

Environmental Compliance Assessment of Star-Rated Hotels in Nepal Based on Environmental Management Plans (EMPs)

Sadikshya Wosti^{1*}, Swasti Shrestha¹, Arati Shrestha¹

¹Department of Environment, Ministry of Agriculture, Forests and Environment, Babarmahal, Kathmandu

*Correspondence: sadikshyawosti22@gmail.com

Abstract

The tourism industry has risen significantly in the nation over the past few years with a considerable surge in especially star rated hotels. With the increased facility to the tourists, this causes an increase in the associated environmental problems also to a greater extent. The major problems associated are solid waste and waste water management, high energy and water consumption, water resources management as well as disaster preparedness. However, the effective implementation of Environmental Management Plans (EMPs) of Environmental study reports can help mitigate such effects. This requires for the need of environmental compliance assessment to verify the existing scenario against the proposed activities. Even though, there are several studies in Nepal which has incorporated the tourism industry; very few are related to compliance status especially on environmental parameters. So, this study aims to assess the compliance status of star rated hotels located in the different provinces of Nepal based on descriptive as well as comparative research design. Several key parameters that range from air and water pollution to solid waste management, water resources management to disaster preparedness along with greenery maintenance and support to locality are considered for this study. The results from the study showed that waste water management was found to be significantly non-compliant across all the parameters examined. However, various other parameters including solid waste management, air and sound quality management along with energy and disaster management were majorly compliant as per their EMPs; while the rest parameters showed mixed compliance status. Hence, the assessment spots a significant gap in certain parameters when it comes to the implementation status. Therefore, it is suggested to implement the mitigation measures more stringently and also sideways encourage the hotels to adopt more environment friendly and sustainable activities.

Keywords: *Compliance status, environmental study, star rated hotels, tourism*

1. Introduction

The tourism and hospitality sector in the present context is recognized as one of the most resource-intensive industries due to its major contribution in solid waste and waste water generation, energy usage, and water consumption. So, the increasing number of hotels in particular, contributes significantly to environmental degradation through these activities. Studies by Bohdanowicz (2006) and Chan and Hawkins (2010) reveal that hotel operations can account for substantial environmental impacts, with a major proportion linked to excessive resource consumption and inefficient operational practices in majority of the cases. Core activities such as heating, cooling, laundry, and waste disposal further amplify these impacts (Han & Yoon, 2015).

Nepal's tourism industry has witnessed a significant growth in the recent years with increase in both domestic and foreign investments. According to the report published by Ministry of Culture, Tourism and Civil Aviation (MoCTC, 2024), the number of tourist standard star hotels have also significantly increased from 182 to 214 in a single year; 2023 to 2024 A.D. which nearly accounts to a massive 18% rise. The increase in standard star hotels are bound to raise the hospitality services provided to the visitors but sideways it also raises the consumption of resources thereby contributing to environmental impacts in various forms. Hence, this requires for the need of effective compliance monitoring. Such monitoring will ultimately help in ensuring the sustainable use of resources which not only supports in environment protection but also promotes the

tourism economy through equally prioritizing safety and quality services.

Environmental Compliance generally refers to the systematic examination of adherence to relevant regulations or standards whereas its assessment represents the overall evaluation of such compliances on various parameters. Environment Compliance in this study is made more specific to assess the adherence to the mitigation measures proposed in approved environmental study reports. Such assessment helps in examining the gaps between the proposed measures and the adopted ones. This will ultimately give us an overall scenario of the compliance in hospitality sector along with recommendations for continual improvement. Besides that, it also involves the continuous process of collecting, analyzing, and interpreting environmental data to support decision-making and improve performance thereby minimizing adverse environmental impacts. It promotes both regulatory mechanisms as well as sustainable resource management hence is essential in ensuring that development activities stay within environmentally acceptable limits. As a component of environmental management systems, environmental compliance assessment makes it possible to evaluate important environmental factors that are directly related to ecological integrity and human health, such as soil, water, air, and noise. In other words, it has become a crucial instrument for evaluating environmental quality and directing sustainable development in the context of rapid urbanization, population growth, and rising tourism.

The Tourism Act, 1978 has provided the government authority for licensing, monitoring, compliance inspections, and penalties for tourism businesses in case of violation of rules. Apart from this, Environmental Assessment along with Environmental Management Plans (EMPs) have been institutionalized in Nepal through the Environment Protection Act (EPA, 2019) and the Environment Protection Rules (EPR, 2020) to regulate the environmental impacts associated with development projects. The EPA explicitly has the provision for environmental monitoring and compliance assessment. Section 39 of the Act

has provided authority to the federal, provincial and local governments to carry out environmental monitoring and inspection to ensure that the development projects have properly implemented the environmental standards and mitigation measures. Furthermore, the Section 12 of the Act also provides for environmental audit provisions, requiring concerned authorities to evaluate whether the predicted impacts and proposed mitigation measures have been effectively implemented. Similarly, the EPR, 2020 mandates that project proponents conduct regular environmental monitoring and submit self-monitoring reports.

Despite the existence of these regulatory provisions, the main concerns remain regarding the actual implementation and compliance of Environmental Management Plans within Nepal's hotel sector, particularly among the star-rated hotels which have very high flow of tourists and maximum utilization of resources. Although the awareness has increased globally regarding the sustainable consumption and hospitality practices but there is a limited research on to which extent the environmental commitments are fulfilled within hotels (Khatter et al., 2019) and similar is the case with Nepal. The existing researches have primarily focused on general tourism impacts with very little attention given to environmental compliance. In Nepal, the expansion of star-rated hotels, particularly in major tourist areas, has raised concerns regarding the effective implementation of Environmental Management Plans (EMPs). Therefore, this study aim to examine the environmental compliance status of selected star-rated hotels in Nepal based on their EMP implementation.

2. Materials and Methods

This study adopts a descriptive and comparative research design to assess the environmental compliance status of several star-rated hotels located in six provinces of Nepal.

2.1 Study Area

Hotels were selected using purposive sampling based on the following criteria: (i) possession of an approved environmental study report

(IEE/EIA) with a documented Environmental Management Plan (EMP), (ii) operational status during the study period (2022–2025), and (iii) classification as tourist-standard star-rated hotels under the prevailing tourism regulations of Nepal, (iv) geographic distribution across provinces to capture regional variation. Star-rated hotels were specifically considered because their establishment and operation generally require the approval of environmental study reports and the implementation of EMP provisions, making them suitable for assessing environmental compliance and monitoring practices.

The study covered a total of 21 star-rated hotels distributed across six provinces of Nepal. One hotel each was selected from Koshi, Madhesh, and Gandaki Provinces; two hotels each from Lumbini and Karnali Provinces; and the remaining fifteen hotels from Bagmati Province, primarily within the Kathmandu Valley. The higher representation of Bagmati Province reflects the substantially greater concentration of star-rated hotels in the Kathmandu Valley compared to other provinces. Hotels in Sudurpashchim Province however could not be included for this study due to time constraints. Therefore, the findings may not fully represent the

environmental monitoring and compliance status of hotels across all provinces of Nepal.

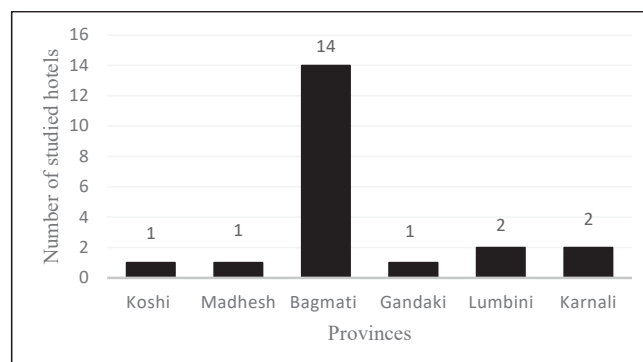


Figure 2: Province wise distribution of studied hotels

2.2 Methods of the study

Following methods were used for the study of compliance assessment of the studied hotels.

Desk Study: The approved environmental study report of the individual project was studied thoroughly to access the information regarding the project. Particular emphasis was given to the Environmental Management Plan (EMP) of each project, as the EMP provides project-specific environmental commitments and mitigation measures. The compliance assessment was

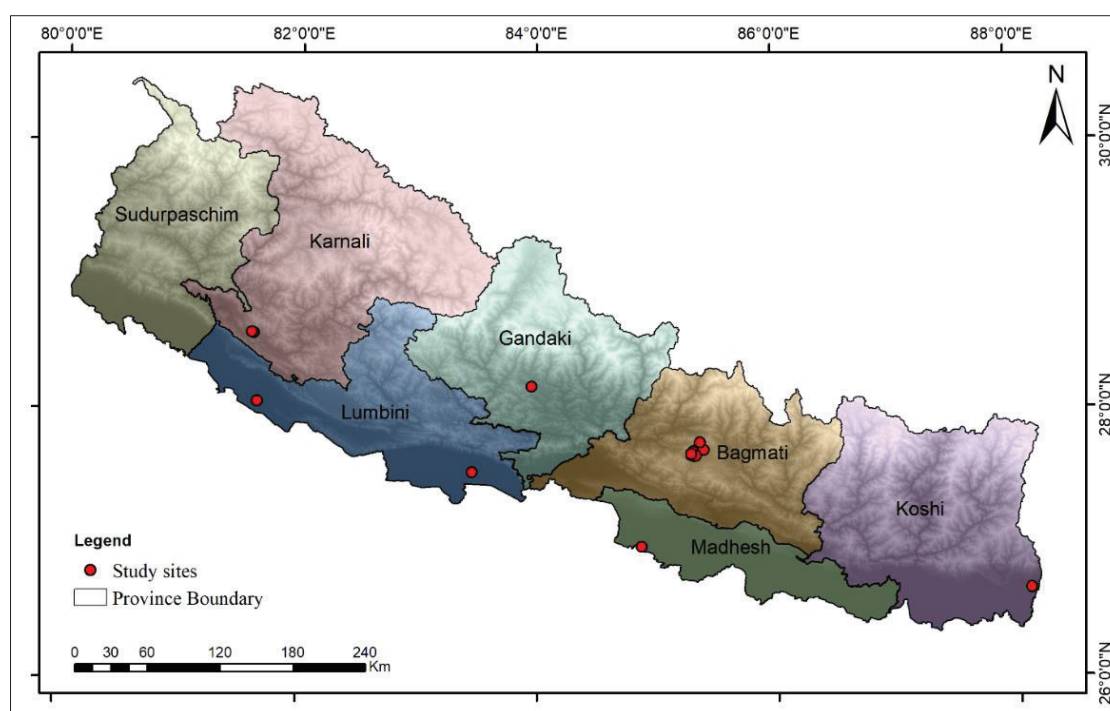


Figure 1: Map showing study sites

conducted by comparing the environmental performance and implementation status of each project against the mitigation and management measures prescribed in its respective EMP. Key environmental aspects examined during the assessment included wastewater management, air/noise quality management, solid waste management, disaster preparedness, groundwater recharge, greenery maintenance as well as corporate social responsibility.

Site Inspection: Site Inspection is carried out on the specific site of the project. During this visit, areas of concern are inspected to get further information regarding the solid waste management, water resources and wastewater management, disaster preparedness as well as implementation status of the approved mitigation measures. The data thus collected are qualitative and quantitative in nature.

Data Analysis: The collected data were analyzed qualitatively and quantitatively to assess compliance across nine key environmental parameters as mentioned beforehand. A comparative framework was used to classify compliance into three categories: compliant, partially compliant, and non-compliant.

Key informants' interview and Discussions: The objective of the inspection was presented with the management team of the project before heading towards the topic based discussion. For the subject based discussion, specific personnel from various units were contacted and relevant information was duly collected. For such key informants' interview, personnel from management level to implementation level are inquired and necessary information is noted.

3. Results and Discussion

3.1 Overview of EMP and Compliance Status

The Environmental Management Plans (EMPs) of these hotels were systematically reviewed to know the compliance status of nine key environmental parameters, including physical (solid waste, wastewater, air/noise quality, ground water recharge, and energy and disaster management),

biological (greenery maintenance) and socio-economic (Corporate Social Responsibility) parameters. Additionally, the mitigation measures mentioned in such EMPs were evaluated to assess the compliance status. However, the overview of the EMPs also hold some gaps as in some cases, the proposed mitigation measures are not specific and measurable in themselves. As a result, such measures are nominally implemented at site which in turn makes the monitoring hampered to certain extent. Hence, this has risen the issue of the relevancy of the mitigation measures in certain scenarios and simultaneously elevates the need for practical, project specific and feasible mitigation measures.

3.2 Comparative Compliance Status

The studied hotels were assessed on various parameters to check the compliance status based on the EMPs of the approved environmental study reports as described in table 1. The compliance status was categorized into three classes namely compliant, partially compliant and non-compliant. They were determined using the following criteria: (i) "Compliant" refers to full implementation of the required mitigation measure as specified in the EMP and compliance with relevant environmental standards; (ii) "Partially compliant" refers to incomplete or inconsistent implementation of mitigation measures, or implementation that does not fully meet the required standards; and (iii) "Non-compliant" refers to absence of implementation or clear violation of the EMP provisions and applicable environmental standards. Hence, the compliance status in this study was analyzed based on the level of conformity to the adoption of approved mitigation measures. The values in the table are represented in percentage with their number in brackets.

3.3 Solid Waste Management

Solid waste generation and disposal is one of the most negative impacts of hotels on the environment (Zorpas et al., 2012). Hence, its management seems crucial not only from the environment point of view but also from the aesthetic aspects of the hotels. The solid waste management in our study comprised adoption of segregation practice

Table 1: Compliance status for studied hotels

S.N.	Parameter	Compliant (%)	Partially Compliant (%)	Non-Compliant (%)
1.	Solid Waste Management	90% (19)	10% (2)	0% (0)
2.	Wastewater Management	33% (7)	19% (4)	48% (10)
3.	Air Quality Management	86% (18)	14% (3)	0% (0)
4.	Noise Quality Management	86% (18)	9% (2)	5% (1)
5.	Groundwater Recharge	57% (12)	14% (3)	29% (6)
6.	Energy Management	90% (19)	0% (0)	10% (2)
7.	Disaster Management	90% (19)	10% (2)	0% (0)
8.	Greenery	67% (14)	9% (2)	24% (5)
9.	Corporate Social Responsibility (CSR)	67% (14)	28% (6)	5% (1)

mostly into dry and wet waste, prohibit dumping of waste in water bodies as well as outside the premises and handling of the waste to private or municipal waste handler for final disposal. Further, some hotels in their EMP also proposed to practice composting for organic waste which was the main limiting criteria for categorization into compliance or partial compliance. Based on the above mentioned parameters, majority of the hotels showed compliance with provision of dustbins in necessary areas for the collection of waste, segregation of dry and wet waste inside the premises and final handling of such waste to waste handlers. Given that, the hotel generates large amount of food wastes, followed by dry wastes and hazardous waste. Off all the waste, food waste can be considered as one of the most important materials to divert from landfills as it decomposes to create methane; also a potent greenhouse gas which significantly contributes to climate change (Pirani & Arafat, 2014). Regarding the composting of organic waste, only three out of total sampled hotels had proposed composting in their EMPs; of which only one hotel was found to be practicing composting inside the hotel premises. Thus the partial compliance of the hotels was attributed by the non-adoption of composting. Since the composting requires space, continuous efforts and dedicated manpower, often the proponents were found to be little reluctant towards practicing it.

Apart from this, recycling could also be an important parameter and is usually mentioned in the EMP of the approved reports. A similar study carried out in 52 different hotels of the United Kingdom found

that recycling was the most widely adopted waste management strategy, with waste prevention and reuse methods being considerably underutilized (Lazareva, 2016). However, this was not considered in this study as such practice could not be verified from the field since the hotels were not found to be formally practicing the recycling. However, the practice of informally selling the waste to vendors was observed at some sites. Recycling can be useful for hotels as they were found to produce large amount of sellable items like bottles and cardboards.

3.4 Wastewater Management

The least complying environmental parameter is wastewater management, which is in line with international research showing it to be a significant environmental problem in hotels (Menegaki, 2025). The presence of either Sewerage Treatment Plant or Wastewater Treatment Plant in itself is a step forward towards the mitigation measures. However, looking at a broader scale, a functional STP/WWTP can only fully ensure the treatment of wastewater such that it meets the approved standards. Hence, complete compliance is only considered for a functional Treatment Plant (TP). By using functional STPs, only one third of the hotels; altogether seven hotels were found complied with wastewater management.

However the categorization in case of wastewater management was more convergent as the partial compliance status was also affected by other factors besides the presence of TP. In this regard, use of septic tanks (but no discharge to public sewerage), fully non-operational TP and partial treatment of

wastewater had caused hotels to be in this range. Of the total 4 partially complied hotels, 2 had septic tanks, one had fully non-operational TP and the remaining had partially treated its wastewater. However, with the advancement of technology and nature of wastewater, many hotels are using Package plants these days as wastewater is mostly domestic in nature. Package Plants (PP) are prefabricated treatment units that comprise mainly three steps; coagulation/sedimentation then aerobic/anaerobic biological degradation and finally filtration. Such PP are found to provide high BOD and phosphorus removal but with low nitrogen and bacterial removal especially in low temperatures (Vidal et al., 2023). Such treatment options come with less economic burden in initial installment and also the operating cost reduces largely.

In contrary, nearly half of the hotels were found to be non-complied as they lacked treatment facility. The non-complied hotels were found to be more concentrated inside the Kathmandu Valley which might be due to the presence of large number of star rated hotels inside the Valley. When inquired for the reasons for the non-compliance, the hoteliers reported of various reasons such as constraint of land, old building structure as well as need of high initial investments. Also, partial and non-complied hotels were found to be less aware regarding the implementation of EMPs as well as approved standards regarding the wastewater management. Along with this, the absence of tolerance limits for wastewater from the hotels in specific has also hindered in effective implementation of this measure.

3.5 Air Quality Management

Air quality management showed high compliance, with most hotels adopting renewable energy sourced heat pumps, regularly maintained and sophisticated generators. Various studies have reported that hotels nowadays increasingly adopt renewable energy technologies and energy-efficient systems, including heat pumps and solar panels as part of sustainable energy management and pollution control practices (Arikan Kargi & Cesur, 2024; Ghimire et al., 2023). Fossil fuel fired boilers are

considered to be the most applied source of heating in Europe despite its high emissions (EC, 2016). Boilers mentioned here refer to the combustion machines, that burn fuel such as oil and natural gas for the heating purpose. As an alternative to such boilers, heat pumps are more efficient as they transfer heat from one temperature level to another. This in turn results in requiring a considerably smaller amount of electricity to generate thermal heat than required by even electricity fueled boilers (Tosato et al., 2020; Smitt et al., 2019). Most of the inspected hotels in our study were found to adopt heat pumps for the heating purposes. These were either electricity fueled or based on solar energy representing cleaner sources of energy. Besides, the partial compliance for some came from the fact that fossil fueled boilers though are being replaced by the heat pumps are still being used in some scale. However, no hotels were found being totally dependent on traditional boilers which no doubt is a positive impact to the environmental pollution. Apart from this, the installation of low pollution, fuel efficient generators were reported in most of the inspected hotels. The height of the stack in generator also decides the dispersion of the pollutants in the surrounding community. During site inspections, stack heights were visually observed as part of the compliance assessment. The compliance of such factor was only one fourth of the total observation while those non-complied were 14%; rest could not be distinctly verified. An absence of obvious standard in this matter might have resulted to this observation. So, this finding highlights a potential gap in existing environmental management requirements and suggests the need for establishing clear stack height guidelines for diesel generators as a measure to abate air pollution by dispersing the pollutants. It should be noted that air quality management in this study was not assessed through direct measurement of ambient air quality parameters such as particulate matter (PM), sulfur dioxide (SO₂), nitrogen oxides (NO_x), or carbon monoxide (CO). Instead, compliance status was evaluated based on the implementation of air pollution management measures specified in the Environmental Management Plan (EMP), field observations and review of available diesel

generator (DG) stack emission monitoring reports.

3.6 Noise Quality Management

Diesel generator sets are used primarily for emergency power generation or stand-by power in case of power failure. Since they are composed of various noise sources, these sets produce noise and vibration. Depending on the severity, noise and vibration can be the cause of serious disturbance and inconvenience to anyone exposed to them and in certain circumstances noise and vibration can be a serious hazard to health, causing permanent damage to hearing system (Elanchelian, 2013). The study also showed high compliance in regard to noise quality management which might be contributed from use of sophisticated generators producing less sound and placement of such sets in enclosure. While those with partial compliance were the sets partially placed in enclosure as they generate more sound. Also, the hoteliers were found to be conscious by themselves in this regard as the visitors seek for peace in their visit. Hence, the generators were mostly found to be placed separately in place where there was sufficient space while for those with limited space; generators were found to be placed separately in basement or enclosed. The role of enclosure is also supported by a study conducted in portable generators which showed that a sand bed of thickness 32 mm reduced noise by 10 dB(A) while an air gap of 5 cm between sandwich enclosure walls can achieve a reduction of even 28 dB(A) (Parvathi & Gopalakrishnan, 2003). Apart from this, the regular supply of electricity was reported to sufficiently reduce the operation of generators thereby reducing its detrimental environmental effects as well.

3.7 Water Usage

Groundwater serves as one of the main sources of water in many areas of Nepal including the capital Kathmandu. In order to combat the water demand of Kathmandu Valley caused by ever increasing number of apartments, hospitals, educational institutions, hotels and industries, ground water has been excessively pumped out which combined with concretization has hindered the groundwater recharging (Bhattarai & Adhikari, 2022). However,

the excess of ground water in the densely populated areas such as in the Kathmandu Valley often leads to land subsidence (Bhattarai et al., 2017). The sampled hotels were found to vastly depend on groundwater to fulfill its water demands. Of the total sampled hotels, majority of the hotels (19) contributing to massive 90% share extracted groundwater to fulfill its daily needs whereas only few (2) hotels were found to exclusively depend on tap water. The amount of groundwater extracted was reported to be within the limits of extraction permit approved from the government authority. However, the requirement for extraction permit is mainly confined inside the Kathmandu Valley only which raises the issue of rampant groundwater extraction in many areas. Basically, the extraction capacity was found to depend on the size of the hotels as well as the guest turnout ratio. However, many hotels reported to be extracting nearly 50,000 liters per day while very few were found to be extracting even higher than 1 lakh liters as per their daily requirement. The high dependence on the groundwater is sure to impact the water table of the area along with associated problems that comes from disturbance in water table.

3.8 Groundwater Recharge

Water is recharging through various methods; natural process (recharge or retention ponds), deep water injection, recharge pits or rainwater harvesting help in replenishing the diminishing groundwater (Bhattarai & Adhikari, 2022). Hence, the provision of recharge pits is generally proposed in the Environment Mitigation Plan of the approved environment study reports as well. Therefore, the compliance status of the hotels on this regard was contributed by the provision of groundwater recharge which in turn refers to the presence of recharge pits. However, in some cases the availability of vast patch of unpaved land was also considered as compliance since this provision also facilitate in recharging of the ground water. From this aspect, 12 hotels were found to be complied; where 4 hotels had recharge pits whereas the remaining had sufficient open unpaved space. Similarly, the partial compliance was considered viable for situations where limited provision of

recharge facility was observed. Hence, owing to this fact, 3 hotels fell under partial compliance; out of which two hotels had limited unpaved land whereas the remaining used existing well for recharge purpose which in itself was not accounted sufficient. In contrary, the remaining 6 hotels were non-complied as they had not exhibited efforts towards the ground water recharge in spite all of them using ground water as their primary source of water. This shows less awareness and willingness of the hotels towards this issue. Moreover, the recharging technique and methods adopted in the complied hotels also lacked in many aspects which has raised another gap especially requiring for the formulation of relevant regulations. Apart from this, the water deficit situation can also be offset through the provision of rainwater harvesting; which is also proposed in many cases. However, despite EMP commitments, the lack of rainwater harvesting in almost instances suggests a large implementation gap. These trends align with previous studies that emphasize unsustainable water usage habits in the hospitality industry, especially in poor nations (Makoondlall-Chadee & Bokhoree, 2024).

3.9 Energy Management and Efficiency

Lenzen et al. (2018) found that tourism is responsible for around 8% of global greenhouse gas emissions. However, the hotels are switching towards renewable energy globally as well. This fact is supported by the evident that research conducted in between 2016 and 2022 emphasized on many hotels worldwide started using renewable energy and adopting green practices. Most hoteliers adopt renewable energy as the customers have positive perception towards such hotels and recommend such hotels to others (Ghimire et al., 2023). Energy management practices in our study also supported the same fact with majority compliant, from use of renewable energy such as solar and hydroelectricity as well as widespread use of LED lighting and energy-efficient appliances. For lighting purpose, all of the inspected hotels (100%) used electricity generated from hydropower as their main energy source with few of them using electricity generated from solar energy as well to some extent. All of the inspected hotels had diesel generator as backup

energy source depicting dependency on fossil fuels along with renewable sources of energy. For water heating system, majority of the inspected hotels (90%) in our study were found to adopt heat pumps. These were either electricity fueled or based on solar energy representing cleaner sources of energy. Besides, the partial compliance in some hotels (10%) resulted from the fact that fossil fueled boilers though in the process of being replaced by the heat pumps are still being used in some scale. However, no hotels were found being totally dependent on traditional boilers which no doubt is a positive impact to the environmental pollution. These actions are consistent with widely used hotel sustainability initiatives (Ouyang et al., 2019). No doubt prior research shows that hotels frequently put cost-cutting energy efficiency measures ahead of long-term sustainable energy transitions (Rassiah et al., 2024), the decreasing cost of renewable energy has shifted the whole paradigm at present. Since, electricity source is certainly dominated by hydropower in case of Nepal, the contribution towards the renewable energy increases simultaneously. A similar study based on data collected from 30 tourist standard hotels in Kathmandu also showed similar results with nearly 80% hotels showing a preference for hydroelectricity whereas just 2% showed towards solar energy (Ghimire et al., 2023). This also highlights the increased level of awareness amongst hoteliers about the renewable energy applications in hotel operations.

3.10 Disaster Management

Disasters experienced by the hospitality industry has gradually increased over the past few decades which have in turn warned the hospitality key players seek ways to cope with such extreme events (Mitroff, 2004). The study also demonstrated similar results with majority of the hotels (90%) complied with adoption of emergency preparedness and response plan as well as provision for emergency equipment and system demonstrating disaster management compliance. The provision for emergency equipment included first-aid kit, fire extinguishers, fire reel hose, safety alarms, smoke detectors along with emergency exit and assembly point. Since the study

was conducted in high end hotels, such provisions were given more priority and also some hotels; being chain hotels of established brands overseas had to follow such protocols. This increased degree of compliance is in line with research that indicates areas that directly affect human safety are given more regulatory attention and enforcement (Ouyang et al., 2019). Only few showed (10%) partial compliance with scope for improvement in disaster preparedness. The studied hotels were found to have organized safety training and drills at regular intervals to prepare staffs during emergencies.

3.11 Greenery Maintenance

Greenery has been undoubtedly the attraction point of any hotel. The aesthetics of a hotel is usually considered the face of its property. The study also tried to incorporate this aspect from the point of environment conservation as maintain greenery is often considered as one of the key mitigation measures in EMP of any approved environment study reports of hotels. However, our data showed mixed results with dominant hotels being complied on maintaining greenery. In spite of this, nearly, one fourth of the hotels could not comply with these measures mostly due to the unavailability of land. The hotel mostly operated in city areas with limited space were found to be little negligence in maintaining greenery. The maintenance of greenery not only brings mental peace to the visitors but is also crucial from maintaining environmentally sound scenarios. A new concept called “green hotels” is increasingly being popular in hospitality globally at present. Such concept promotes green building orientation, which involved using natural resources, renewable energy, and reusing materials and water in a variety of ways that supports sustainable practices and ultimately sustainable development (Ghimire et al., 2023). In align to this, few hotels in our study also showed their preference and orientation towards such practices which in fact indicates a progressive growth of green hotels concept in our context as well.

3.12 Corporate Social Responsibility

Corporate Social Responsibility (CSR) is understood as the responsibility of any project which it is liable

to spend on the welfare of the community as a certain percentage of its expenditure share. CSR has recently received more attention and has been started from different approaches. However, its application and use in hospitality sector is still largely vague in nature. The measurement of CSR in some cases is also attributed from short term and long-term return on asset (ROA) (Mariño-Romero et al., 2020). The studied hotels also showed dominantly complied in this aspect with nearly 70% compliance out of the total. The complied hotels were found to support the community through donations in infrastructure development and social activities. The infrastructure developments were majorly the construction of roads in locality, installment of lights and security system whereas the donations involved funding social activities ranging from orphanage, plantation and health check-up. Besides, some hotels were found to demonstrate less CSR activities falling under partial compliance also.

4. Conclusion

The study has tried to evaluate the compliance status among the star rated hotels in Nepal through categorization of various parameters into compliance, partially compliance and non-compliance based on the inspection. It reveals that compliance over the parameters basically included in EMPs shows mixed results. Moreover, the percentage-based compliance analysis indicates that while parameters such as solid waste management, air and noise quality management and energy as well as disaster management show relatively high compliance levels; wastewater management exhibit lowest observance representing critical gaps owing to absence and/or limited use of treatment facilities. Apart from this, the groundwater recharge seems moderately adherence contributed more by the availability of open surface rather than the provision of recharge pits. Since, most of the sampled hotels heavily relied on groundwater for their overall water demands; the ground water recharge needs to be scaled up in order to compensate for the used ground water. Besides, the greenery and CSR which are both indispensable in case of hospitality sector showed mixed compliance attributing to need for specific assessments. Along with this, it

was also perceived that the mitigation measures proposed in the EMP also needed to be site specific and computable so that its implementation can be more rationale. This limitation in the quality and contextual relevance of EMPs further constrains effective environmental performance, indicating a need for more rigorous, site-responsive planning during environmental approval processes.

Overall, the study emphasizes the significance of thorough environmental monitoring and regular inspections by the relevant authorities to determine whether or not the hotels have been effectively adopting the proposed mitigation measures. Improvement in waste water management systems, sustainable water usage, optimal resources use along with site specific EMPs will contribute to the sustainable tourism.

Recommendations

Based on the findings of our study, the special attention is needed in the areas where weak compliance was observed. Although many hotels have adopted the basic environmental management practices, the implementation of several mitigation measures were found to be partially compliant. Thus, it is recommended that regulatory bodies should use a performance-based monitoring strategy, making wastewater treatment plant installation and operation mandatory, encouraging the use of renewable energy, and enforcing sustainable water management techniques. Such improvements would support the long-term sustainability of tourism development in Nepal.

References

- Arýkan Kargý, V. S., & Cesur, F. (2024). Renewable energy technology selection for hotel buildings: A systematic approach based on AHP and VIKOR methods. *Buildings*, 14(9), 2662.
- Bhattarai, K., & Adhikari, A. P. (2022). Minimizing surface run-off, improving underground water recharging, and on-site rain harvesting in the Kathmandu valley. *Nepal Public Policy Review*, 287-316.
- Bhattarai, R., Alifu, H., Maitiniyazi, A., & Kondoh, A. (2017). Detection of land subsidence in Kathmandu Valley, Nepal, using DInSAR technique. *Land*, 6(2), 39.
- Bohdanowicz, P. (2006). Environmental Awareness and Initiatives in the Swedish and Polish Hotel Industries-Survey Results. *International Journal of Hospitality Management*, 25(4):662-682. <https://doi.org/10.1016/j.ijhm.2005.06.006>.
- Chan, E.S.W., & Hawkins, R. (2010). Attitude towards EMSs in an international hotel: An exploratory case study. *International Journal of Hospitality Management*, 29(4), 641-651. <https://doi.org/10.1016/j.ijhm.2009.12.002>.
- Elancheliyan, S. (2013). Noise Effects of Generator Sets at Construction Sites. *International Journal of Occupational Safety and Health*, 3(2), 12-17. <https://doi.org/10.3126/ijosh.v3i2.6145>
- Environment Protection Act [EPA]. (2019). *Act No. 9 of the year 2019* (Nepal). <https://lawcommission.gov.np/content/12571/12571-the-environment-protection-act/>
- Environment Protection Rules [EPR]. (2020). *Rule No. 5 of the year 2020* (Nepal). Nepal Law Commission
- European Commission [EC]. (2016). An EU Strategy on Heating and Cooling, COM 51Final. Brussels, Belgium. Retrieved on Oct 08, 2010. From http://ec.europa.eu/energy/sites/ener/files/document/1_EN_ACT_part1_v14.pdf
- Ghimire, B., Muneenam, U., & Techato, K. (2023). Renewable energy use in green hotels for sustainability: A systematic review. *International Journal of Energy Economics and Policy*, 13(6), 618-627. <https://doi.org/10.32479/ijeeep.14521>
- Han, H., & Yoon, H.J. (2015). Hotel customer's environmentally responsible behavioral intention: Impact of key constructs on decision in green consumerism. *International Journal of Hospitality Management*, 45, 22-33. <https://doi.org/10.1016/j.ijhm.2014.11.004>
- Khatter, A., McGrath, M., Pyke, J., White, L.,

- & Lockstone-Binney, L. (2019). Analysis of hotels' environmentally sustainable policies and practices: Sustainability and corporate social responsibility in hospitality and tourism. *International Journal of Contemporary Hospitality Management*, 31(6), 2394-2410. <https://doi.org/10.1108/ijchm-08-2018-0670>
- Lazareva, Y. (2016). Exploring the differences in waste management strategies in different types of hotels. *Surrey Undergraduate Research Journal* (SURJ), 2(1).
- Lenzen, M., Sun, Y. Y., Faturay, F., Ting, Y. P., Geschke, A., & Malik, A. (2018). The carbon footprint of global tourism. *Nature climate change*, 8(6), 522-528. <https://doi.org/10.1038/s41558-018-0141-x>
- Makoondlall-Chadee, T., & Bokhoree, C. (2024). Environmental sustainability in hotels: A review of the relevance and contributions of assessment tools and techniques. *Administrative Sciences*, 14(12), 320. <https://doi.org/10.3390/admsci14120320>
- Mariño-Romero, J. M., Hernández-Mogollón, J. M., Campón-Cerro, A. M., & Folgado-Fernández, J. A. (2020). Corporate social responsibility in hotels: A proposal of a measurement of its performance through marketing variables. *Sustainability*, 12(7), 2961. <https://doi.org/10.3390/su12072961>
- Menegaki, A. N. (2025). Optimizing pollution control in the hospitality sector: a theoretical framework for sustainable hotel operations. *Tourism and Hospitality*, 6(2), 85. <https://doi.org/10.3390/tourhosp7050120>
- Mitroff, I. I. (2004). Crisis leadership: Planning for the unthinkable.
- Ministry of Culture, Tourism and Civil Aviation. (2024). *Nepal tourism statistics, 2024*. Government of Nepal. <https://tourism.gov.np/content/83/nepal-tourism-statistics-2024/> [1]
- Ouyang, Z., Wei, W., & Chi, C. G. (2019). Environment management in the hotel industry: does institutional environment matter? *International Journal of Hospitality Management*, 77, 353-364. <https://doi.org/10.1016/j.ijhm.2018.07.015>
- Parvathi, K., & Gopalakrishnan, A. N. (2003). Studies on control of noise from portable power generator. In *Proceedings of the Third International Conference on Environment and Health, Chennai, India* (pp. 328-338).
- Pirani, S. & Arafat, H.A. (2014). Solid waste management in the hospitality industry: A review. *Journal of Environmental Management*. 21(146), 320- 336. 320–336.
- Rassiah, P., Nasir, N. M., Subramaniam, R. K., & Saleeth, H. M. (2024). Sustainable environmental management practices: evidence from hotels in Malaysia. *Global Sustainability*, 7. <https://doi.org/10.1017/sus.2024.28>
- Smitt, S., Hafner, A., & Hoksørød, E. (2019). Presentation of the First Combined CO₂ Heat Pump, Air Conditioning and Hot Tap Water System for a Hotel in Scandinavia. In *Proceedings of the 8th Conference on Ammonia and CO2 Refrigeration Technologies* (pp. 11-13).
- Tosato, G., Giroto, S., Minetto, S., Rossetti, A., & Marinetti, S. (2020). An integrated CO₂ unit for heating, cooling and DHW installed in a hotel. Data from the field. *Journal of Physics: Conference Series*, 1599(1), 12058. <https://doi.org/10.1088/1742-6596/1599/1/012058>
- Vidal, B., Kinnunen, J., Hedström, A., Heiderscheidt, E., Rossi, P., & Herrmann, I. (2023). Treatment efficiency of package plants for on-site wastewater treatment in cold climates. *Journal of Environmental Management*, 342, 118214. <https://doi.org/10.1016/j.jenvman.2023.118214>
- Zorpas, A.A., Lasaridi, K., Voukkali, I., Loizia, P. and Inglezakis, V.J. (2012). Solid waste from the hospitality industry in Cyprus. *Island Sustainability II*, 9(166), 41- 49. <https://doi.org/10.2495/islands120041>