

Development of Infrastructural Facilities in Vadi Village

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Abstract

The study paper is about the development of appropriate facility and a suggestion for an upgrade of Vadi village, Surat district, Gujarat - India. It's an approach towards the development of village with all physical, social and renewable facilities in a way to explore possibilities of providing urban amenities within the existing rural setup. This village is located in Umarpadataluka of Surat district. As per census 2011, the village recorded a population of 5,648 persons out of which 2,542 were engaged in economic activities involving 253 cultivators (owner or co-owner) and 1,470 agricultural laborers. At present, the condition of the village is gloomy. The village is considered to be underdeveloped. Major reasons as obtained from collected data comprise of the village lacking of basic facilities such as good sanitation facilities, Pucca houses, adequate public toilets, Pucca roads, solid waste management and disposal, recreational area, and so on. Under this project effort have been made for sustainable development of village components such as solid waste management system, smart sanitation system and lake development as a recreational area. Hence the project is about proposing development of basic facilities in this village attempting optimization of cost as well as optimum use of available resources.

Keywords: Gap Analysis, Rurbanization, Techno-Economic Survey, Vadi Village, Village Development

I. INTRODUCTION

Rural population of Gujarat as per census 2011 India has been decreased to 57.4% from 62.6% as per census year 2001 which indicates migration as one of the main reason for increase in urban population. Any area is considered as developed area which fulfills all the basic amenities that an individual expects from government. Keeping this in mind government of India under the keen guidance of former Chief Minister and present Prime Minister Mr. Narendra Modi has introduced a new concept for physical, social and socio cultural development of rural which was named as rurbanization. This project study is an initiative to draw the village towards the rurbanization.

The Indian government has launched the idea of developing smart cities and before developing the cities a list of 20 top most cities is also announced. An rurban mission program is also passed by Mr. Shyam Prasad Mukherji in the cabinet. Under this program, there is a vision of converting 300 villages into smart villages. Smart describes the means of science and technology. Developing 300 villages to smart villages out of 7 lakh villages may or may not be proved to be beneficial. The smart cities and villages may be equipped with latest technology but, what villages actually need is pure drinking water, clean public toilets and better roads to travel. The present scenario of villages shows broken electricity wires, degraded public toilets and overhead tanks, unhygienic atmosphere, entries of villages filled with lots of rubbish and also the educational facilities of villages have not shown any progress. The same is with the public health centers (PHC). Some villages don't have PHC while the villages having PHC don't have sufficient doctors. It is shameful that due to lack of public toilets in villages, ladies have to hide out in farms for toilets. Villages need to be smart, but before technology public toilets should be priority. All over India in many village concept of aanganwadi is introduced; even there the low wages of workers are a major complaint. The midday meal for the children is not supplied on time.

“India is a country fully influenced by villages”

II. MOTIVATION

A huge amount of migration of people is observed from rural areas to the urban areas to improve their quality of life. People generally have tended to move permanently to the urban areas instead of daily to and from visits for various urban facilities. Migration mainly occurs due to lack of basic facilities like drainage facilities, water facilities, proper health facilities and most important lack of source of income. Development of rural areas is accidently ignored in the race of developing urban areas. The motive of this project is to suggest development of the rural areas not only by the means of infrastructure but also increasing its economic growth.

III. AIM AND OBJECTIVES

- To carry techno economic survey of the village;
- To carry intensive studies of different components in consultation with the authority and residents;
- To analyze data to be obtained from various departments related to the development process;
- To carry gap analysis in the form of data presentation;
- To carry focus group discussion with Sarpanch and members of the Panchayat;
- To develop some means for economic development of the village;
- To design proposal for infrastructural facilities as appropriate.

IV. METHODOLOGY

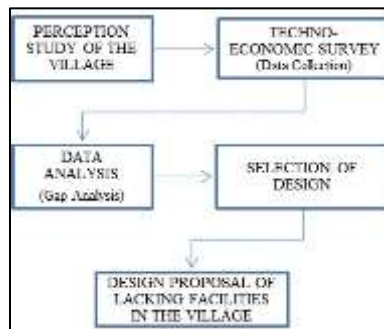


Fig. 1 : Methodology Flow

The project follows the methodology of compiling field visits, techno-economic survey of the village, intensive studies of different components in consultation with the authority and residents, analyzing data to be obtained from various departments related to the development process, gap analysis, data presentation, focus group discussion with Sarpanch and members of Panchayat, and design proposal of infrastructural facilities as appropriate.

V. STUDY AREA PROFILE

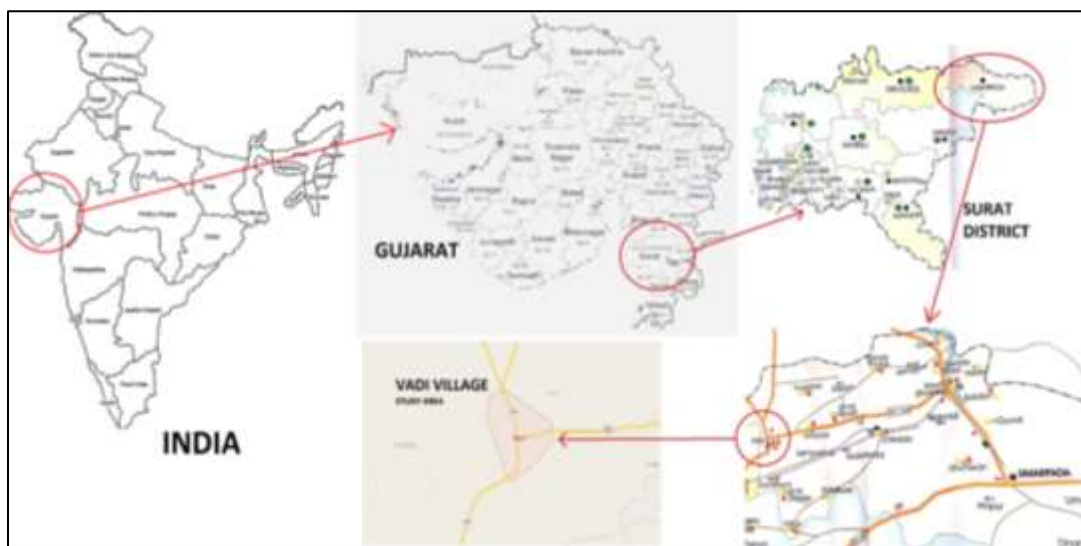


Fig. 2: Study area location

The study area is the Vadi village situated in Umarpada Taluka of Surat district in Gujarat, India. It is 4 Km away from the Jankhvav village of Surat district and it is at a distance of 76.5 Km from Surat Railway station. It is located in North-East of Surat which is an 8th most populous city of India as per census 2011. The exact location of village is at the boundary between Jhankhvav Taluka and Umarpada Taluka with coordinates 21.476136 latitude and 73.342992 longitude. The location code of the Vadi village as per census 2011 is 52389.

VI. DATA COLLECTION AND ANALYSIS

The collected data and its analysis imply to the techno-economic survey and gap analysis of the study area.

- Techno- economic survey is the study of current problems which affects the economy of the village and gives some technical solution of that problem and hence improves the economy of the village. It is the overall survey of the village which includes the appraisal of the economic condition of that area with respect to the technological exposure.
- Gap analysis is the process of finding out the lacking facilities in the village by comparing the needs of the village as per Urban Development Plans Formulation and Implementation (UDPFI) guidelines with the present available amenities. Below table - 1 shows the desired facilities as per norms of UDPFI.

Table - 1
UDPFI norms and gap analysis

Facilities	Planning Commission/UDPFI Norms	Village Name	VADI-Umarpada-Surat	
		Population		5648
		Existing	Required as per Norms	Gap
Social Infrastructure Facilities				
Education				
Aanganwadi	Each or Per 2500 population	10	2	8
Primary School	Each Per 2500 population	4	2	2
Secondary School	Per 7,500 population	1	0	1
Higher Secondary School	Per 15,000 Population	1	0	1
College	Per 125,000 Population	0	0	0
Tech. Training Institute	Per 100000 Population	0	0	0
Agriculture Research Centre	Per 100000 Population	0	0	0
Health Facility				
Govt/Panchyat Dispensary or Sub PHC or Health Centre	Each Village	1	1	0
PHC & CHC	Per 20,000 population	1	1	0
Child Welfare and Maternity Home	Per 10,000 population	0	0	0
Hospital	Per 100000 Population	0	0	0
Public Latrines	1 for 50 families (if toilet is not there in home, especially for slum pockets & kuttcha house)	2	0	2
Physical Infrastructure Facilities				
Transportation		Adequate	Inadequate	
Pucca Village Approach Road	Each village	Adequate	–	–
Bus/Auto Stand provision	All Villages connected by PT (ST Bus or Auto)	Adequate	–	–
Drinking Water (Minimum 70 lpcd)		Adequate	Inadequate	–
Over Head Tank	1/3 of Total Demand			–
U/G Sump	2/3 of Total Demand			–
Drainage Network		Adequate	Inadequate	Not Available
Open		–	–	–
Cover		–	–	–
Waste Management System		Adequate	Inadequate	Not Available
Electricity Network		Adequate	Inadequate	Adequate
Socio- Cultural Infrastructure Facilities				
Community Hall	Per 10000 Population	1	0	1
Public Library	Per 15000 Population	1	0	0
Cremation Ground	Per 20,000 population			0
Post Office	Per 10,000 population	1	0	1
Gram Panchayat Building	Each individual/group Panchayat	1	1	0
APMC	Per 100000 Population	1	1	0
Fire Station	Per 100000 Population	0	0	0
Public Garden	Per village	0	1	-1
Police post	Per 40,000 Population	0	0	0

From the analysis of data collected the most Desired Amenities in the village are:

- 1) Solid Waste Management Syatem
- 2) Sanitation System
- 3) Recreation center

VII. PLANNING PROPOSALS

Designs are the planning done for future implementation of proposed work. The project is concerned with proposal for rural infrastructure, including the above stated most desired amenities.

A. Physical Infrastructure Design

Physical infrastructure facilities narrate to overall water demand of particular area, drainage facilities, sanitation facilities, transportation network with ease of access for public use, availability of electricity (for domestic, commercial, agriculture and other use), and appropriate dwelling condition. Under physical infrastructure design the lacking facility found was a solid waste management system and thus proposal have been made.

1) Solid Waste Management

Solid waste generated in Vadi village is less as compared to the neighboring village Jankhvav. Jhankhvav is having the facility of door to door collection and then management by incineration method. But the existing management of waste by an incineration method in Jankhvav is less efficient. So a system of waste dumping can be developed such that both the villages have a common dumping area. For this *Open Window Composting Method* can be selected for effective and economical management.

The Population of Vadi village is 5648 persons while population of Jhankhvav is 6864 persons. Considering an approximation of 13000 persons in context with population sum of the villages, the total waste generated in combination of these villages is approximately 3300 Kg/day.

55% of total generated waste is considered as Garbage. The waste which can be turned into the compost is called as Garbage. Around 50% of garbage is cattle eatable.

Also, 15% of waste is considered as recyclable and 30% of remaining waste are in the form of ashes, silt, sand, etc.

Unit weight of solid waste is 600 Kg/m^3

Therefore, required pit size = 1.5125 m^3

Say 1.6 m^3 capacity pit is to be excavated.

Open window system requires 40 days for converting waste into manure.

Therefore, for each period of 40 days number of pits required = 40

Now, in Jankhvav Tractor is used for transportation of solid waste. So if we can use the same transportation medium for the Vadi village it will be convenient, but the waste generated in Vadi as compared to Jankhvav is less so a garbage vehicle of estimated capacity i.e. 1.2 tons can be hired as economical.

B. Social Infrastructure Design

Social infrastructure is a subset of infrastructure accommodating services of health and education. The appropriate development of village needs a touch of design proposals for social infrastructure. The requirement for smart sanitation which can sustain without affecting the environment is typically needed in the village.

1) Smart Sanitation System

A sanitation system does not only mention of toilets. Toilets are only one component in a complete sanitation system. Other components such as collection, treatment, transport, and use of excreta are as one vital for sustainable sanitation.

A sanitation technology is 'smart' when reformed to local conditions and flexible to a changing environment. The same technology may be smart in a foreign city, but inadequate when applied to rural India. To build up a smart sanitation solution in a local situation, the following guidelines are essential:

- Connecting families and the private sector in scheme and planning (developing proprietorship);
- Responding to real requirements (demand responsive);
- Building on present practice, experience and infrastructure;
- Considering values, attitudes and behavior of the users (culturally sensitive);
- Structure selections based on affordability and willingness to pay;
- Accounting present institutional settings (develop institutional support).

2) Benefits of smart sanitation

- Removes the spread of disease by treating excreta and other waste, converting this waste into valued resources and avoiding pollution of food and water;
- Composted human excreta and urine can be used as organic fertilizers which end the human nutrient cycle by elevating the farming soil with nutrients. Also reduces the need to buy industrial fertilizers;
- Escapes pollution of scarce water resources;
- Benefits save water for other purposes, drinking, cleaning, washing, and such.

3) Design Brief

The design includes a hygienic dry sanitation system with arrangement for separation of solid matter, urine and wastewater. The separation can be achieved by Squat type toilet pan with three ports for urine, solids and wastewater. This type of pan is cleanable, unbreakable, and comfortable. In addition to squat type pan the shelter and arrangement for pits for collection of wastewater, urine and solids are also included for design of new toilets. For existing toilets the squat type toilet pan has to be installed for applicability of designed system.

4) Proposed design for Sanitation

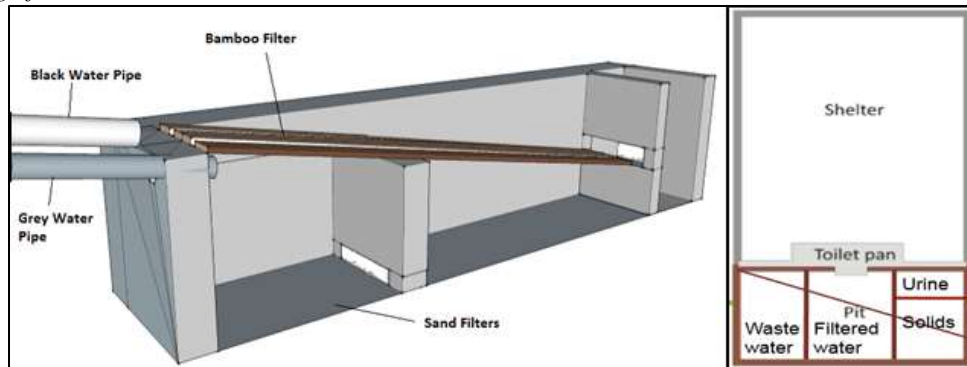


Fig. 3 : Sanitation system components

The separated black water, urine and grey water from a housing unit flows through the pipes connected to the waste disposal system. Now the black water short of urine is passed through the bamboo filter as shown in figure. The faeces in the black water get filtered, and slide over the filter to the faeces chamber and stored for 9 to 12 months to form compost. Urine is collected in the Jerry can of 10 to 15 liters capacity, which can be stored for 8 to 10 days and then transported to agricultural field to be used as fertilizer. While the wastewater from the kitchen, bathrooms and other ablution (grey water) disposes through pipe running parallel to black water pipe directly to the soak pit without passing through the bamboo filter as shown in section Y-Y of above fig. 3. The grey water can be disposed safely to ground without polluting ground water table, through sand filters at bed of the pit or the grey water can also be used to irrigate the field by pumping process.

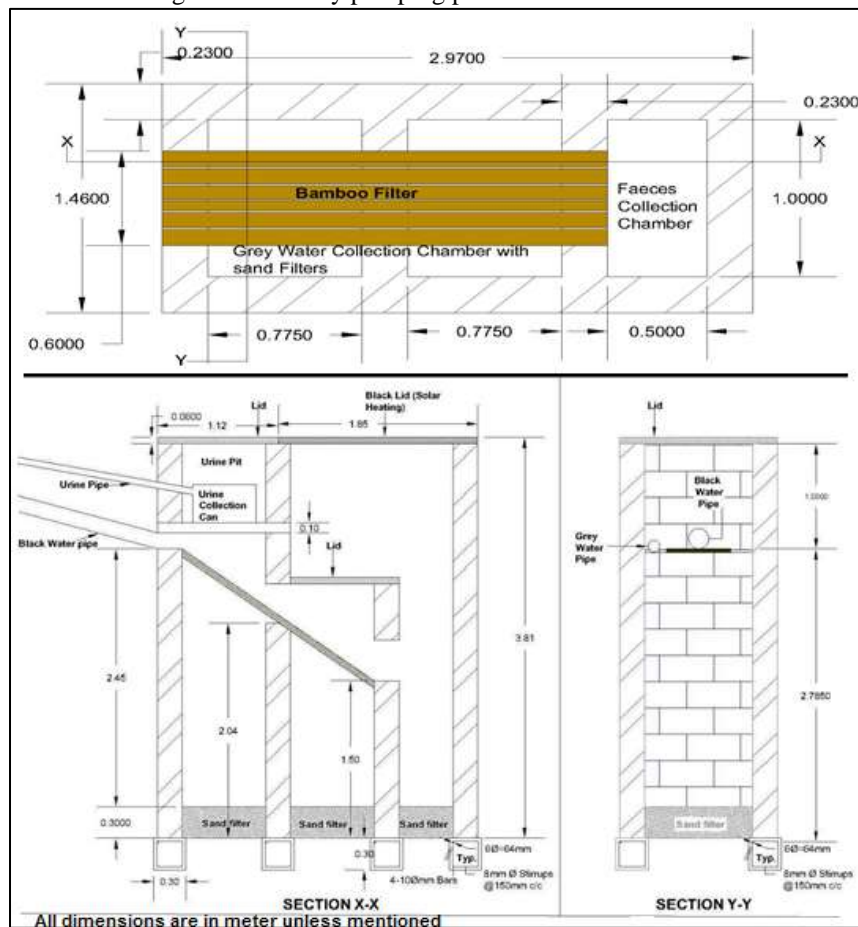


Fig. 4: Plan and sectional view of proposed sanitation system

C. Socio Culture Design

Socio-Culture facilities include development of society, culture and system. The facilities develop society by provision of the community hall, public library, public garden, recreation center, cinema or video hall, assembly polling birth and death registration office, and so on. The Village doesn't have any recreation center and hence it's required. Thus the proposal for pond beautification have been made.



Fig. 5 : Existing situation of Lake Site

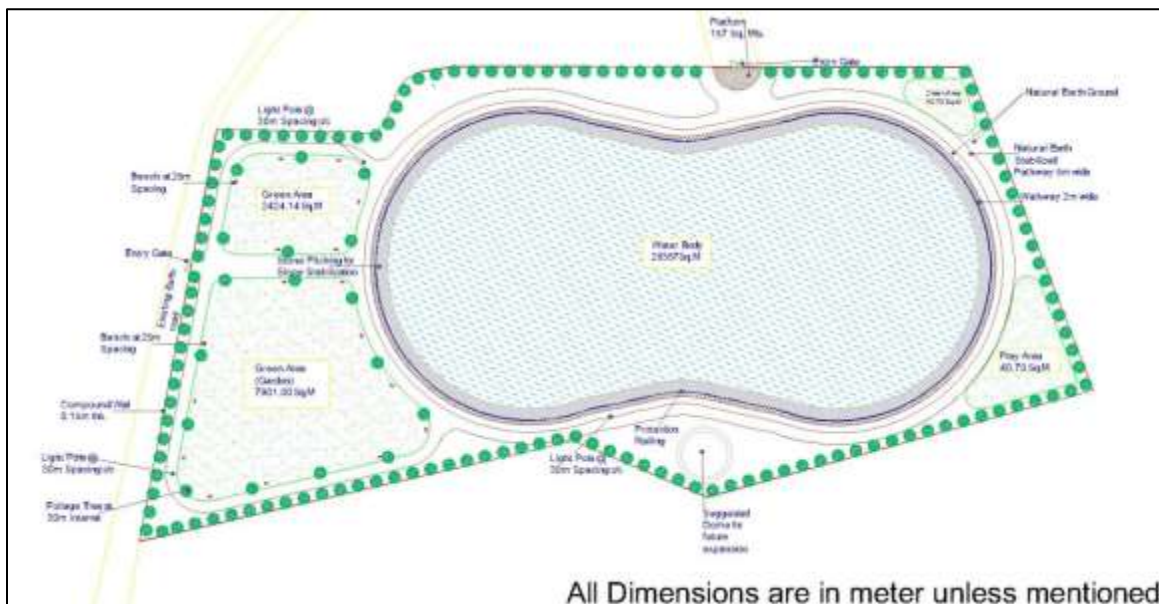


Fig. 6 : Design proposed for lake development

VIII. SUGGESTIONS

- 1) Development of village level step-well recharge mechanism at historical well of Derafalia.
- 2) Solar street lights are available in some places in the village but are not in working condition and in obsolete use. So street lights can be made repaired for good use of renewable energy.
- 3) Rain water harvesting at Derafalia is suggested as people of Derafalia does not get required amount of water during summer ending periods.
- 4) Well-developed and planned water supply system and Development of appropriate health facilities is suggested.
- 5) As not only basic amenities are satisfactory in this fast growing world for achieving high standard life of people, provision of advance facilities like appropriate wireless communication network, Internet and WiFi facility with developed education system is suggested. This can prove to be progress of India towards development with an ideal village.

IX. CONCLUSION

From the study of various components and existing infrastructure facilities in Vadi village, design proposals have been made for the lacking waste management system as a sustainable design proposal and proposed designs for other lacking facilities i.e. Smart sanitation system under social infrastructure and lake development as water storage as well recreational area. The implementation of these proposals can lead towards the development of Vadi village and thus contributes towards the development of the nation.

The application of proposed designs will be a step towards the improvement in quality of life of villagers and helps in raising the standard of living in rural. Hence the concept of rurbanization can play a key role in decreasing the migration rate from rural to urban.

REFERENCES

- [1] G. Tchobanoglous, H. Theisen, S. A. Vigil, "Integrated Solid Waste Management", McGraw Hill-1993
- [2] SP 35: Handbook on Water Supply and Drainage (1987), Bureau of Indian Standards, December 1987
- [3] K. Jain, "Environmental engineering", B. C. Punamia
- [4] UDPFI Guidelines, Urban Development Plans Formulation and Implementation-Vol I, Ministry of Urban affairs and Employment, Government of India, New Delhi, August 1996
- [5] Ecological Sanitation Practitioner's Handbook; United Nations Children's Fund (UNICEF), India, 2011
- [6] Technical Handbook of Ecological sanitation latrine; WaterAid; Nepal Publication, September 2011
- [7] S.K.P. Agarwal; D.S. Upadhyaya; Infrastructure Development of Village; (IJITEE) ISSN: 2278-3075, Volume-3, Issue-11, April 2014
- [8] Industrial Extension Bureau concept paper: Panel Discussion Rurbanization; Vibrant Gujarat 6th global summit; 11-13 Jan, 2013
- [9] Hygienic Rural Toilet (dry sanitation system); Research, Design & Development Carried out at IDC, IIT Bombay, September 2013
- [10] Introduction to Low Cost Sanitation; Centre for Affordable Water and Sanitation Technology (CAWST) - Appendix 3; Design Calculations for Soak Pits and Infiltration Trenches.
- [11] Census of India 2001, 2011 (censusindia.gov.in)