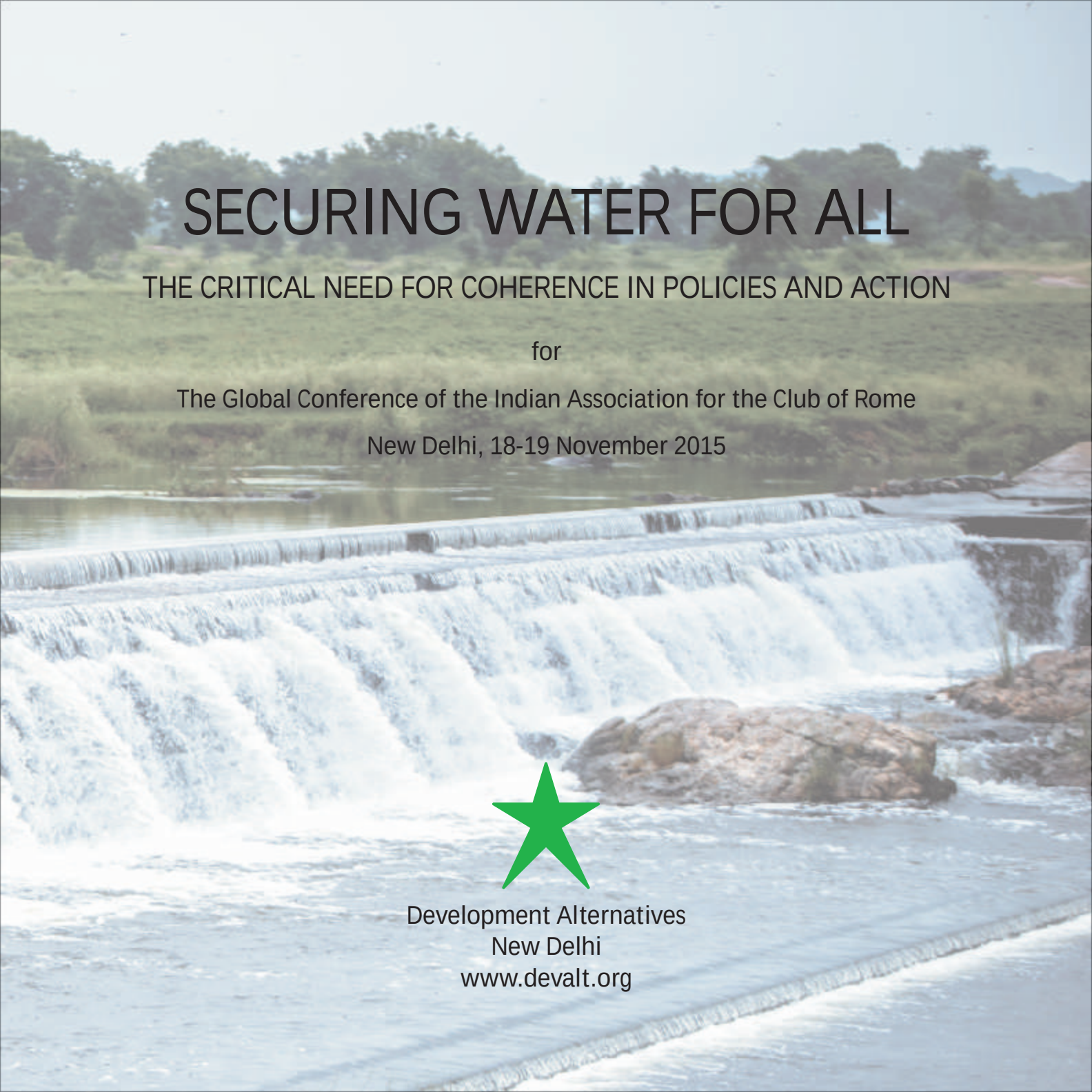


SECURING WATER FOR ALL

THE CRITICAL NEED FOR COHERENCE IN POLICIES AND ACTION

for

The Global Conference of the Indian Association for the Club of Rome

New Delhi, 18-19 November 2015

Development Alternatives
New Delhi
www.devalt.org

Summary

Water is a fundamental human need and a critical national asset. India's huge and growing population is putting a severe strain on its water resources. Water along with food, energy and land forms a critical part of the 'new security agenda'. The drivers of future water challenges are tied to development and economic growth, with agriculture as the largest spender of water, at more than 80%. Moreover, some 21% of communicable diseases in India are related to unsafe water; diarrhoea alone causes more than 1,600 deaths daily—as if eight 200-person jumbo-jets crashed to the ground each day.

'Policy Coherence Analysis' attempts to integrate the economic, social, environmental and governance dimensions of sustainable development at all stages of domestic and international policy.

This booklet explores the nature of the institutions of the State, of business and of civil society that are necessary—even if not entirely sufficient—to serve the economic, ecological and societal, and above all ethical, purpose of speedily eliminating water insecurity from India.

Ashok Khosla
Chairman
Development Alternatives

What is Water Security ?

Water Security is the capacity of a population to safeguard sustainable access to adequate quantities of acceptable quality water for sustaining livelihoods, human well-being, and socio-economic development. It must ensure protection against water-borne pollution and water-related disasters and preserving ecosystems in a climate of peace and political stability.

Evolution of Water Security Concepts

Water is at the core of sustainable development. The question of water security—along with food and energy security—is the primary goal of any civilized society. Only 33% of the people of India have access to traditional sanitation, and over 21% of the country's diseases are water-related. There is considerable scope to improve water resource utilization, as the amount of food produced per unit of water input is relatively low, and access to water serves neither socio-economic nor environmental objectives. Water scarcity occurs when the demand for freshwater exceeds supply in a specified domain. It arises as consequence of a high rate of aggregate demand from all water-using sectors compared with available supply, under the prevailing institutional arrangements and infrastructural conditions.

Water resources and services support poverty reduction, economic growth and environment-al sustainability, while contributing to improvements in social well-being and inclusive growth, affecting the livelihoods of hundreds of millions.

The causes of concern to the future sustainability of access to water supplies, and food, in India are that:

- The population of India continues to grow rapidly
- Deforestation leads to the drying up of rivers, water bodies and groundwater reserves
- Corruption and governance issues make access to water more difficult for the poor
- Climate change is leading to increased temperatures with more variable rainfalls
- The diet is shifting to the consumption of higher water-intensive food products
- The yield in food production has levelled off
- Irrigation and land suitable for food production are reaching their limits

To put these issues in perspective, there are five major global transitions that make historically-based thinking obsolete:

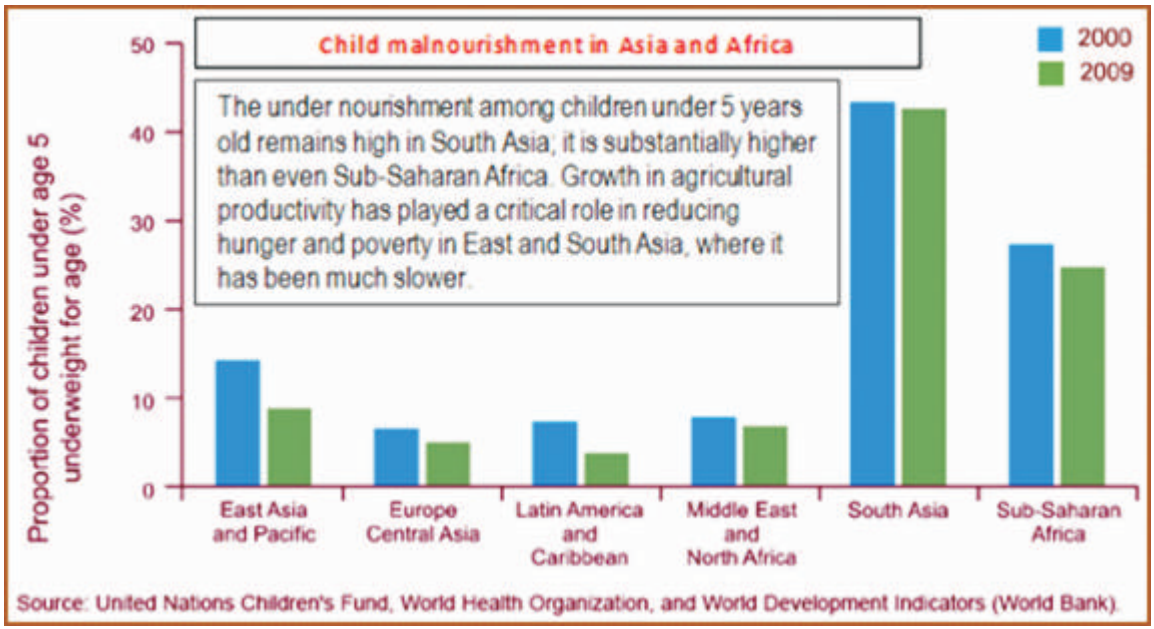
1. Urban population transition: By 2050, it is expected that 50-70% of the nation will be living in cities; these people will have increased purchasing power;
2. Nutrition transition: Urban people demand and consume higher quantities of foodstuffs that have increased quantities of animal and other high-value foods;
3. Climate transition: increasing temperatures and variability in water supplies will lead to variability in food production, prices and access to food
4. Energy transition: From cheap fuels—both fossil and renewable energy resources;
5. Agricultural transition: From small-scale and fragmented farming to large-scale commercial operations, or organized and sophisticated small holdings.

The Nexus of Water, Energy, Land and Climate in Food Production

Agriculture to grow food uses more than 90% of water in India. Hence, the overall goal of understanding the 'food-water-energy-land-climate nexus' is an essential prerequisite for an integrated water policy that would enable the rural and urban poor to access affordable diets that are adequately nutritious.

The nexus revolves around socio-economic issues governance, including women's empow-erment and environmental and ecological concerns, including climate change and biodiversity loss. It centres on creation of sustainable livelihoods and local food production, to ensure that the four pillars of food security—namely availability, access, utilization and stability—are maintained, and hopefully strengthened.

Take, for example, the issue of nutritional security for children under the age of 5:



The principal reason for this in the South Asian region is the breakdown of ecosystem services, weak institutions of governance and of infrastructure, and lack of empowerment of women. Regenerating natural capital, strengthening local institutions and infrastructure and raising the participation of women in planning and implementing development processes are the basis of meeting the needs of food, water, energy and land—even more so in the context of climate-change. Resilient solutions to the problems of food insecurity

need integrated approaches to the nexus of water, energy, land, which have highly nonlinear interactions of these elements. There is now extensive evidence worldwide, that, with good science and modest investment, degraded lands can be restored, institutions and infrastructure can be enhanced and participation of all can be forged with profound effect on the productivity of local natural resources such as water.

Additional ways to meet these critical needs is to increase the technological efficiencies of water, land and energy use, in agriculture. Increasing water productivity, especially the value produced per unit of water, can be an important pathway for poverty reduction in water productivity. The adoption of techniques to improve water productivity requires an enabling policy and institutional environment that aligns the incentives of producers, resource managers, and society and provides a mechanism for dealing with trade-offs.

Box 1

The Megacities' shift in food preferences

Urbanization could double the amount of water required for food production, due to change in the diets of urban people, and new taste for less starchy foods towards more varied diets with more animal and dairy products, fats and oils. These higher quality foods will require producing more animal feed and requirement for processing, storing and refrigerating food products. These processing and storage activities will require more electricity, which has its own large water footprint that is estimated to be an order of magnitude greater than today's conventional municipal water supply.

Without careful planning for Megacities, the shift in food preferences alone could lead to excessive demands on water and energy resources.

An assessment of the potential for reducing water needs and increasing production and economic value requires an understanding of basic biological and hydrological crop-water relations. The main potential for conserving water in agriculture lies in the choice of crops that are appropriate for the water resources available in each given region. Another method for saving water in agriculture depends on the choice of technology and of scale of farming. Resource. But here, the trade-offs between the different inputs of land, labour, capital and technology can be quite complex and the relative costs and benefits have to be carefully weighed. The impacts of these choices on the relative consumption of energy and water can further complicate the calculations.

Aggregation of small farms—backed by equitable institutional arrangements, mechanization and modernization of technologies—can not only maximize efficiency in the use of water, energy and land resources, but also enable them to market their products in urban areas. Strong employment generation from crop diversification into higher value crops enable rural economies to adopt the right technologies and achieve an inclusive growth pathway. A misguided choice of technology or policy could create conditions that may be difficult to change, later.

For example, large scale, capital-intensive, monoculture based farming may provide high short-term financial returns but can lead to massive ecological backlash in due course. On the other hand, relying on small farms that are not sensitized to water and energy saving technologies—to provide for food supplies to large communities—may lead to the exhaustion of water, energy and land resources, due to inefficiencies in the food value chain activities. And reducing the inefficiencies in the food chain cannot be considered independent of energy and agricultural policies.

Appropriate and coherent policy mechanisms are needed to establish mechanisms for societies to address the nature of uncertainties faced under current or future conditions, such as drought or flood conditions in rural areas.

What is Policy Coherence ?

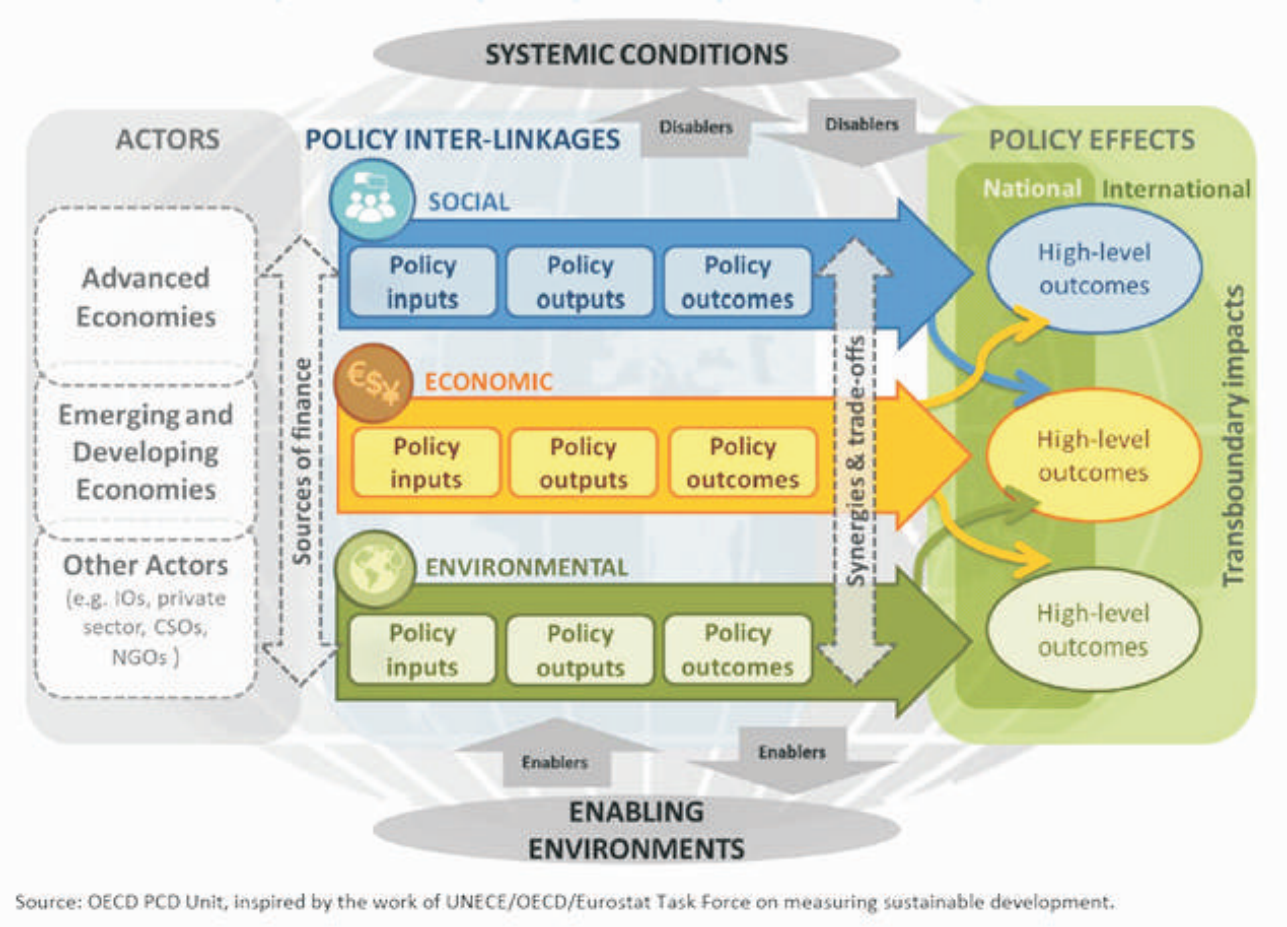
India has an abundance of water within its borders, with 13 major and 46 minor basins. The Ganges-Brahmaputra is the largest basin, covering 34 per cent of India and contributing ap-proximately 59 per cent of the country's water resources. The major sources of water in India are rainfall and glacial snowmelt contributing to river flows from the Himalayan region.

And yet, there is an acute shortage of appropriate water supplies in India. We can attribute this to policy incoherence, which leads to this imbalance in water access.

Policies are usually made independently in different sectors, over different geographical domains and at different levels. This means that quite often, while aiming to fulfil their respective, narrowly defined goals, they can counteract each other and lead to suboptimal or even unintended results.

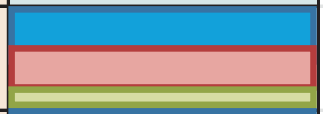
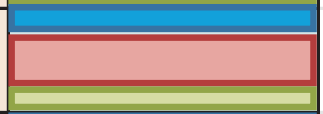
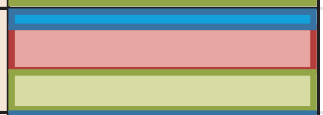
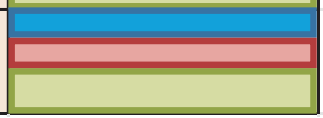
The purpose of the Club of Rome – India Annual Conferences is to garner inputs from a wide range of expertise and to identify the means by which national, state and local polices in different arenas can be brought into line with each other in the attainment of the most basic goals needed for sustainable national development: secure access to food, water, energy and a healthy, productive environment.

Analytical Framework for Policy Coherence for Water Security Development



Source: OECD PCD Unit, inspired by the work of UNECE/OECD/Eurostat Task Force on measuring sustainable development.

'Policy Coherence Analysis' attempts to integrate the economic, social, environmental and governance dimensions of sustainable development at all stages of domestic and international policy, as in the following tabulation:

TARGETS	GOAL Securing sustainable water for all	Keys:
Universal access to safe drinking water, sanitation and hygiene		ECONOMIC
Sustainable use and development of water resources		SOCIAL
Equitable, participatory and accountable water governance		ENVIRONMENTAL
Reduce untreated wastewater, nutrient pollution & increase wastewater reuse		
Reduce mortality and economic loss from water related disasters		

Note: This visualization of the subjective estimates, rather than any attempt at numerical precision for the intensity of each pillar of sustainability, is indicated in the diagram above.

A coherent policy on water focuses on the most salient problems arising from national transitions that can be ameliorated by specific policy instruments, in the short term. Some problems, like climate change for example, although important, are not likely to be dealt with by short-term measures. However, a pragmatic approach to getting coherent policies leaves a range of policy changes and transitions that could be implemented in the short term.

Now, the transitions are happening so fast that the capacity and mindset of planners are most likely overtaken by these equilibrium shifts. The past solutions to the food-water-energy-land (soils) nexus are not only unviable, the long-term commitments of land, water and mineral resources make these transitions irreversible.

In the case of climate change, it is preferable to rely on short-term forecasts that permit mid-course corrections. Climatologists can project information on temperatures and precipitations, which can be mapped to look ahead up to 10 years, to avoid surprises.

Impact of Climate Change on Water Security

Water security is under severe pressure from many sources: population explosion, rapid shifts of people from rural to urban areas, the impact of dietary change as countries develop, increasing pollution of water resources, the over-abstraction of groundwater and the significant issues created by climate change.

Climate change affects water resources through its impact on the quantity, variability, timing, form, and intensity of precipitation. Additional effects of climate change that impact water resources include increased evaporation rates, a higher proportion of precipitation received as rain, earlier and shorter runoff seasons, increased water temperatures, and decreased water quality, in both inland and coastal areas.

Increased evaporation rates are expected to reduce water supplies in many regions. More frequent and severe droughts arising from climate change will have serious management implications for water resource users. Water users will eventually adapt to more frequent and severe droughts, in part by shifting limited water supplies towards higher-value uses. Rising surface temperatures are expected to increase the proportion of winter precipitation received as rain, while rising sea levels could also directly reduce water quality and availability in coastal areas, and indirectly cause water tables in groundwater aquifers to salinise.

Climate Change Adaptation for Water Security

Adaptation to climate change for 'Water Security' is mainly about appropriate adaptation measures built upon known land and water management practices to foster resilience to future climate change, thereby enhancing water security. Any adaptation measure, however, needs to be assessed for inadvertent adverse effects, in particular on the environment and on human health. Adaptation is:

- Transformative and requires a collaborative, problem-solving approach, especially in a resource-constrained environment.

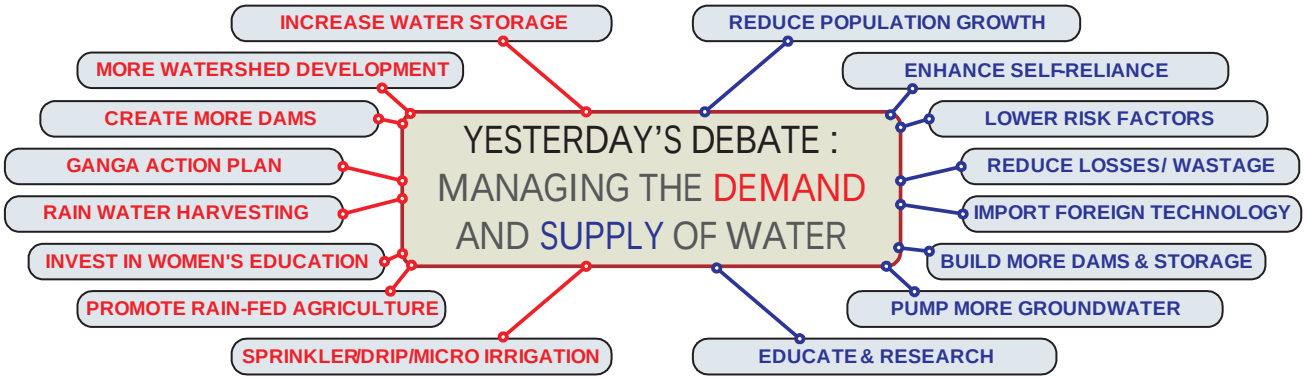
- An active approach to understand vulnerability, reduce risk, and prepare for conse-quences while incorporating new science and lessons learnt

Adapting to increasing climate variability and change through better water management requires policy shifts and significant investments that should be guided by the following principles:

- Mainstreaming adaptation within the broader development context;
- Strengthening governance of water resources management and improving integration of land and water management;
- Capacity-building on climate, water and adaptation measures, and investing in com-prehensive and sustainable data collection and monitoring systems;
- Building long-term resilience through stronger institutions and water infrastructure, including well-functioning ecosystems;
- Investing in cost-effective water management and technology transfer;
- Increased national budgetary allocations and innovative funding mechanisms for ad-aptation through improved water management.

YESTERDAY'S DEBATE: Managing the demand and supply for water

Measures to ensure our nation's water security clearly need people-friendly and participatory approaches. Many of these are not well understood. Every seminar, roundtable and conference on water-related topics trots out the regular technologies, both on the supply and on the demand side, as shown below:



This approach has only resulted in countless proposals, initiatives and goals that are loosely connected at best, and that are often plagued by internal inconsistencies. The frequent suc-cession of governments—each with different ideologies—has left the state of the Indian Re-public's water agenda in tatters.

The "silver bullets" of yesterdays' debate—the various activities that can help bring supply of water into some balance with the demand for it—are necessary and extremely important. However, they are not sufficient. Even if all, or most, of these interventions were to be im-plemented, the water shortage problems would not be fully solved, as there are other political, economic and social barriers, not usually dealt with in the current discourse, that undermine the impacts of such well-intentioned policies and actions.

Water underpins the very fabric of human life – our food and drink, the clothes we wear, the landscapes we enjoy, the societies we live in, the length and quality of our lives. Water supplies and food production are becoming increasingly uncertain due to changes in climate, demographic patterns and economic growth. The current approaches to risk assessment are becoming less reliable. We need a risk-averse strategy to identify the boundaries of a safe space for humanity.

THE DEBATE NEEDED TODAY: And its underlying premises for sustainability

The debate needed today encompass ideas such as:

(a) Improvements in the system of governance, mainly to tackle the issue of corruption and the absence of a development focus in policy making;

(b) Reforestation to naturally recharge the rivers, water bodies and groundwater table and rationalize the food-water-energy-land nexus debates;

(c) New technologies for growing food more efficiently, such as fine bubbling technologies, System of Crop Intensifications (SCI), Aquaponics and other water-energy-land-friendly approaches, and

(d) Innovations in systems, institutional frame-works and economic instruments, to introduce biomimicry approaches and combat trophic downgrading, to ensure that we may *secure water for all*.

(e) Strengthening the participation of all, including particularly women, in the identification, planning and implementation of solutions to their water needs

This means that a new, simple and sustainability-oriented approach is needed, which must now become the central subject of debate in our country. Considering that water security is one of the most important goals for the future health of the nation, we believe our national debate will require several key changes in our general approach and order of business, in order to develop a water security policy framework, which will carry us forward into a truly sustainable future.

The three dimensions of sustainability

No activity that involves the production and consumption of water can be scaled up to reach everywhere or everyone—unless it is economically viable. Hence, reasonable profits and efficient markets are essential for universal water security, as they are for all other basic needs. But profit and markets, though necessary, are not sufficient. They alone, do not guarantee water security for all, either today or in the future. For the poor and the marginalised, additional measures are needed to ensure universal and reliable access to water. And for our children and grandchildren tomorrow, the productivity of the environmental resource base has to be protected and enhanced, in order to ensure that they can continue to get the water that they will require.

The Venn diagram shown below captures today's discussion needs and its underlying premises for sustainability.

Thus, a policy that ensures a sustainable water security for all must focus on the three di-mensions of sustainability: social equity, a healthy environment and a viable economy.

The first commitment is to the efficiency, prioritisation and scaling up of water supplies, which means that the mix of the factors of production – land, labour, capital (and others such as knowledge, technology, infrastructure, market linkages) – have to be optimised for each social, economic, resource and geo-climatic context. Given the changes occurring in the climate, ecosystem productivity, resource prices and transportation costs; the issues of trade and comparative advantage also have to be examined anew.

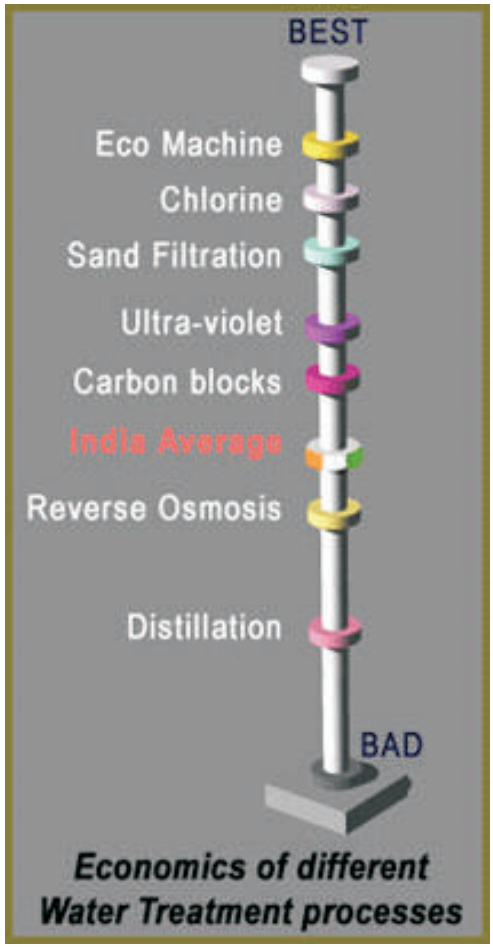
A. Issue of Economic Viability

We have agreed that the first commitment is to the balance needed for a viable economy. If policies and investments in water security favouring the agricultural sector or the industrial sector—or indeed the services sector or the natural resource sector—get out of economic balance, the performance of the economy can only suffer by becoming sub-optimal and less efficient. A balanced and viable economy clearly is a necessary condition for sustainability.

Apart from concerns such as the nation's strategic imperatives and security of water supplies, which have played a major role in food-related decision-making in India and other countries, there are several emerging factors including climate change, that need to be considered in the choice of water production and treatment strategies.

Since few sectors have benefited as much from research and innovation as agriculture, the investment choices made for the supply of water for agriculture can hugely affect the relative importance of different water-guzzling technologies, to the economy.

Implication: Since water security depends on the access to water services and the relative prices, and the choice of technology determines not just what is produced but who gets the income, it is clear that the investments made in infrastructure, research and innovation for water supplies have a large impact on the outcomes.

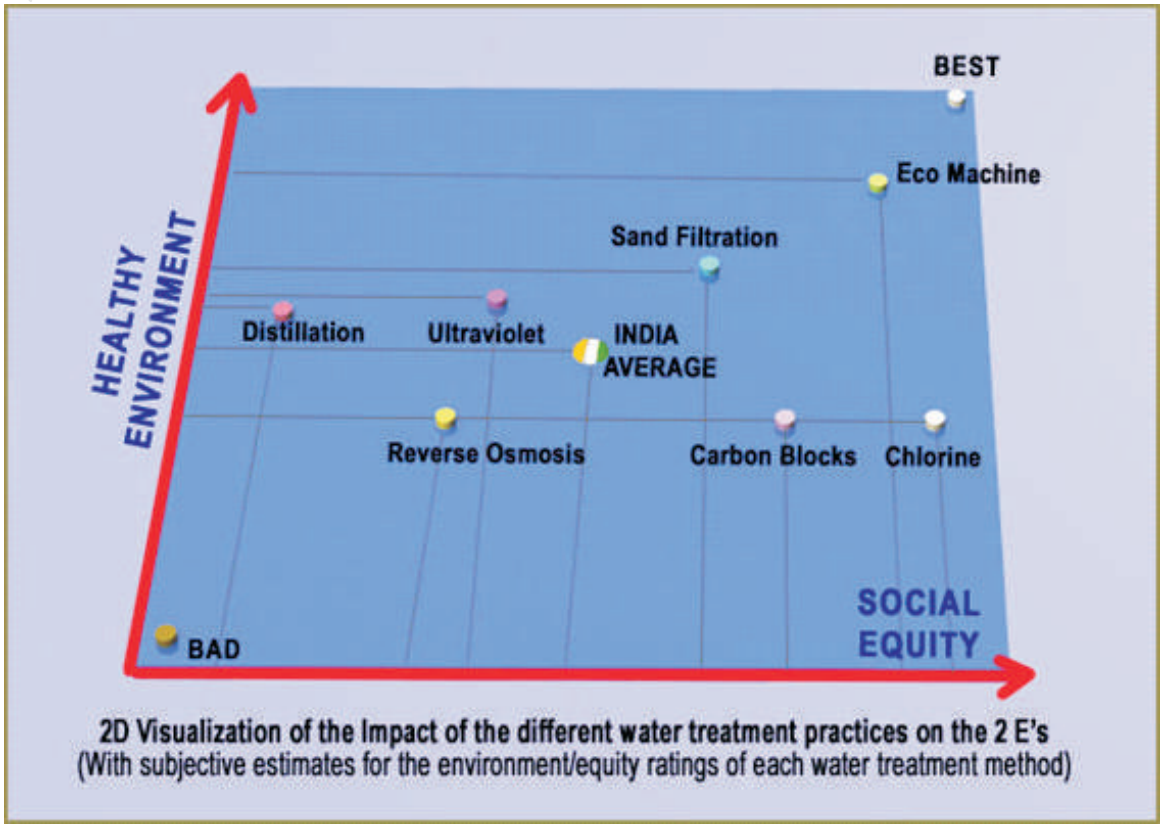


Economics of different Water Treatment processes

B. Issue of Social Equity

The second issue is the commitment to social justice in spatial or class terms – in the here and now. It assumes that water, like food and energy, is the right of all, whether urban or rural, rich or poor, powerful or marginalized.

Let us study the impact of different water treatment practices, when plotted against '*social equity*' on the x-axis, and '*healthy environment*', on the y-axis, as follows:



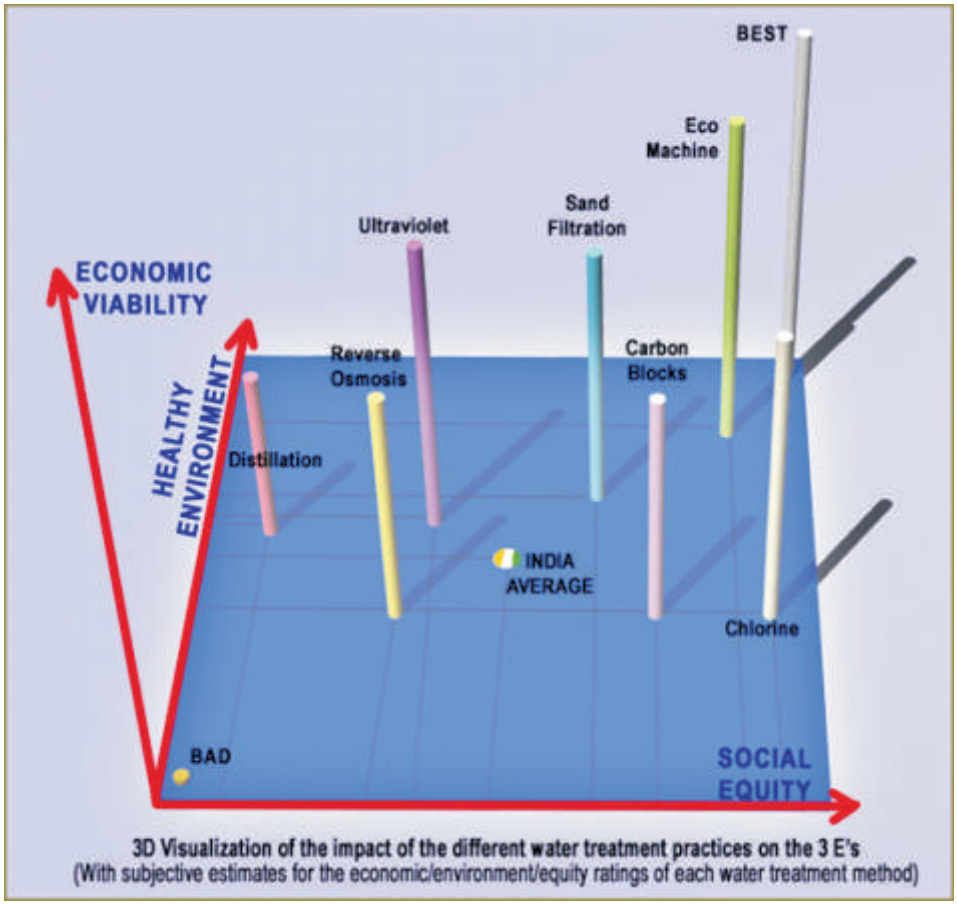
2D Visualization of the Impact of the different water treatment practices on the 2 E's
(With subjective estimates for the environment/equity ratings of each water treatment method)

Recent political upheavals demonstrate that equity is a central component not just of liberal, participative democracies but, more importantly, of the very sustainability of these measures. Equity means that the poor, women, tribal people and other marginalised segments of society must have access to adequate water supplies. This issue necessarily focuses on the imperative participatory approach for sustainable policy development, in order to have truly bottom-up decision making processes for designing, developing and implementing coherent policies.

We do not have to worry about policy incoherence, if the people are truly involved in deciding their own water security arrangements.

Implication: It is essential to create strong, viable and resilient communities, which can ensure the health and nourishment of their members by enabling them to access and fulfil their basic needs.

C. Issue of a Healthy Environment - The third is the commitment to inter-generational equity or responsibility for our legacy to the future – embodied in the Environment pillar of "sustainable development". Let us study the economic viability, when evaluating the impact of a healthy environment and social equity, of a number of water treatment methods:



3D Visualization of the impact of the different water treatment practices on the 3 E's
(With subjective estimates for the economic/environment/equity ratings of each water treatment method)

This visualisation can help decision and policy makers to decipher the robust and effective policy initiatives needed to achieve the goal of securing water for all. It is instructive to note that the natural processes that promote the biomimicry approach is placed at the top right corner, signifying high sustainability credentials.

Based on such representations of the attributes of the '*Water Security*' debate, we may use various modelling approaches, to simulate the trajectory of water security outcomes in terms of time and space variations. This would enable researchers to get a handle on the sensitivity of water treatment approaches to various changes in the economic, social or biospheric environments, and provide sensible information for decision and policy makers.

These studies relate to differences in the time horizons assumed: some are motivated by the immediacy of today's issues (either for societal concern or for political or personal gain), others worry about what impacts the narrowly-conceived, short-term decisions made today will have on future generations. Recent shortage of water in places such as Marathwada and increases in food-water imports in countries such as China demonstrate that the health of the environment and its resource base is a critical factor in sustainability.

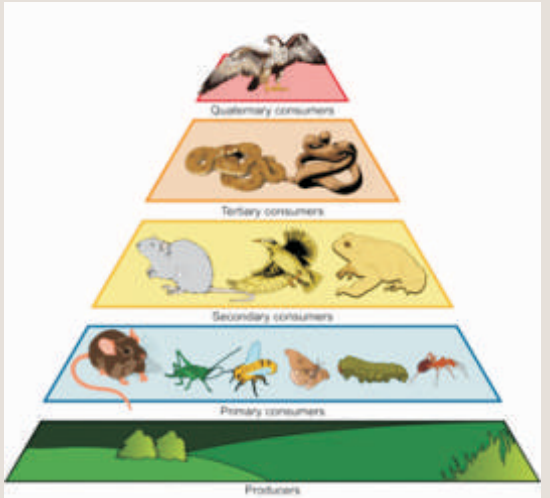
The "*silver bullets*" of yesterday's debate—*the various activities that can help bring supply of water into some balance with the demand for it*—are necessary and extremely important. However, they are not sufficient. Even if all, or most, of these interventions were to be im-plemented, the water shortage problems would not be fully solved, as there are other political, environmental, economic and social barriers—not usually dealt with in the current discourse—that undermine the impacts of such well-intentioned policies and actions.

Impact of Trophic Downgrading

Trophic downgrading results from human activities that eliminate essential predators at the top of the food chain.

Box 2

The trophic level of an organism is the position it occupies in a food chain. A food chain represents a succession of organisms that eat another organism and are, in turn, eaten themselves. The number of steps an organism is from the start of the chain is a measure of its trophic level. Food chains start at trophic level 1 with primary producers such as plants, move to herbivores at level 2,predators at level 3 and typically finish with carnivores or apex predators at level 4 or 5. The path along the chain can form either be a one-way flow or a food "web". Ecological communities with higher biodiversity form more complex trophic paths.



The presence of predators in terrestrial and marine eco-systems controls the secondary consumers and coral-based communities. Wolves, for example, can control and reduce deer populations, smaller numbers of which result in less browsing of shrubby plants. This can result in an explosion of scrubby vegetation on the landscape. Subsequently, grasses decline and along with them many species of herbivores that graze on them.

In India, as in many developing countries, slums are often situated on the edge of streams. The sewage and garbage runs down the streets and ends up in the streams, which cannot remain healthy. Soon, all life within dies and it becomes a negative asset.

A remedial action rarely taken would be to introduce ecological technologies that might trigger and facilitate the internal healing of the stream ecosystem. To reverse trophic downgrading in streams and possibly replace it with trophic upgrading and take steps to create habitats that critical species will find hospitable, we should ask the question whether beneficial niche partitioning can be reintroduced into a body of water and then try and figure out how it might be done.

Counterintuitive Policies in Water Security

A counterintuitive proposition is one that does not seem likely to be true when assessed using intuition, common sense, or gut feelings. For instance, conventional wisdom promotes the idea that modern and industrialized version solutions for agriculture—a term which is generally used to describe the majority of production practices employed globally by large farmers and corporations—is the most efficient way of farming.

Policy-makers need to identify existing capacities, as well as gaps, in order to properly address the water security challenge. Capacity development is a long-term process based on incentives, good governance, leadership, and knowledge management and transfer, which need to be continuously adapted according to stakeholders' feedback and needs. The trick is to get to '*The Horse Jump*', ahead of '*Leap Frog Technologies*', such as:

- Eco-Machines, which are based on natural, biomimicry approaches for the treatment of polluted water, are cost competitive to build and less expensive to operate than conventional waste-water technologies. Living Machine technologies are basically ecologically waste water treatment systems, where waste water comes in, is taken up by the bacteria, converting waste water to high quality reusable water streams.

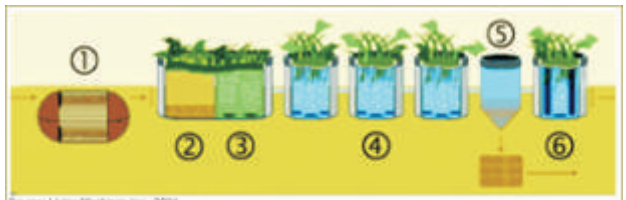


FIGURE 1 THE COMPONENTS OF THE LIVING MACHINE®: (1) ANAEROBIC REACTOR, (2) ANOXIC REACTOR, (3) CLOSED AEROBIC REACTOR, (4) OPEN AEROBIC REACTORS, (5) CLARIFIER, AND (6) "ECOLOGICAL FLUID BED"

- Fine bubble diffused aeration systems, which are sustainable, energy efficient systems available in the market today. The potential of fine bubbles in the treatment of water and im-provement in water quality is enormous, particularly in developing countries suffering from water pollution and shortage. There will be a broad spectrum of business potentials using Oxygen, Nitrogen and a host of other gases that will benefit from fine bubble technology in the coming years, including the food sector, a multitude of cleaning uses, medical applications (such as cleaning of foot sores in Diabetic patients) and other areas.

- System of Crop Intensifications (SCI), and the System of Rice Intensification (SRI) in particular; the farmers are able to produce more rice using less water, seeds, agrochemical in-puts, synthetic fertilizers, pesticides,

herbicides, and often with less labor (once the methods are mastered). The net effect is to improve household incomes and food security, while reducing the negative environmental impacts of rice production, thus making water security more resilient. These methods are producing similar effects also with other crops such as wheat, ragi, sugarcane, mustard, and various legumes (grams). Hence, a counterintuitive policy for promoting water security would be to promote SCI/SRI, in place of modern and industrialized solutions for agriculture.

- Create local sustainable economies around small-holder and urban, artisanal Aquaponics-based and organic farmers, to conserve water and land, with democracy based upon self-governing principles. There is no established policy in place that encourages the creation of either smallholder urban farmers, or local sustainable economies. Without a serious effort by government to address the issue of 'food deserts' in urban and peri-urban areas, we could slide into chronic imbalances in social and environmental problems. Failures in this realm could be the first to land humanity in sudden catastrophic outcomes, as water scarcity, food riots, climate change, and other social and environmental imbalances lead to societal collapse.

- Forest Restoration will recharge streams, rivers, water bodies and most importantly, the groundwater of the region. 'Blue Economy' approaches that involve the generation of multiple revenue streams, will ensure economic balance. Social equity and a healthy environment are natural outcomes of reforestation. Hence, forest restoration is a 'silver bullet' to solving the problems of water insecurity, in both rural and urban environments, as every urban area should have its associated 'forest'.

Legislation cannot change until the peoples' consciousness change. Unless that shift occurs, the government is not going to implement anything until the cause of the people is answered through new legislation.

When the consciousness of the people shifts to a higher level and the government reflects that change with new and coherent policies, we can start implementing the large scale changes with these new approaches to water treatment.

Creating Policy Successes in River Conservation & Water Security

Well-functioning coordination at different levels – from national to river basin and sub-basin – and joint planning involving different interests are important for the sustainable management of water resources.

Good water governance is essential to achieving water security, and requires well-designed and empowered institutions with supporting legislative and policy instruments.

A human rights-based approach to water security addresses critical gaps and bottlenecks, and emphasizes the establishment of regulatory functions and mechanisms for efficiency, participation and accountability. However, reaching effective and balanced inter-sectoral governance is complex, and solutions have a high degree of context specificity.

Some of the ways to protect river water sources are:

- Prevent deforestation and destruction of grasslands – nature's water filters;
- Restore forests and grasslands that have already been lost or damaged, to prevent sending erosion into our waters;
- Equip farmers with practical ways to keep harmful run-off out of our waters
- Restore floodplains that act as sponges and send water down into groundwater supplies and filter pollution out of rivers;
- Create new science that helps pinpoint the greatest threats to our waters and the most effective ways to combat them, *sustainably*.

Trans-boundary waters pose enormous challenges for achieving water security in systems, such as river or lake basins and aquifers, which are shared across political boundaries. In such cases, water-related challenges are compounded by the need to ensure coordination and dialogue between sovereign states, each with its own set of varied and sometimes competing interests.

Impact of Governance Issues in Water Security

Water governance refers to the political, social, economic and administrative systems in place that influence water's use and management. It is a critical area to improve the sustainable development of water resources and services. Access to water isa matter of survival and can break the vicious circle of poverty. Improving water governance is therefore essential to alleviate poverty. The four fundamental dimensions of water governance are:

1. Social: The equitable distribution of water resources and services among various social and economic groups, and its effects on society.
2. Economic: Efficiency in water allocation, its use and the role of water in overall eco-nomic growth;
3. Political: Equal rights and opportunities for water stakeholders to take part in decision-making processes. Participation facilitates more informed decision making, more effective implementation and enhances conflict resolution.
4. Environmental: The sufficient flow of water of appropriate quality is critical to main-taining ecosystem functions and services that build upon them.

Reforms typically include components linked to the following:

- Decision-making: Moving away from a top-down approach, towards bottom-up ap-proaches that combine the experience and knowledge of various local groups and people, to ensure transparency and participatory approaches to local communities;
- Integrity & accountability: Corruption is achallenge that is detrimental to sustainable water use and service provision, by diverting financial resources and skewing decisions away from addressing collective concerns.
- Collaboration: Various private enterprises, CBOs, water users and NGOs play im-portant rolesin the management of water and delivery of water services.Effective government regulations are needed to enable private sector engagement;
- Roles & responsibilities: Establish well-defined, coherent roles and responsibilities can lead to a number of social, economic and environmental benefits. Insecurity of water rights, discrepancies between formal legislation and informal customary water rights, and unequal distribution of water rights, are also frequent sources of conflict.

The Challenge: As local demand for water rises above supply in many regions, the effective governance of available water resources will be key to achieving water security, fairly allocating water resources and settling related disputes.

Impact of Forest Restoration in Water Security

Access to drinking water and sanitation are already enshrined in the MDGs. But both the supply and quality of water are becoming increasingly insecure for all uses.

Ecosystems function as a “natural water infrastructure”. Forests protect water supplies, wetlands regulate floods, healthy soils increase water and nutrient availability for crops and help reduce off-farm impacts, and natural and man-made wetlands and buffer strips can be effective in managing nutrient run-off and pollution.

Degradation of natural infrastructure is often the root cause of disasters and contributes to the scale of impacts. Conservation often provides cheaper and more sustainable solutions, and delivers substantial co-benefits such as tourism, recreation and biodiversity. Natural infrastructure can replace or increase the sustainability and efficiency of built infrastructure.

Core Forest Restoration Principles

- Enhance ecological integrity by restoring natural processes and resiliency;
- Develop the use of economic incentives that protect or restore ecological integrity
- Use and train a highly skilled, well-compensated work force to conduct restoration;
- Document all restoration projects in the context of a restoration assessment and ap-propriate restoration approaches that restore ecological integrity;
- Conduct a restoration assessment prior to restoration activities;
- Determine the appropriate use of protection, and passive and active restoration based on restoration assessments
- Identify and secure areas of high ecological integrity;
- Cease activities that have been determined by a restoration assessment to impede natural recovery processes;
- Reintroduce natural processes or species through direct intervention;
- Distinguish between fuel-reduction treatments that restore ecological integrity and those that serve primarily to protect property and human life;
- Monitoring and evaluation must be assured before restoration proceeds and should be incorporated into the cost of the project;
- Develop and employ positive incentives to encourage ecologically sound restoration;
- Effective restoration depends on strong, healthy and diverse communities and a skilled, committed work force;
- Encourage involvement of a diversity of communities, interest groups, agencies, and other stakeholders at all levels

Security in General with Minimum Environmental Impact

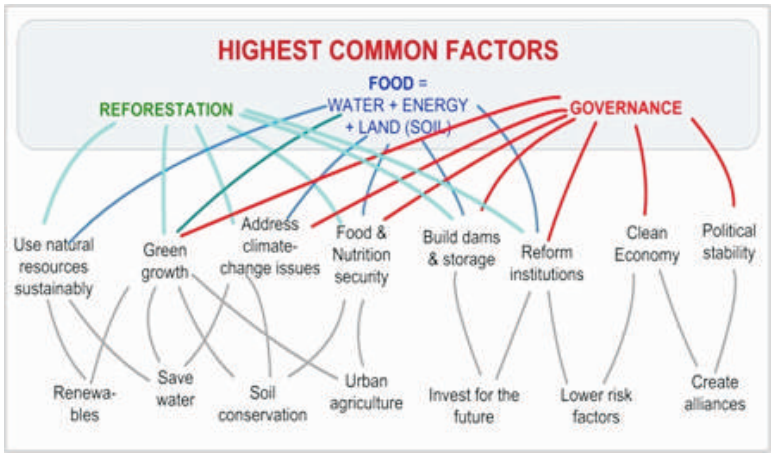
From a holistic viewpoint, the three "silver bullets" for achieving sustainable growth and security are:

1. FOOD = Water + Energy + Land (Soil)

   These are things that people need most. If they are plentiful, then green growth and energy security is guaranteed. These are also automatically obtained, if reforestation and governanceare pre-existent.

2. REFORESTATION is the natural or intentional restocking of existing forests and woodlands that have been depleted. While its main benefits: recharging the water table, combat climate change, reduce carbon emissions and soil erosion, create biodiversity and such are well known, its long-term impact (say, in 15 – 30 years) on society is not

3. GOVERNANCE means: *the process of decision-making and the process by which decisions are implemented (or not implemented)*. We now have enough laws and rules, which are ignored. Mismanagement and non-compliance are the big issues within mis-governance. So! A new and participatory Constitution will help to empower the hoi polloi and ensure that the checks and balances are put in place, respected and are effective. We will also need to promote primary education, health and knowledge services, as key social services, to promote good governance, in a repetitious cycle of desired actions.



These derivations are shown in the figure on the right, which highlights the highest common factors—*food, reforestation and governance—as "silver bullets*", for solving all our security-related problems.

CONCLUSIONS

Indian society should reduce its ecological footprint per unit of consumption, and start doing so in time to avoid global overshoot.

The task would be greatly simplified if human society moved away from its fascination with growth, both in population and economic value.

The concepts defined in this booklet will be meaningless unless they are implemented and lead to results on the ground. Most of these concepts are well known to government officials, businesses and civil society – but the formulation of policies does not seem to be influenced much by this knowledge. Clearly, there exist considerable barriers to rational policy making.

One of these is the turf or territorial issue. The silos within which ministries work and the bu-reaucratic instinct to protect that turf from all new-comers is probably the biggest barrier to rational policy making.

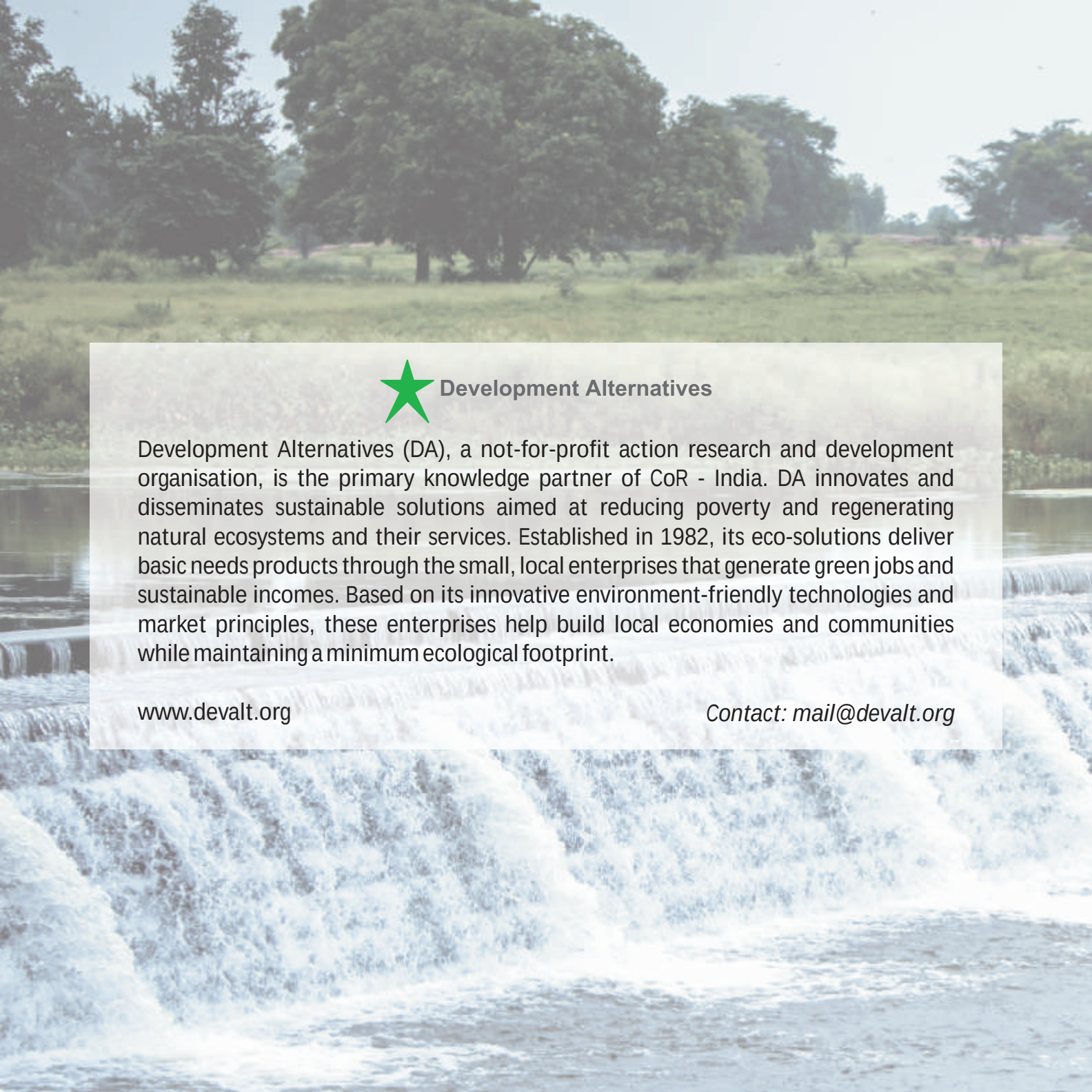
Other barriers include ignorance of the issues, lack of data and attention to research findings, inadequate support to research, lack of respect for the views of others (the "*Not Invented Here*" syndrome"), fear of the unfamiliar, narrowly-defined professional or personal self-interest and the other well-known societal or individual frictional processes such as corruption, inefficiency and lack of concern for the national good.

But such barriers have been overcome in various places and at various times, and given the magnitude of the water security problem in our nation, India has little choice but to make this the place and time when it happens.

Many conferences take place every year on the subject of "*Water Security*". This one convened by the Club of Rome - India offers a valuable opportunity to probe the fundamental, root causes across disciplines and sectors, and find solutions that can be translated into policies in officialdom and action on the ground, in order to enable the country to eliminate thirst and the need for clean water, within a very short time.

THE STARK NEED FOR POLICY COHERENCE

The goals of water security for all can only be attained if we bring a higher level of rationality and systemic insight into our policy and action frameworks.



Development Alternatives

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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