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"The greatest threat to our planet is the belief that someone else will save it." – Robert Swan

EDITORIAL

Health systems are fundamental to building healthier communities. Health system activities significantly impact the environment through multiple means. These include the generation of hazardous healthcare waste, wastewater, greenhouse gas emission, toxic chemicals, and consumption of resources such as water and energy. Fostering environmentally sustainable practices in health system operations translates into benefits in opportunities in multiple domains. These include greater protection and promotion of human health, resilient communities, higher efficiency resulting in greater financial savings, and reduced risk to the environment. While embracing sustainable practices, countries like India, which bear the major brunt of climatic changes, need to focus on developing a well-sensitised workforce and climate-resilient healthcare facilities to meet the challenging needs arising from acute climatic events such as extreme heatwaves, flooding, and deteriorating ambient air quality which is independently and cumulatively propelling pandemics of existing and emerging new diseases. With this backdrop, the fourth issue of the second volume of 'Sustainability Horizon' looks at various aspects of Environmentally sustainable healthcare systems. The issue begins with understanding a few trends in research in the field of sustainable healthcare systems followed by articles from faculty members at GIM. One of these articles highlights the need for a sustainable health system in India pointing out possible elements of a national environmental sustainability policy for health systems. Discussions on such a theme are relevant for many developing countries. The next article explores the current landscape and the way forward for a climate-resilient healthcare system for India. This article discusses how to transform the health system to meet the healthcare threats arising from the climatic changes in India. Another article 'Hospital to healing habitat' describe examples of large hospitals in India embracing green designs and concepts in the construction to comply with the Green Hospital concept. The article, 'Shareholder v/s Stakeholder Value Maximization for Healthcare Sector explains why stakeholders value maximization approach is better suited for assessing the success of critical functions such as hazardous medical waste management, considering the various externalities and accounting for the costs of environmental and social resources. [1]

With great pleasure and pride, we present two articles from our students. While 'Environmentally Sustainable Healthcare Systems' explains the disposal of hazardous medical waste in general, 'Healthcare: Sustainable Waste Management' elaborates on how hospitals in low-resource settings can manage hazardous medical waste, given the high cost of disposal. The 'The Need for Environmentally Sustainable Healthcare Systems: A Brief Insight' shows how pandemics such as COVID-19 accelerate medical waste generation and pose a challenge to the environment. We hope that through this newsletter, we are able to highlight the importance of developing sustainable health systems which is often neglected.

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A CLIMATE RESILIENT HEALTHCARE SYSTEM FOR INDIA: CURRENT LANDSCAPE AND THE WAY FORWARD

The climate crisis is a health crisis. Globally, the direct and indirect impacts of acute climatic events like heatwaves, droughts, floods, wildfires and poor air quality are leading to exacerbation of existing illnesses, emergence of new disease patterns and worsening social and economic impacts on populations around the world. Of particular importance is the fact that these impacts are not equally distributed, with some countries and populations being more vulnerable. Even within a particular region, different age, gender and occupational groups have different vulnerabilities. India is amongst the most vulnerable countries to climate change and must develop a suitable health national adaptation plan to deal with the issue.

In order to deal with the growing burden of climate-sensitive illnesses, only a well-sensitised and equipped health workforce can mount a suitable response. Doctors, nurses, public health professionals and medical students (future health workforce) must be aware of the range of health impacts of changing climate. Exposure to heat waves for example, besides simple heat exhaustion and syncope, can exacerbate cardiovascular and respiratory illnesses, precipitate strokes and affect renal function. Poor air quality has a wide-range of impacts on almost every organ system affecting respiratory function, worsening cardiovascular diseases and their risk factors and affecting child growth and cognitive development as a result of both pregnant women and young children being exposed to poor air quality. Increasing temperatures affect the volume of crop produced as well as crop maturation, thereby impacting food and nutrient security. Climate-induced forced migration also results in access to food, education and healthcare being compromised in displaced communities. Post-traumatic stress disorders affect mental health of all age groups leading to greater levels of anxiety and stress disorders. A sensitive and suitably trained health workforce can prepare a suitable adaptation response even in the face of acute crises. This adaptation response of the health workforce is stated as one pillar of climate–smart healthcare. It enables health workers to address the morbidity and illnesses seen as a result of climate change.

The other important pillar of climate-smart healthcare is the mitigation of healthcare emissions. A recent report (Health Care Without Harm, 2019) described the total global healthcare emissions to be 5% of the global greenhouse gas emissions. If ranked along with countries, hospitals and health systems around the world (taken as one country) would be ranked fifth for their climate footprint. This means, paradoxically, that the emissions of greenhouse gases by all the activities related to the delivery of health services, including the emissions from the supply chain of drugs, pharmaceuticals and medical equipment together are a source of environmental harm. As a responsible entity that must provide not just curative services but also protect and promote the health of communities they serve, doctors and allied health professionals must now take actions at all levels to lead the way to the development of climate-resilient and sustainable, environmental-friendly healthcare facilities. A framework for green and sustainable health care includes attention to at least 10 pillars of action- i. appropriate siting of the health care facility so "it remains the last building standing in the event of an acute climate event like a flood ii. sustainable building materials and infrastructure with adequate focus on natural lighting and ventilation iii. Energy efficiency with a greater focus on renewable energy iv. Optimal water management including wastewater recycling, rainwater harvesting etc. v. Efficient waste management vi. sustainable procurement of goods and services focusing on goods that are locally produced with environmentally responsible manufacturing and supply principles vii. Attention to sustainable modes of transport for patient and health worker commute viii. Linkages to climate information services like meteorological departments that can provide early warning of impending events ix. Ensuring climate financing mechanisms that can facilitate all the workforce and infrastructure strengthening and lastly x. Leadership for climate resilience and adaptation as only sensitized champions can lead the way for optimal action.

The National Program for Climate Change and Human Health launched by the Ministry of Health and Family Welfare, Government of India has a specific focus on the component of green and climate resilient healthcare facilities for India. States are encouraged to develop customized State Action Plans and adopt an incremental approach to activities proposed in the national framework. Private health care facilities are also being encouraged to adopt climate-smart healthcare through the Health and Environment Leadership Platform (https://greenhospitalsindia.com/). With these collective efforts, the Indian health system will steadily address its climate footprint and become a climate-smart health system.

TRENDS IN SUSTAINABILITY RESEARCH

With the outbreak of COVID-19, the global healthcare sector has received historical prominence. However, from an economic perspective, this sector might act as a double-edged sword, i.e., short-run health benefits and long-run environmental damages. This is a classic tradeoff the world is experiencing today. This situation has resulted in the emergence of Environmentally Sustainable Healthcare Systems. According to World Health Organization, these systems are expected to reduce the negative environmental externalities across the entire value chain [1]. This issue has attracted the attention of healthcare policymakers, health and environmental scientists around the world. In keeping with the Paris Accord, the UK National Health Service (NHS) has decided to attain carob neutrality by 2040. This event has set a precedence before the other health systems in the world to make ambitious carbon neutrality targets.

Achievement of this objective calls for a comprehensive policy and operational framework. The study by MacNeill et al. [2] has recommended a Three-Principle approach by integrating the demand and supply sides of a healthcare system, while focusing on the social dimensions of the transition. The resilience of the sector during COVID-19 has also been discussed in this study, and a similar aspect has also been discussed in more detail by thakur [3]. This study has put more emphasis on Sustainable Healthcare Waste Management, while deriving the implications based on the possible political, legal and environmental interventions required to achieve the neutrality objective. The questions raised by [2] are largely answered by [3], as the latter discusses about the impact on macro-environment, which was largely referred to as the social impact in the former one. The practicality of the solutions provided by these two studies can be traced back to the "Green Initiatives" mentioned by [4]. This particular study has put forth more emphasis on the human elements of the value chain, while referring to the associations and interactions between them as low-carbon sources of value in healthcare.

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SHAREHOLDER V/S STAKEHOLDER VALUE MAXIMIZATION FOR HEALTHCARE SECTOR

Shareholders Value Maximization has been the ultimate measure for the success of a company for more than four decades now. This concept is based on the logic that shareholders are the owners of the company and every decision should be made such that their wealth is maximized. The critics of this theory highlight the emphasis that it puts on a single stakeholder, the shareholder, at the cost of other stakeholders. They blame this overemphasis on the wealth of the shareholder for the exploitation of the natural, environmental and human resources and the climate-related challenges that we are facing today. To counter these shortcomings, in the recent years, stakeholders' value maximization theory has been proposed. This theory is based on considering the various externalities and accounting for the costs of environmental and social resources. Stakeholders value maximization is much better suited for certain sectors like the healthcare sector.

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The basic objective of the healthcare sector is to ensure better health for all the human beings on planet earth. This sector has been growing at a fast rate to take care of the growing size and needs of the human race. According to Fortune Business Insights, the global Healthcare Asset Management Market size is expected to reach $ 84.48 bn by 2027, at CAGR of 28.9% from 2020[1]. With this level of growth one of the major challenges that the sector faces is that of management of waste generated.
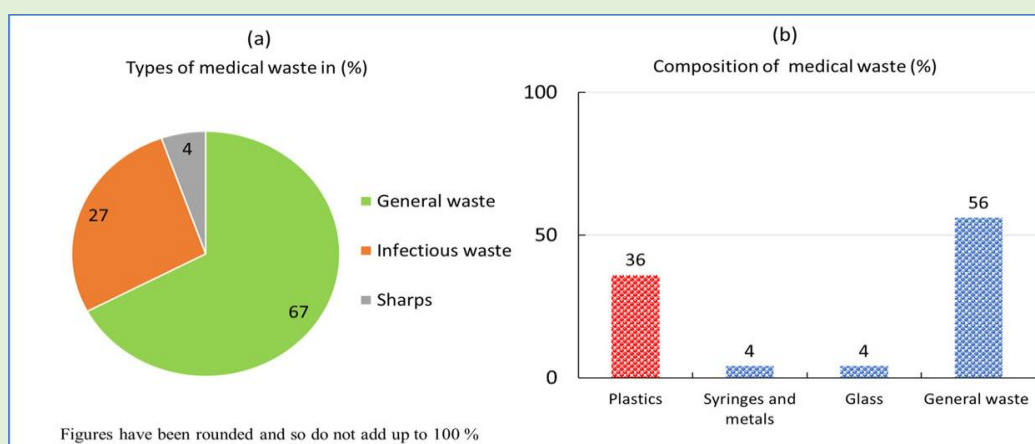
The generation of biomedical waste depends on the type of patients, type of healthcare being given and several other factors. However, it is estimated that in developing countries like India approximately 1.5 to 2 kg waste is generated per bed per day while in developed nations like USA about 4.5 kg of biomedical waste is generated per bed per day.[2]

The waste generated includes general waste, toxic waste and wastes like syringes etc. The graph below highlights the type of waste that is generated.

(a) Types of medical waste in (%) — General waste 67, Infectious waste 27, Sharps 4. Figures have been rounded and so do not add up to 100 %

(b) Composition of medical waste (%) — Plastics 36, Syringes and metals 4, Glass 4, General waste 56

Source: N Singh et al[3]

From these graphs, one can conclude that majority of the waste generated is general waste and can be handled along with the waste in that region and it is only a small percentage that need specialized management. But if proper treatment is not ensured for this small percentage of toxic waste, it could lead to serious health issues for people exposed to it. In spite of this biomedical waste management continues to be a critical problem. Lack of awareness about the health hazards related to health-care waste, lack of proper training in effective waste management, lack of availability of waste management and disposal systems, insufficient financial and human resources and the low priority given to this issue are some of the problems associated with biomedical waste.

The main point out here is that improper waste management by the sector could negatively impact the health of the people in the vicinity of the healthcare facility thus, going against the basic objective of the sector. Therefore, there is a need to take into consideration the value of all the stakeholders and not only the shareholders. With increased private funding to the sector there is an urgent need to understand the cost and benefits to the various stakeholders to do justice to the objective of the sector.

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NEED FOR A SUSTAINABLE HEALTH SYSTEM IN THE INDIAN CONTEXT

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The fundamental goal of the health system is to promote and maintain societal health and welfare, which are critical factors in each nation's development and economic growth. Providing quality healthcare is one of the top priorities of health systems in developing countries, including India. Not only the provision of good health care but policy-makers also ensure that the healthcare system must be delivered in a sustainable way.

What is a sustainable health system?

According to WHO, Ideally, an environmentally sustainable health system "Improves, maintains or restores health, while minimizing negative impacts on the environment and leveraging opportunities to restore and improve it, to the benefit of the health and well-being of current and future generations". The evidence says that most human activities impact the environment and the healthcare system is not an exception. Due to the larger size and complex processes, the healthcare system consumes large amounts of energy and resources. It also produces vast quantities of waste, which harms the environment.

The main side effects of health systems include high consumption of energy, production of greenhouse gas emissions, use and disposal of toxic chemicals, and production of biomedical waste and wastewater. Evidence from earlier studies says that about 75% to 90% of the biomedical waste produced may pose a wide range of health risks to the community. The environmental impact of biomedical waste and wastewater disposal depends mainly on the method of its disposal.

Landfills are the traditional and least expensive way of disposal but can create health risks for the population when improperly managed. Incineration is one of the best ways for bio-medical waste disposal. Still, evidence from a few European countries says that ash from incineration contains high levels of heavy metals and some other toxic pollutants. The increasing use of disposable instruments and personal protective equipment (PPE) also increases the risk of excessive waste generation, especially during the pandemic time. In India, the pandemic has resulted in the massive generation of biomedical waste (BMW) and plastic waste (PW) and has created challenges to the existing waste management infrastructure. Wastewater from healthcare facilities, harmful pharmaceutical products, and other chemicals are also dangerous to the environment. Studies reported that conventional treatment procedures fail to remove these harmful products from the wastewater. Evidence also suggests that health systems emit a significant amount of greenhouse gases that pollute the environment. There is no one-size-fits approach for developing and promoting environmentally sustainable health systems, but WHO recommends a few key actions that could help to build a sustainable health system model.
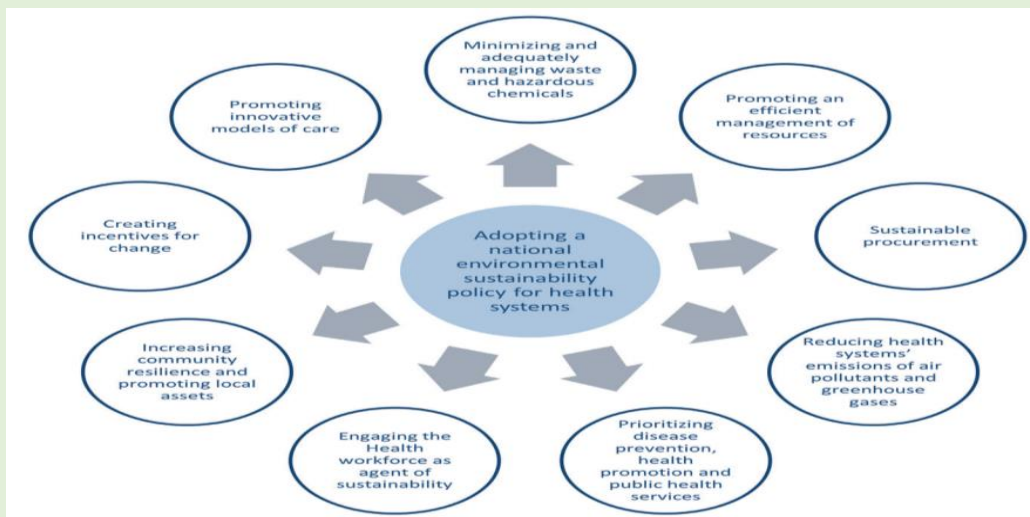

Figure 1:Biomedical waste

Figure 2: Possible elements of a national environmental sustainability policy for health systems-WHO model (Source: WHO)

Fortunately, the last few decades observed a lot of technological advancements in the Indian health sector, which have significant environmental benefits and promote sustainability. Electronic e-health interventions, including e-consultation, telemedicine, e-health records, e-pharmacy services etc reduce wastage and improve access to quality healthcare. It also reduced frequent hospital visits and saved costs and time. New medical devices and technologies have also contributed a lot to lowering biomedical waste generation. Autoclaving, chemical treatment, and microwaving reduced greenhouse gas emissions. Saving energy through solar plants, heating, and cooling systems, water harvesting and recycling etc are becoming more and more popular in developing countries.

But the health care system has unique features and cannot change its primary function of delivering quality care in the light of possible environmental impacts. Healthcare is an essential service to society; sustainably providing quality healthcare will ensure good quality of life and protects and maintain it for the future.

Source: acknowledged to WHO Environmentally sustainable health systems: a strategic document."

THE NEED FOR ENVIRONMENTALLY SUSTAINABLE HEALTHCARE SYSTEMS: A BRIEF INSIGHT

The healthcare system is an integral part of society that ultimately affects the growth and development of the economy. This is a fact proven by how the COVID-19 pandemic has affected economies worldwide and thrown every sector of an economy off gear leading to a fall in production and sales, an increase in unemployment, and cascading effects on the livelihood of millions of people. Thus, the efficiency of a healthcare system determines the intensity of any health crisis on the economy.

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The Indian healthcare sector is expected to grow at a CAGR of 22% between 2016 – 2022 to reach US$ 372 billion in 2022 from US$ 110 billion in 2016[1]. Besides, the Economic Survey of 2022 indicates that India's public expenditure on healthcare stood at 2.1% of GDP in 2021-22 against 1.8% in 2020-21 and 1.3% in 2019-20[2]. The healthcare system in India is growing and expanding however one cannot ignore the detrimental effects it has on the environment. In recent years the world is experiencing the negative effects of neglecting the need to adopt environmentally sustainable practices. A recent study revealed that the United States (546 million metric tons of CO2e), China (342 MtCO2e), and the European Union (248 MtCO2e) are the highest contributors to the global healthcare climate footprint[3]. Besides the COVID-19 pandemic has resulted in tonnes of medical waste leading to a threat to human and environmental health causing a need for improvement in waste management practices according to a WHO report[4]. In India, a major issue faced by the health care system is the safe disposal of medical waste which is highly toxic and detrimental to the environment if not disposed of appropriately. This is because the inappropriate disposal of medical waste leads to the spread of diseases thereby nullifying the basic objective of a healthcare system which is to safeguard the health of society.

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HOSPITAL TO HEALING HABITAT

The concept of green building emphasizes sustainable site, water, energy and material management to ensure lower use of resources at the time of construction as well as during operation. Lighting, air conditioning, and water heating make up more than three-quarters of the energy used in a typical tertiary care hospital. Therefore, it is pertinent to incorporate green designs and concepts into the construction of healthcare facilities. Designs that ensure better daylight exposure, natural ventilation, and air quality are among the vital measures used for green buildings. In addition, the use of energy-efficient lighting systems, medical equipment and provision for using renewable energy sources has paramount importance. A sustainable hospital design should consider measures to improve air quality by minimising the use of harmful chemicals and toxins in clinical settings and operating theatres. This can be achieved by incorporating features such as energy-efficient windows, highly insulated roofs and the use of sensors.

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In India, a number of energy-saving strategies are being used in the recent past for the construction of new hospitals as well as the renovation of existing ones. The All India Institute of Medical Sciences (AIIMS), New Delhi has recently implemented its green hospital project with a number of energy-efficient measures, resulting in substantial (30%) energy savings in the first year. Modern, energy-efficient equipment has been installed to replace the heating, ventilation, and air conditioning systems in the old hospital buildings. The hospital replaced all the conventional lights with LEDs. Further, an information communication technology-enabled Energy Management System (EMS) was deployed to combine various hospital systems in order to offer real-time energy optimization. Newly constructed outpatient clinics were designed in such a way as to ensure natural lighting and ventilation throughout the year. Learning from the experience of AIIMS-Delhi, the government of India has decided to have energy-efficient buildings at six new AIIMS like hospitals coming up in various parts of the country.

Another example is the recently inaugurated Amrita hospital at Faridabad, which claimed to be India's largest private hospital with 2400 beds and 81 specialty departments. Construction materials that met both national and international green building standards were used to build the hospital. Additionally, they created facilities with a negligible carbon footprint, zero wastewater discharge, and will eventually be solar-powered. Rainwater harvesting systems and the water recycling plants at the hospital are estimated to save 40% of portable water. The hospital has a plan to keep 70% of its 130-acre campus as green areas by maintaining water bodies that support native plants and trees. There will also be an organic farm in the hospital premises with 5.5 acres specifically converted to areas for regular cultivation.

In the coming years, the green hospital concept will play an important component in building sustainable healthcare systems across the globe. Instead of being known as concrete structures that house healthcare facilities, hospitals of tomorrow will focus on comprehensive well-being and transform into sustainable habitats for healing.

HEALTHCARE: SUSTAINABLE WASTE MANAGEMENT

The healthcare system around the world saves numerous lives. However, it also generates massive amounts of waste which is hazardous to both human life and the environment. With the recent pandemic, the amount of healthcare waste saw a sudden increase, especially the use of PPE (personal protection equipment). Around 85% of the waste generated is comparable to that of household waste and can be treated as such if proper segmentation of the waste is conducted in hospitals. The other 15% of the waste is hazardous and requires special attention. Despite the negative effects it leads to, incinerators have been used by most European healthcare systems to dispose of these hazardous wastes. India, on the other hand prohibits incineration of PVC.

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Incinerators release various pollutants into the environment which adversely impact humans and the environment. Some of the ill effects include higher incidence of cancer and respiratory symptoms, hormonal defects, global warming, smog formation and animal toxicity. Medical waste usually contains a lot of PVC. And incinerating PVC produces dioxin as a by-product which is toxic in nature. In fact, the US Environmental Protection Agency declared that medical waste incinerators were to blame for 40% of the dioxin contamination in the nation's air in 1994.

Cost and a lack of supportive policy were cited by the European nations polled by Health Care Without Harm in 2020 as the two biggest barriers to converting to non-incineration technology. More than half of those surveyed (60%) stated that recycling businesses refuse to accept and recycle suitable material out of concern of contamination.

Thus, instead of an immediate shift to alternative ways, hospitals and clinics can move in a phased manner. In the short-run, they can use hydroclaves and plasma pyrolysis in incineration of biomedical wastes, which results in less environmental damage, insignificant health effects, proper disposal of treated wastes, lower operating and maintenance costs, more efficient microorganism elimination, and safer disposal.

Additionally, segregation of wastes as hazardous and non- hazardous reduces the quantity that enters the incinerators, reducing not only the environmental impact, but also the financial cost of treatment and disposal. These small steps can accumulate to have a significant impact in the future of the planet.

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ENVIRONMENTALLY SUSTAINABLE HEALTHCARE SYSTEM

The WHO defines Sustainable Healthcare System as a system that preserves and restores human life and reduces its impact on the environment[1].

Healthcare Systems significantly impact and pressurize the environment. Studies reveal that hospitals alone produce over 5 million tons of waste each year whereas only 58% of healthcare facilities have efficient waste disposal systems. Medical wastes are highly infectious and multiple casualties on the part of the hospital management team lead to the spread of harmful diseases in people around the vicinity of the waste disposal site. Hence, these should be disposed of effectively[2]. **Green purchasing to reduce waste** – Hospitals should switch to buying products made of eco-friendly materials so that the packaging materials can be reused and recycled[1].

- **Segregation of the waste** – Hospitals and clinics produce different types of waste (general, infectious, sharps, etc.). Segregating them reduces the risk of contamination, injuries from sharp objects, and toxic exposure from handling. Also, if wastes are sorted, additional recycling costs will be minimized and the focus on more hazardous wastes can be increased[1].
- **Proper disposal methods** – Before the wastes end up in landfills and incinerators, they should be properly treated to make them free of harmful micro-organisms. This can be done through autoclaving, thermal disinfection, and microwave sanitation[1].

The above steps should be followed cyclically. Initially, the focus should be on recycling and reusing the materials that will automatically reduce the amount of waste generated. Secondly, the amount of waste that will be generated should be separated, and then the focus should be on the disposal mechanisms. Skipping any one of these is bound to affect the environment. Healthcare facilities are here to stay forever as well as the environment that sustains us. Therefore, it becomes our responsibility to make the Earth a better place to live in.

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3 ways healthcare systems can reduce their carbon footprint

Commission lifecycle studies for relevant insights
- For medicines, generating data across a wider range of product classes can get us closer to pinpointing areas to address.

Collaborate to share information across sector boundaries
- Emissions do not happen in isolation, and some initiatives could have counterproductive consequences further down the line
- Need to take a holistic approach, in which public and private institutions can collaborate to share data and agree on reporting frameworks.

Create an environment of accountability across all pharmaceutical players
- Real change requires global action across pharmaceutical manufacturing, with shared responsibility for this at all levels within organisations.

Source: weforum.org/agenda/2022/11/3-ways-healthcare-systems-carbon-footprint/
Collated by Karen Fernandes

ABOUT THE CENTRE

GIM has always been conscious about the impact of its decisions on the ecosystem around it and has continuously strived to reduce its carbon footprint. Along with measures like rain water harvesting, solar-powered street lamps, treatment of water for reuse, tree plantation drives and many more, the institute has expressed its commitment to this philosophy also through its mission statement which talks about sustainable business and an inclusive society for India and the world. In line with this commitment, the Centre for Excellence in Sustainable Development was officially formed in July 2018 to contribute to GIM's quest for sustainability. The Centre started working with three core objectives in mind:

1. KNOWLEDGE CREATION
- To develop a model institute for green campus in India and transform GIM community into a more sustainable community. At the same time, use these processes for action research in the field of sustainable development.
- To help develop knowledge through research in the aforesaid fields.

2. KNOWLEDGE DISSEMINATION
- To increase awareness about green living and sustainable development in the community around us
- To carry out activities to try to reduce the carbon footprint of the state of Goa and India as a whole.

3. KNOWLEDGE APPLICATION
- To develop a resource Centre for sustainable development at GIM for imparting training, providing consultancy and participating in policy making.
- To contribute to the development of start-ups and ventures for sustainable development at the grassroots level.

Over the next few years, Centre plans to contribute towards the following five sustainable development goals adopted by United Nations member states in 2015:

CESD believes that every graduate of GIM should be a sustainability ambassador and every employee should be a part of GIM's journey towards environmental sustainability.
Some of the current projects and activities of the Centre include:
- A study of the sustainable campus development initiatives of national level institutions in India
- Development of a Biodiversity Register of the GIM Campus
- Development of a Sustainability Report for GIM
- Webinars and trainings about energy conservation, energy policy, sustainable finance, etc.

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