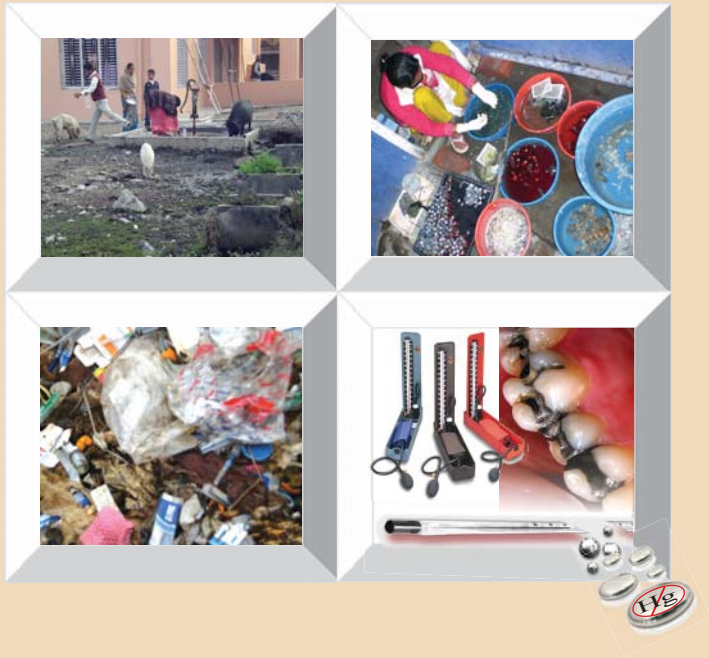
Environmental Health Condition of Hospitals in Nepal



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Government of Nepal

MINISTRY OF HEALTH & POPULATION

Government of Nepal
Ministry of Health & Population

Message

It gives me immense pleasure to give this letter of appreciation to Center for Public Health and Environmental Development (CEPHED) who has completed this important research work on **"Environmental Health Condition of Hospitals in Nepal"**. I believe that this study is very useful for all level of health care professionals to waste management teams including policy makers, when ministry itself initiated numbers of health care waste management and mercury free health care initiatives for improving the overall environmental health condition of health facilities of Nepal.

The report enlists the best practices of different environmental health conditions of different government, private, NGO and mission health care facilities and best practices needs to be replicated in all hospitals. In other hand the critical analysis has been done on existing bad practices too and this needs to be improved as early as possible. Additionally, the review of legislative and policy framework provide the opportunities for all of us to immediately start some of the short, medium and long term policy and legal reforms.

Above all, this study reports on actual condition of all most all aspects of environmental health including water quality, water quantity, accessibility, availability of safe and enough water, sound excreta disposal including enough numbers of toilets, bathrooms, hand washing practices, cleaning and disinfecting agents, repair and maintenance, building design, enough lighting, ventilation system, space , greenery, kitchen, waste water management. It also highlights the safe and separate collection, transportation, storage, environment sound treatment and final disposal of health care wastes including mercury.

Ministry of Health and Population and centers and departments under it has to take up the findings, conclusions and recommendations to the implementations level by making appropriate arrangement of legal, institutional and financial framework for overall improvement of the environmental conditions of the health care facilities of Nepal.

Lastly, I want to thank CEPHED and its team for completing this study and publication of the report and WHO, Nepal country office for providing the technical support to complete this important study.

September 2012

Dr. Praveen Mishra
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In reply please refer to:

03 December 2012

Message

Environmental health is the assessment and control of all the physical, chemical and biological factors within our environment that have an effect on human health. The environment in the hospital plays an important role in the occurrence of hospital-acquired infections, which are among the leading causes of morbidity and mortality in developing countries like Nepal. The hospital environment consists of many components; however, some basic facilities such as appropriate hand washing facilities, safe and adequate water supply, safe food handling and uptake, proper laundry service, adequate ventilation for isolation rooms and high risk areas like operation theatres, control of rodents, pests and other vectors should be taken as major considerations. Hospital waste is a potential reservoir of hazards and infectious agents and requires appropriate management at every step from generation, segregation, collection, transportation, storage, treatment to final disposal. Routine cleaning is important to ensure a clean and dust-free hospital environment.

Most of these components of health care facilities related to environmental health have been monitored during the study. I believe, the sample study carried out in 31 out of total 234 existing health care facilities well represents the eco- and geo-regions of the country with the type of agencies responsible to run the facilities. Hence the outcome of the study clearly reflects the environmental health scenario of the health care facilities, found to be in need of effective interventions. Many measures can indeed be taken almost immediately to reduce the hospital associated disease burden. This report firstly, will alert the health care practitioners to think about the improvement of the existing working environment of the health care facilities. Secondly, it will be very useful to the planners and policy makers working in the health care field for preparing the future strategy. I am sure that the relevant health authorities and many other partners working in the sector will take the finding of the report as opportunity for the improvement of the environmental condition of all the health care facilities for the benefit of patients, health workers and the general public alike.

Dr. Lin Aung
WHO Representative to Nepal

Acknowledgements

Center for Public Health and Environmental Development (CEPHED) highly acknowledges the financial support of World Health Organization (WHO), Country Office for Nepal to accomplish this most urgent and essential study on "**Environmental Health Condition of Hospitals in Nepal"**. It is indeed most relevant and required documents to trigger various national and hospital level policies, guidelines as well as legal and institutional frameworks so as to improve overall environmental health condition of the health-care facilities, public health and environment.

CEPHED wishes to express its appreciation to all, who made efforts for the completion of the hard field work and preparation of this report. In particular, CEPHED gratefully acknowledges the contributions of the following experts, who contributed in field work, report writing and reviewed various level documents including research. CEPHED would like to acknowledge Mr. Krishna Prasad Subedi for designing and layout and Mr. Sunil Kumar Dahal for editing the language of this publication.

Finally, CEPHED highly acknowledge and value the great contributon and cooperation of all the Hospitals, their management and concerned officials during the research.

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The completion of this research and the preparation of this report were made possible with the support and collaboration of the Environmental Health Unit of Ministry of Health and Population (MOHP), Government of Nepal.

Note for Readers:

The total 31 hospitals have been included in the study. So each hospitals carry about 3.23%. Readers are requested to consider the interpretation made either in the term of Number of Hospitals or in term of percentage are equivalent in this publication (ie. 1 hospital = 3.23%).

Figure 1: MOHP representative Mrs. Sarada Pande and Dr. Madhab Pd. Lamsal in the field during this study

Acronyms

BPKIHS	Bisheshwor Prasad Koirala Institute of Health Sciences
CBS	Central Bureau of Statistics
CEPHED	Center for Public Health and Environmental Development
CQI	Continuous Quality Improvement
DDC	District Development Committee
DoHS	Department of Health Services
EH	Environmental Health
EHIA	Environmental Health Impact Assessment
EIA	Environment Impact Assessment
EMP	Environment Management Plan
ENPHO	Environment and Public Health Organisation
EPA	Environmental Protection Act
EPI	Expanded Programme on Immunization
EPR	Environment Protection Regulation
ESM	Environmentally Sound Management
FCHV	Female Community Health Volunteer
FGD	Focus Group Discussion
GoN	Government of Nepal
H_2S	Hydrogen Sulphide
HCF	Health Care Facilities
HCS	Health-care Services
HECAF	Health Care Foundation Nepal
HP	Health Post
IEC	Information Education and Communication
IEE	Initial Environmental Examination
IPD	Indoor Patients Department
Kg.	Kilogram
Km	Kilometer
LDCs	Least Developed Countries
MoEdu	Ministry of Education
MOSTE	Ministry of Science, Technology and Environment

MOGA	Ministry of General Administration
MOHP	Ministry of Health and Population
MOI	Ministry of Industry
MOIC	Ministry of Information and Communication
MOLD	Ministry of Local Development
MPPW	Ministry of Physical Planning and Works
NAMS	National Academy of Medical Sciences
NGO	Non-Governmental Organization
O&M	Operation & Maintenance
OPD	Out Patient Department
ORC	Outreach Clinic
PHC/ORC	Primary Health-care Outreach Clinic
PPE	Personal Protective Equipment
PPS	Population Proportionate Sampling
QA	Quality Assurance
QAU	Quality Assurance Unit
QWL	Quality of Workers Life
SDAN	Sustainable Development Agenda, Nepal
SHP	Sub Health Post
SLTHP	Second Long Term Heath Plan
SPSS	Statistical Package for the Social Sciences
SSI	Semi Structured Interview
TOR	Terms of Reference
WASH	Water Sanitation and Hygiene
WHO	World Health Organization
WWM	Waste Water Management

Executive Summary

Effective functioning of health-care facilities depends on its Environmental Health condition. Environmental Health basically includes safe and adequate water, good sanitation, cleanliness of the surrounding as well as hospital premises, beds, bed sheets (linen), and toilets and at the same time, these should be properly disinfected, too. Additionally, safe injection, environment sound health-care waste management, control and substitute of hazardous chemical like Mercury, mercury base equipments and other disinfecting agents such as Cidex (Gluterdehyde) etc. should be properly managed. Furthermore, health facilities should make a healthy workplace which depends on physical, environmental, psychological conditions and and public relations.

In order to study the overall environmental health condition, mixture of strategically designed methodology consisting direct field survey, patient survey, Focus Group Discussion (FDG) and direct observation of the health-care facilities of statistically drawn 31(13%) sample hospitals out of total 234 existing health-care facilities of Nepal was carried out. These hospital samples represent geographical regions (East, Central, West and Mid to Far West), eco-regions (Himal, Hill and Terai) and type (Government, Community and Private) and settings (urban and rural); and conditional selection process in consultation with World Health Organization (WHO). Further methodology process includes review of relevant documents and policies, developing and testing of different sets of questionnaire for the hospital, patients and FGD, field survey and observation, quantitative and qualitative data analysis, report writing, stakeholder consultation. Field survey was carried out by teaming up with two experts (team leader and investigator) assisted by a local facilitator as well as facilitators from the hospitals under study.

The main objectives of this study were to develop evidence based paper on overall **Environmental Health Condition of Hospitals in Nepal** through review of existing legal and institutional frameworks as well as to investigate environmental health condition by employing detailed questionnaire survey, spot observation and FGDs with memebrs of communities.

There are large numbers of different health-care facilities existing in the country, mostly concentrated on urban centres, providing health-care services to the people. The study includes findings about the hospitals from very general condition to much specific issued like water supply to waste management. The study results found that the non-governmental (private and mission) hospitals have higher average number of beds and technical staff than government hospitals that have average higher number of administrative staff (50). The other most important finding from study which required immediate attention was the high degree of non-compliance of Initial Environmental Examination (IEE) and Environment Impact Assessment (EIA) provision by most of hospitals. In total only 22.58% hospitals had compliance with the IEE and/or EIA provision with only 7.14% of public hospitals and about 40% private hospitals. In view of the fact that none of the health-care facilities are immune to this good environmental provision, it needs immediate attention from concerned implementing agencies.

In terms of safe water sources, 84% of the hospitals have safely protected sources, over

51.6% have acceptable sources and 16% have water supplies from badly protected sources. Very good regular monitoring of water safety and drinking water treatment system lies only in 9.68% health-care facilities whereas 25% of the hospitals did not have any water safety monitoring mechanism at all. There was lacking of cross contamination avoidance mechanism and alternative sources of drinking water in the time of non-acceptable water. Only 12.90% of the hospitals have very good provision of cross contamination avoidance mechanism. About 30% of the hospitals have only got alternate sources of water in case of presece of unaccepted water available. **Drinking water sample from one of the hospitals was found to have coliform contamination up on tested with the help of Coliform P/A (H_2S) Test Vial developed by ENPHO**.

With reference to water quantity, despite of good availability of water among the large number of the hospitals (83.87%) it was not up to the required standard (**500 l/ bed).** Besides, some losses of water have been observed in the hospitals mainly due to negligence. 41.94% of the hospitals have good water accessibility. Among them, more private hospitals have good access of water for the patients and visitors than that of public and NGOs hospitals, whereas 19.36% of the hospitals have got very bad water accessibility. Very few (3.23%) hospitals have adequate and properly working shower facilities in place. 45.16% of hospitals have relatively good number of toilets. Even though most of them have adequate access of water, they did not have other cleaning materials. There was also absence of regular repair, maintenance and cleaning system in place. 83.87% of the hospitals were bad in waste water management and they were directly discharging their liquid waste into drainage or inland whereas very few hospitals (3.23%) have very good waste water management system in place.

Most of the government hospital buildings have been universally considered complying with national building codes. Private hospitals do have good building infrastructures while most of the hospitals still need to meet minimum required parameters. There were increasing amount of stress on all health-care providers, receivers and care takers. Stress over the staff has been found to be handled with due care in government hospitals than in the private hospitals. Mission/NGO hospitals have been found to be given good attention to staff and patients for stress management.

Present community relationship between health-care facilities and local communities isgoverned by several facts like contribution made for hospital establishment, political recommendation and family relationship. About 54.84% of the hospitals have acceptable level of service to the ultra-poor whereas rest 45.16% of hospitals do not have any such additional such provision of serving ultra-poor. Significant percentage of hospitals do care about the external environmental issues and even sent their emergency response team to investigate further but some did not bother about the external environment at all. Substantial percentage (41.95%) of hospitals have poor level of hand washing practices. 38.71% of hospital did not have availability of hand washing material in place. Most of the hand washing basins and toilets dedicated only for the patients and visitors were not supplied with soap and generally found dirty. There was lack of knowledge about proper hand washing practices among 35.48% of the hospitals. Almost 50% of the hospitals were found to be having acceptable level of

arrangement regarding food hygiene and only about 12.90% of hospitals have good level of hygiene. About 54.84% of hospitals have acceptable level of controlling vector breeding sites. Most of the hospitals did not have any written action plan and annual plan for hygiene information promotion. Only 38.71% of the hospitals have somewhat action plan on ad hoc basis. Only one hospital (3.23%) has a dedicated Information desk for promoting hygiene information.

Over 60% of the hospitals have satisfactory level of cleanliness and laundry system in place. However, one of the government hospitals did not provide patient with the bed linen at all. Regarding health-care waste management practices: Only one public hospital (3.23%) had onsite source separation of waste but not in all wards; about 32.26% of the hospitals have acceptable level of waste segregation; rest 61.29% of hospitals have very poor waste segregation including complete absence in 6.45% of the hospitals. 12.90% have acceptable level of waste collection system whereas 80.65% of hospitals do not practice appropriate and separate waste collection. Only 22.58% of hospitals have relatively appropriate and separate waste transfer system. 90.32% hospitals did not have any waste treatment system at all. Only one public hospital (3.23%) has adopted a very good waste disposal system, whereas 80.65% hospitals did not practice safe disposal of health-care waste. Rest did not follow any disposal system at all.

Large numbers of health-care facilities are still using huge numbers and quantity of mercury based measuring equipments, chemicals and products including fluorescent lamps. According to a study of CEPHED 2012 about the use and release of mercury from health sector of Nepal, it has been found that about 500 Kgs of mercury has been used only in two measuring devices such as thermometers and sphygmomanometer and about 125 Kgs of mercury has been found to be released annually to the environment from health-care services of Nepal. It needs immediate attention of concerned government authorities.

Concerning the renewal of national institutional and legal frameworks related to over all environmental condition of Nepal, there are some extreme good as well as bad provisions in existence. Some are clearer but others are unclear, undefined and overlapping as well.

The required infrastructural, institutional and legal frameworks with effective implementation strategies as well as regular compliance monitoring should be in place. Adequate and easy access to safe water; well designed, built and maintained adequate numbers of cleaned and non-smelling toilets with adequate provision of water, cleaning and disinfecting agents with proper lighting and ventilation should be in place and also should have regular repair, maintenance and operation system. Adequate management facilities of health-care waste, solid and liquid waste should be in place with regular training, operation and maintenance of hospital waste management system. Mercury free health-care policy with time bound implementation strategies of replacement of mercury based equipment, practices and promotion with safer, validated, quality, and accurate mercury free alternatives and proper environmentally sound management of mercury and mercury containing wastes are needed. Continuous research, awareness raising and capacity building for the overall environmental health and especially to water, waste management, sanitation, hand washing, cleanliness and hygiene etc. are required at all level of levels hospital.

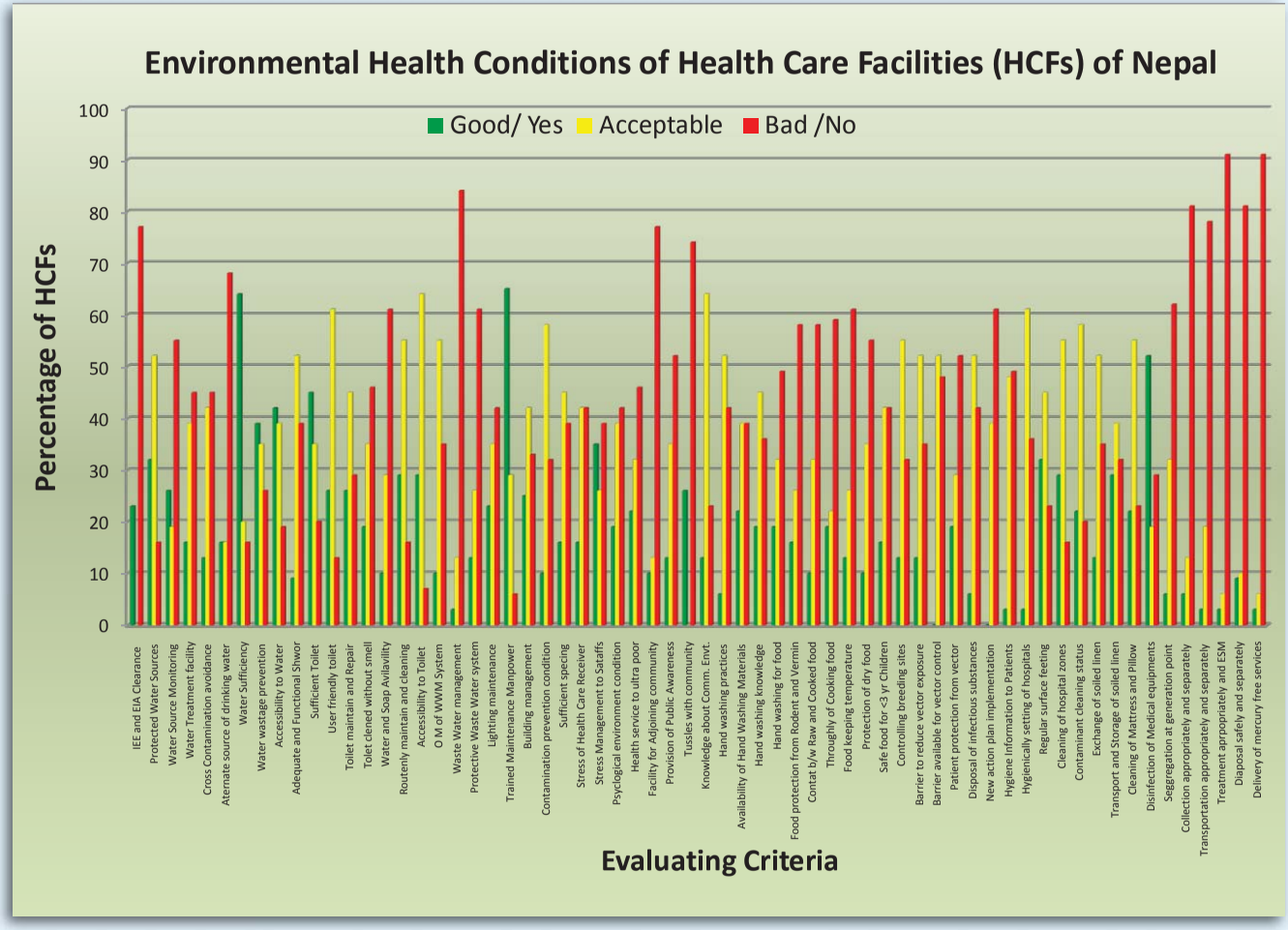

Figure 2: Environmental Health Condition of Health Care Facilities of Nepal

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ENVIRONMENTAL HEALTH CONDITION OF HOSPITALS IN NEPAL

1. Background

1.1 Environmental Health Condition, Problems and Monitoring Initiative

Provision for every person shall have the right to live in clean environment as well as every citizen shall have the right to get basic health services free of cost from the State as provided for in the law have been ensured as fundamental right under Article 16 (Right regarding Environment and Health) of the Interim Constitution of Nepal 2007.

Ministry of Health and Population (MOHP) in coordination with other line ministries such as Ministry of Science, Technology and Environment (MOSTE), Ministry of Industry (MOI), Ministry of Local Development (MOLD) and their subordinate departments and centers are responsible for ensuring the overall best environmental condition of the health-care facilities for providing quality health-care services for all.

Overall environmental health condition of the health care facilities of Nepal is poor. Effective functioning of health-care facilities depends on its Environmental Health condition. In addition, health facilities should make a healthy workplace which depends on physical, environmental, psychological conditions and public relations, etc.

The environment condition of a health-care facility encompasses the actual condition of: water quality, water quantity; accessibility and availability of safe and enough water; sound excreta disposal including enough number of toilet, bathroom, hand washing practices, cleaning and disinfecting agent, repair maintenance of toilet and sanitation, appropriateness of toilet and sanitary facilities; waste water management including its regular maintenance, repairs; building design as per the country code as well as maintaining proper lighting, ventilation, earthquake resistance; way to collect and transport waste, waste treatment methods, storage site, disposal method, etc. This study further includes detailed investigation on stress management due to increase in demand of health-care services, which does not match with the number of the health-care professional as well as people who have been receiving the health-care and visiting the health-care facilities. The special health-care facilities given to local people as well as addressing the local complaint about the problem resulted due to mismanagement and throwing the health-care waste and liquid waste or any other local grievances were also covered during the study. The hand washing practice among the health-care professionals before and after attending the patient, using toilet as well as taking food are most essential. Similarly, safe and adequate nutritious food supply is essential in hospital, the sanitation condition as well as clieanliness, preventive measure of vector and rodent movement in the kitchen have also been also studied with due consideration.

1.2 Country Profile of Health-Care Facilities

The health care delivery network in Nepal was though poorly developed, this is the one among other most essential services that has been reached up to the ward

level smallest administrative boundaries of the country. Health-care practices in the country could be classified into three major categories: popular folk medical care, which relied on a jhankri (medicine man or shaman); Ayurvedic treatment; and allopathic (modern) medicine. These practices were not necessarily exclusive; most people used all three, depending on the type of illness and the availability of services, sometimes even simultaneously.

According to the Annual Report of DOHS/ MOHP (2009/2010), there are different levels health-care facilities running throughout the country, operating under government, non-government and private ownership. Large numbers of these facilities have been located in most of the urban areas. The Kathmandu valley that has been included in this studies has highest percentage of these facilities. Table 1 and 2 provide details about the number of government and private (rural and urban) health-care institutions in Nepal.

Table 1. Hospital Types and their numbers

Government, Private and Mission Health Care Setting of Nepal		
Hospitals Type	**No. of Hospital**	**Total Bed**
Government Hospital including Teaching under MOHP	95	6601
Government Hospital including Teaching under Other Ministry	3	1036
Government Total	**98**	**7637**
Private Hospitals	110	9207
Private Teaching Hospitals	13	8626
Private Total	**123**	**17833**
Mission Hospitals /NGO	13	612
Country Total	**234**	26082
Source: Management Division, DOHS and MOHP		

Table 2. Small Scale Health care facilities

Government Health Care Institutions (other than Hospitals) of Nepal		
S. N.	**Item**	**Number**
1.	Primary Health Care Center/Health Center (PHC)	208
2.	Health Post (HP)	675
3.	Sub-Health Post (SHP)	3,127
4.	PHC/ORC Clinic (PHC/ORC)	13, 180
5.	EPI Outreach Clinic	16, 474
6.	Female Community Health Volunteer (FCHV)*	48, 489

*FCHVs are not the institutions in health setting, but for current study purpose this category has been taken as part of institution. Since they also use the mercury base equipment's and serve for the health sector of Nepal.

Source: Department of Health Services, Annual Report 2066/67 (2009/2010) Nepal, Pg. 24

1.3 Objectives

Main objective of the study is to develop evidence based paper on Environmental Health condition of hospitals in Nepal.

Specific objectives are:

- Investigate environmental health condition of selected hospitals from different regions and types.
- Review policy, guidelines, programs and institutions in the context of environmental health condition of hospitals in Nepal

1.4 Sampling Design and Methods

Lists of different levels health-care facilities have been obtained from published and unpublished sources as well as the data information sections of the DOHS and MoHP, GoN. Compilation of all such information of hospitals gave the result to know about the universe of the health-care facilities ranges from Regional, Sub-regional, Zonal, District

level and private hospitals. The sorting of these health-care facilities with reference to our study criteria to be included such as development region, eco-region, geographical region, types of hospitals, mode of operation etc. was carried out to comply with the given criteria and at the same time it also represents the health-care facilities of the whole nation. Mostly proportionate samples with some specific inclusion methods have been derived using some statistical tools and came out with the finally selected **31 Hospitals** of different levels and types representing all geographical, eco-region and development regions of Nepal.

Population Proportionate Sampling (PPS) methodology was applied for this quantitative information based on Universal Sampling distribution of hospital throughout Nepal. According to the record of DOHS and MOHP there are 234 hospitals except primary health-care centres, health posts and sub health posts. There were 45% government hospitals, 48% private hospitals and 6.5% missionary hospitals in universal sampling. It was tried to the extent that one could maintain equally proportional Eco region, Development Region, Public, Private and NGO (Missionary Hospital) as shown in the tables below. The detailed methedology can be found in Annex 1.

The finally selected 31 samples can be found in **Annex 2.**

1.5 Survey Tools/Technique

Semi structure interview schedule: Different aspects of SSI/questionnaire were prepared for the Study Unit (Hospital as Health-care Setting).

Table 3: The sampling design and distributions among the study criteria.

Basis of	Distribution	Sample Frequency	Sample %	Universe Frequency	% of Universe
Ecological Region	Mountain	2	6.46	11	4.70
	Hill	18	58.06	143	61.11
	Terai	11	35.48	80	34.19
	Total	**31**	**100**	**234**	**100**
Developmental Region	Eastern	4	12.90	32	13.68
	Central	16	51.61	128	54.70
	Western	5	16.13	37	15.81
	Mid-Western	4	12.90	24	10.26
	Far Western	2	6.45	13	5.55
	Total	**31**	**100**	**234**	**100**
Ownership of Hospital	Government/ Public	14	45.16	98	41.88
	Private	15	48.39	124	52.99
	Mission/ NGO	2	6.45	12	5.13
	Total	**31**	**100**	**234**	**100**

Focus group discussion: It was done with members of Hospital Development Committee, local community leaders, civil societies, patient's representatives, teachers, journalists and surrounding communities who have been receiving the health-care services as well as frequently visiting the hospitals as caretakers of the patients, family members and relatives.

In depth Interview: It was done through a detail questionnaire survey with the Chief of Hospital (Medical Superintendents), the Housekeeping in-charge, Matron, Repairs and Maintenance chief as well as administration chief of the health-care facilities during field survey.

Concerned authorities meetings: To make the study more effective, study frequent consultation, meetings, and discussion were done with WHO team, Ministry of Health and Population, researchers and the host organization Center for Environmental and Public Health (CEPHED).

Qualitative information was summarized and written in narrative form with specific importance like FGD, in-depth interview and meeting workshops. Quantitative information was written with the help of Excel and SPSS software. Primarily, within the base of *Essential environmental health standards in health-care 2008,* the 15 Environmental components and sub components were broken kdown in small questionnaires during the survey. After collecting the information, such small questionnaires were merged to the research sub components so that it could be easy to analyse based on sub questionnaire, observation and situation analysis by research team of experts. It was ranked as Very Good, Good, Acceptable, Bad, and Very Bad by coding 1,2,3,4 and 5 respectively.

Figure 3: Waste Water Treatment System at BPKIHS, Dharan

2. Findings

Findings were based on the comprehensive sampling designing and detailed rigorous field survey. Observation in the specific locations like wards, stores, canteens, waste storage sites, collection sites, treatment and disposal sites, laundries, water sources, toilets & bathrooms of the health-care facilities were under the study. The following findings have been drawn by using statistical tool like Excel and SPSS. The conclusion, thus, derived from data analysis (quantitative and qualitative) has been illustrated with the help of best fitted table, charts and diagrams and interpreted in both numerical and descriptive terms.

2.1 General Finding

The general information about all the hospitals included the name, year of establishment, location and number of staff. One of the major information can be drawn from this general information section was that the different hospitals under study have been operated with diverse scale and nature ranging from small 15 beds to about 700 beds with teaching facilities under MOHP and Ministry of Education (MoEdu). They are also representing from private, public and NGO/ Mission kinds of operational arrangement. Some are even under the central unique kind of operation arrangement such as NAMS for Bir Hospital whereas Nijamati Hospital has been operated under Ministry of General Administration (MOGA). Some of the general information collected characterizing the hospitals under study are as follows:

Table 4. General Information of Hospitals

Human Resource and Infrastructure	Govern-mental	Non-Gov-ernmental	Min	Max
Average Number of Bed	127	228	15	1050
Average number of staff	242	337	20	1520
Average number of female staff	114	161	15	647
Average number of Doctors	40	58	2	290
Average number of Nurse	67	90	4	527
Average number of Paramedics	29	41	0	179
Average Numbers of Admin Staff	50	36	1	568
Average number of Waste Handlers	34	49	1	302

From above table, it is clear that the nongovernmental (private and mission) hospitals have higher average numbers of technical human resources and infrastructures than government hospitals. The government hospitals have higher number of administrative staff over private and mission ones. The other most important finding from this particular section is about the compliance of environment protection provision of the Government for carrying out Initial Environmental Examination (IEE) for 25 to 100 Beds and Environmental Impact Assessment (EIA) study for hospitals with more than 100 beds. It is important to note that IEE for the health-care facilities has been administrated by MOHP whereas EIA has been administrated by Ministry of Science, Technology and Environment (MOSTE). Though the result of compliance with the IEE and EIA provision is not much encouraging, it has been under good progress among the private hospitals as it is made mandatory for getting renewable of the respective health-care facilities. Still, some of the big hospitals with teaching facilities do not bother about conducting EIA and they just do not care about the respective ministries. It is painful to note that government hospitals seem to be immune to this IEE and EIA

provisions, which is unlawful and sector bias.

In total, only 22.58% hospitals had compliance with the IEE and/or EIA provision with only 7.14% of public hospitals and about 40% private hospitals, despite the fact that none of the health-care facilities are immune to this good environmental provision and needs immediate attention from concerned implementing agencies.

Figure 4: Unprotected drinking water source

Table 5. Compliance status of IEE and EIA provision by the health-care facilities of Nepal

Types of Hospitals	Numbers	Compliance with IEE & EIA	% of Compliance	Remark
Government/ Public	14	1	7.14	Only One under MoGA has EIA clearance
Private	15	6	40.00	Encouraging
Mission/ NGO	2	0	0.00	Not all
Total	31	7	22.58	Very Poor implementation
NOTE: Some of the private hospitals getting renewed just by passing TOR of IEE and/or EIA are very serious issue needs immediate attention by concerned ministries MOHP and MOSTE.				

Regarding top five epidemic diseases in the hospitals, they vary from region to region, the most commonly reported are mainly water borne and climatic condition induced such as diarrhoea, dysentery, fever, and respiratory infection. Drinking water sample from one out of 31 studied hospitals is found to have coliform contamination up on tested with the help of Coliform P/A (H2S) Test Vial developed by ENPHO.

2.2 Water Quality

The water supply source varies from hospital to hospital across the region, type and ownership and so does the water quality. Most common sources of water supply in Terai and hilly regions are tube well with low source protection provision and water supply system as well as ground water extraction with somewhat relatively protected sources respectively. Some hospitals do have source protection, pretreatment as well as chemical disinfection such as chlorination; some do have provision of euroguard along with boiling facility of drinking water.

From analysis results, 84% of the hospitals have safe sources of water; 51.6% have acceptable sources of water whereas 16% of the hospitals have water supplies from badly protected sources.

Figure 5: Drinking Water Sampling Shows Coliform Contamination

Figure 6: Water Source Quality

Similarly, there is lack of regular water safety monitoring among the hospitals. Only 9.68% hospitals have very good regular monitoring mechanism whereas 25% hospitals did not have any monitoring system in place at all.

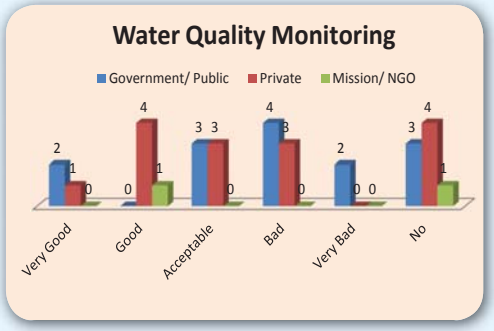

Figure 7: Water Quality Monitoring

Overall, 45.16% of hospitals have relatively better monitoring system. Only 6.45% hospitals have very good drinking water treatment system in place; one each in public and

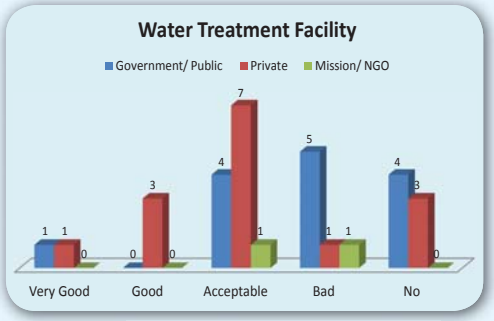

Figure 8: Water Treatment Facility

private sector having filtration and chemical disinfections.54.84% hospitals do have satisfactory level of drinking water treatment facilities including filter like Euroguard and very few do have chemical disinfection. 45.16% hospitals have very poor drinking water treatment system in place including 7 hospitals which have bad and the other 7 hospitals even do not have any treatment facilities at all. People directly use groundwater sources, mostly in Terai hospitals where tube well is only available and accessible sources of drinking water.

There is lack of cross contamination avoiding mechanism for drinking water from other waste water. Only 12.90% hospitals have very

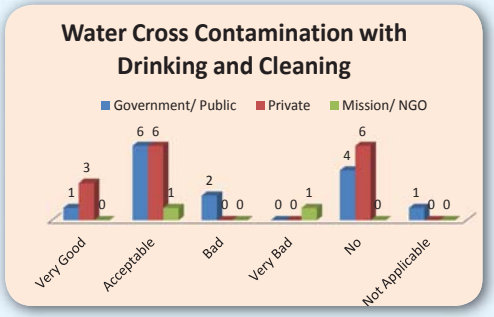

Figure 9: Water Cross Contamination with drinking and cleaning

good cross contamination avoiding mechanism in place with a separate drainage system for drinking and waste water. 41.94% hospitals have acceptable level of cross contamination avoidance system, rest 45.16% have very poor cross contamination avoidance system including large number of hospitals; 32.26% do not have such mechanisms.

In case of unacceptable source of water supply, most Private hospitals have alternative source of drinking water. 67.74% of hospitals have poor alternate sources including completely no alternative in 58.06% of the hospitals.

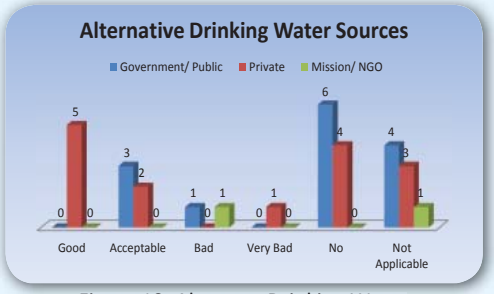

Figure 10: Alternate Drinking Water

2.3 Water Quantity

There is relatively good amount of water available with most of the health-care facilities across the type but comparatively large numbers of private hospitals do have good supply of water at all the times and for all purposes.

About 83.87% of hospitals do have sufficient water supply at all the times and for all the purposes. Public Hospitals have insufficient water supply.

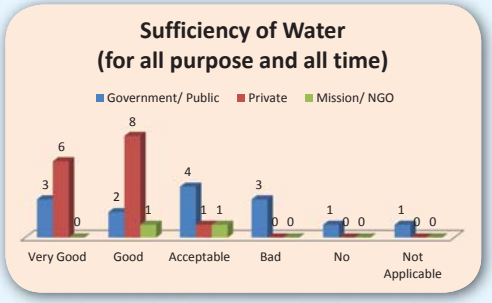

Figure 11: Water Accessibility

74.19% of hospitals have mechanism of avoiding water loss from regular repair and maintenance of fittings. Relatively better mechanism of water wastage prevention exists in private hospitals than that of in public hospitals. Mainly public hospitals have poor mechanism of avoiding water loss

Figure 12: Avoidance of water losses

2.4 Water Facilities and Access to Water

The water facilities for all the required purposes and water sources accessibility vary across the type of hospitals among government, private and mission/NGO. More private hospitals have good access to water for the patients and visitors than that of public and NGOs hospitals.

41.94% hospitals have better water accessibility mainly in private hospitals than in public and mission hospitals. 38.71% hospitals have more acceptable level of water accessibility mainly in public hospitals than private and mission hospitals, 19.36% hospitals have very poor water accessibilities among all types of hospitals.

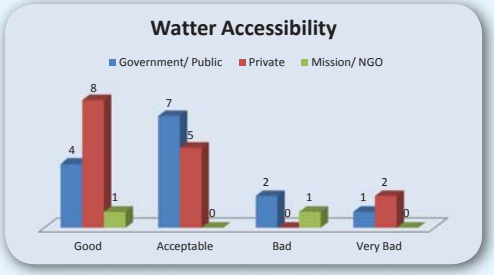

Figure 13: Accessibility of Water

Very few hospitals have adequate and properly working shower facilities in place. 51.61%, largely private hospitals have

acceptable level of shower with respect to their adequacy in number and proper working condition. Few hospitals do not have shower at all. 35.48% hospitals are having inadequate and poorly working number of showers, mostly in the public hospitals.

Figure 14: Shower adequacy and working properly

2.5 Excreta Disposal

Adequate number of toilets should be well designed, built and maintained for hygienic and acceptable use and should not become centers for disease transmission. This includes measures to control fly and mosquito breeding, and a regularly monitored cleaning schedule. The overall excreta disposal system related facilities, their user friendly designing, regular repair and maintenance, cleanliness, smell, availability of water and soap, routinely cleaning and maintenance mechanism vary across the types of the hospital.

Figure 15: Badly operated toilet

45.16% hospitals have good number of toilets with large number of private hospitals (10) and only few number of public hospitals (3) and NGO (1) have good number of toilets. 35.48% hospitals have acceptable number of toilets, especially in large public hospitals (6) whereas only 4 private hospitals

have acceptable number of toilets. 19.35% hospitals have very less number of toilets mostly with the public hospitals.

Maximu no. of hospitals have user friendly toilet design.

Figure 16: Sufficiency of Toilet

Large no. of hospitals has regular toilet maintenance and repair mechanism.

About 40 % of hospitals have good supply of water and soap whereas about 60% of hospitals have bad availability of water and soap.

Figure 17: Design of Toilet

Only 29% of hospitals have good maintenance and cleaning routine, rest have poor.

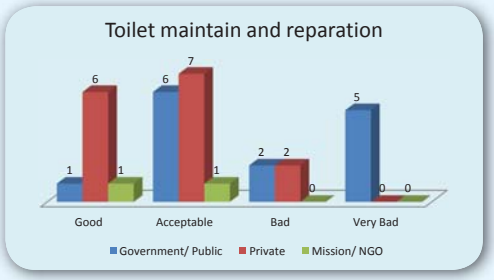

Figure 18: Toilet Maintenance and Repair

Six (20%) hospitals have clean toilets without smell and rest have dirty smelling toilets.

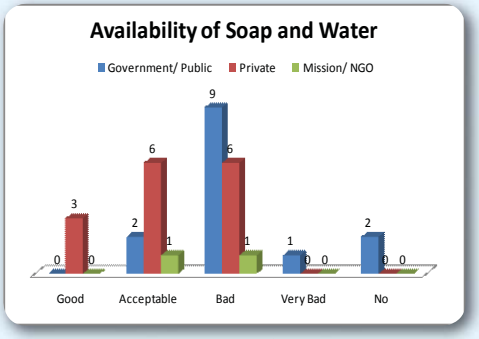

Figure 19: Availability of Soap and Water

Figure 20: Routine Maintenance

Figure 21: Cleanliness of Toilet

29% of hospitals have good accessibility of toilet for staff, patients and their care takers. About 65 % of hospitals have acceptable level of quality toilet with accessibility for all.

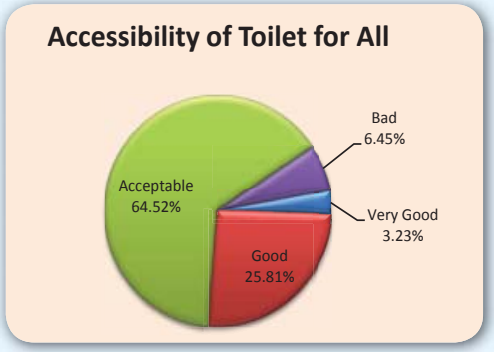

Figure 22: Accessiblity of Toilet

2.6 Waste Water Management (WWM)

Very few hospitals have taken waste water and liquid waste management matter seriously. Most of them even did not think of liquid waste issues and hence did not have the proper drainage system at all. However, there are very few but they are demonstrating very good waste water management system in place and operating successfully as low cost waste water treatment technology. The various level of arrangement regarding WWM system, its operation and maintenance as well as protective situation of WWM system

has been found at various degrees across the different types of hospitals shown in bar diagrams.

From diagrams, it is clear that, only 3.23% hospitals have very good operated and maintained WWM system whereas, very large 54.84% of the hospitals have acceptable level of operated and maintained WWM system in place. Remaining 35.48% of hospitals have poorly operated and maintained WWM system. Similarly, only 3.23% of the hospitals have good WWM. Majority, 83.87% of hospitals have very poor WWM including complete absence of any waste water system in 58.06% as shown in diagram with red corner bar.

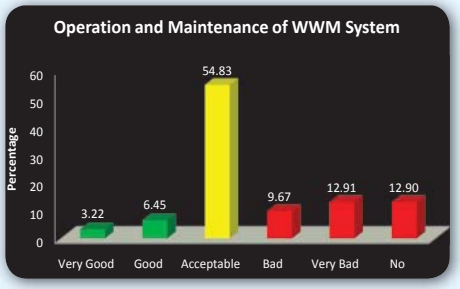

Figure 23: Operation and Maintenance of WWM System

Likewise, 58.06% hospitals do not have any protective features maintenance mechanism in place of WWM system. Therefore, overall WWM system and associated operation, maintenance and protective features maintenance of WWM system is poor across

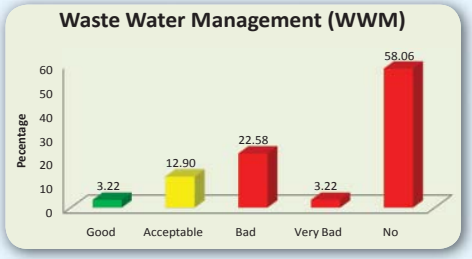

Figure 24: Waste Water Management

different types of hospitals with absolute absence of such facilities and accessories in some hospitals. This is found to be disturbing in the field situation and posing serious hreats to the environment and public health.

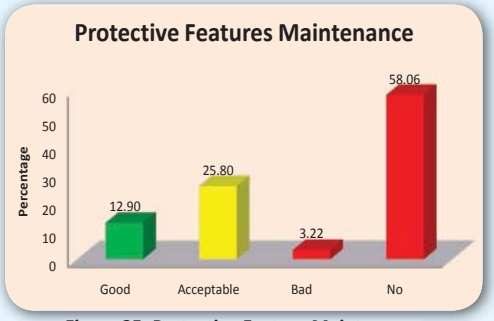

Figure 25: Protective Feature Maintenance

Figure 26: Waste Water Drainage System at BPKIHS, Dharan

Figure 27: Reed Bed Technology at Illam District Hospital

2.7 Building Design, Construction and Management

Buildings are designed, constructed and managed to provide patients, health care staff and care-takers with a healthy and comfortable environment because following factors largely depend on and are interrelated with proper building design, construction and management. Air temperature, humidity and airflow in the health-care setting provide patients, staff and care-takers with a comfortable environment. Airflow minimizes the risk of transmission of airborne pathogens from infected patients to susceptible staff, patients and care-takers.

Sufficient lighting is provided during all working hours to allow safe movement of staff, patients and care-takers and for normal undertaking of medical activities. Buildings are designed and activities are organized so as to minimize the spread of contamination by the movement of patients, staff and care-takers, equipment, supplies and contaminated items, including health-care waste, and to facilitate hygiene. Health-care settings are built, furnished and equipped with materials that minimize infectious disease transmission and facilitate cleaning. Sufficient space is provided for people in wheelchairs, as well as to minimize infectious

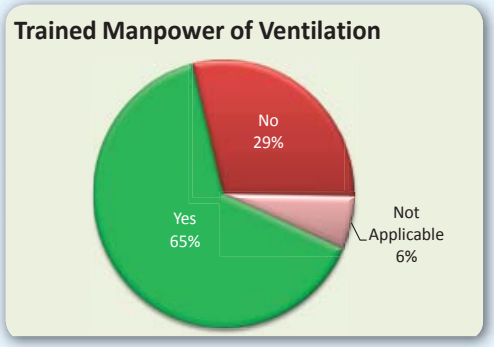

Figure 29: Trained Manpower of Ventilation

Figure 30: Building Management

Figure 28: Lighting Maintenanance

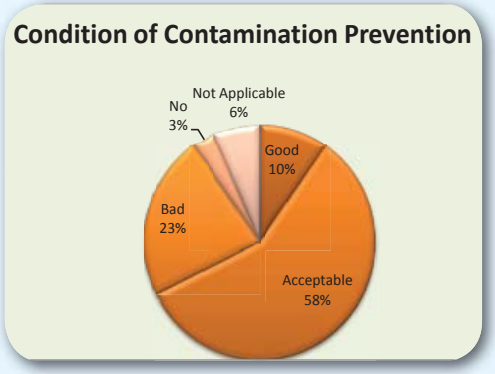

Figure 31: Contamination Prevention

disease transmission. Following diagram summarizes the finding about all these issues related to building design, construction and management.

All the studied hospitals, building design, construction and management vary differently with reference to lighting maintenance, provision of trained manpower for ventilation, building management, contamination prevention and adequate space between beds, corridors and peripheries.

2.8 Stress Management

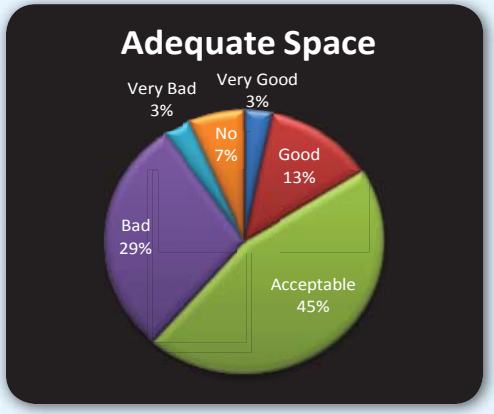

Figure 32: Adequate Space

There is increasing amount of stress not only on the health-care provider, but also severe and intense on the patients and sometimes more on the patient caretakers. Stress may arise due to several factors such as large number of patients i.e. high ratio of patient to health-care providers, lack of proper supply of materials, infrastructures not being user friendly, unhygienic condition, poor supply of water and sanitation of health-care facilities which resulted into the stress among the people working as well as getting treatment in the hospitals. This may result into increasing of the medical negligence cases threatening to the patient health and well-being. Hospital administration can play an important and major role to reduce the existing stress as well as create a suitable environment that reduces the chances of arising stress. Following figures summarize the finding of stress condition of the health-care providers, stress management to the staff and psychological environmental conditions.

From diagrams, it was clear that the stress over the health-care receiver has been handled with good manner among large number of the hospitals however some hospitals did not care about the hospital acquired stress on the patient and their care takers. 16.13%, 41.94% and 6.45% of hospitals have good, acceptable and very bad management of health care receiver's stress condition respectively while 9.68% have no management at all.

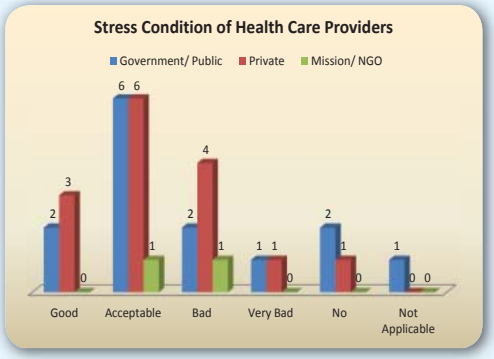

Figure 33: Stress Condition of Health Care receiver

35.48% of the hospitals have good level of staff's stress management. Stress over the staff has been found to be handled by due care more in government hospitals than in the private hospitals. Mission /NGO hospitals pay good attention to staff stress management.

18% of hospitals have acceptable managerial level of psychological environment while 3.23% of hospitals have no management of psychological environment at all.

Figure 34: Stress Management to Staff

There was very good psychological environment management among government hospitals in comparison with private and mission hospitals. There was bad psychological condition more among private hospitals as there was always insecure kind of fears about the job security in the private hospitals. There was also evidence of bad psychological environment among private sector as number of tussles between workers and health-care facilities owners and/or manager was high in private than in public.

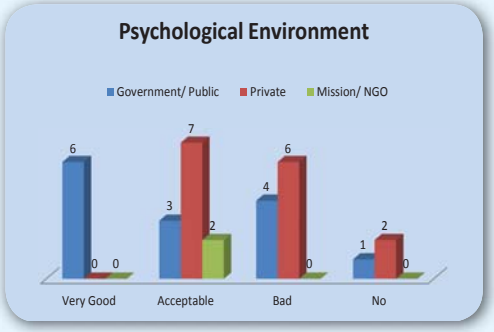

Figure 35 : Condition of Psychological Environment

2.9. Community Relationship

TThe full functional and best operated health-care facilities should have a friendly relationship with the community. These days, community leaders and senior citizens are found to be the active board members of the health-care facilities. This was one of the good provision through which the operation and maintenance of a health-care facility can be monitored as well as raise the concern of communities with the hospital administration. For example, local patients have been given special privilege of getting free and emergency treatment as in case of Dhulikhel Hospital, the land contributor to this hospital has been receiving free treatment services.

From diagram, it is clear that though the government has adopted free health-care facilities, it is not fully realized in the field. Both public and even increasingly private hospitals are providing some short of free health-care service to the ultra-poor identified during the course of treatment

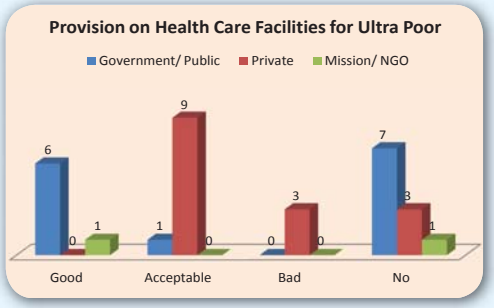

Figure 36: Health Care Facilities for Ultra Poor

and on the basis of recommendation from any political party, political figures or just based on personal judgment of the hospital administration. About 54.84% of the hospitals have acceptable level of service to the ultra-poor whereas rest 45.16% of hospitals do not have any additional such provision of serving ultra-poor. All are treated equally in them.

Not much encouraging additional facility were given to adjoining communities except in very few. Hospitals do have number of public awareness campaigns, mostly in line with the specific days such as hand washing days, Anti- Smoking days, Vaccination days, Environment days, but very few have planned and regular public awareness days. However, this should be the regular phenomenon among all hospitals to have organized special health camps over the years. Significant percentage of hospitals do care about the external environmental issues and even send their emergency response team to investigate further. However, some did not bother about the external environment at all. Some of the important information has been presented with the help of bar diagrams. There is increasing number of tussles with community in public and mission hospitals where as it is almost equal in case of private hospitals.

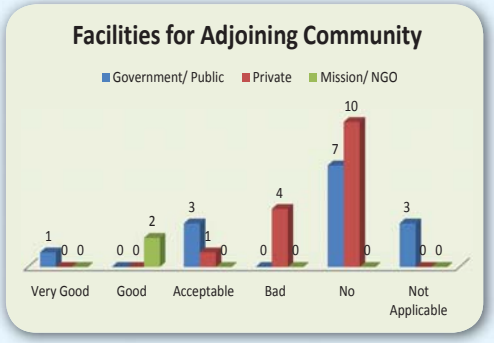

Figure 37: Facilities for Adjoining Community

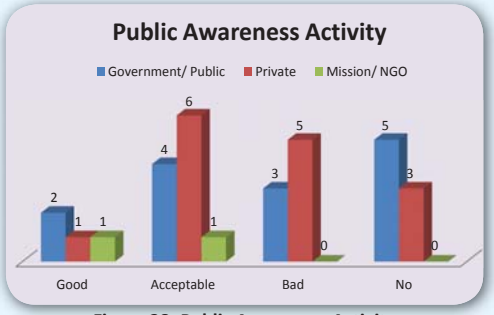

Figure 38: Public Awareness Activity

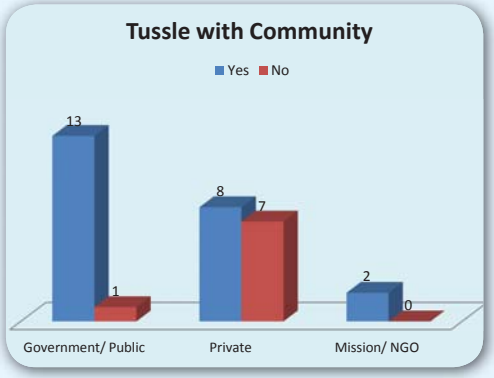

Figure 39: Tussle with Community

Figure 40: Knowledge about Community Environment

2.10 Hand Washing

Hand washing practices have been considered universally as the best way to prevent spread of infections. However, it is found to be at the moderate level even among the health care communities and very poor among the patients and care takers.

Diagrams summarize the practice of hand washing as well as availability of hand washing materials and knowledge about the hand washing practice across the government, private and mission hospitals.

From the figure it is clear that substantial (41.95%) of hospitals have poor level of

Figure 41: Hand Washing Arrangement Near Nursing Station

Figure 42: Hand washing Practices

Figure 43: Availability of Hand Washing Materials

hand washing practices. Once again 38.71% of hospital did not have availability of hand washing materials in place. Most of the hand washing basins and toilet dedicated to the patients and visitors were not supplied with soap and generally not clean as well.

Figure 44: Knowledge about Hand Washing

There was lack of knowledge about proper hand washing practices among 35.48% of the hospitals.

2.11 Food Hygiene

Food for patients, staff and care takers should be stored and prepared in a way that minimizes the risk of disease transmission and at the same time it has to be nutritious too. Food handlers should be trained in basic food safety. Food handlers should wash their hands after using the toilet and whenever they start cooking, change tasks, or return after an interruption. Soap and water should be available at all times during food preparation and handling food to ensure that hand washing can be done conveniently. Surfaces used for food preparation should be washed with detergent and safe water and then rinsed, or wiped with a clean cloth that is frequently washed. Scraps of food should be disposed off rapidly, as they are potential harbor for bacteria and can attract insects and rodents. Refuse should be kept in covered bins and disposed off quickly and safely. Kitchen utensils should be washed immediately after each use with hot water and detergents and air dried. The cleaner saucer utensils are; the easier they are to wash. Drying cloths should not be used, as they can spread contamination. In many inpatient settings, care-takers may bring food to patients, or may

prepare food at the health-care setting. In these cases, staff should seek to ensure that food is prepared hygienically and that cooked food is consumed immediately. Cooking facilities may need to be provided. Cooked and uncooked food should be kept separate and covered.

Following diagrams summarize the finding of the study with respect to hand washing practices while handling food, protection of food from rodent and vermin, possibilities of close contact between raw and cooked food, cooking, storage and dry food maintenance practices adopted in the studied hospitals.

Figure 45: Food Cooking Uusing Traditionally Stove

Figure 46: Cooked Food Openly Kept in Waiting Area

Figure 47: Food Eating Inside the Ward Near Patient's Bed

The canteen facilities were present in many health-care facilities with different quality ranging from open tea and bakery shop in the hospital premises to very much sophisticated and clean canteen with all modern facilities of cooking and supplying food. Some of the hospitals did not have any canteen provision at all and patients were supplied with food either from their care takers, or from outside shops poorly.

Figure 48: Hand Washing Practice while Handling Food

32.26% of hospitals have acceptable level of hand washing practice for food while 22.58% have bad practice, especially in governmental hospitals (6). 16.13% of the hospitals have good practice of food protection from rodent and vermin while one government hospital

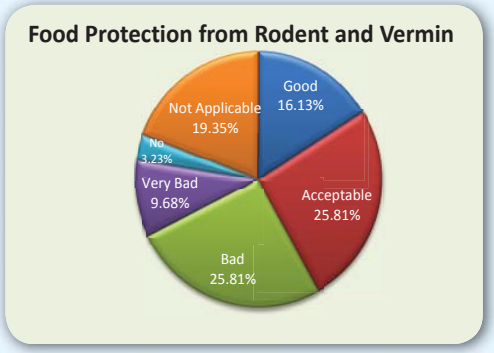

Figure 49: Food Protection from Rodent and Vermin

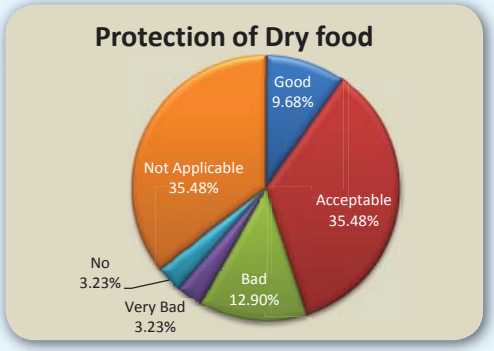

Figure 51: Protection of Dry Food

does not have any food protection practice at all. 6.45% and 22.58% of hospitals have very good and acceptable level of food cooking practices respectively while 35.48% of hospitals have bad cooking practices (both in government as well as private hospitals). For the children below 3 yrs. of age, food safety is very important. 41.94% of hospitals have acceptable level of food safety while 35.48% do not have any food safety practices for children below 3 yrs. This case was found in 5 government and 6 private hospitals.

Almost 40% of the hospitals were found to be having acceptable level of arrangement regarding hand washing practices while handling food, protection of food from rodent and vermin, possibilities of close contact

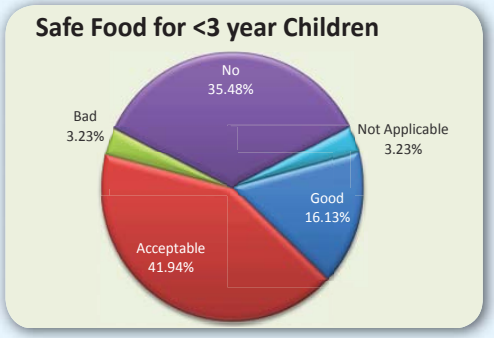

Figure 50: Food Safety for <3 yr. Children

between raw and cooked food and thoroughly cooking of food meaning rest 60% of hospitals need to make massive improvement to secure, cleanliness and sanitation aspects of the food hygiene.

2.12 Vector Borne Diseases

Appropriate and effective approaches, practices, environment and public health friendly proven methods for excluding or reducing vector numbers is of most important to control vector borne diseases. These depend on the type of vector; the location, climatic condition and number or size of breeding sites; vector habits, including places and times of resting, feeding and biting; and resistance of specific vector populations to control chemicals etc. Basic environmental control methods, such as proper drainage, waste disposal, excreta disposal and food hygiene, should be maintained all the time and routine-based dedicated monitoring is required for these.

Mosquitoes and flies can effectively be excluded from buildings by covering open windows with arrangement of mesh wire of appropriate holes, size and fitting self-closing doors to the outside. Any use of chemical control requires specialist advice, such as for

residual insecticide spraying, in and around the health-care setting. Advice should be available from within the MOHP.

From above diagrams, it is clear that only about 12.90% of hospitals have good level and about 54.84% of the hospitals have

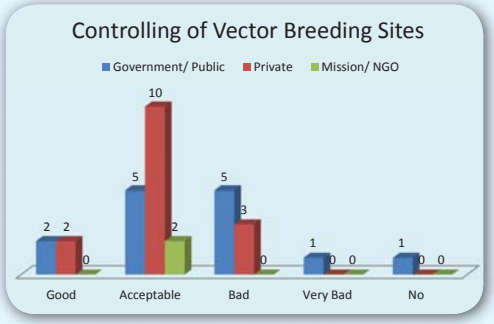

Figure 52: Controlling of Vector Breeding Sites

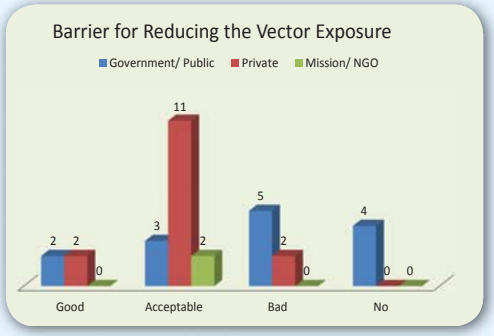

Figure 53: Barrier for Reducing the Vector Exposure

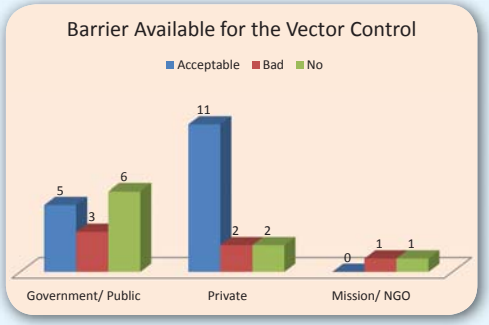

Figure 54: Barrier Available for Vector Control

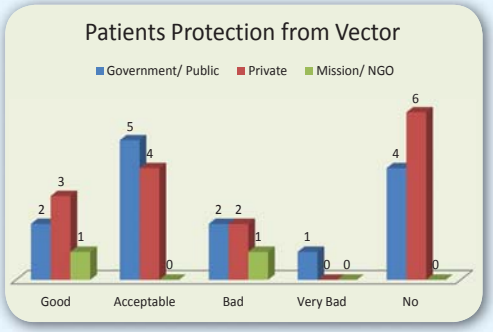

Figure 55: Patient Protection from Vector

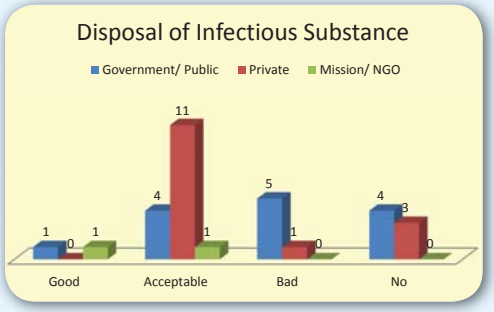

Figure 56: Disposal of Infectious substances

acceptable level of controlling vector breeding sites by filling the water logged areas and maintaining cleanliness around the hospital. Overall, more than 50% of the hospitals have relatively good practices of controlling of vector breeding sites; barriers for reducing vector bites and exposure, patient protection from vectors and proper practices while handling food, sanitation facilities, especially the management practices of the infectious substances disposal.

2.13 Information and Hygiene Promotion

Hygiene promotion is important for all staff, patients and carers. It should be given constant reminders of the importance of infection control and the routine measures are required to achieve it. This applies to all health-care settings, including home

care. Health promotion may be limited to providing basic information about such things from the location and correct use of waste bucket, toilets and hand washing points. Health-care workers have a primary and leading role and responsibility for these entire practices in places.

From diagrams, it is clear that most of the hospitals did not have any written Action

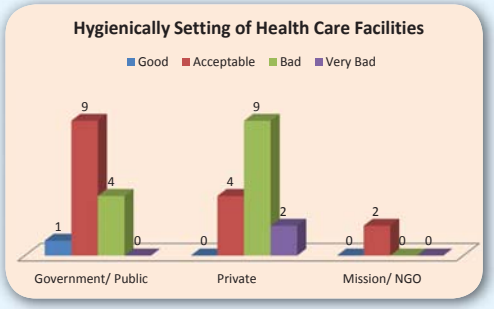

Figure 57: Hygienically Setting of Health Care Facilities

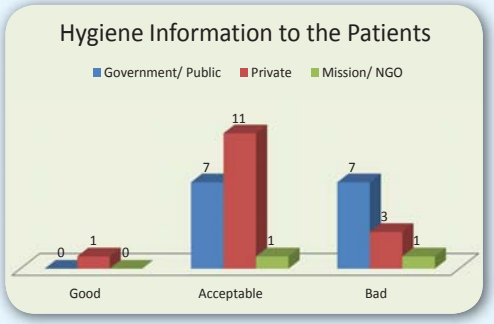

Figure 58 Hygiene Information to Patients

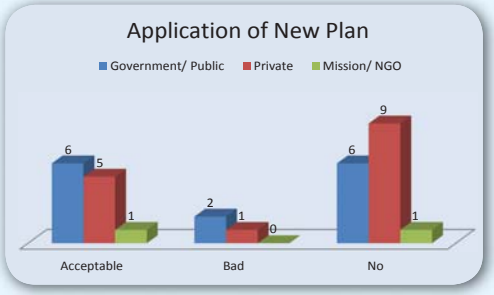

Figure 59: Application of New Plan

Figure 60 : Dedicated Information Desk at BPKIHS

Figure 61: Waste Water System Operation Demonstration

Figure 62: Hand Washing Posters and Assets

plan and annual plan for hygiene information promotion. Only 38.71% of the hospitals have somewhat Action plan on ad hoc basis. Only one hospital (3.23%) has a dedicated Information desk for promoting hygiene information at BPKIHS. Other 15 (48.39%)

hospitals do have hygiene information promotion process as we saw a series of hygiene promotional materials displayed either in some department or in all around the hospitals. The content and subject matter displayed were more relevant and correspondent to the place specifically used for treatment.

The information displayed was relevant and updated over the time. In the waiting zone, most of the hospitals have provision of television for entertainment. These visual aids can be used for the hygiene promotion activities by playing suitable video documentaries and cartoons or public interest advertisements on health, sanitation and environment.

2.14 Cleanliness and Laundry

90% of microorganisms are present within visible dirt, which should be eliminated by routine cleaning. Neither ordinary soap nor detergents have antimicrobial properties, and the degree of cleanliness with destruction of microbial depends essentially on cleaning process using mechanical action. Wet mopping with hot water and detergent, if available, is recommended, rather than sweeping. If hot water is not available, a 0.2% chlorine solution, or other suitable disinfectant in cold water should be used. However, detergent is sufficient for normal, domestic cleaning of floors and other surfaces that are not in contact with hands and medical instruments.

32.26% and 45.16% of hospitals do have good and acceptable regular surface fitting respectively while 22.58% have bad surface fitting regularity, especially in government hospitals (6). 6.45% of hospitals have bad practices of hospital zone cleaning, particularly in government hospitals (2) while two private hospitals do not have any cleaning practices at all.

In 22.58% of hospitals, there is good situation of contaminants cleaning while 19.35% hospitals (6 government hospitals) have bad contaminants cleaning practices. In case of

Figure 63: Soiled Linens Ready for Cleaning Outside

soiled linen, 51.61% of hospitals practice exchange system while there is no exchange practice in 2 governmental hospitals. In 54.84% of hospitals cleanliness of mattress and pillow is acceptable whereas in bad cleanliness practices of pillow and mattress lie in 22.58% (7 government hospitals).

From bar diagrams it is clear that over 60% of the hospitals have satisfactory level of cleanliness and laundry system in place

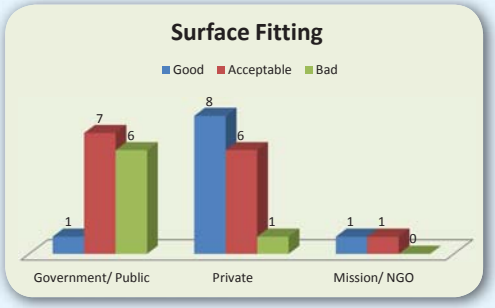

Figure 64: Surface Fitting

Figure 65: Cleanliness of Pillow and Mattress

Figure 66: Contaminants Cleanliness

Figure 67: Hospital Zone Cleaning

Figure 68: Exchanged Soil Linen

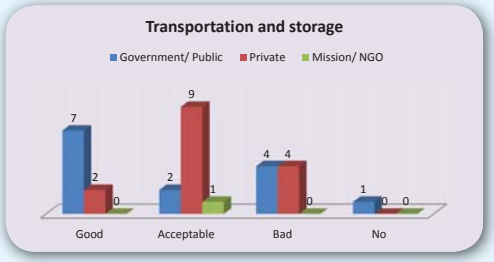

Figure 69: Transportation and Storage

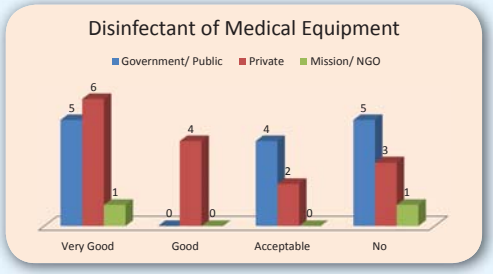

Figure 70: Disinfectant of Medical Equipment

Figure 71: Cleaned Linen for Supply in the Wards

with reference to cleaning of surface fitting, cleaning of hospital zone, contaminants cleaning, exchange practices of soiled linen, its transport procedures, disinfection of pillow and mattresses as well as equipments used in the studied hospitals. Some of the extreme end we found in one of the government hospital is that the patient has not been supplied with the linens for the bed as we have seen most of the beds with different linen brought by the patients themselves.

2.15 Health-Care Waste Management

There are several kinds of hazardous waste generated in hospitals and each requires separate collection, transportation, specific treatment and disposal methods, which include encapsulation, sterilization, burial, incineration and long-term storage. Some wastes, such as pharmaceutical wastes, cannot be disposed of in low-cost settings and should be sent to a large centre for destruction or returned to the supplier. The waste-disposal zone should be fenced off; it should have a water point with soap or detergent and disinfectant for hand washing or to clean and disinfect containers, with facilities for wastewater disposal into a soak away system or sewer. The waste-disposal zone should also be located at least 30m from groundwater sources. Following diagrams represents the hospital waste management approaches.

From above diagrams, following inference can be drawn:

a) Only one public hospital (3.23%) has complete onsite source separation but not in all wards. 3.23% (1 private) of hospital have good source separation of waste. While 32.26% of the hospitals

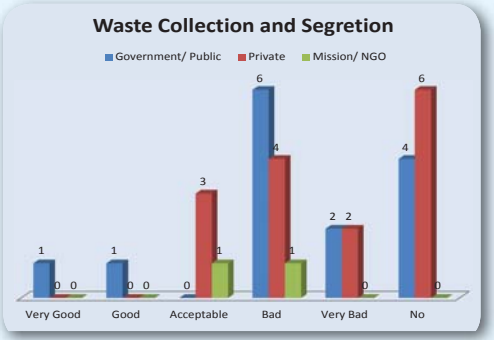

Figure 73: Waste Collection and Segration

Figure 74: Transporationa and Waste Transfer

Figure 75: Waste Treatment

Figure 72: Waste Seprate at Source

Figure 76: Heatlh care Waste Disposal

have acceptable level of source separation practices. 61.29% of hospitals have very poor source separation including complete absence of such practices in 6.45% (2 private) of the spitals.

adopted very good waste disposal system and; 6.45% public hospital do have good disposal system; 9.68% of the private hospitals have acceptable level of waste disposal practices whereas 80.65% hospitals do not practice safe disposal of health-care waste.

Figure 77: Hospital waste management system i.e. Source separation, collection & transfer appropriately and separately and treat with autoclave

b) Only 3.23% (1 public) hospital has very good waste collection system; 12.90% have acceptable level, whereas 80.65% of hospitals (6 private and 4 governmental) do not practice appropriate and separate waste collection.

c) Only 22.58% of hospitals have relatively appropriate and separate transport of waste and remaining large 67.42% of hospitals have very poor transportation.

d) Only one hospital (3.23%) has adopted environment sound management treatment practices, another 6.45% hospital does have acceptable level of waste treatment practiceswhereas rest 90.32% hospitals do not practice environment sound waste treatment system at all.

e) Only one public hospital (3.23%) has

2.16 Mercury Free Health-Care Services

Even today in the 21st century, a large number of health-care facilities in Nepal still use large number of mercury based measuring equipments such as mercury thermometers and mercury sphygmomanometer, chemicals and practices and products such as dental amalgam, vaccine preservative, contact lens preservative, dilator tubes, fluorescent lamps, batteries and other many items in the health-care sectors.

From recent estimate of CEPHED 2011 about the use and release of mercury from health sector of Nepal, it has been found that about 500Kg of mercury has been used only in two measuring devices such as thermometers and sphygmomanometer and about 125Kg of mercury has been found to be released annually to the environment from health-care services of Nepal just from breakage of

Figure 78: Liquide Mercury for Dental Filling

mercury thermometers. More than 150Kg mercury based chemicals and dental amalgam have been found to be annually sold into the Nepalese market for dentistry. About a million of florescent lamps including CFL with varies amount of mercury has been imported, sold, distributed and used with various promotional programs of government, business communities and even media houses as well as NGOs. A good thing is that there is increasing number of mercury free alternatives of all those practices and products have been available in the country at very affordable price, which are equally reliable and accurate.

In line with this global mercury free health-care initiatives, GoN through its line ministry MoHP has realised the importance of the issues and is under the process of formulating mercury free health-care policy to regulate this issue to reduce the environment and body burden out of this heavy metal mercury. Before the policy, a number of successful pilot programs were introduced at various levels of hospitals from private, public to communities. As a result, several health-care facilities are mercury free now. As of today more than 15 hospitals have successfully made the shift from mercury base to non-mercury and many more in the verge of shifting are the

Figure 79: Mercury Free Health-Care is Economic, Health & Environment for Friendly

positive sign of the improvement with clear evidences of finding zero level of mercury residues in the hospital environment up on post intervention testing the mercury level in the hospitals. Like Maternity and Stupa Community Hospitals were made mercury free by CEPHED with the help of WHO and others. Moreover, CEPHED has been doing research; paper production and dissemination of several IEC materials like fact sheets, posters, study report, radio and video documentary, mercury spill management tool kits etc. along with organising series of district, regional, national level awareness and capacity building programs on heavy metals including mercury. In addition to this, learning from mercury related works has been presented and shared at different international forums by CEPHED. .

2.17 Environment Condition of HCF in patient perception

A set of questionnaire was also administered with the patients to solicit the direct responses from the patients who were admitted into the emergency, OPD and IPD and have first-hand experiences of the environmental health condition of the hospital they were admitted for undergoing treatment.

Table 6. Patient's Perception on Hospital Environmental Health Condition of Nepal

Components	Wards of the Hospital	Frequency	%
Patient staying ward	Emergency	29	33.0
	OPD	36	40.9
	IPD	23	26.1
Purpose of coming	For Check up	76	86.4
	Receiving the information	9	10.2
	Visit patients	3	3.4
Sanitation Condition of Hospital	Satisfied	52	59.1
	Not so Hygienic	33	37.5
	Very poor	3	3.4
Use of Toilet during stay	Yes	81	92.0
	No	7	8.0
Sanitation condition of toilet	Well mentioned	26	29.5
	Normal	49	55.7
	Not so good	10	11.4
	Not Applicable	3	3.4
Adequately availability of water	Yes	76	86.4
	No	10	11.4
	Not Applicable	2	2.3

Components	Wards of the Hospital	Frequency	%
Availability of cleaning person	Yes	27	30.7
	No	44	50.0
	When Necessary	17	19.3
Patient's Behaviour of waste disposal	Nothing	3	3.4
	In Bucket	79	89.8
	In any accumulated Area	4	4.5
	Throw Everywhere	2	2.3
Counselling about waste Handling	Nobody	2	2.3
	Yes	25	28.4
	No	61	69.3
Counselling person	No Body	32	36.4
	Nurse	26	29.5
	Guard	1	1.1
	Not Applicable	29	33.0
Availability of Soap	Yes	23	26.1
	No	65	73.9
Grading of waste management	Very Good	17	19.3
	Good	61	69.3
	Bad	9	10.2
	Very Bad	1	1.1
N= 88			

From the above table, 55% of patients were satisfied with overall sanitation condition of hospitals. 86% said there was adequate water supply but maximum (44%) said about unavailability of cleaning agent near the toilets.

3. Policy Review and Recommendations

A broad range of relevant national and international policy documents were reviewed in light of the included 15 major research components in this study. A brief summary of policy reviewed has been included into the following sections.

3.1 Problems on Policies and Legislation

Health sector has been recognized as the most important segment of the social structure in national policy and legislation. Review of legislation policies did not have all important sectors of environmental health parameters that are posing serious threats on health workers, patients, visitors and the communities as well. At the same time, the implementation of several provisions related to Act as well as policies are also questionable in absence of defined delegated authority.

It has been recognized that IEE or EIA provisions of EPR and EPA can play a vital role in taking steps to prevent environmental degradation due to health-care service (HCS) and hospitals. There is a provision of environmental assessment, but in many cases, the HCS had not carried out environmental assessment and those carried out were not following the EMP and commitments at the time of its approval. For private hospitals, EIA or IEE is compulsory to renew their license. However, government hospitals are running without these provisions. Again, there is new provision for renewal to go through; the structure of private hospital buildings should have earthquake safety. This provision is lacking in the case of government hospitals.

Solid Waste Management (SWM) Act 2068 fulfills legal basis and regulation for health-care waste management (HCWM) in Nepal. According to the Act, hazardous waste and hospital waste should be managed by its generator by him or herself. The Act clearly states that they should manage the waste according to the standard technology in environmental friendly manner. However, most of HCS are disposing the waste in community and degrading the environment. There is provision to fix HCWM standards and ensure their implementation to provide permissions for new HCS establishment. However, HCWM standards have not been established yet.

Private and Non-Governmental Health Institutions Establishment, Operation, Standards and Infrastructure Guidelines, 2061 B.S. contains the code of conducts required for the operation of health institution by any private or NGO institution. This guideline deals with the infrastructure and standards required for the operation of health institutions like equipments, pharmacy, OPD and In-patient services, human resources, emergency preparedness, waste disposal and management and all other prerequisites. However, follow up of the guideline is not up to the mark.

There are overlapping responsibilities in implementing the provisions regarding the environmental health in hospitals. There is an urgent need for coordination and cooperation among the concerned stakeholders to implement the current environmental health provisions of the available legislations effectively.

The present policy mostly focuses on increment of service delivery capacity and

number of health institutions in the country. Moreover, the provisions in Act regarding the environmental health are distributed in several headings and responsibilities are also distributed along with but there is lack of provision of coordination among them. There is not any confined legislative document and, or body to promote the environmental health of HCS in the nation.

The promotion of sound environmental health of hospitals in Nepal is declining due to lack of clear policy, proper coordination, and responsible government agency for environmental health of hospitals. Knowledge and awareness among health workers, awareness and commitment in hospital management, fear of change and increase in cost, poor consultation system, absence of environment friendly work culture (both health workers & management), lack of research and database on different indicators as per Nepalese conditions are also responsible as barriers for not improving environmental health of HCS.

Ineffective enforcement mechanism of the government needs a great improvement in order to build the capacity to control the situation. At national level, to gain momentum to get healthy environment throughout the country in all HCS, Environmental Health Unit needs to be established in every HCS.

3.2 National Level Policy Recommendation

There are several provisions related to environmental health of hospitals in policy level, but unfortunately, the provisions are not much effective in practice and still need a lot of awareness, capacity building campaign, effort and single responsible department to coordinate the efforts. Hospitals have never taken care of minimum standards provisions in the laws. Therefore, there is a need of a concise policy covering all aspects of environmental health.

The new policy should assure to achieve the goals and fix the standard for 15 or more components and their indicators included in this study. The standards required for water quality, water quantity, water facilities and access to water, excreta disposal, waste water management, building design, construction and physical condition, stress management, community relationship, hand washing, food safety, vectors borne disease prevention, information and hygiene promotion, cleanliness and laundry, health-care waste management, mercury free health-care service should come in same policy heading with responsible department to look over for promotion, implementation, monitoring in the hospitals irrespective of ownership of hospital.

3.3 Hospital Level Policy Recommendation

To achieve goals every hospital should move towards healthy hospital through raising awareness and creating strong commitment to have change among owners, senior and middle management as well as all health workers. They need to have a single responsible officer and related department to look after environmental health condition of the hospital. They have to form an inclusive Environmental health team to perform need assessment for all of the components as well as fix their indicators and prioritize the problems to develop environmental health action plan for resolving them. Implementation process and outcomes should

be evaluated in short and long terms and necessary improvement action should be promptly taken.

3.4 Program Level Policy Recommendation

At national level following are the recommended programs and set of actions to gain momentum to make healthy hospitals throughout the country.

Environmental Health Policy (containing improving directions for EH components) of hospitals should be developed to move forward to improve current EH conditions of the hospitals. Based on Environmental Health Policy, Environmental Health Standards for each component and indicators of EH for hospitals should be developed by MoHP.

It is recommended that formation and mobilization of EH Department and committees in each hospitals can result to best results at hospital level. To encourage the managers at local level there should be periodic situational survey of hospitals on EH indicators with system of award and punishment. EH policy implementation and meeting EH standards should be made compulsory for renewal of hospital. These provisions should also be applied for government hospitals. At the time of approval of new hospitals, there should be EH commitment by management and adequacy of infrastructures related to EH. There is a need of regular and effective inspection form MoHP.

There should be involvement of top management level officials in EH issues. For this, there is a need of awareness raising among top management level, too. EH related problems should be identified and their local solutions should be researched. For research and awareness raising, there is a need of joining hands with international agencies like WHO and cooperation with NGOs working on the issue of EH.

Figure 80: Environment Sound Management Model of Health Care Waste ©CEPHED

4. Best Practices of Environmental Health Condition in Studied Hospitals

There are many best practices which have been found to be replicated into the other health care facilities for improving the overall environmental health conditions. Following table provides a list of best practices, one can adopt in their health care facilities.

Table 7. Best practices of environment conditions and management adapted in hospitals

S.No.	Hospital Name &Location	What is Best practices	Reason of Being Best
1	Dhulikhel Hospital, Dhulikhel, Kavre	Reed Bed Waste Water Treatment System	Local and low cost and effective treatment
2	Bir Hospital, Kathmandu	Complete set of solid health-care waste management system	Separate at source Collection separately Transported separately Stored separately Treat with autoclaving and vermi-composting Mercury free Injection safety Biogas generation from organic waste etc.
3	Bandipur Hospital, Bandipur	Rainwater harvesting	They store rainwater for cleanliness and other purposes. During summer they lack required amount of water supply which they fulfil by collected rain water harvesting.
4	BPKIHS , Dharan	Waste Management Overall cleanliness Greenery maintain Ventilation and Barrier from Vectors Food hygiene Good billing system Dedicated information desk	Source separation of waste Liquid Waste Treatment facilities and infrastructures. High class safe canteen for patients. Bilateral agreement with bank for registration and billing system.

S.No.	Hospital Name &Location	What is Best practices	Reason of Being Best
5	Ilam District Hospital	Liquid Waste Treatment Plant established Adopting plastic Free and Mercury Free health-care initiative of Municipality and interested to develop waste management practice.	Newly constructed Reed Bed technology for New Hospital under constriction with the help of SEMEN and PPPUE. Declaration of plastic free municipality has positive impact on hospitals as well. Municipality also planned for mercury free health-care services.
6	Parvat District Hospital, Kusma	Nutrition home for small kids	First of its type in district hospital level. Providing nutrition as well as awareness and saving kids from malnutrition
7	Gandaki Teaching Hospital, Pokhara	Well maintained Sanitation faculties including Clean toilets	All toilets have nearby basins with soaps for washing hands.
8	United Mission Hospital, Tansen	Free service to ultra-poor	Good community relation due to pro-poor services
9	Butwal Hospital, Butwal	Good provision of sanitation and hand washing and compliance with IEE provision	For hand washing, the hospital has sufficient water supply and tap/ basin facilities with soap for all patients. Have IEE clearance.
10	Chitwan Medical College	Regular water quality testing	The water quality is tested by hospital regularly by department of microbiology.
11	Maula Kalika Hospital, Chitwan	Mosquito control and Compliance with IEE provision	No pits within the hospital compound Mesh wire in windows Provision of net. Have IEE clearance.
12	Star Hospital, Sanepa	Hand washing Accessories and Compliance with IEE provision	Provision of water supply and tap/ basin/soap facilities. Soap availability for all patients. Have IEE clearance.
13	Om Hospital, Kathmandu	Water quality maintained and compliance with EIA provision	Own treatment facility Regular monitoring of water quality. Have EIA clearance.
14	Dhading District Hospital	Control water wastage	The provision of Valve in the water supply in common toilets. Only required numbers of toilets are in operation rest are closed.

S.No.	Hospital Name &Location	What is Best practices	Reason of Being Best
15	Kist Hospitals and Research centre	Auto clave Machine and Cleanliness and compliance with EIA provision	Allocated Autoclave for waste treatment by hospital itself. Waste separation practice is relatively good. Good laundry arrangement. Have EIA clearance.
16	Birat Hospitals and Research Center	Water availability	Water for all purpose available and water filter plant has been installed with the water supply for drinking point source.
17	Janakpur Zonal Hospital, Janakpur	Hand washing, IEC material by student	Hand washing practice has been seen frequently among nurses, numbers of IEC materials developed by nursing intern students were displayed in hospitals wards.
18	Sidhhismriti Community Hospitals	Soap and clean emergency ward, clean canteen for patients and old age homage	Good cleanliness maintained even in emergency wards as well as availability of cleaning agents.
19	Nepal Medical College, Birgunj	Good Spacing between patient bed and building infrastructures. Provision of Preventive Clinic	Bed to Bed distance is more than 5 ft. maintained, evidence of ultra-poor services and good building infrastructure. Preventive clinic concept is good.
20	Gandak Hospital Pvt. Ltd Birgunj Parsa	The compliance of IEE	Compliance of IEE provision before expanding the health-care facilities
21	Nijamati Hospital (Civil service hospital), Kathmandu	Dedicated factory of water purification	Own treatment facility on the base of reverse osmosis process with regular lab test
22	Kantipur Hospital	Good supply of Cleaning agents in most of the toilets	Almost all toilets of staffs and patients were having availability of water and cleaning agents like soaps.

5. Conclusion and Recommendations

Based on the conducted detailed study on environmental health conditions of the health-care facilities using a set of preplanned approaches of detailed survey with the help of structured questionnaire with hospital focal persons corresponding to the research components, survey with the patients- the real users of the health-care facilities, focus group discussion and more importantly with direct observation and checking the things personally by the expert teams engaged during the field visit, the following conclusion and recommendations have been made up on detailed analysis of quantitative as well as qualitative case studies.

5.1 Conclusion

From the general information view point, there are large number of different types of health-care facilities existing in the country, mostly concentrated on the urban centres and providing quality services to the people. The non-governmental (private and mission) hospitals have higher average number of beds and technical staff than the government hospitals. Whereas, government hospitals have average higher number of administrative staff than private and mission hospitals.

The most important thing that came into the picture from this section requires immediate attention was the non-compliance situation of the provision of IEE and EIA by most of the hospitals of all categories.

With reference to water from safe sources, more than 50% of hospitals have acceptable sources of water whereas 16% of the hospitals have water supplies from badly protected sources. Very few hospitals have very good regular monitoring of water safety and drinking water treatment system. Hospitals lack cross contamination avoidance and alternative sources of drinking water in the time of non-acceptable water. In terms of water quantity, though water availability among the large numbers of the hospitals (83.87%) is good it is not up to the required standard of 500 litres per day as recommended by DWSS for the health-care facilities. Some losses of water have also been found in the hospitals due to negligence nature. More private hospitals have good access to water for the patients and visitors than that of public and NGOs hospitals and very few hospitals have an adequate and properly working shower facility in place.

Large numbers of hospitals have relatively good numbers of toilets but most of them do not have adequate access of water and other cleaning materials coupled with absence of regular repair, maintenance and cleaning system in place. Very few hospitals have taken waste water and liquid waste management matter seriously. However, very few are demonstrating very good waste water management system in place and operating successfully as low cost waste water treatment technology to be replicated elsewhere.

Most of the buildings under government sector hospital have been universally considered as per the national building codes. Private hospitals do have good building infrastructures with minimum required characteristics. However, these things have to be ensured by concerned authorities.

There is increasing amount of stress not only on the health-care provider, it is even severe and intense on the patients

and even sometimes more on the patient care takers. Stress on the staff has been found to be handled by due care more in government hospitals than in the private hospitals. Mission /NGO hospitals pay good attention to staff stress management. There is presence of some degree of community relationship between health-care facilities and local communities governed by several factors from direct contribution made during the facilities establishment to the political recommendation and family relationship.

About 54.84% of the hospitals have acceptable level of service to the ultra-poor whereas rest 45.16% of hospitals do not have any such additional provision of serving ultra-poor. All are treated equally in them. Significant percentage of hospitals do care about the external environmental issues and even send their emergency response team to investigate further. However, some did not bother about the external environment at all.

Regarding hand washing practices and accessories, substantial 41.95% of hospitals have poor level of hand washing practices. Once again 38.71% of hospitals did not have any availability of hand washing material in place. Most of the hand washing basins and toilet dedicated to the patients and visitors were not supplied with soap and generally not clean as well. There was lack of knowledge about proper hand washing practices among 35.48% of the hospitals. Almost 50% of the hospitals found to be having acceptable level of arrangement regarding hand washing practices while handling food, protection of food from rodent and vermin, possibilities of close contact between raw and cooked food and thoroughly cooking of food meaning rest need to make massive improvement in secure, cleanliness and sanitation aspect of the food hygiene. Only about 12.90% of hospitals have good level and about 54.84% of the hospitals have acceptable level of controlling vector breeding sites by filling the water logged areas and maintaining cleanliness around the hospital. Overall more than 50% of the hospitals have relatively well practices of controlling of vector exposure.

Regarding hygiene promotion, most of the hospitals did not have any written Action plan and annual plan for hygiene information promotion. Only 38.71% of the hospitals have somewhat Action plan on ad hoc basis. Only one hospital (3.23%) has a dedicated Information desk for promoting hygiene information at BPKIHS. Other 15 (48.39%) hospitals do have hygiene information promotion process.

With respect to cleanliness and laundry, over 60% of the hospitals have satisfactory level of cleanliness and laundry system in place. However, one of the government hospitals did not even provide patient with the linens for the bed at all.

Regarding health-care waste management practices: 32.26% of the hospitals have acceptable level of source separation; rest 61.29% of hospitals have very poor source separation including complete absence of such practices in 6.45% of the hospitals; 12.90% have acceptable level of waste collection system whereas 80.65% of hospitals do not practice appropriate waste collection system; only 22.58% of hospitals have relatively appropriate and separate waste transport system and remaining large 67.42% of hospitals have very poor transportation; only one hospital (3.23%) has adopted environment sound management treatment practice while 90.32% hospitals do not practice environment sound waste treatment system at all; 9.68% of the private hospitals

have acceptable level of waste disposal practice whereas rest 80.65 % hospitals do not practice safe disposal of health-care waste.

Large number of health-care facilities in Nepal still use large number and quantity of mercury based measuring equipments, chemicals and practices and products and other many items in the health-care sectors. About the use and release of mercury from health sector of Nepal, it has been found that about 500 Kg of mercury has been used only in two measuring devices such as thermometers and sphygmomanometer and about 125 Kg of mercury has been found to be released annually to the environment from health-care services of Nepal just from breakage of mercury thermometer.

Patient response shows different responses about the environment condition of the HCF as they come from different background. From their response, it is clear that 55% of the patients considered the sanitation condition as normal; 86% said there was adequate water supply and 44% said about non-availability of cleaning agent near the toilet.

5.2 Recommendations

Following recommentations have been made based on this study carried out in selected hospitals of Nepal.

1. The organizational reform is necessary with government health-care facilities towards increasing the technical human resources than the administrative human resources.

2. All newly constructed Health Care center or the old health-care facilities and expanding and/or relocation of the existing health-care facilities should fully comply with the provision of IEE and EIA compliance. None of the health-care facilities including government and teaching hospitals are immune to IEE and EIA and hence, all need to be brought within the regimes of full IEE and EIA. The renewable of the health-care facilities should be discouraged based on just approval of TOR of IEE or EIA; it should be based on the approved full IEE and/or EIA.

3. All hospitals should have mandatory regular good monitoring of water safety and drinking water treatment system in place. Overall water quality improvement is required through avoiding cross contamination and ensuring alternative water sources.

4. Massive increment in water accessibility as well as adequate number of working shower facilities is required among all types of health-care facilities.

5. Adequate number of well designed, built and maintained toilet should be ensured with high hygienic and acceptable condition with enough quantity of cleaning and disinfecting agents.

6. Concerned authorities need to ensure that buildings are designed, constructed and managed so as to provide safe and comfortable environment for patients, staff and care takers.

7. Stress over health-care providers as well as patient and care takers should be managed and addressed with due care by the respective hospital management bodies.

8. Community relation should be developed and strengthened and should follow the equality and equity principles while delivering health-care services with due consideration to locals as well as ultra-poor. One should also follow the government rules on this.

9. Mandatory provision of all materials required for the hand washing coupled with ensuring best practices for the same shall be encouraged.

10. Food for patients, staff and care takers should be stored and prepared in a way that minimizes the risk of disease transmission and food poisoning.

11. All appropriate and effective approaches, practices, environment and public health friendly proven methods for excluding or reducing vector numbers shall be encouraged.

12. A dedicated information corners/desk with allocated information officer should be mandatory in all the health-care facilities in addition to general inquiry desk.

13. The existing visual aids can be used for the hygienic promotion activities by playing suitable video documentaries and public interest advertisements on health, sanitation, public health and environment.

14. Adequate sanitation and cleanliness shall be maintained in all health-care facilities at all the time and in all the places with regular functional mechanism of surface fitting, cleaning, disinfecting contaminations, exchange of soiled linen and other items between patients, separate transport and storage of soiled and clean linen and equipments, etc.

15. Environment sound management of health-care waste (solid and liquid) management policy and corresponding specific legislative as well as institutional frameworks should be developed and effectively implemented.

16. All types of incineration treatment technologies should be discouraged and non-burning technologies such as microwave, autoclaving and biological treatment e.g. composting and digestion technology should be promoted.

17. Mercury free health-care policy should be enacted soon with time bound implementation strategies of replacement of mercury based equipment, practices and safer promotion, validated, quality accurate mercury free alternatives and proper environmentally sound management of mercury and mercury containing wastes.

18. Conducive legal and institutional frameworks for environmental health condition promotion as well as chemical safety need to be enacted soon.

19. Continuous research, awareness raising and capacity building for the overall environmental health condition and especially to water, solid and liquid waste management, sanitation, hand washing, cleanliness and hygiene, etc need to be carried out.

6. References

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Figure 81: Cleaned linen at National Medical College, Birgunj

ANNEXES

Annex 1. Detail Methodology

A detailed methodology has been developed and employed to complete the study. Following strategic approaches and methods were adopted to complete the work.

Existing information analysis:

1) Policy review: The existing health and environment policies, legal documents related to Environmental Hospital of Nepal were studied and incorporated.

2) Secondary Literature review: *Essential environmental health standards in health-care 2008* **Edited by John Adams, Jamie Bartram, Yves Chartier and another WHO healthy workplace framework Model by Joan Boarton 2010 were taken as guiding methodology for this study. Time series study of Health-care Waste Management carried out by Management Division/DOHS in 2007 and Ministry of Health 2003 were also reviewed.**

Sampling Design and Methods

Lists of different level health-care facilities have been obtained from published and unpublished sources as well as the data information sections of the DOHS and MoHP, GoN. Compilation of all these information of hospitals gave the result to know about the universe of the health-care facilities ranging from Regional, Sub-regional, Zonal, Districts level and private hospitals. The sorting of these health-care facilities with reference to our study criteria to be included such as development region, eco regional, geographical region, types of hospitals, mode of operation etc. carried out to comply with the given criteria and at the same time it also represents the health-care facilities of the whole nation. Mostly proportionate samples with some specific inclusion methods have been derived using some statistical tools and came out with the finally selected 31 Hospitals of different levels and types representing all geographical, eco-region and development regions of Nepal.

Population Proportionate Sampling (PPS) methodology was applied for this quantitative information based on Universal Sampling distribution of hospital throughout Nepal. According to record of DOHS and MOHP there are 234 hospitals except primary health-care centres, health posts and sub health posts. There were 45% government hospitals, 48% private hospitals and 6.5% missionary hospitals in universal sampling. It was tried to the extent that one could maintain equally proportional Eco region, Development Region, Public, Private and NGO (Missionary Hospital) as shown in the tables below.

The sampling design and distributions among the study criteria.

Basis of	Distribution	Sample Frequency	Sample %	Universe Frequency	% of Universe
Ecological Region	Mountain	2	6.45	11	4.70
	Hill	18	58.06	143	61.11
	Terai	11	35.48	80	34.19
Developmental Region	Eastern	4	12.90	32	13.68
	Central	16	51.61	128	54.70
	Western	5	16.13	37	15.81
	Mid-Western	4	12.90	24	10.26
	Far Western	2	6.45	13	5.56
Ownership of Hospital	Government/ Public	14	45.16	98	41.88
	Private	15	48.39	124	52.99
	Mission/ NGO	2	6.45	12	5.13

The finally selected 31 samples can be found in **Annex 2.**

Survey Tools/Technique

Semi structure interview schedule: Different aspects of SSI/questionnaire were prepared to the Study Unit (Hospital as Health-care Setting)

Focus group discussion: It was done with Members of Hospital Development Committee, local community leaders, civil societies, representatives of patients, teachers, journalists and surrounding communities who have been receiving the health-care services as well as frequently visiting the hospitals as caretakers of the patients, family members and relatives.

In depth Interview: It was done with the Chief of Hospital (Medical Superintendents), Housekeeping in-charge, Matron, Repairs and Maintenance chief as well as administration chief of the health-care facilities during field survey.

Concern authorities meetings: To make more effective study frequent consultation, meetings, and discussion was done with WHO team, Ministry of Health and Population, researchers and host organization Center for Environmental and Public Health (CEPHED).

Development Research Criteria

Thorough reviews of several publications and reports of other countries, a set of factors and/or areas to be studied for bringing out evidence based environmental health condition of the health-care sector of Nepal has been developed. Keeping these set of criteria in background, a series of broad research criteria has been developed (Annex 3) covering all aspects of the environmental health to be studied and answered need to be claimed about overall environmental health condition of the health-care facilities of Nepal.

Questionnaire preparation

- Several documents as well as references, experts were consulted and very rigorous exercises have been carried out to come up with three set of questionnaire.

- The first set of questionnaire was the major questionnaire set used mostly within the hospitals with relevant section and personnel as well as observations and discussions. These were carried out with the close coordination of MOHP and the respective In-Charge of the selected health-care facilities and focal personnel such as administrative officers, medical registration record keeper, accounts, store and housekeeping in charges, waste handlers, incinerator operators, etc.

- The second set of questionnaire checklist for the Focus Group Discussion was developed and asked to the selected people from the community about the related issues of environmental health condition of the hospitals, public relations, and stress management, etc. The findings have been incorporated into the detailed description and case studies of health-care facilities annexed to this report.

- The third set of questionnaire for the patients and caretakers was developed to study the perception of the patients and visitors regarding overall environmental health condition of the selected hospitals.

- In addition to these, a descriptive note checklist was also developed to get in-depth details and story to write case stories of six selected hospitals. Details from this have been included into the descriptive note of the hospitals.

Sampling Unit

Hospitals were the sampling units. Here somewhere Health-care facilities (HCF) were defined as hospital.

Sample Size

31 HCF/hospital based on proportion were the amount of sample which would be representative for this study which could be 13% of Universe Sampling of 234 hospitals.

Data Collection Approaches

Detailed review of literature as well as questionnaire development followed by field testing was performed and all sets of questionnaires were rearranged. Group of experts and field investigators of the different fields e.g. environment science, environment engineering and public health were hired by CEPHED. These experts were teamed up in three groups of two people (team leaders and field investigators). These teams developed their travel plan for the field visit in close coordination with the Environmental health unit chief of the MOHP. Field survey was carried out by these teams of experts supported by two facilitators each one from hospital and local communities. The hospitals were approached with help of formal letter from MOHP, CEPHED and also based on personal communications. The relevant data were collected from the concerned authorities and officials of the health-care facilities. Broadly four approaches: questionnaire

survey; focus group discussion; patient survey and direct meeting with concerned as well as observations were made in the specific locations. The MOHP representative Mrs. Sarda Pande and WHO Representative Mr. Nam Raj Khatri supervised and monitored some of the field works and were actively engaged in the discussion and observations.

Data Analysis

Qualitative information was summarized and written in narrative form with specific importance like FGD, in-depth interview and meeting workshops. Quantitative information was written with the help of Excel and SPSS software. Primarily, within the base of Essential environmental health standards in health-care 2008, the 15 Environmental components and sub components were broken down in small questionnaires during the survey. After collecting the information, such small questionnaire were merged to the research sub components so that it could be easy to analyse based on sub questionnaire, observation and situation analysis by research team of experts. It was ranked as Very Good, Good, Acceptable, Bad, and Very Bad by coding 1,2,3,4 and 5 respectively.

Validity and Reliability

Questionnaires were prepared by subject expert; public health expert, environment engineer and Environment scientist in close coordination with professional officer of WHO. After this, the developed tools were consulted with different field experts for verification and improvement by incorporating their feedbacks. Field investigators of the above discipline were hired and provided with orientation. Questionnaires and field investigators were pretested. Such pretested tools were used for the study under direct supervision and engagement of the MOHP representative.

Figure 82: Focus Group Dicussion at Birgunj, Parsa

Annex 2. Final Hospital List Sample

SN	Name of the Hospital	Eco Region	Region	Zone	District	Type of hospital	Nature of hospital
1	Siddhi Smriti Mahila & Child Hospital, Bhaktapur	Hill	Central	Bagmati	Bhaktapur	Private	Private
2	College of Medical Science, Bharatpur, Chitwan	Hill	Central	Narayani	Chitwan	Private	Teaching
3	Maula Kalika Hospital and research Centre, Bharatpur	Terai	Central	Narayani	Chitwan	Private	Private
4	Rapti Sub Regional Hospital	Terai	Mid-western	Rapti	Dang	Governmental	Sub Regional
5	Baitadi Hospital, Baitadi	Hill	Far-western	Seti	Baitadi	Governmental	District
6	Dhading Hospital, Dhading	Hill	Central	Bagmati	Dhading	Governmental	District
7	Janakpur Hospital, Janakpur	Terai	Central	Janakpur	Dhanusha	Governmental	Zonal
8	Bandipur Hospital, Tanhu	Hill	Western	Gandaki	Tanhu	Governmental	District
9	Salyan Hospital Salyan	Hill	Mid-western	Rapti	Salyan	Governmental	District
10	Karnali Zonal Hospital, Jumla	Mountain	Mid-western	Karnali	Jumla	Governmental	Zonal
11	Mahakali Zonal Hospital Mahendranagar	Terai	Far-western	Mahakali	Kanchanpur	Governmental	Zonal
12	Nepalgunj Nursing Home, Nepalgunj	Terai	Mid-western	Bheri	Banke	Private	Private
13	Gandaki Teaching Hospital	Hill	Western	Gandaki	Kaski	Private	Private
14	Nijamati Karmchari Hospital, Baneshwar	Hill	Central	Bagmati	Kathmandu	Governmental	central
15	Bir Hospital	Hill	Central	Bagmati	Kathmandu	Governmental	central
16	Star Hospital Pvt. Ltd	Hill	Central	Bagmati	Lalitpur	Private	Private
17	Medicare Nepal Pvt. Ltd. Putalisadak Kathmandu.	Hill	Central	Bagmati	Kathmandu	Private	Private
18	Om Nursing Home, Kathmandu, Chabhil.	Hill	Central	Bagmati	Kathmandu	Private	Private
19	Dhulikhel Hospital, Kavrepalanchowk , Dhulikhel	Hill	Central	Bagmati	Kavrepalanchok	Private	Private

20	Anandaban leprosy Hospital	Hill	Central	Bagmati	Lalitpur	NGO	Mission
21	Kist Medical College, Imadol	Hill	Central	Bagmati	Lalitpur	Private	Private
22	Birat Nursing Home maternity Home, Morang	Terai	Eastern	Koshi	Morang	Private	Private
23	Palpa Mission Hospital	Hill	western	Lumbini	Palpa	NGO	Mission
24	Illam Hospital, Illam	Hill	Eastern	Mechi	Illam	Governmental	District
25	Parvat Hospital, Kusma, Parbat	Hill	Western	Dhaulagiri	Parbat	Governmental	District
26	National Medical College (NMC), Birgunj	Hill	Central	Narayani	Parsa	Private	Teaching
27	Gandak Hospital Pvt. Ltd, Birgunj,	Terai	Central	Narayani	Parsa	Private	Private
28	Butwal Hospital Pvt. Ltd, Butwal	Terai	Western	Lumbini	Rupandehi	Private	Private
29	Solukhumbu Hospital, Phaplu, Solukhumbu	Mountain	Eastern	Sagarmatha	Solukhumbu	Governmental	District
30	BPKIHS Dharan	Terai	Eastern	Koshi	Sunsari	Governmental	Teaching
31	Kantipur Hospital Pvt. Ltd	Hill	Central	Bagmati	Kathmandu	Private	Private
Coverage	31 Hospitals	Mountain Hill, Terai	5 Dev. Region	14 Zones	23 Districts	Private, NGO, Governmental	Pvt., Teaching, Central, Sub-regional, Zonal, District

Figure 83: Focus Group Discussion at Shidhi Memerial Hospital, Thimi

Annex 3. Broad Research Components

1	**General Background Information of Hospital**	
2	**Water (Quality)**	
	2.1	Is water from a safe source?
	2.2	Is the safety of the water monitored regularly?
	2.3	If supply is not safe can water be treated at the HCS effectively?
	2.4	If the water is not acceptable is there a safe alternative supply of drinking-water?
	2.5	Is the water supply designed and built so that low-quality water used for cleaning, laundry, etc. cannot enter the drinking-water supply?
3	**Water (quantity)**	
	3.1	Is sufficient water available at all times for all needs?
	3.2	Is the water supply operated and maintained to prevent wastage?
4	**Water facilities and access to water**	
	4.1	Is water accessible where needed at all times?
	4.2	Are showers properly used and adequately maintained?
	4.3	Is there enough knowledge about hand washing?
5	**Excreta disposal**	
	5.1	Are there sufficient toilets Actually in use?
	5.2	Are the toilets used according to their design?
	5.3	Are the toilets maintained and repaired in a timely and effective way?
	5.4	Are the toilets clean and without smell?
	5.5	Is there water and soap available all the time?
	5.6	Is there an effective cleaning and maintenance routine in operation?
	5.7	Do patients, staff and carers find the toilets appropriate?
	5.8	Are access routes to toilets kept in good condition and well lit?

6	**Waste Water Management**	
	6.1	Is the system operated and cleaned so as to maintain its capacity?
	6.2	Are cleaning and wastewater disposal Activities prevented from ending up in the open environment and contaminating rainwater and run-off?
	6.3	Are protective features properly maintained?
7	**Building design, construction and management**	
	7.1	Is the lighting system correctly operated and maintained?
	7.2	Is the ventilation of the HCS appropriately managed and health-care workers properly trained?
	7.3	Are the HCS buildings managed so as to maintain comfortable and healthy conditions?
	7.4	Are the HCS Activities organized to minimize the spread of contamination?
	7.5	Is space in the HCS used in the most effective way for easy access and to minimize the spread of contamination?
8	**Stress management**	
	8.1	Do HCS care about stress on service receiver?
	8.2	Do HCS care about stress on staffs?
	8.3	Have they maintained Psychological healthy environment?
9	**Community Relationship**	
	9.1	Are there facilities for deprived people and ultra-poor people?
	9.2	Are there facilities for adjoining communities?
	9.3	Does HCS take parts for public awareness Activities?
	9.4	Are there tussles among nearby community and HCS?
	9.5	Do they have sufficient knowledge about community environment?
10	**Hand Washing**	
	10.1	Is there a good practice of hand washing?
	10.2	Is there availability of materials for hand washing?
	10.3	Is there is enough knowledge about hand washing?

11	**Food Safety**	
	11.1	Do food handlers wash their hands when necessary?
	11.2	Is food preparation areas kept clean and protected from Rodent and Insect?
	11.3	Is contact between raw foodstuffs and cooked food prevented?
	11.4	Is food cooked thoroughly?
	11.5	Is food kept at safe temperatures?
	11.6	Is dry food stores kept clean and protected from rodent and insect?
	11.7	Are the Food is safe for the child of less than 3 yrs
12	**Vector borne disease**	
	12.1	Are vector-breeding sites avoided or controlled?
	12.2	Are inbuilt protective measures effectively used and maintained?
	12.3	Are barriers or repellents used to reduce exposure to Vectors?
	12.4	Are all patients, and particularly patients with vector-borne diseases, treated or protected to
		Prevent further transmission?
	12.5	Are infectious substances removed or covered or disposed of immediately and completely?
13	**Information and hygiene promotion**	
	13.1	Are staffs aware of this plan?
	13.2	Do staffs follow new procedures?
	13.3	Do staffs follow infection control procedures correctly and consistently?
	13.4	Do staffs provide appropriate hygiene information to carers and patients?
	13.5	Is health-care setting facilities maintained so as to be easy to use hygienically?
14	**Cleanliness and Laundry**	
		Are the Hospital is visibly and technically Clean?
	14.1	Are the surface and fittings cleaned routinely?
	14.2	Are all zones of hospitals cleaned as per its requirement?
	14.3	Are contaminated spills (blood & Vomiting) cleaned and disinfected immediately?

	14.4	Are the soiled linen replaced and placed immediately in waste container and properly cleaned and dried?
	14.5	Is cleaned and soiled lines transported and stored separately?
	14.6	Are mattresses and pillows cleaned between patients and whenever soiled?
	14.7	Is the medical equipment's appropriately cleaned and disinfect/sterilize between users?
15	**Health-care Waste Management**	
		Is there any proper legislative, institutional and infrastructural framework for waste management?
		Are health-care waste is segregated, collected, transported, treated and disposed safely?
		Is a Mercury free health-care service can be practiced?
	15.1	Are the health-care waste is segregated at the point of generation?
	15.2	Are the health-care waste collected separately and appropriately
	15.3	Are the health-care waste transported appropriately and safely?
	15.4	Are the health-care waste treated environmentally friendly?
	15.5	Are the health-care waste is disposed safely and securely?

Figure 84: Waste Water Treatment System at BPKIHS