –Economic Growth: 2001-02 to 2004-05

Year	% Growth of GSDP at Constant (2004-05) Prices	PCI at Constant (2004-05) Prices (Rs.)	% Growth of PCI-Constant (2004-05) Prices	PCI at Current Prices (Rs.)	% Growth of PCI-Current Prices
2001-02	3.58	15,497	2.86	16,408	5.98
2002-03	7.74	16,606	7.15	18,809	14.70
2003-04	5.93	17,643	6.25	20,519	9.04
2004-05	8.21	19,179	8.71	22,708	10.67

Source: Government of Uttarakhand, Directorate of Economics and Statistics, *Estimates of State Domestic Product of Uttarakhand (1999-2000 to 2006-07 with base year 1999-2000)*, n.d.

The story of fast economic growth that these data convey has come in for considerable approbation as it places Uttarakhand among states with the highest aggregate economic growth rates in India. The success story is repeated in terms of per capita income too. According to information on per capita income (PCI) at current prices provided by the Economic Survey 2013-14 Uttarakhand ranked 14th among all states and 10th among 17 major states in 2004-05. The thirteen states ranking higher than Uttarakhand were Andhra Pradesh, Arunachal Pradesh, Goa,

Gujarat, Haryana, Himachal Pradesh, Karnataka, Kerala, Maharashtra, Nagaland, Punjab, Sikkim and Tamil Nadu. Among major states Andhra Pradesh, Gujarat, Haryana, Himachal Pradesh, Karnataka, Kerala, Maharashtra, Punjab and Tamil Nadu ranked higher than Uttarakhand. In 2004-05, PCI in Uttarakhand was only slightly higher than the country average (Rs 24,726 as against Rs 24,143). By 2012-13 Uttarakhand had risen to sixth rank among all states, exceeded only by Goa, Haryana, Maharashtra, Tamil Nadu and Sikkim, and fourth among major states behind Haryana, Maharashtra and Tamil Nadu – all having major concentration of industry. PCI of Uttarakhand (Rs 97,528) was now even higher than that of Gujarat (Rs 96,976). In 2013-14 PCI in Uttarakhand was higher than the country average by 30 per cent (Rs 97,528 in Uttarakhand as against Rs 74,920 in India)[10].

The economic success story conveyed by these data hides a dark underbelly. Economic growth in Uttarakhand has been highly skewed geographically. It is confined to the four districts of Dehradun, Udham Singh Nagar, Hardwar and Nainital. In Dehradun it is only the Doon valley that has participated in the economic growth process. The much larger mountain area falling under Chakrata and Tiuni tehsils has not benefited as much. Similarly in Nainital too, a narrow strip of plain area in the south known as *bhabar*, where important urban centres like Haldwani, Ramnagar, Lal Kuan, Kaladhungi are located, has been the main centre of modern economic activity. The data in Table 4 show the big difference in per capita income between these four districts and the nine mountain districts.

These data underline the dilemma of development in a mountain state. Development, in the sense of economic growth, is largely the product of investment in modern industrial enterprises. The mountains are not conducive for this activity as they lack basic infrastructure. Development of infrastructure in the mountain areas is both time-consuming and expensive on account of constraints of geography and terrain. On the other hand the plains do not suffer from these these constraints so that infrastructure development is much faster as well as less expensive. Furthermore, the plain areas are also better placed in terms of rail and road connectivity, which is very important for transport of raw materials and finished products.

Table 4: Per Capita Income in Districts of Uttarakhand: 2010-11*

District/Uttarakhand	Per capita Income (Rs)
Uttarkashi	42,521
Chamoli	62,608
Rudraprayag	42,418
Tehri Garhwal	51,442
Dehradun	81,406
Garhwal	57,596
Pithoragarh	51,464
Bageshwar	41,047
Almora	55,050
Champawat	51,648
Nainital	74,758
Udham Singh Nagar	80,241
Hardwar	80,850
Uttarakhand	59,584

*Provisional

Source: Government of Uttarakhand, Department of Planning, Directorate of Economics and Statistics

In order to highlight the inherent conflict between economic growth and environmental preservation in a mountain state like Uttarakhand we may take the example of energy. Uttarakhand today faces a shortage of energy, which threatens to considerably slow down the pace of industrial growth. All facets of modern economy, especially industry and the service sector are dependent on assured and reliable energy supply. In Uttarakhand the entire power generation capacity is based on hydro sources, which is being developed in the mountain areas for obvious locational reasons. Total hydropower potential in Uttarakhand has been estimated at over 25,000 MW, while only 3164 has so far been developed. About 14,000 MW is at various stages of development, but it has recently run into serious problems on account of environmental concerns and work on 24 projects has been halted on the orders of the Supreme Court. Although hydropower is a relatively clean source of energy compared to coal-based thermal power being developed in the rest of the country, it would be mistaken to consider it environmentally or

socially benign. From an environmental perspective, hydropower projects, especially the larger ones, entail considerable civil construction works. Tunnels, often quite long, are also bored through the mountains to carry water to the turbines from the reservoirs or pondage created by dams and barrages. They also need to be provided with good roads that are sufficiently wide without too steep a gradient and sharp turns in order to facilitate movement of heavy construction and machinery and power turbines. All this construction, much of which makes use of explosives to blast hills to build or widen roads, create space for civil works and build tunnels, causes considerable disturbance to the fragile Himalayas. The Himalayas, it must be remembered are a young and active mountain range that is still colliding against the eurasian plate. Disturbances generated in the course of construction are triggers for destabilisation of the hills and landslides, even with moderate rainfall. The muck from construction is disposed of by rolling down hillsides. It ultimately finds its way into streams and rivers raising their bed, which becomes a cause of floods. Floods and landslides cause considerable destruction to human and animal lives, houses, commercial establishments and agricultural terraces every year, thereby adversely affecting already precarious livelihoods. Large projects, in particular, lead to displacement of large number of families and to considerable deforestation. Displaced families have to be rehabilitated; our record in this regard is none too good.

Thus the fruits of fast economic growth that Uttarakhand has been witness to since its emergence as a separate state go almost entirely to lowland plain areas, while upland areas suffer increased environmental hazards, adverse impact on livelihoods, displacement and deforestation. This is the main reason why a large number of people, especially able-bodied young men are moving out of the mountains in search of new opportunities. Some of it may be due to 'pull' factors – the desire to be part of the new aspirational lifestyle being promoted by images brought to even the remotest areas by the ubiquitous television, and increasingly by information through mobile connectivity. However, a large part of the migration is due to 'push' factors – the inability of the local economy to ensure adequate livelihood opportunities, especially to the educated youth who seek a better future. With jobs in Uttarakhand being created in the new industries of the plain districts, many young people tend to move to these places. The bigger urban centres in the plains also have much better facilities for education and health. Hence many families are also tending to move to these places for these reasons. This explains the much higher population growth recorded in the plains districts during 2001-2011 – 33 per cent in Dehradun, Udham

Singh Nagar and Hardwar and 25 per cent in Nainital – than in the whole state (see Table 1). Undoubtedly, these three districts would also be attracting migrants from the adjoining districts of Uttar Pradesh.

One consequence of this skewed pattern of development carrying worrisome social and political portents for the future is the emerging mountain-plains divide. The creation of Uttarakhand as a separate state, it may be recalled, was envisioned as an attempt to address the development needs of the hill areas and people in the composite state of Uttar Pradesh. There was a general feeling among the people of the mountain region that they did not get their proper due in Uttar Pradesh. Almost the same sentiment is now beginning to be heard in Uttarakhand. This has happened because gradually but decidedly, the plains districts have become more important relative to the mountain districts in terms of both economic and political power. That the fulcrum of political power has shifted towards the plain districts is evident from the fact that at the time of its creation the 70 constituencies of the state legislative assembly had a division of 42:28 in favour of the mountain districts; after a fresh delimitation of constituencies in 2006 based on the 2001 census, the mountain districts lost 6 constituencies to the plain districts so that the new distribution of mountain and plain constituencies at 36:34 bringing them almost at par.

It should be quite clear from the above discussion that behind the development dilemma in Uttarakhand is the fact that development has been mainly conceived in terms of aggregate economic growth. Though conservation of resources and preservation of the environment forms part of the rhetoric, it is not really central to the scheme of development in the sense aggregate economic growth is. To be sure Uttarakhand is not alone in this regard. All states in the country, and India as a whole, have been pursuing this path ever since the era of planned economic development since 1952, and even more vigorously since the adoption of liberal economic policies. It is even doubtful to what extent one state can deviate from the general pattern and strike out a separate path. Yet, it is also quite clear that for a mountain state like Uttarakhand ignoring environmental constraints can prove disastrous, as the events of June 2013 have amply demonstrated. Hence it is necessary that the state should align its development policy and practice with the notion of sustainability. Sustainable development must be seen as an urgent necessity in environmentally fragile and vulnerable regions like the Himalayas. However this is

easier said than done. The challenge is to devise an appropriate sustainable development strategy. This is what the final section seeks to explore.

III

The discussion in the two previous sections has underlined: (i) the problem of imbalance between environment and economic development in the Himalayan region of Uttarakhand resulting in increasing threat to human life, property, livelihoods and infrastructure from environmental disturbance; (ii) the importance of sustainable development as a strategy to not only minimise these threats, but also to adapt development to the long-term goal of environmental harmony in order not to imperil the survival chances of future generations. Theoretical formulation and acceptance of this dilemma is the easy part. The more difficult part is giving it practical shape by spelling out the approach, policies and strategy that will make it happen. This poses a major challenge to policy-makers and implementing agencies who are often confronted by difficult choices.

We may perhaps be in a better position to appreciate the dilemma of formulating and implementing a sustainable development policy by returning to the case of hydropower in Uttarakhand. Hydropower development in Uttarakhand has run into sustained opposition from environmental and other groups in recent years. Among instances of opposition to development of hydropower, the most important from the perspective of the state's present and future development has been the abandonment of some under construction and proposed hydroelectric projects. These include the 600 MW Loharinag-Pala, the 480 MW Pala-Maneri and the 381 MW Bhaironghati projects on the Bhagirathi river. The central government has also declared the Bhagirathi river from Gaumukh (the origin of the Bhagirathi, generally considered the main stream of the Ganga river, held sacred by millions of Hindus) to Uttarkashi town, a stretch of 135 kilometres, as an ecologically sensitive zone and prohibited many activities likely to cause environmental damage. The eco-sensitive zone covers a belt extending to five kilometres on either side of the river and covering an area of 4179.59 sq. kms. Recently (August 26, 2013) the Nainital High Court imposed a ban on "all construction within 200 metres of all major rivers in the state – including the Ganga and its tributaries such as the Alaknanda, Bhagirathi, Mandakini, Pindar, Kali and Gouri – with immediate effect."[11] To add to the woes of Uttarakhand

government the Supreme Court has temporarily stayed work on 24 hydropower projects in the Alaknanda and Bhagirathi basins.

Two kinds of objections have been voiced to construction of hydropower projects on Himalayan rivers – the Bhagirathi and Alaknanda and their tributaries. The first, mentioned earlier, relates to environmental concerns especially the fear that owing to the cascading nature of the projects the rivers would run virtually dry for long stretches, since their water would be diverted through tunnels for feeding the power houses. This, it is argued, would spell the death of the river and its ecosystem. A river, it may be mentioned, is not just a stretch of flowing water, but it is also an ecosystem that supports considerable biodiversity in the form of aquatic life and fauna. The second objection is based on people's faith in the divine nature of the Ganga river, of which the Bhagirathi and Alaknanda are the two main streams. This objection has been forcefully put forth by Hindu religious heads and groups who want no interference with the uninterrupted flow (*aviral dhara*) of these rivers. The counter argument that the flow of the Bhagirathi has already been interrupted by the Tehri dam or the fact that Har-ki-Pauri, the sacred bathing place and the main locale of the famous *kumbha mela*, in Haridwar is not located on the main river but on the Upper Ganga Canal have failed to make any impression.[12]

Three important issues about the impact of major construction activity in the Himalaya that have been raised from time to time, but more stridently after the June 2013 flash floods, may be identified. The first is the argument from an environmental perspective: diverting the flow of the water through tunnels will cause the river to run dry for long stretches resulting in untold, and perhaps irreversible, damage to its ecological health and indeed to its status as an ecosystem. This argument has considerable merit. The response, however, need not necessarily be to stop all hydropower development, but to do it in such a way that the ecological health of the river is not irreversibly compromised. This can be ensured by maintaining an ecologically minimum flow of water (e-flow) so that the river does not "die" for any length of its course. The quantum of e-flow can be scientifically determined. It needs to be kept in mind that Himalayan rivers do not have a uniform flow of water through the year. Water flow increases during summer when glacial snow melts and peaks during monsoons and remains low during winter. Ecological flow cannot remain uniform through the year. It would have to be adjusted in the light of seasonal variation.

Maintaining the minimum necessary ecological flow will inevitably result in a corresponding reduction in the power generation capacity. This is a small price to pay for preserving the riverine ecosystem; the gains can be quite large as it avoids the extreme remedy of abandoning all power projects.[13]

The second issue relates to faith and has its roots in the religious sentiment of millions of Hindus. It has been argued that the Ganga should be preserved in its pristine form since it has divine origins. There can be no rational engagement with this argument. It is quite easy to mobilise mass protests on matters of faith, and no government, especially in a fractious democracy like ours, would like to be seen to be going against the sentiments of the majority of society. Matters of faith ultimately end up trumping rational discourse. However, if the state plans to go ahead with development of hydropower it will have to devise ways of addressing these issues. It would be necessary to engage religious and environmental groups on these matters. Such issues can be sorted out only through negotiations in a democracy. Perhaps a lesson can be learnt from the way the British sought the support of the Ganga Sabha led by nationalist leader Madan Mohan Malviya when it faced opposition from religious leaders to its plan of constructing a permanent barrage at Bhimgoda, about 3 kms. upstream of the existing temporary diversion structure, to augment the flow the Upper Ganges Canal, and accepting the solution proposed by him in 1916.

The third, and perhaps most important, issue relates to energy policy in Uttarakhand. It is one thing to oppose power projects on the ground of their adverse environmental impacts; the issue raised by such action is: What is the alternative energy policy that the state can or should adopt? Uttarakhand today is wholly dependent on hydropower for its energy needs. Thermal power, whether coal or gas based, does not appear to be a feasible alternative. It does not have any deposits of fossil fuels, whether coal or hydrocarbons, it is situated far from pit-heads and the cost of transporting coal or natural gas would be very high. The environmental consequences would also be much more damaging from coal-based power plants. In the case of gas, availability without pipeline connectivity is a major constraint. The other energy options – solar or wind – though highly attractive from the environmental point of view have only a marginal share in the current energy profile of Uttarakhand. There is also the issue of the cost of these

energy sources. At the end of March 2011 Uttarakhand had a total electricity generation capacity of 1.80 GW. Of this, 1.65 GW came from hydropower and 0.15 from new and renewable sources (including small hydropower). The total potential of renewable power sources as on March 31, 2011 has been estimated as 1767 MW, the bulk of which (1577 MW) is accounted for by small hydropower. Wind power comes a distant second at 161 MW.[14] Hence hydropower in some form – whether from large, medium or small projects, preferably a combination of all three – will continue to constitute the backbone of the energy supply system of the state. Hydropower has the advantage of being a clean source of energy with a well-established technology. If the environmental issues pointed out by its critics are adequately addressed then it remains the best option before the state of Uttarakhand.

It is important to bear in mind that energy policy cannot be seen in isolation. It is inextricably linked to development policy. In the absence of clarity on development goals and policies, energy policy too would lack clarity. The issue boils down to assessing energy needs for a given set of development goals. If these are not articulated in clear terms and not linked to appropriate policies and programmes, energy policy too is likely to suffer from inadequacies. This simple truth is often lost sight of. It is important to reiterate that the state government should shed the practice of thinking, planning and acting in silos – sectoral and departmental. A major shortcoming of development planning at the level of states in India is that it is generally conceived in sectoral and departmental terms. With implementation also taking place in individual departments of the government, development gets locked into a rigid framework of departmental programmes and schemes. As a result the integrated and holistic character of development gets lost. Development, it hardly needs emphasis, encompasses a number of dimensions which are closely inter-related. For instance the rate of economic growth, the most emphasised and avidly pursued aspect of development, cannot be pushed up without a concomitant development of infrastructure such as reliable and efficient power system, good railway and road network, communication facilities and attendant changes in the service sector viz. banking, insurance, warehousing etc These, on their part require an efficient, accountable and responsive governance system. Economic growth, moreover, is dependent on adequate supply of skilled manpower. Moreover, as modern economies are becoming increasingly knowledge intensive, the level of skills and education demanded has also increased manifold. As

a result, we cannot think of high and sustained growth without concomitant development in the education status of the people. Today we cannot depend only on the universalisation of literacy. The skill and quality of education being imparted by our institutions have to be of such standard and quality as would be commensurate with the demands of the development path that is chosen. Finally, an efficient workforce presupposes a healthy workforce. Health of the people is promoted by preventive and curative measures. The former requires proper nutrition, clean drinking water, sanitation, and pollution free environment to name the most obvious factors, while the latter presupposes an efficient and affordable health delivery system from the grassroots up. Finally, we cannot ignore the need to preserve social and cultural diversity and provide avenues for cultural expression and enjoyment, without which human existence cannot be considered complete. Thus, the linkages of economic growth with a wide range of actions in many areas of economic, social and indeed cultural life become apparent.

What this implies is that we must conceptualise development as a network or web of inter-related fields, all of which are equally important. All should be addressed simultaneously, since change in one field has an impact on, and is in turn affected by, change in other fields. It would be mistaken to conceive of change or development in a sequential mode: viz., let us take care of economic growth first and later worry about say health or education. The "triage"[15] model which underlies this thinking is inappropriate in the field of development. The aim of development policy is, or should be, to benefit all persons, irrespective of their economic or social status. On the contrary, the idea of social justice and equity demands that those who are most deprived and most in need should be benefited to a greater degree by allocating a larger share of resources in order to reduce economic and social inequalities and achieve a larger measure of equality in outcomes.

Economic and social policy should proceed in tandem in order to realise the larger goals that a society has set before itself. In India these goals have been spelt out by the Directive Principles of State Policy detailed in Part IV of the Constitution. The challenge before framers of development plans and policies is to craft a framework for addressing changes in all areas of economic, social, cultural life of a people in a holistic manner, while eschewing a narrow sectoral and/ or sequential approach. A network-based approach will, hopefully, overcome the

limitations of the existing approach. The policy framework for sustainable development should resemble a complex web of inter-related activities rather than a series of discrete linear relationships. Such an approach requires careful mapping of all the areas in which interventions are proposed to achieve stated goals along with the mutual interrelationship of these areas. In the beginning a model such as this may not be easily amenable to quantification, except perhaps in the case of its economic components. It would therefore have to be largely articulated in a descriptive mode. That in itself would be a great advance over the existing situation. As greater sophistication is achieved in the articulation of the model, some degree of quantification can be expected.

A model for quantification of inter-relationships among a large number of economic sectors and sub-sectors is already in use at the level of national economies in the form of input-output framework. Input-output analysis refers "to the study of the effects that different sectors have on the economy as a whole, for a particular nation or region." The distinctive feature of the analysis is that it shows how "the output of one sector can become an input for another sector, which results in an *interlinked economic system*[16]" (emphasis added). In India input-output tables for the national economy have been in use since the 1950s. Input-Output tables for a few states have also been constructed, but mainly as one-off exercise. Unlike the Central tables the state tables have not been periodically revised. The input-out framework is a good model for conceptualising development as a network of closely inter-related activities. Though the economic variables are capable of quantification, the same cannot be said of non-economic factors. Gradually as the understanding of linkages among different components improves and relevant data become available, more areas can be quantified. Quite clearly this is an iterative exercise. The real challenge is to build in environmental factors and limits as inherent elements of the development process instead of considering them as externalities. A beginning has been made in this respect by the Government of India which constituted an Expert Group on Green National Accounts in April 2011 chaired by the noted economist Sir Partha Dasgupta. The Expert Group submitted its report in March 2013. I end this paper with this lengthy quote from the Executive Summary of the report:

> The Report's central conclusion is that adjusting for population, the coin on the basis of which economic evaluation should be conducted is a comprehensive notion of wealth (adjusted for the distribution of wealth in the economy), not gross domestic product (GDP), nor the many other ad

hoc indicators of human well-being that have been advanced in recent years, such as the United Nations' Human Development Index (HDI). By wealth we mean the social value of an economy's stock of capital assets, comprising (i) reproducible capital (commonly known as "manufactured capital": roads, ports, cables, buildings, machinery, equipment, and so forth), (ii) human capital (population size and composition, education, health), and (iii) natural capital (ecosystems, land, sub-soil resources, and so on). We show in particular that changes in the circumstances of an economy should be judged on the basis of their effect on the economy's wealth per capita, adjusted for the distribution of wealth. We are able to so argue because we show that wealth per capita is the mirror image of intergenerational wellbeing averaged across the generations. To put it in other words, wealth per capita tracks intergenerational well-being averaged across the generations exactly: the former increases over a period of time if and only if the latter increases over that same period of time. This equivalence forms the basis for what may be called sustainability analysis (pp. 4-5).

Notes

[1] http://www.unep.org/Documents.Multilingual/Default.asp?documentid=97&articleid=1503

[2] [2] http://www.clubofrome.org/?p=326

[3] Stephen McKenzie traces the origin of sustainability to the 60s when concern about environmental degradation as a result of poor resource management emerged. He quotes the founding charter of OECD that talks of promoting policies in member countries that would lead 'the highest sustainable economic growth and employment...in order to stimulate employment and increase living standards'. See Stephen McKenzie, "Social Sustainability: Towards Some Definitions", Hawke research Institute, Working Paper Series No. 27, 2004.

[4] "The world has enough for everyone's need, but not for everyone's greed" – Mahatma Gandhi

[5] Ideas like limits to growth (based on a report commissioned by the Club of Rome), small scale economy, and steady state economy which had considerable following in the decade of the 70s in the last century do not have much of a following except among some committed environmentalists. See Donella H Meadows et.al. *The Limits to Growth*, (New York: Universe Books, 1972); Herman E. Daly (ed.) Toward a Steady State Economy (San Francisco: W. H. Freeman,1972); E. F. Schumacher, Small Is Beautiful: Economics as if People Mattered (New York: Harper and Row Publishers, 1973)

[6] http://www.iisd.ca/consume/oslo004.html

[7]According to one articulation of the scientific basis of sustainability there is a basic difference between the views of nature held by policy-makers and public on one hand and by ecologists on the other. For the former nature is at or near equilibrium, conveyed by the general use of the term "balance of nature"; deterministic and predictable; highly resilient; and linear with an additive response to disturbance. Consequently it believes that disturbances can be dealt with by appropriate policy responses and social and technological interventions. These may be adequate to bring the system back to equilibrium. For ecologists nature is in a state of non-equilibrium; stochastic with low predictability; has contingent resilience; and is non-linear with multiplicative response to disturbance. Thus ecological systems are dynamic and non-equilibrial, dependent on natural disturbance processes with time lags following disturbance events that accumulate in space and time, are subject to threshold values that can lead to alternative stable states. The levels of resilience of ecological systems are not well known. Some key concepts relevant to ecological sustainability are:

Integrity – the state of being unimpaired, or the quality of being whole or complete. An ecological system has integrity when it maintains its characteristic compositions, structures, and processes against a background of anthropogenic disturbance.

Resistance – the amount of stress that can be absorbed by an ecosystem prior to a major state change

Resilience – the time taken to system recovery following a major state change

Thresholds – (i) non-linear changes in the value of an ecological state variable due to some external stressor or set of stressors (ii) precipitous change in the state of an ecological system after a physical or biological variable(s) surpasses a critical value. Barry R. Noon, "Scientific Concepts Underlying Ecological Sustainability", presentation made at a seminar on *Forests of the Western Himalaya: Conservation and Restoration of Ecosystem Services in a time of Climate Change,* organised by Centre for Ecology Development and Research (CEDAR) at Dehradun, June 28-29, 2014.

[8] http://en.wikipedia.org/wiki/Himalayas

[9] http://des.uk.gov.in/pages/display/103-district-tehsil-block-wise-census-details

[10] PCI data for some states is not available in the Economic Survey 2013-14. Hence comparison with all states is not possible.

[11] D. S. Kunwar, The Times of India, Tuesday, August 27, 2013.

[12] On July 2010, in response to an RTI application the Uttarakhand irrigation department claimed that the water flowing at Har Ki Pauri and Brahma Kund was not Ganga, but Aapoorti Dhara, as there are no records of Ganga flowing at this particular spot in government records. It claimed that the Ganga upstream of Bhimgoda has been diverted to meet the Upper Ganga Canal, and the Har Ki Pauri has the Aapoorti Dhara, not the Ganga. The sadhus of Haridwar, have countered this claim by pointing out that during the British period, after strenuous efforts of Pandit Madan Mohan Malviya, the water from the Ganga had to be diverted to Har Ki Pauri in Haridwar for the daily evening Ganga Aarti to be performed. (http://www.indiatvnews.com/print/news/is-it-ganga-or-someother- water-flowing-at-haridwar-uttarakhand-21795-1.html).

[13] The Inter-ministerial Group (IMG) appointed by the Ministry of Environment and Forests, Government of India to look into issues related to hydro power plants and ecological flows on the Ganga in its report dated April 2013 is reported to have recommended e-flow of 25% for the high flow (May-September) and average flow (April, October and November) seasons and 50% and 40% for power projects where the average monthly 6 river inflow during lean season (December-March) is less than 10% or between 10-15% respectively, of the average monthly river inflow of the high flow season (May-September), and 30% for the others. One member of the group, Sunita Narain, did not agree with this recommendation and instead proposed a 30% e-flow during May-October and 50% e-flow during November-April, based on an analysis of seven small hydro projects in the Alaknanda and Bhagirathi basins. The IMG estimated power loss of 11-23% and increase in levelised tariff of 13-30% in the Alaknanda basin; and power loss of 8-20% and increase in levelised tariff of 10-23% in the Bhagirathi basin as a result of the recommended e-flows. In Sunita Narain's estimate energy generation is reduced by 24% and levelised tariff increases by 27% (Chandra Bhushan, Jonas Hemberg and Abhinav Kumar 2013, *Green Norms for Green Energy: Small Hydro Power*, Centre for Science and Environment, New Delhi, p 15 and p, 29)
The recommendations of the IMG have been severely criticised by Himanshu Thakkar who concludes his lengthy critique by saying: "A broad conclusion is inescapable that the IMG report (except the dissent note by Shri Rajendra Singh) is largely an exercise in deception, with a pro-hydropower bias. While this note points out key negative aspects of the IMG report, the IMG report is not without some positive aspects." "Comment on IMG (B.K. Chaturvedi) Committee Report on Upper Ganga Hydro and the River"
(http://sandrp.in/IMG_report_on_Ganga_has_Pro_Hydro_Bias_June2013.pdf

[14] *Energy Statistics: 2012*, Central Statistics Office, Ministry of Statistics and Programme Implementation, Government of India.
The study by Chandra Bhushan et.al,. op.cit., citing *State-wise Numbers and Aggregate Capacity of SHP Projects (Upto 25 MW)*, Union Ministry of New and Renewal Energy reports SHP potential capacity of 1707.87 MW, installed capacity of 170.82 MW and capacity under development of 178.04 MW for SHPs in Uttarakhand.

[15] "Triage" is a term that has its origins in "the sorting of and allocation of treatment to patients and especially battle and disaster victims according to a system of priorities designed to maximize the number of survivors". In its application to projects it stands for "the assigning of priority order to projects on the basis of where funds and other resources can be best used, are most needed, or are most likely to achieve success". (http://www.merriam-webster.com/dictionary/triage).

[16] www.investopedia.com/terms/i/input-output-analysis.asp. Accessed on 17 June 2013.
A good analysis of input-analysis tables prepared for the Indian economy since 1948 is provided by Hiroshi Kuwamori & Hajime Sato "Features of Input-Output Tables of India". Paper presented at the 17th Input-Output Conference in Sao Paolo, July 13-17, 2009
(www.iioa.org/pdf/17th%Conf/Papers/89005152_090517_225849_Paper267.PDF)

References

Anand, Sudhir and Amartya Sen (2000), "Human Development and Economic Sustainability, World Development, Vol. 28, No. 12
(http://www2.econ.iastate.edu/classes/tsc220/hallam/Readings/AnandSenHumanDevelopmentEconomicSustainability.pdf)

Asian Development Bank, Government of Uttarakhand, The World Bank (August 2013), *Uttarakhand Disaster 2013: Joint Rapid Damage and Needs Assessment Report*

Baland, Jean Marie, Sanghamitra Das and Dilip Mookherjee (2014), "Forest Degradation in the Himalayas: Determinants and Policy Options" in Barrett, Maler and Maskin (2014)

Barrett, Scott, Karl-Goran Maler and Eric S. Maskin (Eds.) (2014), *Environment & Development Economics: Essays in Honor of Sir Partha Dasgupta* (Oxford University Press)

Barrett, Scott, Karl-Goran Maler, and Eric Maskin (2014), "Partha Dasgupta's Contribution to Environment and Development Economics" in Barrett, Maler and Maskin (eds.) (2014) pp 22-23

Chandra Bhushan, Jonas Hemberg and Abhinav Kumar (2013), *Green Norms for Green Energy: Small Hydro Power*, Centre for Science and Environment, New Delhi

Daly, Herman E. ed. (1972), *Toward a Steady State Economy*, San Francisco: W. H. Freeman

Eckholm, Erik P. (1976), *Losing Ground: Environmental Stress and World Food Prospects*, New York: W. W. Norton

Goodland, Robert (1995), "The Concept of Environmental Sustainability" *Annual Review of Ecology and Systematics*, Vol. 26

Government of India, Ministry of Finance (2014), *Economic Survey 2013-14*

Government of India, Central Statistics Office, Ministry of Statistics and Programme Implementation *Energy Statistics: 2012*

Government of India, Registrar General and Census Commissioner, Census 2011, Paper 1 of 2011: Provisional Population Totals, Uttarakhand

Government of Uttarakhand, Directorate of Economics and Statistics (Report of 15 February 2014 a)

Government of Uttarakhand (2014 b), Directorate of Economics and Statistics, *Statistical Diary 2012-13*

Government of Uttarakhand, Directorate of Economics and Statistics, *Estimates of State Domestic Product of Uttarakhand (2004-05 to 2013-14 with base year, 2004-05)*, n.d

Government of Uttarakhand, Directorate of Economics and Statistics, *Estimates of State Domestic Product of Uttarakhand (1999-2000 to 2006-07 with base year, 1999-2000)*, n.d.

Green National Accounts in India: A Framework (2013), A Report by an Expert Group Convened by the National Statistical Organization, Ministry of Statistics and Programme Implementation, Government of India

Ives, Jack and Bruno Messerli (1989), *Theory of Himalayan Degradation*, Routledge

Kunwar, D. S. (August 27, 2013) The Times of India

McKenzie, Stephen (2004), "Social Sustainability: Towards Some Definitions", Hawke Research Institute, Working Paper Series, No. 27 (https://atn.edu.au/Documents/EASS/HRI/working-papers/wp27.pdf)

Meadows, Donella H et.al. (1972), *The Limits to Growth*, New York: Universe Books

Morelli, John "Environmental Sustainability: A Definition for Environmental Professionals", http://www.environmentalmanager.org/wp-content/uploads/2011/09/Article2Morelli1.pdf

Mulder, Peter and Jeroen C. J. N. Van Den Bergh (2001), "Evolutionary Economic Theories of Sustainable Development", *Growth and Change*, Vol.32 (Winter 2001)

Noon, Barry R. "Scientific Concepts Underlying Ecological Sustainability", presentation made at a seminar on *Forests of the Western Himalaya: Conservation and Restoration of Ecosystem*

Services in a time of Climate Change, organised by Centre for Ecology Development and Research (CEDAR) at Dehradun, June 28-29, 2014.

Pezzey, John C. V. & Michael A.Toman, "The Economics of Sustainability: A Review of Journal Articles", *Resources for the Future*, January 2002, Discussion Paper 02-03, http://www.rff.org/Documents/RFF-DP-02-03.pdf

Prakash, Surya (2013), Brief Report on visit to Alaknanda Valley, Uttarakhand Himalaya during 22-24 June 2013, National Institute of Disaster Management, New Delhi (http://www.indiaenvironmentportal.org.in/files/file/Uttarakhand%20Disaster.pdf)

Schumacher, E. F. (1973), *Small Is Beautiful: Economics as if People Mattered* , New York: Harper and Row Publishers

Sutton, Philip (2004), "Living well within our environment: A Perspective on environmental sustainability?" A paper for the Victorian Commissioner for environmental sustainability. (http://www.green-innovations.asn.au/A-Perspective-on-Environmental-Sustainability.pdf)

Thadani, Rajesh (2014), "Deforestation & Degradation in the Central Himalaya: An Introduction", presentation made at a seminar on *Forests of the Western Himalaya: Conservation and Restoration of Ecosystem Services in a time of Climate Change,* organised by Centre for Ecology Development and Research (CEDAR) at Dehradun, June 28-29, 2014.

Thadani, Rajesh (n. d.) "Forests and Society: How a move away from an agrarian economy may influence Himalayan Forests"

Thakkar, Himanshu"Comment on IMG (B.K. Chaturvedi) Committee Report on Upper Ganga Hydro and the River" (http://sandrp.in/IMG_report_on_Ganga_has_Pro_Hydro_Bias_June2013.pdf

The World Commission on Environment and Development (Brundtland Commission), Our Common Future, OUP: 1987

United Nations. 1987."Report of the World Commission on Environment and Development" General Assembly Resolution 42/187, 11 December