Sustainability: an Essential Concept for Current and Upcoming Technological Practices

IOP Conf. Series: Materials Science and Engineering **804** (2020) 012023 doi:10.1088/1757-899X/804/1/012023

SUSTAINABILITY: AN ESSENTIAL CONCEPT FOR CURRENT AND UPCOMING TECHNOLOGICAL PRACTICES

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Abstract. The Agenda 2030 of the United Nations organisation aims at sustainable development of each country by the end of the upcoming decade. The agenda comprises of the 17 SDGs i.e sustainable development goals for the liveable and sustainable life on the planet Earth. In last two decades, the concept of sustainability has been extensively defined with coinciding different viewpoint and assessments. This paper comprises the history, definition, affecting factors, challenges and opportunities in the field of sustainable development for the new decade researchers and engineers.

Keywords - Sustainability, Sustainable development, SDG's, LCA, PCA

Introduction

In the past few years, the term Sustainability has been used in most of the concepts and every researcher, engineer or any person involved in technical or even non-technical work has been listening about this word. Many of them are now eager to know more about the sustainability.

As the term itself indicates, anything which can sustain or the ability to sustain in existence can be considered as a definition of sustainability for a layman. But it is far more than only this. It is a matter for the sustainment of the life on our planet. Therefore, the concept of sustainability becomes even more important for the current generation to understand and the most important for the new generation to adhere on.

The term sustainability got more lights after the United Nations Organisation has framed the goals for sustainable development i.e. SDGs in the year 2015. The target to achieve these sustainable development goals was within 15 years from 2015. Hence, Agenda 2030 for sustainable goals has been of prime importance for every country associated to the UNO. But apart from UNO, Sustainability of the life on our planet has become both moral and mandatory responsibility of every human being living on earth. Why Sustainability has to become way of living to survive ? why this concept is so important ? These questions might be tickling your mind. To understand the importance we must know how our Nature works in a cycle.

Importance of Sustainability

UNO's focus on the sustainable development in every nation within 15 years of span triggers the alarming situation. The damage to the mother nature by the humankind has crossed all the limits that now every human being on the planet has to make their mind conscious for thought process of sustainable life.

Sustainability is all about how we can fulfil our needs of the present generation without compromising with the need of future generations. Till not whatever we have done was mere based on the fact that how we can achieve our goals, not considered any environmental factor, but as we see the destruction that we have caused to the environment forces us to rethink our approach towards development. The increasing carbon emissions in the environment day by day is due to our extravagant lifestyle and due to increasing luxury in our life .So due to higher rate of carbon emission global warming is increasing rapidly .Keeping in mind all this situation it has become the necessity and is the high time to rethink and

re-plan our approach of development ,and the best alternative or the best solution of the problem is sustainable development.

History of Sustainability

It can be considered from Brundtland Report that Sustainable Development is the development that fulfils the needs of the present generation without affecting the needs of the future generation. Sustainable Development is the concept of growing awareness of ecological crisis. The term sustainability was firstly introduced in English Oxford Dictionary in 20th century. In Europe, the shortage of wood started in 18th century due to excessive use of woods. Due to this problem the term sustainability comes into existence in German Forestry Circle. Then, in 1848 in the book of Principles of political economy there is a short chapter on 'Stationary state' which means the constant condition of economic capital and population.

In 20th century, there are two concepts of thoughts one is Optimistic and another one is Pessimistic with respect to human advancements. During this period, the industrial and corporate widening takes place due to this the environmental crisis started. After Industrial Revolution, from 1800 to 1970, the world population has increased from 978 to 3632 million and the manufacturing production increased 1730 times[1-4].

In 19th century, the main problem is the excessive use of coal and its shortage. So in this regard, a book "The coal question" states that the existence of coal will ruined in next hundred years in 1866. It can be considered that the advancements in the technology results in huge damage to the environmental ruining. In 1970s, the report from the club of Rome in "The limits to growth" stated that the planet earth has limited physical and energy resource, whose excessive use will turn into catastrophe. In 1960s the thought process is optimistic so due to this they think that this problem will be rectify quickly, but in real it is not possible.

Then it was realised that the advancement is to be needed sustainable. Only focussing on economic and social matters will not favour for the future sustainable development but have to focus also on natural resources. In 1984, the United Nations had form a group of 22 people representing developed and developing countries to recognise the strategy for the long-term environmental development. This group is known as Brundtland Commission[5-7].

The term sustainable development can be defined as the settlement between preservation and growth. The sustainable development is the concept which is never ending; it will be required for decades.

Redefining the sustainability

The term Sustainable Development is firstly coined in 1987 by Brundtland Report presented by United Nation. According to this the Sustainable Development can be expressed as, "Evolution that meet with the present generations without affecting the needs of the future generation". It basically addresses the interlinked feature of environment, economy and social well-being. Around 140 modified definitions have been proposed within two years. And currently there are 300 different definitions of sustainability & sustainable development. It can be considered that the sustainable development is acting like a sustainable itself which increase the tendency to be assumed word as weak. So to rectify this problem, the word can be related with continuous evolution of society as a whole[8-10].

Simply the sustainability can be stated as the given task is having a potential to sustain continuously. In order to achieve authentic sustainability, the temporal scale should be considered in thinking. The ecosystem of this earth was introduced 5000 years ago, and the speed by which it getting changed is very high. According to the extensive literature, Sustainability can be expressed as the prevention of the debasement of the natural resources in a way to support the ecological balance[11].

A sweedish scientist Karl-Henrik Robèrt introduced a four first order system condition which is based on the law of Thermodynamics, also known as Principles of Sustainability. The framework is also introduced in order to define the principles of sustainability named as "The Natural Step Framework". These system conditions are used to define the overall biosphere including human beings. These principles can be understood by asking three questions

WCW[12].

In terms of ethics, the four TNS principles can be used to describe the ethics of the living polyphony with the nature. The problems which are reducing the co-existence of human and nature has been founded by the government and various NGOs and are getting slowly rectified by implementing different policies and rules. And the changes are also in front of us. For example-EU Water Framework Directive. The deficiency of the shared ethos in all the parts of the society results in changing of the definitions of sustainability[13].
The political instruments and rules should be tested firstly with respect to sustainability principles before implementing it. The factor that plays an important role in sustainability and sustainable development is population i.e. if the population increases the rate by which the resources consumed will increases, which lead to the failure of sustainability and sustainable development[14].

Environmental Sustainability
Sustainability may be defined as the ability of anything such as energy, environment, social, economic, water, or any technology that can sustain constantly. Environment Sustainability can be expressed as the responsible activity with the environment to prevent depletion or debasement of the natural resources and save them for the long-term environment quality. In the mid of 20th century, the earth is seen from the space for the first time, where the earth is seen to be covered with clouds, greenery, soils & oceans. But due to increase in the in-human activities, the earth is changing its pattern[15].
Here comes a question, why environmental sustainability needed? The answer for this question is to fulfilling the needs of present generation without compromising the requirement of the future generation. John Morelli stated in his paper that the need of sustainability is the maintenance of natural resources. The US Federal Trade Commission (FTC) list the sustainability as first term in its Green Guides released on 6 October 2010. There are many problems associated with sustainability, like a tenner got involved in getting relevance of this term in different profession. According to John Morelli, Sustainability is reported as most abused term in corporate suffrage. The sustainability can be defined in terms of various professions that are Ecological, Agricultural, and Environmental. Economic Sustainability states that fulfilling humans need by involving cost of meeting standard without affecting the health of ecosystem. In case of Social sustainability, it can be a positive condition within society that can easily achieve the desired condition. It is considered that sustainability exists as a three legged table which also consist of the environment and the table is economy, environment and society, or a dual relationship between humans and the ecosystem. According to John Morelli, There should be a provision for clean water, clean air, and productive land for a socioeconomic system. The actions that are chosen to remove threats from environmental sustainability should also contribute to a sustainable socioeconomic system. The John Morelli suggests that the ecological sustainability is that fulfilling human needs without affecting the health of ecosystems sounds inappropriate. So after correcting it the final definition is that environmental sustainability is defined as a condition of resilience, balance and interconnectedness that developed a way for human to fulfil its needs without compromising other factors. The primary focus of his effort was to develop a good definition of environmental sustainability. There are five guiding principles of environmental sustainability that are – Societal needs, Preservation of Biodiversity, Regenerative Capacity, Reuse and Recycle and Factors of non-renewable resources and power generation. The John Morelli is intended for the articulation of professional goals of the environmental professions[16-18].
Energy Sustainability

As in today's scenario, Global warming is considered as the most dangerous problem. The cause of global warming is the discharge of greenhouse gases like CO2 due to the burning of fossil fuels. The discharge of these gases is varied country to country. As the primary source of energy is coal, but the coal is reducing day by day. So to overcome these problem countries are implementing new rules which tells the combine use of renewable and non-renewable resources[19].
A "13th Five-Year Plan" was introduced in 2016 which focuses on the decreasing of the primary pollution and energy usage. The demand of renewable energy will increase with increase in population and economic growth. Due to this the energy demand started from1970 in Japan and from 1980 it shifted to Taiwan and after 1990 shifted to china, later on India. It can be easily said that the Economic

development of any country is directly proportional to its energy demand and import. And the sustainability and environmental cost linked with that advancement remains unclear. For this United Nations has introduced Sustainable Development Goals (SDGs) which is named as Agenda 2030. The objective of this agenda is to provide a way to no. of disciplines like engineering, research and developments to pass-on a delightful future. This agenda comprises of 17 goals out of one is Sustainable and Renewable energy. One of the reasons of requirement of this agenda is that in Southeast Asia 130 million peoples do not get access to electricity. For this some countries had started reducing the discharge of CO2. In this approach United States lead followed by China and Japan[20-21].
According to the statistical review of world energy, Malaysia emits 6.3% of CO2 discharge, Indonesia emits 7.6% and China & Japan reduced to -0.7 & -1.5% in 2016 as compared to 2016. As it is clearly seen by SWOT analysis that the Government and low level administrator have to play an important role to fight with this problem and to ensure the harmony with the nature, economy and the environment. To increase the growth of the sustainability new polices should be implemented and a good multilevel communication required[22-24].

Challenges of Sustainability

We see sustainability as a solution of the problem that we have created, but fact is that if we try to shift towards sustainable development the major challenge come in the production of goods. Let us consider a case that if we try to manufacture a product in a way that we completely utilize all the raw material and produce the minimum possible waste and suppose that all the processes is done in a manner that it doesn't polluted the environment in any way. Ultimately the price of the product is going to rise as the manufacturing price is costly and the sale of product is going to decrease therefore it is not a feasible idea for a producer or manufacturer to manufacture such items or products[25-28].
In the above case we mainly considered the environmental pillar of sustainability and we have just ignored the economic and social pillar . So here comes the major challenge because we have left the other two pillars of sustainability untouched, so the challenge is how we can achieve sustainability by considering all the three pillars of sustainability. Further we will try to find the solution for our problem[29-31].

Principal Component Analysis (PCA)

United nation has proposed the concept of sustainable development in 1987 with three guiding principles Economic, Social, Environment development. According to WCED 1987, Sustainable development is the impartial sharing of nature costs and benefits of economics advancement between nations. These three guiding principles is considered as pillars of sustainability which shows that the advancement require humans, nature and economic capital. These three dimensions are mutually proportional to each other in both ways, positive or negative. Government of Western Australia says that the world requires New Harmony to be finded and system reasoning also in 2003[32].
To empirically investigate these principles i.e. economy, environment and social advancement will require analysis. Swiss sustainability strategy formulates 15 goals for these three principles, 5 for each principle in 2002 with the help of Principal Component Analysis (PCA). The PCA analysis shows deficiency of harmony and integration between these three pillars or principle. The result of the PCA will be introduced as Principal Sustainability Component (PSCs)[33]. The PSC is considered to be divided in three parts PSC1, PSC2 and PSC3. PSC1 can be stated as Product & Process Development that covers positive harmony between less and more wise usage of natural assets. PSC2 can be stated as Education & Social Economics that covers typical stream of nature, education and landscapes. And, PSC3 can be stated as Protection of Nature & Humans that covers environmental management and prevention of nature and landscapes from any accidents. Hence, The PSCs is helpful for searching harmony between economy, environment and social development[34].
Life Cycle Assessment (LCA)
The basic goal of life cycle assessment is to achieve sustainability .It is also called as life cycle analysis and it is a tool for examining the total environmental impact of a product through every step of its life-from – from obtaining raw materials and to making it in a factory, selling it and using it in the workplace or at home, and its disposal too is considered.

There are various steps involved in LCA method ,the first step starts with the identification of Goal and scope of the entity for which the LCA needs to be done. In this first we identify the product of which LCA is to be done and then find the purpose of study and then we fix the constrains or boundary for study. Secondly, Inventory Analysis will be done to identify the various inputs and outputs, like the energy consumed the various resources utilized ,and what are the amount of emissions from the products. Then after Inventory Analysis, Third step is to analyse the various environmental impacts of the products, it can be consider as Impact Analysis. And the fourth and last step is to do Interpretations, by using the data of above three steps we finally come to a judgement in the relation of the study. So with the help of LCA we can check whether we are able to achieve sustainability or not and LCA has also been used in past like, In 1960 for finding the alternative of glass bottles for coca –cola company their LCA was done by Midwest Research Institute (MRI)[35-36].

Conclusions

As we can see that there are many challenges in achieving sustainability , Now a days we are trying various approaches towards sustainability, but for all the approaches to be implemented it is necessary that we keep in mind the basic three dimensions of sustainability that are social, economic, and environmental pillars and if we maintain our prime focus on these pillars while making our policy surely we are going to achieve Planet life sustainability sooner.

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