



Government of Tamil Nadu
Department of Health & Family Welfare

Environmental Strategy for
Health Care facilities in Tamil Nadu

Promoting a safe and healthy Environment in our health care facilities



Tamil Nadu Health System Reform Program



Abbreviations and Acronyms

AERB	Atomic Energy Regulatory Board
BMWM	Bio-Medical Waste Management
C&D waste	Construction and Demolition Waste
CEA	Clinical Establishment Act
CME	Continuing Medical Education
COVID	Coronavirus disease
CPCB	Central Pollution Control Board
CTF	Common treatment facility
DALY	Disability-adjusted life years
DM	District Magistrate
ELCOT	Electronics Corporation of Tamil Nadu limited
ESSA	Environmental & Social system assessment
GO	Government Order
HIV	Human immunodeficiency virus
IC-WM	Infection Control -Waste management
IEC	Information, education and communication
IMA	Indian Medical Association
LED	Light emitting diode
MoEFCC	The Ministry of Environment, Forest and Climate Change
NGO	Non-Governmental Organization
NHB	Nursing Home Board
NO ₂ , SO ₂	Nitrogen Oxide, Sulphur dioxide
PM	Particulate Matter
PPE	Personal protective equipment
PWD	Public Works Department
SDG	Sustainable Development goal
SHDI	State's Human Development Index
TNES-HS	Tamil Nadu Environment Strategy for Health sector
TNMSC	Tamil Nadu Medical Service Corporation Limited
TNPCB	Tamil Nadu Pollution Control Board
WASH	Water, sanitation and hygiene
WBG	World Bank Group
WHO	World Health Organization



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Environmental Strategy for Health Care facilities in Tamil Nadu

Promoting, protecting and supporting a safe and healthy Environment in our health care facilities

1. INTRODUCTION

The environment in simple words is the living and non-living elements around us. Humanity's entire life support system depends on the well-being of these environmental elements. The wellness of the environment is of great importance because it has a huge bearing on human health. Health care sector operates in the same environment as any other sector. It is affecting and in return is being affected by the environment.

Hospitals are high energy-consuming facilities, operating throughout the day in patient diagnosis and treatment thro' various medical systems, surgical procedures and equipment. Hospitals and Health care facilities, through utilisation of huge resources and generation of tons of waste has a great responsibility towards society and should refrain from becoming a public concern.

The Human factor in hospitals which is also a part of the environment include healthcare providers, administrative and supportive staff, auxiliary service providers, patient and their attenders, visitors, etc. Various stakeholders and the community at large are also a part. Each and every person should feel safe and secure when in the hospital either it be the patient seeking health care or the doctors and the paramedics providing health care.

2. WHAT IS AN ENVIRONMENTAL POLICY?

Any measure by a government or other public or private organization regarding the effects of human activities on the environment, particularly those measures that are designed to prevent or reduce harmful effects of human *activities on ecosystems* constitutes the environmental policy.

3. MOTIVATION AND NEED FOR DEVELOPING STRATEGY

The Constitution of India under Part IVA (Art. 51A-Fundamental Duties) casts a duty on every citizen of India to protect and improve the natural environment. Also the constitution under Part 1V (Art 48A –Directive Principles of State Policies) notes that the state shall protect and improve the Environment. So the duty lies on each and every citizen and the state to strive to be environment friendly.

Different aspects and services are interfaced in the hospital environment. Maintaining it safe reflects the competency and efficiency of the health care system. Promoting a healthy environmental system within the facility is vital for the benefit of both man and nature. So along with its duty in providing healthcare, the ethical responsibility of protecting the eco system and natural resources and thereby protecting the future generation also lies with the healthcare sector. Ensuring worker safety, protecting vulnerable groups and avoiding workplace conflict is also its administrative responsibility. Hence adoption of an environmental friendly strategy in terms of both internal and external environment is the need of the hour.

With this motivation it is pertinent for the health sector to develop a robust and holistic strategy for safe environment and to adopt "GO GREEN VENTURE".



4. GOALS AND OBJECTIVES

The **goal** of this strategy is to lower the Environmental Footprint of the Health Sector in Tamil Nadu by Promoting, Protecting and Supporting environmental friendly practices in the health system and optimal utilization of the resources.

Policy for Sustainable Development Goal

The United Nations' [193 member states} in 2015 established the 17 **Sustainable Development Goals (SDGs)**, an agenda to be met by 2030.

These goals primarily focus on Global Economic, Social and Environmental dimensions of development. The SDG Goal 3 specifies *GOOD HEALTH AND WELL BEING*.

The following base rules when adopted by the health care facilities strive towards the attainment of these Goals and targets:

1. Efforts on cutting down pollution, using resources efficiently in protecting the environment.
2. Improved environmental monitoring and analysis.
3. Clear methodologies for sustainable development indicators - institutions accountable for their action — or lack of action — on the SDGs.
4. Improved statistical systems-investing more in collecting (and using) environmental data.
5. Focus on local and regional contexts. -With specific attention to the needs of individual communities.
6. Sustainable consumption and production-feasible modalities and if not alternate ways and means.
7. Overcome water resource challenges.-judicious and responsible use and maintenance of water resources.

The following are the objectives

1. Identify the key environmental challenges that health sector contributes to.
2. Assess the institutional capacity for environmental management .
3. Identify key actions and resources required to reduce/mitigate adverse environmental impacts emanating from the health sector.
4. Identify and enhance good practices that contribute to environmental health.
5. Ensure that all health facilities in the State are in compliance with the existing legal and regulatory requirements relating to environmental issues.
6. Ensure that all healthcare facilities adopt and implement the Occupational Health & Safety (OHS) requirements both for healthcare staff/workers and patients/visitors.
7. Ensure that all health facilities manage solid and liquid wastes generated, with particular reference to the biomedical wastes (and COVID related wastes).
8. Identify opportunities to lower the energy use, Green House Gases emissions and improve greening of the healthcare facilities through use of renewable energy resources, efficient lighting, environment friendly green buildings etc.
9. To create environmental awareness among patients and general public and in doing so increase stakeholder participation and inter-sectoral coordination.
10. To incentivize and recognize those health facilities that show high compliance for environmental compliances and green initiatives.



5. GUIDING PRINCIPLES AND MAJOR COMPONENTS

The **State's Human Development Index (SHDI)** is a composite measure of progress in three major dimensions of well-being: *EDUCATION, HEALTH AND INCOME*. Hence to improve the SHDI, **major components** have to be formulated in terms of a healthy environment. The components are to:

- a. *Ascertain* and act upon potential environmental and social benefits, risks, and impacts.
- b. *Abide* by the policy and legal framework related to management of environmental impacts. E.g. BMW RULES 2016.
- c. *Assess* institutional capacity for environmental and social management systems.

GUIDING PRINCIPLES

- Government of Tamil Nadu promotes environmental friendly initiatives. The Government guides the health facilities in achieving good practices for environmental and social sustainability.
- The Government advocates the efficient and judicious use of resources.
- The Government enables health care facilities to avoid or mitigate adverse impacts to people and environment.
- The Government enhances stakeholder engagement and promotes worker and community health and safety thereby promoting positive outcomes.
- The Government encourages the adoption and implementation of additional or alternative environmental and social requirements.
- The Government recognizes the health facilities in fulfilling their state and national environmental and social obligations.
- The Government will measure the compliance of its health care facilities as per the legal obligations periodically and corrective action will be undertaken.

6. POLICIES AND REGULATIONS IN PLACE WITH REGARD TO ENVIRONMENT SAFETY

Regulation is the effective means to prescribe and control behaviour. From the early 1970s the united nation (UN) has provided a forum for negotiations and agreements on environmental policies across the globe. India has joined hands in the global movement in establishing a safe environment.

In India the Ministry of Environment, Forest and Climate change (MoEF) was established in 1985. This is the chief administrative body for ensuring environmental protection. The ministry and the pollution control boards (central and state) constitute the administrative and regulatory core. The Environment Protection Act was passed in 1986. National action plan on climate change (NAPCC) was formulated in 2008. The National Green Tribunal Act was passed in 2010.

NATIONAL ACTION PLAN ON CLIMATE CHANGE (NAPCC) - 2008

NAPCC is a detailed plan that outlines measures on climate change related to adaptation and mitigation, while simultaneously advancing development.

NAPCC has identified 8 core National Missions (NMs) which represent multi-pronged, long-termed and integrated strategies for achieving goals by various Ministries of Government of India. The NAPCC Missions that promote the health system are:

- National Solar Mission
- National Mission for Enhanced Energy Efficiency
- National Mission for Sustainable Habitats
- National Water Mission



- National Mission of Green India
- Nation Mission for Strategic Knowledge on Climate Change.

Tamil Nadu State Environment policy 2017

The State has formulated the Vision TN 2023, in line with NAPCC, in which it is stated that the state will take action and necessary steps to face the impact of climate change, protecting environment resources, developing and renewing it and integrating environment dependent welfare schemes with development projects. All the health care facilities in the state of Tamil Nadu are to adopt the policy and action plan as outlined in the document.

Some important legislations which aim at environment protection are tabulated below:

S. No.	Act/Regulation/ Policy	Objective and Provisions	Remarks
1	The Constitution of India Part IVA (Art.51A-Fundamental Duties)	under Part IVA (Art. 51A-Fundamental Duties) casts a duty on every citizen of India to protect and improve the natural environment	Relevant to the overall system
2	The Constitution of India (Articles 15,16 and 46)	Article 15 prohibits any discrimination based on religion, race, caste, sex, and place of birth. Article 16 refers to the equality of opportunity in matters of public employment. Article 46 directs the state to promote with special care the weaker sections of the people, and also directs the state to protect them from social injustice and exploitation.	Relevant to the overall system
3	Tamil Nadu clinical establishment Act-1997 and Tamil Nadu Clinical Establishments (Regulation) Rules, 2018	Provision for registration and regulation of all clinical establishments with the view to prescribe the minimum standards of facilities and services provided by them.	All the health care facilities have to register under this Act.
4	The cigarettes and other tobacco products(COTPA) Act 2003	For protecting citizens from involuntary exposure to tobacco smoke, Ban on use of tobacco and other related products in public places.	The act has specified hospital buildings as public place. And thus health care facilities are NO SMOKE ZONES
5	Bio-medical Waste Management Rules 2016 and Amendment Rules 2018	Schedule 1: Categorization and Management Schedule 2: Standards for treatment and disposal of BMW Schedule 3: Prescribed Authority and duties Schedule 4: Label of containers, bags and transportation of Bio-Medical waste.	-Healthcare facilities are required to develop Standard Operating Procedures (SOPs) in the handling of medical solid, liquid and radioactive wastes. -The requirements in MOEFCC Notification- G.S.R.234 (E), dated 28th March, 2016 cover



		Liquid waste should be treated with 1% to 2% sodium hypochlorite solution having 30% residual chlorine for twenty minutes before discharge into sewers. Hospitals either connected with sewerage network without terminal sewage treatment plants or not connected to public sewers shall install compact on-site effluent / sewage treatment plant	good international industry practice (GIIP) such as labelling and symbols for hazardous materials and waste, waste reduction, segregation, storage, transportation (manifest), treatment and handling (with autoclave, incineration), health workers occupational health and safety and public health and safety.
6	Construction and Demolition Waste Management Rules, 2016	Waste comprising of building materials, debris and rubble resulting from construction, re-modelling, repair and demolition of any civil structure	CPCB guidelines on Environmental Management of Construction and Demolition Waste Management in India (2017) will be applicable.
7	E-Waste Management Rules, 2016	To address proper collection and disposal of e-waste. The 2016 Amendment brought health care facilities (with turnover of more than one crore or have more than 20 employees).	The disposal of E-wastes to be done at the specified centres or authorised dismantlers and recyclers and reported annually.
8	Plastic Waste Management Rules 2016	All generators of plastic waste, shall segregate and store the waste generated by them in accordance with the Solid Waste Management Rules, and handover segregated wastes to authorized facilities	Hospitals are generators of large quantity of plastics apart from infectious plastics as mentioned in BMWWM Rules, 2016.
10	Water (Prevention and Control of Pollution) Act 1974 Air (Prevention and Control of Pollution) Act 1981 Environment Protection Act (and Rules), 1986 & 1996	Provisions are to prevent air and water pollution by not discharging untreated effluents and harmful emissions.	Gaps exist in disposal of liquid wastes from healthcare facilities
11	Environment Impact Assessment Notification(EIA)2006 and amendments	The schedule of the Act lists investment activities under two categories 'A' and 'B', including expansion of existing ones and sets up State EIA Authority. All investment activities listed under 'A' require approval from the Expert Appraisal Committee of the Ministry of Environment, Forests and Climate Change.	a) Common Biomedical Waste Treatment facility b) Common Effluent Treatment Plant; and c) building with built up area > 20,000 sq.m. And < 1,50,000 sq.m
12	Indian Penal Code (IPC)	Section 278 (making atmosphere noxious to health) and Section 269 (negligent act likely to spread infection or disease dangerous to life, unlawfully or negligently)	individuals would require providing evidence



13	The Indian Medical Council Act 1956 The Indian Medical Council Professional Conduct, Etiquette and Ethics Regulations 2002)	Provisions are applicable to practicing doctors and medical professionals to provide quality service to the patients or healthcare seekers.	
14	Right to Information Act, 2005	Provides a practical regime of right to information for citizens to secure access to information under the control of Public Authorities.	Certain documents requires to be disclosed to public.
15	The Sexual Harassment of Women at Workplace (Prevention, Prohibition and Redress) Act, 2013	It requires employer to set up an "Internal Complaints Committee" (ICC) and the Government to set up a 'Local Complaints Committee' (LCC) at the district level to investigate complaints regarding sexual harassment at workplace. The ICC need to set up by every facility with more than 10 employees.	Applicable to all health directorates and most of the health care facilities
16	TN Hospital Protection Act 48, 2008. Tamil Nadu Medicare Service Persons and Medicare Service Institutions (Prevention of Violence and Damage or loss to property) Act 2008	An act to prohibit violence against Medical service persons and damage or loss to property of Medicare service institutions and for matters connected there with and incidental thereto	Applicable to all the health care facilities in Tamil Nadu.
17	Criminal Law (Amendment) Act, 2013: Sexual Offences	The Act recognizes the broad range of sexual crimes to which women may fall victim, and a number of ways in which gender based discrimination manifests itself.	Applicable to deal with Gender Based Violence including Sexual Exploitation and Abuse / Sexual Harassment issues.
18	The Panchayat (Extension to the Scheduled Areas) Act, 1996	The PESA Act empowers the Gram Panchayat to take charge of village administration. Government of India stipulates to conduct consultations and obtain consent for the development Program from the tribal advisory council (TAC), and the Gram Panchayat under the Fifth Schedule Areas.	All Tribal Sub Plan (TSP) districts as 'High Priority Districts' are under National Rural Health Mission. Also, the Gram Panchayat have control over local institutions including the Health Sub centres and Anganwadi centres.
19	The Building and Other Constructions Workers (Regulation of Employment and Conditions of Service) Act, 1996 and the associated Central Rules, 1998	Benefits workers engaged in building and construction activities and provide for their safety, health and welfare measures.	Applicable for sub-projects involving any construction.



20	The National Environmental Tribunal Act 1995	Provides provisions for expeditious remedies to parties injured by environmental crimes.	
21	The Hazardous and Other Waste Management Rules, 2016	The H&OW Management Rules, 2016 provide for generation, collection, treatment, transport, import, storage and disposal of hazardous wastes. Improper storage, handling, transportation, treatment and disposal of hazardous waste results in adverse impact on ecosystems including the human environment.	

Tamil Nadu government orders on environment protection:

No.	G.O No. & Date	Department	Cause	Remarks
1	G.O.(MS) No. 135 Dated: 07.12.2007	Environment and Forests	Reconstitution of State Crisis Group for Management of Chemical Accident	Chemical Accidents (Emergency Planning, Preparedness and Response) Rules, 1996
2	G.O. (Ms) No. 260 Dated: 15.11.2012	Environment and Forests	State Level Environment Impact Assessment Authority (SEIAA) and State Level Expert Appraisal Committee (SEAC)	Strengthen the existing bodies of SIEAA and SEAC
3	G.O.(D).No.6 Dated: 13.01.2014	Environment and Forests	5069 Eco-clubs in schools	Sanction of Rs.2500/- per School annually for eco-friendly activities.
4	G.O.(D)No:304 Dated: 12.12.2017	Environment and Forests	National Medicinal plants Board Implementation of schemes under "Promotion of school / Institutional and Public herbal gardens"	100% assistance by National Medicinal Plants Board, Government of India
5	G.O. Ms No. 84 dated 25.06.2018	Environment and Forests	Ban on use of certain use and throwaway plastics with effect from 01.01.2019.	To prevent the indiscriminate littering of use and throwaway plastics
6	G.O.(D)No.265 Dated:20.09.2018	Environment and Forests	Ban on use of certain use and throwaway plastics in Govt Departments /Institution/Public Sector Undertakings.	To prevent the use of certain use and throwaway plastics

It is therefore the responsibility of the health care facility to be aware of the existing Rules, Regulation and statutory norms and ensure compliance at all strata without any deviation.

Scope and Coverage of the Environment Strategy

All the healthcare facilities functioning in Tamil Nadu (Both Government and Private) will be covered by this environmental strategy.



7. CURRENT SITUATION ANALYSIS

GLOBAL SCENARIO

Global problems that threaten the environment are ozone depletion, rapid urbanisation, population exploitation and greenhouse warming etc. Nature's resilience and defence in combating these threats is weakening day by day. The ecological equivalent of the Plimsoll line may be stated as the recent years during which the ecosystem balance is tipping towards the negative side.

Atmospheric carbon dioxide (one among the greenhouse gases) levels, which have remained steady at 180-220 ppm for the past 420,000 years, are now close to 370 ppm and rising. Global health care has an environmental impact that accounts for between 1% and 5% of the total impact. The health-care sector causes a large share of the total carbon footprint (4.4% of greenhouse gases, 2.8% of PM, 3.4% of NO₂, and 3.6% of SO₂). Health-care organisations are thus major players in accelerating the **environmental emergency**.

WHO attributes 13.7 million (24.3%) deaths in 2016 to environmental factors and in this 4.2 million deaths are attributable to ambient air pollution. The *Lancet* Countdown on health and climate change attributes 2.9 million deaths to ambient particulate pollution and 7 million deaths to overall air pollution. According to Centre for Disease Control and Prevention (CDC), cancer incidence rates have risen drastically in the last 4 decades. Available data shows that testicular cancer is up 300 percent, Non-Hodgkin's lymphoma has increased by nearly 100 percent while brain cancer and breast cancer are up by 90 and 60 percent respectively. Scarce water and poor sanitation and hygiene were responsible for 829 000 deaths in 2016.

NATIONAL SCENARIO:

India, with a population of 1.38 billion people living across states at different levels of economic, social, and health development, has one of the highest air pollution levels in the world. None of the Indian states met the WHO-recommended criteria of ambient particulate matter air quality of less than 10 µg/m³. A substantial 8% of the total disease burden in India and 11% of premature deaths in people younger than 70 years could be attributed to air pollution. In 2017, 1.24 million (95% UI 1.09–1.39) deaths in India were attributable to air pollution.

Of the total DALYs attributable to pollution in India in 2017, the largest proportions were from lower respiratory infections (29.3%), chronic obstructive pulmonary disease (29.2%), and ischaemic heart disease (23.8%), followed by stroke (7.5%), diabetes (6.9%), lung cancer (1.8%), and cataract (1.5%). *The average life expectancy in 2017 would have been higher by 1.7 years (1.6–1.9) without environmental pollution.*

Hospitals are large waste producers – much of which is infectious clinical waste. It has been roughly estimated that of the 4 kg of waste generated in a hospital at least 1 kg would be infectious. Health facilities generate 700,000 tons of waste per year, or more than one ton per bed, equivalent to 3.5% of the national waste production. (<https://www.veolia.com/en/market/tertiary/environmental-challenges-healthcare-facilities>)

The daily per capita generation of solid waste in India ranges from about 100 g in small towns to 500 g in large towns. The solid waste generated in Indian cities has increased from 6 million tons in 1947 to 48 million tons in 1997 and is expected to increase to 300 million tons per annum by 2047 (CPCB, 2000).



As far as the liquid waste is concerned the wastewater from the healthcare facilities contain effluents loaded with harmful substances (solvents, heavy metals, radioactive materials) which also pose problems.

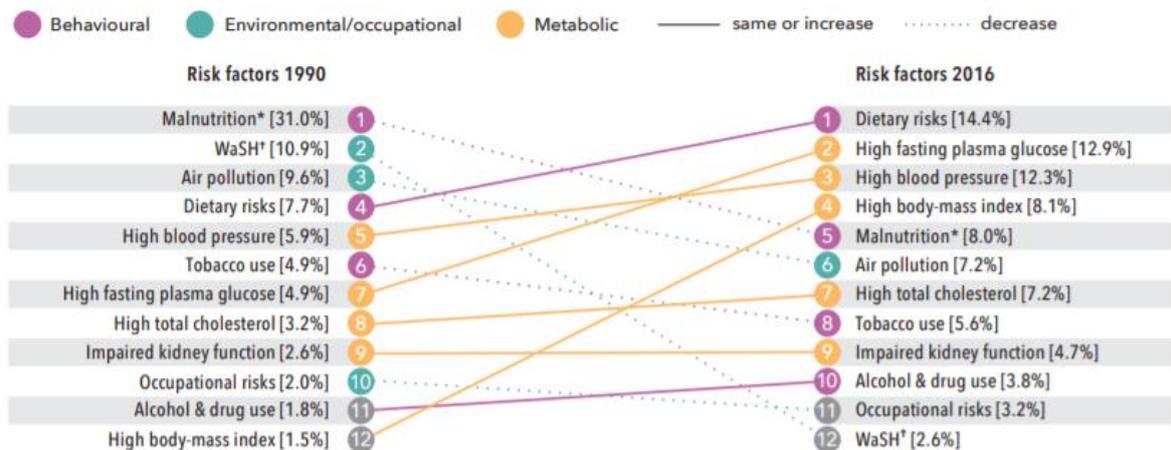
STATE SCENARIO:

Tamil Nadu is the tenth largest state in India and sixth largest by population. The State is comprised of 38 districts, 226 taluks and 15 city corporations. Tamil Nadu population in 2020 is estimated to be 77 million (7.7 crores).

The state had twice the number of deaths attributable to ambient particulate matter pollution. These findings were consistent with the higher exposure levels to ambient particulate matter pollution in Tamil Nadu. Of the total 480.7 million (441.7–526.3) DALYs in India in 2017, 38.7 million (34.5–42.4) or 8.1% (7.1–9.0) were attributable to air pollution. 21.3 million (17.7–25.1) or 4.4% (3.7–5.3) of the total DALYs were attributable to ambient particulate matter pollution

Cancer statistics, 2020-report from National cancer Registry Programme, India has projected that the number of cancer cases in India will be increasing by 4% wherein Chennai Zone’s share alone is a whopping .9%.This may even increase.

What risk factors are driving the most death and disability combined?
Contribution of top 10 risks to DALYs number, both sexes, ranked by number of DALYs, 1990-2016



The percent figure in bracket next to each risk is DALYs from that risk out of total DALYs.

*Malnutrition is child and maternal malnutrition.
*WaSH is unsafe water, sanitation, and handwashing.

The Tamil Nadu Disease Burden Profile 1990 to 2016 observation thus shows that the environmental and occupational threat still looms large in the state.



8. ENVIRONMENTAL FACTORS

External Environment

Environmental factors are the sum of **biotic and abiotic** factors that influences the environment. This also includes cultural, demographic and economic factors. This strategy strives for the protection of these factors.

1. Abiotic factors:

Changes in **temperature** (heat waves or cold spells) has a significant impact on health. Recent studies show unusual fluctuations in temperature is linked to cerebrovascular, cardiovascular, and respiratory conditions.

Breathing polluted **air** puts us at a higher risk for asthma and other respiratory diseases. Also many skin ailments are reported. The release of carbon dioxide in the atmosphere causes the Earth to become warmer.

The quality parameters of **water** are very important to public health because of its major implication on health. Elevated levels of metals like lead in drinking water can increase the risk of developing cancer, high blood pressure, stroke, kidney disease and memory problems.

A highly **humid** environment is the perfect breeding ground for disease-causing microorganisms and parasites and also cause significant health challenge for individuals prone to allergies and asthma attacks. On the other hand, low levels of humidity have been found to increase the risk of developing viral flu, congestion, dry eyes and scaly skin according to some studies.

The toxic effects of **ultraviolet light from sunlight** is a major concern for human health because of its relation to skin cancer and premature aging. The journal *Environmental Health Perspectives* reports that spending at least one hour or more outside every day over a ten year period decreases the likelihood of developing breast cancer among women.

2. Biotic factors:

The impact of biotic environmental factors on health are by their roles in the aetiology of infectious and zoonotic diseases. Available data shows that an estimated 16% of cancers in humans are caused by viruses or bacteria. (<https://www.discovermagazine.com/health/16-of-cancers-are-caused-by-viruses-or-bacteria>)

INTERNAL ENVIRONMENT

In addition to the above mentioned abiotic factors the internal environment chiefly is made of the **human factors** such as:

Patients

The core of the health care facility are the patients. The facility should focus on the creation of an enabling atmosphere for them.

Visitors and attenders

The facilities population has to include visitors, attenders and others who use the facility.eg students, trainees etc.



Skilled and non-skilled healthcare providers

The Doctors, staff nurses, lab technicians, pharmacists and other skilled and non-skilled health care providers are a major component in the facilities human resource. It also comprises other nonmedical personnel such as plumber, manager, security etc.

Community and other stake holders.

They also have an important role in the facilities environment. The facility's duty is in fact to serve the community and the stake holders.

9. STRATEGY ON THE MANAGEMENT OF THE ENVIRONMENTAL FACTORS

1. Environment and Social assessment and commitment plan
2. Resource optimisation
3. Pollution mitigation and Management:

1. Environment and Social assessment and commitment plan(ESCP)

Even before the establishment of the healthcare facility, a detailed assessment of the environment and social background of the locality should be undertaken and based on the assessment (ESSA) findings the blueprint of the new facility should be worked. Utmost care is to be exercised in maintaining environmental balance without tipping the scale to the harmful side.

- In the assessment, the geographical locale, ethnic background of the population, health needs and the available resources should be mapped.
- Environment commitment plan should be detailed with short term and long-term goals. It is advisable that each facility develops and adopts its own Environmental and social Commitment plan (ESCP).

2. Resource optimisation:

- Healthcare institutions should strive to reduce their energy consumption and maximise use of solar energy and other similar renewable sources.
- A plan for water conservation by rain water harvesting, regular de-silting of water resources and waste water recycling systems should be in place.
- Regular energy audits and phased renewal plan for making the buildings more energy efficient should be worked out.
- Implementation of technically and financially feasible measures for improving efficient consumption of energy, water etc. for the health care facility should be sketched in consultation with field experts.
- Waste generation including medical waste generation must be brought down by an approach of *reduce, reuse and recycling*.



3. Pollution Mitigation and Management

Pollution refers to hazardous and non-hazardous chemical substances in the solid, liquid, or gaseous phases which deter their purity and pose health risks. It also includes odours, noise, vibration, radiation, etc.

Pollution management are measures aimed to avoid or minimize pollutants. The measures encourage optimal use of energy and raw material, reduce emissions of pollutants. E.g., avoiding mercury based thermometers, sphygmomanometer and replacing them with electronic instruments etc.

- The Health care facility will consider alternatives and implement technically and financially feasible and cost-effective options to avoid or minimize such pollutants.
- If the generated waste is hazardous, the facility will comply with existing norms for management (including storage, transportation and disposal)
- The health care facility should focus on **the cradle to grave** of all the products, their uses and their environmental adverse effects.
- The risks of reuse verses the benefits of single use should be thought before disposal.
- Harmful chemicals should not be used in housekeeping and for laundry. The Health care facility may consider alternative eco-friendly options.

Noise Pollution

Noise Pollution is generally defined as regular exposure to elevated sound levels that may lead to adverse effects in humans. The instruments used for measuring the noise level standards are:

- Optimus Red Class-2 Integrating Sound Level Meters (ISLM's)
- Dose Badge Noise Dosimeters

WHO Guidelines for hospitals:

- In Wards, the equivalent sound levels should be 30 dBs, the levels should not exceed 35 dB in rooms where patients are being treated or observed.
- The noise peaks during the night should not exceed 40 dBs.
- Sound inside incubators may result in health problems, including sleep disturbance, and may lead to hearing impairment in neonates. Hence noise levels have to be maintained within 30-35 dBs.

Strategies to reduce noise pollution in Hospitals

- Reducing the frequency and intensity of medical alarms.
- Using sound-absorbing ceiling tiles and carpets.
- Designating sleep hours during which there are no routine checks unless necessary.
- Asking everyone to talk quietly.
- Installing a noise monitor to identify when noise needs to be diminished.
- Providing patients "Quiet Kits" with sleep masks, earplugs etc.



AIR POLLUTION

Air pollution refers to the release of pollutants into the air that are detrimental to human health and the planet. *Air pollution contribute to climate change.* The tiniest airborne particles are especially dangerous because they can penetrate the lungs and blood stream and cause diseases. Hence it is important that the hospital adopts measures to mitigate and monitor its air pollution levels.

AIR POLLUTANTS MONITORING METHODS

POLLUTANTS	WHO Stds	METHODS
Carbon monoxide	100 mg/m ³ for 15 minutes, 60 mg/m ³ for 30 minutes, 30 mg/m ³ for 1 hour	Non-dispersive infrared spectrometry Gas-chromatographic method Hot mercury oxide method Sensitive diffusive sampler
Ozone	120 µg/m ³ as an 8-hour mean value.	Chemiluminescence Ultraviolet photometer Differential optical absorption system (DOAS) Spectrometer
Sulphur di oxide	500 µg/m ³ for 10 minutes of exposure. 125 µg/m ³ for 24-hour average exposure. 50 µg/m ³ for annual average exposure.	Spectrometer Ion chromatography Acidimetric method tetrachloromercurate method Remote sensors
Nitrogen di oxides	40 µg/m ³	NO ₂ Diffusion Tubes Differential optical absorption spectroscopy
PM₁₀ , PM_{2.5}	20 mg/m ³ (as PM _{2.5}) or 30 mg/m ³ (as PM ₁₀)	High volume samplers

Strategy to mitigate air pollution:

- The plantation around the hospital will be of a nature so as to capture particulate pollution. This greenery will also provide a pleasant ambiance.
- Avoid open burning of trash, debris.
- Use environment safe paints and cleaning products.
- Conserve electricity and set air-conditioners to no lower than 25 centigrade.
- Reduce or eliminate wood stove use.
- Use alternatives to mercury using equipment.
- Use PVC free medical devices.



Water pollution definition:

Water pollution occurs when harmful substances—often chemicals or microorganisms—contaminate water bodies, degrading water quality and rendering it toxic to humans or the environment

Water Parameters

No	Physical parameters	Measurement & Unit	Chemical parameters	Method	Biological parameters	Unit
1	Turbidity Turbidity in drinking water is esthetically unacceptable	<ul style="list-style-type: none"> Measured by nephelometric turbidimeter, which expresses turbidity in terms of NTU or TU. High levels can protect microorganisms from disinfection, stimulate the growth of bacteria. Effective disinfection requires turbidity less than 5 NTU. 	pH <ul style="list-style-type: none"> Excessively high and low pHs can be detrimental for the use of water. 	<ul style="list-style-type: none"> The methods available for the determination of pH are: electrometric and colorimetric methods. 	Bacteria E. coli or thermo tolerant coliform bacteria. Presence indicates recent faecal contamination,	<p>Must not be detectable in any 100-ml sample in water intended for drinking</p> <p>Measurement by colony count/culture</p>
2	Temperature	Most people find water at temperatures of 10–15°C most palatable	Acidity <ul style="list-style-type: none"> Acids can influence processes such as corrosion, chemical and biological reactions. 	<ul style="list-style-type: none"> The level of acidity is determined by titration with standard sodium hydroxide (0.02 N) using phenolphthalein as an indicator. 	Algae Algae are primarily nuisance organisms in the water supply	Spectrophotometric measurements
3	Color Pure water is colorless, which is equivalent to 0 color units	<ul style="list-style-type: none"> True color is measured after filtering the water sample to remove all suspended material. Color is graded on scale of 0 (clear) to 70 color units. 	Alkalinity The high levels of either acidity or alkalinity in water is an indication of chemical pollution	<ul style="list-style-type: none"> Alkalinity is determined by titration with a standard acid solution (H₂SO₄ of 0.02 N) using indicators 	Viruses Waterborne viral pathogens cause infectious hepatitis and poliomyelitis	powerful electronic microscope



4	<p>Taste and odour</p> <p>This can be caused by foreign matter such as organic materials, inorganic compounds, or dissolved gasses.</p>	<p>The numerical value of odor or taste is determined by measuring a volume of sample A and diluting it with a volume of sample B of an odor-free distilled water so that the odor of the resulting mixture is just detectable at a total volume of 200 ml.</p>	<p>Chloride presence of relatively high chloride concentration in freshwater indicate wastewater pollution</p>	<p>Standards for drinking water require chloride levels that do not exceed 250 mg/L. There are many methods to measure the chloride concentration in water, but the normal one is the titration method by silver nitrate.</p>	<p>Protozoa</p> <p>Form cysts that are difficult to inactivate .They cause diseases like giardiasis</p>	<p>Formalin or ether concentration methods</p>
5	<p>Solids</p> <p>If the filtered portion of the water sample is evaporated, the solids form a residue. (total dissolved solids or TDS).</p>	<p>Water is classified by the amount of TDS per liter as follows: freshwater: <1500 mg/L TDS; brackish water: 1500–5000 mg/L TDS; Saline water: >5000 mg/L TDS.</p>	<p>Chlorine residual</p> <ul style="list-style-type: none"> Chlorine can react with organics in water forming trihalomethanes or THMs, which are carcinogens such as chloroform CHCl₃ 	<ul style="list-style-type: none"> In drinking water, a Chlorine residual of about 0.2 mg/L is optimal. Guideline value for free chlorine in water supplied to the public is 5mg/litre. Chlorine residual is normally measured by a color comparator test or spectrophotometer. 		
6			<p>Nitrogen</p> <p>If water is contaminated with sewage, most of the nitrogen is in the forms of organic and ammonia.</p>	<p>Excessive nitrate concentration (more than 10 mg/L) in drinking water causes an immediate and severe health threat to infants.The nitrate ions react with blood haemoglobin, which leads to a disease called blue baby or methemoglobinemia.</p>		



7			<p>Fluoride A moderate amount contributes to good dental health. Prevents tooth decay. Excessive amounts cause discoloured teeth, known as dental fluorosis</p>	<p>The maximum allowable concentration of fluoride for potable water is 1.4 mg/L; in colder climates, up to 2.4 mg/L is allowed. There are four methods to determine ion fluoride in water; the selection of the method depends on the type of water sample.</p>										
8			<p>Iron and manganese No health problems, but impart a bitter taste to drinking water</p>	<p>They are measured by methods such as atomic absorption spectrometry, flame atomic absorption spectrometry, etc.</p>										
9			<p>Copper and zinc essential for human health</p>	<p>Same measurement method as above</p>										
10			<p>Hardness causes problems such as scale deposits in pipes</p>	<table border="1"> <tr> <td data-bbox="1023 943 1176 1042">Soft water</td> <td data-bbox="1176 943 1395 1042"><50 mg/L as CaCO₃</td> </tr> <tr> <td data-bbox="1023 1042 1176 1157">Moderately hard</td> <td data-bbox="1176 1042 1395 1157">50–150 mg/L as CaCO₃</td> </tr> <tr> <td data-bbox="1023 1157 1176 1278">Hard water</td> <td data-bbox="1176 1157 1395 1278">150–300 mg/L as CaCO₃</td> </tr> <tr> <td data-bbox="1023 1278 1176 1374">Very hard</td> <td data-bbox="1176 1278 1395 1374">>300 mg/L as CaCO₃</td> </tr> </table>	Soft water	<50 mg/L as CaCO ₃	Moderately hard	50–150 mg/L as CaCO ₃	Hard water	150–300 mg/L as CaCO ₃	Very hard	>300 mg/L as CaCO ₃		
Soft water	<50 mg/L as CaCO ₃													
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Very hard	>300 mg/L as CaCO ₃													



11			Dissolved oxygen The higher the concentration of dissolved oxygen, the better the water quality	Measurement are the colorimetric method—quick and inexpensive, the Winkler titration method—traditional method, and the electrometric method		
12			Biochemical oxygen demand (BOD) BOD is a measure of sewage; strong sewage has a high BOD and weak sewage has low BOD	BOD is a function of time. At time = 0, no oxygen will have been consumed and the BOD = 0. As each day goes by, oxygen is used by the microbes and the BOD increases.		
13			Chemical oxygen demand (COD) measures organics: biodegradable and non-biodegradable	It is a chemical test using strong oxidizing chemicals (potassium dichromate), sulfuric acid, and heat.		
14			Toxic inorganic substances danger to public health	Determined by atomic absorption photometers, spectrophotometer. Cyanide is measured by colorimetric, or electrometric methods.		
15			Toxic organic substances Eg. insecticides, pesticides	By gas chromatography (GC), high-performance liquid chromatography (HPLC), and mass spectrophotometry.		

***Water Quality Parameters By Nayla Hassan Omer Published: October 16th 2019



Strategies for Water management:

- Inventory of existing water harvesting structures and repairs needed,
- Construction of new water harvesting structures,
- Construction of targeted recharge structures (roof water harvesting, artificial recharge of aquifers and defunct wells),
- Restoration of major, medium and minor water holding systems (repair of breach to structures and supply channels, desilting of tanks),
- Participatory Hydrological Monitoring (surface and groundwater) for hospital water audits,
- Reduce the gap between resource potential created and actual demand,
- To increase the storage capacity of the existing reservoirs by de-silting of wells, bore-wells, besides cleaning the tanks
- Install water-efficient taps, with standards faucet aerators (2.2 gallons or less per minute)
- New toilets with the low flow model (1.6 gallons or less per flush)
- Checking periodically for "silent" leaks in the supply system
- Use drought-tolerant plants and grasses for landscaping
- Installing water meters to measure usage of water
- Water free urinals and other water saving devices

WASTE MANAGEMENT PLAN

This strategy document will not be complete without a mention on infection control and waste management including solid waste, liquid waste and Bio-medical waste. Efforts are to be made by the administration of the health care facilities in co-operation with the local bodies and the pollution control board to comply and carry out the regulatory norms.

Solid waste management

The solid waste generated in the health care facilities are segregated at source in specific containers as Bio degradable and non-Bio degradable wastes and are handed over to the local authorities for recycling and disposal as per the Solid Waste Management Rules, 2016.

As per the Solid Waste Management Rules, 2016, all institutions with more than 5,000 sq.m. area shall ensure segregation of waste at source as prescribed in these rules, facilitate collection of segregated waste in separate streams, handover recyclable material to the authorized recyclers. The bio-degradable waste shall be processed, treated and disposed off through composting or bio-methanation within the premises if possible.

Management of Plastic Wastes

The State of Tamil Nadu has embarked upon intensive awareness campaign and also banned use of one time use and throwaway plastics. Campaigns focusing on educating the public on preventing the use of throw away plastics as well as the benefits of using eco-friendly substitutes to plastic items is to be organised frequently. The ill-effects of throwaway plastics are to be displayed in public view places. The health care facilities are expected to abide by the guidance of the government and thus be exemplary organisations in handling plastic wastes.



Management of Hospital Liquid wastes

Sources of wastewater generation from the hospital are wards, laboratories, operation used disinfectants, floor washing, washing of patient's area, hand washing, laundry, discharge of accidental spillage, bathroom/toilet, canteen, etc.

The definition of regulated liquid wastes is as follows:

1. Liquid or semi-liquid blood
2. Contaminated items that will release blood or other potentially infectious materials in a liquid or semi-liquid state
3. Pathological or microbiological wastes containing blood or other potentially infectious materials
4. Dialysis wastes
5. Amniotic fluid
6. Bodily secretions and wastes
7. Spinal and Ascitic fluid
8. Lab, Operation theatre and labour room effluents
9. Chemotherapy drugs and other liquid medications
10. Dental effluents

Parameters to be Monitored in Effluent before Discarding/ Re-use of Treated Hospital Waste Water

pH
BOD₅
COD
Total Suspended Solids
Bio-assay test
Escherichia Coli.
Concentration.

Collection and Segregation:

Liquid waste is generated due to use of chemicals, or disinfectants, silver x ray film developing liquid, discarded formalin, infected secretions, aspirated body fluids, liquid from laboratories and floor washings, cleaning, house-keeping and disinfecting activities, etc. As per the BMW Rules 2016, the chemical liquid waste of the hospital must be collected through a separate collection system for pre-treatment.

Treatment and Disposal:

Liquid waste is collected and pre-treated prior to disposal through Effluent Treatment Plant (ETP). Hospitals with large standalone labs shall install separate drainage system leading to pre-treatment unit prior to mixing the same with rest of the wastewater from hospital for further treatment. For middle and small healthcare facilities having no system of separate drainage/collection system, the liquid waste is required to be collected on-site in containers for pre-treatment before mixing the same with other wastewater.

Silver X -ray film developing fluid should be given or sold to the authorized recyclers for resource recovery, else it should be handed over to CBWTF as yellow (e) chemical waste.

Depending on type of chemical effluent generated, pre-treatment should comprise of neutralization/precipitation, followed by disinfection prior to mixing with rest of the wastewater from hospital. Prior to mixing with rest of the hospital effluent, disinfection should be done preferably by passing the effluent through UV sterilizer rather than using disinfecting chemicals since use of chemicals may affect performance of biological treatment in down-stream.

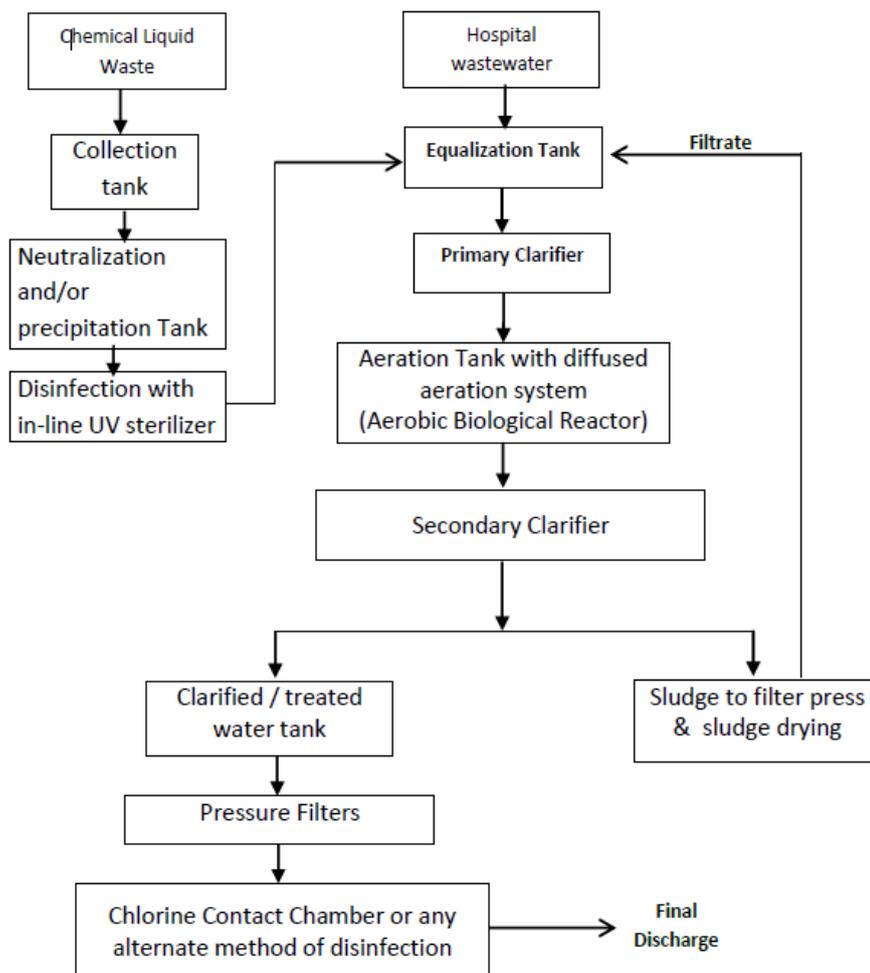
Effluent Treatment Plant should be provided in every HCF to treat the wastewater generated from the hospital in order to comply with the effluent standards prescribed under the BMW Rules, 2016.

The combined wastewater should be treated in the ETP having three levels of treatment; primary, secondary and tertiary;

- Primary Treatment: equalisation, neutralization, precipitation and clarification
- Secondary Treatment: High rate aerobic biological treatment, secondary settling tank
- Tertiary Treatment: Pressure Filtration, Disinfection and disposal to drain/sewer



Typical flow chart for the Effluent Treatment Plant is given as follows:



Pre-treatment of hazardous liquids

Pre-treatment is to reduce or eliminate contaminants in the liquid waste before discharging it into the sewer as defined below:

- **Medical Laboratory** - Acid-base neutralisation, Filtration and sedimentation, Autoclaving. Hazardous wastes (colorants, formalin) should be separately collected, mixed with an absorbent (e.g. saw dust) and disposed.
- **Pharmacy** – Liquids in vials (excluding cytotoxic materials) to be crushed in a closed bucket, mixed with saw dust and disposed.
- **Faeces or vomitus** – Decontamination with lime milk (Hydrated Calcium oxide or Calcium hydroxide) – ratio of 1:2 for stools and vomitus with lime for 6 hours minimum and ratio of 1:1 for urine with lime for 2 hours minimum.
- **Blood or blood by-products** – blood can be pre-treated by thermal method.
- **Dental effluents**– Amalgam separators may be installed in sink and the separated mercury wastes must be safely stored and handed over to CTF operator.
- **Radiotherapy** – involves separate collection of radioactive wastewater (e.g. Urine of patient from thyroid treatment) and storage for decay in a secured die-away basin until concentration are decreased. Then the wastewater can be disposed.



10. BIOMEDICAL WASTE MANAGEMENT IN HOSPITALS

Under Biomedical Waste Management Rules (BMWM Rules), a number of guidelines were developed and disseminated, which included sections on good practices for infection control (IC) and waste management (WM).

One of the duties of the Health and Family Welfare Department is grant of license to health care facilities (under the Clinical establishment Act) with a condition to obtain authorization from the prescribed authority (TNPCB) for BMW management.

POINTS TO NOTE on BMWM RULES

- The pollution control Board has issued authorization to 12 Common Bio-Medical Waste Treatment Facilities (CBMWTF) in the state for the handling of the Bio-medical waste.
- Every health care facility shall obtain Consent under Water (P&CP) Act, 1974 & Air (P&CP) Act, 1981 as amended and Authorisation under Biomedical Waste Management Rules, 2016 as amended from TNPCB and execute agreement with the available Common Bio-Medical Waste Treatment Facility (CBMWTF) for the disposal service.
- Bio-Medical Waste is classified into 4 categories based on the segregation pathway and colour code. Each category is specified a colour code (Yellow, Red, Blue & White) and shall be stored in bar-coded colour bags. From the point of generation to the point of safe handing over to the CBMWTF codal procedures has to be strictly followed.
- Ambit of rules is expanded to health camps, vaccination camps, blood donation camps, first aid rooms, Laboratories and research labs.
- No on-site treatment or disposal (if CBMWTF is within 75 Kms). Pre-treatment of laboratory waste, microbiological waste, blood samples and blood bags is required before disposal to CBMWTF.
- Phase out the use of Chlorinated plastic bags, gloves, Blood bags.
- Training to all health care workers at least once in every year to handle BMW.
- Maintain and update records on daily basis and consolidate monthly records.
- All bedded health care facilities shall make available the annual report on its website.
- Advisory Committee to meet every 6 months once to monitor BMWM and submit minutes in the annual report (Form IV)
- Untreated human anatomical waste, soiled waste and biotechnology waste shall not be stored beyond 48 hours.
- Any violation of BMWM rules shall be liable for action under section 5 (closure and disconnection of power supply) and section 15 (imprisonment up to 5 years or penalty up to Rs.1 Lakh or both) of Environment (Protection) Act, 1986 and liable to pay Environmental Compensation as per G.O. Ms. No. 77 of E&F (EC.2) Department dated 28.10.2020.

11. MANAGEMENT OF OTHER WASTES

Management of Used Batteries

As per the provisions under Batteries (Management & Handling) Rules, 2001, used lead acid batteries generated from health care facilities (HCFs) should be sold/auctioned/sent only to the authorised dealers, designated collection centres or authorised recyclers or any authorised agency. In no case the used batteries be handed over to an unauthorised person.

Hospital having purchased more than 100 batteries should maintain records of number of batteries purchased, and number of used batteries sent to registered recyclers/authorised dealers/designated collection centres/any other agency as per Form-VIII of Batteries Rules, 2001 and the returns shall be filed half yearly i.e. by 30th June and 31st December of every year to the concerned State Pollution Control board.



Management of Radioactive Wastes

The Atomic Energy Regulatory Board (AERB) has been mandated by the Central Government, as the Competent Authority as per Atomic Energy (safe Disposal of Radioactive Wastes) Rules, 1987 notified under the Atomic Energy Act 1962.

As per provisions of Atomic Energy (safe Disposal of Radioactive Wastes) Rules, 1987, no person shall dispose of radioactive waste (a) unless he has obtained an authorization from the competent authority under these rules; (b) in any manner other than in accordance with the terms and conditions specified in the authorization issued under these rules; (c) in any location different from those specified in the authorization; and (d) in quantities exceeding those specified in the authorization.

Health Care Facilities generating radionuclides waste from treatment of Cancer patients and end-of-life equipment containing radio radionuclides shall obtain authorization from AERB for its disposal. As per the policy of AERB, radionuclides wastes are required to be re-exported back to the manufacturer. It was recommended that such generators shall ensure arrangement with manufacturer at the time of purchase of such equipment.

Management of E-Wastes

As per provisions under E-Waste (Management) Rules, 2016, as amended every generator of end of life electrical and electronic equipment (EEE) listed under Schedule-I are required to ensure that such E-Waste is sent to an authorized E-Waste dismantling or recycling facility or an authorised collection centre of the Producer of EEE or through designated take back service providers of Producers or registered Producer Responsibility Organization (PRO) of a Producer. E-waste can be auctioned only to authorised E-Waste Recyclers/ Dismantlers/ PRO of a Producer. Records of E-Waste transfer/sale should be maintained in Form -2 for verification of the SPCBs/PCCs and Annual returns as per Form-3 of E-Waste (Management) Rules, 2016, as amended should be submitted to SPCBs/PCCs by June 30th of every year.

E-Waste generated from hospital equipment not listed in Schedule-I should also be sold/ transferred to only the authorized E-Waste Recyclers/Dismantlers.

12. Infection Control-Waste Management Plan(IC-WM)

To avoid penal provisions and for scrupulous implementation every facility should have an **Infection Control-Waste Management Plan(IC-WM)**. The Plan provides a consolidated, reference material on IC-WM good practices that may be modified to suit the facility's needs. The Plan is to include following framework:

- Section I: Infection Control
- Section II: Capacity Building

Section I: Infection Control

The key areas of infection control are:

- Immunization against nosocomial infections
- Availability and use of barrier protection
- Management of Post Exposure Prophylaxis
- Awareness of occupational hazards

All the above features have been discussed in detail in safe working conditions and patient safety.

Section II: Capacity Building

Training Plan has to be developed, based upon the need. Training should be provided to all Health Care Workers.



Training should be imparted through:

- Dissemination of Information, Education and Communication (IEC) materials.
- Technical training for all the staff with specific responsibilities for discrete activities related to IC-WM.
- Training should be provided on an annual basis, with refresher courses periodically from thence.
- Each facility should keep records of training provided to employees.
- The IEC material must be prepared in the local language on both Infection Control and Waste Management and should be prominently displayed at various places. It should serve as a reminder for all the trained employees as well as sensitize patients visiting the facility

The operational guidelines for QUALITY ASSURANCE in public health care facilities

(handbook for assessors published by NHSRC, Government of India) in its *areas of concern-F:* Infection control, Standard F6 notes whether the facility has defined and established procedures for segregation, collection, treatment and Disposal of Bio-Medical and hazardous waste. Hence as a Quality Assurance standard it is the moral and ethical responsibility of the facility to establish a strict compliance system for Bio-Medical waste collection and disposal.

13. STRATEGY ON HUMAN FACTOR

The health care facility will build on two foundations: a workers welfare culture and a patient safety system. Three strategic aims will support the development of both:

- Improving understanding of personnel safety and satisfaction by drawing information from multiple Sources e.g. worker satisfaction survey (**Insight**)
- Equipping staff with the skills and opportunities to improve performance throughout the career e.g. training, CME etc. (**Involvement**)
- Designing and supporting conditions that deliver effective and sustainable change (**Improvement**)

WHO recommends a set of decent employment policies to ensure occupational health and safety, fair terms for workers, merit-based career development, and a positive practice environment. In addition to broader policies, a set of steps for facilities to foster joy and engagement in their own workforce has to be formulated. These include an initial process of inquiry to understand workforce priorities and to spur larger-scale change to create a fundamentally more satisfying and happier work environment.

1. Personnel Strategy:

- a) Positive working conditions.
- b) Implement national programmes for occupational health and safety of health workers.
- c) Protect health workers from violence in the workplace including Gender based violence.
- d) Improve mental health and psychological well-being of health workers.
- e) Protect health workers from physical and biological hazards.
- f) Grievance redress mechanism.

2. Beneficiaries and Community strategy:

- a) Patient Health and Safety.
- b) Community engagement and information disclosure.
- c) Grievance redress mechanism.



1. Personnel safety

a) Positive Working conditions:

A positive work climate has been significantly correlated to increased outputs and reduced risk of work injury and exposure. Some salient points to note are as follows:

- Inclusion of health and safety skills pertaining to personal and patient safety in education and training programmes for health workers at all levels; and capacity building and skill development programs are to be scheduled periodically.
- Incorporating basic requirements for health worker safety in health care licensing and accreditation standards,
- Appreciate management support for safety programs, fit worker campaigns, availability of personal protective equipment, cleanliness of work site, etc.
- Establishing a fair organizational climate is most likely an essential antecedent to the development of a strong safety climate and job satisfaction.

b) Implement national programmes for occupational health and safety of health workers

- Develop and implement programmes for occupational health and safety of health workers in line with national policies.
- Develop a facility level written policy on safety, health and working conditions for workforce protection in line with the national policies.
- Appoint responsible officers with authority for occupational health and safety of health workers at facility levels.
- Strengthen intersectoral collaboration on health worker safety,

c) Protect health workers from violence in the workplace

Workplace violence is a major issue. Examples of workplace violence in a healthcare setting can include inter personnel disputes, physical or verbal attacks from patients, attacks from patients' attenders etc.

- Issues in the workplace may manifest as inequality, abuse, harassment, discrimination, stigmatization and conflicts. Checks and balances are to be in place to monitor and to avoid such issues.
- Policies and mechanisms to prevent and eliminate violence in the health sector is to be implemented and to adopt a culture of zero tolerance of violence against health workers.
- Establish relevant implementation mechanisms, such as ombudspersons and helplines, to enable free and confidential reporting of incidents and render support for any health worker facing issues.
- Police outposts, security personnel, Closed circuit television camera (CCTV) installation, Public Addressing System (PAS), visitor passes, restricted visitor timings are some measures to deter hostile elements.

d) Improve mental health and psychological well-being of health workers

Health workers work in high-demand, high-risk and high-stress work settings. Work settings link to the behaviour, attitude, and mental health among personnel. The behaviour and orientation can, in turn, affect outcomes. A growing number of studies in health care show that workers are more satisfied when they work in facilities that have more supportive leadership and organizational arrangements. Improving the organizational climate is likely to improve the psychological well-being of health workers, caregivers, which in turn have an impact on the outcomes.

- establish policies to ensure appropriate and fair duration of deployments, working hours and rest breaks,
- define and maintain appropriate safe staffing levels



- provide insurance coverage for work-related risks to health workers, especially those working in high-risk areas;
- establish a blame-free and just working culture through open communication, supported by legal and administrative protection from punitive action when reporting adverse safety events;
- Provide access to mental well-being and social support services for health workers.

e) Protect health workers from physical and biological hazards

Health workers face multiple physical, biological and ergonomic hazards including exposure to infections, sharps, falls, radiation, chemicals, fire and electrical hazards etc. Based on mapping the internal and external risks to which the health care facility is exposed, the action plan can be drafted into four categories: proactive; strategic; reactive; and crisis preventive. Within this context, priority actions and interventions include the need to:

- Ensure the implementation of minimum patient safety, infection prevention and control, and occupational safety standards across the health care facility.
- Ensure availability of personal protective equipment (PPE) at all times, as relevant to the roles and tasks performed, in adequate quantity and of acceptable quality.
- undertake adequate training on the appropriate use of PPE and safety precautions;
- ensure adequate services, including water, sanitation and hygiene, disinfection, and ventilation, in the health care facilities;
- ensure vaccination of all at-risk health workers against vaccine preventable infections, in accordance with the national immunization policy; and in the context of emergency response, e.g. COVID 19 pandemic, giving health workers priority access to newly available vaccines;
- Provide adequate resources to prevent health workers from injury and harmful exposure to chemicals and radiation.

f) Grievance redress mechanism:

The grievance mechanism is to address complaints promptly and effectively which is appropriate and accessible to all, at no cost. The procedure will not prevent access to judicial or administrative remedies. Acceptable and easy mechanism for grievance redress should be in effect to resolve worker issues.

Specific Actions for protection in work place are:

- Following the infection control guidelines of the workplace.
- Using Personal Protective Equipment (PPE), such as gloves, goggles, and/or masks Facial shields etc.
- Treating all blood and body fluids, handling and disposing of needles and sharp instruments as per BMWM Rules.
- Getting immunized for necessary vaccines.
- Use rounded blades in place of sharp blades and use neutral zones to transfer sharps and hazardous materials.
- Avoiding grabbing sharps with fingers and passing of sharps and in case of injury avail measures of PEP (post exposure prophylaxis).
- Work ergonomically which include keeping objects within easy reach, raising beds when examining patients, and alternating positions frequently to avoid being locked in one position.
- Washing hands regularly so as to prevent the spread of infection – from patient to patient and from patient to healthcare worker.



2. Beneficiaries and Community strategy:

- a) Patient Health and Safety
- b) Community engagement and information disclosure
- c) Grievance mechanism

a) Patient Health and Safety

Patient safety involves avoiding errors, limiting harm, and reducing the likelihood of mistakes and errors. Mortality or Morbidity due to avoidable hospital errors is a serious concern. Care providers, patients, and support staff share the same goal; the best possible treatment outcome. However, it takes planning, commitment and work to maintain a safe hospital environment.

- The health care facility should anticipate and avoid adverse impacts on the health and safety of the patient.
- Incident register and adverse event register should be maintained and reviews to be conducted for corrective measures.
- Prescribed safety norms are to be in place without default.
- The Health care facility will document its emergency preparedness protocols and response activities, resources, and responsibilities and will train its personnel with mock drills periodically.

b) Community Engagement and Information Disclosure

- The health care facility is to identify its various stake holders and build and maintain a constructive relationship with them. It should encourage community participation in the facility's environmental and social performance.
- The health care facility will ensure that needy information on environmental and social issues is made available to stakeholders in an understandable and appropriate manner.

b) Grievance redress mechanism

The facility will document all grievances received from patients or others. Handling of grievances will be done in a discreet, sensitive and responsive manner. This will also allow for anonymous complaints to be raised and addressed.

- a) The definitive ways in which users can submit their grievances are to be specified and displayed in the premises. The grievance may include submissions in person, by phone, text message, mail, e-mail.
- b) A register in which such petitions received and remedial action taken should be maintained.
- c) The grievance procedure, and the governing structure for the redress should be transparent.
- d) An appeal process to which unsatisfied grievances may be escalated should also be clearly defined.



14. THE PATHWAY TO IMPLEMENTATION

The pathway for the implementation of the strategy can be mapped in the following steps:

1. Adoption of the environmental strategy



2. Setting up Organizational Framework

(Merger/Reconstitution of State level committee, District level committee, Facility level committee etc.)



3. Adoption of interventions and Measurement System (Indicators)

(Formulating checklist and scoring system as per the need)



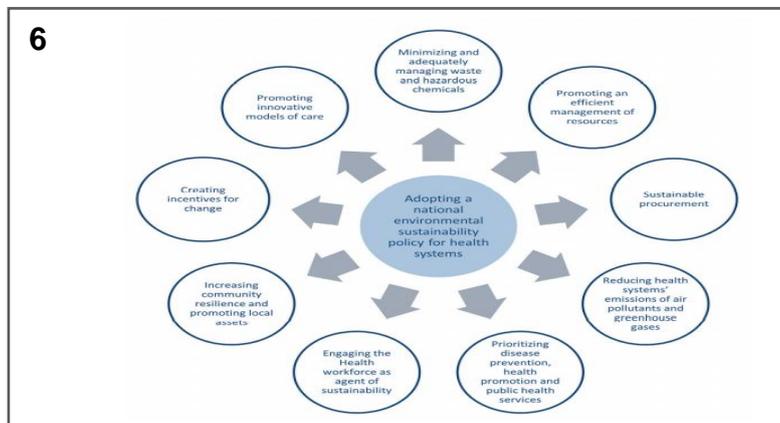
4. Training and Capacity Building

(Environmental health awareness workshops, Bio-Medical Waste management Training, Training for Disaster management, training to sanitary workers in workplace safety etc.)



5. Facility level environment safety improvement

(Facility level SWOT analysis, Energy audits, corrective actions, rapid improvement events, standard operating procedures, calibration & EQUAS, facility policy and objectives, satisfaction survey etc.)



7. Sustenance & Incentives

Recognition and felicitation of achievement, financial and non-financial incentives



There is no predetermined path for implementing this plan, but hospitals themselves should adopt steps of good environmental practices. ***Specifically, they can start with waste management, energy and water consumption.*** Basic energy and water saving methods (such as LED bulbs and two stage flushing) can be adopted. Basic recycling policies are also easy to implement without excessive financial burden. This first step is "***Mitigation***".

Environmental friendly activities have become an important tool to achieve effective compliance and awareness. Environmental awareness is to understand the fragility of environment and the means of its protection. As a major contributor to air, water, and other kinds of pollution, health care can damage health even as it heals. By working together to reduce the environmental impact of health care, doctors and patients can keep themselves, and the planet healthier for generations.

A further step, "***Strategic Actions***" involves actions that deeply modify the services provided by the hospital to avoid negative impacts. Systems are to be in place to promote environmental innovation and practices. Eg. Traditional hospital design predominantly focuses on operational efficiency, however, patient-centred building design should also focus on air quality, noise dampening, and standardized fixtures that reduce contagion spread, such as employee hand sinks, elbow taps, cross ventilated rooms etc.

Maintaining a safe environment reflects a level of compassion and vigilance for patient welfare by the health care facility. The way to improve safety is to learn about causes of the risks and use this knowledge to design systems of care to "... make errors less common and less harmful when they do occur". The health care facility has to intensify its efforts to understand and change organizational processes of health care as they relate to patient safety.

The single largest factor driving health care pollution is clinical care. Every diagnostic and therapeutic choice that physicians and patients make, affects nearly every category of environmental impact — waste generation, chemical use, water consumption, energy use, and, indirectly, building construction. All the attributes of health care—the medications administered, the surgical procedures performed, the health behaviour recommended to the public, the system to deliver services—ought to be safe, effective and established by evidence. (Gawande, 2007; IOM, 2000; Smith, 2005).

Hospital administrators shall continually monitor and evaluate how employees follow established policies. Institutional administration may use this information to adjust organizational policies as needed.

Motivated providers are less likely to make medical errors and are more likely to be empathic towards patients. Good working conditions, regular pay, clinical support, and opportunities to learn and grow are essential to maintain a workforce that is motivated and committed to providing high-quality care.

ENVIRONMENTAL STRATEGY FOR GREEN CLEAN HOSPITALS TOWARDS LOW CARBON FOOT PRINT

To limit global warming to 1.5°C, Hospitals need to cut current greenhouse-gas-emission levels in half by 2030 and reduce them to "net zero" by 2050, in line with the Paris Agreement. For this carbon crediting should be increased.

There are three basic types of carbon credit:

- from reduced emissions (typically energy efficiency measures)
- Removed emissions (carbon capture and planting greeneries)
- And avoided emissions (for example refraining from cutting down Trees).



A **carbon footprint** is the amount of greenhouse gases—primarily carbon dioxide—released into the atmosphere by a particular human activity. It is usually measured as tons of CO₂ or other greenhouse gases emitted per year.

Methods of reducing carbon footprint include driving more-efficient vehicles, taking public transportation, using energy-efficient appliances, insulating the facilities to reduce heating and air conditioning costs, consuming food that doesn't require as much transportation, and eating less meat, which has a higher carbon footprint than fruits and vegetables.

Hospitals can achieve **low carbon emission** and **high carbon credit**. Every kWh of energy wasted in hospitals leads to high quantity of CO₂ emissions to the atmosphere, thus climate change happens as CO₂ is a greenhouse gas. To mitigate this, the system needs to calculate carbon foot print, increase carbon credit and put in carbon sequestration based hospital operation. The Percentage of Hospital Energy through renewable resources should be improved. Energy Self-sufficiency in Hospitals needs to be ensured. Newer concepts such as Wind mills in Hospitals, Solar Energy on roof top of hospitals, Biogas energy generation using the food waste from the canteen and other organic solid wastes has to be encouraged.

15. SUPPORTING GREEN HEALTH CARE AND WAY FORWARD

Public health should address principally the fundamental causes of disease and requirements for health, aiming to prevent adverse health outcomes." (Thomas et al. 2002). Green health care falls squarely in the tradition of public health because the fundamental cause of disease is the Biotic and Abiotic factors and the fundamental requirement of the society is a healthy environment.

"**Green Investment**", involves financial/resource investment, periodical training etc. Here comes the concept of ECO_LABELLING. *Eco-labels and certificates are to announce to the consumer about the eco performance of the product.* This label also ensures that the product has met the minimum standards for consumer safety as well. Hospitals and health care facilities use large quantities of materials, manpower and other resources. Utilisation of eco-labelled material is to be encouraged. Health care decisions in the utilisation of eco-friendly resources and products ought to consider both patient safety and public health, neither to be ignored.

Environmental issues are created when the rate of depletion of resources exceeds the rate of replenishment/ availability. Hence conservation, mitigation and antipollution activities are necessary in health care facilities. Energy star ratings which denote the energy performance level of appliances is one example, while LEED standards (Leadership in Energy and Environmental Design) is another example of buildings being rated according to their energy performance. Administrators have to encourage these standards and promote activities which fall on these lines.

Healthcare institutions are complex systems and they do not change easily or quickly. Many factors drive change, including new protocols, new regulations, demands for quality, data for reporting, etc. Advocates of green health care need to understand the institutional dynamics, including the strengths and weaknesses of particular institutions and the opportunities and threats both at the institutional level and in the larger operating environment. Hence strength-weakness-opportunities-threats (SWOT) analysis is a pre-requisite even before operationalizing Green Health.

With environmental degradation and environmental risks emerging as the single biggest source of diseases – from ordinary water borne diseases to cancers – the plans for setting up a network of capacity building within institutions and also with field experts should be modelled in line with the existing guidelines and rules and acts. Examples may be sought from the guidelines of All India Institute of Hygiene and Public Health, Kolkata, and the Centre for Occupational and Environmental Health, Delhi.



The main drivers regarding the adoption of environmental sustainability programs are *Regulation, and Ethics*. The regulative dimension is the most obvious of these because it exerts a coercive power and compliance. The regulator can also provide the necessary support to organizations for the implementation. The other dimension refers to the ethical aspect and it appeals to the moral responsibility of the individual and the facility.

Regulatory factor	<ul style="list-style-type: none"> • The environmental program aims at fulfilling environmental regulations. • The organization improve its processes in order to achieve greater environmental and economic efficiency. • Allocation of resources, financial and otherwise, are consistent and cover the needs of environmental management. • There is concern about the environmental efficiency of suppliers and service providers who serve the organization. • Incident prevention aims to avoid fines, compensations and penalties. • Waste disposal aims to meet the minimum needs established by the legislator or regulator.
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Ethical factor	<ul style="list-style-type: none"> • Environmental sustainability is a challenge for all and we have to do our part because it's the right thing to be done • Environmental responsibility programs have positive effect in ensuring short and long term benefits for the community and mankind as a whole. • The highest level of management of the organization is actively involved in environmental responsibility programs hence all other levels also fall in line. • A good precedence shall pave a good pathway for others to follow.
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Some hospitals and health care systems are already working to improve their environmental performance. Go Green, Health care without harm, Clean and Green are some of the mottos that the facilities can acknowledge in their mission statement. Finally, we should all demand better environmental performance by health systems and health professionals.

16. LIST OF PRIORITIZED ENVIRONMENTAL SAFETY INTERVENTIONS

Interventions by definition are the acts of interfering with the outcome or course especially of a condition or process (as to prevent harm or improve functioning). Interventions are at three levels: macro, meso and micro.

Macro interventions will be prioritized because they are system-wide and has more sustained impacts. Interventions should focus on reducing waste (particularly reducing the use of unnecessary plastics, single-use items, drugs and interventions more generally). Reducing pollution is equally important, especially greenhouse gas emissions, including anaesthetic gas.



Levels / Characteristics	Domain	Area of Intervention	Selected/Prioritized Intervention
MACRO - State Government or other state-level stakeholders. - System-wide interventions via regulations, standards, large scale engagement, etc.	Enhance population demand for environmental safety.	Formalized citizen engagement and empowerment	Annual Tamil Nadu District and State Health Assemblies with resolutions/actions to improve environmental friendly interventions as an agenda.
		Population level IEC and environment related literacy	1. Development and implementation of environment protection initiatives and to empower citizens / patients to take charge of keeping hospital environment clean and hygienic. 2. Comply with existing rules and regulations of the state as well as the facility. 3. Understand and demand for safe environment and hold providers accountable for the same.
		Public reporting of the health care facility safety certification	<ul style="list-style-type: none"> • Publicize the results of <ol style="list-style-type: none"> i. Facility certification e.g. Building stability, CEA license, Rain water harvesting etc. ii. Facility accreditations and star ratings etc.
	Advocacy for environmental friendly issues	Monitoring & Comparative benchmarking Institutional arrangements for environmental strategy	<ul style="list-style-type: none"> • Facility assessment <ol style="list-style-type: none"> i. For evaluating safety aspects in the hospital ii. Periodic safety surveys Permanent member in the health department established at state level- a dedicated officer in all the directorates.
		External evaluation and certification	Environmental clearance & certification from TNPCB ,fire safety department safety certificate etc.
		Self-regulation by professional associations (e.g. IMA, NHB)	professional associations/groups to create SOPs/protocols/guidelines as per the local need and demand
		Professionalization of facility administration/management	Administrative reforms which improves the green strategy of the Health Care Facility. Training for the hospital staff in mitigation, management etc. Integrated stake holder management
		Private sector	Extended environmental focus to private sector institutions including registrations as per CEA, BMWM etc.
	Transform the health work force	Improve work environment	Ensuring HR as per necessity Protecting the vulnerable – women workers Providing CRECHES, library, Yoga centre, Gym etc.



Levels / Characteristics	Domain	Area of Intervention	Selected/Prioritized Intervention
	Incentives & finance	Performance based financing	Institutional performance based incentives for 'GO GREEN VENTURES' e.g. awards on Environment day June 5
		Non-financial incentives	non cash incentives for exemplary performance (exchange program, sponsor for training, etc.),
MESO (Subnational levels) (district, sub-district ,etc.,)	Networking of providers	Environment friendly collaborative	<ul style="list-style-type: none"> Strengthening and linking existing quality improvement collaborative and networks at district level. Mentors from best practice facilities to provide support to other facilities
	Strengthening of district planning and management	District planning and management	<ul style="list-style-type: none"> District environment committee strengthening
	Networking of patrons	Corporate and patrons support	<ul style="list-style-type: none"> Formation of facility welfare groups, Eco- clubs to aid in green hospital activities.
MICRO (providers, patients interface) Characteristics – implemented at the interface between health workers and patients. -	Facility	Improvement of supplies and infrastructure,	<ul style="list-style-type: none"> periodic facility environmental improvement plans based on gap analysis
		Audit and feedbacks	<ul style="list-style-type: none"> Conducting audits for various issues like – adverse events, incident reports, safety audit, energy audit, complaints, etc. with a feedback and action taken report.
		Reviews and redresses	
		Adverse event reporting	<ul style="list-style-type: none"> Strengthening and scaling of the incident reporting and adverse event reporting
		Continuous improvement cycles	<ul style="list-style-type: none"> Set up and operationalize all institutions with committees related to environment care.
	Health care worker	Mentorship	<ul style="list-style-type: none"> Assess and provide supportive supervision for adopting standards/ protocols, safety check list and decision support tools for environ friendly care.
		Supportive supervision	
		standards/pathways/ protocols	
		Safety checklists/ Innovative job aids/ decision support tools	
	Individual patients	Patient education	<ul style="list-style-type: none"> Develop counselling capacities of the facilities to address various patient related issues.
		Patient feedback on experience of care	<ul style="list-style-type: none"> Patient experience study systems to be put in place in all facilities.



17. STAKEHOLDERS AND THEIR ROLES

STAKEHOLDERS IN TN HEALTH SECTOR	ROLE IN ENVIRONMENTAL STRATEGY
Department of Health and Family Welfare	Policy, strategies, standards, regulations, oversight, regulation, resource mobilization
Government apex/ research institutions	Insights for policy/strategy/data/standards
Providers of facilities at all levels in Tamil Nadu (public and private)	Provide green healthcare service
Medical colleges (Public and private) Nursing colleges (Public and private) Paramedical colleges Dental colleges	Transform pre-service training, Provide green healthcare services,
Accreditation agencies	Accreditation/certification of health care facilities
Professional associations Indian Medical Association(IMA), Nursing Home Board(NHB)and other Private sector associations in the healthcare	Advisory, behaviour change, capacity building, self-monitoring Feedbacks on new regulations

STAKEHOLDERS OUTSIDE THE HEALTH SECTOR	ROLE IN ENVIRONMENTAL STRATEGY
Department of Finance	Provision of finance
Department of Environment	Support for service delivery in the health care facility by creating awareness, eco-restoration activity, climate change mitigation initiatives.
Procurement agencies: PWD,ELCOT,TNMSC	Procurement of infra, equipment, drugs, services, etc. and adequate supply chain management in line with environ safety
Municipal Corporations	Oversight, regulation and service delivery
Departments of police, electricity, water supply, urban local bodies and civil supplies	Support functions for service delivery in the health care facility.
Social Welfare – Women and Child Development & Tribal welfare	Nutrition, women and child welfare service delivery
Mass media organizations (radio, Magazine newspapers, etc.)	Awareness generation, information sharing & creates demand for green hospital green services
Patient societies/community groups-NGOs/civil societies	Peer support/peer education, patient advocacy Holding provider accountable for quality of services
AERB certification, TNPCB, fire and rescue department Etc. and etc.	Certification, mock drills,



18. ORGANIZATION STRUCTURE FOR IMPLEMENTING ENVIRONMENT STRATEGY WITHIN THE HEALTH SECTOR

Effective implementation of any strategy necessitates a strong institutional framework.

This IC-WM Plan and the environmental strategy necessitates a three-tier Task Force. G.O. (Ms) No. 254, dated. 24.06.2020 of the Health and Family Welfare (F1) Department states the constitution of State level Inter Department Coordination Committee, the District level Inter Departmental Coordination Committee and the Expert (Technical) Committee-(21 committees in Toto), for the functioning of the newly formed occupational, social and environmental health wing in the office of the Director of Medical and Rural Health Services(G.O.is in annexure) .This committee may be identified as the one which will give technical guidance in implementing this environmental strategy. In addition to the committees mentioned in the Government Order, a facility level Committee may also be formed to implement this strategy at the institutional level.

- At the **state level**, Principal Secretary is the head. The other members are as detailed in the BMW state committee nominations (as per the Act) and as per the above mentioned G.O. The meeting of State Level Inter Department Co-ordination committee shall be conducted once in six months.
- At the **district level** DM/Collector and District Nodal Officer /Chief Medical Officer/District Medical & Health Officer among others are the members. The meeting of District Level Inter Departmental Co-ordination committee and Expert (Technical) committee shall be conducted on quarterly basis.
- All implementing facilities should be members in **District level environmental club**. District Level BMW Advisory Committee under the Chairmanship of District Collector will guide this club in promoting environmental friendly activities.
- Deans of Medical Colleges are included in the respective District Committees. The Joint Director will coordinate with other stake holders.
- At the **facility level** the Medical Superintendent (MS) or Resident Medical Officer will be the head of the advisory committee. It is proposed a safety officer can also be included in the facilities organization committee. One Nodal officer should be identified and given the overall responsibility for IC-WM planning and implementation of environmental strategy.

Meeting of stakeholders should be convened periodically and the continuous process of planning and development has to be undertaken. All the three-tiers has to work towards the goal of a safe and healthy environment.

State Environmental Inter Departmental Coordination committee

This committee's Chairperson is the Secretary Health and Family welfare and the member secretary is Director of Medical& Rural Health Services. The committee has members including the heads of various departments and projects. The other members are listed in the government order

1. Chairman, Tamil Nadu Pollution Control Board (TNPCB),
2. The Additional Chief Secretary to Government, Labour & Employment Department,
3. The Principal Secretary to Government, Rural Development & Panchayat Raj,
4. The Commissioner, Rural Development & Panchayat Raj (Training),
5. The Mission Director, National Health Mission,
6. The Commissioner of Mines and Geology,
7. The Managing Director, Tamil Nadu Corporation for the Development of Women (TNCDW),
8. The Commissioner of Labour,
9. The Chief Engineer, Tamil Nadu Pollution Control Board (TNPCB),
10. Director of Medical & Rural Health Services (ESI),



11. Director of Medical Education (DME).
12. Director of Public Health & Preventive Medicine (DPH&PM),
13. Director, Directorate of Industrial Safety (DISH).
14. Director, National Institute of Epidemiology,
15. Director, Regional Labour Institute (RLI),
16. The Secretary, Construction Welfare Board,
17. The Secretary, Manual Workers Welfare Board,
18. Officer-In charge, Regional occupational Health Centre, Indian Council of Medical Research (ICMR),
19. Director, National Institute for research in TB (NIRT),
20. Nodal Officer (Occupational Health Specialist), Office of the Director of Medical and Rural Health Services,
21. President, Indian Medical Association (IMA), Tamil Nadu Branch,
22. President, Tamil Nadu Medical ,
23. Representatives from the Trade Union, NGOs and Not for Profit Organizations

This committee in addition to the responsibilities specified in the Government Order will also:

- 1) Provide overall guidance and directions for the development and adoption of the TN environmental strategy (TNES) for healthcare facilities.
- 2) Review periodically the TNES implementation and make course correction as needed.
- 3) Approve annual action plan for implementation of TNES (including key interventions).
- 4) Select the winners of the Annual GREEN AND CLEAN HOSPITAL AWARD.

District Environmental Inter departmental Coordination committee

This committee is headed by the district collector and has membership of around ten members from various departments, private healthcare sectors, local bodies etc. the activities in addition to those specified in the government order are:

- 1) Ensure adoption and implementation of environment friendly initiatives.
- 2) Participate and monitor audits at the district, facility level and provide supportive supervision to the healthcare facility in the districts.
- 3) Support certification/ accreditation of health care facility in the districts.
- 4) Ensuring participation in eco-friendly activities in the community.
- 5) Ensure implementation of intervention recommended in TNES.
- 6) Provide feedback to the state unit periodically.

Facility Committee for Environmental issues	
This committee is in the facility level. The details of the membership of the committee is given below	
Chairperson	Hospital Superintendent of the DHQH/ CMO/ Medical Superintendent of medical college hospitals
Members	One dedicated Nodal Officer in the category of Medical Officer/Hospital Manager
Member	Nursing Matron / Nursing superintendent
Member	Chief Pharmacist / stores in-charge
Member	Outsourcing representative
Member	Community /NGO representative
Additional members as per the need of the institution	



Responsibilities of the Facility Committee:

The Facility Committee is a unit in the facility which will monitor and will strive for the adoption of the strategy in the facility and to look into environmental issues. Duty of the unit is to perform the following functions:

- 1) Monitoring the facility in terms of eco vigilance and to regulate BMWM compliance.
- 2) Provide supportive supervision to the facilities in the district
- 3) Support certification/ accreditation of health care facility in the districts
- 4) Monitor implementation of interventions recommended in TNES and thus improve environmental health indicators.
- 5) Provide feedback to the state and district units periodically

19. ENVIRONMENT HEALTH INDICATORS

Environmental health indicators are pointers towards the effects of the environment on health. The areas encompasses 11 environmental issues of public health importance and is based on the DPSEEA (Driving force – Pressure – State- Exposure– Effect – Action) framework. ***These indicators can be revised from time to time as per the significance and need.***

Environmental health indicators are for:

- Monitoring trends in health outcomes linked to environmental hazards and exposures and raising awareness about environmental health issues.
- Comparing data in terms of environmental health status in order to target action and allocate resources;
- Monitoring the effectiveness of policies and interventions on environment and health;

Matrix of the Strategy evaluation indicators

Objective	Proposed indicative indicators
Protect and improve air quality	<ul style="list-style-type: none"> • Air quality improvement rate (sulphur oxides, nitrogen oxides and suspended particulates) • Respiratory disease rates
Protect and improve water quality	<ul style="list-style-type: none"> • Number of operating Waste Water Treatment Plants • Success rate of water quality indicators for Waste Water Treatment Plant WWTP • Number of hospitals serviced with safe system of drinking water
Control land degradation	<ul style="list-style-type: none"> • Proportion of green areas to built areas
Develop and improve waste management	<ul style="list-style-type: none"> • Integrated system for waste management in place • Percentage of sorted solid, paper and plastic wastes • Percentage of recycled solid waste • Biogas plant established
Reduction of pollution	<ul style="list-style-type: none"> • Percentage of institutions conducting pollution management training • Comprehensive control and monitoring system
Reduction of radioactive contamination	<ul style="list-style-type: none"> • Study of locations for treating and burying radioactive wastes
Integrated management of hazardous chemicals	<ul style="list-style-type: none"> • Comprehensive maps and surveys on the spread of chemicals in the hospital environment • Percentage of hazardous chemicals disposed of in environmentally sound ways
Develop institutional and legal framework of environment sector	<ul style="list-style-type: none"> • Number of prepared and approved environmental strategies and plans • Number of institutions integrating the environmental dimension in their own policies • Number of relevant scientific researches



STATE LEVEL ENVIRONMENTAL HEALTH INDICATORS:

Issue	Effect	Type	Frequency	Source of data
Air Quality	Annual average concentration of NO ₂ , PM ₁₀ (or BS or TSP) and SO ₂ ;	Exposure	Annual	Environment Survey
	Mortality rate due to respiratory diseases in children	Effect	Annual	HMIS
	Mortality rate due to respiratory diseases all ages	Effect	Annual	HMIS
Noise	Percentage of population with exposure to noise above 80 dB	Effect	Annual	Environment Survey
	Percentage of population with sleep disturbance due to noise	Effect	Annual	HMIS/survey
Waste and Contaminated Lands	Percentage of children with blood lead level > 10µg/dl	Exposure	Annual	HMIS / Survey
Radiation	Annual incidence rate of skin cancer	Exposure	Annual	HMIS/Cancer registry
Recreational water	Number of outbreaks of waterborne diseases	Effect	Annual	HMIS/IDSP report
	Percentage of estimated liquid waste captured and treated	Action	Annual	Institution Report
Drinking water	Diarrhoea mortality rate in children under five years of age	Effect	Annual	HMIS
General	Strengthen disaster mitigation policies/manuals/drills for State and districts	Action	Annual	HOD Report
	Undertake studies to investigate links between climate change and disease patterns, also between pollution loads and disease patterns	Action	Annual	DME Report
	Research on development of low cost vaccines, particularly related to vector borne diseases	Action	Annual	DME Report
	Public education on prevention of diseases related to climate change and environmental pollution	Action	Annual	Survey
Waste Management	Scientific management of municipal solid waste (MSW) and plastic waste in all hospitals	Action	Annual	HOD Report
	Policy and incentives for rooftop solar power generation and provision of grid connectivity	Action	Annual	HOD Report
Energy Efficiency	Use of fuel or energy efficient electronic and electric equipment (including Retrofitting)	Action	Annual	HOD Report
	Promotion of affordable alternative energy sources i.e. solar water heating systems, solar lights, etc.	Action	Annual	HOD report
	Enforce the laws on management of municipal solid waste and plastic waste (the PCB is a statutory authority in this matter)	Action	Annual	HOD report
	Enforce energy audit in hospitals	Action	Annual	HOD report
	Energy saved as a result of action following from the audit	Action	Annual	HOD report
Food safety	Incidence of microbiological food-borne diseases	Action	Annual	HMIS/IDSP
Chemical Emergencies	Mortality rate from chemical incidents	Action	Annual	HMIS
Workplace	Annual incidence rate of occupational injury and illness	Action	Annual	HMIS
	Statutory reports of occupational disease	Action	Annual	HMIS



DISTRICT LEVEL ENVIRONMENTAL HEALTH INDICATORS:

S.no	Framework Element	INDICATOR TITLE	Numerator / Denominator	Freq uenc y	Source of data	DPSEEA
1	Outdoor Air	Number of hospital admissions for respiratory diseases	No.of patients admitted for respiratory diseases/ Total no.of general admissions	Monthly	HMIS	Effect
2		Percentage of children under 18 years with Asthma and chronic bronchitis	No.of patients under 18years with asthma and chronic bronchitis / Total no. of patients admitted for respiratory diseases	Monthly	HMIS	Effect
3	Indoor Air	Proportion of hospitals having a moisture problem, visible mould or mould odour	Proportion of hospitals having a moisture problem, visible mould or mould odour/ Total no.of hospitals in the district	Annually	PWD report	Exposure
4		Proportion of hospitals exceeding indoor air radon concentration of 200 Bq/m ³	Proportion of hospitals exceeding indoor air radon concentration of 200 Bq/m ³ / Total no.of hospitals in the district	Annually	Environment Survey	Exposure
5	Noise	Number of people at working place exposed to noise levels (8 hr)>80 dB(A)	Number of people with occupational deafness ----- Total number of patients with occupational disease	Annually	Environment Survey	Exposure
6	Hazardous Waste	Amount of hazardous waste disposed with regard to the total waste disposed	Amount of hazardous waste disposed in kgs/ total waste disposed in Kgs	Annually	Environment Survey	Pressure
		Cancer incidence for children under 20 years by type	Number of children under 20 years with cancer related to environmental hazards ----- Total number of children under 20years with newly diagnosed cancer	Annually	Environment Survey/ Cancer Registry	Pressure
		Average concentration of lead in blood for children under 5 years of age	number of children (under 5years) with toxic levels of lead in blood ----- Total number of children screened(under 5years)	Annually	Environment Survey	Pressure



7	Recreational Water	Frequency of water quality monitoring	Total water recreated in litres/ Total water Flow in litres	Annual	Hospital report	Action
		Number of facilities having rain water harvesting	Number of facilities having rain water harvesting/ Total no.of facilities in district	Annual	Hospital report	Action
8	Drinking Water	Number of IP cases of proven water-borne diseases	Number of IP with water-borne diseases/ Total no.of IP general medicine admissions	Monthly	HMIS/ IDSP	Effect
		Maintenance of water bodies (Wells tanks, sump etc.) and restoration of existing water bodies (Rain water reservoir)	Total number of water Bodies maintained for the year ----- Total number of water bodies	Annual	Hospital Report	Action
		Mandatory rainwater harvesting in hospitals	Number of hospitals with rainwater harvesting ----- Total number of hospitals	Annual	Hospital Report	Action
9	General indicators	Infant mortality rate - The number of deaths to children under 12 months of age per 1,000 live births	No.of deaths under 1 year of Age which occurred among the population of a given area during the given year _____ x 1000 No.of live births which occurred among the population of a given area during the given year	Annually	Review of Records	Outcome
		Under 5 mortality rate - The number of deaths to children under five years of age per 1,000 live births	Deaths between 0-4 years during the year of calculation _____ X 1000 live births of new born during the year of calculation	Annually	Review of Records	Outcome
10	Chemical emergencies	Incidence of people hospitalised because of chemical incidents	Incidence of people hospitalised because of chemical incidents/ Total no.of IP general medicine admissions	Monthly	HMIS	Effect
11	Radiation incidents	Radiation incidents reported In the given time period	Radiation incidents reported In the given time period\total adverse events reported	Outcome	Monthly	Effect & Expo
12	Work place safety	Committee in Place and functional- Visaka Committee	No of hospitals having functional visaka committee / total no. of hospitals	Process	Annually	Review of Rec



FACILITY LEVEL ENVIRONMENTAL HEALTH INDICATORS:

S. N	Indicators	Definition	Formula	Type of Indicator	Frequency	Data source
1.	Access to safe water	Proportion of hospital wards having potable water supply for drinking (24x7)	Hospital wards with potable water supply / Total wards in the hospital (24x7)	Structure	Half-yearly	Survey/ reports
2		Proportion of hospital wards having safe water supply for drinking:	Sample with approved quality criteria ----- Total number of sample taken	Structure	Half-yearly	Survey/ reports
3		Collection of rain water	Number of buildings with rain water harvesting/ total number of buildings in the hospital	Structure	Annual	Survey
4		Recycling of grey water %	$\frac{\text{Litres of recycled water}}{\text{Total litres of waste water collected}} \times 100$	Process	Annual	Review of Records
5	Access to sanitation	Proportion of hospital toilet with 24/7 running water	$\frac{\text{Number of hospital toilets with 24/7 running water}}{\text{Total number of toilets in the hospital}}$	Structure	Annual	Review of Records
6	Air	Number of hospital admissions for respiratory diseases	$\frac{\text{No.of patients admitted for respiratory diseases}}{\text{Total no.of general admissions}}$	Effect	Monthly	HMIS
		Proportion of hospitals having a moisture problem, visible mould or mould odour	$\frac{\text{Proportion of wards having a moisture problem, visible mould or mould odour}}{\text{Total no.of wards in the hospital}}$	Exposure	Annually	PWD report
7	Percentage of caregivers with appropriate hand washing behaviour	Appropriate hand washing behaviour (includes critical times and technique)	$\frac{\text{Appropriate hand washing behaviour among health care workers}}{\text{Total health care workers}} \times 100$	Process	annually	Staff Interview
8	Prevalence of diarrhoea	Percent of children under five years old who had diarrhoea among the Paediatric admission	$\frac{\text{children under five years old who are admitted with diarrhoea}}{\text{Total paediatric admissions}} \times 100$	Outcome	Monthly	Review of Records
9	Prevalence of acute respiratory infection	Percent of children under five years old who had ARI among the total Paediatric admission	$\frac{\text{children under five years old who had ARI}}{\text{Total paediatric admissions}} \times 100$	Outcome	Monthly	Review of Records



10	BMWM	Disposal mechanism of BMWM with full compliance	$\frac{\text{No. of wards implementing BMWM}}{\text{Total no. of wards in the hospital}}$	Process	Monthly	Review of Records
11	Regulations	Mandatory certificates Available	$\frac{\text{Certificates Available}}{\text{Total no. of Mandatory certificates needed}}$	Process	Annual	Review of Records
12	Committee in Place and functional	Visaka Committee	$\frac{\text{No of cases resolved}}{\text{Total no of cases reported}}$	Process	Monthly	Review of Records
13	Security	Theft/Security related Events reporting system	$\frac{\text{Theft/Security related Events reported}}{\text{Total adverse events reported}}$	Process	Monthly	Patient/staff interview
14	Clinical services	Radiation incidents reported In the given time period	$\frac{\text{Radiation incidents reported In the given time period}}{\text{Total adverse events reported}}$	Outcome	Monthly	Review of Records
15	Support services	Ventilation and temperature control in wards	$\frac{\text{Ventilation and temperature control in Wards}}{\text{Total no. of wards}}$	Structure	Monthly	Physical verification
16	Support services	Availability and percentage of Green cover (shrubbery, Herbal Garden etc.)	$\frac{\text{Area of Greenery}}{\text{Total area of the hospital}} \times 100$	Structure	Annual	Physical verification
17	Optimal utilisation of resources	% of Increasing energy efficiency in lighting , electrical appliances etc	$\frac{\text{Energy annually consumed by the hospital}}{\text{Energy consumption of previous year}} \times 100$	Outcome	Annual	Hospital record
18		Electricity generation using non- conventional sources like food residues, solid waste, wind and solar	Bio-gas production rate	Structure	Annual	Hospital report
19		Promote energy efficient lighting, efficient climate control equipment etc. in hospitals	$\frac{\text{Number of energy efficient equipment replaced this year}}{\text{Total number of non-efficient equipment}}$	Outcome	Annual	Hospital report
20	Patient care	Enquiry counter/ help desk Functioning	$\frac{\text{No of hospitals having functional enquiry counter / help desk}}{\text{total no. of hospitals}}$	Structure	Monthly	Patient Interview



Adoption of Environmental strategies for short term action plan/targets:

Certain targeted activities may be taken up in the initial stages of the implementation of this strategy by the health care facilities. These activities point towards the improvement of environmental health indicators.

1. Indoor Air Pollution control measures especially in Operation theatres and ICU closest to Road with Cyclonic filters, Centrifugal filters, Centrifugal common Air filters
2. Noise management by identifying Noise dangerous zones in Hospitals and installing Glass Fibre Noise barriers in OTs, ICU etc.
3. At least 50% of all health care facilities will deploy solar power to meet 50% of their energy needs by 2025.
4. All health care facilities in the state to shift to efficient LED lighting by 2025.
5. At least 10% of health care facilities to generate Bio-Gas from solid waste for kitchen fuel.
6. All health care facilities to use only eco-friendly /non –hazardous cleaning /dis-infecting materials by 2025.
7. Water recycling plants to be established in at least 20% of health care facilities by 2025.
8. Rain water harvesting to be established in all health care facilities by 2025.
9. All hospitals are to be ensured as eco-friendly zones by 2025.
10. Robust grievance redress system in all health care facilities by 2025.

20. BIBLIOGRAPHY

1. Environmentally sustainable health systems: a strategic document –WHO
2. Access to Modern Energy Services for Health Facilities in Resource-Constrained Settings A Review of Status, Significance, Challenges and Measurement Acknowledge-WHO/WB
3. Infection Control And Waste Management Plan For National Aids Control Program, National Aids Control Organization, Government Of India, June, 2006
4. Environmental Protection Agency (EPA). EPA guidelines. Medical waste management–storage, transport and disposal.
[.http://www.epa.sa.gov.au/xstd_files/Waste/Guideline/guide_medical.pdf](http://www.epa.sa.gov.au/xstd_files/Waste/Guideline/guide_medical.pdf)
5. Community Practitioners’ and Health Visitors’ Association (CPHVA) [Internet]. Infection A2Z. Waste management: storage and disposal of waste [cited 2013 April 1]. Available from:
<http://www.infectiona2z.org/stdPage.aspx/home/Wastemanagement/CoreContent/Storageanddisposalofwaste>
6. Prüss A, Giroult E, Rushbrook P, editors. Safe management of wastes from healthcare activities. Geneva: World Health Organization; 1999.
http://www.who.int/water_sanitation_health/medicalwaste/wastemanag/en/
7. Doc 203: Health Care Waste Management Audit Procedures – Guidance, Doc 206: Inspection Checklist: Laboratory Waste Management
8. Doc 204: Inspection Checklist: Housekeeping/Waste Handler .Doc 207: Inspection Checklist: Supervisor/Matron
9. August_2019_1566047427_6804725 (Downloads 17.10.2020) https://www.who.int/quantifying_ehimpacts/publications/preventing-disease/en/



10. IOSR Journal of Humanities and Social Science (IOSR-JHSS) Volume 21, Issue 10, Ver. 5 (October.2016) PP 45-54 e-ISSN: 2279-0837, p-ISSN: 2279-0845. www.iosrjournals.org DOI: 10.9790/0837-2110054554 www.iosrjournals.org 45 | Page Causes and Effects of Cancer in Tamil Nadu: A Path Analytic Approach Mr A.Arunselvam* and Dr.S.Vadivel*
11. Environmental and Social Management Framework for India COVID-19 Emergency Response and Health Systems Preparedness Project, Ministry of Health and Family Welfare, Government of India, August 2020
12. Tamil Nadu: Disease Burden Profile, 1990 to 2016 http://www.healthdata.org/sites/default/files/files/Tamil_Nadu_-_Disease_Burden_Profile%5B1%5D.pdf
13. Environmental health indicators: Development of a methodology for the WHO European.
14. Proposal for Poverty Reduction Strategy HNP Core Indicators. Life cycle segment: Childhood, email FlaviaBastreo, World Bank 2000b.Billig and others 1999 www.worldbank.org/poverty/health/data/indicat.html WHO 2000 D. Whittington 2000
15. Tamil Nadu State Environment Policy 2017
16. TN Quality of Care strategy document 2020
17. Environmental social safeguard Assessment – World Bank
18. Operational guidelines for Quality Assurance in Public health facilities – 2013
19. Program Appraisal Document – Tamil Nadu Health system Reform Program
20. Control Guidelines: Pre-Treatment of HWW (WHO 2014).
21. Access to Modern Energy Services for Health Facilities in Resource-Constrained Settings A Review of Status, Significance, Challenges and Measurement – World Health Organization 2014.
22. https://www.ehf.org.il/en/health_Indicators_trends
23. State action plan on climate change for Andhra pradesh
24. Water Quality Parameters By Nayla Hassan Omer Published: October 16th 2019
25. LalitDandona. The impact of air pollution on deaths, disease burden, and life expectancy across the states of India: the Global Burden of Disease Study. Lancet Planet Health. 2019; 3: e26–39.)
26. (Liu C, Yavar Z, Sun Q. Cardiovascular response to thermoregulatory challenges. Am J Physiol Heart Circ Physiol. 2015;309(11):H1793-H1812. doi:10.1152/ajpheart.00199.2015)

