

## FULL PAPER

# Environmental sustainability practices (ESP) of health care sector in India

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The present study is an initiative to explore the performance of various hospitals relating to various environmental sustainability practices in the health care sector in the study area. Seven broad factors considered for the study were sustainable management -8 sub-variables, environmental communication-6 sub-variables, managing hospital pollution -3 sub-variables, resource conservation-7 sub-variables, water recycling -5 sub-variables, energy conservation-7 sub-variables, and patient room sustainability-8 sub-variables. Totally, 316 responses were considered for the study including lower level, middle level, and senior level employees of the hospitals under study. The results found that all the health care service providers are following the environmental sustainability practices as per norms, but still certain areas which need to be addressed by the health care providers in the study area.

### KEYWORDS

Sustainable management; environmental communication; managing hospital pollution; resource conservation; water recycling; energy conservation; patient room sustainability.

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## Introduction

There is a constant push to improve healthcare services and make sure they keep becoming better. Various projects targeted at accomplishing this objective are actively being engaged in by many healthcare organisations. However, many of these encouraging projects fail to keep up their momentum and do not provide long-term advantages despite large expenditures in terms of staff time and money [1-6]. Such failures not only squander important human and financial resources [7,8], but they also significantly alter how comparable providers provide care and lead to major variances in practises. These programmes often fail to maintain their momentum, even when they are initially effective in improving patient outcomes [7,8]. As a

result, future participation in comparable programmes is hindered by the waning trust and enthusiasm of staff, patients, and the general public towards reform initiatives [9,10]. It has become essential for healthcare planners and stakeholders to comprehend the environmental sustainability of implemented projects and assure the long-term effect of their investments considering rising demands, changing priorities, and resource rivalry [1,11].

Environmental sustainability has historically been seen as a "outcome" that preserves activities, activities, or labour capacity [8]. The cyclical and reflexive character of sustainability, as well as the on-going modifications that define the process, are not taken into consideration in a linear perspective of environmental sustainability,

according to some experts [13]. As a possible concept of environmental sustainability, the ideas of adaptation and continual development have lately come to light [14]. Environmental sustainability integrates ideas of adaptability, learning, and continuous progress by seeing it as a "process" as opposed to a predetermined result [15]. This viewpoint helps us to see environmental sustainability as a dynamic change process that can be impacted by people throughout the course of projects and is always changing and adapting to fit the demands of the system [15-17].

Many academics and healthcare professionals have created frameworks, models, and tools to promote and monitor environmental sustainability in healthcare settings due to the lack of agreement about the definition and influences of sustainability [12, 18]. However, since there is a lack of comprehensive overarching direction in this area of study, individual investigations have led to the development of new definitions, criteria, and techniques for assessing environmental sustainability [18]. While there have been some attempts to analyse frameworks that are exclusive to certain programmes and settings, there is still a need to thoroughly examine the existing strategies for environmental sustainability across all healthcare settings [15,18-19].

## Materials and methods

### Objectives

- To identify the environmental sustainability indicators in the health care sectors in Odisha, India
- To evaluate the performance of the hospitals on these parameters.

### Scope of the study

The present study is restricted to various selected government and private hospitals in

Odisha. The respondents include various paramedic staffs such as nurses, technical staff, patient care assistants, therapists, sanitarians, etc. Only private health care sectors are considered. In the present study, including KIMS Hospital, Care Hospital, Utkal Hospital, Kalinga Hospital, Appolo Hospital, AMRI Hospital, Sparsh Hospital, Blue Wheel Hospital, and SUM Hospital. The period of study spread over five months.

### Need for the study

The results of the current study will be used to assess the extent to which environmentally friendly practices are being used in Odisha's healthcare system today. This will help the policy makers to implement the environmental schemes for these hospitals.

### Sample size determination

In the current investigation, a sample size of 1:4 to 1:10 was computed (Rummel, 1970). According to the results of the current study, the sample size should be at least 4 times the number of things and at most 10 times the number of items. In this instance, 44 qualities were taken into account for the study. In the current study, 316 replies were included, which is within the minimum and maximum limits as per the sample size formula proposed based on Rummel, 1970, and Schwab, 1980. In the present situation, one should anticipate the sample size to be 176 minimum sample size and 440 maximum sample size.

### Research design

In this study, both primary and secondary data were utilised. Secondary data were used to identify research gaps. Snowball sampling was used for sampling procedure. We used the sustainability index developed by Smerecenik and Anderson (2011) to assess seven different aspects of hospitals' environmental performance. They include resource conservation, hospital pollution control,

environmental communications, water recycling, energy savings, and patient room sustainability. With scores of four for Completely Aware (CA), three for Aware (A), two for Neutral (N), one for Not Aware (NA), and zero for Completely Not Aware (CNA), this study employed a Likert-type five-point scale

approach to compute data and analysis of variance. To account for the numerous difficulties experienced by diabetes patients, data under seven parameters are generated using perception weights. The rank technique was used to get the conclusion.

**TABLE 1** Demographic profile of the respondents

Demographic variables	Details	Frequency	Percentage
Gender	Male	164	51.90
	Female	152	48.10
Age (years)	21-30	34	10.75
	31-40	123	38.94
	41-50	74	23.42
	51-60	42	13.29
	Above 60	43	13.60
	Diploma	55	17.41
Education	Graduation	127	40.19
	Post-graduation	67	21.20
	Others	67	21.20
Organization hierarchy	Junior level	126	39.88
	Middle level	117	37.02
	Senior level	73	23.10
	Less than 1	31	9.81
Period of service in current organization	Between 1-5	54	17.08
	Between 5-10	44	13.92
	Between 10 and 15	79	25
	Above 15	108	34.19
	Married	111	35.13
Marital status	Unmarried	115	36.40
	Widowed	54	17.08
	Divorced	36	11.39
Place of origin	Urban	109	34.49
	Semi-urban	118	37.35
	Rural	89	28.16

(Source: Primary data)

With reference to Table 1, 51.90% are male rest were female. In case of age group 34 respondents consists of 21-30 age group, 123 in the age group of 31-40, 74 are in the age group of 41-50, 42 were in the age group of 51-60, and the rest were above 60 years. In case of education, 55 in the diploma category, 127 were graduates, 67 post-graduations, and the remaining studied other courses.

In case of organization hierarchy, 126 were junior level, 117 were middle level and the rest were senior level employees. Similarly,

for the period of service, 108 were above 15 years of service, 44 were between 10-15 years, 54 were between 5-10 years of service, 54 were 1-5 years of service, and 31 were less than one year. With reference to marital status, 111 were married, 115 were unmarried and 54 were widowed and the rest were divorced. In case of place of origin, 89 were from rural, 118 from semi-urban, and 109 from urban.

## Results and discussion

**TABLE 2** Sustainable management

Variables	Overall Rank			Average rank	Final rank
	Junior Level	Middle Level	Senior Level		
Eco-Watch Brigade to assess the ecological impact of daily operations.	5	8	3	5.33	5
Manifesto of Earth Stewards for a Sustainable Future.	8	2	2	4	2
Regularly unveils the Ecological Footprint Gazette.	1	1	1	1	1
Orchestrates the Green Harmony Initiative for environmental preservation.	4	4	5	4.33	3
Enlists Eco-Visionaries as consultants to guide eco-conscious policies and initiatives.	3	6	4	4.33	3
Dispatches emissaries to symposiums dedicated to global ecological equilibrium.	2	7	6	5	4
Employs the Carbon Trailblazers Unit to gauge greenhouse gas emissions and carbon footprints.	6	3	7	5.33	5
Embraces acclaimed sustainability accolades, heralding a global commitment to Earth's wellbeing.	7	5	8	6.67	6

(Source: Annexure A, B, and C)

Table 2 presents the sustainable management practices shows that regularly unveils the Ecological Footprint Gazette stands first rank followed by Manifesto of Earth Stewards for a Sustainable Future. Similarly, Orchestrates the Green Harmony Initiative for environmental preservation and Enlists Eco-Visionaries as consultants to guide eco-conscious policies and initiatives stands third rank equally. Dispatches emissaries to symposiums dedicated to global ecological equilibrium stands fourth. Eco-Watch Brigade to assess the ecological impact of daily operations and Employs the Carbon Trailblazers Unit to gauge greenhouse gas emissions and carbon footprints both stands fifth rank. Embraces acclaimed sustainability

accolades, heralding a global commitment to Earth's wellbeing.

With reference to Table 3, promotes community involvement and support for environmental initiatives stands the first rank, engages in dialogues with other healthcare institutions regarding environmental sustainability stands the second rank which includes environmental statements in public messages or hospital descriptions and Holds frequent meetings to address and discuss environmental concerns both stands third rank. Followed by providing environmental education to patients and their companions and arranges staff training programs focused on environmental awareness ranks fourth and fifth, respectively.

**TABLE 3** Environmental communication

Variables	Overall Rank			Average rank	Final rank
	Junior Level	Middle Level	Senior Level		
Arranges staff training programs focused on environmental awareness.	3	5	5	4.33	5
Provides environmental education to patients and their companions.	5	1	6	4	4
Includes environmental statements in public messages or hospital descriptions.	4	3	4	3.67	3
Holds frequent meetings to address and discuss environmental concerns.	6	2	3	3.67	3
Promotes community involvement and support for environmental initiatives.	1	2	2	1.67	1
Engages in dialogues with other healthcare institutions regarding environmental sustainability.	2	4	1	2.33	2

(Source: Annexure A, B, and C).

**TABLE 4** Managing hospital pollution

Variables	Overall Rank			Average rank	Final rank
	Junior Level	Middle Level	Senior Level		
Possesses awareness of the environmental pollution in the vicinity of the hospital.	2	3	2	2.33	3
Plans and implements interventions to mitigate pollution.	3	1	1	1.67	1
Ensures the preservation and upkeep of the local habitat and biodiversity.	1	2	3	2	2

(Source: Annexure A, B, and C).

Based on Table 4, under managing hospital pollution, plans and implements interventions to mitigate pollution stands first rank, ensures the preservation and upkeep of the local habitat and biodiversity stands the second rank and possesses awareness of the environmental pollution in the vicinity of the hospital stands the third rank.

With reference to Table 5, related to resource conservation, implements the segregation of hazardous, biomedical, and

human anatomical wastes stands the first rank, supports the procurement of recycled goods and reusable products to minimize environmental impacts. Prioritizes the reduction, recovery, and recycling of flood-related wastes are the second and the third rank, respectively. Motivates patients to adhere to recycling procedures and values the purchase of energy-saving and less hazardous materials stands the fourth rank. Possesses information about local recycling firms, their

operations, and actively collaborates with them for recycling initiatives and Places emphasis on sourcing products from local

firms and companies stand the fifth and the sixth rank, respectively.

**TABLE 5** Resource conservation

Variables	Overall Rank			Average rank	Final rank
	Junior Level	Middle Level	Senior Level		
Implements the segregation of hazardous, biomedical, and human anatomical wastes.	2	1	1	1.33	1
Prioritizes the reduction, recovery, and recycling of flood-related wastes.	4	3	2	3	3
Possesses information about local recycling firms, their operations, and actively collaborates with them for recycling initiatives.	7	4	3	4.67	5
Supports the procurement of recycled goods and reusable products to minimize environmental impacts.	1	5	2	2.33	2
Motivates patients to adhere to recycling procedures.	3	6	4	4.33	4
Places emphasis on sourcing products from local firms and companies.	6	7	5	6	6
Values the purchase of energy-saving and less hazardous materials.	5	2	6	4.33	4

(Source: Annexure A, B, and C).

**TABLE 6** Water recycling

Variables	Overall Rank			Average rank	Final rank
	Junior Level	Middle Level	Senior Level		
Manages a cutting-edge on-site wastewater treatment facility that ensures the proper treatment of wastewater.	2	1	5	2.67	2
Incorporates measures to responsibly release treated wastewater into the surrounding environment.	1	4	4	3	3
Implements a sophisticated rainwater runoff collection and reutilization system.	5	3	2	3.33	4
Establishes guidelines for utilizing treated wastewater in landscaping irrigation and horticultural practices.	4	2	1	2.33	1
Implements a sustainable approach by utilizing recycled water for sanitation purposes.	3	4	3	3.33	4

(Source: Annexure A, B, and C).

With reference to Table 6, establishes guidelines for utilizing treated wastewater in landscaping irrigation and horticultural practices stands first rank followed by manages a cutting-edge on-site wastewater treatment facility that ensures the proper

treatment of wastewater, implements a sophisticated rainwater runoff collection and reutilization system, and implements a sustainable approach by utilizing recycled water for sanitation purposes stands the third and the fourth rank, respectively.

**TABLE 7** Energy conservation

Variables	Overall Rank			Average rank	Final rank
	Junior Level	Middle Level	Senior Level		
Harnesses the power of solar, wind, and other renewable sources to generate all the necessary energy.	1	1	2	1.33	1
Prioritizes procuring renewable energy from local utility providers to support the community.	5	2	5	4	3
Proactively plans to obtain renewable energy credits and green tags to further support sustainable energy sources.	4	3	1	2.67	2
Manages a transportation fleet that predominantly consists of alternative fuel or hybrid vehicles.	6	4	3	4.33	4
Extends public transportation services to patients and their companions, ensuring convenient and eco-friendly mobility options.	2	2	4	2.67	2
Encourages carpooling among employees and offers incentives for utilizing alternative transportation methods.	3	5	6	4.67	5
Constructs buildings with a focus on maximizing energy efficiency and utilizing sustainable materials and techniques, meeting the criteria for Leadership in Energy and Environmental Design (LEED) or Energy Star Certifications.	7	6	7	6.67	6

(Source: Annexure A, B, and C).

According to Table 7, harnesses the power of solar, wind, and other renewable sources to generate all the necessary energy stands first rank followed by proactive plans to obtain renewable energy credits and green tags to further support sustainable energy sources,

extends public transportation services to patients and their companions, ensuring convenient and eco-friendly mobility options stands the second rank equally. Followed by others such as prioritizes procuring renewable energy from local utility providers

to support the community, encourages carpooling among employees, and offers incentives for utilizing alternative transportation methods and constructs buildings with a focus on maximizing energy

efficiency and utilizing sustainable materials and techniques, meeting the criteria for Leadership in Energy and Environmental Design (LEED) or Energy Star Certifications.

**TABLE 8** Patient room sustainability

Variables	Overall Rank			Average rank	Final rank
	Junior Level	Middle Level	Senior Level		
Implements an innovative energy-saving control system in private wards, general wards, and outpatient department (OPD) rooms, ensuring optimal energy usage.	1	2	2	1.67	1
Incorporates a state-of-the-art keycard control system in OPD rooms and private wards, automatically deactivating power upon card removal for energy conservation.	6	1	5	4	3
Illuminates private and OPD rooms with energy-efficient light bulbs, minimizing energy consumption.	3	3	5	3.67	2
Adopts a sustainable approach by utilizing recycled papers and containers.	4	5	2	3.67	2
Encourages voluntary participation in linen and towel reuse programs, promoting resource conservation.	8	6	3	5.67	5
Operates a meticulous housekeeping department that categorizes linens based on their level of dirtiness, optimizing laundry processes.	7	4	1	4	3
Implements a strategic plan to reduce the usage of cleaning chemicals, prioritizing environmental safety.	2	8	4	4.67	4
Utilizes sensor-activated lighting in lobby restrooms and other intermittent-use areas, effectively managing lighting needs and reducing energy waste.	5	7	6	6	6

(Source: Annexure A, B, and C).

Based on Table 8, related to patient room sustainability, it shows that, implements an

innovative energy-saving control system in private wards, general wards, and outpatient



department (OPD) rooms, ensuring optimal energy usage stands first rank followed by illuminates private and OPD rooms with energy-efficient light bulbs, minimizing energy consumption and adopts a sustainable approach by utilizing recycled papers and containers stands second rank equally. Incorporates a state-of-the-art key card control system in OPD rooms and private wards, automatically deactivating power upon card removal for energy conservation and operates a meticulous housekeeping department that categorizes linens based on their level of dirtiness, optimizing laundry processes stands third rank equally. Similarly, implements a strategic plan to reduce the usage of cleaning chemicals, prioritizing environmental safety, encourages voluntary participation in linen and towel reuse programs, promoting resource conservation and utilizes sensor-activated lighting in lobby restrooms and other intermittent-use areas, effectively managing lighting needs, and reducing energy waste stands the fourth, the fifth, and the sixth rank, respectively.

## Conclusion

From the data collection, it suggests that, in case of sustainable management factor; the variables such as embraces acclaimed sustainability accolades, heralding a global commitment to Earth's wellbeing, eco-watch brigade to assess the ecological impact of daily operations and embraces acclaimed sustainability accolades, heralding a global commitment to Earth's wellbeing needs more attention by the hospitals in the study area. For the environmental communication viewpoint, staff training programs focused on

environmental awareness and environmental statements in public messages or hospital descriptions need to be addressed.

In case of managing hospital pollution, awareness of the environmental pollution in the vicinity of hospital needs to be increased. For the resource conservation, places emphasis on sourcing products from local firms and companies and possesses information about local recycling firms, their operations, and actively collaborates with them for recycling initiatives variables need more attention.

In case of water recycling, a sophisticated rainwater runoff collection and reutilization system and a sustainable approach using recycled water for sanitation purposes need to be improved. In case of energy conservation, constructs buildings with a focus on maximizing energy efficiency and utilizing sustainable materials and techniques, meeting the criteria for Leadership in Energy and Environmental Design (LEED) or Energy Star Certifications and encourages carpooling among employees and offers incentives for utilizing alternative transportation methods requires more focus.

Similarly, in case of patient room sustainability, utilizes sensor-activated lighting in lobby restrooms and other intermittent-use areas, effectively managing lighting needs and reducing energy waste and encourages voluntary participation in linen and towel reuse programs, promoting resource conservation need to be given priority along with others. This will lead to adequate environmental sustainability practices and this will lead to better health care services to the stakeholders.

<b>Annexure -A</b>							
<b>Junior Level (JL)-126</b>							
<b>Variables</b>	<b>CA</b>	<b>A</b>	<b>N</b>	<b>DA</b>	<b>CDA</b>	<b>Weight</b>	<b>Rank</b>
	4	3	2	1	0		
<b>Sustainable Management (8)</b>							
Eco-Watch Brigade to assess the ecological impact of daily operations.	82	21	5	14	4	415	5
Manifesto of Earth Stewards for a Sustainable Future.	78	23	11	7	7	410	8
Regularly unveils the Ecological Footprint Gazette.	96	19	3	4	4	451	1
Orchestrates the Green Harmony Initiative for environmental preservation.	87	18	6	5	10	419	4
Enlists Eco-Visionaries as consultants to guide eco-conscious policies and initiatives.	86	22	7	4	7	428	3
Dispatches emissaries to symposiums dedicated to global ecological equilibrium.	92	17	8	4	5	439	2
Employs the Carbon Trailblazers Unit to gauge greenhouse gas emissions and carbon footprints.	83	16	12	10	5	414	6
Embraces acclaimed sustainability accolades, heralding a global commitment to Earth's wellbeing.	78	22	13	7	6	411	7
<b>Environmental Communication (6)</b>							
Arranges staff training programs focused on environmental awareness.	91	12	15	4	4	434	3
Provides environmental education to patients and their companions.	84	16	6	12	8	408	5
Includes environmental statements in public messages or hospital descriptions.	79	17	18	6	6	409	4
Holds frequent meetings to address and discuss environmental concerns.	74	18	16	15	3	397	6
Promotes community involvement and support for environmental initiatives.	93	23	4	2	4	451	1
Engages in dialogues with other healthcare institutions regarding environmental sustainability.	91	22	8	3	2	449	2
<b>Managing Hospital Pollution (3)</b>							
Possesses awareness of the environmental pollution in the vicinity of the hospital.	92	16	1	8	9	426	2
Plans and implements interventions to mitigate pollution.	90	15	6	8	7	425	3
Ensures the preservation and upkeep of the local habitat and biodiversity.	92	13	15	4	2	441	1

<b>Resource Conservation (7)</b>							
Implements the segregation of hazardous, biomedical, and human anatomical wastes.	89	14	14	4	5	430	2
Prioritizes the reduction, recovery, and recycling of food-related wastes.	84	18	12	6	6	420	4
Possesses information about local recycling firms, their operations, and actively collaborates with them for recycling initiatives.	82	16	14	6	8	410	7
Supports the procurement of recycled goods and reusable products to minimize environmental impacts.	92	13	13	5	3	438	1
Motivates patients to adhere to recycling procedures.	92	12	8	8	6	428	3
Places emphasis on sourcing products from local firms and companies.	89	14	6	7	10	417	6
Values the purchase of energy-saving and less hazardous materials.	86	12	16	6	6	418	5
<b>Water Recycling (5)</b>							
Manages a cutting-edge on-site wastewater treatment facility that ensures the proper wastewater treatment.	92	16	5	9	4	435	2
Incorporates measures to responsibly release treated wastewater into the surrounding environment.	93	14	14	5	0	447	1
Implements a sophisticated rainwater runoff collection and reutilization system.	91	12	4	4	15	412	5
Establishes guidelines for utilizing treated wastewater in landscaping irrigation and horticultural practices.	90	11	10	8	7	421	4
Implements a sustainable approach by utilizing recycled water for sanitation purposes.	92	13	6	7	8	426	3
<b>Energy Conservation (7)</b>							
Harnesses the power of solar, wind, and other renewable sources to generate all the necessary energy.	92	17	6	6	5	437	1
Prioritizes procuring renewable energy from local utility providers to support the community.	91	15	6	8	6	429	5
Proactively plans to obtain renewable energy credits and green tags to further support sustainable energy sources.	86	14	20	4	2	430	4

Manages a transportation fleet that predominantly consists of alternative fuel or hybrid vehicles.	84	13	21	8	0	425	6
Extends public transportation services to patients and their companions, ensuring convenient and eco-friendly mobility options.	92	12	14	4	4	436	2
Encourages carpooling among employees and offers incentives for utilizing alternative transportation methods.	92	11	13	6	4	433	3
Constructs buildings with a focus on maximizing energy efficiency and utilizing sustainable materials and techniques, meeting the criteria for Leadership in Energy and Environmental Design (LEED) or Energy Star Certifications.	85	14	13	4	10	412	7
<b>Patient Room Sustainability (8)</b>							
Implements an innovative energy-saving control system in private wards, general wards, and outpatient department (OPD) rooms, ensuring optimal energy usage.	89	11	24	2	0	439	1
Incorporates a state-of-the-art keycard control system in OPD rooms and private wards, automatically deactivating power upon card removal for energy conservation.	84	16	13	7	6	417	6
Illuminates private and OPD rooms with energy-efficient light bulbs, minimizing energy consumption.	91	9	14	8	4	427	3
Adopts a sustainable approach by utilizing recycled papers and containers.	89	11	17	3	6	426	4
Encourages voluntary participation in linen and towel reuse programs, promoting resource conservation.	83	12	4	7	20	383	8
Operates a meticulous housekeeping department that categorizes linens based on their level of dirtiness, optimizing laundry processes.	84	14	11	7	10	407	7
Implements a strategic plan to reduce the usage of cleaning chemicals, prioritizing environmental safety.	86	18	14	3	5	434	2
Utilizes sensor-activated lighting in lobby restrooms and other intermittent-use areas, effectively managing lighting needs and reducing energy waste.	91	12	7	8	8	422	5

(Source: Primary data).

<b>Annexure -B</b>							
<b>Middle Level (ML)-117</b>							
<b>Variables</b>	<b>CA</b>	<b>A</b>	<b>N</b>	<b>DA</b>	<b>CDA</b>	<b>Weight</b>	<b>Rank</b>
	4	3	2	1	0		
<b>Sustainable Management (8)</b>							
Eco-Watch Brigade to assess the ecological impact of daily operations.	76	12	13	8	8	374	8
Manifesto of Earth Stewards for a Sustainable Future.	84	13	12	7	1	406	2
Regularly unveils the Ecological Footprint Gazette.	92	8	6	6	5	410	1
Orchestrates the Green Harmony Initiative for environmental preservation.	87	14	4	3	9	401	4
Enlists Eco-Visionaries as consultants to guide eco-conscious policies and initiatives.	83	12	7	7	8	389	6
Dispatches emissaries to symposiums dedicated to global ecological equilibrium.	81	10	14	6	6	388	7
Employs the Carbon Trailblazers Unit to gauge greenhouse gas emissions and carbon footprints.	86	14	6	6	5	404	3
Embraces acclaimed sustainability accolades, heralding a global commitment to Earth's wellbeing.	79	16	13	5	4	395	5
<b>Environmental Communication (6)</b>							
Arranges staff training programs focused on environmental awareness.	81	13	14	4	5	395	5
Provides environmental education to patients and their companions.	89	14	4	6	4	412	1
Includes environmental statements in public messages or hospital descriptions.	87	15	4	4	7	405	3
Holds frequent meetings to address and discuss environmental concerns.	92	8	4	9	4	409	2
Promotes community involvement and support for environmental initiatives.	93	7	6	4	7	409	2
Engages in dialogues with other healthcare institutions regarding environmental sustainability.	86	8	16	4	3	404	4
<b>Managing Hospital Pollution (3)</b>							
Possesses awareness of the environmental pollution in the vicinity of the hospital.	79	12	14	6	6	386	3
Plans and implements interventions to mitigate pollution.	83	11	14	8	1	401	1
Ensures the preservation and upkeep of the local habitat and biodiversity.	84	9	12	6	6	393	2

<b>Resource Conservation (7)</b>							
Implements the segregation of hazardous, biomedical, and human anatomical wastes.	87	7	15	4	4	403	1
Prioritizes the reduction, recovery, and recycling of flood-related wastes.	86	6	16	4	5	398	3
Possesses information about local recycling firms, their operations, and actively collaborates with them for recycling initiatives.	85	8	12	8	4	396	4
Supports the procurement of recycled goods and reusable products to minimize environmental impacts.	82	9	14	8	4	391	5
Motivates patients to adhere to recycling procedures.	80	11	13	4	9	383	6
Places emphasis on sourcing products from local firms and companies.	79	16	5	5	12	379	7
Values the purchase of energy-saving and less hazardous materials.	84	16	4	9	4	401	2
<b>Water Recycling (5)</b>							
Manages a cutting-edge on-site wastewater treatment facility that ensures the proper treatment of wastewater.	92	13	4	5	3	420	1
Incorporates measures to responsibly release treated wastewater into the surrounding environment.	86	8	7	8	8	390	4
Implements a sophisticated rainwater runoff collection and reutilization system.	87	12	9	7	2	409	3
Establishes guidelines for utilizing treated wastewater in landscaping irrigation and horticultural practices.	84	9	11	7	6	419	2
Implements a sustainable approach by utilizing recycled water for sanitation purposes.	83	12	7	8	7	390	4
<b>Energy Conservation (7)</b>							
Harnesses the power of solar, wind, and other renewable sources to generate all the necessary energy.	91	8	7	4	7	406	1
Prioritizes procuring renewable energy from local utility providers to support the community.	86	7	11	7	6	394	2
Proactively plans to obtain renewable energy credits and green tags to further support sustainable energy sources.	81	12	9	9	6	387	3

Manages a transportation fleet that predominantly consists of alternative fuel or hybrid vehicles.	84	10	7	6	10	386	4
Extends public transportation services to patients and their companions, ensuring convenient and eco-friendly mobility options.	87	8	7	8	7	394	2
Encourages carpooling among employees and offers incentives for utilizing alternative transportation methods.	81	7	16	7	6	384	5
Constructs buildings with a focus on maximizing energy efficiency and utilizing sustainable materials and techniques, meeting the criteria for Leadership in Energy and Environmental Design (LEED) or Energy Star Certifications.	79	12	10	8	8	380	6
<b>Patient Room Sustainability (8)</b>							
Implements an innovative energy-saving control system in private wards, general wards, and outpatient department (OPD) rooms, ensuring optimal energy usage.	94	11	4	4	4	410	2
Incorporates a state-of-the-art keycard control system in OPD rooms and private wards, automatically deactivating power upon card removal for energy conservation.	92	12	4	4	5	416	1
Illuminates private and OPD rooms with energy-efficient light bulbs, minimizing energy consumption.	89	11	7	3	7	406	3
Adopts a sustainable approach by utilizing recycled papers and containers.	88	12	4	5	8	401	5
Encourages voluntary participation in linen and towel reuse programs, promoting resource conservation.	89	10	4	5	9	399	6
Operates a meticulous housekeeping department that categorizes linens based on their level of dirtiness, optimizing laundry processes.	84	12	13	5	23	403	4
Implements a strategic plan to reduce the usage of cleaning chemicals, prioritizing environmental safety.	83	10	7	8	9	384	8
Utilizes sensor-activated lighting in lobby restrooms and other intermittent-use areas, effectively managing lighting needs and reducing energy waste.	81	12	11	8	5	390	7

(Source: Primary data).

Variables	Annexure -C Senior Level (SL)-73					Weight	Rank
	CA 4	A 3	N 2	DA 1	CDA 0		
<b>Sustainable Management (8)</b>							
Eco-Watch Brigade to assess the ecological impact of daily operations.	56	12	1	2	2	264	3
Manifesto of Earth Stewards for a Sustainable Future.	57	10	3	3	0	267	2
Regularly unveils the Ecological Footprint Gazette.	58	11	4	0	0	273	1
Orchestrates the Green Harmony Initiative for environmental preservation.	49	8	8	4	4	240	5
Enlists Eco-Visionaries as consultants to guide eco-conscious policies and initiatives.	47	12	8	3	3	243	4
Dispatches emissaries to symposiums dedicated to global ecological equilibrium.	45	14	6	4	4	238	6
Employs the Carbon Trailblazers Unit to gauge greenhouse gas emissions and carbon footprints.	43	12	7	7	4	229	7
Embraces acclaimed sustainability accolades, heralding a global commitment to Earth's wellbeing.	42	8	6	9	8	213	8
<b>Environmental Communication (6)</b>							
Arranges staff training programs focused on environmental awareness.	46	9	10	4	4	235	5
Provides environmental education to patients and their companions.	47	5	6	8	7	223	6
Includes environmental statements in public messages or hospital descriptions.	47	7	14	5	1	238	4
Holds frequent meetings to address and discuss environmental concerns.	52	8	5	4	4	246	3
Promotes community involvement and support for environmental initiatives.	54	7	4	4	4	249	2
Engages in dialogues with other healthcare institutions regarding environmental sustainability.	56	4	7	6	0	250	1
<b>Managing Hospital Pollution (3)</b>							
Possesses awareness of the environmental pollution in the vicinity of hospital.	52	7	4	4	6	241	2
Plans and implements interventions to mitigate pollution.	53	4	7	5	4	243	1
Ensures the preservation and upkeep of the local habitat and biodiversity.	52	2	6	6	7	232	3



Resource Conservation (7)							
Implements the segregation of hazardous, biomedical, and human anatomical wastes.	56	4	8	5	0	257	1
Prioritizes the reduction, recovery, and recycling of flood-related wastes.	54	5	6	6	2	249	2
Possesses information about local recycling firms, their operations, and actively collaborates with them for recycling initiatives.	53	7	5	4	4	247	3
Supports the procurement of recycled goods and reusable products to minimize environmental impacts.	52	8	7	3	3	249	2
Motivates patients to adhere to recycling procedures.	50	11	4	4	4	245	4
Places emphasis on sourcing products from local firms and companies.	48	8	7	4	6	234	5
Values the purchase of energy-saving and less hazardous materials.	46	9	5	4	9	233	6
Water Recycling (5)							
Manages a cutting-edge on-site wastewater treatment facility that ensures the proper treatment of wastewater.	42	10	4	7	10	213	5
Incorporates measures to responsibly release treated wastewater into the surrounding environment.	44	9	8	7	5	226	4
Implements a sophisticated rainwater runoff collection and reutilization system.	53	8	6	6	0	254	2
Establishes guidelines for utilizing treated wastewater in landscaping irrigation and horticultural practices.	52	10	8	3	0	257	1
Implements a sustainable approach by utilizing recycled water for sanitation purposes.	49	12	4	6	2	246	3
Energy Conservation (7)							
Harnesses the power of solar, wind, and other renewable sources to generate all the necessary energy.	53	10	3	4	3	252	2
Prioritizes procuring renewable energy from local utility providers to support the community.	49	12	4	4	4	244	5
Proactively plans to obtain renewable energy credits and green tags to further support sustainable energy sources.	48	14	8	3	0	253	1

Manages a transportation fleet that predominantly consists of alternative fuel or hybrid vehicles.	52	10	4	4	3	250	3
Extends public transportation services to patients and their companions, ensuring convenient and eco-friendly mobility options.	51	9	5	4	4	245	4
Encourages carpooling among employees and offers incentives for utilizing alternative transportation methods.	49	11	4	4	5	241	6
Constructs buildings with a focus on maximizing energy efficiency and utilizing sustainable materials and techniques, meeting the criteria for Leadership in Energy and Environmental Design (LEED) or Energy Star Certifications.	47	10	4	8	4	234	7
<b>Patient Room Sustainability (8)</b>							
Implements an innovative energy-saving control system in private wards, general wards, and outpatient department (OPD) rooms, ensuring optimal energy usage.	46	14	8	5	0	247	2
Incorporates a state-of-the-art keycard control system in OPD rooms and private wards, automatically deactivating power upon card removal for energy conservation.	44	18	4	4	3	242	5
Illuminates private and OPD rooms with energy-efficient light bulbs, minimizing energy consumption.	52	7	4	5	5	242	5
Adopts a sustainable approach by utilizing recycled papers and containers.	51	8	8	3	3	247	2
Encourages voluntary participation in linen and towel reuse programs, promoting resource conservation.	53	6	4	6	4	244	3
Operates a meticulous housekeeping department that categorizes linens based on their level of dirtiness, optimizing laundry processes.	52	12	6	3	0	259	1
Implements a strategic plan to reduce the usage of cleaning chemicals, prioritizing environmental safety.	49	8	7	9	0	243	4
Utilizes sensor-activated lighting in lobby restrooms and other intermittent-use areas, effectively managing lighting needs and reducing energy waste.	48	9	4	8	4	235	6

(Source: Primary data).

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## Conflict of Interest

The present work is contribution of authors do not have any conflict of interest as such with any other individual or institutions. No funds have been received for the present study.

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