

Sustainable Planning and Design of Keltan Village

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Abstract:- The sustainable development of rural regions in India is significantly important since it aids in the effective increase of agricultural production and productivity.; hence, a specific balance in economic and social development should be maintained. This research paper examines the Kelthan village of Vijeshwari in Wada Taluka, Thane District, Maharashtra, India., which addresses the concerns and challenges current amenities highlight and provides the best economical alternative. A survey was undertaken to determine several issues that the community was experiencing in the following areas - facilities, infrastructure, and renewable energy. Based on our understanding and research of the issues plaguing the community, the following recommendations were made – installing solar street lamps to illuminate the village, building a new biogas plant as a sustainable energy source, and modifying the current school building. Hence a survey was conducted to identify all the problems faced by the people and the following set of solutions were been proposed School, Biogas, and Solar Street lamps. Based on the survey results, we made the following decisions: to modify the current school building; construct a new biogas plant as a sustainable energy source; and install street lighting to illuminate the village. Therefore, improving the current school will aid in both the community's socioeconomic development and the children's academic growth. A biogas plant can assist in meeting the daily need for cooking gas, and the finished product can either be sold to create income or utilized as fertilizer. Installing solar street lighting in the community is expected to, it'll increase people's security and the safety of driving. This study will help in our understanding of rural regions' bad situations and the issues faced by rural economies and significantly improve our ability to assist them in becoming sustainable.

Keywords:- Biogas, LED street lamp, Proposal of redevelopment, Sustainability development.

I. INTRODUCTION

Sustainable development has the potential to drive economic growth in small villages, while concurrently preserving the environment and conserving resources for future generations. This can be accomplished through the adoption of environmentally conscious practices, such as the use of renewable energy sources, the conservation of natural resources, and the promotion of eco-friendly industries. Moreover, it serves to enhance the quality of life for those living in these villages by providing access to essential amenities such as better infrastructure facilities, healthcare services, education, and employment opportunities. The project was carried out for a small village name Kelthan located in Palghar. The project's main aim is to help in the sustainable development of the village. And by doing so we can help the people by providing the necessary amenities, and infrastructure which is needed to satisfy both the present-day population and future generations. As a result, the community in that village will be able to sustain itself and avoid having to relocate due to a lack of basic resources and inadequate infrastructure in the rural areas. Use the enter key to start a new paragraph. The appropriate spacing and indent are automatically applied.

A. Objectives of Study-

- To improve the waste management system by providing a biogas plant.
- To provide a street light system through solar energy.
- By redeveloping the existing School building.
- Build a sustainable facility for the community.

II. STUDY AREA

Kelthan village is located in the Palghar district of Maharashtra, India. It is situated about 130 km north of Mumbai and about 55 km south of Nashik. The village is surrounded by lush green hills and is known for its scenic beauty. The primary occupation of the villagers is farming, with rice, wheat, and vegetables being the main crops grown here. The village also has a few small-scale industries that produce pottery and handicrafts. Kelthan has a population of around 1,500 people, and the majority of the residents are Marathi-speaking Hindus. The village has a primary school and a few shops catering to the villagers' basic needs. Tourists can visit Kelthan to experience rural life and enjoy the scenic beauty of the surrounding hills. The village is also known for its annual fair, which is held in February or March and attracts visitors from nearby villages.



Fig. 1: Location of Kelthan Village.

III. METHODOLOGY

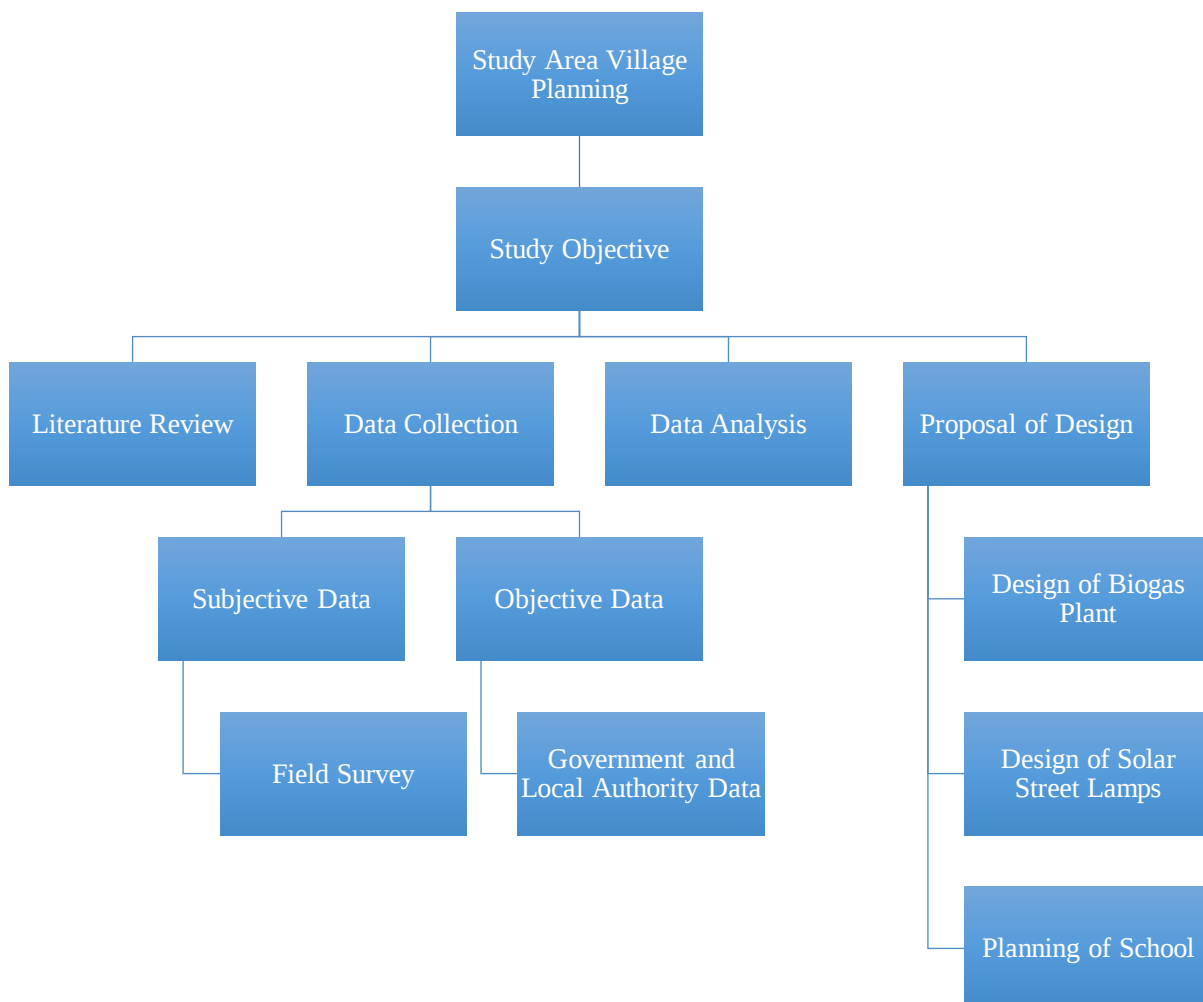


Fig. 2: Project Methodology

A. Data Collection

The data is collected from several Houses in Kelthan village through personal interviews & analyses in a proper manner.

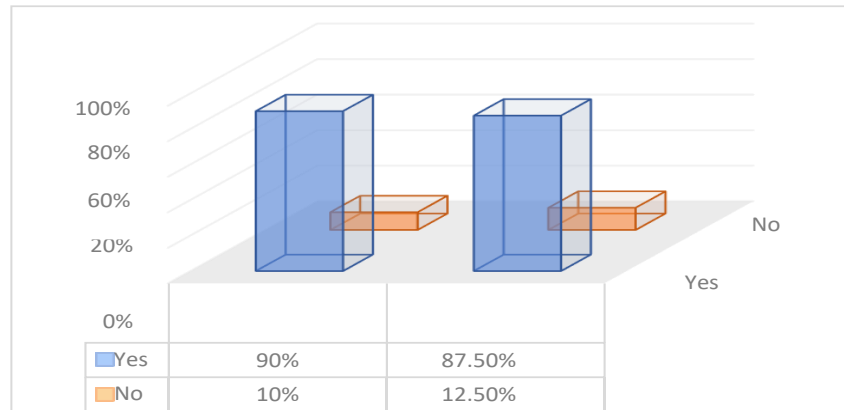


Fig. 3: Data represent in terms of yes & no

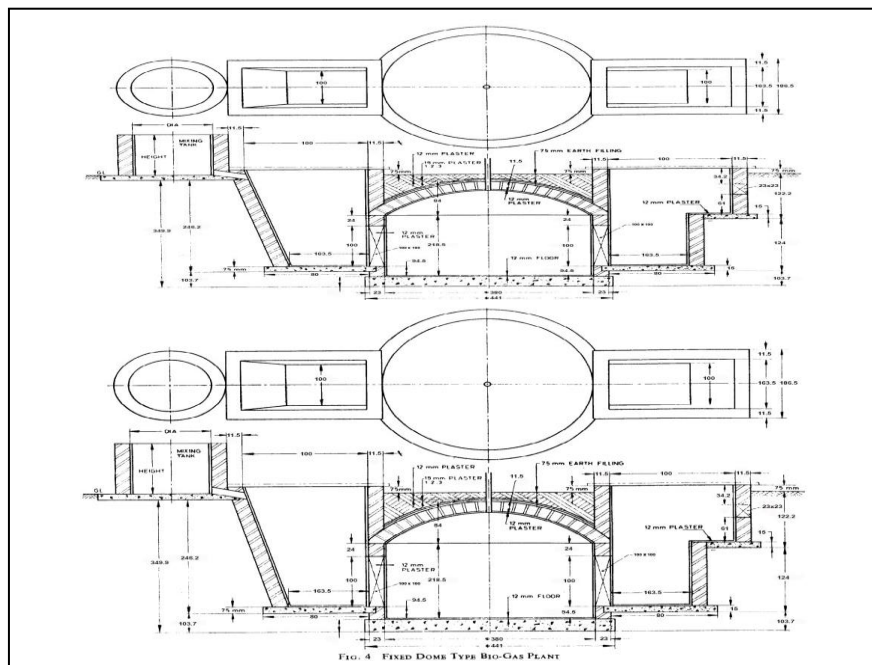


Fig. 4: Data represented in terms of Good, average & poor basis from the survey

IV. PLANNING PROPOSAL

A. Solid waste management-Bio gas Plant

Fixed dome digester plant Bacteria in the digester transform the biomass into biogas and a liquid called slurry (digested waste). The pre dominant gases in the gas are CH_4 and CO_2 , with traces of other gases. The slurry is moved to the off set tank after being collected in the gas holder, which has a dome shape. The feed load in grate, how it is used, and the amount of gas produced all affect how much slurry is produced. The slurry is pressed backwards and sideways

while gas is being produced and transferred to an offset tank. Slurry from the offset tank is pumped back into the digester as the gas is utilized. With a life span of roughly 20 years, the fixed dome digester is reasonably priced and thus economical. Because the majority of it is buried beneath the earth's surface, the fixed dome digester can safely stand cold temperatures. Additionally, there is a difference in temperature between day and night inside the bio digester, which is better for methanogens-producing biogas.

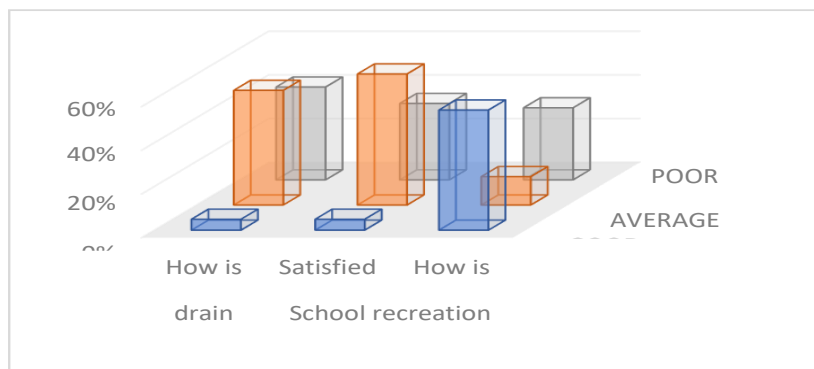


Fig. 5: Biogas Plant

Data Collection Methods

- House hold survey by using Questionnaire.
- Interview method.
- Visit/physical verification of the bio gas plants.

For calculating and designing bio plants, it is appropriate to use Is code method i.e., IS9478:1989 after data collection and selecting the most effective and efficient type of bio.

According to some estimates, 1 kg of cow dung can produce about 0.03-0.04 m³ of biogas, which is roughly equivalent to 0.022-0.030 kg of methane. Therefore, 170 kg of cow dung could produce approximately 5.1-6.8m³ of bio gas or 3.74-5.1 kg of methane.

B. Solar System-Solar Street Lamps.

The distance between two solar street lamp poles 5 meters tall with 9 watts of LED bulb and a road width of 6 meters can vary depending on several factors such as the desired lighting level, the spacing between the poles, and the angle of the light distribution.

However, some general guidelines can be used as a starting point. For a road width of 6 meters, a common pole spacing for solar street lamps is between 20 to 30 meters. In this case, assuming a pole spacing of 25 meters (82 feet), the calculation would be as follows:

$$\text{Total distance} = \text{Pole spacing} + (2 \times \text{Pole height})$$

$$\text{Total distance} = 25\text{m} + (2 \times 5\text{m})$$

$$\text{Total distance} = 35 \text{ meters (114 feet)}$$

Therefore, the distance between two solar street lamp poles 5 meters tall with 9 watts of LED bulb and a road width of 6 meters would be approximately 35 meters (114 feet).

C. Education Facilities –Primary and secondary School planning

By IS 8827:1978, the school is designed.

For each component of the school building, a distinct clause is used.(A)

We have modified the present school design and created a new one that is efficient and effective for having more kids, more classrooms, and more open space, among other things.

A school is a division of the educational system that consists of students who are divided into one or more grade levels or other identifiable groups, are organized as a single unit with one or more instructors to provide instruction of a particular kind, and are located in one or more buildings.

There may be more than one school there, such as elementary and secondary schools in the same building or campus.

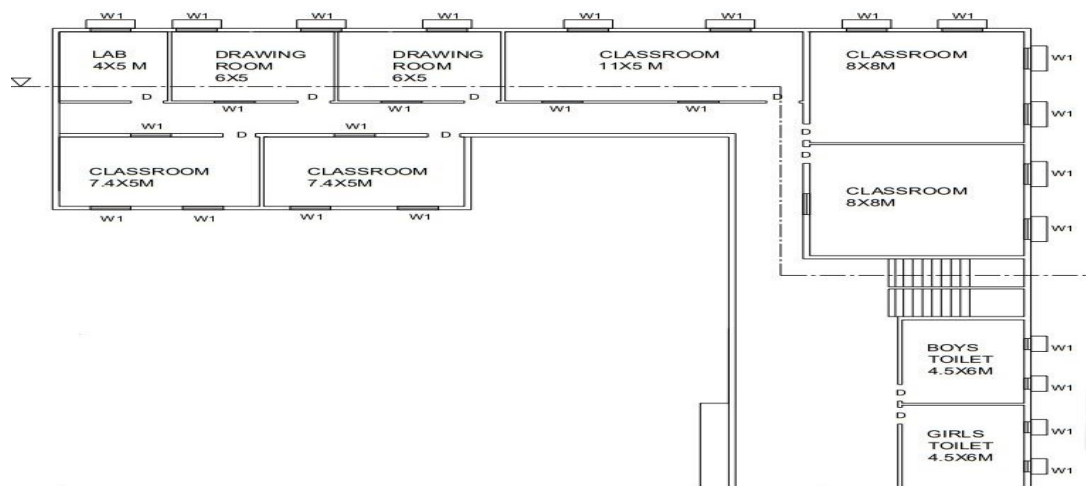


Fig. 6: Ground Floor Plan

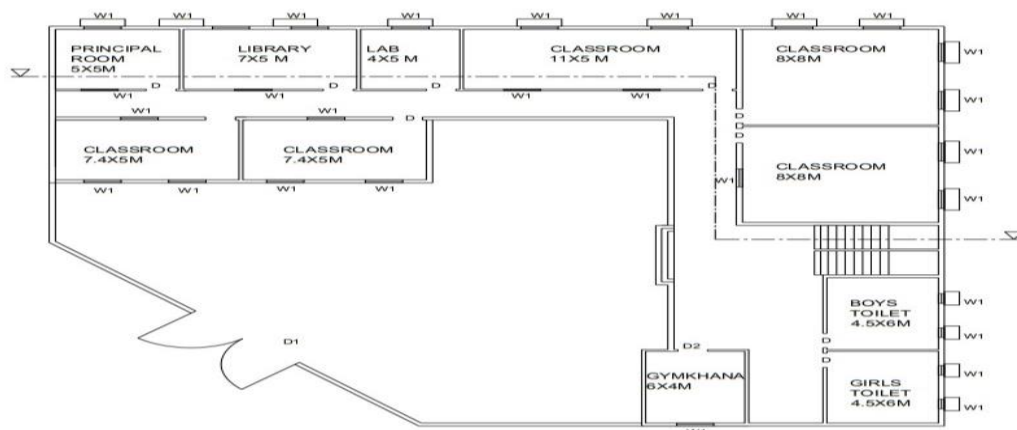


Fig. 7: First Floor Plan

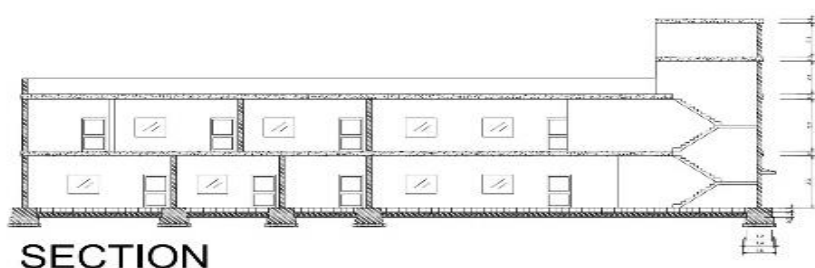


Fig. 8: Sectional Plan

V. RESULT

The provision of all the above amenities will help in the following way like

- By providing a Biogas plant that can be used for household purposes.
- It can be the replacement for natural gas
- Farmers can use it as manure
- By planning of classroom students can have more classrooms and a free space area which is usually more than the previous one.
- Provided primary and secondary school design which will help in the socio-development of the village

VI. CONCLUSION

In the study of Sustainable development of Kelthan village, it is observed that the infrastructure which was already in use was reasonably in poor condition. Because of this, there was a need for improvement in the infrastructure facility to enhance the villager's life and help them to become self-sustainable for the present and future generations. For education purposes, they should provide secondary school (High School) which would nurture the students and increase the student capacity, per classroom by 50 students. As mentioned above, the quality of the school is poor and was not having proper infrastructure facilities because of which there was a need for a better school. So, we provided a secondary school design that was best suited for the student living in that particular area.

There was no proper disposal or use of livestock excretion, so we provide them with a biogas plant design for the entire village which helps in the natural gas of 4.42kg/day of methane production and biomass later can be used as a good fertilizer. It reduces global warming. For luminous we have provided solar street lamps of 9 watts.

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