INDIAN NATIONAL ASSOCIATION

TOWARDS A RESOURCE RESILIENT INDIA

Security of Natural Resources for All: The Critical Need for Coherence in Policies and Actions

Development Alternatives for Club of Rome-India

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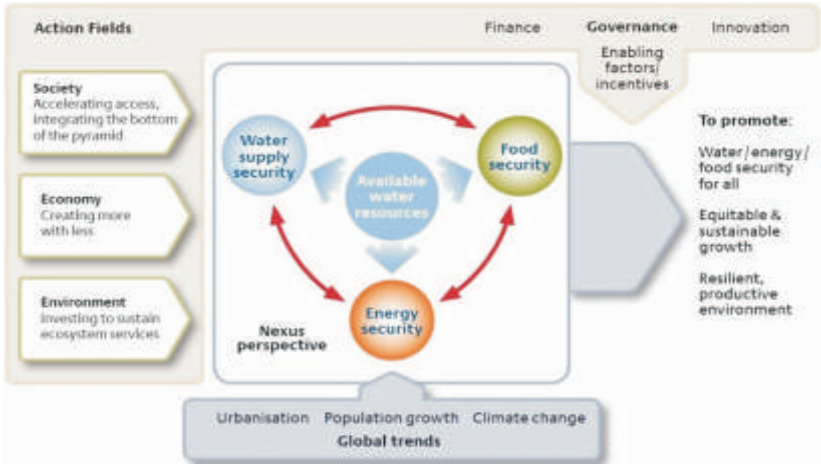
Message

This booklet has been prepared and published by Development Alternatives (DA) for the Club of Rome's 2017 Annual Conference on "Towards a Resource Resilient India", to be held in Mumbai, from 16-17 November 2017. It draws on some earlier work that DA contributed to the International Resource Panel of UNEP. I am deeply grateful to my coworkers in DA for their help in preparing this publication, and to the Secretary and Staff of the Indian National Association for the Club of Rome for their very valuable inputs, both in substance and text to illustrate the issues covered.

Ashok Khosla
Trustee - Club of Rome – India
Chairman, Development Alternatives and
Co-President, Club of Rome (2005-2012)

Policy Coherence for Managing the Nation's Resources

Established in 2011, the Indian National Association for the Club of Rome is a non-profit organisation, which aims "to act as a global catalyst for change through the identification and analysis of the crucial problems India is facing and the communication of such problems to the most important public and private decision makers as well as general public." The broad goal of the national chapter, CoR-India, is to help design an agenda for governments in India, the business sector as well as all its citizens' organisations that could enable everybody in the country live fuller lives in harmony with their surroundings by the centenary of the nation, 2047.



In 2014, the Indian National Association for the Club of Rome initiated a 5-year series of Annual conferences to examine and analyse the issues of policy coherence in how India manages its key resources. This series was designed to cover the following issues:

- 2014 - "Securing Food for All"
- 2015 - "Securing Water for All"
- 2016 - "Securing the Forests, Land and Soils for All"
- 2017 - "Securing Materials and Energy for All "
- 2018 - "Sustainable Livelihoods for All" (Planned)

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Summary

Transforming fundamental social and economic paradigms is both a challenge as well as an opportunity. With a population of 1.2 billion people and growing, accounting for 17 percent of the global population, living on only 2.4 percent of the world's surface, India faces deep impediments to achieving the kind of secure and sustainable access to the natural resources and its future generations need for the prosperity and wellbeing they legitimately aspire to.

Though not yet as widely recognised as other global threats we face such as climate change or species extinction, resource issues are now becoming increasingly visible through their impacts on economic production, trade, and environment – witness the growing scarcity and consequent price shocks constraining the use of energy, water and once abundant building materials such as sand.

These also have larger economic, social, political and environmental consequences, including particularly the burden borne disproportionately by the poor and vulnerable, both within and among nations.

India's extraction of primary raw materials increased by around 420% from 1970 to 2010. The country's consumption, at 5 billion tonnes, made it the third largest consumer after China and the United States, using about 7.2% of the resources extracted in the world. Till the 1970s-80s, biomass constituted the predominant share of resources consumed, but by 2010, the share of abiotic materials has climbed to nearly 50%. Despite high aggregate consumption levels, per capita consumption in India remains lower than the world average.

Our concerns regarding natural resources, then, are:

(i) How can the economy get the maximum benefit for all citizens from the Earth's resource endowments? and

(ii) What technology, economic and lifestyles choices would enable us to maximise human wellbeing and minimise ecological damage?

India now needs to pursue a "circular economy" path based on efficiency, greater use of renewable and secondary resources and waste minimisation (the 3Rs – reduce, reuse, recycle) – and of course, sufficiency. The 2017 Annual Conference is therefore titled "Towards a Resource Resilient India", to explore how Government's policies, Industry's practices and Consumers' behaviour can lead to a more resource secure national future.

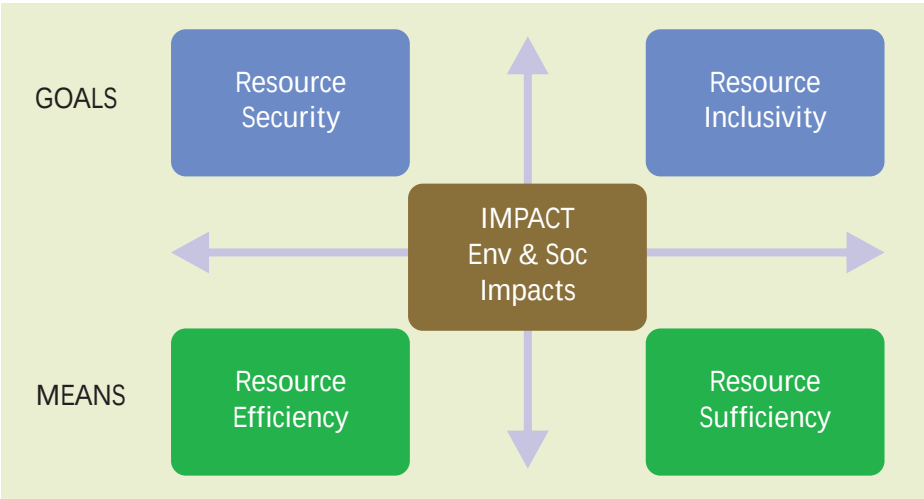
Ashok Khosla
Chairman, Development Alternatives and Trustee, The Club of Rome-India

Natural Resources - Goals and Means - and Impacts

Over 4.5 billion years of evolution and sustenance, Nature has successfully provided its vast and abundant bounty of resources for a growing complexity of living organisms on our common planet. For the first time in that long history, over less than one century, one species – human beings – have created stresses and scarcities that threaten the survival, let along the wellbeing, of all those living organisms.

The human population is increasing rapidly and needs are also growing, demand of resources has increased drastically; eventually there is a great pressure on the existing finite resources and they are being over exploited. Structural changes in a society also lead to transformations in consumption patterns and lifestyles, which then impact resource consumption patterns.

Security of natural resources is embedded under four themes in the present context for countries like India - Resource Efficiency, Resource Inclusivity, Resource Security and Resource Use Impact.



Goal 1: Resource Security

All agricultural and manufacturing activities need natural resources, as do construction, transportation and day-to-day living and India's manufacturing sector is primarily natural resource-driven. Metals, chemicals, textiles and food contribute about 60 per cent of manufacturing. The Indian economy requires more materials per output than many other economies. To avoid the negative impacts of resource scarcity on India's economic future, considerable policy foresight is needed to ensure continuing security of minerals along with food, water, forest and biodiversity, land and soil.

Goal 2: Resource Inclusivity

Perversely, the worst development outcomes -- measured in poverty, inequality, and deprivation--are often found in those countries with the greatest natural resource endowments. Often, development that is heavily dependent on resources induces displacement and related loss of livelihoods, particularly among the poor. Women, children, the elderly and those vulnerable to natural disasters have less access to resources which increases their marginalisation.

Means 1: Resource Efficiency

Resource efficiency means using the Earth's limited resources in a sustainable manner while minimising the impact on the environment. It allows us to create more with less and deliver greater value with lesser input. Its directly available tools are the Six R's (Reduce, Reuse, Recyle, Refurbish, Remanufacture and Refuse) and the most effective long term strategies are miniaturization, durability and sharing of physical products and assets.

Means 2: Resource Sufficiency

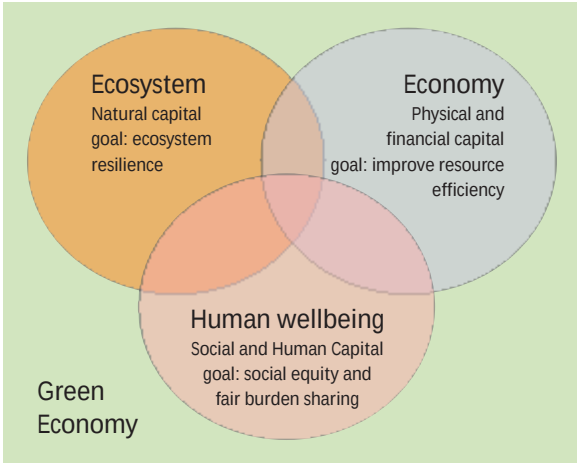
Resource sufficiency is achieved by simply adopting lifestyles and consumption patterns that are neither more nor less than what is needed for everyone to have a decent, healthy and prosperous life. While this is a necessity more among affluent societies, it applies to all whose basic needs are met.

Impact: Resource Use Impact

The positive impacts of resource use on society, environment and the economy have to be maximised and the negative ones must be reduced to the minimum.

The Debate Needed Today

The three different dimensions - ecological, economical and ethnological (i.e. social or cultural) - are associated with natural resources. If a natural resource is required to be used, its use must be physically possible, economically viable and culturally acceptable.



Economic benefits - Prosperity

A Resource Resilient approach has the potential to improve resource availability that is critical to the growth of industries, which translates into reduced price spikes because of supply constraints or disruptions. By using resources more efficiently, or by using secondary resources, industries can improve competitiveness and profitability, since material cost is typically the largest cost for the manufacturing sector.

Social benefits - Human Wellbeing

Reduced extraction pressures from adoption of Resource Resilient approaches have the potential to lessen conflict and displacement and improve human wellbeing. This can increase affordability and access to resources critical for removing poverty and raising human potential. A resource resilient approach has enormous potential for job creation, not only in the recycling sectors, but also high skilled jobs in innovative design and manufacturing.

Ecosystems - Environmental Benefits

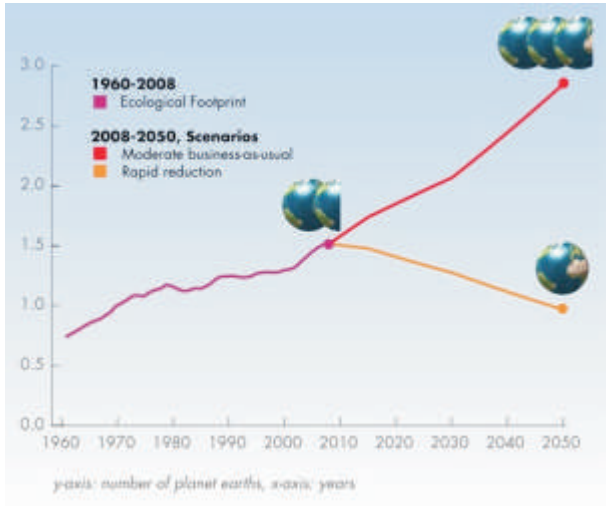
Lowering extraction pressures through Resource Resilient approaches helps in reducing ecological degradation and other risks, and leads to opportunities for landscape restoration and regeneration of degraded areas. Reduced contamination of water, air and soils can lead to healthier and more productive assets for agriculture, manufacturing and habitation.

Targets – Examples

1. Materials and Minerals: Optimise use of minerals, conserve and recycle materials in manufacturing and infrastructures, secure critical minerals, tackle challenges of fluctuating commodity markets and introduce efficient innovations in resource extraction, etc.

2. Water and Marine Resources: 'Fewer Drops for More Crops', prevent flooding and drought by fighting climate change, protect water qualiity, regulate use of surface water and groundwater, etc.

3. Croplands and Grazing Lands: Protect fertile land from diversion to other uses, remediate contaminated sites, redesign policies for land use, etc.



Source: Global Footprint Network

4. Soils: prevent soil damage, mitigate infrastructure impact, restore organic matter contents, avoid chemical pollution, etc.

5. Ecosystems and Biodiversity: Reduce acidification, avoid ecosystem damage and maintain biodiversity.

6. Energy: Regular and adequate supply of energy, less waste and losses of electricity, less energy losses, effective distribution network and SMART grids, minimise demand and supply gap of energy, effective asset management, etc.

7. Wastes: Reduce consumption, develop new materials, use newer cleaner technologies, use more abundant resources, reuse and recycle; promote circular economy, thinking beyond 'take, make, dispose,' and design an economy that restores and regenerates.

Towards a Resource Resilient India
- The Critical Need for Coherence in Policies and Actions

THE OBSTACLES: OBJECTIVES TOO NARROW, TIME HORIZONS TOO SHORT

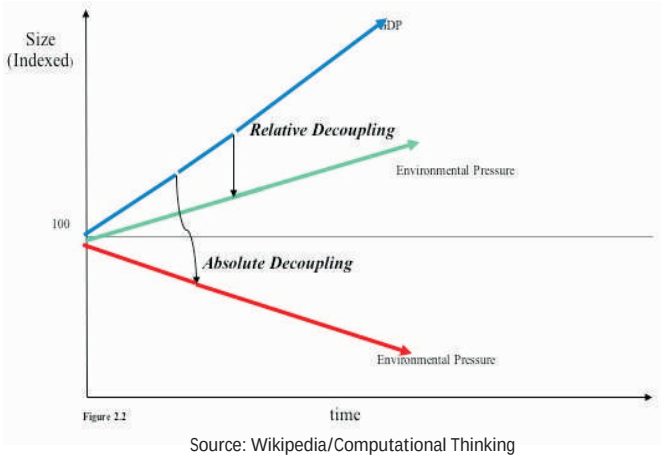
With today's production systems – industrial, agricultural, extractive or service-based - there are very large opportunities for raising efficiency. From simple housekeeping or technological measures to logistical and systemic ones, great increases in efficiency can be won at very little marginal cost and even improved overall economic performance to enable producers and consumers to get much more with much less. Resource efficiency is thus a "good", delivering "triple win" outcomes for the economy and for society and the environment. Given the general convergence of self-interest and the broad area of common purpose among participants in international negotiations, the push for efficiency is a "low hanging fruit" to be pursued.

The need for sufficiency ("raising the floor", "at least enough for survival") at the lower end of the economy (where the poor and marginalised live) is self-evident for any society that aims at being socially just. The need for sufficiency ("lowering the ceiling", "enough is enough") at the upper end of the economy may be less self-comfortable for those in the wealthier social strata, but needs to be recognised – as was already clear to Mahatma Gandhi many decades ago - as a logical consequence of a finite natural resource base and planetary boundaries.

Policy makers who wish to deal with these difficult choices are confronted by factors that further obfuscate their decisions: growing complexity, rapid change and significant uncertainty in the system – political, social, economic or technological – that they must deal with daily. Often the short-term takes inordinate precedence over longer time horizons (which are themselves shortening by the day).

Adopting leaded petrol for automobile efficiency, Freons (CFCs) for air conditioners and foams, DDT for malaria control were all well-intentioned policies, which led to unintended consequences that were so negative that use of these 'miracle' substances is no

The Global South typically wants relative decoupling, and the North should aim at absolute decoupling



Source: Wikipedia/Computational Thinking

longer permissible. The promise of plastics has led to the mass murder of marine life and widespread deterioration of terrestrial ecosystems, making it another material headed for oblivion. The convenience of fossil fuel use has led to the ultimate threat to life on Earth - Global Warming.

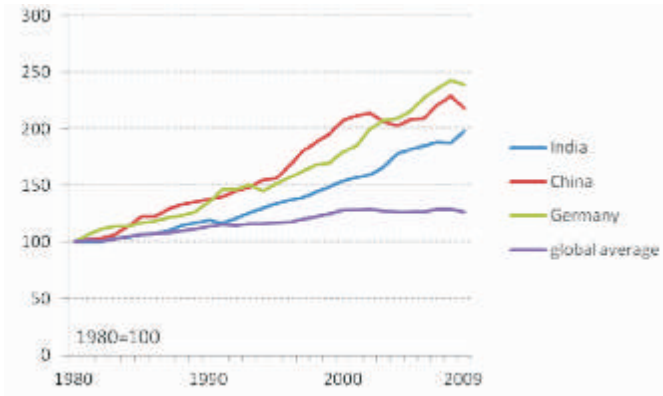
The introduction of the 'Green Revolution' in the mid-1960s enabled Punjab and other states in India to literally save the nation from starvation, but within 50 years, it has left these states with poisoned soils and water bodies, loss of soil fertility and declining crop productivity, explosion of cancer and other diseases, rampant unemployment and drug use and a general breakdown of social systems.

Every day, we see the conflict between different sets of otherwise desirable social objectives where policies designed to solve immediate problems end up creating bigger problems later. Free electricity for farmers leading to over-irrigation and unnecessary contamination of aquifers; building of ill-planned overpasses leading to even greater traffic congestion; promotion of biofuels leading to competition with food crops, irrigation water and forests – these are all common examples of counter-intuitive and countervailing impacts of well-intentioned but narrowly conceived decisions.

REDEFINING PROGRESS: BEYOND GDP AND GROWTH

Despite several decades of advocacy for alternative economic models, global and most national economies are still ruled by a virtual total reliance on the paradigms of GDP and economic growth. All measurement, analysis, tracking and subsequent communication is based on the flawed and highly limited index of gross production and the bulk of subsequent policy formulation is aimed at how to accelerate its growth.

Domestic Material Consumption (DMC) Per Unit GDP



Source: Wikipedia/Computational Thinking

Under these circumstances, it is no wonder that even fundamental issues such as growth of joblessness, resource depletion, environmental destruction or community vulnerability hardly figure in national policies.

Policies to promote GDP growth tend automatically to focus the minds of policy makers on increasing investments and providing incentives to industry, urban and other infrastructure, mining and resource

extraction – implicitly promoting increased resource use and producing more waste and pollution i.e. encouraging more of the 'bads' that actually need to be reduced.

Globalisation in the sense of international economic integration has brought with it many goods and bads of its own. Growing trade, transfer of technology, movement of skilled professionals and the exchange of knowledge have all contributed to improving the lives of people in many countries. At the same time, rising inequity, lopsided accumulation of wealth and the concentration of economic and political power that comes with it, has now started to limit how much integration will be tolerated, either by the poor or the rich.

Mechanisation and digitalisation, including robotics, artificial intelligence while delivering great improvements in lives and opportunities are now threatening jobs, making it necessary to question the future of work and accelerating the need for alternative sources of taxation.

The major guzzlers of material resources are construction, infrastructure, transportation, industry and energy production. Together, these account for the bulk of the major raw materials used in the economy: steel, cement, aluminium, copper, sand, clay, etc. Agriculture is a major consumer of fresh water, energy, phosphorous, and other minerals. It has now become apparent that the goods and services provided by these sectors could with improved technologies and logistical systems, be provided with far lower inputs than they do at present, thus resulting in far less geophysical damage and also producing much fewer wastes and pollution. The cumulative impact of doing so on maintaining biodiversity is a huge additional bonus.

Thus, while GDP and other conventional indicators of economic progress will no doubt continue to be important inputs for decision-making, we now also need to incorporate measures of other social and environmental outcomes of economic activities to obtain a better understanding of what is the degree of genuine human progress. This, science, often termed 'full-cost accounting' is still in its infancy and needs to be rapidly advanced if costly, possibly irreversible changes in the biosphere that sustains us are to be avoided.

CURE OR PREVENTION?

Despite received wisdom, we continue to think of implementing end-of-pipe solutions rather than mitigating causal factors.

Systems thinking provides policy makers the framework and a toolkit to understand seemingly disconnected effects of actions; and why for example, solutions in the short term (such as focusing only on cash crops) in later

years exacerbate the very problems (farmers' financial security) they were designed to solve. We urgently need to strengthen our nation's ability to build the skills of our policy makers, planners and programme implementation personnel. In summary,

- Deep linkages exist across sectors, geographies, social and institutional systems.
- Ignoring these inter-linkages leads to outcomes that diminish the value of development interventions.
- Frameworks for policies, laws and regulations and implementation processes must be designed to generate synergies among these components, minimise trade-offs and reinforce sustainability.
- A systems view is essential for promoting resource and energy efficiencies, healthy local economies and equitable and fulfilled societies over the long term.
- To achieve this, requires a paradigm shift in mental maps of our development planners and implementers, which needs Systems Thinking Skills Systems Modelling Ability.

The new paradigm thinking that is based on Systems Thinking for Sustainable Development compels users to seek direct-indirect, spatial, temporal, sectoral and hierarchical linkages in policy strategies and solutions. It widens perspectives and induces decision makers to look critically at the indicators of development beyond the traditional economic and growth measures of GDP. These are the areas that the Development Alternatives Group and the Club of Rome seek to explore and implement.

Q1: What are examples of major policy conflicts, policy requirements relating to Material Resources, within these sectors and in other sectors that impact these resources?

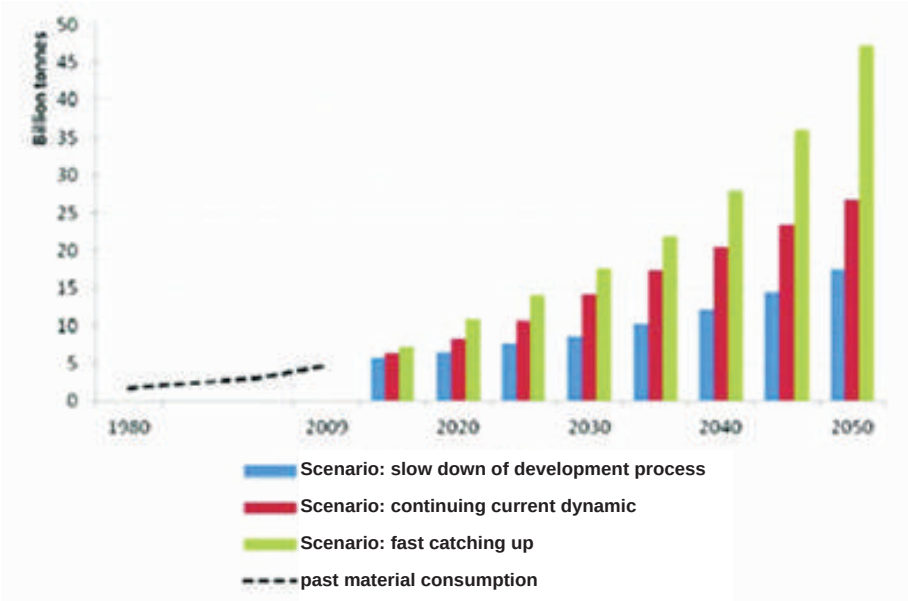
Q2: What structural changes are needed in governance to ensure that policies in different sectors and domains that effect Material and Natural Resources are coherent, convergent and mutually reinforcing?

Q3: What are the knowledge gaps or other barriers that prevent rational policy formulation for these resources?

Plenary 1 Issue: Materials Security for Efficient Make in India

India is on a path of 'Make in India' with a focus on 25 sectors, most of which directly use natural resources as raw materials.

India's population and economy, which are both among the largest and most rapidly growing in the world, require large amounts of material resources. Although the per capita use of resources is very low, the nation's aggregate of 5 billion tonnes per year is already straining their availability for essential development needs. For its own future and as a leader and role model for other developing countries, India needs urgently to become more resource efficient and thus resource resilient.



India's Past Material Demand and Future Material Consumption (IGEP, 2013)

Earth's capacity to continue to provide resources for human population in the immediate and more distant future is of critical importance. This was recognised more than 50 years ago in the ground-breaking report 'Scarcity and Growth, from Resources for the Future' (Barnett and Morse, 1965[1]). The report concluded that innovation and technology had largely stabilised or reduced the costs of resources, but that environmental endowments were not as amenable to such innovation. It warned that environmental scarcity would ensue if the environmental market externalities were not efficiently internalised.

The extraction of both biomass and fossil fuels has doubled, while the extraction of metal ores has tripled and the extraction of non-metal minerals has nearly quadrupled during the period. Since countries of Asia are growing very fast, the extraction of primary materials is more than quintupled within the 40 years.

No doubt India is rich in natural resources but its rate of consumption of these is a major cause for concern for future resource security..

While extraction of biotic materials increased only by a factor of 2.4, the extraction of abiotic materials, particularly of non-metallic minerals, showed a remarkable increase, primarily for the construction, infrastructure and transport sectors.

Compared to extraction, India's exports and imports are still small in terms of quantity. However, both have grown significantly. Exports continue to be dominated by metal ores, particularly iron and steel; while imports are dominated by energy-carriers, particularly petroleum and coal.

Therefore, there is a need to address the following questions:

Q1: What are the existing means and policies available to support materials security in India? Do these policies need changes or revision?

Q2: What policy changes are needed to ensure adequate material availability at least environmental cost to fulfil the aims of the 'Make in India' goals?

Q3: What changes in policies and corporate practice are needed to promote resource efficiency and use of secondary/renewable materials?

Q4: Can Corporate Sector, Government and Civil Society Organisations contribute jointly to solve the issues of material security in India at large?

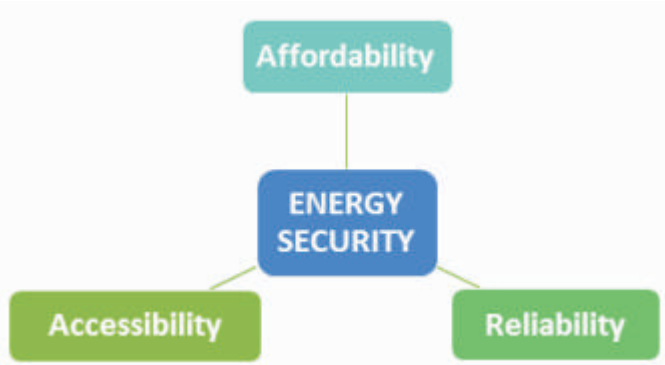
[1]Harold J. Barnett , Chandler Morse ," Economic Development and Cultural Change 14, no. 1 (Oct., 1965): 113-117.

Plenary 2 Issue: Energy Security for All

Often energy security is considered as the uninterrupted availability of energy sources at an affordable price. This covers all major aspects of affordability, accessibility and reliability at a National and Global context.

Energy security is deeply correlated to Economic Security. Equitable accessibility of energy at lower or affordable costs is essential for the economy to function properly. The world's economic growth is derived by the primary energy and final source of energy.

With limited petroleum and natural gas resources, India faces a major challenge to meet the energy needs of the nation without transgressing its commitments to carbon emission reduction. In 2015 India consumed 882 million tonnes of oil equivalent energy, out of which 290 million tonnes of oil equivalent energy were imported from other countries. Until it can generate sufficient energy from renewable sources such as the sun, wind and biomass, its energy security is highly dependent on external sources of energy.



India's power generation capacity is around 315 GW, well below that of China and USA. Around 69% of India's power comes from thermal (non-renewable) and 29% from renewable resources. The latent demand and supply is around 20 times the actual power generated in India.

The Government is committed to provide 24×7 reliable supply of electricity to all the citizens of the country in the next 5 years. In order to achieve this objective several targeted programmes have already been launched by the Government of India which include: (1) Deen Dayal Upadhyaya Gram Jyoti Yojana with an investment of US$ 7 billion, (2) Integrated Power Development Scheme that covers 5,000 towns with an investment of US$ 6 billion, (3) North Eastern Regional Power System Improvement Project (NERPSIP) with an investment of US$ 1 billion, (4) New RE Program with a target of 175 GW by 2022 and investment commitment of US$ 260 billion, (5) 100 Smart Cities and Rejuvenation of 500 towns where smart grids will provide clean and sustainable energy, (6) National Mission on Electric Mobility with a target of 6-7 lakh electric vehicles by 2022; and (7) National Smart

Grid Mission (NSGM) that will take up development of smart grids on fast track in coordination with the above programmes.

Emerging Challenges in Power Sector

Power generation, transmission, distribution and consumption are linked to each other and this cycle must function properly. The current technical and institutional systems have not been able to deliver power of adequate quanitity and quality to the people, farmers, businesses and industries of the country. However, current policies and initiatives aim at improving the situation, and the Conference is invited to evaluate their potential contribution:

- Renewable energy and non-renewable energy
- Power Grids, Smart Grids and Policies
- Decentralised energy: Challenges and Possibilities
- Nuclear Energy

The conference would try to capture the following questions:

Q1: What roles do digitalisation, management information systems, and smart grid management have and what policies can enhance these?

Q2: What innovations or regulations can improve economic viability, reduce transmission loss, and enhance reliability at National or SMART Grids?

Q3: What structural changes such as business or community participation can help improve the economics and universality of energy networks?

Q4: What measures can promote spread of renewable energy, and can it cater to 100% of India's needs?

Q5: What suggestions could help improve:

a. Quality of power in the rural areas
b. Erratic and unreliable supply
c. The pump storage capacity
d. Nuclear Energy and nuclear waste

Plenary 3 Issue: Equitable Access to India's Natural Resources - Water and Terrestrial Ecosystems for All

Issues of lack of natural resources, such as, water, land, soils, and forests – and of lack of equitable access to these by all – are now becoming commonplace and are in some areas reaching dangerous levels. What was once the pride and unique wealth of India, its biotic and abiotic resources, are now suffering from massive degradation and loss.

Today India needs some 1.7 Indias to sustain itself, up from the 0.3 or so Indias it needed at the time of independence. The generous wealth endowed to us by Mother Nature, like a spendthrift's bank balance, is rapidly disappearing, as the gap between withdrawals and deposits keeps growing.

This session will review the recommendations of earlier Annual Conferences and current government actions and policies, and discuss how think tanks can support policymakers to evolve more pragmatic and easy to apply recommendations. Some of the issues to be covered are:

Climate Change and Water Security

- Impacts
- Adaptation
- Mitigation

- System Dynamics of Pollution, Exploitation and Encroachment of Rivers
  Global and National Politics for Coherence in Water Policy
- Counterintuitive Policies in Water Security
- Environment And Resources Issues In Water Security
- Creating Policy Successes in River Conservation and Water Security
- Best Practices in Water Management for a Water-Secure Future

This plenary session will address the questions such as the following, with a view to drawing out the synergies and trade-offs among the different concerns:

Q1: How effective are the existing policies and practices in maintaining the productivity and health of our water resources?

Q2: What are the major barriers and hurdles to enabling local communities to act as guardians of their local natural resources?

Q3: What is the current knowledge base on the minimum water flows, particularly in our rivers and streams, which is needed to maintain basic ecological services and what research is required to be conducted?

Q4: How can multi sector involvement and financial inclusion be encouraged so as to maintain natural resources and ensure equitable access for all?

Plenary 4 Issue: Price Volatility of Resources - An Economic and Geopolitical Challenge

The future commodity prices and availability of resources like minerals, water and land may often be similarly out of line with the future reality. Repeatedly, the focus of price volatility on energy and power sectors in policy domains is more prominent, as it has a direct impact on the consumer. However, the cost of resources is also equally important.

One of the greatest challenges facing humanity today is to maintain the healthy growth necessary to lift the world's one billion people out of absolute poverty and manage the natural resources required for the well-being of nine billion people by 2050 – all while keeping environmental impacts within acceptable limits and sustaining life's natural support system.

Improving the rate of resource productivity, doing more with less, faster than the economic growth rate is the notion behind decoupling, to the extent of actually using less resources.

The worldwide use of natural resources has accelerated, causing severe environmental damage and depletion of these resources.

Annual material extraction grew by a factor of eight through the twentieth century. At the same time, the use of resources, such as freshwater, land, sand and soil has transgressed sustainable levels.

This explosion in demand is set to accelerate as population growth and the increase in incomes continue to rise. More than 3 billion people are expected to enjoy "middle class" income levels in the next twenty years, compared to 1.8 billion today.

A global economy, based on the current consumption models, is not sustainable and carries significant economic consequences. Price volatility and supply shocks of resources have already been observed across a range of key materials and commodities. The volatility of food prices, for example, increased to 22.4 per cent in 2000-2012 compared to 7.7 per cent in the previous decade.

A high level of leadership is obviously needed in the public and private sectors to overcome the resistance that is commonly faced by such deep policy changes and to promote the needed policy action.

However, reducing investment uncertainty and political lock-in, and changing unhelpful public decision making structures, increasing innovation capacity, adjusting government pricing instruments to align market resource prices with decoupling and creating new and effective market structures are always helpful for mitigating the price volatility.

Indian policies are quite strengthened, which is why, in 2015, India was one of the fastest growing economies in the world. However it remains one of the few countries that have been able to overcome the challenges posed by the sluggish global economy. Sustaining such growth is a necessary, if not sufficient, condition to ensure that the living standards of hundreds of millions of people living in absolute poverty are improved.

This session will address the following questions:

Q1: What are the current trends in the central government and provincial government to cope up with price volatility and restricted availability of resources? What India is doing to control price volatility of resources?

Q2: How to ensure economic visible technology and mechanism to link with supply chains – internationally and nationally?

Q3: How can India be more self-reliant on material resources without destroying the land and fresh water resources?

Q4: What type of role private sector and government can play to strengthen each other?

Plenary 5 Issue: Education for Internalising Natural Resource Efficiency in Corporate Performance

Today's economic systems are complex, rapidly changing and vulnerable to external perturbations of many kinds, ranging from natural disasters to hostile trade-related actions to changing fashions.

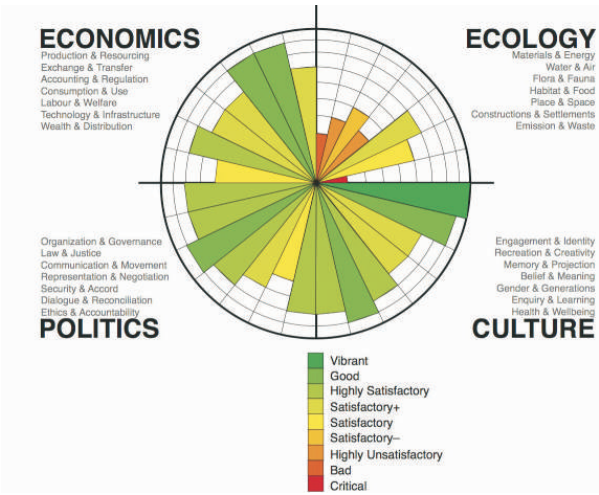
Many businesses that were iconic five decades ago no longer exist. Many businesses that did not exist five decades ago are among the largest corporations today. Every decade, a completely new business model becomes the dominant paradigm, only to be replaced by another, often after an unexpected and sometimes catastrophic collapse of the market.

Appropriate skills, knowledge and attitudes are essential for conducting a successful business in the modern economy. And because of the fluidity of business requirements, the ability to let go of old skills and quickly learn new ones becomes more important for retaining jobs than ever before.

Moreover, single-minded focus on the bottom line (or even top line) is no longer acceptable, given the broader landscape of stakeholders that today's businesses have to operate in. Sustainability issues dictate that the least number of bottom lines a business must pay attention to now is three – financial, social and environmental.

Fifty years ago, a professional with a freshly minted degree in a specific subject could spend an entire working life without any further need for study. Today, technology and markets are changing so rapidly that a professional may well change specialisations three or four times within his or her working life. In many cases, because of changing demand patterns, obsolescence, mechanisation or other reasons, jobs simply disappear and no new ones with similar skill requirements take their place.

But the need for specific skills for specific tasks is no longer the primary issue. A professional now needs to bring many other unfamiliar considerations into the domain of work: external market changes, environmental



Circles of Sustainability

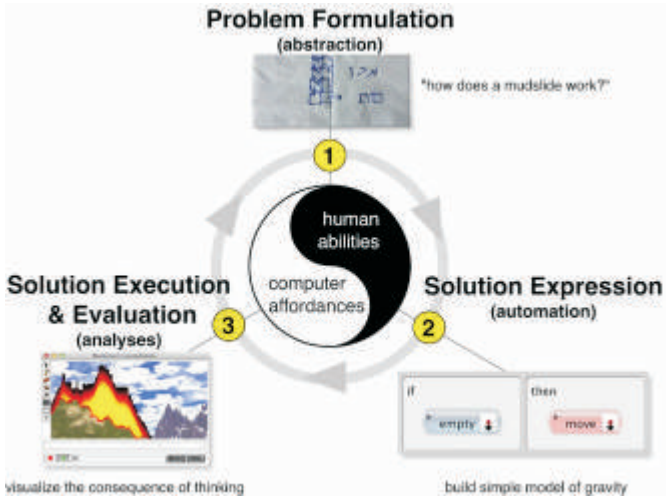
Source: Wikipedia

requirements, longer-term product impacts and other issues that are now becoming just as important as the basic engineering or management concerns.

The impacts of natural resource availability, price behavior and vulnerability of supply to external factors beyond a resource user's control can be very large. The tightening of supply of rare earth minerals when China introduced export quotas led to a decade of disruptions in the computer hardware sector, a factor that can lead to significant economic losses. Business professionals needed to be very nimble in finding solutions that kept their companies operational and profitable.

As new environmental, economic and other vulnerabilities become apparent, quick adjustments of technology, processes, supply chains and markets will have to be introduced, sometimes very quickly and these need flexibility of thinking rather than the rigid mindsets nurtured by conventional MBA-type training.

The institutions for tomorrow's business needs do not exist at the moment and one of the most urgent needs of the economy is for curricula that "educate" professional to think systemically and holistically, directly in contradiction to the conventional, legacy educational systems based on rigid, compart-mentalised disciplines and sectors.



Source: Wikipedia

The future will belong to those who master systems thinking and learn to apply it to generate a wide variety of business solutions:

Q1: What changes are needed in the school, college and MBA curricula?

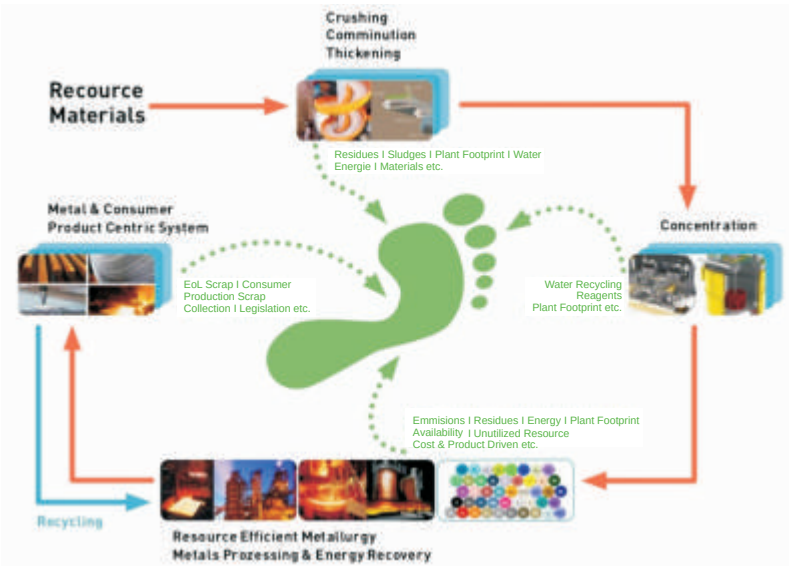
Q2. How can the Systems Dynamics learning be made available at all levels of education?

Q3: What incentives can be given to MBA programmes to include the issues of sustainability and ethical business?

Plenary 6 Issue: Circular Economy and Material Recycle - Business Scope for the Use of Secondary Raw Materials in India

An enormous quantity of waste is generated by industrial activity, right from extraction of raw materials till the end product disposal stage. Once the waste is produced, money, manpower and additional materials must be spent to manage it. The best and least expensive means of waste management is to reduce the amount generated at the source itself. However, low awareness among communities on the depletion of resources due to waste and lack of appropriate infrastructure for managing end of life of complex products are the main causes of high waste of resources in India. To deal with this issue the economy needs to focus on recycling and reusing of waste material, using them as secondary raw material and converting them into productive or usable material. Recycling and reuse, is the process of removing a substance from a waste and returning it to productive use. However, identification, prevention of waste, its reuse and safe disposal, etc. are required to maintain natural resource efficiency.

The increasing demand for metals in the course of the last century, putting permanent pressure on natural resources, has revealed that metals are a priority area for decoupling economic growth from resource use and environmental degradation. Recycling the waste is more resourceful and cost-efficient than just throwing away the resources and starting all over again. A considerable quantity of iron and copper, is now embodied in products and structures that one of the least costly way to extract these resources is from “urban mining”.



Source: UNEP Report on Metal Recycling – Opportunities, Limits, Infrastructure -2013

The imperative of decoupling will become even more pressing in the future with a

global demand for metals on the rise. As a result of rapid industrialisation in developing countries and in developed countries due to modern, metal intensive technologies that are crucial especially for the transformation towards green technologies. Ensuring appropriate levels of supply while reducing the negative environmental footprints will therefore be essential on our way towards a global green economy.

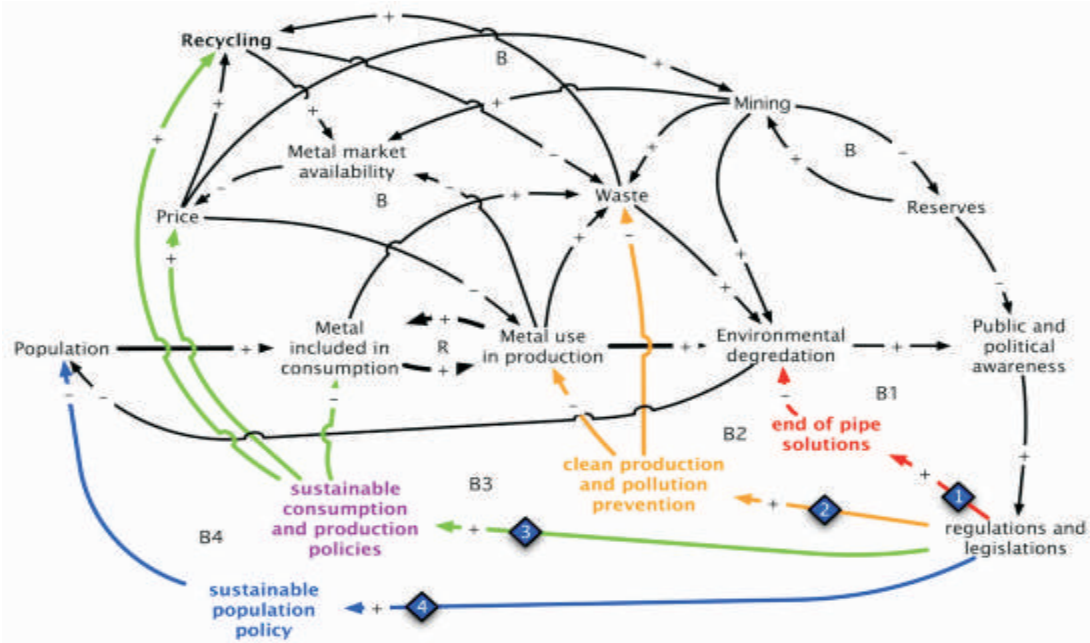
In this regard, recycling and thus resource efficiency plays a crucial role, as it decreases the necessity to fulfil the demand by exploiting our natural resources further. The basic assumption of recycling is that the value of the recovered (and other materials) has to pay for all collection, dismantling, sorting and other recycling activities. The economics of such recycling is based on estimating the true value of recyclables from the best recovery of refined metals, alloys and compounds.

Using secondary resources temporarily locked up in so-called "urban mines" decreases not only the environmental impacts associated with mining, but also decreases the release of – partly toxic – wastes into the environment. Taking into account that most modern technologies rely on 'critical' elements, which are not abundant in nature, it is of crucial importance to preserve and reuse them as much as possible.

India produces over 1000 million tonnes of solid waste from agriculture, mining, industrial and domestic activities. Some of these waste are hazardous and have the potential to harm human beings or other organisms because of their toxic, corrosive, flammable, explosive, reactive, or pathological nature and ultimately create a harmful effect on environment and ecology. However, much of the waste produced can be transformed into a secondary resource by recycling and reusing such solid waste again in industry.

Government policy can have a very significant impact on increasing recycling. It can:

- Influence the economics of any part of the recycling chain, changing the economic viability of the whole chain or of any part of it.
- Provide the incentives and means for stakeholders in the recycling chain to exchange information and cooperate to increase recycling.
- Act as a stakeholder in the chain – public organisations (often local authorities) are frequently part of the recycling industry – providing waste-collection services and recycling or disposal infrastructure.
- Set framework conditions that enhance quality of recycling, such as setting certified standards.



Source: UNEP

India needs effective secondary raw material policy to promote effective waste management. Therefore, this plenary session will address the following questions:

Q1: How can national self-sufficiency in raw material resources be achieved? Renewables? Secondary raw materials?

Q2: What are the possibilities of adopting renewables and secondary raw materials?

Q3: How can innovations in extraction and use of secondary raw materials be effectively encouraged?

Q4: How much can infrastructure and construction convert to wastes from demolition, mining or industry into useful resources?

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Established in 2011, The Indian National Association for the Club of Rome (CoR-India) is a non-profit organisation, which aims "to act as a global catalyst for change through the identification and analysis of the crucial problems facing India and the communication of such problems to the most important public and private decision makers as well as to the general public." The broad goal of the national chapter, CoR-India, is to help design an agenda for governments in India, the business sector as well as all its citizens' organisations that could enable everybody in this country to live a full life in harmony with their surroundings by the centenary of the nation, 2047.

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Development Alternatives (DA), a not-for-profit action research and development organisation, is the primary knowledge partner of CoR-India. DA innovates and disseminates sustainable solutions aimed at reducing poverty and regenerating natural ecosystems and their services. Established in 1982, its eco-solutions deliver basic needs products through the small, local enterprises that generate green jobs and sustainable incomes. Based on its innovative environment-friendly technologies and market principles, these enterprises help build local economies and communities while maintaining a minimum ecological footprint.

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