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SUSTAINABLE DEVELOPMENT WITH THE CLIMATIC CHANGE: ISSUES, CONCERNS AND THE WAY AHEAD

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ABSTRACT

There has been a heightened awareness of pervasive, accelerating and unabated environmental changes, the potential economic value of rapidly depleting finite resources, and their attendant implications for sustainable development across the countries. On the basis of a critical examination of environmental preservation, uncertainty and irreversibility, the paper makes a compelling case, for an accent on renewable energy- an accent appropriate in scale and magnitude.

Since sustainable development has implications for life, biodiversity, climate variability, environmental sustainability, inter-generational and distributive equity, the paper stresses the need for the formulation of an effective strategy, for environment-friendly development, through common effluent treatment plants, cleaner production technologies and environmental concerns in services, acquisition of ISO 14000, real participatory action-research, etc.

In view of the success of local experiments, incentive measures, community enterprises and popular participation, these aspects of the energy discourse need to be replicated on a much wider level, by adopting a holistic approach comprising transforming institutions, growth and quality of life.

There is a manifest need to improve access to renewable, reliable and affordable energy services, promote sustainable use of biomass, and support the transition to cleaner use of fossil fuels. This would constitute the basis for long-term economic development, in a true and meaningful sense. Accordingly, a proposed approach to action-oriented, time-bound outcomes underscores the need for facilitating the transfer of energy technologies, enabling policy environments and creating conditions for greater private sector involvement and setting up of proper appraisal mechanisms.

There has to an accent, on interactive and mutually reinforcing strategies, such as, strengthening the institutional capacity, public-private partnerships and synchronized relationship between government agencies, UN bodies, business and industry, non-governmental organizations and academia to reduce ubiquitous risks.

The survival of species and eco-system services requires making the pursuit of sustainable development a credo, by designing both appropriate energy programs and appropriate energy delivery systems. Towards this end, there has to be enabling policy and operational frameworks comprising cleaner use of fossil fuels, improved use of traditional biomass, sustainable transport, biomass and systems approach, international, national and regional cooperation, gender issues and commitment to concrete measures, with a sequence and well-defined timeline. Policies and programs at both national and global levels must reflect the inextricable connection between socioeconomic and environmental objectives

In the absence of integrated policies and programs with inter-institutional linkages, the outcome would be "the worst of all possible worlds" for the citizens of the world, whose tragedy is "awesome" because of "*the integral and interdependent nature of the Earth, our home*".

KEYWORDS: Sustainable Development, Renewable Energy, Enhanced Energy Efficiency Measures, Finance, Projects, Emerging Market Economies (Emes), Cleaner Production Technologies**,** Environmental Impact Assessment (EIA), Win-Win-Options, stakeholders.

INTRODUCTION

Considered in a proper historical and comparative perspective, access to modern energy has improved the standard of life, for persons across the developmental spectrum. But over 1 billion people still lack access to modern energy services. Against this backdrop, achieving universal access and meeting growing energy, requires a paradigm shift in the delivery of energy services, the use of renewable energy and enhanced energy efficiency measures. This requires a sense of contextual immediacy because, around 1.4 billion people have no access to reliable electricity (GTR, 2013), drastically reducing their chances of getting an education and sustainable livelihoods. Simultaneously, more than 2.7 billion people are dependent, on traditional bio-energy.

The process of transforming unsustainable patterns of consumption and production and developing sustainable livelihood systems can be facilitated by resolving conflicts between the trade regimes and environmental agreements, integrating advanced modern technology, with traditional practices and mainstreaming education, to promote awareness, attitudes, concerns and skills.

DYNAMICS OF SUSTAINABLE DEVELOPMENT

Cohesive efforts for dealing with environmentally sustainable economic development must be based on four pre-requisites of renewal:

- The rate of regeneration must exceed, or equal the rate of rate of harvest;
- Waste emissions should not exceed the renewable assimilative capacity of the micro-environment;
- The rate of exploitation of non-renewable resources, must always be less than or equal to the rate of creation of renewable substitutes;
- If an existing renewable resource substitutes a depleting non-renewable resource, the rate of harvest of this resource, must be strictly less than its rate of regeneration, to the extent necessary to prevent this substitution.

The sustainability of fossil fuels is worked out, by Reserves-to-production ratio (R/P), i.e., the extrapolation of the basis of the reserves, at their present rate of consumption. Estimated global R/P ratios for the main conventional fuels are – Oil-46 years, Natural Gas-58 years and Coal-118 years. This brings to the fore, the concepts of interrelatedness, of a shared planet, of global citizenship and of 'spaceship earth'.

While sustainable development in a globalizing world, stresses the mutuality of activities, we cannot be oblivious to the issue of common but differentiated responsibility, wherein all nations must try and save the planet but rich countries are expected to shoulder greater financial burden than poor nations.

The impact of equitable, sustainable energy policies and programs at both national and international levels requires a holistic approach towards sustainable development reflecting the inextricable connection between economic, social and environmental objectives. This necessitates mutually coherent policies or approaches in finance, trade, investment, technology and sustainable development, particularly because of the inter-linkages of the global village- "*vasudhaiva kutumbkam*", as we say in Sanskrit. More specifically the unsustainable consumption and production patterns jeopardizing the natural life-support system requires improved design and establishment of effective institutions and associated legal and regulatory frameworks; improved policy measures; modernized forestry approaches; improved data collection and associated biomass energy planning; the provision of adequate financial and technical resources and effective mechanisms for transfer of technology.

Protecting and managing sustainable development is a tall order, and requires *inter-alia*, adroitly managing of land degradation, desert ecosystems, forests and wildlife, river and mountain systems, groundwater, wetlands and coastal eco-system**.** This requires reversing the trend of reporting standards that confine to financial information or risks without questioning economic or societal risks. In sum, the background environmental processes need not be taken as exogenously given. The initiation of some welcome measures by various agencies needs to be strongly reinforced by a different mindset, fostering of transformational changes and the sensitization of the common man to environmental concerns to institutionalize sustainable development and develop pathways for our future development.

The goal of equitable, participatory, and environmentally sustainable broad-based sustainable development (BBSD) must replace the narrower goal of economic growth. Good governance for sustainable development at the local, national and global levels and sound economy-wide and sector-specific policies provide the basis for BBSD. Given the enormity of the issue, "*incremental changes*'', as Peter Baker, President and CEO, World Business Council For Sustainable Development (WBCSD), stresses "*cannot be a strategy for sustainability"*.

EMERGING ROLE OF RENEWABLE ENERGY

The traditional approach to some of our most pressing development challenges was demonstrated to be "dangerously inadequate". Hence, the focus of environmental problems has now expanded to encompass problems, such as, water shortage, crop failures, tropical diseases, flooding and extreme weather event condition. Going forward, all these problems could considerably worsen because of increased concentration of greenhouse gases (GHGs). This makes Peter Baker wonder, "*Why do government subsidies and incentivize fossil fuels, and not renewable energy*?" What a remarkable alchemy it is that about $40-50 billion is spent on renewable energy innovation while fossil fuel subsidies exceed $500-800 billion annually.

In view of the fall in prices for renewable energy technologies, e.g., wind and solar, there is a compelling need to revisit the energy mix. But renewable are yet to become mainstream and competitive with conventional energy sources. Greater usage of renewable is still largely a function of a level playing field and a robust policy environment encompassing energy efficiency measures and the implementation of renewable energy technologies. According to International Energy Agency (IEA), the percentage of people without access to energy will rise by around 55-60% by 2030. Our main fossil fuel sources (oil, coal and gas) are finite natural sources and are depleting rapidly. This is why global demand for renewable energy continued to rise during 2011 and 2012, supplying an estimated 19% of global energy consumption in 2011, with a less than a half from traditional biomass. Renewal energy consumption is estimated to grow by 3.1% per year and share of

renewable energy to total energy will increase from 10% in 2008 to 16.5% in 2035 (GTR, 2013).

ISSUES IN RENEWABLE ENERGY

Perspective of Banks and Financial Institutions

Modern renewable energy can substitute fossil and nuclear fuels in power generation, heating and cooling, transport fuels and rural/off-grid energy services. Renewable energy projects are, however, capital intensive with lowers organizational and management costs (except for bio-mass projects). Further, these projects carry high inherent risk and their viability is dependent on multiple factors, such as, government regulatory support and technology trends leading to cost and time overruns. Higher risks lead to higher interest rates because of the risk-reward matrix.

Overseas borrowing is extremely limited, thereby increasing the transaction cost for relatively smaller renewable energy projects. There is constrained availability of bank funds because bank financing is mainly for conventional projects, which have reached near saturation levels.

There is inadequate awareness of specific risk and opportunities for banks and financial institutions preventing them for adopting standard corporate finance projects, i.e., insurance products for mitigations of loss of power not available.In case of solar-thermal energy projects, the crux of the issue boils down to commercial viability and storage technologies (flywheels, super conducting magnetic energy storage-SMES, batteries, pumped storage hydro-electricity – PSH, compressed air energy storage – CAES, electrolysis of water and methenation, thermal storage, hydraulic hydro-energy storage – HHS). There are also issues of commercial viability, scaling up, and replication of successful models elsewhere, lack of reliable solar radiation data and occasional sand and dust in the sunnier regions. In case of state utilities, availability of funding is a major constraint. States do not have a dedicated renewable transmission plan. In sum, renewable energy projects need to acquire a critical mass for them to take-off significantly.

Prism of Emerging Market Economies (EMEs)

While EMEs saddled with three times more population than the developed countries, have been far less responsible for “polluting” the global atmosphere with GHGs, the contribution of EMEs to the worsening of environmental problems is increasing rapidly. A ‘dualistic society’, wherein environmental problems emanate basically from the greed of the rich and the poverty of the poor characterize most EMEs.

Conventional wisdom suggested that EMEs had nothing to gain from environmental concerns - they were ‘too poor to be green’ - and needed to attend to more urgent business of growth theoretic and practices. However, strong environmental movements sprung up in most EMEs. Evidently, there are three rapidly accelerating trends of agricultural intensification, rapid industrialisation and rising energy use, particularly, greater use of fossil fuels.

Sustainable agricultural development encompasses integrated use of agronomic practices, including, soil, water, nutrients, pests and diseases in the pursuit of an increased diversity of enterprises within farms combined with increased linkages and flows between them. A wide range of local to global environmental interventions is needed to safeguard both environmental quality and human health. The strategy of effective environmental management, *interalia*, requires expanding water and sanitation coverage, tackling indoor air pollution, controlling disease vectors in the local environment, eco-friendly industrialisation by pollution abatement measures, reducing exposure to the worst offenders and cleaner production in the future, etc.

Poverty eradication and sustainable livelihoods require the integration of the agricultural, economic, social, and environmental sectors of the economy with combinations of practical, applied, and theoretical perspectives.

Reducing acute risks from pesticide use, adopting less disruptive agriculture practices by strategic management of pests, reduced fertiliser use and rational irrigation, checking rising energy use, reducing CO_2 emissions and close association between the state industries and Pollution Control Board (PCB) in identification of toxic substances would be helpful in shaping our vision of a greener and more sustainable world. However, Dole et al have persuasively argued, "*Perhaps the biggest question for environmental policy in developing countries is not how to improve an existing system, but rather how to build a system relative to a country's given economic, social, and political status*" (Dole, D. and Abeygunawardena 2002).

Bridging the gap between energy-rich and energy-poor countries requires an institutionalized mechanism of incentives, integrated policies and programmes, greater global cooperation, proactive role of national, state and local governments and strengthened linkages between formal and informal / non-formal institutions. There is a compelling need for establishing policies that can sustain inter-institutional linkages for the technical development of the biomass sector; micro-level planning and grassroots assessment for identifying energy needs and priorities to design appropriate biomass energy programmes; and designing appropriate energy delivery systems for rural areas. This requires strategic direction, thorough consultation, business creativity and innovative market solutions together with a long-term partnership between business and government.

Imperatives of Cleaner Production Technologies

Increasing industrialization without proper treatment of effluents is a major cause of rapidly rising pollution levels. Inappropriate handling of industrial wastes aggravates problems both for the human beings and the natural environment. Cleaner production (CP), which is the continuous application of an integrated preventive environmental strategy to processes and products to reduce risks to human beings and the environment, can play a major role in the control and management of industrial waste. Cleaner production leads to financial benefits through energy savings, waste reduction, waste conservation and higher–quality-output. Consequently, in most industries, there is a potential of reducing the consumption of resources by 10-15 % with more efficient production processes and, therefore, better bottom-lines. The principal cleaner production technologies, which could provide a basis for effective environmental management within a business setting, relate to source reduction, recycling and reuse and product reformulation or modification.

Despite the demonstrated benefits of cleaner production technologies, firms are reluctant to install cleaner technologies because of the difficulty in accessing finance, sometimes the cost of investment exceeds the benefit realized, insufficient mechanisms of regulations and monitoring and enforcement measures to push firms to internalise the environmental cost. There is thus a considerable potential to move 'upstream' to cleaner process technologies and materials. These technologies, which reduce resource use while injecting productivity and quality gains, require computerised monitoring and control systems (for process optimisation), 'natural' and water-based adhesives, coatings and laminates, high efficiency spray guns, zero emission chemical mixers, high efficiency/ low maintenance 'hose pumps' for effluents and abrasive materials, and high pressure leaning in place systems for vessel/ booth washing, etc.

Given the wide variety of technology practices in the industrial sector, sustainability must be embedded in every process or activity of businesses. Hence, the eco-competitiveness agenda for industry must stress:

- **Move towards zero emission and zero effluent goals.** Focus on holistic recovery and recycling strategies, attack inherited pollution, and create wealth from wastes.
- **Adopt an integrated approach towards environment, quality, health and safety.** Look beyond ISO 14000, address safety and emergency response issues and adopt eco-labeling.
- **Translate cutting edge technology into environmental benefits**. Focus on biotechnology up gradations, environmental and processed management solutions and accelerate research.
- **Utilize new markets for environment trading and Clean Development Mechanism (CDM) projects**. Implement efficient, reasonable and clean energy technology projects and introduce carbon accounting.
- **Adopt environmental performance as corporate social responsibility.**

There is a need for waste minimization ranging from good operating practices to modified production process. Attempts need, therefore, be made to provide assistance for pre-competitive industrial research and to involve business in setting benchmarks and targets for each of major energy-using industries. Altering the frameworks and drivers of the corporate world requires adoption of technologies and best practice techniques for environmental benefits among industrial units, preferably technologies for process changes in industrial units.

Change management requires vigorous efforts to promote and facilitate industry action for environmental improvement and management, dissemination of business related information on climate change, energy efficiency and climate friendly technology, and providing technology intermediation and business to business match making services. Accordingly, environmental concerns need to be dovetailed into development planning to formulate a coherent strategy for environment-friendly development:

Level	Integration of Environmental Policies And Procedures	Environmental Assessment Planning
National	Environmental policy included in national action plan	Environmental profiles International Assistance Agency Country Programming.
Regional	Economic-cum-environmental development	Integrated regional development planning. Land use planning Environmental master plans.
Sectoral	Sectoral review linked with other economic sectors	Sector environmental guidelines. Sector review strategy.
Project	Environmental review of project activities EIA procedures.	Environmental Impact Assessment (EIA) Environmental guidelines

Sustainable development requires a careful integration of environmental, economic and social needs to achieve both an increased standard of living in the short term and a net gain or equilibrium among human, natural, and economic resources in the future. The cost-benefit analysis of projects must factor in appropriate discount rates, substitutability and the assurance of inter and intra-generational equity through institutional regulation, community participation and education to seek long-term solutions. This process needs to be facilitated by knowledge exchange, policy development, networking and collective action between all segments and societies.

CONCLUSIONS

The challenge of sustainable development for policy and development agencies requires devising of programmes for each area on the basis of the short-term strategy and the long-term programme for survival. The commonality of interest requires equitable allocation of resources, attention to quality of economic growth, new technologies for efficient resource use and need-oriented economic and ecological development. In the Indian context, empowering local government and people, increasing a forestation and preventing swamping of traditional social and cultural systems would also help in the pursuit of win-win options. What is urgently called for is the broad basing of the development process - different programmes ought to be looked at not in isolation but as part of an organic whole. More specifically, well-defined policy and procedures need include political will and determination to implement response actions and research for new technology initiatives, global cooperation and coordinated action reflecting sectoral and regional differences and supplementing the role of markets by government action.

In the context of developing countries like India preoccupied with higher growth rates, it is also important to consider the concerns of fragile eco-system. Sustainable development is not attainable without economic growth. Sustainability requires alleviation of poverty, a decline in fertility, the substitution of human capital for natural resources, effective demand for environmental quality and a responsive supply to the vicious circle of environmental degradation-low productivity- unemployment/ underemployment and inflation – poverty- environmental - low productivity by a strategy of attaining higher income.

The process of development itself also generates considerable environmental degradation. Development at the cost of environment could be attributed to the myopic short-term vision that a transition from an agricultural or rural economy to an industrialised and urban economy is invariably accompanied by a rise in pollution. However, the pollution levels might fall later. This development challenge requires subjecting new technologies to environmental scrutiny and constantly modifying them to meet environmental needs. Recognition of inherent complimentarily in the long run needs to replace the misplaced perception that the roles of environment and development are essentially conflicting and adversarial. The developing countries thus now also need to strengthen institutions, broaden inclusiveness in the access to assets and increase transparency (WDR 2003).

There are definite "*limits to growth*" and in the ultimate analysis, eco-friendly development is often the best, sometimes the only method, of enhancing economic development. There is no unavoidable trade-off between environment and development objectives and a synergistic relationship exists between growth and employment, employment and environment and environment and growth. Worldwide experiences demonstrate that environmentally unsustainable practices turn out to be more expensive in the long run in terms of human and health costs and loss of capability. The WDR 2003 attributes the failure to implement effective long-term policies "*to the social and political problems associated with distributing costs and benefits within and between groups and generations*." The UN initiative "Sustainable Energy for All" (SE4ALL), which aims to provide universal access to modern energy services, improved rates of energy efficiency, and increased use of renewable sources globally by 2030, could provide important guideposts.

In overcoming the scourge of environmental catastrophe, all stake-holders including Government, global organizations, industry associations, customers, voluntary environmental initiatives (VEIs) and agreements (VEAs), science and academic and civil society must make synchronized efforts to rapidly transit to a renewable energy future

while furthering energy security, socio-economic development and poverty alleviation.

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