

A Vision for Sustainable Future

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Abstract—City is the greatest tool yet invented for humans to meet, learn, experience each other, and exchange ideas, goods and services. The rapid and continuing urbanization in countries like India and China shows how much one of the world's oldest cultures value this experience, and how important cities are for the future of its society. But, with new times, factors like unforeseen population growth, unprecedented rates of urbanization, rapid industrial development, are causing incorrigible impacts on environment and resources such as water, air and land, which in turn is creating stress in these urban cores. Cities are becoming more stressed than ever, which is reflected through their deteriorating livability indices. Therefore, providing a solution seems necessary. In this regard, certain elements of sustainability must be taken into consideration and worked upon in a way that they can be integrated with the functional frameworks of a city. Taking references from the visits to the world renowned projects like Arcosanti, Arizona and various other 'Experimental Utopian towns', this paper seeks to investigate and delve deeper into certain prospects of sustainability that can enhance the living standards of the masses in today's cities and can lead to a better tomorrow.

Keywords: Urbanization, Cities, Sustainability, Livability, Policies.

1. INTRODUCTION

The dictionary language of sustainability, as it stands till today is "avoidance of the depletion of natural resources in order to maintain an ecological balance". But today in the times of green fuels and air purifiers we need to ask ourselves, does sustainability only take into consideration the depletion of natural resources, or is there something more to it? What is the need of sustainability? What are the origins of sustainability? And, how do we define sustainability in today's context?

1.1 Origins of Unsustainability

The need of sustainability can be traced back to the origin of 'Unsustainability'. In today's context, sustainability can be linked to the change and improvement in the living conditions of people. It was the Industrial Revolution that led to a huge boom in the industrial sector and led to the overexploitation of the natural resources, because of the human instinct for development and progress. The increased dependence on machinery and emergence of factory towns gave birth to the prospects of 'Rapid Urbanization' and 'Linear Economy'. It was because of the rattling affects and statistics of unsustainable development that the world got aware of

sustainable development and started moving in the direction of 'Sustainable future and green development'.

1.2 Steps towards the Sustainable Future

The first step towards a sustainable future was taken by the United Nations at 'The United Nations Conference on Sustainable Development', keeping in mind the objectives of securing renewed political commitment for sustainable development and addressing new and emerging unsustainability challenges. A new definition of sustainability came into light, which defined sustainability as "The development that meets the need of the present without compromising the need of future generation". All around the world, calculate, conserve, compensate, reduce, reuse, recycle, environment economy and many other such terms came to be linked with this modern day agendas of development.

2. MODIFIED DEFINITION OF SUSTAINABILITY

On going through all the major aspects of sustainability and taking into consideration various definitions that have been presented time to time, a new definition of sustainability can be derived:

"A human instinct to uphold their aspirations for more at a viable point that compels one to make tenable use of resources so as to avert extinction and at the same time conserves the environment for future generations."

3. THE KEY ASPECTS FOR SUSTAINABLE FUTURE

3.1 Tangible Aspects

Through various literature and case studies, it has been concluded that the two major tangible aspects that need to be worked upon in order to make a city more livable were:

1. Urban Sprawl
2. Green Technology

3.1.1 Urban Sprawl

City is the greatest tool yet invented for humans to meet, learn, experience each other, and exchange ideas, goods and services. The rapid and continuing urbanization in countries like India and China shows how much one of the world's oldest cultures values this experience, and how important cities are for the future of its society.

For countless centuries humankind had lived in more or less balanced relationships with the nature. Ways of life were reliant on the nature's cycles, and humans lived and died according to its rhythms. The Industrial Revolution, from the mid-eighteenth century characterized the period in which central priorities were scientific endeavors and technological advancements. This period was accompanied by a change from the traditional to the modern worldview; the worldview which, according to Taylor, was 'shallower and flatter' than its predecessor.

Ever since the Industrial Revolution, the quest for 'more' has flooded the human habitat, cities especially, with more than what they were meant for. This not only contrived the cities to expand their boundaries, but also enticed masses from the suburbs to be a part of this vicious cycle. This ceaseless cycle, today becomes one of the roots for emergence of urban sprawl, unsustainability and lowering livability indices in certain maximally stressed mega-population cities.

In a primary survey conducted amongst a small group of working class people living majorly in metropolitan Indian cities, the results further reinforce our conclusions drawn from the literature case studies about the key aspects which need to be worked upon for increasing livability in these cities.

More than 70% people stated that in a day they spend more than an hour to travel from their residence to the workplace. The figures are found to be highest people in the National Capital Region. There were a major chunk of people, who literally crossed multiple state borders in order to commute between the residence and workplace on a daily basis (traveling from Noida to Gurugram). These figures are a clear indicator as to how urban sprawl has engulfed the urban areas of the country.

Adding on to the increased wastage of time because of traversing longer distances, the figures for mode of transportation used for commuting are even more alarming. Survey report says that around 85% people still use their private vehicle running on petrol/diesel for the commute, which has major implications on the environment. Some of which are clearly noticeable in the national capital, Delhi.

Below are some of the statistics for the daily commute, between residences and workplaces.

Table 1: Mode of Transportation for Daily Commute from Residence to Workplace

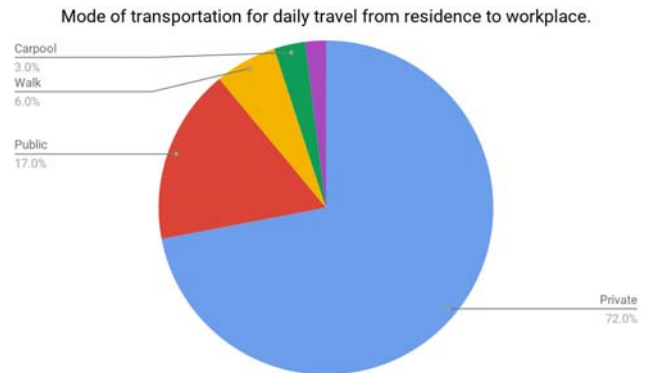
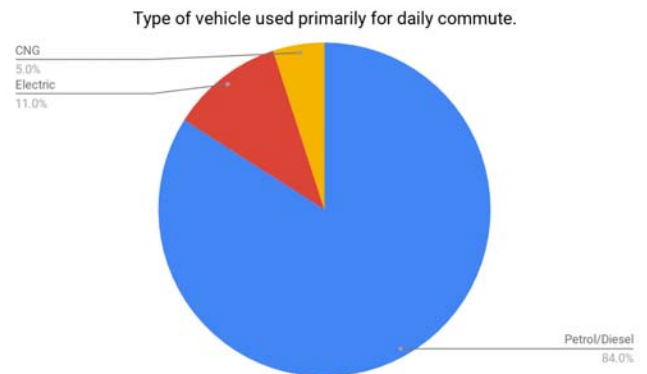


Table 2: Type of Vehicle Used for Daily Commute



3.1.1.1 Proposed Methodology

When we come across the concepts of 'Utopian Towns' which provide alternatives to various issues persisting in the metropolitan cities all around the globe, they talk about a completely new design from scratch. Now, in the real world, cities are already built and are continuously expanding, they cannot be torn down to create new ones. Hence, it becomes a matter of utmost prominence that a set of guiding policies are laid down by the governing bodies, that can lead the cities to a more sustainable future and can offer its inhabitants a better place to live in.

One of the most famous experimental towns, Arcosanti, also termed as the 'Urban laboratory' situated in the Arizona high deserts, United States, is designed on the underlying principle of 'Arterial Arcology'. Arterial Arcology is concept which works primarily with the focus on reducing urban sprawl. It talks about designing a city in a way that most of the functions can be accommodated in an arterial form i.e. most of the tasks to be performed by the inhabitants of the city can be harbored within a certain walk able distance.

Looking at the Indian context, there are a number of urban transport challenges which our metropolitan cities are facing,

A. Growing Economy Impacts

Increased Car Ownerships.
Increased Traffic Volumes.
Increased Congestion.

B. Urban Sprawl Impacts

More car dependency.
Increased trip lengths.
High costs for extending infrastructure and services.

C. Adverse Climate Change

Global warming.
Higher emission levels.

D. Reduced Road Safety

E. High Energy Consumption

3.1.1.2 Sustainable Approach to Transport Development

Transport development with low impact on the environment, and includes walking and cycling, along with technology to move people, goods, and information in ways that reduce its impact on the environment, economy and society. A transportation system which is more efficient, equitable and environmental friendly.

3.1.1.3 Proposals for Negating the Adversities of Urban Sprawl

Transit Oriented Development - Inspired from the High Density Development Public Corridor in Curitiba, Brazil, We propose a similar infrastructural setup, structured around major transportation hubs. These are to be designed in a way that the workplaces are accommodated within these transportation hubs. Following are the possible benefits:

A. The masses travelling from far off places to the respective workplaces wouldn't have to move further within the city. This, would not only reduce the trip lengths for working individuals, but also, reduce the traffic volumes at the cities' core areas.

B. Also, these working individuals, whose workplaces are situated at the Transportation hubs, would be encouraged to use more of public transports for their daily commute, as it would prove to be a faster and economic alternative to driving self-owned vehicles.

Shared Mobility - There may be instances where the Transit Oriented Development cannot be followed, and the existing transportation systems need be followed. At those situations, it becomes really important that these existing transportation systems are made more efficient and sustainable in a longer run. According to us, shared mobility is one of the key strategies that can help achieve the same.

A. India is grappling with the consequences of rapid urbanization.

B. Traffic congestion is an unfortunate and inevitable feature of life in large cities in India and real drag on millions of Indian citizens' lives.

C. Mobility choices are increasingly changing the dynamic socio-economic scenario in India.

D. Shared mobility coupled with public transport offers an alternate sustainable mobility option to tackle increasing congestion in cities in India.

E. There is a need to evolve shared mobility policy for cities.

Statistics from OLA, the leading Cab operator in India, clearly delineates the benefits of shared mobility in Indian cities:

Table 3: Ola Cabs Statistics

Ola Share			
City	Cars kept off the road	Fuel saved (In liters)	CO2 emission reduced (in KGs)
Delhi	9,10,086	5,39,768	12,50,636
Mumbai	3,75,090	2,94,024	7,23,660
Kolkata	1,34,996	91,676	1,70,580

3.1.2 Green Technology

The second major tangible aspect for elevating the livability and making a city more sustainable is the incorporation of Green technologies.

Green technology (also known as environmental technology, clean technology or Greentech) is the application of environmental monitoring, green chemistry, environmental science, and various technological processes for environmental protection. This term is also used for sustainable energy production technologies such as wind turbines, bioreactors, recycling, photovoltaic, etc. Also, environmental technology may be related to electronic devices and gadgets that promote the sustainable resources management.

From a primary survey conducted about how the inhabitants perceive the energy efficiency of the buildings they reside in, it could be easily concluded that the majority of people (about 70 percent) depended majorly on the artificial modes to achieve optimum comfort levels.

But, here 'Green Technology' doesn't just imply the use of 'green' or ecologically sustainable building materials for construction or increasing dependency on passive cooling/heating in a building (these have already been talked about a lot). To address this, we first introduce the concepts of **Urban Green Infrastructure (UGI)**, **Ecological Services (ES)** and **Natural Capital (NC)**. These concepts have a long

and rich history in the academic literature, dating back to decades - 1985 for UGI, 1990s for NC, and mid-1990s for NC.

Urban Green Infrastructure (UGI)

“An interconnected network of green spaces that conserves the natural ecosystem values and functions, and provides associated benefits to human populations.” It captures a multifunctional and networked view of green habitats in cities, and because of this, it has gained considerable traction in planning and landscape circle.

Natural Capital (NC)

It refers to the world’s stocks of natural assets which include geology, soil, air, water and all living things.

The links between UGI and NC are clearly visible; they both relate to the physical variability of natural habitats and species in landscapes. While NC focuses attention on the stocks of resources, UGI emphasizes the interrelationships between various things in the landscape.

Ecological Services (ES)

This can be defined as, ‘Benefits provided by natural ecosystems that contribute to make human life both possible and worth living.’

3.1.2.1 Proposed Methodology

Green technologies primarily affect biodiversity by reducing emissions and other environmentally harmful outputs that contribute to climate change and habitat pollution. The main green technologies that we believe can have the maximal positive impact are clean energy, green transportation, and efficiency applications. The replacement of old technologies should be done with newer versions that reduce emissions by eliminating fossil fuels or increasing efficiency. Replacing current, dirty technologies with green versions is the only way to preserve the many species that are highly susceptible to climatic and environmental changes caused by humans. Replacing old technologies worldwide would be a very expensive project, so we propose replacing dirty technologies when they become obsolete with the cleanest options that are available at that time.

A. Clean Energy

Clean energy must come from emissions-free sources. Clean energy categorizes all of our primary current energy sources except for fossil fuels, the primary source of energy. Fossil fuel burning currently makes up over three quarters of the world’s energy consumption. Renewable energy sources include solar, wind, nuclear, hydroelectric, and geothermal sources. Realistically, the world’s energy should come from a combination of these renewable resources, depending on what is available at a given area.

B. Green Transportation

Fossil-fuel based transportation is responsible for 23 to 24 percent of global carbon dioxide emissions. This transportation sector can be split into public and private transportation. Public transportation is in general more efficient because it transports more people for less energy. But, it could be further improved by using cleaner fuels or clean electricity sources. Private vehicles are almost entirely powered by fossil fuels today. To transition to renewable energy sources they will have to be replaced by battery-electric vehicles or plug-in hybrid electric vehicles. Simply increasing the efficiency of private cars can be achieved by reducing the size of the cars and making the engines more efficient for regular driving.

C. Efficient Appliances

One of the main causes of energy inefficiency in homes is inefficient power supplies. Power supplies have efficiencies ranging from 50 to 90 percent, but they believe that a minimum efficiency of 80 percent for all power supplies is easily achievable. The price difference between an inefficient power supply and an efficient one is estimated at Rs.100 - hence, the supply will pay for itself within six months. However, efficient power supplies are not in wide use because they are not purchased by individual consumers; Rather, they are purchased by manufacturers of appliances. This problem could potentially be solved by using government incentives to motivate companies to produce efficient power supplies.

Energy can also be saved by switching to newer appliances. Newer appliances are surprisingly more efficient than their older counterparts. In the past few years, appliances have been programmed to draw more power at certain times of the day. For example, certain lights draw less power during the daytime, when they are somewhat unnecessary. According to Electrolux.com, if Europe exchanged all of its appliances that are more than a decade old with the newest models, 20 billion kWh of electricity would be saved and CO₂ emissions would be reduced by 18 billion kg.

3.2 Intangible Aspects

3.2.1 Human Aspirations

It is the hope and ambition of achieving something that has pushed humans so high up in the ecosystem. And it is these ambitions which knowingly or unknowingly leads to the depletion in the quality of life for humans. So the next requisite for understanding sustainability is ‘Human Aspirations’.

Throughout ages humans have been transforming and adapting to become the most evolved species on this planet. Humans have never ending potential and intense will that tends to push them forward in all aspects of life. And the development brought about by those aspirations is what leads to sustainability and unsustainability. It is those aspirations

which led to the evolution of the world but the question for the era is, Will these aspirations lead to its downfall as well?

In today's time sustainability has become a container for our highest aspirations which provide it a strong sense of continuity. These aspirations when collected over time give birth to the term "Flourish". Flourishing gathers a bundle of qualities which constitute some of the main focal point of human aspirations from time to time. Some of these include – good life, health, solidarity, autonomy, freedom and dignity. In the past there have been incidents and eras in which human aspirations for development have led to the downfall of the world as we see it today.

Human aspirations have their roots deep in the origin of unsustainability and decrease in the quality of lives. The cutting down of forests, exploitation of resources and other unsustainable activities erupted from the core of desire to progress and develop which in turn is controlled by Aspirations. One of the major events in history 'The industrial revolution' was a result of these aspirations which ended at being the worst era for environmental development and sustenance. The reckless and over exploitation of resources tend to the decrease in quality of life for the future individuals. The rapid urbanization and increased dependency on machinery led to a change in environmental conditions and they took turn for the worse. That era also saw a huge boost in the human population which influenced the matters for worse.

It was the human aspiration for development, that led to the depletion of resources and unsustainability and today it is the human aspiration for survival which tends to push him towards sustainable development.

Humans need to stop and uphold their aspirations till a viable point. The environmental degradation and decrease in the quality of living is not an event that can be forgotten. It is a phenomenon that is going to affect us in one way or the other. Today in a country like ours where the middle class is increasing at a high rate, it is becoming difficult for people to uphold their aspirations for comfort and luxury, because of increased purchasing power. This leads to the increase in industrial towns and activities which adversely affects the ecosystem, socially and environmentally. It is the human aspirations which need to be controlled and put a limit to if we want to move towards sustainable, economic and environmental development.

3.2.1.1 Proposed Methodology

Human aspirations do not have a physical form. They are incorporeal and formless. They originate in the human heart and affect the human mind. It is a fractious human emotion and one of the basic human traits. It has been encoded in the human gene since the birth of human race. Over times it is because of the 'Human Aspirations' that humans tend to move forward and evolve over and over since times infinite. Human aspirations have brought us to this era of technological advancement, but today we need to ask ourselves, how further

will it be able to take us with the resources and ecological balance depleting at such a fast pace?

It is said that "the surplus of everything is bad", and that is true for 'Human aspirations' as well. The depletion in human living conditions and ecological imbalance has been brought about by the excess of these human aspirations only. Now the next question that arises is, how can we put a break to these surfeit human aspirations?

There's no rule that can restrict something that we can't touch but only feel. People need to be educated and taught about the effects that can be brought about by the excessive use and overexploitation of resources. People themselves need to keep a check on their own needs and yearnings. People should use the resources but not overexploit them. It is the responsibility of us humans to leave the world better than what the previous generation left for us, for the future generations. Rather, we should concentrate our efforts on preserving the resources. Everyday activities, such as owning not more than two cars, using public transport etc, can make a huge difference if viewed from a larger perspective. We should try to restrict our own will to the extent of our needs and rather than individual good, start focusing on the communal good. The day we will restrict our own will and aspirations to a certain limit, a completely new world of sustainable development will be revealed in front of us.

This world will develop at an equitable pace and will carry on the wills of both the past and future generations with it. The development in this world might be at a brisk pace but it will help the humans achieve a long lasting and more humane development and peace and ecological stability that form the basis of human survival while fulfilling all their luxury and aspirations at the same time.

3.2.2 Circular Economy

We are currently living in an era of constant change and urban growth. Over time, cities have expanded so much that they have absorbed the small towns near them, or conversely several cities have merged into a single metropolitan zone. The increase in average income in both developed and developing countries has resulted in a growing middle-class, which is demanding more products and services. To meet this growing demand, an increasing volume of raw materials is being extracted globally (flowing into the city), producing large amounts of waste (flowing out of the city) in the process. These laws require careful consideration for current and future city generations. There are varied diverse arrays and quantities of flows (and accompanying interactions) that occur in, around and outside of a city. These flows include, but are not limited to:

1. **Flows In** – resources (metals, plastics, timber, fuels, food, water)
2. **Flows Out** – manufactured products, but also solid, liquid and gas Wastes. These include, for example, municipal solid

waste, waste water, and Atmospheric pollution (from carbon dioxide emissions).

Circular economy supports the reuse of waste as a resource for other production activities by a process that is more commonly referred to as Industrial Symbiosis (IS), and it is an important aspect of UM, since it fosters cooperation between industries to identify where a waste outflows or by-products from one industry can be used as a resource inflow for another.

Circular economy refers to, “An economic system that replaces the ‘end-of-life’ concept with reducing, alternatively reusing, recycling and recovering materials in production/distribution and consumption processes. It operates at the micro level (products, companies, consumers), meso level (eco-industrial parks) and macro level (city, region, nation and beyond), with the aim to accomplish sustainable development, thus simultaneously creating environmental quality, economic prosperity and social equity, to the benefit of current and future generations. It is enabled by novel business models and responsible consumers.”

For cities to be sustainable we need to rethink and reorganize how they work. In a city that embraces circular economy, all the culprits are considered as potential inputs for another production system. All types of waste are regarded as a potential asset, rather than a burden and circular economy functions are fundamental as to how cities function, rather than just an optional supporting characteristic.

In the Indian context we need to start by segregating between the biodegradable and non-biodegradable waste which tends to increase the (re)use of resources and encourages revitalization of materials. The resources that are being converted to waste tend to be used more effectively and efficiently rather than just disposing them off. For cities to be sustainable, we need to rethink and reorganize how they work. In a city that embraces circular economy, all the outputs are considered as a potential input for another production system. All types of waste are regarded as a potential asset, rather than a burden, and circular economy principles are fundamental to how cities function, rather than just an optional supporting characteristic.

3.2.2.1 Proposed Methodology

Circular economy refers to the, flow of resources in the urban areas and how we need to rethink, reorganize and reuse our resources. Potential benefits of implementing circular economy in cities are achieving better resource efficiency and resource security. This achieves best environmental behavior and best performance in both economic terms and resources.

In today’s time when we are becoming poor in resources and rich in waste, we really need to address the problem of waste management.

The problem of waste management needs to be addressed at various levels in our society. First at personal level and then at community level which will then move towards national level. We need to be more sustainable in our local community and

then move towards devising policies for waste treatment. On our personal level and community level we need to segregate between the recyclable and reusable resources. Having a separate dustbin for both in our homes and in the neighborhood can be a start.

Along with that we need to make people aware about the concept of circular economy which focuses on the limited quantity of resources in the nature and capacity for waste disposal. Along with that the reuse of non biodegradable materials, especially plastics should be encouraged. The urban metabolism needs to be rethought, which will in turn help us to redefine a city and its functioning. All the outputs of a city should be considered as a potential input for another production system. All types of waste should be regarded as potential assets and aim towards making best use of resources to reduce waste, at the same time addressing different agendas of – economic, environmental, social, cultural and political – development of a country and a nation.

In today’s times it is important to study the flow of resources in urban areas and we need to maintain a baseline to assess different initiatives or interventions and determine their effectiveness over time. The circular economy is the base at which a country stands. It is up to us whether that base will be made of waste or of resources.

4. CONCLUSIONS

Through the research carried out, I believe that it is high time now that people start thinking about the ecosystem as a whole rather than, our own individual lives. It is time that we start moving towards reuse of resources rather than exploiting them. It is time we start to think about the reorganization of cities rather than, establishing new ones.

Humans’ aspirations need to be limited up to a certain level, and for that people themselves need to work on controlling their yearnings and desires. Along with that a proper flow of the resources i.e. reuse, rethink and reorganize must be maintained according to the existing urban fabric and the waste production and management needs to be kept in check.

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