# ABSTRACT

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<u>**Title of the Thesis: Analysis of Water Consumption Pattern and its Reuse in Five star Hotels**</u>

Water, along with oxygen is an essential for existence of life on earth. However, the availability of freshwater is limited, which maintains the ecosystem for its sustainability. Further, unmindful and unchecked water consumption pattern by intensive water use sectors or industries and unabated pollution are pushing the poor people to unfavorable conditions to survive. Also, such practices are pushing to unsustainable environment.

The pressure on freshwater resources and substantial growth of tourism sector has led to diagnose the research problem with following objectives:

- Inventorization of water consumption, wastewater generation from different utilities of Hotel and its characterization.
- Statistical analysis of water consumption pattern and development of water consumption prediction model.
- To establish the benchmark for water consumption using Delphi technique.
- Identification of cost effective wastewater treatment technology and to explore the reuse potential of treated wastewater.

In order to achieve the objectives of the research study, the 27 five star hotels of Delhi were selected. The basic data/information of the hotel is collected through meetings with the hoteliers including physical survey and using a questionnaire. This collected data/information has been used in analyzing and assessing the water consumption pattern in the five star hotels of Delhi.

The statistical analysis is done using Statistical Package for Social Sciences (SPSS) software and R-software. The equations for predicting total water consumption, consumption for

consumptive and non-consumptive uses are developed applying statistical analysis tools, i.e., Principal Component Analysis (PCA) and Multiple Regression Analysis. The three equations are developed and validated using t-test and $R^2$ coefficients. The benchmark for fresh water consumption in five star hotels of Delhi is also developed using Delphi technique.

The study identifies the significant variables which are affecting water consumption pattern. These variables are number of rooms, plot area, number of guest and green area etc. This inferred that these factors do influence the water consumption in varying intensities. The study also reveals that water consumption varies with quantitative change in variables and ranges from minimum 125 KLD to maximum 823 KLD and an average consumption by a tourist is 1294 L/GN in five star hotels of Delhi against the best practice of water consumption of 500 L/GN globally.

Fresh water use efficiency has been devised by development of models to predict water consumption for various usages. The equation to predict water consumption for non-consumptive use is to account the reuse of the treated effluent. The developed statistical model(s) could explain 78%, 82% and 85% of the original variability for non consumptive, consumptive and total water demand respectively.

Delphi technique has been adopted to develop a benchmark for fresh water consumption wherein majority of the respondents have agreed that there should be a water consumption benchmark in five star hotels based on potable and non-potable (consumptive use and non-consumptive) purposes. From Delphi technique has established that 400 liters/guest-night can be accepted as benchmark for fresh water consumption.

The treatment technologies were comparatively analyzed in terms of cost effectiveness for a discharge varying from 50 to 750 KLD. Standard power equation has been used for an analysis of cost effectiveness wrt elecrtro mechanical, civil, manpower etc. Final analysis is emerged in a hierarchy MBR < SAFF<EA<MBBR<SBR.

The reuse potential has also been assessed in terms of current practice and its expected reuse. Analysis of collected data emerged that presently 10-20% is being practiced whereas the reuse potential is worked out to be 50% of total water demand in five star hotels.

Based on such research initiatives and findings, a holistic approach for conserving and sustaining water resources can be developed for posterity. The research study has a cumulative effect for water saving and its conservation for future generation.

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