International Journal of Academic Research
ISSN: 2348-7666; Vol.4, Issue-2 (1), February, 2017
Impact Factor: 4.535; Email: drtvramana@yahoo.co.in

A Study on Sustainable Development of Modern Technology and New Challenges in India

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Abstract: *There is a general understanding on technology to solve environmental problems around the world today, because of an almost universal unwillingness by governments and those who advise them to make the social and political changes that would be necessary to reduce growth in production and consumption. Yet the sorts of technological changes that would be necessary to keep up with and counter act the growing environmental damage caused by increases in production and consumption would have to be fairly dramatic. And the question remains, can such a dramatic and radical redesign of our technological systems occur without causing major social changes and will it occur without a rethinking of political priorities? Technology is not independent of society either in its shaping or its effects. At the heart of the debate over the potential effectiveness of sustainable development is the question of whether technological change, even if it can be achieved, can reduce the impact of economic development sufficiently to ensure other types of change will not be necessary*[1].

Key words*: Environment, Information, Poverty, Sustainable development, Technology*

Introduction:

The basic premise of these policies is that continual growth in a limited world is possible through the powers of technology, which will help us find new sources or provide alternatives if a particular resource appears to be running out. Otherwise, technology will help us use and reuse what we have left in the most efficient manner. The tools of sustainable development, economic instruments, legislative measures and consumer pressures aim at achieving technological changes such as recycling, waste minimization, substitution of materials, changed production processes, pollution control and more efficient usage of resources. Finally, how much impact these technological changes have on Indian society.

The new technology is eventually replacing the traditional technology. More important, the new technology obviously less harms the environment than the traditional one. The alternative to end-of-pipe technologies is to adopt new 'clean' technologies that alter production processes, inputs to the process and products themselves so that they are more environmentally benign. Clean technologies are preferable to end-of-pipe technologies because they avoid the need to extract and concentrate toxic material from the waste stream and deal with it[2]. Technologies that require less water, energy and raw materials, and that reduce waste discharges can best be utilized. Also, raw material inputs and processes can be changed so that, for instance, solvent-free inks and paints, and heavy metal-free pigments are used. Indeed, once used products can be recycled and redesigned for use and waste flows can be reused within the production process rather than dumped.

Most investment in pollution control was being used for end-of-pipe technologies, with only 20 per cent being used for cleaner production. Cleaner technologies may not always be available, and, even if they are available, companies tend to run their old technologies until they get spoiled not minding to what degree they would have bad impact on the environment. Besides, companies tend to make minimum organizational changes that need to be made; they like to play it safe when it comes to investment in pollution management. The problem with measures such as end-of-pipe technologies is that they are technological fixes that do not address the cause of the problem and such fixes can often cause other problems.

The United Nations World Commission on Environment and Development (WCED) in its 1987 report Our Common Future defines sustainable development: Development that meets the needs of the present without compromising the ability of future generations to meet their own needs[3]. Under the principles of the United Nations Charter the Millennium Declaration identified principles and treaties on sustainable development, including economic development, social development and environmental protection. Broadly defined, sustainable development is a systems approach to growth and development and to manage natural, produced, and social capital for the welfare of their own and future generations.

The concept of sustainable development was originally synonymous with that of sustainability and is often still used in that way. Both terms derive from the older forestry term "sustained yield", which in turn a translation of the German term "nachhaltiger Ertrag" dating from 1713[4]. Sustainability science is the study of the concepts of sustainable development and environmental science. There is an additional focus on the present generations' responsibility to improve and maintain the future generations' life by restoring the previous ecosystem and resisting contribute to further ecosystem degradation.

Important related concepts are 'strong' and 'weak' sustainability, deep ecology, and just sustainability. "Just sustainability" offers a socially just conception of sustainability. Just sustainability effectively addresses what has been called the 'equity deficit' of *environmental* sustainability. It is "the egalitarian conception of sustainable development". It generates a more nuanced definition of sustainable development. "the need to ensure a better quality of life for all, now and into the future, in a just and equitable manner, whilst living within the limits of supporting ecosystems.[5]

Information and communication technologies:

The effect of infrastructure services, and among these of information and communication technologies (ICT), on development outcomes is one of the widely open areas on the agenda of development economists and policy makers alike. Despite a flurry of studies on the topic, our knowledge of the strength of the linkages and of the precise channels possibly supporting this relationship is clearly lagging. In part, this is because most of the studies so far have taken a macroeconomic approach, making use of cross-country data to

quantify the effect of different types of infrastructure services on growth, productivity, inequality, or poverty. The many methodological problems involved in this type of empirical analysis have led to uncertain and unstable conclusions. As stressed with respect to a comparable strand of literature, namely, that analyzing the link between institutional quality and development outcomes with cross-country level data, it is probably fair to consider that these studies will not take us much further, and that a more microeconomic approach is needed. For this reason, the volume edited by Torero and von Braun appears as a worthwhile effort to fill such a gap with micro econometric case studies exploring the effect of telecommunications on development in different developing countries. The results support the existence of a positive and significant causal effect, as well as a stronger relative one for low and middle-income countries. As usual in this literature, however, this piece doesn't escape a number of key criticisms. The data discussion is somewhat too long and lacks focus, especially considering that measures others than telecom penetration is finally not used in the empirical exercise. It is not clear either how these data can account for issues like changes in the modality of use as a result of different types of coverage (e.g., a lower telecom connections coverage being compensated by more shared use of the existing ones). Moreover, it would be important to state exactly what question is being asked. Is it about comparing the growth effect of telecom capital to that of overall capital? Does it tell us something about transitory versus permanent effects? Can anything be inferred about optimal infrastructure stocks? Finally, the techniques used appear to be an appealing mix of best practices plus some unit root correction. However, the convenience of using these techniques together should be discussed, in particular in light of the fact that first-differencing destroys long-term relationships.

Measuring the benefit from access to telephone lines for rural households by estimating compensating variations, the results support the idea that households' willingness to pay makes rural coverage extension both feasible and worthwhile on general welfare grounds. Additionally, an interesting insight is that most households value the better communication with family and friends (to which remittances and emergency issues can be added since they are also likely to link to distant family members) above more strictly economic motives like employment or business information. Obviously, family and friend issues may have more diffused economic consequences, for example, in terms of risk sharing, but this observation may go some way to explaining why a strictly economic impact of network expansion is generally difficult to find in the data.

On the other hand, chapter 4 is rather disappointing. In general, the case studies on the firm-level impact of ICT (India, Kenya and Tanzania, Laos) are based on relatively weak data, which limits the lessons that can be drawn from them. Most rely on single-wave, small-scale surveys that prevent their authors from addressing in a satisfactory way some crucial econometric issues, including the endogeneity of the use of ICT because of reverse causation with performances, endogenous placement of firms, and potential selection bias. Furthermore, dynamic issues that seem

pivotal to understanding the effect of ICT on firms' medium-term behavior and performances, especially if one believes that effects of new technology adoption take at least some time to materialize, are obviated. Given this, one cannot help thinking that a more promising avenue would have been to take the time to repeat the surveys and construct decent panel data, thereby alleviating unobserved effects problems, and to generate suitable instruments by collecting more data on the economic environment.

As a result, it is hard to interpret the failure to identify a meaningful economic effect of ICT access on firms' performance. Is there really no such effect, or is this due to data limitations? The evidence from chapter 5 discussed above, showing a positive welfare effect for households, could lead one to think that part of the missing effect on firms is in fact captured by household-level data, to the extent that small informal entrepreneurial activity (including maybe agriculture) is indeed positively affected by ICT access but does not show up in the sample of bigger firms under study. Alternatively, it could be that there is no identifiable effect on firms, for example, because productivity improvements are compensated by more intense competition as the result of better markets and locations interconnection. Better data sets will be needed to tell these and other potential assumptions apart.

Technological development in rural areas:

A large number of voluntary organizations are involved in developing technologies for rural areas. However, these technologies have hardly touched the lives of rural population. Data on rural market potential shows that a population of about 250 million in rural areas exhibits a high level of market potential. This is almost 25% total population of India. With such a high market potential, why have the good efforts of organizations developing technologies, devices and products for rural areas not borne any fruit? This article tries to analyze the reasons and to give some possible solutions.

Most of the technologies being propagated in rural areas are urban-based and biased. They trickle down to rural areas. Rural population is not composed of subhuman beings. Their needs and aspirations are similar to those living in urban areas. Technology development should take place keeping these aspirations in view. Most of the technology development that takes place for rural areas is carried out with an aim to keep it simple so that the devices can be made in rural areas itself. This is a peculiar mindset of technology developers. For poorer sections of rural population, it is asking too much to have them make their own *chulhas, bullock carts* etc. At least nobody in urban areas asks consumers to make their own scooters or cooking stoves! Again the emphasis of technology developers for rural areas has been on catering for needs (with small improvement) rather than creating a demand. History shows that technological development has been fueled by creation of demand. And the watchword is convenience. Thus convenience is the vehicle of development. For example, a large number of developmental groups are working on making better *chulhas*. Feedback from the '*better chulha*' program has not been very

encouraging. Developers do not realize that *chulha* is still a *chulha,* even if it is slightly better. Every housewife, irrespective of the economic strata, which she comes from, would like to have the convenience of blue flame of a gas stove. There is a demand for it. Negligible work has been done on developing technology for producing blue flame from fuel wood and biomass residues.

There is also a peculiar mismatch of groups with perception of, and those with resource for, rural technology development. Thus labs, especially National labs, which have resources, do not have any perception of the needs and demands of rural population. On the other hand, the grass-root NGOs who have the perception of the problem do not have the technological resources to solve them. Again there is a mindset for simple technologies in rural technology developers. Why it is so, is difficult to comprehend when right in front of them are examples contradicting it. For example, bicycle which is the mainstay of rural transport is a complex piece of machinery and is manufactured in sophisticated plants all over the country. It has spread in every nook and corner of rural India because of the convenience of easy availability of spare parts and a large number of repair facilities. This kind of example should be followed in all rural technological development. Also no government subsidy is given for bicycle purchase. It stands on its own.

Another interesting example of demand creation is the setting up of supermarkets in rural Maharashtra. These supermarkets in Taluka areas are similar (though on a smaller scale) to those found in western nations. These supermarkets are owned by local sugar cooperatives and because of their size and economic clout, these markets stock goods at cheaper prices than those available in the local *bania* shops. Besides, the variety of goods available is very large. These supermarkets in one shot have changed the perception of rural people and have created demand for better quality goods. The local *bania* shop could have been enough to take care of the needs but these supermarkets have created demand. In doing so they have helped in upgrading the life style of a certain section of rural population.

The other reason is that the technological output is available and accessible to only a few people because of its cost, and utility. The fact is that though majority of the population in villages do not avail the manufactures produced by this technology, still, the greater damage is being done to environment and it causes water, air, noise, land and radioactive pollutions. Ironically, the damage done by technology is more than the utility of its production. However, a few educated, who are aware of the threats posed by the old technology, may take care of themselves.

A common reaction to the litany of problems attributed to technologies is to argue that the problem is not so much in the technology but in how it is used or abused. Technologies themselves only become environmentally harmful if they are not applied with due sensitivity to the environment. Another reaction is here that technologies often have unexpected side-effects or second-order consequences that were not originally designed into the technology. Pollution is one such side effect that is never intended by the

designers of technology. However, Commoner does not accept these views, arguing that these pollution problems arise not out of some minor inadequacies in the new technologies, but because of their very success in accomplishing their designed aims[6].

Plastics do not degrade in the environment because they were designed to be persistent; similarly, fertilizers were designed to add nitrogen to the soil, so it is not an accident that they add to the nitrogen reaching the waterways. Part of the problem is that many a time technologists make their aims too narrow that they hardly ever aim to guard the environment. That technology can be successful in the ecosystem if its aims are directed toward the system as a whole rather than at some apparently accessible part. Some engineers designed their technology to overcome a specific problem: when raw sewage is dumped into rivers, it uses up too much of the river's oxygen supply as it decomposes. Modern secondary sewage treatment is designed to reduce the oxygen demand of the sewage. However, the treated sewage still contains nutrients which help algae to bloom; and when the algae die they also reduce the oxygen of the river. Instead of this piece meal solution, Commoner argues, engineers should look at the natural cycle and reincorporate the sewage into that cycle by returning it to the soil rather than putting it into the nearest waterway, a new type of technology that is designed with a full knowledge of ecology and the desire to fit with natural systems.

Appropriate technology has been defined as technology tailored to fit the psychosocial and biophysical context prevailing in a particular location and period. It was designed not to dominate nature but to be in harmony with it. Appropriate technology involves attempting to ensure that technologies are fitted to the context of their use both the biophysical context which takes account of health, climate, biodiversity and ecology, and the psycho-social context which includes social institutions, politics, culture, economics, ethics and the personal/spiritual needs of individuals. The reluctance of many engineers to take up alternative technologies can be explained partly in terms of technological paradigms. As a result, technological development tends to follow certain directions, or trajectories, which are determined by the engineering profession and others. Ideas can be developed if they fit the paradigm; otherwise, they tend to be ignored by the mainstream engineers, the bulk of the profession. It seems that those pinning their hopes on technology to deliver to us a sustainable future may well be doing the same thing. Having the technological means to reduce pollution and to protect the environment does not mean that it will automatically be used.

Bird Life partners in France, Ireland, Portugal, Spain and the UK, are deploying unprecedented actions to protect the marine environment, through the project FAME (Future of the Atlantic Marine Environment, Interring Programme 2010-2012). Amongst other, they have been tagging seabirds with mini cameras, which recorded wonderful images**.** Seabirds experts from those countries share their knowledge and their survey methodologies, for a better understanding of seabirds distribution at sea, and their interactions with human activities. In France, David Grémillet's team from the CNRS-CEFE of Montpellier, has deployed several

telemetric devices on a colony of Northern Gannets, in Rouzic, the heart of the National Reserve "SeptIles". This work was performed in close collaboration with the LPO/BirdLife in France Reserve's staff, and with from the University of Rennes. GLS, GPS, Time Depth Recorders, are real concentrates of technology, and provide increasingly accurate information about birds' location and behavior. Their permitted to reply to many questions nobody could answer before such as where the birds' foraging areas and wintering areas are. As a complementary action, several adults from the Northern Gannets colony were tagged in 2011 with a mini- camera. Those images will allow improving the knowledge about the fishing behavior of Gannets, for example know if they fish in group or as isolated birds or what their interactions with fishing boats are. This promising first experience is going to be repeated during the 2012 breeding period, final year of the FAME project.

Conclusions:

Sustainable development relies on technological change to achieve its aims but will governments take the tough steps that are required to force radical technological innovation rather than the technological fixes that have been evident to date? Such measures would require a long-term view and a preparedness to bear short-term economic costs while industry readjusts.

It would seem that as long as sustainable development is constrained to minimal low-cost adjustments that do not need value changes, institutional changes or any sort of radical cultural adjustment, the environment will continue to be degraded. Only if substantial change takes place, the present generation can pass on an equivalent stock of environmental goods to the next generation. Firstly, the rates of loss of animal and plant species, arable land, water quality, tropical forests and cultural heritage are especially serious. Secondly, and perhaps more widely recognized, is the fact that we will not pass on to future generations the ozone layer or global climate system that the current generation inherited. A third reason that devastatingly adds to the anxieties about the first two is the potential impact of continuing population growth and the environmental consequences if increasing standards of material income around the world produce the same sorts of consumption patterns that are feature of the currently industrialized countries.

Even if people believe in the ability of human ingenuity in the form of technology, will be able to safeguard their lifestyles and make sure an ever increasing level of consumption for everyone. They must not overlook the significance of redesigning our technological systems and they should rather continue to apply technological fixes that are seldom satisfactory in the long term. Technological sanguinity should not run away from the need for fundamental social change and a move in priorities[7]. That was the mistake many in the Appropriate Technology Movement made. Indeed, it takes more than the existence of right or clean technologies to make sure their extensive implementation.

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