A study of lifestyle changes in Xavier Institute of Development Action & Studies, India to mitigate global warming

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Abstract. The Sustainable Development Goals (SDGs) outlined by the United Nations as tools to transform the world by 2030, outline Goal 13 to “Take urgent action to combat climate change and its impacts by regulating emissions and promoting developments in renewable energy”. But the seventeen goals are all interrelated and it is our cumulative efforts that can make them achievable in the next 13 years. As a civilization we have thrived upon decades of denudation and degradation, gradually, but immensely, yet quite indifferently. This indifference might be debated upon as the recent times has seen ever-growing concerns to address the crisis at hand, but this is no more than burning the night oil for a saving grace. If we look back, then it will not be difficult to analyze that the exploitation of the resources and the processes of degradation accelerated from the era of Industrial Revolution, dating back to 1750, but it took us more than a century to feel the repercussions of our actions. The first time ever the terms “global warming” and “climate change” was addressed as an internal issue of concern was in the Rio Summit, held in Rio-de-Janeiro in Brazil in 1992. Since then, the world has witnessed a series of environmental protocols, treaties and summits, each one raising a doubt on the validity and effectiveness of the previous. Meanwhile, the ever-impending population surge has compounded the environmental stresses. To combat the changes we are introducing in our ecosystem, the research focuses on implementation of minor and doable actions in the mundane yet regular activities of our daily life, which have a direct impact on individual carbon footprint. The research establishes the success of these measures in Xavier Institute of Development Action and Studies (XIDAS) by comparing the scenarios before and after implementation of a “Green Lifestyle”, which will help us achieve sustainability beyond environment protocols and beyond international treaties.

1. Introduction: Need of Life-Style Changes as a Mitigation Measure

1.1. Highlighting Concerns over Climate Change

Human beings, by nature tend to take beneficial things for granted and it is by the virtue of this tendency that the natural environment in which we have thrived upon for decades has been denuded and degraded, gradually, but immensely, yet quite indifferently. This indifference might be debated upon as the recent times has seen ever-growing concerns to address the crisis at hand, but this is no more than burning the night oil for a saving grace. If we look back, then it will not be difficult to analyze that the exploitation of the resources and the processes of degradation accelerated from the era of Industrial Revolution, dating back to 1750, but it took us more than a century to feel the repercussions of our actions. The first time ever the terms “global warming” and “climate change” was addressed as an internal issue of concern was in the Rio Summit, held in Rio-de-Janeiro in Brazil in
1992. The melting polar ice-caps were accidentally recorded by remote sensing satellites and the temperature changes all over the world were moving towards an all time high. The unprecedented incidents gave global climate change the due concern it deserved and it was the most highlighted issue of United Nations Conference on Environment and Development (UNCED) in Rio. [1] A landmark achievement towards bringing the majority of nations, 171 countries to be precise, to accept the issue of climate change as an imminent threat to the bare existence of human race has been the ratification of The Paris Agreement (CMA 1) on October 5, 2016 in Marrakech, Morocco.[2] Beyond environment protocols and beyond international treaties, there is a dire need to focus upon implementation of minor and doable actions in the mundane yet regular activities of our daily life, which have a direct impact on individual carbon footprint. The research establishes the success of the measures by comparing the scenarios before and after implementation of the measures to a "Green Lifestyle".

1.2. The Rio Summit and Its constitution
The Rio Summit by the United Nations had 172 governments participating. The statistics are not as staggering as that of the recent Copenhagen Summit (COP15, 2009 UNFCC) or the Paris Agreement (Paris Climate Agreement, UNFCC, with effect from 4 November 2016), but it was still impressive, considering that fact that the issue was not as highlighted as it is today.

The details of the conference are as follows: [1] [2]
It was organized by Conference United Nations Conference on Environment and Development (UNCED) in Rio de Janeiro, 3-14 June 1992. The Earth Summit Host nation was Brazil. Number of Governments participating was 172, 108 at level of heads of State or Government. Conference Secretary-General was Maurice F. Strong, the Canada Organizers UNCED secretariat. Principal themes were “environment” and “sustainable development”. It was under the issue of environmental crisis that climate change was first ever addressed as a global issue. NGO presence was somewhere around 2,400 representatives of non-governmental organizations (NGOs), with 1700 people participating parallel.

The outcomes of the Rio “Earth” Summit can be summarized as the following:
1. Resulting document Agenda 21
2. The Rio Declaration on Environment and Development
3. The Statement of Forest Principles
4. The United Nations Framework Convention on Climate Change
5. The United Nations Convention on Biological Diversity Follow-up mechanisms

But the follow-up mechanism of the conference, which include the Commission on Sustainable Development, Inter-agency Committee on Sustainable Development and High-level Advisory Board on Sustainable Development proved to be both inefficient to force eco-friendly standards and irrelevant with the changing economic conditions.

1.3. The Protocols That Followed
“Rules are meant to be broken”. It is unanimously accepted by us when most of the times we find the rules too stringent to obey. The situation is identical for the developed nations. The only difference is that, the rules are not broken but bended around. After the much talked-about Rio Summit, a number of protocols followed. The most significant of them are as follows: [3] [4]

1. Kyoto Protocol on Carbon Emission Norms (1997, Kyoto, Japan):
It brought into existence the concept of “Carbon Trading” and constituted “Carbon Funds” which promoted the Annex-I countries to purchase carbon credits from the third world nations. Though its inception took place as early as 11th December 1997, yet it came into existence in 16th February 2005 as it required minimum 55 countries with minimum 55% of the total Carbon Dioxide (CO2 ) emission.
In November 2009, it has 187 states who have signed it, aiming to reduce emission of 4 GHGs and other PFCs and HFCs.
2. Montreal Protocol on Substances that Deplete Ozone Layer (1989, Montreal):
The biggest ever ozone-hole was about the size of the surface area of North America and the population was subjected to the harmful UVB wavelengths (270–315 nm). The alarming rate of this
depletion gave rise to the Montreal protocol which came up with projects to replenish the ozone layer. It came up with the following norms for CFCs:

A. From 1991 to 1992 the levels of consumption and production of the controlled substances in Group I of Annex A do not exceed 150 percent of its calculated levels of production and consumption of those substances in 1986.

B. From 1994 the calculated level of consumption and production of the controlled substances in Group I of Annex A does not exceed, annually, twenty-five percent of its calculated level of consumption and production in 1986.

C. From 1996 the calculated level of consumption and production of the controlled substances in Group I of Annex A does not exceed zero.

3. Vienna Convention on Civil Liability for Nuclear Damage (1963, Vienna, Austria):

The Vienna Convention came into being when nuclear energy was being considered as a probable energy alternative. It was highlighted specially after the nuclear leak in Chernobyl, Germany.

2. Expanding our Horizons beyond Protocols

2.1. Increased Environmental Stressors

The word “Stressor” is defined as an activity, event or other stimulus that causes stress. Outlined by the Encyclopaedia of Biodiversity, second edition, Environmental Stress is:

An action, agent or condition that impairs the structure or function of a biological system. Environmental stress can be either natural or anthropogenic (i.e. resulting from human actions) in origin.[5]

Amongst the basis of characterization of Environment Stress[6] the utmost challenging one has been the “novelty” of the stress; it signifies the damages are greater since the preparedness of the ecological system to combat a “novel” environmental stress is comparative much lower than widely known phenomena. With the world population estimated at 7.3 Billion in the year 2015[7], the impending surge is illustrated in figure 1.

![Figure 1. Growth in World Population](image)

The surge illustrated in figure 1 in the world population will be compounding the “novelty” factor of Environmental Stresses since the natural balance mechanism of our ecosystem will be unable to cope with multiple changes introduced in the system; these may include generation of non-biodegradable wastes, green-house-gasses, release of chemical compounds, exploring radioactive compounds for generating nuclear energy and various other sources of disturbing the equilibrium beyond scope of restoration. In such a hypothetical yet probable scenario in the not-so-distant future, protocols and preventive measures, which have existed beyond early 1960s, may result in being fractionally effective even with 100% implementation.

2.2. Objectives & Hypothesis of the Study

Instrumental in framing sustainable livelihood promotion and eco-friendly initiatives in the state of Madhya Pradesh, India, Xavier Institute of Development Action and Studies have been in a pioneering role to frame action plans which promote sustainable development. In an attempt to check the reality at ground zero, the research has taken the aforementioned institute as the universe of the study with the following objectives:

I. To identify areas of habitual and unintentional wastage of resources in XIDAS

II. To estimate and quantify the extent of wastage for impactful visualization
III. To recommend habitual changes designed to be implemented at individual level to develop a Green Lifestyle to mitigate Global Warming

The root cause of the extensive impact of global warming has been attributed to the human desire to keep raising the standard of living above subsistence level[5]. The Hypothesis hence formulated is:

H₀: There exists no area to be identified, in which individual efforts can bring impactful changes to mitigate climate change

H₁: Designing a quantitatively impactful Green Lifestyle will result in measurable reduction of Carbon Footprint of an individual, result in mitigation of Global Warming.

3. Trends to Transform*

3.1. Research Methodology

The research has been limited to Xavier Institute of Development Action & Studies[9] as the universe of the study, with a total population of 500. Sample size is 300, 60% of the population. Simple random sampling has been applied; data collection has been made using focused group discussions and questionnaire-based survey method.

3.2. Food Habits

We can incorporate an eco-friendly consumption pattern of edibles in our lifestyle which promotes sustainability in the following ways:

3.2.1. Eat to live and don’t live to eat: The total population of the city of Jabalpur is 932484[10] and it classifies under C-Grade cities of India. Xavier Institute of Development Action and Studies is located in the Tilhari Region of the city with an on-campus population of 300 people.

Recommendation.1: Estimating our Diet: while the institute has a detailed meal-plan for its mess, it is recommended that a consumption plan is formulated as per the calorie required in an individual’s diet, i.e. 2100 calorie/day considering an urban population.

3.2.2. Distinguish between needs and wants: The consumption pattern of the canteen portrays despite 3-regular meals provided to the respondents per day, the 24X7 operational canteen provides quick-service refreshments and packaged food which can be curtailed if not absolutely abolished.

Recommendation.2: Student diet charts can be created, without the institute limiting itself to the mess food. By reflecting on the wasteful ways, we can reduce the rate of overconsumption. An institute promoting rural development and sustainability shouldn’t be at the forefront serving packed chips and cold-drinks. Thus there is a need to review the policies and the nutrition of the food being served in the canteen.

Figure.2 depicts the expenditure pattern and figure.3 depicts the consumption patterns of the respondents during November 2017 for the sample size of 300 respondents:

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*Trends mentioned are designed for individual efforts and not depicted for institutional policies.
3.2.3. Prevent wastage: When was the last time we didn’t, though unknowingly, leave a few morsel of food on our plate? Mostly the quantity is so less, it doesn’t pay or even matter to waste. But it seems immaterial when it is on an individual level. Simple mathematics and approximation can help us decide the magnitude of this problem:

Case-I
1. Total population of India = 1,156,897,766[10]
2. Collectively, if every Indian wasted a single grain of rice just for a single day of the year, it will be around = 1,156,897,766 grains.
3. The number of grains of rice per gram = 50[11]
4. Hence, 1,156,897,766 grains = 23137955.32 grams = 23138 Kilograms
5. The amount of Annapurna [12] Rice distributed to Public Distribution Scheme Card Holder, a Government of India initiative for Below Poverty Line population in India is 10 Kilogram per month.

Thus, a day’s wastage of a single grain of rice can boost the PDS distribution of 2313 people for a month.

Case-II
1. Considering the present population of XIDAS, Jabalpur:
2. Total number of female respondents having dinner in the Ladies’ mess every day = 38 (sample size of a single batch allowed entry)
3. The capacity of the waste bucket where food is dumped = 20 Litres
4. On an average, almost every day the bucket is half full, the daily approx. wastage amounting to 10 litres i.e. weighing 20 Kilogram of food on an average per day when weighed for 30 days consecutively.

Recommendation.3: Apart from sharing and sensitizing the respondents about the gravity of the situation as illustrated above, the institute can devise segregation of the wasted food from metal/plastic/non-biodegradable items and utilize it in portable compost bins. This can be of instrumental in maintaining the in-house plantation of the campus.

3.3. Water Crisis
It is a common site to see reservoirs and tanks overflowing almost every day and we never pay much heed to it. This wastage of fresh water can amount to a few gallons per household per year.

Case III:
The water wasted (per student in XIDAS, after lunch, once a day) while washing dishes, when stored in a container, amounted up to 200 ml, even if the tap is kept on in a medium speed.

This amounts up to a whopping 200 ml * 7 days = 1.4 litre per week per student.

Recommendation.4: Instead of using normal taps, if fail-safe mechanism taps are used, only the amount of water required will be used by the respondents.

3.4. Implementing Energy Saving Initiatives
The institute has been a flag-bearer of renewable energy in the Jabalpur City, being the first to install solar water heaters in the year 2005. Another laudable initiative has been the “Don’t Stand-By, Just Turn It Off” slogan, applied to the computer lab and the data center of the institute. Nevertheless, in a “Green Lifestyle, there remains a wide scope for further improvement.

Recommendation.5: Presently running with a 100% power back-up in the power-deficit state of Madhya Pradesh, India, it is recommended that the on-campus population is alerted through the on campus alarm/hooter once there is a switch-over from grid power to diesel generator sets. Individuals can thereafter selectively use electronic appliances which are required on priority; this will not only reduce the consumption of diesel but alert each user about the necessity to save power.

4. Conclusion

4.1. Calculating Our Contribution:
Carbon Footprint, by definition, is the amount of CO₂ or any other GHG emission caused by an organization, event or product. But as life-style changes focus on initiatives taken on an individual level, the technique of carbon foot-printing can be used to evaluate how much an individual is contributing towards the global phenomena. The carbon footprint of an individual can be broken down into primary and secondary footprint. Primary footprint of an individual is the direct emission of CO₂ by burning fossil fuels for consumption of energy. Secondary footprint is the indirect measure of CO₂ and other GHGs produced during the entire life-cycle of a product which is being used by an individual.

The recommendation made in the study can be mapped with the corresponding decrease in carbon footprint using the Carbon Footprint Calculator [13] as per the illustrations of Table.1.

**Table 1.** Estimation of Reduction in Annual CO₂ Emission with reference to Recommendations

| Sr. No | Recommendation                                                                 | Reduction in Annual CO₂ Emission                                                                 |
|--------|--------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------|
| 1      | Recommendation.1: Estimating our Diet with Calorie Count                      | 540 metric tons for avoiding food wastage / offsetting wasted food in to compost                |
| 2      | Recommendation.2: Avoiding Overconsumption                                     |                                                                                                 |
| 3      | Recommendation.3: Converting Food-wastage to compost                          | 2 metric tons for avoiding 40 leaking taps                                                      |
| 4      | Recommendation.4: Installing Fail-Safe Taps                                    | 163 metric tons for avoiding 6 hours of Diesel-fired power back-up per day                      |
| 5      | Recommendation.5: Minimum use of Power Back-ups                                |                                                                                                 |

4.2. Impactful Green Lifestyle

The quantification of CO₂ reductions as an effect of the recommendations, illustrated above nullify H₀ that there is exists no area to be identified, in which individual efforts can bring impactful changes to mitigate climate change.

Supported by a reduction of 3.25 metric tons of CO₂ per respondent per year, the working hypothesis H₁ stating that designing a quantitatively impactful Green Lifestyle will result in measurable reduction of Carbon Footprint of an individual and result in mitigation of Global Warming, is hence accepted. The cumulative effect of the recommendations made in the study show an estimated reduction of 705 metric tons of CO₂ emission for 300 respondents over a period of one year. The figure can be hypothecated as carbon sequestered by 18,271 tree seedlings grown for 10 years. [17]

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