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Dear Members,

Sustainable development is based on three pillars of sustainability viz. economic, environmental and social. It is only achieved when there is a balance or trade-off between these three keystones. Environmental factors obviously play a key role in affecting both economic and social sustainability. The current issue of the Digest attempts to understand the multifaceted role of the environment and explore diverse environmental strategies in bringing about sustainable socioeconomic development.

Achieving economic development is vital for any nation, but it cannot be made to occur at the cost of the environment. As it is, the whole world is paying a high price today in terms of global warming and climate change that is resulting from relentless environmental degradation. The Indian economy (especially our agricultural sector) is predicted to be particularly hard hit by climate change and unless the public at large is soon made aware of the gravity of the situation, there is a real danger of waking up when it is too late.

In dealing with environmental issues, we do not have the luxury of time. Rivers and other waterways all over India are getting increasingly polluted due to the unchecked dumping of wastes in them. This has led to poor water quality for consumption, and subsequently, a deterioration in human health leading to a fall in workplace productivity. The extent of use of non-renewable resources has not only hastened their depletion but also caused an irreversible increase in pollution and ecological imbalances.

Large scale industrialisation has led to widespread fragmentation of previously intact landscapes. From the clearance of richly biodiverse forests to the damming of large rivers, the knock-on effect of isolated, impacted ecosystems is detrimental to the health of their unique flora and fauna. This also threatens the extinction of rare species which will have an injurious impact on the larger ecosystem. Initiatives need to be taken to promote landscape connectivity, as it is vital to preserve the remaining biodiversity and to protect the interlinked ecosystems on which the very survival of mankind depends.

In the long run, the success of all evolution strategies depends on working with the environment rather than against it. Strategies for
adaptation to global warming and climate change need to address domestic socioeconomic vulnerabilities as well as enhance resilience on a transnational scale. They also need to avoid short term fixes that may have only local benefits but are politically convenient. In today’s interconnected world, global cooperation and the sharing of best practices are needed to identify and avoid those environmental protection strategies that may appear to mitigate the underlying issues but actually end up compromising the quality of life for future generations.

A key challenge for the new government is to strengthen the overall economy within a structure of environmental protection. In that regard, a lot of good work has already been done like the interlinking of major rivers to ensure greater equity in the national distribution of water, and the noteworthy Ganga cleaning project which has produced some positive results. In the long run, we need to redesign our current socioeconomic model for accommodating the realities of environmental sustainability in a policymaking and regulatory-friendly framework.
From The President’s Desk

The Inspirational Cycle of Aspirational Indicators, What does this really mean?
Dr. Arvind Kumar

Environment Protection Under the Indian Constitution
Mr. Shrey Sharma

Mahatma Gandhi: Progenitor of the Concept of Sustainable Development
Dr. Govind Singh

What will it take to create a Circular Economy
Ms. Kanika Ahuja

CLIMATE CHANGE – the biggest challenge of our lifetime
It’s time to ACT!! NOW!!
Mrs. Vandana Chavan

Pollution and economic development: an empirical research review
Mr. Saleem H. Ali and Mr. Jose A Puppim de Oliveira

Growing Trees in cities is like Planting Healthy Air
Dr. Anil K. Rajvanshi
Solid Waste Management  
P. Sharma, K. Dhanwantri and S. Mehta

Using Catchment Area Treatment Plans for betterment of forests– A suggested approach.  
Cdr. Dipak Naik & Mrs. Rekha Somayaji

GOVERNMENT

हरित संकल्पना (Call for Green Ideas) योजना माण्डर्न कूचना  
Department of Environment, Govt. of Maharashtra

राज्य नदी संचरण योजना  
Department of Environment, Govt. of Maharashtra

SPECIAL FEATURE

MPCB unlocks its new web portal, contributes for “Ease of doing business”  
Dr. Pundlik Mirashe  
Asst Secretary(Tech), Maharashtra Pollution Control Board
The Inspirational Cycle of Aspirational Indicators, What does this really mean?

Dr. Arvind Kumar
President, India Water Foundation
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From periphery to mainstream, having covered wide range of districts from Chitrakoot, Fatehpur, Balrampur, Siddharth Nagar, Shravasti and Bahraich in the states of Uttar Pradesh, the entire experience deciphered understanding the real meaning of ‘Aspirational Districts’. The districts represented important spiritual & cultural hotspots but remain relatively backward in development. But being less developed, it also signified that these districts have immense potential to bring Mainstream and Balanced development through ‘participatory governance’ and serve as an inspiration for other districts to tailor a similar model.

It is always opinioned that ‘Development is not just mere creation of infrastructure but building own capacity in order to create a sense of ownership’. This was necessary to understand socio-economic views and take into consideration the local geographic perspective. India Water Foundation covered the Aspirational Districts for a period of six months with November and December especially spent to garner plethora of experiences, learnings and understanding the challenges that plagued the mainstream Development of these districts. These districts stands imprinted among the 115 selected districts of ‘Transformation of Aspirational Districts (TADA)’ It also assumes significance for being an important religious, spiritual and cultural place. However it lacks in development indicators like health, education, water resources, clean environment, etc. To envisage holistic development, it must display a clarion call from the roots, i.e. through participatory governance. This is where a civil society like ours acted as a Communicating Interface to bridge various common Aspirations of the districts.

Water being an important socio-economic connector was the missing link amongst these focused areas. Arsenic is a major problem, especially for people residing in the Ganga-Brahmaputra belt in eastern India. Public Stakeholder discussion for example in Bahraich, explained that out of 14 blocks, 10 blocks faced arsenic poisoning on one hand and lack of adequate water testing kits & in-experienced staff to handle such crisis was a second major challenge. The other districts especially the Bundelkand region of Chitrakoot faced problems of poor water quality, desertification, abysmal state of river bodies viz cleanliness & conservation. Even the plight of rivers Mandakini and Saryu improved but at a slower pace. In similar parlance, District Magistrate of Fatehpur acknowledged that ‘out of the actual 284 ponds only 50 ponds stands functional where Fatehpur in the past stood in the category of water affluent district’.

The ‘Dynamic Ground Water Resources of India’, a report by the Central Ground Water Board (CGWB), gives a startling view on the state of Uttar Pradesh, the worst-hit state, shows alarming depleting groundwater levels in many districts with equal levels of ‘stressed’ or over-exploited water reservoirs.

If water reservoirs were highly mismanaged and the declining water level was due to adverse result of massive ground water exploitation used for irrigation and mismanaged agricultural activities. NITI Aayog has also acknowledged that while the country is in the throes of the “worst water crisis in its history and given the combination of rapidly declining groundwater
levels and limited policy action, this is also likely to be a significant food security risk for the country going forward”.

Hindered availability (quality) of water led to witnessing plethora of problems like ill-health, unclean WaSH practices, inadequate nutrition, disease prone and malnourished children. Major issues in the schools witnessed low learning outcomes, high absenteeism, and lower enrolment, especially for girls. In Siddharth Nagar, basic infrastructure of schools and hospitals was missing for which inadequate budget allocation was cited the major reason coupled with absurd socio-economic human development indicators. Coordination among different departments was missing to bring integrated results among Health, Education, basic infrastructure etc. The low quality of education in the districts (and dearth of jobs) further reflected in Uttar Pradesh’s high unemployment. Youth unemployment was especially high with disproportionate skill sets. The state is struggling even in industries that have traditionally been strong. We raised our focus on low-hanging fruits or projects that can be completed with minimum but focused intervention. To be precise, if Shravasti was plagued with problems of limited funds for MGNREGA, non-availability of skilled labor and out-migration of people to seek better job avenues then Balmampur faced an uphill task of opening of Prashikshan Kendras due to non-availability of industry, infrastructural problems, skill sets and remunerative jobs.

NITI Aayog, in a recent report ‘Composite Water Management Index’, termed India’s water crisis the “worst in its history” as 600 million people face high to extreme water stress. In the report, Uttar Pradesh ranks poorly for overexploiting groundwater resources, on-farm water use and limited policy action. These statistics are grim enough to invite a national debate on the unfolding water crisis.

The Health & Nutrition Indicator also remained far from optimal levels. According to data provided by the Ministry of Drinking Water and Sanitation, only 47.21 per cent of rural areas in Uttar Pradesh have been covered under the Swachh Bharat Mission, with districts like Chitrakoot and Fatehpur not even recording 30 per cent coverage. The state, however, claims having 4,743 open defecation-free (ODF) villages. We found that lack of basic infrastructure; out of pocket expenditure coupled with lack of awareness were a setback for people. Swachh Bharat Abhiyan at the premises lacked progress at implementation level with limited monitoring efforts.

‘Development also has a vicious cycle, even if one of the 6 indicators is misplaced or removed, the entire cycle breaks. Hence, it becomes important to converge Development at a single platform laying its focus on fulfilling the aspirations of people’.

Moving Forward towards Amicable Solutions

To improve the socio-economic parameters of the place, it is necessary to amalgamate the fusion of ‘innovation’ entrepreneurship, science,
social engineering and good governance’. Acknowledging the same, IWF while ‘taking science at ground zero’ made an effort to raise the scientific awareness and temper, capacity building of the people, disseminating good practices on health, education and hygiene.

Realizing this, India Water Foundation felt the need to raise awareness of the people to bring about ‘development from below’. Acknowledging the idea of ‘Learn Global and Act Local and vice-versa’ and upholding the principles of Solve Different, we realised this concept through Eco Routes: Eco and WASH dialogues for Eco intelligent rural rejuvenation field capacity enhancement’ a project supported by NCSTC department, Ministry of Science and Technology in aspiring districts. Taking a bird’s eye view, we took cognizance of the noble issues viz 6 key indicators of ‘Education, Heath & Nutrition, Basic Infrastructure, Agriculture & Water Resources, Skill Development and Financial Inclusion’.

Having discussed the ‘Status- Problems-Challenges’ among various stakeholders, words of wisdom, experiences and ground realities were exchanged to unleash the untapped potential and prospects the Aspirational Districts carries. It was an interactive session which assimilated delegates from various arenas to converge at a single platform to deliberate amicable suggestions having a long lasting impact. As per the problems, issues shared by the community stakeholders, experts from our end also deliberated and advised amicable solutions local, nature-based solutions and technical suggestions as well to address water scarcity, ground water depletion, interlinking health-nutrition, sustainable agricultural practices, raising entrepreneurship skills and the prospects of river rejuvenation.

IWF ensured to lay a foundation stone of ‘unique yet proactive’ solutions.

We have been emphasizing on capacity building of all stakeholders in water sector in judicious use of water resources, keeping groundwater and surface water resources free from pollution, rainwater harvesting and recycling of wastewater for reuse as effective means to tackle water related problems in a sustainable manner. Learning modules from Meghalaya specified in Integrated Water Resource Management, Water-Food-Energy Nexus and Ecosystem based Adaptation approaches and promoted knowledge dissemination regarding sustainable management of ecosystem services, leveraging water as natural capital and green practices anticipating vulnerabilities and improving resilience among the communities.

We provided training to the trainers who would take the lead forward to diffuse their experience and learning to the people of Community. IWF applauded the innovative efforts of distinguished people in their respective work space and community by felicitating them with ‘Champions of Change’ Award. They represent the future discourse of the respective
districts to chart out a roadmap based on their ambitions, successful stories, innovative grass root ideas and willingness to bring ‘Real Change from below’.

In Bahraich, we saw tremendous vigor among farmers through practices like organic farming, tissue culture and the cultivation of Dragon Fruit Bonsai, in a move towards crop diversification.

Also, the stakeholder consultation was preceded with activities of painting competition for school children, public consultation, school interaction and play-card activities, human-chain formation. The campaign was indeed educative for everyone, including us to learn & share experiences, pieces of wisdom, attempting to bring cohesive solutions, which was previously ignored largely. The essence of such campaign was that people from diverse cultures, formed a mosaic of opinions reflected the symbolic representation of various opinions, mindset, and thoughts of the people.

Taking gains from Meghalaya, Non-functional resources were converted to Functional resources through Value-added entrepreneurship. Knowledge exchange was acknowledged through creative and innovative tools of information via stakeholder dialogue and public outreach programs. In schools, keeping Education as a key tool, we encouraged schools; teachers motivate students to think about worsening crisis of environment with specific impetus to Water and disseminate their social responsibility to children. We also commend efforts towards ‘mother-child’ healthcare through POSHAN Abhiyan and Sabla Saloni aiming to bring awareness on WaSH and basic literacy on nutrition and health is well acknowledged. But this should move beyond toward Social and Inclusive Education.

We believed that these districts are not able to reap demographic dividend as they lacked in critical sector of Education and health. We raised the mandate of Eco literacy higher ranging from scientific principles of WaSH especially among children & women, reducing plastic trash & litter and promoting water conservation and intricately seized the golden opportunity to align the success with our ‘Eco Routes mandate’. The mass campaign gathered an intense momentum of approvals or disapproval of many local causes and challenges. Through these powerful messages, we seized the golden opportunity to mobilize people, garner new dimensions and align our ‘Eco Routes stakeholder dialogue’ along the same lines. We spearheaded the idea that ‘Change is the need of the rightful need of the hour & it must come from within’. In these districts, every single individual acted as a ‘Catalyst of Change’.

**Future Course of Agenda**

*The mandate of Aspirational Districts must be to engage the community as equal Partners-in-Development. Opportunity must be seized to disseminate knowledge, best green practices, train and educate and capacity...*
building initiatives in order to help them understand the significance of conserving environment and make their respective schools as the Environmental harbingers of ‘Future Next’.

* A strong message of linking development with Agenda for Sustainable Development 2030 to strengthen socio-economic parameters of the state and the country. The Administration must join hands with the community and such an eventuality is bound to ensure the upward trajectory of these ‘Aspirations’ to a satisfactory level.

*Infrastructure, which has direct bearing on the quality of life should be strengthened to interconnect the six indictors. Strong financial resources and strategic planning must fasten the expansion of the social sector – health, skill development and education accommodated by scientific IEC models ’ in order to bring them to the mainstream.

*Water as an Enabler and Catalyst should hold the key which addresses various issues of sustainable development related to Rejuvenation and Regeneration of water and natural resource management, capacity building, development of infrastructure etc, with climate change perspective.

*History of Neglect must be reversed to History of Reimage to make these Aspirations felt in real terms and regain the divine and serene Cultural Hotspots as envisaged during ancient times.

A Right Step in a Right Direction was already laid in the last six months but it’s high time these districts take an overarching command to regain these ‘Cultural Hotspots’.

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Environment Protection under the Indian Constitution

Shrey Sharma

Introduction

It’s evident from the construction of the Constitution that the idea of environment was never there in the minds of the founding fathers of the Indian Constitution. Consequently, the expression ‘environment’ does not find any mention in the Constitution. However, there are many items in the legislative lists which enable the Centre and the State to make laws in the field of environment like public health, sanitation, agriculture etc.

Moreover, it is interesting to note that all the substantial steps taken by the State towards the protection of environment, were taken after the Stockholm Conference, 1972. Prior to the conference, it did not hit the conscious of the Indian government that they need to proactively work towards safeguarding the environment.

The Constitution 42nd Amendment Act, 1976 which moved forest, wildlife and population control from the State to the Concurrent List enabling both the state and the centre to make laws pertaining to these areas is one of the examples out of the several initiatives taken by the Indian Government towards environment protection.

There is no doubt in saying that it is the responsibility of the State to protect the environment. However, it took a long time for the Apex Court to pronounce explicitly that the right to life under Article 21 of the Constitution contains right to have a healthy environment.
Steps Taken Post Stockholm Conference, 1972

Several environmental legislations existed even before the independence of India. However, the major development took place after the UN Conference on the Human Environment (Stockholm, 1972). After the conference, the National Council for Environmental Policy and Planning was set up in 1972 within the Department of Science and Technology to establish a statutory body to look after the environment related issues.

The council later evolved into a fully fledged Ministry of Environment and Forests (MoEF). MoEF was established in 1985 and today is the apex Administrative body in the country for regulating and ensuring environmental protection and; lays down the necessary legal framework for the same. Further, since the 1970s a lot of environmental legislation have been laid down. MoEF and various Pollution Control Boards (“CPCB” i.e. Central Pollution Control Board and “SPCB” i.e. State Pollution Control Board) together form regulatory and administrative core of the sector.

Apart from establishing numerous pollution control boards and MoEF, various other legislation like The Air Act and the Environment Protection Act (EPA) were also enacted. Moreover, as their long titles show, these Acts were enacted by virtue of the provision in Article 253 of the Constitution to implement the decisions of the international conferences and conventions. Indian Parliament also enacted Wildlife Act and the Water Act by exercising its power under Article 252 of the Constitution of India.

Steps taken by the Indian Government and Judiciary towards Environment Protection

The right to live in a clean and a healthy environment is not a recent invention of the Indian Judiciary. The only difference is that the right has been recognised as a fundamental right by the Indian Judiciary over the period of time. The right to live in a clean and healthy environment existed from centuries ago, but it attained the status of ‘Fundamental Right’ only a few years back. The judiciary has widened the ambit of Article 21 by including right to have a clean environment in it and further making it a fundamental right.

Article 21 talks about the right to life and personal liberty, it reads as follows “No person shall be deprived of his life and personal liberty except according to procedure established by law”. This article imposes a duty on the state to protect the life and liberty of the people. The concept of this article has been broadened by judicial pronouncement. In the case of Subhash Kumar v State of Bihar, it was held that ‘right to life’ guaranteed under Article 21 includes the right to have pollution-free water and air. Through this case the court recognised the right to a wholesome environment as part of the Fundamental Right, making it a landmark judgment.

In the case titled as Rural Litigation and Environment Kendra, Dehradun v. State of UP the representatives of the rural litigation and entitlement Kendra, Dehradun wrote to the Supreme Court alleging that illegal mining in the Mussoorie-Dehradun belt is causing damage to the eco-system. Therefore, the court ordered the closure of a number of limestone quarries.

Moreover, the issue of vehicular pollution was discussed in the case titled as M.C. Mehta v. Union of India. The apex court, in this case, reaffirmed that the right to a healthy environment as a basic human right and held that right to clean air also stems from Article 21 which talks about right to life. It is considered to be a landmark judgment, as after this judgment lead-free petrol supply was introduced in Delhi.

Further, The Constitution of India originally adopted did not have any direct and specific provision regarding the protection of natural environment. It only contained few directives to the State regarding public health, agriculture and animal
husbandry but none were judicially enforceable. Some of the Directive Principles of State Policy showed a minute inclination towards environmental protection i.e. Article 39(b), 47, 48 and 49 which individually and collectively impose a duty on the State to take measures for improving the general health of the environment and provide a clean environment to the country.

However, later through a constitutional amendment, two specific provisions i.e. Article 48-A and Article 51-A (g), has been added to the Constitution which puts a duty on the State as well as the citizens of India to protect and conserve the environment.

**Conflict between Environment Protection and Citizen’s Rights**

The freedom of expression under Art 19(1) (a), right to carry on a business, trade or occupation under Art 19(1) (g) , freedom of religion under Art 25 and above all equality under Art 14 are the areas where these conflicts arise in contradiction with the right to a healthy environment under Art 21. An inquiry into the cases will reveal, as to how the Courts reconciled the two issues.

**A. Land Use**

In T Damodhar Rao v Special Officer Municipal Corp, Hyderabad, it was held for the very first time by an Indian Court that the conversion of open space, the lungs of a populated area, would affect the right to life under Art 21 of the constitution. Later, in Banglore Medical Trust v BS Mudappa the Supreme Court proceeded with the same vigour and prevented using the open space for constructing a private medical complex.

Similarly, in V Lakshmipathy v. State, the petitioners challenged the location and operation of industries and industrial enterprises in a residential area as violative of Karnataka Town and Country Planning Act, as well as the right to life under Art 21 of the Constitution. The court held that the mandate of the Constitution is to build a welfare society and for that utmost priority should be given to the environmental protection and its preservation. Thus, neglecting this will be an invitation to a disaster.

**B. Freedom of Trade and Property**

In Residents of Sanjay Nagar v. State of Rajasthan, the Rajasthan High Court came across an interesting situation. In this case the owners of the slaughterhouse were discharging untreated animal blood in the drains of the residential colony, where it was situated. Consequently, the court reminded the owners of their duties under Art 21 and 48A for protecting and improving a clean environment and ordered them to shut the slaughterhouse. An observation made by the Supreme Court in one of the MC Mehta cases is in consonance with the above-mentioned judgment. It was pointed out in MC Mehta v Union of India that the most vital necessities, namely air, water and soil having regard to the right to life under Art 21 cannot be permitted to be misused and polluted so as to reduce the quality of life of others.

Moreover, the case titled as Ivory Traders and Manufacturers Association v. Union of India is another example of a judgment, restricting the fundamental right of the citizens for preserving and safeguarding the environment. It was held that any trade which is detrimental to the environment, can totally be banned without attracting Art 19(1) (g) of the Constitution. It was further held that any trade which involves killing of animals like elephants, in this case, cannot be taken as business or trade in the sense of Art 19(1)(g) of the Constitution.

**C. Constitutional Obligations of Hazardous Industries**

The Supreme Court in MC Mehta v Union of India has ruled that an enterprise which has engaged in a hazardous or inherently dangerous industry which poses a potential threat to health and safety of persons working in the industrial unit and residing in the surrounding areas, owes and absolute obligation to the community to ensure that no harm results to anyone on
account of such hazardous or inherently dangerous nature of the activity.

D. Restriction Freedom of Speech

The Constitution of India grants every citizen the Right to Freedom of Speech and expression. However, if it impinges upon the rights of another then it can be restricted. Noise pollution is a notable example of such impingement. In Rajni Kant v State the petitioner, the leader of a political party was not allowed to use loudspeakers in the public meeting he wanted to organise. The petitioner, in this case, contended that such restriction is violative of his right to freedom of speech under Art 19(1) (a) of the Constitution. The court held that the impugned bylaws do not infringe Art 19(10) (a) of the Constitution.

Conclusion

It can be easily deduced from the above-mentioned cases that though the facts and circumstances of all the cases are different but the underlying principle in all the cases is the same i.e. protection and preservation of the environment. Initially, the Indian Government adopted a very lackadaisical attitude towards the conservation of the environment, by not including any legally enforceable principles in the Constitution of India. However, with the passage of time the State realised the blunder that they have made and thus, started making conscious efforts in not only protecting the environment but in developing it too. The evolution was slow but it happened in due time and as it is said better late then never. Moreover, the importance of the right to health and the right not to be afflicted by diseases. The decision, undoubtedly promotes the aims behind EPA, namely protection and improvement of the environment. Since its incorporation into the constitution by the Forty-Second Amendment, the idea of protecting and improving the environment did not attract the attention of the Indian judiciary for a long time till the significant ruling in Municipal Council, Ratlam v Vardhichand was passed. Though the apex court moved at a snail’s pace in achieving its objective of environment protection but the High Courts, interestingly made a huge leap in this respect. No wonder, the Supreme Court was quite convinced of the Constitutional mandate for environmental protection and rendered decisions with necessary interpretations and in consonance with this mandate.

*Courtesy: This article was originally published on the website https://blog.ipleaders.in/environment-and-constitution/*
On 2nd October, 1869, the coastal city of Porbandar in Gujarat, a Harappan relic, and the birthplace of Sudama, the friend of Lord Krishna, witnessed the birth of a child who was to change the destiny of Porbandar, and of India. The child was none other than Mohandas Karamchand Gandhi and Porbandar is now known the world over for being the birthplace of Mahatma Gandhi. Mahatma Gandhi played a significant role in India’s independence and became the champion of the cause of peace and non-violence. His birthday is now celebrated as the International Day of Non-Violence by the United Nations and he is remembered by one and all in India as the Father of our Nation.

Gandhi’s teachings on non-violence were not limited to conflicts between human beings but also highlighted the need for living in harmony with Nature and Natural Resources. His teachings are therefore even more relevant today, at a time when the world is grappling with an imminent environmental crisis in the form of global warming and climate change.

On 2nd October 2014, Mahatma Gandhi’s 145th birthday, the Prime Minster of India Shri Narendra Modi held a broom in his hand and led the country for adopting Gandhi’s vision of a Swacch Bharat. When the Prime Minister of the world’s largest democracy swept the roads clean, not only was the world awe struck, it also served as a reminder to all Indians about the vision and values of Mahatma Gandhi that are entrusted to every Indian, coming from all sections of the society. During his struggle for independence, after Gandhi travelled to different parts of India, he made an observation that Swaraj or independence will have no value for India if we do not improve our dirty habits. He was referring to the lack of adequate toilets and sanitation facilities mainly in rural India and the resulting open defecation that he witnessed.

Throughout the freedom struggle, Mahatma Gandhi kept reminding his followers of the deep rooted connection between Swaraj and sanitation. His quest for cleanliness and sanitation did not obviously conclude with India’s independence. While addressing the partition refugees at the Kurukshetra camp in 1947, Gandhi did not forget to remind them that the cleanliness and sanitation of their refugee camp was in their own hands and that they must make every effort to keep the camp clean and hygienic.

About a century ago, in 1909, Mahatma Gandhi had already envisioned and identified the insatiable and unending pursuit of material pleasure and development in the Western Society as a threat to the Planet and its Resources. In his writings compiled in the Hind Swaraj, Mahatma Gandhi had warned...
Western Society of the ill-effects that their over-consumptive lifestyle could bring on the Planet. He also appealed to his countrymen to not remain trapped by the thought of material gains.

Warning against the destructive development model adopted by the West, Mahatma Gandhi had noted, “God forbid that India should ever take to industrialisation after the manner of the West. The economic imperialism of a single tiny island kingdom is today keeping the world in chains. If an entire nation of 300 million took to similar economic exploitation, it would strip the world bare like a locusts.” It is indeed this very Western model of development, which depends heavily on burning coal and petroleum, which has resulted in global warming and related consequences in the present day. This speaks of Mahatma Gandhi’s remarkable vision and understanding of the relationship between society and environment.

Mahatma Gandhi was also a very strong advocate of simple living and high thinking. He did not just preach this but also practiced it in his daily life. Along with this, he worked for every section of the society and believed in inclusive development, which is for all and not just for a chosen few. His contribution towards highlighting the plight of Dalits in India, especially through the publication of the weekly journal Harijan, has gone a long way in addressing such challenges in our society.

In 1987, the World Commission on Environment and Development of the United Nations published a report titled Our Common Future. The Report, for the first time, put forward and defined the concept of sustainable development as that development which meets the needs of the present generation without compromising the ability of the future generations to meet their own needs. According to this Report, sustainable development can be achieved by finding a balance between economic growth, social development and environmental protection. Since all this has already been demonstrated by Mahatma Gandhi through his life and teachings, the Our Common Future Report is but a Eulogy of the Father of our Nation. It is not surprising therefore, to see Mahatma Gandhi responded to a question on what message does he want to pass on to the next generation. “My life is my message”, he had promptly responded.

Mahatma Gandhi had put forward his various thoughts on different aspects of the environment. Many of these were visionary observations and are being realized in the present day. For instance, he had noted how clean air is becoming a scarce resource and soon clean air may not remain freely available. He had therefore...
forewarned, “Anyone who fouls the air by spitting about carelessly, throwing refuse and rubbish, or otherwise dirtying the ground, sins against man and nature”. In modern day India, clean air has indeed become a scarce resource and our automobiles and industries continue to pollute the air with increasing impunity each day. Mahatma Gandhi was of the opinion that bad air is even more harmful than bad water.

Similarly, Mahatma Gandhi had highlighted how water, air and grains are the three basic foods required by every human being on a daily basis. These resources were to be therefore given utmost care. Gandhi was also a strong advocate of natural healing and nature cure. He attempted to invoke the *panch tatwas* and create a natural cure system which could be made accessible to every Indian citizen who may not be able to afford Western medicines. Throughout his life, Mahatma Gandhi advocated the principle of sustainable development and called for harmony between society, development and environment. His simple and minimalist lifestyle has inspired millions of global citizens for walking on the path of sustainable development.

One of the last notes left behind by Mahatma Gandhi in 1948 is also referred to as Gandhi’s Talisman. It is perhaps, the single most important message for ensuring sustainable development of the world community. The Talisman is directed at everyone and especially towards those who need to make a development related decision which may have a considerable impact on the society. This is how it reads, “I will give you a talisman. Whenever you are in doubt, or when the self becomes too much with you, apply the following test. Recall the face of the poorest and the weakest person whom you may have seen, and ask yourself, if the step you are going to take is going to be of any use to him. Will he gain anything by it? Will it restore him to a control over his own life and destiny? In other words, will it lead to *swaraj* for the hungry and spiritually starving millions? Then you will find your doubts and yourself, melt away.”

Mahatma Gandhi is perhaps one of the first modern environmentalist of India and champion of the cause of promoting sustainable development. His life is indeed a message that he has left for the entire world, in an attempt to promote sustainable living and lifestyles with minimal impact on our common environment.

The year 2019 will mark the 150th anniversary of the birth of Mahatma Gandhi. It will also mark five years of the Swacch Bharat Abhiyan or the Clean India Campaign which is led from the front by the Hon’ble Prime Minister of India, Shri Narendra Modi. The Swachh Bharat Abhiyan has provided every Indian with an opportunity to work towards fulfilling the dream and vision of Mahatma Gandhi. It is the responsibility of all of us to take necessary steps for ensuring cleanliness, hygiene and sanitation around us at all times. It is only after achieving 100% cleanliness and sanitation that we would have paid our real tribute to the Father of our Nation, Mahatma Gandhi.
Economist Tim Jackson writes in his book, Prosperity without Growth, “The vision of social progress that drives us – based on the continual expansion of material wants – is fundamentally untenable...In pursuit of the good life today, we are systematically eroding the basis for well-being tomorrow.” Our current economic system relies on consumption, obsolescence and more consumption. From time to time, we are sold the myth that our ingenuity can decouple growth from environmental impacts, but it’s a fallacy. Consider how we use materials for example.

Most economic processes follow a linear flow paradigm where materials are extracted, transformed, utilized, and finally disposed- tons and tons of waste is added to landfills every day. The key insight behind the Circular model is that waste is not waste but a resource. This view contrasts with the widespread and traditional view of waste as a non-good, useless and with a price lower than zero.

The transition to a low-carbon, circular economy will deliver significant economic, social and environmental benefits. Globally, Accenture Strategy predicts a $US4.5 trillion reward for circular economy businesses models by 2030.

The concept of a Circular Economy focuses on creating new opportunities and jobs especially for MSMEs based on resource efficiency, use of biological materials which can be returned as such to nature, eco-design techniques and other innovative tools. Since products are kept in use, the embedded energy, materials and labour are preserved.

Social and green entrepreneurship is considered as one of the main engines playing a relevant role within the complex systemic process enabling a more Circular Economy. Its key drivers, the social and green entrepreneurs, accelerate the transition anytime they convert their ideas into feasible and viable enterprises. The core business of their enterprises is mostly environmentally and socially oriented rather than purely economic. They offer products or services to reduce environmental impacts and create social values through the use of innovative, effective and efficient business models and natural resources. Their work concentrates on sustainable sectors such as renewable energy, waste management, recycling, organic food or eco-tourism while resale, repair and rental are the future for Retail.

What will it take to create a Circular Economy?

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MSMEs are building new innovations and business models but large organizations are needed to adopt those practices to create widespread impact. “Innovation will provide the solutions but the main point is connecting knowledge, across industries. Its about partnerships.” Says Roberto Canevari, Chief Supply Chain Officer at Burberry, at the Copenhagen Fashion Summit 2019.

The idea of a circular economy may seem very “pie in the sky,” but some companies are already putting circular principles to use—and profiting from it. For example, the fashion industry is the second largest polluter in the world after oil, but new business models are renting out the latest trends; instead of buying a new dress, wearing it once, and then getting rid of it, you can borrow it from a company such as Rent the Runway and send it back when you’re done so that someone else can enjoy it. It’s also a lot cheaper than buying high-end fashion.

LIFAFFA is another example of a fashion brand that is utilizing cross-industry Circular Economy principles to generate profit. LIFAFFA has developed a proprietary process to convert the common plastic bag, chips packets and biscuit wrappers into a new fabric that they call “Handmade Recycled Plastic”, which can be used as a type of vegan leather, for home furnishings and even to create low-cost housing tiles. LIFAFFA’s design team—led by an acclaimed Green Designer, Anita Ahuja, works rigourously to first create attractive patterns within the fabric. Majority of people are not even able to identify that its made from plastic! “Its like creating a water-colour painting. The diverse colours of the plastic bags blend together to create prints and textures that are both-attractive and easily repairable.”-- says Anita. Contemporary upcycled product designs made with upcycled fabrics that extend the value chain of a difficult material like Plastic is just the kind of innovation we need to evolve to a Circular Economy. LIFAFFA is now focusing on creating Partnerships to share their patented technology to create and train interested organizations and communities and building micro-enterprises that use waste as a resource. (www.lifaffa.com)

Challenges in achieving a Circular Economy

There are four potential drivers for the circular economy: altruism (doing it because it’s the right thing to do); shareholders (because there’s money to be made from it); market demands; and government.

There are several challenges on these fronts that we must first address before we can realise a true Circular Economy. First, to consumers the circular economy brings psychological and ethical value. Yet, despite the expressed willingness of many to be more environmentally friendly, in actual purchasing decisions most shoppers hesitate to pay more. Potentially, however, consumers can generate enough pressure to ignite the circular economy with their wallets. If companies win or lose market share because of consumer purchases (“votes”) in favour of sustainable products, producers would have an incentive to respond.

Second, the producers of consumer goods typically describe themselves as open to the circular economy. However, most action is short term and premised on managers’ assumption that going ecological sacrifices margins. Recycling is perceived in risk terms: new regulation would require expensive compliance or costly lobbying to contain or rid regulation. The principle is that only if a circular economy project makes economic sense it stands a chance. In other words, the circular economy is evaluated from a traditional ROI perspective.

Third, the public sector is often seen as provider of new regulation that is critical to ignite the circular economy. Much like changing consumer behaviour, regulation and associated costs of non-compliance can pressure producers to reduce waste.

Fourth, recycling businesses supply the technical solutions and factories where actual waste recycling happens. The cost of the delivered input materials plus their recycling process must be less than the sales price of outputs, that is products made of recycled materials, commonly termed as “Upcycling”.

A slight rebranding of “sustainability” could help
Cover Story

...to make circular economy more appealing. For too long, ‘sustainability’ has meant ‘reduction,’ while a few are hopping on to the Minimalist/Zero waste lifestyle, there are many who just don’t want to use less. Thus, its imperative that we make changes holistically to create a sustainable economy. “It’s like trying to choose between going on a diet or choosing a healthy lifestyle. A diet is all about cutting back on what you’re eating—eating less all the time. Whereas a healthy lifestyle you’re looking holistically at what you’re doing and making improvements to your life system.”—says Stephanie Kersten-Johnston, adjunct professor in Columbia’s Sustainability Management program and director of Sustainable Business at Heineken USA.

So the end goal may be sustainability of a planet and even our industries and our companies and so on, but it’s just a reframing of how we think about that sustainability approach.

To develop a global circular economy, changes are desired at an international level and countries are taking part in the transition—various mature economies have put forth similar legislations. Taking the lead is the European Union (EU)’s Circular Economy Package, which broadly deals with transforming the way plastics and plastics products are designed, produced, used and recycled. Further, Sweden is giving tax breaks (50 percent cut on VAT) on repairs of washing machines, bicycles, or simply any broken item. It passed a law that directs retailers selling electronic goods to accept the same quantity of products they had sold, for recycling or reuse. The Netherlands and Japan have also promoted intensive circular economy legislation. The Dutch government has introduced several programmes to attain a circular economy such as the Green Growth, From Waste to Resource (VANG) and the Biobased Economy.

Circularity – a traditional way of life in India

A multitude of circular activities is inherently practiced by Indian society. As a people, it is bred in the bone in us to reuse and recycle to the maximum possible extent. As a matter of fact, the collection and recovery rate for a slew of scrap materials as also the re-use rate of goods is relatively higher than most developed countries. We are always striving for novel ways to squeeze the extended value out of forsaken objects, revamping our old T-shirts into dusters, washcloths, and mops, disposing of them only when they are too tattered to be used, reusing jam bottles to store home-made pickles, recycling old saris to make lehengas and anarkalis. Sadly, with increasing disposable income, we are losing our environmentally-rich practices with the abundance of cheap and disposable products available in the market. Most of the time, this recycling takes place at the far end of the value chain by the poorest sections of society. This part of the society treats the reusing activity as a scarcity management approach instead of making it an essential part of the economic construct. An obvious result of this is value loss, in addition to health risks for those who obtain value from waste such as the garbage processors and rag pickers. In addition to that, as the people belonging to the lower strata of the society and the population, in general, is reducing, we are losing touch with our innate circular habits.

India knows how to manage resources when it comes to sorting, separating, and the other low hanging fruits. India’s network of ragpickers, though an unrecognised force, is the backbone of our strong (but non-compliant) waste management system. But, when it comes to advanced technologies, there is scope for India to incorporate some expertise. This can be done by creating a nexus between research institutions and industry, between micro-enterprises and large organizations and creating awareness about Circularity principles from the primary education level. There is a need for a coherent roadmap that ushers in mutually complementary platforms and policies to boost the transition towards a circular economy. This is an opportunity which India should harness, to take the lead in a circular model of development—sans sacrificing economic growth.
Climate Change in India:

India, like several other countries across the globe, is facing the impacts of Climate Change – Heat waves, torrential rains, cloud bursts, cyclones, flooding, droughts and different weather events are becoming a norm, heavily impacting life and property. Sea levels are rising. Every country in the world is experiencing first-hand the drastic effects of climate change. While the impacts of climate change or global warming are being felt globally, experts opine that Asia will be amongst the hardest hit and India lists amongst one of the most vulnerable countries.

India ranks 12th in the list of the most vulnerable countries to climate change impacts according to the Global Climate Risk Index of 2018, published by German Watch, a non-profit working on North-South equity and preservation of livelihoods. India witnesses an average of 3,570 deaths attributable to climate-related events every year. It is predicted that in the near future India will run into costs of trillions of dollars for climate change impact. If it remains to be business as usual, a World Bank report released in June 2018 estimates a loss of 2.8 percent of GDP and lowering the living standards of nearly half of its population by 2050. The worst hit would be people in 10 districts in central India (including some regions of Vidarbha in Maharashtra) some in Chhattisgarh and Madhya Pradesh where the GDP loss could be as high as 9.8 per cent as against the national average of 2.8 per cent. The report estimated the overall loss in national GDP in actual terms could be $1,178 billion.

We in India have been witnessing several climate events in the recent past. July 26, 2005 witnessed the deluge in Mumbai, which brought the financial capital of India to a halt. August 6, 2010 witnessed a cloud burst in Ladakh triggering floods and landslides causing huge loss to life and property. One of the worst calamities came in June 2013 with the cloud burst and flash floods in Uttarakhand, claiming the lives of more than 10,000 people. In September 2014, Jammu and Kashmir saw the worst ever floods recorded in the State. Cyclones Aila in May 2009, Hudhud in 2014 and lately Daye in September 2018 hit Odisha, Titli in Oct 2018 hitting Odisha and Andhra Pradesh, Gaja in Nov 2018 hit Tamilnadu and now Fani in Odisha on the 3rd May 2019 all created havoc, loss of life and loss of property and livelihood that people and Governments have not been able to recover.

Farmers’ suicides are on the increase due to dry spells and the number seems to be only increasing.

Climate change has affected agriculture in our country and disrupted national economies, affecting lives of people, especially the poor and the vulnerable. It is a global challenge...
and does not understand national borders. A polluting country may drastically affect others and hence this issue requires a solution that needs to be coordinated at the international level with action on all fronts at the local level.

So climate change is serious and we need to act now!! It is our duty to to save the earth for our future generations. Considering the serious situation all over the world scientists say it is a final call to save the world from ‘climate catastrophe’.

Greenhouse gases:
As far as our knowledge goes, the Earth is the only planet that is habitable in the entire Universe - it is the right distance from the Sun, it is protected from harmful solar radiation by its magnetic field, it is kept warm by an insulating atmosphere and has the right amount of water, carbon and other ingredients, constituting greenhouse gases, to sustain all forms of life.

Greenhouse gases occur naturally and are essential for the survival of humans and millions of other living things, by keeping some of the sun's warmth from reflecting back into space and making Earth livable. Since the 18th and 19th centuries however, due to rapid industrialization, deforestation, and large scale agriculture, quantities of greenhouse gases in the atmosphere have risen to record levels. As populations, economies and standards of living have kept growing, so has the cumulative level of greenhouse gas (GHGs) emissions in the atmosphere. The Carbon dioxide that was 280 parts per million (ppm) before the industrial age, today has crossed 400 ppm and is still rising. This is described as an anthropogenic process, which means ‘humans have caused it’ and therefore if anyone has to address the concern it is we human beings at all levels and in all spheres who have to work to bring down our Carbon footprint through government policies and change of lifestyles.

Why do we need to worry?
80 per cent of our energy today comes from fossil fuels and its use continues to increase. According to the US Energy Information Administration 2017 forecast, world energy consumption will increase by 28 per cent between 2015 and 2040 and over 75 per cent of that energy will still be coming from fossil fuels, which means the carbon dioxide in the atmosphere will continue to increase and the earth will continue to heat.

The frightening bit is that climate events are happening exactly the way scientists have predicted - sometimes even worse and most times faster than they were expected. Greater amount of carbon dioxide in the atmosphere would mean hotter temperature on Earth - which means a significant change in the climate thereby resulting in erratic and extreme weather conditions.

Worldwide melting glaciers, and rising sea levels have started affecting ecosystems. There are predictions that climate change would result in the extinction of 30-40 per cent of the world’s species. As far as human beings are concerned we are already seeing the impacts – people have had to be evacuated due to storms or floods, livelihood and agriculture has been affected, people are facing severe water shortages in some parts of the world, disease is on the rise as pests and mosquitoes breed faster in warmer climates – all this resulting in the poorest being hit the hardest.

International Community:
World leaders, Experts and Scientists, from Rio de Janeiro in 1992 to the Paris Agreement in 2015, have through Conferences deliberated on this important issue of Climate change and various related aspects so as to arrest greenhouse gas concentrations in the atmosphere. This has certainly brought great hope to the world community.

It was at the Paris Climate Conference in Dec 2015, that
195 countries adopted the first ever universally, legally binding global climate deal. The agreement sets a global action plan to put the world on track to avoid dangerous climate change by limiting global warming to well below 2°C and pursuing efforts to limit it to 1.5°C. Every signatory was asked to submit a Nationally Determined Contribution document and then follow up with actions.

That the international community recognizes climate change as a defining challenge of our times is also evident from the fact that the international community decided to include it in the SDGs (SDG 13) – ‘urgent action to combat climate change and its impacts’.

The SDGs spell out the road map and the targets to be achieved

- Strengthening resilience and adaptive capacity to climate-related natural disasters in all countries
- Integrate climate measures into national policies, strategies and planning
- Improve education and awareness and build capacities of humans and institutions on climate change mitigation, adaptation, impact reduction and early warning

The developed countries have agreed to commit to a goal to mobilize $100 billion annually by 2020 to address the needs of the developing countries.

Promote mechanisms for raising capacity for effective climate change related planning and management in LDCs and small island developing States, including focus on women, youth and local and marginalized communities.

Reports however reveal that we are totally off track and heading towards a 3°C. Keeping to the preferred target of 1.5°C above pre-industrial levels will mean “rapid, far-reaching and unprecedented changes in all aspects of society”. It will be hugely expensive - but the window of opportunity remains open.

Highlighting the seriousness of the impact of Climate Change on the planet and its inhabitants, United Nation’s Secretary General António Guterres recently drew the attention of the world to insufficient actions and made an appeal to politicians, businessmen, scientists and people in general to take effective and sustained action to meet the global challenge and to ensure a peaceful and sustainable future for all.

The good news is that it is still possible to reach the level outlined in the Paris Climate Agreement as the threshold of 1.5°C increase in global temperature, beyond which the world would experience almost irreversible damage. This is however with a caveat that this would require committed action so as to reach zero emissions by 2050.

What do we need to do?

Individuals will have to work consciously to reduce their carbon footprint. Limiting use of Fossil Fuel by making trips only when absolutely required, carpooling and using public transport, walking/cycling short distances. Pressurizing governments to provide good and efficient public transport. Use of renewable energy wherever possible. If one cannot become a vegetarian one can make an effort to atleast slightly cut down consumption of animal protein. Try to eat local vegetables and fruits as others coming from far would have heavy food miles and a higher carbon footprint. It is interesting to find so many lifestyle changes one can bring about to bring down ones carbon footprint – imagine if each and every citizen on the globe decides to do that, what a magical effect that would have.

Governments will have to take the issue seriously and accordingly
make climate policies and legislations. Governments at all levels will have to take mitigation and adaptation measures and compile data so as to be able to benchmark their progress. Massive awareness programs will have to be initiated.

Agriculture is responsible for one-third of global greenhouse gas emissions. Agriculture consumes roughly 70 per cent of the world’s fresh water. Today several agricultural areas are facing acute scarcity of water which has resulted in a serious crisis. Water conservation is therefore urgent. It is important to explore ways and technologies to treat waste water for agriculture before it reaches the water bodies. Adoption of contour planting would also help plants in holding more moisture. Soil needs to be kept healthy and should be enriched through regular application of compost. This not only would help procure a healthy crop but also help to sequester greenhouse gases.

Business will have to work on energy efficiency and commit to the use of renewable energy. They should work towards building and taking pride in the fact that their company is climate conscious and build a positive brand image in the minds of the customer. The first step could begin with measuring the carbon footprint of the company, drawing an action plan, and then finding ways and taking steps to reduce it by setting targets, followed by a third party audit. It is important for every company to control and treat its waste and recycle whatever possible. It is important that each and every employee understands and is made a part of this program so that the culture trickles back to his home and family and through them into the community, thus impacting several lives simultaneously in a big way to save the Earth.

Climate change brings risks that will, in one way or another, impact most people’s lives—and certainly the generations that follow to whom we owe a responsibility – it is our time to Act! And the time is NOW!!
Pollution and economic development: an empirical research review

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Abstract

Pollution and the economy seem to have been inextricably linked throughout human history. Yet the relationship between environmental harm and economic development is complex and its understanding has been fragmented by disciplinary biases. Economists and environmental scientists have diverged on the urgency of abatement mechanisms and the marginal returns on investment on control technologies and social adaptations. The Environmental Kuznets Curve hypothesis has dominated this discourse, but is only one part of a broader pollution-economy nexus. As we consider a societal shift towards a circular economy, there is a need to consider a more integrated framework for analyzing the empirical evidence that connects pollution and economic development, and its implications for human well-being and the achievement of the sustainable development goals. This paper develops the main connections between pollution and economic development by reviewing the existing empirical evidence in the literature.

1. Introduction

The relationship between pollution and economic development has been widely debated across various disciplines in the natural and social sciences. The prevalence of the Environmental Kuznets Curve (EKC) has blurred the more complex relations between economic development and environmental outcomes, despite the limitations of the EKC to consider ecological carrying capacity concerns. Moreover, the empirical isolation of many studies in highly specific disciplinary contexts has hitherto prevented us from considering an integrated framework for analysis. As we consider ways of moving towards a circular economy in which pollution itself could be harnessed as a material asset for usage in products to diminish waste, a more integrated framework is needed. This is particularly true in developing countries where pollution rates are rising most dramatically and where narratives about the impact of environmental regulations on economic growth and broader human development. The relationships between pollution and economic development are complex with several possible feedback loops that are predicated on drivers and consequences of economic growth, ecosystem resilience and the ultimate reliance of financial capital on nature. The aim to achieve the sustainable development goals (SDGs) is an opportunity to revise and organize the debates between pollution and economic development.

Historically, the modern ecological movement, which started in industrialized countries in the 1960s blamed economic development as the main driver of pollution. Studies, such as the Report of the Club of Rome (Meadows et al 1972), suggested that if the economy continued with the same pattern we would deplete natural resources and reach unpredictable, and perhaps unacceptable, levels of pollution, advising zero growth...
as an alternative to environmental and human catastrophe. Zero or negative economic growth emerged as the ardent environmentalist’s solution for ecological problems, particularly in more industrialized countries at the time, as economic growth and a clean environment appeared to be antagonistic and interchangeable. The environment-economy antagonism permeated the debates on Human Development in Stockholm in 1972. However, some dissenting voices, such as the prime-minister of India Indira Gandhi, argued that poverty, or lack of economic development, can also be problematic to environmental pollution (e.g. lack of sanitation) (Gandhi 1972).

Indeed, later on, we found that the relation between the environment, the economy and human well-being was much more complex. Nevertheless, the zero growth movement has been influential since then and has a diversified range of contemporary streams, such as the more European degrowth movement and the more American steady-state economy (Daly 1991, Demaria et al 2013).

Figure 1 attempts to distill some of these connections and this literature review will focus on five of the fundamental connections noted in this diagram in pathways, A, B, C, D and E with clarification on some of the other feedback loops and connections also noted. This figure is meant to reflect the various debates and controversies in the field as represented by possible causal pathways and is not meant to be an exhaustive or deterministic diagram of all possible causal mechanisms. Some of the most common intervening variables that can lead us towards one or another pathway are presented and will be further explicated in the accompanying text.

The extreme nodes of the vertical development axis of the diagram is meant to reflect an established and accepted spectrum of development goals. Economic growth is clearly the dominant pathway towards reaching the positive goals of development but alternative approaches are also considered in terms of ecological constraints that could take us via a

Figure 1. Schematic representation of feedbacks between pollution, economic growth and development which will be covered in this review with possible causal pathways which are further explicated in narrative.
circular economy or post-growth model of development which will be discussed towards the end of this review as a possible opportunity for ‘win–win’ outcomes. This diagram is meant to show a range of possible paths and impact categories as a heuristic exercise rather than a deterministic model.

The term ‘eco-primacy’ reflects the assumption which proponents of that pathway make regarding environmental issues requiring priority because of long-term reliance of economic systems on the environment (Daly 2014). The role of technology in providing a positive development outcome along this pathway is an essential part of the literature that also connects economics with engineering and operations research (National Academy of Engineering 1991). In contrast ‘eco-externality’ refers to the dominant approach in neoclassical economics wherein environmental impact is perceived as exogenous to economic performance of firms and consumers and presents a more short-term approach to considering pollution (Oats 2006, Stavins 2012). Increased consumption, or ‘affluence factors’, is indicative of what comes forth as a natural outcome of development processes in most cases up to a certain point (Myers and Kent 2004). However, it is important to recognize that there is huge variation between countries regarding how this affluence effect leads to pollution. Japan, Germany and the United States are the most compelling examples of divergence in pollution impact and resource use intensity despite comparable economic development indicators (Schreurs 2003). The economic contraction is contending with the trade-offs between financial and natural capital depletion, which is investigated in further detail from the perspective of inter-dependence of livelihood generation on both forms of capital in the contemporary context of market economies. Let us now consider each of these key areas of interactions between the economy and the environment in terms of evidence-based research that can inform policy formulation.

This paper attempts to distill some of these environment economy connections (labeled in figure 1) and provide new analysis from the recurring discussions on the links between environmental protection and economic development, and their implications for human well-being. It will focus on six of the fundamental connections (A, B, C, D, E and F) that have permeated the environment-development debate as follows:

(A) Economic development outcomes leading to pollution abatement (EKC hypothesis).
(B) Economic development increasing pollution.
(C) Pollution abatement’s negative impact on economic growth.
(D) Pollution’s negative impact on economic growth.

(E) Pollution’s negative impact on development (even with economic growth-inequality effect).

(F) Circular Economy as a way forward?

Each of the following sections examine those connections between the environment and economic development based on the literature.

1.1. Can economic development outcomes lead to pollution abatement? The EKC hypothesis

Are some negative effects of economic development worth enduring as a necessary sacrifice to reap greater rewards of growth, that would self-correct the deleterious impacts of development? This was the prognosis of the work of economist Simon Kuznets, whose name is now immortalized in the famous ‘Kuznets curve.’ The original curve shows the result of his hypothesis that economic inequality would increase with economic growth but eventually decline (Kuznets 1955). The same logic was also employed by subsequent economists to environmental harm, suggesting that ecological damage was a price to pay for initial development, after which a self-correcting mechanism would somehow kick in to improve environmental performance (Grossman and Krueger 1995, Stern et al 1996, Smulders and Gradus 1996). Such an approach is known as the EKC hypothesis.
This hypothesis has been debated for at least 25 years in various forms (Stern 2017). Much of the controversies have revolved around the scale of the analysis, the kind of pollutant chosen and the relative determinism of the pollution reduction with income. The curve also does not account for the pollution haven phenomenon that is associated with growing pockets of unequal pollution impacts. Shafik (1994) while working at the World Bank found that for many pollutants the relationship between income and pollution is not shaped like an upside down U (which might suggest that the solution to pollution is more growth) but rather more like a cedilla—rising with income, then falling as the low-hanging fruit of pollution abatement is plucked, then rising again as the under-lying thermodynamic-physical reality asserts itself’ (Zenclusey 2012).

However, the empirical evidence has only marginally supported the reduction of inequality and environmental harm with economic development (Stern 2004). The literature now suggests that the EKC is by no means deterministic in terms of a development path, and that there can be variations in its trajectory, based on the pollutant as well as frequent changes in its inflexion, based on what form of development path is chosen. The temporal variation in pollution loading needs to be considered over much longer time horizons and also with greater granularity of measurements to gain an accurate understanding of the relationship between economic growth variables and pollution. For example, Wagner (2007) showed how EKC estimates related to greenhouse gas emissions could be deconstructed if one considered how the nonlinear transformation of integrated regressors were generated as well as cross-sectional dependence in the data used (World Bank Group 2012).

Kahn (2006) provides an important study of how the EKC explains some kinds of pollution such as air and noise while not other forms of environmental harm such as land degradation, deforestation and soil erosion, particularly in urban ecosystems. Grossman and Krueger (1995) used the Global Environmental Monitoring System database on air and water quality and conducted an analysis which supported the EKC hypothesis. They concluded that the inflection point of the Kuznets curve for most of the 14 major pollutants they studied occurred when a country’s annual per capita income reached around $8000. However, their analysis also revealed some ‘baffling’ results—in their own words—for example, coliform bacteria’s correlation to per capita income rises with income and then falls but then rises again after $10 000 per capita.

In a study of countries in the Mediterranean basin Gurluk (2009) conducted an EKC fit analysis for 15 countries in the basin and only for France did a quadratic relationship similar to an EKC emerge when biological oxygen demand (BOD) was used as a pollution variable. The inflection point was found to be at per capita income reaching $22 161. All the remaining countries follow either a logarithmic increasing or an inverse-logarithmic increasing function between BOD and per capita income.

Such results point towards a weakness of using econometric techniques in such analysis as well where highly specific variation may be found with certain pollutants and where more qualitative research methods are needed to ascertain any definitive relationship between variables. In another study Hettige et al (2000) measured the effect of income growth on three determinants of pollution: the share of industry in national output, the share of polluting sectors in industrial output, and ‘end-of-pipe’ (EOP) pollution intensities per unit of output in the polluting sectors. They found that the industry share of national output follows a Kuznets-type trajectory, but the other two determinants do not and in combination their results implied the rejection of the EKC hypothesis for industrial water pollution. The sectoral composition follows a clean technology dividend for low-income developing countries, but exhibits little or no trend beyond the middle-income
range. However, EOP pollution intensity declines continuously with increased income.

The causal pathway by which economic development can lead to environmental conservation is presented through the EKC in terms of consumer pressure on government to engage in more stringent regulations once a certain income level is achieved, which can then also lead to win–win outcomes of a ‘green economy’ or ‘ecological modernization’ (Hajer 1996). Yet environmental activism is by no means correlated with greater income in and of itself, although in specific cases, it may have greater policy impact in higher income countries (Mertig and Dunlap 2001). Moreover, the idea that higher income groups of countries are more environmentally conscious is also contested, as the poor may be more environmentally friendly than the rich (Martinez-Alier 2003). Furthermore, another important determinant of the EKC can be the influence of trade whereby pollution intensity in some sectors is simply exported to other parts of the world. Although this may be true for a few sectors like mining of rare earths, which shifted largely to China due to environmental regulations, the most comprehensive evaluation of the embedded pollution of imports suggests that within the US, there has been a gradual shift to greener imports (Levinson 2010).

In their comparative analysis of countries at various stages of economic development Suri and Chapman (1998) found that while both industrializing and industrialized countries have added to their energy requirements (as a corollary for environmental impact) by exporting manufactured goods, the growth has been substantially higher in the former. Concomitantly, industrialized countries have been able to reduce their energy requirements by importing manufactured goods. They conclude that ‘exports of manufactured goods by industrialized countries has thus been an important factor in generating the upward sloping portion of the EKC and imports by industrialized countries have contributed to the downward slope’.

Despite the contentions surrounding its empirical observation (Ekins 1997) and the need for a more nuanced approach to pollution policy, the EKC provides a good initial framing mechanism for further unpacking the pollution-development dynamic. The upward and downward slopes of the curve are thus an important heuristic mechanism for investigating the other four loci of analysis in this paper.

1.2. How economic development can lead to increasing pollution

The environmental pollution impact of economic development stems from two key pathways that have been widely studied in the literature: (a) The resource base needed to develop infrastructure to deliver key economic development outcomes such as access to transport, electricity, water and food; (b) the increased consumption of pollution-intensive resources that comes from access to more disposable income (Brannlund and Ghalwash 2007). These consumed goods may be more pollution-intensive in their production and life cycle. This can arguably further exacerbate income inequality and differential community impacts on the poor (Boyce 1994).

Within development discourse there is a recognition that some environmental pollution will be an inevitable outcome of achieving other urgent development aspirations (Constantini and Monni 2008), most recently enshrined in the United Nations’ 17 SDGs up to the year 2030. However, the linkages and feedback loops that exist between deterioration of the environment and other development outcomes deserves to be considered as a complex system. LeBlanc (2015) has developed a detailed network map for the SDGs and intriguingly enough Goal 12 (Ensuring Sustainable Production and Consumption) has the most network connections (14) to the other goals. This would be fairly intuitive in terms of the broad economic nexus of the goal but the linkages to the other environmentally-linked goals deserves attention. This goal is
most directly linked to pollution externality concerns and the network analysis highlights how reaching the broadest range of development outcomes can have an impact on the environmental sustainability of production and consumption systems.

Infrastructure remains a major direct determinant of environmental impact from economic development in absolute terms. Roads and other transport infrastructure is the most widely studied impact category in this arena as it is considered a conduit for other forms of pollution-intensive infrastructure development as well. Much of the research on these impacts has focused on forest cover, land degradation and bio-diversity decline as key indicators of overall environmental quality decline. The studies have often been conducted by biologists who are considering the impact of roads that dissect habitats in high biodi-versity forests and the resulting impacts on species loss (Caro et al 2015). However, there is also a recognition that infrastructure could also provide access for con-servation research data that could help protect vulner-able populations, and that some positive social development impacts are inextricably linked to infra-structure of structures like better access to human and animal hospitals; breeding centers for endangered species and water treatment plants for higher density settlements. Thus there has been a focus on the literature to use optimization techniques in determining the least impactful mechanism for infrastructure development (Laurance et al 2015). Such techniques offer an amicable way forward for managing the environmental impacts of development and for ongoing environmental to allay conservation concerns.

Complex modeling techniques have not only been used for optimization analysis but also to do forecasting and thereby consider development pathways. In 2008, The Organization for Economic Cooperation and Development (OECD) harmonized the most widely accepted global economic and environmental change models of long-term development environment linkages in their OECD Environmental Outlook 2030. The results clearly showed that economic growth which was likely to occur up to 2030 primarily in developing countries would have serious environmental implications. The overall share of environmental impact of development would increase in developing countries, particularly with reference to sulfur dioxide pollution from fossil fuel energy generation and impairment of waterways. As an example, the model captured data from 6000 major rivers world-wide and the analysis showed that India, China and Africa would account for almost half of all the water-induced soil degredation, and around one-third of all anthropogenic nitrogen loading into river-ways by 2030 (OECD 2008). Thus forecasting models project that further economic growth in developing countries is likely to substantially worsen pollution levels in a ‘business as usual (BAU)’ scenario and thus pollution control mechanisms would be needed to mitigate these impacts.

However, there is also a new strand of research called Shared Socioeconomic Pathways, which has been developed by research communities working in modeling and scenarios for energy and climate over a century time scale (O’Neill et al 2014, 2017). It examines the set of challenges humanity will face to adapt to the impacts of and mitigate climate change under differ-ent social, economic and environmental conditions in the long-term (Wagner 2007).

Moving from macro-models to specific examples, Malaysia provides an important case study of a country which has shown a rapid increase in development indicators over the past 50 years but has also fared well on environmental performance indices such as the

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1 The OECD used the ENV-Linkages computable general equilibrium model, alongside the Integrated Model to Assess Global Environment (IMAGE) and the Timer Image Energy Regional (TIMER) model—developed by the Netherlands Environmental Assessment Agency (MNP)—with some additional input from the Global Trade Analysis Project (GTAP) agricultural-economy model developed at the Agricultural Economics Institute of the Netherlands.
Yale Environmental Performance Index. However, even in this case of a ‘win–win’ outcome trajectory, research shows that overall pollution loading, particularly in waterways, has been directly correlated with economic development. Muyibi et al (2008) considered several economic variables and conducted a regression against water quality indicators in Malaysia. Their results showed that despite employing a range of technologies and government interventions there were strong correlations between development and pollution loading in waterways. GDP per capita variable accounted for 81% of variances in rivers’ pollution episode with an alpha level of 0.005; population accounted for 74% of total polluted rivers with R² of 74.2 and p-value less than 0.005 and industrial production accounted for 78% of the yearly variances in levels of river pollution (p less than 0.005).

In an intriguing converse study of the impact of economic contraction and reduced industrial activity on pollution, Davis (2012) found that over a 20 year data period in California (1980–2000), economic recessions were correlated with reduced pollution. The study concluded that ‘33% and 48% of the variability in air pollution levels was estimated by the overall R² values. The relationship between the employment measures and air pollution was statistically significant, suggesting that air quality improves during economic downturns’ (Davis 2012, p 1956).

One may argue that poverty itself can generate environmental impacts and hence pollution abatement costs should be seen in the context of how they might increase poverty and thereby lead to a negative spiral of development. This mainly well-recognized causal pathway is that larger family size is often correlated with poverty. However, the actual environmental impact of this relationship between population and poverty is contested. A notable study to consider these impacts by Heath and Binswanger (1998) conducted in Colombia concluded that the population and poverty impacts can easily be modulated by specific policy interventions and are not in themselves deterministic. Furthermore, the demographic dividend offered by higher population in terms of labor availability for development and tax income still needs to be considered.

Baland et al (2006) find that the net environmental impact of poverty itself in the context of rural Nepal is negative but is quantitatively negligible: an increase of 10% in income leads to a net fall of 0.2% in firewood collected. They find the impact of forest degradation (via increased collection times) on local living standards is also minuscule and support similar findings from the Himalayan region and suggest that demographic factors rather than economic growth itself will determine ecological impacts.

More recently, the idea of ‘Green Growth’ has emerged as a policy alternative that could reconcile economic development and pollution. With a mix of smart management and advanced environmental technology, we could avoid many of the deleterious effects of economic growth and use the environmental improvements to prop up economic growth. Indeed, some proponents of green growth suggested that rapid economic growth could help us to tunnel through the EKC and move us quickly to a rich and clean society. However, green growth policies have brought mixed results. For example, green growth policies in South Korea, which was the strongest proponent of the green growth alternative, were questioned as they were based on nuclear energy, construction of dams and land reclamation leading to irreversible impacts on the natural environment (Bluemling and Yun 2016).

Similar analyses are needed more widely across a broader range of pollutants to consider the causal mechanisms that exist in this upward and downward sloping component of the EKC in terms of development leading to increased pollution through material usage and pollution in the long-term.

1.3. Pollution abatement’s negative impact on
econometric growth

Pollution, particularly downstream from the polluter, can be a classic externality problem wherein the curtailment of the pollution to protect those down-stream or payment for pollution charges has an immediate cost on the polluter. When the polluted resource is somehow shared as a resource the incen-tives for cooperation on pollution control increase. Unlike a ‘tragedy of the commons,’ where a focus on quantity of extraction leads to depletion, in a model where resource quality is the locus of interest, greater cooperation is possible (Ostrom 1990). Thus, in principle, there is more likely cooperation over lakes that require sharing of borders, than with rivers that are often asymmetric in terms of their benefits for the upstream riparian versus the downstream riparian suffering the impact of pollution. In order to thus grapple with pollution, the downstream riparian has to invest considerable cost which has to either come from public funds or from private industrial margins. There is an opportunity cost for any such investment; government could utilize those funds for other higher-growth generation activities, and businesses could potentially invest in expansion and further enterprise. Although some growth may be generated by the pollution abatement technology sector itself in terms of ‘green growth,’ the proximate short-term negative impact of pollution abatement on economic development cannot be ignored. Many studies that show the negative economic impact of pollution abatement costs consider the analysis at the level of a firm, a sector or a locality and are heavily weighted towards private costs rather than public benefits. Operations research tools are now being applied to find a workable balance between the abatement cost’s short-term impact and its long-term technological and societal dividend (Fare et al 2016).

Since 1973, the United States government has had a formal system of tracking Pollution Abatement Costs and Expenditures through the census bureau, largely to keep track of industry competitiveness. A detailed government study of pollution abatement expenditures on plant-level productivity due to these costs found wide variation between sectors in terms of the impacts being felt (Shadbegian and Gray 2003). Using a Cobb–Douglas production function to study 68 pulp and paper mills, 55 oil refineries and 27 steel mills, it was found that a $1 increase in pollution abatement costs leads to an estimated productivity decline of $3.11, $1.80 and $5.98 in the paper, oil and steel industries respectively. However, the study noted that that these figures indicate proximate impacts and long-term viability of the sector through pollution abatement in terms of increased worker productivity was not estimated. Researchers within the United States have largely avoided focusing on pollution costs at the industry level because of these concerns. This is why focused studies that only lay out pollution abatement costs as a constrained locus of analysis in the short-term are very few. Such studies are largely industry consulting reports for internal usage since broader environmental economics research tends to focus on development outcomes for a larger number of stake-holders in society.

For example, within China (Liu 2012), there has been some ongoing research on pollution abatement costs in the context of energy competitiveness. However, here too researchers are trying to consider the cost models in terms of different technological options. Indeed, the marginal return on investment in pollution control based on particular technologies, can be the most constructive short-term way of industry abatement costs for corporate decision-making and public policy. For specific pollutants where high morbidity and mortality in health and ecosystem function are feared, performance based regulations can encourage development of newer more cost-effective technologies. This has been the approach taken on mercury pollution in China. For example, Alcora et al (2015) found that 193 tons of mercury was removed in 2010 in China’s coal-fired power sector, with annualized mercury emission control costs of 2.7 billion Chinese Yuan (Aprox $ 450 million). Under a projected 2030 Emission Control (EC)
scenario with stringent mercury limits compared to BAU scenario, the increase of selective catalytic reduction systems technology was then considered alongside halogen injection (HI), that could contribute to 39 tons of mercury removal at a cost of 3.8 billion CNY. Policy makers would thus need to consider economic tradeoffs based on incentives for new technological development within this time period or consider subsidies for reduction.

The concern about focused research on pollution abatement costs also stems from the context that the impacts of environmental pollution is realized at different time scales from economic benefits. Therefore, we tend to use a discounting factor (often manifest even as high discount interest rate) for future benefits of pollution abatement and conversely a high economic cost for the short-term investment needed to curtail the pollution. Thus pollution abatement gets presented as a ‘luxury’ for those who are already entitled with economic security and the immediacy of income generation can trump the long-term concern about environmental resilience of the full economic system.

This perception of grassroots priorities is often reflected in developing country respondents to surveys on prioritization of government expenditure. Consider, for example a survey conducted by Globescan of 10 000 Africans from 10 countries across the continent in 2007\(^2\). The fundamental question asked was: What should be our government’s top priority? The results reflect the salience of livelihoods to residents of the world’s most impoverished continent. Finding jobs may well be the most significant issue for Africans, whereas protecting the environment is of least priority in terms of expenditure. This seeming paradox between the observable impact of pollution on health and well-being versus a lack of public prioritization has also been documented by Greenstone and Jack (2015). They suggest some possible causal mechanisms that deserve further research in what they term as a new field of ‘envirodevonomics’. Such a research agenda would specially help in considering livelihood and jobs linkages to environmental harm.

It can also be argued that making a linear argument for any industry simply on the basis of jobs can be problematic, if the jobs being created are harmful to society—for example, the huge employment created by the highly pollution-intensive arms trade (Yang et al 2015). Instead, what is needed is a consideration of opportunity costs of particular forms of employment with a view of livelihoods that considers various potential paths to development that may involve a short-term slow-down in job creation in pollution-intensive sectors to deliver a more long-term and sus-tainable job creation in other sectors (Elliott and Lindley 2017).

There is thus a need to consider abatement costs in proximate terms versus long-term benefits of the abatement cost as an investment towards a sustainable economy. There is also evidence to suggest that pollution abatement costs tend to provide increasing returns to scale, which in turn can also explain some observations of why inflection points in the EKC framework can be found. Managi (2006) studied how pollution abatement through choice of pesticide and dispensing technologies due to regulations led to increasing return on investments. Investment in abatement technologies for most common air pollutants for which major abatement costs are incurred such as sulfur or nitrogen oxides reduction also shows an increase in marginal return on investment per unit of pollution abated (Pappin et al 2015).

Moser et al (2013) suggest that we consider pollution abatement in terms of a competitive market economy where a continuum of identical firms using identical technologies produce a homogenous income creation, which impacts aggregate macroeconomic indicators such as GDP. In this economy, two types of capital are accumulated. First,
there is conventional capital, also called brown capital, which is more pollution-intensive. Secondly, a less-polluting green capital is presented. Furthermore, the government sets environmental performance standards which entrepreneurs (who are often the job creators in a development process) are obligated to meet. The necessary abatement effort and costs depend on the stringency of these environmental regulations. Consequently, firms adopting cleaner technologies have to spend less on EOP abatement. This benefit, however, comes at a cost because the required resources for green research and development could be invested otherwise profitably in conventional research and development.

However, their analysis shows, that increasing environmental regulation indeed has a positive impact on the accumulation of green capital and on the increase of green R&D investments. This can especially be seen when the shares of capital levels and R&D investments under varying stringency of environmental standards are considered. Although both capital levels decline, increasing abatement costs even accelerate the decrease of brown capital levels so that in total production turns out to be greener the higher environmental quality standards are. The same applies for R&D investments. They conclude that environmental regulation standards can cause a shift to greener production but only at the cost of reduced economic growth. Therefore, the introduction of additional environmental instruments, such as taxes or subsidies, could be considered if this causal pathway for pollution abatement is taken into account. Indeed, there are studies showing that a pollution tax can potentially have a ‘double dividend’ by reducing pollution while spurring economic growth (Fisher and van Marrewijk 1998). This was unfolded in the concept of co-benefits as the idea of having alternatives for achieving economic, environmental and human development goals at the same time, even though there is a long way to bring it to mainstream practice due to technical and political economy factors (Puppim de Oliveira 2013). Moreover, environmental regulations have different effects on different environmental problems and may not be possible in a different governance context. For example, Mie Prefecture in Japan was successful to tackle air pollution with environmental regulations in 1960s, but it has had problems with reducing the emissions of greenhouse gases (Puppim de Oliveira 2011).

An empirical example of how ‘green capital’ can be considered in terms of the cost of pollution control regulations was researched by Cai et al (2011). They studied pollution mitigation policies in China’s power generation sector from 2006 to 2009 and noted that this caused a total of 44 thousand net jobs losses. However, as the share of renewable energy that has an indirect employment impacts increased. The renewable energy policies from 2006 to 2010 actually resulted in 472 thousand net job gains. Their research suggests that to ensure the co-existence of green economy and green jobs in China’s power generation sector, policy makers should further promote solar PV, biomass and wind technologies. They concluded therefore that in 2010, for every 1% increase in the share of solar PV generation there could be a 0.68% increase in total employment in China, larger than any other power generation technology.

There is also an overarching international dimension of pollution abatement’s impact on global economic activity which needs to be considered in the context of trade. In the landmark anthology on this topic, the role of environmental regulation on economic activity edited by Boyle (1994), Benedict Kings-bury identifies a tripartite division of trade measures which need to be considered in terms of overall regulatory impacts on the economic activity: those intended to have a direct effect on a perceived environmental problem (e.g. trade measures relating to trans-boundary environmental issues, or to protection of the domestic environment); those taken in direct support of a different measure directed at the environmental problem (e.g. the...
ban on trade in ozone-depleting substances under the Montreal Convention); and trade measures (sanctions or incentives) intended to change environmental behavior which is essentially unrelated to the trade measure (Boyle 1994). Each of these approaches can have highly divergent impacts on the economy at a local level as well as on long-term international economic stability. However, international governance mechanisms which recognize the danger of a ‘race to the bottom’ in terms of pollution havens emerging at national and sub-national levels deserve attention (Porter 1999). The relevance of this ‘unpacking’ of trade policy can assist governments in considering the kind of pollution abatement pathway that should be deliberated within each regional context.

1.4. Pollution’s negative impact on economic growth

The primacy of natural capital as a limiting means from which we derive other forms of capital is a fundamental premise in both economic and ecological sciences. Technological progress and innovation can often augment the availability of natural capital but a decline in basic environmental systems that support natural capital still remains a looming concern (Kolstad 2010). Yet, neoclassical economics has generally thought of pollution as a ‘social cost’ rather than an ‘economic cost.’ Harkening back to the work of Nobel laureates Ronald Coase (1960) and Robert Solow (1971), pollution was presented as an externality. There was historically also a distinct differentiation in the study of natural resource depletion (resource economics) which was embarked upon by pioneering resource economists such as Hotelling (1931) and concerns about the pollution outcomes of economic activity (environmental economics) by scholars such as Krutilla (1967) and Kneese (1971). Later economists, like 2018 Nobel laureate William Nordhaus, extended some of the concerns about pollution’s impact on society and the economy as whole in the context of planetary pollutants such as ozone and greenhouse gases (Nordhaus 1994), but largely kept issues of resource depletion and pollution separate.

This reductionist approach came under sharp criticism from ecological economists who saw environmental decline both in terms of absolute depletion of resource stocks, as well as relative depletion due to pollution impairing use of the resource (Norgaard 1989, Krishnan et al 1995). Ultimately, if natural capital is depleted through overharvesting of stocks or through unviability of harvests due to pollution impact on the resource (for example heavy metal contamination of fish), there will inevitably be a negative impact on economic growth.

However, there is also another important dimension of how pollution can stifle the full potential of economic growth which was first noted and modeled by Fisher and van Marrewijk (1998). In their model of extended generations of human development where clean air was a pure public good that could be used as a private input for production, they noted that firms that profit from pollution crowd out investment in innovation and slow economic growth.

There is growing evidence of the negative impact of pollution on economic growth and that we need to pay far more attention to indicators of environmental harm such as the ecological carrying capacity to prevent irreversible harm to particular ecosystems that also sustain livelihoods. In addition to direct impacts on environmental systems that can impact natural capital which in turn influences growth, there is also a major loss in productivity caused by the health impacts of pollution. Respiratory distress can lead to lost work days and have a major impact on the economic output of a locality. A rigorous study of air pollution in Jakarta, Indonesia is a widely cited example in recent years in which the annual cost of air pollution, which is estimated to result on average around 3000 deaths, at around $180 million, which is 1% of the city’s GDP (Resosudarmo and Napitupulu 2004). The study also considered the benefits of pollution abatement in this context by forecasting at the time of publication up to 2015 using a range of policy and growth
scenarios.

At the national level, China (Lu et al 2016) is perhaps the archetypal example of the ultimate impact of pollution on economic indicators, and for the past ten years or so, the government has measured the economic impact of pollution on its economy. One Chinese government study in 2006, cited by the New China Agency, suggested that the country’s western provinces will suffer an annual loss equivalent to 15 billion euros, or 13% of the region’s gross domestic product, because of environmental damage. The Indian government conducted a similar study of damage caused by pollution in in the country in 1999 and estimated the cost at $14 billion annually: amounting to close to 4.5%–6% of GDP (Managi and Ranjan Jena 2008). Such estimates rely on a mixture of lost production due to closure of sites due to pollution; health impacting workers resulting in lost labor hours as well as healthcare costs. Despite clear evidence emerging of the long-term impacts of pollution on conventional measures of macroeconomic performances such as growth, often the more consequential impact which needs to be considered by development practitioners.

The direct loss of livelihoods from natural resources can also be an additional metric of pollution impacts on economic growth. For example, research on acid rain’s impact on fisheries in the Adirondack region by Caputo et al (2017) and Beier et al (2017) suggest that the economic value of the fishing resource itself declines measurably with reduced pH. For small regional economies, this can have substantive localized impact on economic growth but is challenging to isolate and measure.

Another means of estimating the connection between pollution and economic growth is to consider productivity impacts in particular sectors. For example, a study by Aragona and Rud (2016) in Ghana used a consumer–producer household framework to estimate the agricultural production function and found that farmers located near pollution-intensive mines experienced a relative reduction in total factor productivity of almost 40% between 1997 and 2005.

Concerns of pollution’s impact on productivity are not confined only to the outdoor environment. There is also clear evidence from research in experimental economics that there can be productivity losses of between 6% and 9% due to indoor air pollution in common office spaces coupled with noise pollution (Wyon 2004).

A corollary for economic growth which has also been used by researchers interested in studying the impact of pollution is the labor supply availability. In a recent study of the impact of pollution in Mexico City on the hours worked by residents near an oil refinery Hanna and Oliva (2015) found that a 20% drop in sulfur dioxide results in 1.3 h increase in hours worked the following week. This implies an $126 per worker gain from reduced absenteeism over the course of the year for those who lived in close proximity to the refinery. Aggregating such analysis can generate some estimates for direct growth impacts, though accounting for intervening exogenous variables makes that next leap of estimating more challenging.

Thus studies looking at the negative impact of pollution on economic development tend to focus on aggregated impacts in the whole economy in larger scale at the medium and long-term, instead of analyzing impacts of pollution abatement private costs (such as in item C).

1.5. Pollution’s negative impact on human development in spite of economic growth

As noted by the World Bank in its Approach paper on pollution, approximately nine million people die annually from pollution, mostly young children (1.7 million) and older people (4.9 million). 94%, or 8.4 million, of the 9 million deaths...
caused each year by pollution occur in lower-middle-income countries (Landrigan and Fuller 2016). The paper further notes that ‘healthy life years lost due to pollution in developing countries amount to 15 times that of developed countries’ (WHO 2014a, 2014b).

One of the most widely studied pollutant is arsenic, which also occurs naturally in parts of Eastern India and Bangladesh and often contaminates the water supply. However, the same inference about pollution linkages to development could be drawn of anthropogenic pollutants as the causal pathways of impact on human capital is identical, whether the Pollutant is coming from natural or man-made sources. In one study of Murshidabad region of India Samadder (2011) studied a population of 1.07 million with 0.32 million exposed to arsenic above the 0.05 mg l\(^{-1}\), which the WHO considers permissible in drinking water. The Human Development Index of all six spatial blocks analyzed in this study was severely impacted by the arsenic pollution and reduced by as much as 25%, largely due to reduction in life expectancy. Another way to analyze the data could be to consider the environmental justice concerns (Schlosberg 2002), which would suggest that property values would be lower in areas of arsenic and hence pollution would more greatly impact the poor through market mechanisms. Evidence for such differentiated exposure to pollution by the poor has been documented most comprehensively by Walker (2012).

Mercury is another notable pollutant which has been widely studied and has recently resulted in an international treaty on its control (The Minamata Convention on Mercury, which entered into force in August 2017). In the most widely cited study Trasande et al (2005) found that the costs to the U.S. economy of anthropogenic (or human produced) mercury emissions due to decreased IQ's ranges from $2.2 billion to $43.8 billion annually (costs are in 2000 dollars). Given the vast range in cost estimates, there can be even greater concern for local variation in terms of policy-making. Thus, for example, this study was used by the state government of Minnesota to develop mercury policy and concluded that American mercury emissions cost Minnesota an estimated $6.7–$263.2 million annually and American power plant emissions cost Minnesota an estimated $1.7–$108.3 million annually. The total cost of anthropogenic mercury emissions, including emissions worldwide, is roughly $36.6–29.5 million annually. Minnesota’s use of coal (which attributes to mercury emissions) to generate power is higher than the national average. In 2004, coal was the source of 65% of Minnesota’s energy across the total electric power industry.

In addition to health impacts, pollution can hamper development by reducing the viability of land for agriculture, water usage for fishing and trees for forestry. The connection of the poor to global value chains is often considered a way to help quell poverty. Yet, the ecological resilience of the environment to pollution in which the poor are often situated can test this presumption (Bolwig et al 2008).

The concept of ecosystem services as a common-good that is provided to all social strata of society may help to address some of these concerns about environmental injustice as well as providing an accounting mechanism for us to reconcile economic development and environmental conservation (Adams et al 2004). Quantifying the financial value that comes from con-serving nature has been a major area for research and led to the concept of ‘ecosystem services’—those benefits provided by nature that have direct economic benefit but do not have a market (Daily ed. 2012). This also led to further investment by the international banking community in recent years including The World Bank in programs which can allow for accounting of these ecosystem services. The next question to ask, however, is if the accounting can be carried out, how might we use financial transaction to help the poor conserve nature. The concept of ‘payment for ecosystems services’ (PES) has emerged as a result and is now being widely used as a policy tool to mitigate
the ultimate development harms of environmental decline (Kumar and Muradian 2009).

Research on the efficacy of PES deserves greater attention. The findings of Bulte et al (2008) support the analysis of Pagiola et al (2005) who suggested that the pre-condition for PES programs to have beneficial effects on poverty reduction is that the poor should: (i) be in the ‘right place’; (ii) want to participate (e.g. it should ‘fit’ into the farm practice); and (iii) be able to participate (e.g. they should be able to make the necessary investments, have sufficiently secure tenure, etc). However, they also conclude that tying PES and poverty reduction may result in lower efficiency in meeting either objective—and in fact it may be better to focus programs on one or the other objective separately. Nonetheless, since PES programs can have indirect effects on the poor through changes in food prices, wages and land access—poverty and the poor do need to be taken into consideration in designing PES programs, even if poverty reduction is not an objective of the program. However, there is a rising concerns of some authors about the ‘commoditization’ of the ecosystem services in a market, which can lead to over-exploitation and evictions of the traditional ecosystem users to make the services available to those who can afford paying for the ecological services (Lohmann 2016). Thus ‘green growth’ could be achieved, but the benefits would not be distributed evenly for all.

1.6. Circular economy a way forward?

As we consider win–win opportunities in balancing economic and environmental issues, the nascent concept of a ‘circular economy’ posits a definitive paradigm shift in the way industrial processes relate to the modern economy (World Economic Forum 2014, Ghisellini et al 2016). The conventional economic model has been focused on linear material flows from mines to markets. However, a circular economy approach that has emerged in recent years suggests the need to reconfigure the economic systems around materials recycling and hence circularity. As with any such major shift in human endeavor, a strong philosophical underpinning can help to draw theoretical insights which in turn allow for transferability of concepts across cases. In this article, the aim is to suggest that a form of dialectical analysis has particular potential in addressing many of the concerns raised by critics of a circular economy. Circularity in modern discourse often implies stasis and thus the circular economy paradigm encounters the same criticism from many neoclassical economists which was faced by Herman Daly (1991) three decades ago with his concept of a ‘Steady-State Economy.’ There were two key avenues of critique with regard to such an approach: (a) ‘steady-state’ implied an atrophy of incentives for innovation and hence would diminish the potential for technological advancement of humanity; (b) the development needs of the indigent on the planet meant we had a moral imperative for economic growth that would be precluded by a steady-state economy. It is important to note, however, that proponents of circular economy are willing to embrace growth, so long as material flows are better cycled within the growth paradigm—they are thus focused on stability at the microeconomic level rather than having a steady-state at the macro-economic level (George et al 2015).

A neglected aspect of the circular economy discourse has been an evaluation of how such a paradigm would impact basic human development challenges. There seems to be is a presumption that ‘win–win’ outcomes would emerge from efficient systems in a circular economy that could provide development dividends in the world’s poorer nations (Ghisellini et al 2016). Yet some of the dominant premises of a circular economy necessitate reduced consumption and increased durability of material products which has the potential for a major impact on human development in areas that depend on livelihoods from those processes. The simple
idea of increasing efficiency by a circular economy will lead to the solution for the increasing ecological footsteps does not hold true, as the Jevon’s Paradox may boost aggregate consumption of more efficient system in the long-term in a market economy (Jevons 1865, Dale et al 2016). Overall reduction in consumption may be necessary.

As a locus of analysis, consumption of myriad products and services and the fundamental primary resources on which they depend provides an essential link between economic development and environmental impact (Ali 2010). In this regard, there have been calls in the literature to have a better environmental accounting system to track elemental inputs and outputs so as to gauge the tradeoffs between positive economic impact of a project and is negative environmental effects (Almeida et al 2017). Further enhancements to the classic input-output modeling developed by Nobel laureate Wassily Leontief (1986) have been enhanced by some of his protégés within ecological engineering most notably Duchin and Glenn-Marie (1995).

A major concern in implementing a circular economy model would be the ultimate provision of employment in an economy structured around conventional jobs. Optimists in this regard would argue that a transition to a service sector and its concomitant wealth creation would counterbalance the reduced throughput of manufacturing employment and livelihoods for industrial economies. The transition of livelihoods following automation of major labor-intensive industries during the past century is often alluded to in this vein. Core to such a transition in employment has been the role of entrepreneurs that fuel new opportunities for employment and livelihood growth (McMillan and Woodruff 2002). However, the opportunities to benefit from a more circular economy through increasing the value and efficiency of waste material can displace jobs from those less powerful. For example, increasing the value to recyclables can lead to the emergence of recycling companies to the detriment of waste pickers (Do Carmo and Puppim de Oliveira 2010). Moreover, there are limits to the absorption of employment by the service sector, even in advanced economies, as researched by scholars such as Ebner (2010).

The potential for high population developing countries in reaching a saturation of entrepreneurial activity deserves further study in the green technology sector, similar to how it has been studied in the case of the IT sector in India. However, such analysis will require a much broader global effort to harness data across supply chains of material usage. In a neoclassical paradigm of green growth, the long-term economic development through increasing efficiency in a more circular economy may lead to more green jobs in the short and medium term, but overall less jobs in the long-term with the continuous push to efficiency through competition mechanisms (Dale et al 2016).

2. Conclusion: opportunities for win–win policy options

Harkening back to the 1992 World Development Report which was themed for the first time on issues of ‘Development and the Environment’ there was a clear recognition that economic growth and the environment were inextricably linked and that neither are functionally exogenous to each other (World Bank 1992). That salient observation still holds true, though it has since been unpacked through research. The literature presented in this paper has highlighted the mechanisms by which the interactions between financial and natural capital, as manifest often in terms of economic growth and ecological resilience, respectively occur.

Population growth, particularly in the context of developing countries, remains a lingering imponderable for a more coherent vision for balancing environmental tradeoffs with economic growth. Even with short-term economic growth, a downward spiral can occur by the negative feedback loops between natural capital decline, and rush to overexploitation due to desperation—the fabled ‘tragedy of the commons’ outcome that
we were warned of by Hardin (1968). Such a presumption of population impacts on irreversible environmental decline further led Hardin to post the extreme view of ‘Life Boat Ethics’ whereby we would sacrifice other development goals in favor of extreme resource conservation, for what was deemed by many neo-Malthusians as an existential environmental crisis (Hardin 1974). However, such an approach is no longer plausible in terms of global ethical norms and a realization that some level of irreversible global environmental decline may well be acceptable to meet some human development objectives. The key focus of environmentalists is now to ascertain which ‘planetary boundaries’ are the most salient for conservation (Steffen et al 2015).

Population growth can suggest greater innovation potential and an able workforce—often termed ‘the demographic dividend’—but also a major drain on resource endowments. The IPAT equation (Ecological impact = Population × Affluence × Technology) needs to be revisited here to consider how best to oper-ationalize a circular economy within a development context. The various permutations of this equation have been admirably studied before (particularly, Chertow 2001) and are beyond the scope of this article. Suffice it to say that for our purposes here, the technological variable needs to be better connected to the concept of ‘planned obsolescence’, which is an important feature of consumer product-driven development (Guiltinan 2009). One effort to incorporate the IPAT analysis within a circular economy has been posited for the development of Shaanxi province in China (Ying and Wen-ping 2015). However, the technological variable in their analysis is not adequately unpacked to consider the development and innovation dividends of obsolescence (Kurz 2015). Product design, modularity and finding more ecologically sustainable energy sources would likely be needed to ensure that a ‘spiral of development’ that was envisaged by social ecologist Murray Bookchin (1995) as a dialectical process can occur as the circular economy is established. Other win–win opportunities are also offered by proponents of green technology economic multipliers and ways of ‘technological leapfrogging’ which would reduce resource intensity and pollution while growing the economy, albeit more slowly (Pollin 2015).

Ultimately, the costs of pollution to society and economic growth occur over longer time horizons than the internalization of abatement costs at the level of industry. However, the kind of governance established can influence the outcomes and response from economic actors (Puppim de Oliveira and Jabbour 2017). Moreover, pollution’s impact on economic growth is measured more indirectly as well through loss of productivity and health costs rather than through a direct causal relationship. Thus the pollution-development nexus must continue to be an area of intense research activity from a broad range of disciplines. Ultimately, the value of pollution control will need to be constantly evaluated as new technologies emerge across the multiple pathways and connections between pollution and development presented in this review paper.

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Growing Trees in cities is like Planting Healthy Air

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The first thing one sees when a flight approaches New Delhi is thick smog that envelopes the city and the lack of greenery. In almost all other major cities in India lack of greenery is the most obvious sight that one sees when approaching that city by air.

The sorry state of Delhi’s air has recently been in the news. Planting trees on a large scale in cities is one of the best solutions to air pollution.

A large body of data on the beneficial effects of trees has been published the world-over. It has been shown that trees are excellent in capturing harmful particulate matter (PM) of 2.5 to 10 micron (micrometer) size. These particulates are mostly produced from automobile exhausts and from burning biomass. When inhaled, the 2.5 PM particles can also go directly to the brain and can cause various ailments including cancer while PM 2.5 to 10 particles causes asthma and various other lung diseases. There are guestimates (since the numbers are speculative) that 3 million deaths per year the world-over are due to inhalation of this particulate matter.

Trees capture these particles quite effectively in the following way: the waxy surface of leaves and their random orientation help in capturing them. Also the leaves are positively charged and hence attract the negatively charged 2.5-10 PM particles. All these three mechanisms make a tree an excellent particulate remover. This was corroborated by a 2016 study at University of Exeter in UK where researchers found that more trees in urban neighborhoods correlated with a lower incidence of asthma.

Researchers have also discovered that if about 20-30% of city area is covered by trees then it can reduce the particulate pollution by almost 24%! In most Indian cities tree cover is between 7-15% and hence there is a need to increase it. Besides reducing air pollution trees also make-up the planet’s heat shield. They keep the concrete and asphalt of cities and suburbs 4-5°C or more degrees cooler and protect our skin from the sun’s harsh UV rays. Tree cover also reduces tremendously the air conditioning load of buildings.
Though the leaves of every type of tree catches the pollutants, one of the best catchers are conifer trees (pines or those with needle-like leaves). They are also evergreens (do not shed their leaves during winter) and have shown to have the highest efficiency in catching particulates and dust. Thus there should be a healthy mix of evergreens in the tree selection for planting.

The efficiency of particulate capture reduces when the leaves are covered with dust and oil from the vehicular pollution. However a single rain shower cleans them up and they become ready for the process of removing particulate pollutants. Besides trees can also be cleaned by ground-based high speed hoses. This is far better and cheaper than the artificial rain that some people have suggested for removing air pollution.

Trees have nurtured life since time immemorial. They are literally a bridge between heaven and earth. They take water and minerals from the soil through the roots, carbon dioxide from the atmosphere through their leaves and with the help of solar energy convert them into oxygen and food - the two fundamental ingredients of life. Without trees there would be no life on planet earth.

Trees are also rain producers since the evaporation of water from their leaves changes the microenvironment and helps in rain precipitation. Increased rain can also reduce air pollution.

Trees also help clean the air and environment by reducing dust, reducing noise pollution, absorbing pollutants like carbon monoxide, sulphur dioxide, nitrogen dioxide, etc. and fighting soil erosion.

Some years ago the state highway in front of our house was widened. The noise of heavy machinery and the dust clouds produced by earthmovers were effectively dampened by layers of trees in our garden. Without trees, living in our house for those 3-4 months would have been hell.

Trees also release vast clouds of beneficial chemicals. On a large scale, some of these aerosols appear to help regulate the climate; others are anti-bacterial, anti-fungal and anti-viral.

Trees are nature’s water filters, capable of cleaning up the most toxic wastes, including explosives, solvents and organic wastes, largely through a dense community of microbes around the tree’s roots that clean water in exchange for nutrients, a process known as phytoremediation.

If all the above services were to be provided by man-made machines then it would cost mankind about 4 trillion dollars per year (twice the size of Indian economy). A recent study concluded that for city of Mumbai alone trees provide about 13 billion dollars’ worth of ecosystem services. Thus trees and forests provide services which are nearly impossible to be provided by any other means.

In the old times there used to be a slogan for tree planting - Each one plant one. I think it should be revived and it is in the interest of every city dweller to plant trees. A simple method is to carry seeds of any tree variety in one’s pocket and keep on throwing them around especially in the rainy season while walking near the roads and empty spaces in cities. With time some of them will germinate and grow. If each one of us does it then cities can become greener. However for this to happen it is necessary that the local governments (and forest departments) should make the seeds of various trees available to general public.

Also too often the tree litter is burnt in most cities and towns which further increases the area’s air pollution. All leaf and other tree litter should be composted to further enrich the soil for more trees to grow.

Besides cleaning the atmosphere physically, trees also act as spiritual antennas. Gautam Buddha, Ramakrishna and other saints achieved enlightenment under a tree. It is said that even Newton got his idea of universal gravitation when an apple fell from the tree under which he was sitting. History is full of examples on how some of the great thinkers got their ideas while taking long walks in the woods.
In Japan, researchers have long studied what they call “forest bathing”. A walk in the woods reduces the level of stress chemicals in the body and increases natural killer cells in the immune system, which fight tumors and viruses. Studies in inner cities show that anxiety, depression and even crime are lower in a landscaped environment.

Having lived for last 40 years in a green environment (both my house and our Institute NARI is surrounded by lots of trees). I can vouch for their beneficial effects. Trees provide balm to eyes, green lungs to surroundings and solace to the soul.

*All photos are from Internet*

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**BLUE IS THE NEW GREEN**

“At WAE, we strive to innovate for nature. We are doing our best to develop sustainable hydration solutions and stop the Plastic-Menace that has groped our globe. Thousands of single-use plastic bottles have been avoided through the installation of our Bottle Filling Stations. The objective integral to all our endeavors is to build green technology for a greener tomorrow.”

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Solid Waste management

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Abstract

The waste which is generated out of human or animal activities which is generally solid is known as solid waste. This is discarded as unwanted and useless (except human waste). Solid waste is the unwanted or useless solid materials generated from combined residential, industrial and commercial activities in a given area. It may be categorized according to its origin (domestic, industrial, commercial, construction or institutional); according to its contents (organic material, glass, metal, plastic paper etc); or according to hazard potential (toxic, non-toxin, flammable, radioactive, infectious etc). A number of processes are involved in effectively managing waste for a municipality. These include monitoring, collection, transport, processing, recycling and disposal. The solid waste generally includes garbage, refuse, ash, trash and special wastes. Garbage: The term garbage is used to indicate dry refuse & it includes decayed fruits, grass, leaves, paper pieces, vegetables, etc. It is essentially food waste, which is generated due to cooking, eating, handling, selling of food products. It is generally organic decomposable waste. Rubbish: The waste which is non-decomposing (organic or inorganic). It includes plastic, paper, rubber, metal, cans, cloth, etc. Ash: This is a residue left over after the burning of coal, wood, paper, etc. This also causes nuisance and it spreads by winds. Trash: These are large bulky materials which cannot be dumped into the bins like large logs, metal scraps, etc. Special waste: It includes special waste from industries, construction wastes, etc. Classification of Solid Waste

1. Municipal waste: Food waste, rubbish, ashes, construction waste, special waste
2. Industrial waste: The waste which is left over after the process of manufacturing is complete is called as industrial waste. This includes: rubbish, special waste, ash
3. Hazardous waste: These are toxic, reactive and unhealthy. These are resulted from atomic reactions etc. This includes: special waste, ashes

1. Introduction

Solid waste is the unwanted or useless solid materials generated from combined residential, industrial and commercial activities in a given area. It may be categorized according to its origin (domestic, industrial, commercial, construction or institutional); according to its contents (organic material, glass, metal, plastic paper etc); or according to hazard potential (toxic, non-toxin, flammable, radioactive, infectious etc). A number of processes are involved in effectively managing waste for a municipality. These include monitoring, collection, transport, processing, recycling and disposal.

1.1 Reduce, Reuse, Recycle

Methods of waste reduction, waste reuse and recycling are the preferred options when managing waste. There are many environmental benefits that can be derived from the use of these methods. They reduce or prevent greenhouse gas emissions, reduce the release of pollutants, conserve resources, save energy and reduce the demand for waste treatment technology and landfill space.

1.2 Waste reduction and reuse

Waste reduction and reuse of products are both methods of waste prevention. They eliminate the production of waste at the
source of usual generation and reduce the demands for large scale treatment and disposal facilities. Methods of waste reduction include manufacturing products with less packaging, encouraging customers to bring their own reusable bags for packaging, encouraging the public to choose reusable products such as cloth napkins and reusable plastic and glass containers, backyard composting and sharing and donating any unwanted items rather than discarding them. All of the methods of waste prevention mentioned require public participation.

1.3 Recycling
Recycling refers to the removal of items from the waste stream to be used as raw materials in the manufacture of new products. Recycling occurs in three phases: first the waste is sorted and recyclables collected, the recyclables are used to create raw materials. These raw materials are then used in the production of new products. The sorting of recyclables may be done at the source for selective collection by the municipality or to be dropped off by the waste producer at a recycling centers. Another option is to mix the recyclables with the general waste stream for collection and then sorting and recovery of the recyclable materials can be performed by the municipality at a suitable site.

2. Treatment and Disposal
Waste treatment techniques seek to transform the waste into a form that is more manageable, reduce the volume or reduce the toxicity of the waste thus making the waste easier to dispose of. Treatment methods are selected based on the composition, quantity, and form of the waste material. Some waste treatment methods being used today include subjecting the waste to extremely high temperatures, dumping on land or land filling and use of biological processes to treat the waste.

3. Thermal Treatment
This refers to processes that involve the use of heat to treat waste. Listed below are descriptions of some commonly utilized thermal treatment processes.

3.1 Incineration
Incineration is the most common thermal treatment process. This is the combustion of waste in the presence of oxygen. After incineration, the wastes are converted to carbon dioxide, water vapour and ash. This method may be used as a means of recovering energy to be used in heating or the supply of electricity. Incineration technologies have the advantage of reducing the volume of the waste, rendering it harmless, reducing transportation costs and reducing the production of the greenhouse gas methane.

3.2 Pyrolysis and Gasification
Pyrolysis and gasification are similar processes they both decompose organic waste by exposing it to high temperatures and low amounts of oxygen. Gasification uses a low oxygen environment while pyrolysis allows no oxygen. These techniques use heat and an oxygen starved environment to convert biomass into other forms. A mixture of combustible and non-combustible gases as well as pyroligenous liquid is produced by these processes.

3.3 Open burning
Open burning is the burning of unwanted materials in a manner that causes smoke and other emissions to be released directly into the air without passing through a chimney or stack. This includes the burning of outdoor piles, burning in a burn barrel and the use of incinerators which have no pollution control devices and as such release the gaseous by products directly into the atmosphere. Open burning has been practiced by a number of urban centers because it reduces the volume of refuse received at the dump and therefore extends the life of their dumpsite. Garbage may be burnt because of the ease and convenience of the method or because of the cheapness of the method. Open burning has many negative effects on both human health and the environment.

This uncontrolled burning of garbage releases many pollutants into the atmosphere. The particulate matter can be harmful to persons with respiratory problems such as asthma or bronchitis and carbon monoxide can cause neurological symptoms. The harmful effects of open burning are also felt by the environment. This process releases acidic gases such as the halo-hydrides; it also may release the oxides of nitrogen and carbon.
Nitrogen oxides contribute to acid rain, ozone depletion, smog and global warming. In addition to being a greenhouse gas carbon monoxide reacts with sunlight to produce ozone which can be harmful. The particulate matter creates smoke and haze which contribute to air pollution.

4. Dumps and Landfills

4.1 Sanitary landfills

Sanitary Landfills are designed to greatly reduce or eliminate the risks that waste disposal may pose to the public health and environmental quality. They are usually placed in areas where land features act as natural buffers between the landfill and the environment. For example the area may be comprised of clay soil which is fairly impermeable due to its tightly packed particles, or the area may be characterized by a low water table and an absence of surface water bodies thus preventing the threat of water contamination. The bottom and sides of landfills are lined with layers of clay or plastic to keep the liquid waste, known as leachate, from escaping into the soil. The leachate is collected and pumped to the surface for treatment. Boreholes or monitoring wells are dug in the vicinity of the landfill to monitor groundwater quality. A landfill is divided into a series of individual cells and only a few cells of the site are filled with trash at any one time. This minimizes exposure to wind and rain. The daily waste is spread and compacted to reduce the volume, a cover is then applied to reduce odours and keep out pests. When the landfill has reached its capacity it is capped with an impermeable seal which is typically composed of clay soil. Some sanitary landfills are used to recover energy. Thus some landfills are fitted with landfill gas collection (LFG) systems to capitalize on the methane being produced. The process of generating gas is very slow, for the energy recovery system to be successful there needs to be large volumes of wastes.

4.2 Controlled dumps

Controlled dumps are disposal sites which comply with most of the requirements for a sanitary landfill but usually have one deficiency. They may have a planned capacity but no cell planning, there may be partial leachate management, partial or no gas management, regular cover, compaction in some cases, basic record keeping and they are fenced or enclosed. These dumps have a reduced risk of environmental contamination, the initial costs are low and the operational costs are moderate. While there is controlled access and use, they are still accessible by scavengers and so there is some recovery of materials through this practice.

5. Biological Waste Treatment

5.1 Composting

Composting is the controlled aerobic decomposition of organic matter by the action of micro organisms and small invertebrates. There are a number of composting techniques being used today. These include: in vessel composting, windrow composting, vermicomposting and static pile composting. The process is controlled by making the environmental conditions optimum for the waste decomposers to thrive. The rate of compost formation is controlled by the composition and constituents of the materials i.e. their Carbon/Nitrogen (C/N) ratio, the temperature, the moisture content and the amount of air.

Moisture content greatly influences the composting process. The microbes need the moisture to perform their metabolic functions. If the waste becomes too dry the composting is not favored. If however there is too much moisture then it is possible that it may displace the air in the compost heap depriving the organisms of oxygen and drowning them.

A high temperature is desirable for the elimination of pathogenic organisms. However, if temperatures are too high, above 75oC then the organisms necessary to complete the composting process are destroyed. Aeration is a very important and the quantity of air needs to be properly controlled when composting. If there is insufficient oxygen the aerobes will begin to die and will be replaced by anaerobes. The anaerobes are undesirable since they will slow the process, produce odours and also produce the highly flammable methane gas. Air can be incorporated by churning the compost.
5.2 Anaerobic Digestion
Anaerobic digestion like composting uses biological processes to decompose organic waste. However, where composting can use a variety of microbes and must have air, anaerobic digestion uses bacteria and an oxygen free environment to decompose the waste. Aerobic respiration, typical of composting, results in the formation of Carbon dioxide and water. While the anaerobic respiration results in the formation of Carbon Dioxide and methane. In addition to generating the humus which is used as a soil enhancer, Anaerobic Digestion is also used as a method of producing biogas which can be used to generate electricity.

6. Integrated Solid Waste Management
Integrated Solid Waste Management (ISWM) takes an overall approach to creating sustainable systems that are economically affordable, socially acceptable and environmentally effective. An integrated solid waste management system involves the use of a range of different treatment methods, and key to the functioning of such a system is the collection and sorting of the waste. It is important to note that no one single treatment method can manage all the waste materials in an environmentally effective way. Thus all of the available treatment and disposal options must be evaluated equally and the best combination of the available options suited to the particular community chosen.

7. Conclusions
The quantities of garbage collected and transported need to be monitored against targets, preferably by citizen monitoring, through effective management information systems and a recording weigh-bridge: computerized for 1 million+ cities. At least 80% of waste-clearance vehicles should be on-road, and two-shift use implemented where there is a shortage of vehicles. Decentralized ward-wise composting of well-segregated wet waste in local parks is recommended, for recycling of organics and also for huge savings in garbage transport costs to scarce disposal sites. Cities must fulfill their obligatory functions (like waste management) before funding any discretionary functions, while being granted fiscal autonomy to raise adequate funds. Solid-waste-management and other charges should be linked to the cost-of-living index, along with levy of “administrative charges” for chronic littering. Funds should be earmarked for minimum expenditure on solid waste management: Rs 100 per capita per year in 5-lakh-plus cities, or a minimum of Rs 50 per capita in smaller towns. Many cities are already providing conditional funding to residential areas or colonies willing to take responsibility for improved waste-management of their respective areas.

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Using Catchment Area Treatment Plans for betterment of forests— A suggested approach.

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We have worked in the catchments of rivers for over 24 years in varied forests, from the high altitude of the origin of Spti river in the mountain desert and Beas river in Vyas Kund in Rohatang to the west flowing short rivers of north Konkan. Differrent soil, gelogy, slope, vegetation, socio-economic life styles, farming practices and above all forestry practices make a Catchment Area Treatment Plan deals with the flow of surface water that is generated by rain and snow melt and is controlled by gravitational force. In our ancient wisdom all the origins or rivers were revered as a temple and the forest surrounding it was a sacred groove to ensure soil conservation and cleanliness of the water. The water cycle in nature follows its course. Evaporation from sea--- Formation of clouds---Clouds generate rainfall----Rainwater moves from hills in trails, streams and tributaries joining together as a river …. The river goes back to the sea----some water enters the soil---some evaporates back to atmosphere from soil and plants----but major part goes back to sea.

In tropical and sub-tropical regions, monsoonal pattern of hydrological cycles operate—most rains occur in three months followed by small showers, but floods and droughts are common. The rain or snow melt flows down the mountain slopes on either side of the ridge line in small streams flowing down and joining together at the bottom of the valley / gully as illustrated in the following images.

Urbanisation, mass scale cutting down of forests, untreated sewage, erosion caused by wind, water and diurnal temperature variation and many other factors join together to deteriorate the state of a catchment. Availability of funds for this all important task and their appropriate deployment is a key issue that needs to be addressed. The best opportunity to set the catchment area right stems from the river valley projects. The Govt of India, Ministry of Environment has stipulated that at least 2.5% of the project cost should be allotted for the CAT plan. Most of this money has to be spent by the department of forests as the land in a catchment area is invariably forest land. In cases where the land belongs to farmers and villages or the revenue department, separate approach for conservation of soil is necessary. This paper addresses only the forestry aspects and leaves aside the socio-economic
The Catchment Area Treatment Plan envisages controlling the soil erosion processes and subsequent sediment transfer to river.

Policy guidelines for allocation of funds for Catchment Area Treatment

We are pleased to point out that the approach suggested in this paper is evolved over time in close consultations with the forest department of the state of Himachal Pradesh. The interventions in the catchment are aimed at increasing the forest cover, soil and moisture conservation measures (SMC), wildlife habitat improvement and enabling the forest department and communities in efficient management of forest land and wildlife. We thus arrived at nine main components and the percentage apportioning of available funds for preparation of a CAT plan (The HPFD has formalised it as guidelines for CAT plan)

List of main components and percentage allocation funds for a CAT Plan

<table>
<thead>
<tr>
<th>Sr. No</th>
<th>Components</th>
<th>Percentages of Total Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Afforestation, Maintenance, Pastures &amp; Nurseries</td>
<td>25</td>
</tr>
<tr>
<td>2.</td>
<td>Soil and water conservation measures</td>
<td>25</td>
</tr>
<tr>
<td>3.</td>
<td>PES including study and its implementation</td>
<td>25</td>
</tr>
<tr>
<td>4.</td>
<td>Research, Capacity build-up, publicity</td>
<td>10</td>
</tr>
<tr>
<td>5.</td>
<td>Infrastructural build-up &amp; Forest Protection</td>
<td>15</td>
</tr>
<tr>
<td>6.</td>
<td>Wildlife related interventions</td>
<td>5</td>
</tr>
<tr>
<td>7.</td>
<td>Monitoring &amp; Evaluation</td>
<td>3</td>
</tr>
<tr>
<td>8.</td>
<td>Making Site Specific Plans</td>
<td>2</td>
</tr>
<tr>
<td>9.</td>
<td>Contingencies</td>
<td>10</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>100</strong></td>
<td><strong>100</strong></td>
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Technical Description of the CAT Plan Components

Afforestation measures: It must be stated at the outset that any reasonably well stocked forests should be left alone. The afforestation measures suggested in the plan will close gaps, if any. The objective is raising multi-tier mixed vegetation of suitable local/native species in the steep and sensitive catchment areas of rivers/streams to keep such areas under permanent vegetative cover. Afforestation is divided into plantation of various types including pastures, conifers, broadleaf plants, herbs, shrubs and NTFP species. Afforestation measures are used to check erosion. Practice and prudence in forestry demands, that plantation patterns should be poly-culture. It should contribute to improve the habitat for fauna, while simultaneously catering for the human demand for fuel, fodder and NTFP. The Afforestation measures are categorized under six sub-components.

Nursery Development:
Development of nurseries is at the core of successful forestry. The desired number of healthy plants of desired species should be produced in time for plantations, gap filling and enrichment. Three types of nurseries are suggested. These are Range Level, Beat Level and the Gypsy Nursery (temporary nursery near an area where plantation is to be carried out). Such an experiment has been successful in similar terrain in the State of J&K.

i. Gap Filling: Gap Filling is prescribed for the degraded plantations having survival percentage of less than 40% during last 15 years to improve stocking. The NERIL study team visited 20% of the plantations which are less than 15 years old. The survival percentage for gap filling was extrapolated from these physical observations. The indicated area is a notional hectare for the sake arriving at the cost. 800 plants constitute one notional hectare. Protection of the plant is by providing bush/twigs for individual
ii. Normal Afforestation:
The normal afforestation is further sub-divided into two types. These are Broadleaf Plantations and Conifers Plantations. The details of these plantations are given hereunder. Both the components have different plantation models, different fencing and, therefore, different cost models. Normal afforestation is synonymous with New Plantations.

- **Broad leaved plantation:**
  Under this component four to five strand barbed wire fencing with RCC fence posts and two layers of live-hedge plants to reinforce fencing is prescribed with 1100 plants per Hectares out of which at least 20% would be trees of medicinal value and 10% of wild fruits species to maintain diversity.

- **Conifers/ Oaks Plantation:**
  After studying the repeated failures of plantations of conifers in the study area, we compared the process of successful plantation in Jammu & Kashmir. A two-stage plantation technique is recommended in the Alpine region. The totally denuded and barren area should not be straight-away taken for planting of the coniferous species. Such areas need to be closed effectively and sown/planted first with the associates of the main coniferous species intended to be planted in such area. The plantation of the major/main coniferous species should always be taken up after having given complete rest to the site for a period of at least one to two years. The soil working in general, should always be carried at least six months to one year in advance of actual planting affording sufficient time for weathering of the dugout soils and pits/trenches. Fencing in alpine range have repeated instances of failure because of extreme variation of temperature. The steel barbed wires snap as they become tough due to contraction during winter. If they are left loose to cater for contraction, then the purpose of fencing is lost.

iii. Enrichment planting:
Under Enrichment Planting also, 800 plants per notional hectare notionally have to be planted in the degraded forest areas to improve stocking. Maintenance support has to be provided for Enrichment Plantations for 5 years. Fencing is also to be provided. The pit size for plantations will be 30x30x30 cm for Conifers/main species, while for Broad Leave/ Associate species the pit size will be 45x45x45 cm. Five years maintenance as per old practice prevalent in the forest department is prescribed under Afforestation scheme.

iv. Natural Regeneration:
The upcoming natural regeneration is required to be assisted by artificial regeneration by resorting to effective closures followed by patch (15cm x 15cm x 15cm) sowing of quality seeds/pit (45cm x 45cm x 45cm)/trench (100cm x 30cm x 30cm) planting of well grown tall and quality seedlings of indigenous species.

v. Fodder Development:
It is observed that invariably, due to adverse climatic factors, there is scarcity of grass and fodder in the CAT Areas. Large herds of sheep and goat are owned by the local people. The pastures are heavily grazed and have declined in the quantity and quality of grass. The productivity of these pastures is decreasing. For improvement of these pastures it is proposed to augment the existing grass production by way of:

- Patch sowing of palatable grass seed in 60x60x25 cm patches
- Broadcast sowing of seed after making pellets with cow dung
- Removal of obnoxious weeds and unpalatable grasses
- Application of Farm yard manure to augment fertility.

The above measures are required to be taken jointly by the graziers and the forest department after adequate awareness generation and consultation.

Soil and water conservation measures:
The soil and water conservation measure works are prescribed under the following categories:
i. Moisture retentivity operations: staggered contour trenching (priority activity), bio-engineering species planting. To improve the soil & moisture conservation in forests, contour trenches of size 1x 0.3x 0.3m in the required numbers are recommended.

ii. Vegetative structures- fascines, brush-wood check dams, bamboo crib etc. wherever applicable.

iii. Civil structures- masonry crate wire check dams, Gabion check dams, masonry dams (primarily dry stone), check/protection walls.

iv. Drainage line treatment and landslide control, with site specific estimates, using interventions mentioned in a-d above.

**Brushwood checks dams:**
Brushwood check dams are made up of posts in single or double rows and then brushwood is placed across the gully. The main objective of brushwood check dams is to hold fine material, carried by flowing water in the gully. Small gully heads, no deeper than one meter, can be stabilized by brushwood check dams. They are temporary structures and should not be used to treat ongoing problems, such as, concentrated run-off from roads or cultivated fields.

**Civil structures:** Drainage line treatments like gabion check dams, protection/retaining walls, toe walls and water harvesting structures, are recommended in the affected areas. To facilitate the establishment of vegetation, these civil structures are extremely important. The erosive velocity of runoffs is reduced by structures like silt detention dams, drop structures, spurs, water harvesting structures etc.

**Treatment of Landslips/Landslides:** The active and locations, prone to landslips/landslides, are prescribed with mechanical measures such as Gabion retaining walls at the foot. In addition, vegetative measures such as brushwood, live hedges and safe water disposal techniques are implemented.

**Stream Bank Stabilisation:**
The banks of river are unstable in many locations, but in lean season, no bank erosion is observed. Eventually as the water level and velocity increases, the bank erosion starts at an alarming rate, along the banks.

**Payments for Environmental Services:** The population in the catchment must work together with the foresters. They must also be rewarded for such environmental services. Works under PES activity are described under as:

i. Agriculture Camps

ii. Crop Demonstration introducing of high value crops like off season vegetables and other cash crops and other agriculture related problems and suggestions

iii. Development of Horti-Pastures

iv. Improvement of Orchards

v. Distribution of Medicines in the project area for animals

vi. Renovation of Cattle sheds to improve the health of animals and also to promote stall feeding on cost sharing basis of 50%.

vii. Provision of LPG connection with stove to the poor farmers on 50% cost sharing basis.

viii. Formation of User Groups and Self Help Groups and to link with income generation activities linked. Back Yard Poultry, Dairy Farming, Goat Rearing, handi-crafts etc. Eco Tourism

ix. Crematorium in the villages

x. Distribution of sewing machines for the motivating self-employment in the ladies.

xi. Promotion of Eco-Tourism and home stays

**Research training and Capacity building of forest staff.** Works under this head are described under as:

i. GPS & GIS maps trainings to Forest Staff

ii. Practical training/workshops to Forest Staff About Soil and water conservation Measures and preparation of estimates.

iii. Imparting training to farmers

iv. Exposure visits of the farmers to Watershed areas for improving their skill

v. Exposure visits of Forest Field staff
vi. Vehicles to Range Officers

vii. Capacity building trainings to forest staff in related subjects

viii. Office Equipment for better operation.

Monitoring & Evaluation. Provision for in-house (Forest Dept.) and third party monitoring of the CAT Plan works has been made in this CAT Plan. M & E studies including impact evaluation studies.

Wildlife Measures: The wildlife measures works is described under the following categories.

i. Awareness program among the community to protect wildlife.

ii. Rewards for anti-poaching campaign to the community

iii. Rewards to the informers Reporting Poaching or Apprehending poachers.

iv. Reward and incentives to informers who actively associate with the forest department in protecting the forest areas against poaching and illicit felling.

v. Awareness programs in schools Colleges

vi. Quiz Competition and Painting competition at various levels. (School, College, Community). The environmental awareness of children is therefore something that is becoming increasingly important.

vii. Compensation against

Wildlife Damage

viii. Creation of unique wildlife Habitat in the wildlife area.

The catchment area seems to have lot of unique wildlife habitats such as gorges and hidden valleys, which are houses to many such species like amphibians, reptiles, birds, mammals etc.

There is need to identify such unique habitats to protect them from activities like blasting and degradation. This is also true for the nesting site of vultures and galiform etc (cliffs and ledges).

The mapping of such critical and unique area is required to be done and necessary provision for this has to be made.

- Sign and slogan boards providing information about the protection of wildlife.
- Printing brochures provide information about “Protecting forest and wildlife”.

Infrastructure Build Up and Forest Protection:

Activity under this heading are described under:

i. Working with the local communities to reduce/mitigate their dependencies on the natural resources

ii. Fire Protection Measures

iii. Forest Roads/ Inspection Paths

iv. New construction / Maintenance of Building for stay of staff, FRH/I Hut

Setting Up Of Data Centre at Division and Circle Level:

Interaction with forest Officers at different levels brought out that technology absorption level is inadequate. In the years to come newer technologies will be introduced for efficient management of forests and wildlife reserves. Data Centres at division and circle levels should work as training centres as well. Initially it will need contracted manpower to handle the hardware, software and training of forest staff for forestry managements based on GIS applications and specially developed software for forest management.

Conclusion: The importance of better management of forests in the catchment needs no elaboration. We have a long way to go in making our forests a pristine place as it was in the past. Our wildlife deserves to coinhabit our lands as much as we do. The tribes and communities who are dependent on the forest also need to achieve their goals of life. Project based funding can be best utilised if we as a nation create a national awareness and enable our foresters to discharge their function in a studied, planned and effective manner.

We are happy to convey that all these principles of catchment area treatment plan are used by us while preparing the CAT plan for the proposed Gargai drinking water dam project for Mumbai city.
Call for Green Ideas

Maharashtra Shasan
Parivaarvan Vigabha

Prastavana-

Sahajawasth Satish Kumar

1. The call for Green Ideas was launched in June 2019 by the Maharashtra Economic Development Council (MEDC).

2. The call is open to ideas from individuals, organizations, and institutions.

3. The ideas will be evaluated based on their potential to contribute to environmental sustainability.

4. Interested individuals and organizations are encouraged to submit their ideas by the deadline.

5. Successful ideas will be implemented by the MEDC, with funding provided by the state government.

6. The call is part of the state government's commitment to promoting environmental sustainability and reducing carbon footprints.
7. बचत ग्राहकाच्या माध्यमातून कापडी पिसावून, पक्की लाकडी पहरावून वापर.

8. ग्रामीण भागातील रोकण-यासाठी पर्यावरण जननागती अभियान.

7. येथून पृथ्वीला रोजाने होणार व्यवस्थापित विचारात वेळात असल्यामुळे त्‍या अत्यंत रोजाने होणार नाही.

2. प्रस्तावित नाविकपूर्ण संकल्पनाची अंतर्गत वाणी प्रत्यक्षरत्या किमान सधा (६) महिलांच्या काळातील प्रक्रिया झालेली असली पाहिजे. अथवा प्रस्तावित नाविकपूर्ण संकल्पनेचे उदिष्ट मूर्ती/दृष्टी स्वरूपात दाखविलेले शास्त्र असले पाहिजे.

3. प्रस्तावावर भवनशीतीत यरसाडता, संकल्पनाची अन्य ठिकाणी पुनरात्मक होणारी श्रमिक, प्रक्षेपत क्रमजोडक काळात स्वप्नपूर्णरत्या चालविक्षेपाची कामात व प्रक्षेपाचा त्यागक परिणाम या चार निवासाच्या आधारस सिद्धांत प्रस्ताव प्राप्त माहितीच्या आधारावर प्रस्ताव विचारात घोषणेचे वेळ.

4. प्रस्ताव सादर करावाच्या संकल्पना स्थानिक पर्यावरणशी संबंधित विशिष्ट समस्या/विषयारूप आहारित असावी. विशेषतः दि. ५ जून या ज्यानांतर पर्यावरण दिनांना निमित कार्य होणारी संकल्पनेचा आधारावर भावनेचा प्रश्नांचा प्रश्नांचाच विचार केले जाईल. आवश्यकतेनुसार वेळजेवी सुकानून समतप्रती यासाचा रेखांत निर्णय घेईल.

यादी mahenvis.nic.in या संकल्पसाधारां व्यावस्थी दि. ३० ऑक्टोबर पर्यंत उपलब्ध कराव्याचे वेळ.

5. विविध प्रचार सादर अर्जाने निवासाच्या आधारावर प्राथमिक छान्याची करुण स्वरूप विचारात व्यवस्थी यासाठी यादी अपूर्त संगणक/प्रधान संघू/संघ यांचा माध्यमातून पर्यावरण विभागाने माहिती मिळवाव्याचे करावेल.

6. महाराष्ट्र प्रवृत्ती निवृत्ती मंडळ यांच्याकडून विचारातील संकल्पनांचे- ती संकल्पना प्रत्यक्षरत्या किमान सधा (६) महिलांच्या काळातील प्रक्रिया झालेली असल्याबाबतची अथवा प्रस्तावतील नाविकपूर्ण संकल्पनेचे उदिष्ट मूर्ती/दृष्टी स्वरूपात साधूने केलेले असल्याबाबतची छान्याची कराव्याचे वेळ.

7. महाराष्ट्र प्रवृत्ती निवृत्ती मंडळ यांच्याकडून प्राप्त अस्वलाच्या आधारावर पर्यावरण विभागाने पर्यावरण सुकानून समतीसमोर विचाराध्यात्मी वेळ.

8. सुकानून समतीच्या निर्णयानुसार शासन माध्यमातून पुढील कार्यातील पर्यावरण विभागाने माहिती मिळवावे वेळ.

b) प्रस्ताव निवडणारी कार्यपद्धती:-

1. दरवर्षी दि. ५ जुन रोजी साजरा होणारा होणारा जागतिक पर्यावरण दिनाच्या सूत्रे व्याख्यान दि. ३० सप्टेंबर या काळातील विविध मुद्रायात सादर होणारे प्रस्ताव त्र क्षेत्र मर्यादास सर्वसाधारणपणे विचारात घोषणेचे वेळ.

2. प्रस्ताव सादर करावाच्या अर्जाचा नूतन सोबत प्रस्ताव "अ" येथे जोडणाऱ्यात आलेला असल त्यानुसार प्रस्ताव विविध काळातीलत त्र क्षेत्र मर्यादास सादर करावेल याचा.

3. प्रस्ताव मंदिरीकृत पोष/ पार्वतीद्वार (रजिस्टर एडी) पर्यावरण विभागाचा अधिकारी पीडीएफ (Pdf) mJe*Heele envmtra-mh@nic.in या ई-मेलवर पाठविलेला याचा.

4. दरवर्षी दि. ३० सप्टेंबर पर्यंत प्राप्त होणारा होणारा प्रस्तावाची
मुलायमन करणे इत्यादी. यासाठी आवश्यकतेनुसार महाराष्ट्र प्रदूषण नियंत्रण नियामकांच्या सहाय्ये येईल.

५. सदस्य सचिव, सुकारण समिती यांनी या योजनेसाठी वेळखेरी उद्देश्यांना बाबीच्या अनुष्ठानाने मांडलेल्या प्रस्तावनांवर निर्णय घेणे.

३) आर्थिक सहाय्य:

१. प्रात प्रस्तावात्मक अनुष्ठानाने राज्यशासनाच्या संगठनांना एकूण खर्चांचा जास्तीत्त्व जास्त ७५% एवढा हिस्सा देय असेल.

२. सदर हिस्सा प्रकल्पाच्या कालावधीनुसार ब निर्धारी उपलब्धनुसार निर्धारित करण्यात येईल.

३. राज्य शासनाचे आर्थिक सहाय्य व प्रकल्प धारकाचा हिस्सा यांचे ७५.२५% हे प्रमाण प्रकल्प मंजूरीनंतर एकूण प्रस्तावित खर्चासाठी लागू राहिले. यात प्रस्ताव धारकाने यापूर्वी केलेला प्रत्यक्ष खर्च विचारात्मक घेण्यात येणार नाही.

(३५३५-५\(५५५५) परिस्थितिकी व परिवार वृत्त, प्रदूषण प्रतिबंध व नियंत्रण, १०३, वायू व जल प्रदूषण प्रतिबंध, पंचवर्षिक योजनांतरी योजना-राज्य योजनांतरी योजना, (२०२) पर्यावरण प्रतिबंध, (२०२)१३ पर्यावरण विषयक जानजागृती, शिक्षण व वातावरण बदल कृती योजना (३५३५-१३०२). सहाय्य कीर्ती अनुसार (वेलनेते) या अर्थसंकल्पी शिक्षावादी नेतृत्वाचा व संबंधित आर्थिक वर्ष० उपलब्ध तरतूदीतून भागविण्यात येईल.

(३५३५-५\(५५५५) परिस्थितिकी व परिवार वृत्त, प्रदूषण प्रतिबंध नियंत्रण नियामकांच्या सहाय्ये येईल.

(३५३५-५\(५५५५) परिस्थितिकी व परिवार वृत्त, प्रदूषण प्रतिबंध नियंत्रण नियामकांच्या सहाय्ये येईल.

शेष उपलब्ध तरतूदीतून भागविण्यात येईल.

६) योजनेचा खर्च

सदर प्रयोजनार्थ होणारा खर्च हा माणी क्र-३, ३५३५-५\(५५५५) परिस्थितिकी व परिवार वृत्त, प्रदूषण प्रतिबंध व नियंत्रण, १०३, वायू व जल प्रदूषण प्रतिबंध, पंचवर्षिक योजनांतरी योजना-राज्य योजनांतरी योजना, (२०२) पर्यावरण प्रतिबंध, (२०२)१३ पर्यावरण विषयक जानजागृती, शिक्षण व वातावरण बदल कृती योजना (३५३५-१३०२). सहाय्य कीर्ती अनुसार (वेलनेते) या अर्थसंकल्पी शिक्षावादी नेतृत्वाचा व संबंधित आर्थिक वर्ष० उपलब्ध तरतूदीतून भागविण्यात येईल.

महाराष्ट्राच्या राज्यपाल यांच्या आदेशानुसार व नवाब.

(म. वा. हजारी)
उपसचिव, पर्यावरण विभाग
महाराष्ट्र शासन
आकडे‌वारी

1) हरित संकल्पना योजना:–

- नैसारिक धार्मिक संसाधन संवर्धनांच्या संवर्धनांना तसेच पर्यावरण संवर्धनांत राज्याच्या नैसारिक धार्मिक गरजा लक्षात देऊन लोकसभाभाषानुसार साधनमोहनस्वती वार्षिक समाप्ति म्हणजे २०१० पासून जागतिक पर्यावरण दिनी तत्कालिन माहित्य विभागाच्या पर्यावरण विभागासाठी हरित संकल्पना ही योजना राष्ट्रविविध यें. (सोबत हरित संकल्पना योजनेच्या मार्गदर्शक सूचना शासन निर्णय)
- सदर योजनेच्या अंतर्गत इयतेच्या साधनची शासनने दिनांक ०८/१२/२०१६ रोजीच्या शासनाच्या मार्गदर्शक सूचना निर्णयाने मार्गदर्शक सूचना निर्णयाचा केल्या आहेल.
- सदर मार्गदर्शक सूचने सूचना प्राप्त प्रसार सूचना संस्थास्थायी ठेऊन निधी वितरित करण्याचे येतो. सदर निधीमध्ये ७५% हिस्सा राज्य शासनाचा व २५% हिस्सा प्रकल्प धारकाचा आहेल.
- (सदर योजनेतर्कने निर्मित करण्याचा आलेल्या मार्गदर्शक सूचने सूचना नाविकपूर्ण प्रसार साधनने सदर योजनेतर्कने सन २०१७-१८ मध्ये प्राप्त कोणताही प्रसाराच्या निधी वितरित करण्याचा आलेला नसल्या.)
- सन २०१८-१९ मध्ये सदर योजनेतर्कने १३५ प्रसार विवरणासाठी प्राप्त हाते असून सदर प्रसार दिनांक ८ मार्च, २०१९ रोजी हरित संकल्पना या कार्यक्रमांतर्गत माहित्य संचित (पर्यावरण) याच्या अथवा अलंकाराच्या ज्ञाताच्या म्हणजे २०१० पासून “सुदीमित” ही योजना राष्ट्रविविध येत आहेल.
- प्राप्त हाते १३५ प्रसाराच्या दिनांक ५ जून, २०१८ ते सर्वांत, २०१८ वा कालावधीतील ६२४ प्रसार प्राप्त हाते असून उद्धरित ५५ प्रसार

2) वृद्धि मित्र पुरस्कार योजना:–

- पर्यावरण विषयातील बाबूच्या जागीवी प्रमाणांत तत्कालिन माहिती करण्यात येणारे विविध प्रभागांना प्रमाणांत जननागृही करण्याचा हातने राज्याच्या सुवर्णपत्र वार्षिक संपूर्ण म्हणजे २०१० पासून “सुदीमित” ही योजना राष्ट्रविविध येत आहेल.
- सदर पुरस्कारच्या आयोजने व समान्य पर्यावरण शिक्षण केंद्र (Centre for Environment Education, CEE), पुणे याच्या मार्गांमधून करण्यात येते.
- सदर योजनेच्या सन २०१८-१९ करण्यात पर्यावरण शिक्षण केंद्र (Centre for Environment Education, CEE), पुणे याच्या मार्गांचे ३९,५७,७५०/- पैकी घटला हला २५% हाते. स. २९,६७,३५०/- हा तत्कालिन माहित्य दिनांक १०/०८/२०१८ रोजीच्या शासन निर्णयाने वितरित करण्यात आलेला आहेल.
राज्य नदी संचरन योजना

महाराष्ट्र शासन
पर्यावरण विभाग

प्रस्तावना -

बादले नागरिकरण व औद्योगिकरणामुळे राज्याची जलसंचरन विपरीत परिणाम होत आहे. राज्यात २० नदीं खोळ्यांच्या सर्वेक्षणानुसार नदीकाळावर वसल्या मोठ्या शहरांपासून निर्माणसाठी सांगणांमुळे आंदोलने ७० तक्ते नद्यांच्या पाणीचे प्रदूषण होते तर औद्योगिक सांगणांमुळे आंदोलने ३० तक्ते प्रदूषण होते. या जलप्रदूषणाचा, मानवी आरोग्य, शोध्यांत्री अध्ययने नद्यांच्या प्रदूषणाचे प्रसंग असते. त्यामुळे प्रत्येक व अप्रत्येक तारीखाने राज्याचे आर्थिक नुकसान होत होईल. नागरी सांगणांमुळे होणार्य नद्यांच्या प्रदूषण रोकणे व राज्याच्या जलसंचरन अंतर्गत देखील व त्याचे संबंध असते, या संदर्भात सर्वेक्षण विचार करून नागरी सांगणांमुळे नद्यांच्या प्रदूषण रोकणासाठी विविध उपायांमध्ये करणे नद्यांचा प्रदूषण नद्यांच्या गुणवत्ता सुधारणे, त्यासाठी गोष्टी प्रकार तयार करणे, धोरण ठरविणे, प्रश्नांद्वनी तीव्रतेनुसार योजनेतील प्रक्षेपण प्राथमिक उद्देश्ये ठरविणे, प्रूफुक्त पट्टी निर्धारीत करणे व योजनेसाठी निर्धारीत उभारण योजना स्वयंपूर्व व शासन मोडलून यासतं धोरण निर्धारीत करणे इतर ती बाब शासनाच्या विचारधीन होती. त्यासारखे मान.मंतरालयाच्या दि.१८.२.२०१४ रोजी झालेल्या बैठकीत निर्णयासारखे राज्य नदी संचरण योजना राजविण्याचा निर्णय घेतला आहे.

शासन निर्णय-

१) योजनेसाठी व्यावहार - ही योजना नदीकाळात रोजील महानागरपालिका/मंत्रालयांत, अगरपसर व १५,००० वरिष्ठ लोकसंख्या असेली नदीकाळात गोवऱ्या इत्यादी ठिकाणी लागू असेल. योजनेतील नदी प्रदूषी पद्धत खोळ्यांच्या संबंधात नदी भागावरून मोठ्या योजनेसाठी रोजील शहराचा /गावांचा संबंध व प्राथमिक त्या पद्धतील प्रमाणवाची अध्ययने निर्धारीत करणात येईल. यामध्ये नदीकाळात अंतर्गत पद्धतील धार्मिक, ऐतिहासिक, वातावरणिक व पर्यटनरूपात्मक महत्त्वाच्या ठिकाणाना प्राथमिक देखाव केलेला येईल.

२) योजनेतील समाविष्ट कामे -

(अ) (१) शहरातून /गावातून नवीनसाठी सांगणांमुळे नदील ज्या ठिकाणी सोडले जाते (Point Source) तेयून गोदा करणे, अडविणे, बळविणे व सांगणांप्रमाणे आंदोलने अडविणे १५ तक्ते प्रदूषण करणे तर औद्योगिक सांगणांमुळे आंदोलने ३० तक्ते प्रदूषण होते. या जलप्रदूषणाचा, मानवी आरोग्य, शोध्यांत्री अध्ययने प्रदूषणाचे प्रसंग होते तर औद्योगिक सांगणांमुळे आंदोलने ३० तक्ते प्रदूषण होते. या जलप्रदूषणाचा, मानवी आरोग्य, शोध्यांत्री अध्ययने प्रदूषणाचे प्रसंग होते तर औद्योगिक सांगणांमुळे आंदोलने ३० तक्ते प्रदूषण होते.

(२) सांगणांप्रमाणे प्रक्रिया करण्यासाठी सांगणांमुळे प्रमाण, गुणवत्ता व भौगोलिक परिस्थिती लक्षात पेडून योग तंत्रज्ञानाचा आर्थिक सांगणांप्रमाणे प्रक्रिया तुळ्षी व त्यास अनुसंधान आवश्यक घटक ह्याची उभारणे.

(३) प्रक्रिया केलेत्या सांगणांप्रमाणे, प्रकल्पक्षेत्रातील किंवा जनकीलेली शोध्यांत्री, उद्योगधक, वागवण्याचे इत्यादीमध्ये पुरुषवापर व पुरुषक्रम शक्य होणार्य सांगणांप्रमाणे आवश्यक ति त्याचा/सुविधा/व्यवस्था ह्याची उभारणे, जेणेकरून या वागवण्याचा महत्त्वातून प्रक्रिया देखभाल करून राहावून ह्याची इत्यादीविद्याचा संरक्षण होईल.

(४) नदीच्या जवळील भागात कमी किंमतीचे स्वच्छतागृहे बंधणे, त्यासारखे इत्यादीसाठी तस्मात उपयोगयोजना करणे इत्यादी.

(५) नदी घाट विकास, नदी काळेली घूऱ्याची उपयोजना, नदीच्या भव्यताचे संबंध इत्यादी.

(६) योजनेतील स्थांभिक कामांची, तंत्रज्ञानी क्षमता वृद्धी, प्रशिक्षण, संसूचना तसेच योजना विहित केलेत्या मानकांमध्ये यशस्वी होणार्य सांगणांप्रमाणे आवश्यकतेनुसार सल्लागावा तेस्त अभियंता इत्यादीची तापमानी नियुक्ती.
(7) Yojanachya swaranak parishthitiyonsar pradusshat karathyachya tustiine itar mahaavachi kame jase, shastriy prabhatniy nangari phnakchara vyavvashasvan v vitelvab, aparyarangik urjii nimitiyee v vapar loki saksham itayadiy kame.

(8) Yojaneantargati 234 mabhe samapikit kame swarvasadharapan rastriy nadii kriti yojanachya mahardarskar tawanausar aasitile. tahapik aavaryakalensonar yojanantargit samsitar mahardarskar tate bekhotheadi vighavadarhre swantarpana niigmit karanyat veteile.

3) Yojaneantargit sthanik swarajy swanshechii jivabadarai :-

(1) Yojanesaathii prastavita upayyojjanonastii aavaryak til jammin prakrty sader karanyapoojrni upalabh karan dene sthanik swanshebar bannakarak aasifvil. prakrtya keshasaathii sthan nisichit karatana te sthan shasanachya dinank 13 jumli, 2009 rojita niyapanausar tartudi v saaearoger aathysuvaana, 2019 mahiil tartudius aasen aavaryak aasifvil.

(2) Yojaneantargit shasanen mjunor kelteyla yojanachya kinmitjaike sthanik swarajy swanshebra hissaa upalabh karan dene, lypasadi swarvasadharan swaneha tharav prastavasobet sader karane ituthai.

(3) Yojanachya yashasviteesathii v ya yojnet patra hoyansathii sthanik swarajy swanshebra lyancha ekraon varthik aarotvaklyapeekii 30% nihpreyavaran pashayatmya suvabha vikasit karanyakarita prakrtye vrrna rachhu teve jine aavaryak aasifvil.

(4) Yojanachya purnintantar poorn jhalarlyaa kamaancha dekhural v rakharkhalsaathii lagannara khchalene lypasadi swarvasadharan sweneha tharav prastavasobet sader karane.

(5) Yojana mjunor jhalarantyaa mjunor kame vihit keteet poorn karane, kamaanchi guvanata tapasane, prakrty poorn jhalarv poorn jhalarlyaa kamaancha dekhuratalbariyya vyavvaspan karane, ityadisaathi sthanik prakrty sarnintyana samitiyee ghatit karane, lypasadi tartudi rachhu teve, itayadi.

(6) Prakrty ketele sandoopane shetti, udographat, bahkamam, banqam ityadaisathi upalabh karan denyaal yeilel v tyadharee mishanara mahosut swarangi bank khayamathye naga karan yojanachya dekhuralisathi vappediyat yeilel. abadatya swarvasadharan sweneha tharav yasaathi jivajhassace shekteri, udographat ityadaisobet kelleyta karanaamayithi prath prastavasobet sader karene aavaryak angal. yojanechya jivat aasatlyaa udogra graphan prakrty ketele sandoopani udographat vappediyast praksahan v prathyayit yeilel.

(7) Yojnet patra hoyansatii 234 mabhe vihit karadarskar tawanausar sushayatha ahavalsah (Prefeasibility Report) v samsitar prakrty ahaval v keshatrai mahavapot rastriy tamik samiteMARK kintaa sallagaryaa maddhan te tyah karun shashanaa sader karah. yasaathi shasanaadhe rast sallagarachhe sruhoi swantarpana niigmit karanyat yeilel. yojnet patra hoyansathii gav / sahar nihay prakrty ahaval kintaa xorhe nihay prakrty ahavalsah tyah karanyasathi anoonyy sallagaro sanya shulke, bhadothi kamaamche anoonyy prakrty vyaspaan sallagar sanya shulke, tamnik mulyanan ahavalsah tyah karanyasathi anoonyy sallagar sanya shulke, ityadhie yee sarv miyoon jnatitajnata prakrtyachya ekruun mool sJunor kintmitjaa 7 stakrtya brahmit itahil. yojaneantargit vitambhameshu mjunor mool kintmitjaahe bhadh jhalarlyaa eshanaya faarcahiy raakam sanvadhit sthanik swarajy swanshebra dene banchakarak aasifvil.

(8) Yojaneantargit bhikrhyaa nihir swarangi vstasora rastriykarleet bhekit khate utadhun teve banchakarak aasifvil. yee itar pryojjanasathii warapata yeayar haahi.

(9) Yojanantargit mahanagaapaliyaa, nanrapaliyaa v grameen keshatrai sader karavvadaya prakrtyaiche tamnik mulyanan mharastrii jivin pradhikar kintaa saksham pradhikruti swanshebyare karun vappediyat yave.
(10) The government of Maharashtra has established the Maharashtra Economic Development Council to promote economic development in the state. The council aims to foster economic growth through various initiatives and policies.

(11) The council is responsible for formulating economic policies and strategies to address the economic challenges faced by the state. It works closely with various stakeholders, including private sector organizations, to promote business growth and job creation.

4) *Government*

4) *Government*

(1) The government of Maharashtra has announced a new infrastructure project aimed at improving the state's transportation system. The project involves the construction of new roads and highways to enhance connectivity and reduce travel time.

(2) The government of Maharashtra has launched a new initiative to promote tourism in the state. The initiative includes the development of new tourist destinations and the promotion of existing attractions through various marketing campaigns.

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Ahbāwa (Detailed Project Report) nādi kūtī Ḳoḷossēva ṭārghaṅkār takāvaḷaḷāna ṭayār karēl kīṁva Ḳoḷossēvaṛghat śāpītaḥ tāṁśrīḥ kāṛṣṭūkūṭra kṛṇaḥ ेहि. Sāṅvaṁṣtārā prākṛto ṭhāvālāḷaḥ śrībhūṁkṛtaḥ sāṁśeṣeṃḥār tāṁśrīḥ ṭatāṅkōk kṛṇaḥ tīyaṃ pīmāyaṃpaśaḥ ṭhāvāḷaḥ śāpeṣaṅaḥ ṭāntāṁ maṅyaṭaṣṭāḥ śaṭdār karēn ṭēveḷ. 3) Sāṅvaṁṣtārā prākṛto ṭhāvāḷaḥ śāpeṣaṅaḥ śāpeṣaṅaḥ śrīṣkṣaṇākī vṛtiḥ tāṁśrīḥ ṭānteṣṭaḥ śāpītaḥ śrāvaṭaḥ śaṇṭāḥ kāmaṇāḥ vā ṭhānaṃ puṣṭhāḥ ṭhānāḥ ṭānteṣṭaḥ śāpītaḥ śrāvaṭaḥ śaṇṭāḥ kāmaṇāḥ. 4) Ṭhāvaḷaḥ śāpeṣaṅaḥ vṛtiḥ śrīṣkṣaṇākī vṛtiḥ śrīṣkṣaṇākī ṭhānaṃ puṣṭhāḥ śaṇṭāḥ kāmaṇāḥ. 5) Ṭhāvaḷaḥ śāpeṣaṅaḥ tīyaṃ prītāḥ śrāvaṭaḥ śaṇṭāḥ kāmaṇāḥ śaṇṭāḥ kāmaṇāḥ. 6) Ṭhāvaḷaḥ śāpeṣaṅaḥ vṛtiḥ śrīṣkṣaṇākī vṛtiḥ śrīṣkṣaṇākī ṭhānaṃ puṣṭhāḥ śaṇṭāḥ kāmaṇāḥ. 7) Ṭhāvaḷaḥ śāpeṣaṅaḥ vṛtiḥ śrīṣkṣaṇākī vṛtiḥ śrīṣkṣaṇākī. 8) Ṭhāvaḷaḥ śāpeṣaṅaḥ tīyaṃ prītāḥ śrāvaṭaḥ śaṇṭāḥ kāmaṇāḥ.
(8) योजनेवंतरंग समाविष्ट बाबीचे स्थानिक परस्थितीनुसार आवश्यक यागदर्शक तत्त्व तत्त्व करणे ते निर्दिष्ट करणे.

(9) योजना सार्वजनिक खमजी तत्त्वाच (BOT) राष्ट्रविवाहानुसार आवश्यकस्त्रूत व याबाबत मार्गदर्शन करणे.

(10) कामांचे गुणधर्मा तपासणीसाठी सदर समिती जस्त तात्त्विक संस्करण मंजूर योजनेत वेगवेगावळ जगन्त पूर्व जळेल्या कमांचे तपासणी करण्यासाठी अशा संस्थाच्या आवश्यकतेनुसार नेमणूक करेल.

(११) तथापि राज्यस्तरीय योजनेप्राथमिक समाविष्ट करायणाचा शहरांबाबत तत्त्व योजनेवंतरंग करायणाचा कामांचा प्राध्यादेयनुसार शासनाचा निर्णय अंतिम होईल.

(१२) या योजनेवंतरंग खर्च “पर्यावरण विभाग-माणिक क्रमांक यु-4, ३४३५, परस्थितीनुसार पर्यावरण, ०४ प्रदूषण प्रतिबंध व नियंत्रण, १९ नागरपालिका/परिषदांचा संविधान, (२०२२) राज्य निवडने योजना’’ या लेखारिष्टांनी वेजोलेटी मंजूर अनुदाततून करण्याचे येईल. प्रस्तुत शासन निर्णय नियोजन व विविध विभागाच्या अनुपालनाचे संदर्भ अनुक्रम क्र. ३.०९/दि. १ २.१२.२०१२ व क्र. ३७४/१२ विव. १२.२०१२ अनुसार देयणात आलेल्या सहभागीतेनुसार निर्धारीत करण्याचे येईल आहे.

हा शासन निर्णय पर्यावरण विभागाच्या www.mahenvis.nic.in व www.envd.maharashtra.gov.in आधिकृत संस्थेनुसार उपलब्ध आहे.

हा शासन निर्णय महाराष्ट्र शासनाच्या www.maharashtra.gov.in या संस्थेनुसार उपलब्ध करण्यात आला असून त्याचा संकेताचा क्र. २०११/२०१२ १२.१२.२०१२ असा आहे. हा आदेश डिजीटल स्वाच्छन्दी साधनाची साधनांस्थळात करणे कायम येईल आहे.

महाराष्ट्रातील राज्यपाल यांच्या आदेशानुसार व नावाने.

डॉ. बी. एन. पाठलिले
संचालक (पर्यावरण), महाराष्ट्र शासन
राज्य नदी संवर्धन योजना:

नगरी सांडपणामुळे होणाया नद्यांचे प्रदूषण रोखणे व राज्यातील जलसोत अबाधित ठेवणे व त्याचे संवर्धन करणे या संदर्भात सर्वकाळी निर्देशक खासगी कलन नगरी सांडपणामुळे नद्यांचे प्रदूषण रोखणासाठी विकिंद्र उपाययोजना कलन नद्याच्या पाण्याची गुणवता सुधारणे, त्यासाठी योग्य प्रकल्प तयार करणे, धोरण ठरवणे, प्रदूषणाच्या तीव्रतेनुसार योजनेतील प्रकल्पांचा प्राथमिकतेनुसार प्रतिष्ठित, प्रदूषण पटू निषिद्ध करणे व योजनेसाठी निर्णय उभारण्यास योजना स्वयंभू शासक होईल यास्तव राज्य नदी संवर्धन योजना १७/०३/२०१४ रोजीच्या शासन निर्णयाने घोषित करण्यात आली आहे. (सोबत राज्य नदी संवर्धन योजनेचा शासन निर्णय)

• सदर योजना नदी काठावरील महानगरपालिका/ नगरपालिका/ नगरपरिषद व १५,००० वरिच लोकसंख्या असलेली नदी काठावरील गावे इत्यादीकरता लापूर करण्यात आली आहे.

• सदर योजनेतील नदीच्या प्रदूषण पटवाण्या/खोयाण्या समावेश किंवा नदी काठावरील शहरांचा/ गावाचा समावेश व प्राथमिकतेनुसार प्रदूषणाच्या आधारे निषिद्ध करण्यात येलो.

मुळा-मुळा नदी, पुने प्रदूषण कमी करण्याचा प्रकल्प (केंद्र विभाग)

राष्ट्रीय नदी संवर्धन योजनेतील पुऱे शहरातील मुळा मुळा नदी संवर्धन करण्याच्या प्रस्तावादासाठी केंद्र शासनामाफ्त र. २६.०६ कोटी हिंदू माहणे महानगरपालिकेचा प्रस्ताव दिनांक १४/०९/२०१६ रोजी मंजूरी मिळाली आहे. सदर योजनेमध्ये केंद्र शासनाचा ८४.९९ कोटी व पुऱे महानगरपालिकेचा १५.५४ कोटी हिंदू माहणे आहे. यापैकी सन २०१६-१७ मध्ये केंद्र शासनाकडून प्राप्त र. ६.९९ व र. २६.०६ कोटी इतका निर्धारी अनुक्रमे दिनांक २६/०२/२०१६ व दिनांक २६/०२/२०१६ रोजीच्या शासन निर्णयाने पुऱे महानगरपालिकेचे वित्तीय करण्यात आला होता.

सन २०१७-१८ मध्ये सदर योजनेतील र. ५० कोटी रक्तमेची तरतूद करण्यात आली असून यापैकी केंद्र शासनाचा मंजूरी केलेली र. ३१.७३ कोटी इतकी रक्तम दिनांक १५/०२/२०१७ रोजीच्या शासन निर्णयाने पुऱे महानगरपालिकेचे वित्तीय करण्यात आली आहे. सन २०१८-१९ मध्ये उत्तरित र. १८.२५ कोटी हिंदू माहणे महानगरपालिकेचा वित्तीय करण्यात बंद आली.
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MPCB has initiated several reforms to ease the process of consent approvals for industries in Maharashtra. In this regards, the Board had launched its newly developed web portal to streamline the process of consent application for establishing industries in Maharashtra. The initiation of the web portal also marks as a contribution to the ‘Make in Maharashtra’ initiative.

With the launch of web portal, industries will be able to easily apply for consent for setting up their business with more convenience. Usually, it was an elongated process that consumed ample of time; however, now, the portal streamlines consent management system by facilitating online application. The consent management system involves a list of application that includes consent to establish, consent to operate and renewal of consent including Authorizations under various Rules.

At the time of establishing new industry/establishment, it has to undergo several procedures and one of them is obtaining consent from the Board. The usual practice of managing documents has proved inefficient with the increase in number of applications and in time disposal. To setup the business, getting permission in time is also equally important for the growth of industries, which intern help to contribute towards the economy and betterment of the nation.

The mandated web portal designed as per the Boards requirement, launched with an aim to speed up the process of Industry establishment in Maharashtra by providing online services including consent approvals, thus simplifying the procedures and cutting down time limit.

The online process is not only designed to promote speedy work but also to ensure that industries to comply with the environmental standards set for them in order to minimize the pollution problems so as to have sustainable development in the State. Industries can apply for consent and Authorisation under E-waste, plastic, hazardous waste, biomedical Rules including submissions of statutory reports online.

The new consent management process will minimise human interface and speed up the process of delivering permissions to industries/establishments. Therefore, there is no need to physically visit the government offices as one can get all the essentials related permissions of
the Board right at the online web portal. The foremost advantage of MPCB Web Portal is the reduction in processing time, disposal period of Consent reduced to 60 days from 120 days. The shortened time line will encourage the industries/establishment to set-up their business in Maharashtra, which in turn will help to improve development in the State.

The web portal is highly collaborative and user-friendly that enables easy application for obtaining certificates and online payment too. Moreover, it has completely reduced the use of hard copy of document submission, which further resulted in paperless work in the office. This also eliminates storage and security challenges such as misplacing documents, causing external damage to the application, etc. Now everything being online, MPCB can secure all the data and information online, reducing the risk of data loss.

Tracking of documents and applications has become highly convenient to project proponents because of the online process. Besides, proponents can also get the copy of consent with much less hassle from their dashboard itself.

It has facilitated to process the application across the department by defining task flow for approval with timely application status updates to the business users. In addition, the web portal has enabled effective online tracking of the applications through each stage, which has significantly enhanced internal communication between authorities and facilitated @ 50% less time to process the applications.

However, obtaining the consent approvals is not the only task for the industries but they are subjected to comply all the stipulated standard prescribed for them.

To ensure the compliance Industry has to maintain all the pollutant parameter under control, MPCB has introduced the web-based “Randomized Risk Based Inspection and Sampling” module, which is the part of the web portal having Central Inspection System in place where four departments (MPCB, Labour directorate, Directorate of industrial labour & safety and Maharashtra Labour Welfare Board) are linked for joint inspections as per EoDB norms. It has facilitated to keep the historical master record of the business related to permissions given by the Board including their analysis reports. It is mandated to pay a surprise visit to industries and if the wilful defaulter is found, suitable legal action will be implied against those industries.

Not only MPCB, but it is every citizen’s duty to ensure the well-being of our environment. Although government has initiated plans to conserve the environment by promoting sustainable measures, it is everyone’s equal responsibility to contribute their role in maintaining a greener and healthy ecosystem.
NERIL is a leading name in the field of environmental consultancy, water resource development, land use planning, and the management of habitats since 1996. The company was established in the year 1995 to carry out EIA Studies for obtaining environmental clearance from competent authorities for development projects.

NERIL’s objective is to provide project related specific services to government, semi-government and private organisations as well as conduct research in the field of environment.

We have a competent and well-experienced team of experts and the necessary equipments and infrastructure to conduct studies in the field of environment. NERIL is committed to provide scientific and sustainable solutions for ensuring unhindered conservation and improved ecology in tune with the developmental prerogatives. Our highly qualified team can provide holistic design, applied research, timely execution and professional support in the best possible manner.

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Preparation of catchment area treatment plans (CAT Plans) for large and medium scale hydro-power and infrastructure projects.
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Preparation of eco-friendly development plans

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SOFTWARE CAPABILITY

NERIL has the in-house ability to design web based application software for GIS applications for wide ranging needs in cartography, forestry and other user specific applications. We work with ArcGIS, ERDAS, Auto Cad, HEC-RAS, and such other specialised software.

We have expertise in the use of Remote Sensing, GIS and Resource Mapping with specific reference to Environmental Impact Assessment (EIA), land use land cover planning and state of environment reports (ESR).

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संकल्प प्रदूषण नियंत्रणाचा,
निश्चय पर्यावरण रक्षणाचा.

हवा प्रदूषण कमी करण्यासाठी आपणही हातभार लावू शकतो.

दैनिकतः जीवनात हरित संकल्पनेचा अंगीकार करा, कार्यन उत्सर्जन कमी करा.

पाठीयांच्या क्षेत्रात, खास किंवा जल्न न करता नैसर्गिक वायुमंडळ वापर करा.

सार्वजनिक वाहनांचा जास्तीत जास्त वापर कस्तो कर्षन कार्यन उत्सर्जन कमी करा.

पारंपरिक शेर पद्धतीत सुका पालापायचा जाऊन शेरीची महागत करू नका. त्याएवढी संदर्भित खाताचा वापर करा.

नैसर्गिक संसाधनांत, जंगल यांचा कमीत कमी वापर करा.

दैनिक वापराचील सीजन व पाणी यांचा कमीत कमी वापर करा.

पारंपरिक आयुष्मान व सुका कच्चा कच्चा बैठवा करा, तसेच आयुष्मान वर्तचतुर शंकित खट तयार करा.

हवा प्रदूषण कमी करणे शक्य आहे, त्याकारिता हरित जीवनशेती अंगीकारणे हे आवश्यक आहे.

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