An Overview of Physical Infrastructure Development in Rural Household Communities: A Case Study of The Surat Fringe Area of Mandvi Taluka

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***Abstract*—Population growth, increasing urbanization and industrialization and rising standards of living have all contributed to an increase in both the amount and variety of waste generated in most countries. According to the Indian Census, urbanization grew from 28.53% in 2001 to 31.6% in 2011.In the recent decade, migration from rural to urban areas grew from 42% to 56%, which is one of the key causes of environmental degradation in metropolitan areas. They are used to throw the solid wastes in ponds, drains, fields, and beside the road which not only makes our country dirty but also it creates soil, water and visible pollution. This study aims to throw light on the practices of solid waste management, the issues faced because of it, the existing scenario of MSW, the steps taken by the Surat Municipal Corporation, and the legislations of SWM 2016 associated with the system of waste management in Surat. Recommendations on how to effectively manage the waste, the innovative and modern techniques employed by the Surat Municipal Corporation under the regulations of MSW 2016. To limit uncontrolled solid waste management in rural area sit is vital to recognize present scenarios and prepare future development proposals.**

***Keywords:* Physical infrastructure, Solid waste management, Water distribution system Household community, Water Gems software.**

I. INTRODUCTION

India is one of the most populous countries in the world. It comes in second place overall in the world. From a rural population of 75% in 1947, India's rural area will rise from 40% to 65% by 2020. In India, rural development is happening at a substantially slower rate than urban growth. The term "rural development" refers to activities that support the social and economic development of rural areas. In rural and remote locations, this approach improves both the economic well-being and quality of life of residents.

India may be able to reach its full potential if its infrastructure is improved. If improvements are not made to the infrastructure, India's economic growth will be hampered. The Indian government's major concern is how to manage strong growth through, among other things, investments in the infrastructure sector.

A project is a group of project experts tasked with determining the infrastructure needs or issues facing a town and creating a workable engineering solution. It offers a suggestion and an estimated price for the facilities required to support the village's future expansion.

Currently, illiteracy, poverty, and a high death rate are all present in India. The prevalence of these problems is higher in rural areas than in the nation's urban centers. Focusing on local infrastructure development methods is a distinctive feature of rural area development. In order to solve issues with solid waste management, the Indian government has recognized the need for standardized infrastructural amenities in the health, education, solid waste management, transportation, and social and cultural sectors. Providing sanitary amenities and clean drinking water is a challenging task for a developing country like India. Over 20 million people in India did not have access to safe water, and 100 million did not have sanitary facilities, according to the 2011 Census of India. The general condition of the city's water supply is shown in this report.

Problem definition:

- The quality of life in any rural area depends upon the availability and accessibility to quality physical infrastructure.
- In1947, the rural population of India was75%, and in2020 the rural population of Indiais65%, this is due to lack of proper infrastructure in a rural area which causes migration.

Objectives of study:

- To study the existing infrastructure & gap identification.
- To prepare planning proposal for physical infrastructure development of mandvi taluka.

LETERATURE REVIEW

Today, rural area facing serious problems of safe drinking water shortage, inadequate sanitation, and limited resources etc. due to rapid growth of population & unmanaged planning. Therefore, needs to pay attention towards water supply & sanitation as these

affects quality of life & economy growth of nation. This section briefing background study based on literature, research papers & case study.

1. TYPES OF INFRASTRUCTURE

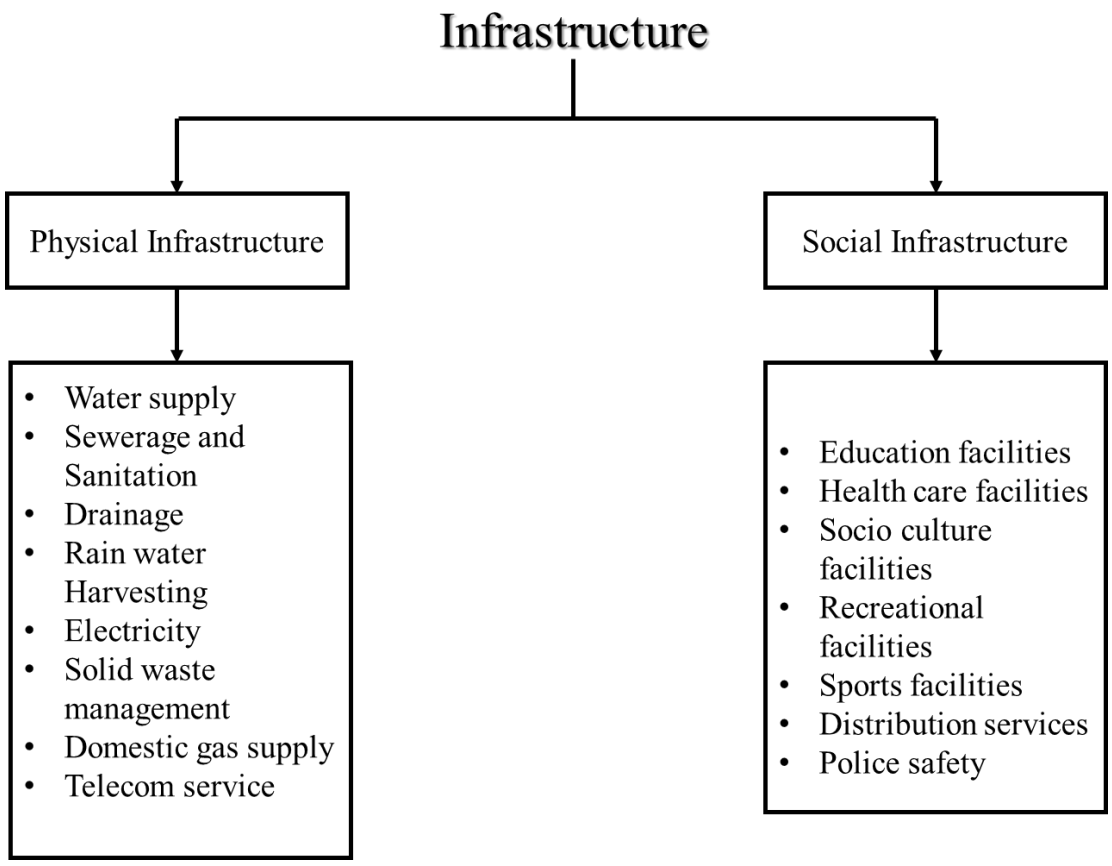


Figure 1 Classification of Infrastructure

2. PHYSICAL INFRASTRUCTURE

Power, irrigation, transportation, telecommunications, water supply, sewerage, sanitation, energy, solid waste management, and other services are all included in this category of infrastructure; infrastructure is directly or indirectly related to the Millennium Development Goals; the national government of India has many policies and programs that support the development of the country.

3. SOCIAL INFRASTRUCTURE

The availability and accessibility of high-quality social infrastructure determines the quality of life in any metropolitan area. The term "social infrastructure" refers to the networks, services, and facilities provided by the local government that support the social needs of people, families, groups, and communities while maximizing their development potential.The following topics are covered by the social infrastructure:

- Health-care facilities
- Education facilities
- Socio-cultural facilities
- Recreational facilities
- Sports facilities
- Distribution services

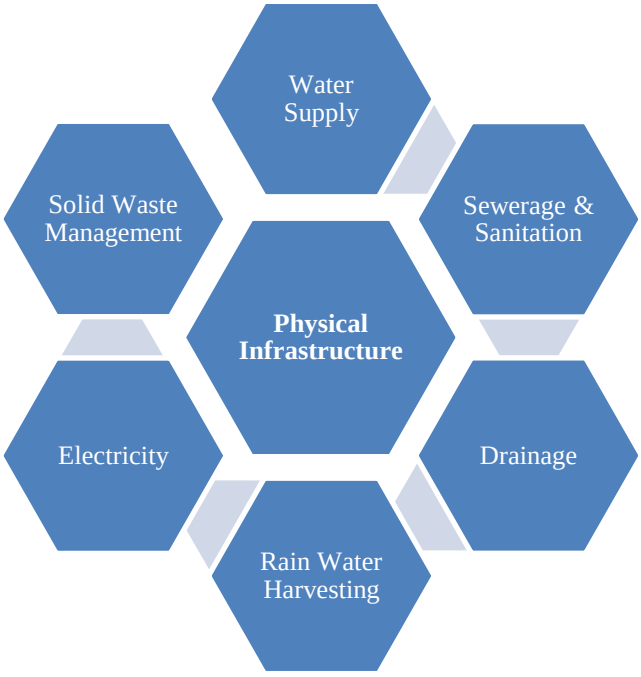


Figure 3 Classification of Physical Infrastructure

NEED OF THE STUDY

The Gujarat model is one of the top development models for urban and rural development in India. Gujarat has been successful in luring businesses with its industrialization agenda, and the benefits have trickled down to metropolitan regions, which have evolved and come into focus for greater infrastructure facilities. While rural areas did have economic opportunities, the migration of villagers to cities has raised concerns because there aren't enough infrastructure facilities for waste management and water supply distribution. The following are the areas where the rural cluster needs physical infrastructure to help the city:

- To provide a good and adequate infrastructure for the rural cluster's water supply and waste management facilities.
- To improve the quality of life through the strengthening of Physical infrastructure.
- To minimize migration towards urban areas due to lack of qualitative education and health facilities.

RURAL WATER SUPPLY SYSTEM CHALLENGES

Management of Urban water systems are major challenges to all town and cities. Other major problem is reaching consensus among various stakeholders on the environment, social, and economic goals and values of urban water systems.

➢ **Other major challenges suggested by Mays (1996) are as follows:**

- Inadequate water flows
- Infection of surface waters & ground water from uncontrolled or deficiently directed strom water drainage and waste water.
- Lack of awareness & understanding of value of urban water system
- Poor recreational water quality
- Lack of investment

STORAGE OF WASTE

The initial crucial stage in solid waste management is garbage storage at the source. Solid garbage is regularly produced by every home, business, and facility. At the point of waste generation, the trash should typically be held until it is collected for disposal. The supplier should provide separate bins for the collection of biodegradable and non-biodegradable garbage.

- Green colour bins – Waste bins for biodegradable wastes
- White colour bins – storage of recyclable wastes
- Black colour bins – storage of other wastes

GUJARAT WATER SUPPLY & SEWERAGE BOARD

The State Government established the GWSSB as a statutory organisation to develop, regulate, and control the State's drinking water sector. The whole state of Gujarat is included in the GWSSB (Board's) ward, with the exception of areas occupied by urban areas and cantonments. The Board establishes a framework for rural water supply and oversees the practical management of programmes for rural regional water supply that cover a number of municipalities. Here, the Board's primary responsibility is to

prepare, formalise, progress, and finance the plans for the supply of water for drinking. Installation of hand pumps, Mini water supply framework, etc. in small dwellings, and funnelled water supply framework for individual is all examples of rural water supply frameworks.

Under State Wide Water Supply Grid, there are a total of 306 finished activities. 171 of the ventures total 3250 kilometres. Separately, the Sujalam Suphalam Yojana Programme and the Sardar Sarovar Canal Based Water Supply Project programme are realising mass pipes and 9633 cities/131 towns of the Narmada Master Plan. While, under the rural water supply programme at the State/National level, 135 enterprises involving 3758 towns and 12 towns based on surface/sub-surface sources are now being implemented.

In total, 10675 towns and 127 towns have so far been protected by the Water Grid out of 13391 planned towns and 143 towns. For this reason, the state has heavily invested in the foundation's construction, which consists of 155 water treatment facilities, stockpiling and pressure-driven structures, 2178 km of mass water pipelines, 116697 km of circulation pipelines, and a system of stockpiling and pressure-driven structures. The combined daily water consumption cap is 279 crore litters. GWSSB provides planning, management, and financial inputs to ensure that all rural water supply plans operate effectively, suitably, and financially and can maintain traditional and healthy drinking water for the recipient population. GWSSB has been heavily dependent on being developed of since the day of its launch in 1979.

Water and Sanitation Management Organization

The purpose of WASMO is to facilitate public participation in drinking water administration conveyance at the user level in Gujarat State's provincial territories through a shift in perspective on the side of administration from supplier to facilitator. The Constitution's 73rd amendment, which was passed in 1993, altered the drinking water section's viewpoint. There was a shift away from centralised, supply-driven government-owned water supply and sanitation frameworks to decentralised, interest-driven, group-claimed frameworks with a focus on enhancing and limiting the functioning of community groups. The Panchayati Raj Institutions (PRIs) were granted protected status and were given more influence in managing community assets and problems. Following this, WASMO was established as an institutional development in the administration to promote the changes.

Town Characteristics

The town is the location where various capacity are built. The town is reportedly made up of a combination of these capacities, which makes it significant for the remainder of the region survey. These capacities can be financial, social, political, managerial, or even budgetary.

- Large, medium-sized towns: focus points with populations between 50,000 and 100,000, or higher-require central submissions
- Small to medium-sized towns: those with fewer than 50,000 residents in the central or focal areas with greater or
- Medium demand Small town: Possession of town mandates and benefits, frequently with a low level of focus.

In this viewpoint, Gatzweiler uses the centrality of the town as a primary criterion for determining which towns can be classified as medium-sized or small.According to URDPFI Guidelines Classification of town For the purpose of this study the town centres have been classified as:

Classification of town	Population range	
	Plain area	Hilly area
Small town	Less than 50000	Less than 20000
Medium town	50000 - 500000	20000 - less than 80000
Large city	more than 500000	80000 and more

Source: URDPFI guideline

UDPFI Guidelines

The basic objective of suggesting various norms and standards for urban development plans formulation is to provide a basis for taking decision. The suggested norms and standards as shown in Table No. 3 are indicative and can be suitably modified depending upon the local conditions.

Table 3 water supply guideline Size of Town			
Aspects	**Small**	**Medium**	**Large and Metro**
Domestic Absolute Min. desirable	70 lpcd 100 lpcd	70- 100 lpcd 135-150 lpcd	135 lpcd 135- 150 lpcd
Non- Domestic Fire fighting Public Purpose	1 % of total demand 10-15 lpcd	20-25 lpcd	30-35 lpcd

Review paper:

1. Analysis and Redesign of 24/7 Water Distribution Network using WaterGems Softwar(Nikita Adhav, Vishal Zerikunthe,2022)

India has seen a lot of interest in continuous water supply systems because of their many benefits. Furthermore, it helps maintain the quality and quantity of water. As a result, there is a daily increase in the demand for drinking water. The current study demonstrates redesigning the current network and building the water distribution network using a programming tool that runs an extended period simulation of hydraulic and water quality behaviour inside the pressurised network of pipes known as WaterGems. The hydraulic analysis of the distribution network is done using WaterGems, as this research shows. For the hamlet of Nighoj in the Indian state of Maharashtra, the studies offer the hydraulic design and analysis of the rural water distribution system (WDS).

One significant new trend in managing the water supply is the consumer throughout the year. The water distribution network must be precisely designed with the best possible pipes, pumps, tanks, etc. to provide a constant supply of water. reduce the project's total cost as much as possible. 24x7 water supply is defined as 'the supply of potable water to end users through system of pipes, comprising interconnected bulk transmission and/or distribution systems, which are continuously full and under positive pressure throughout their entire length, such that the end user may draw water at any time of the day or night.

- **The study's main goals are to:**

1) Examine the hydraulic characteristics of the area's current water distribution system.
2) To locate the important locations in the current water distribution system.
3) Create a water distribution network using GIS for CST.
4) To distribute water to specific users at the proper pressure, quality, and quantity.
5) To provide water at practical times and locations.
6) To redesign the water delivery system
7) Improvements to water supply services and 24-7 water supply initiatives in pilot areas.
8) Development of sustainable water sources.
9) Metering for 80% of the connections to homes
10) Recover at least 80% of the O&M costs associated with water delivery and sanitation.
11) Achieve a collecting efficiency of at least 80%.

2. Physical Infrastructure Planning and Management for Sustainable Development in Ramtek Town.(Kalpana N. Kawathekar, A. J. Sanyal,2016)

This paper, when concentrating on a town's physical growth, urban local bodies frequently disregard sustainability. This raises questions about how physically unsustainable infrastructure affects the sustainable growth of the entire town. In order for local organizations to work towards sustainable development, architects should consider the carrying capacity of neighboring resources while planning a development.

In order to build planning and management methods for the sustainability of physical infrastructure while taking into account the sustainable development of a town Ramtek, the following objectives are set forth.

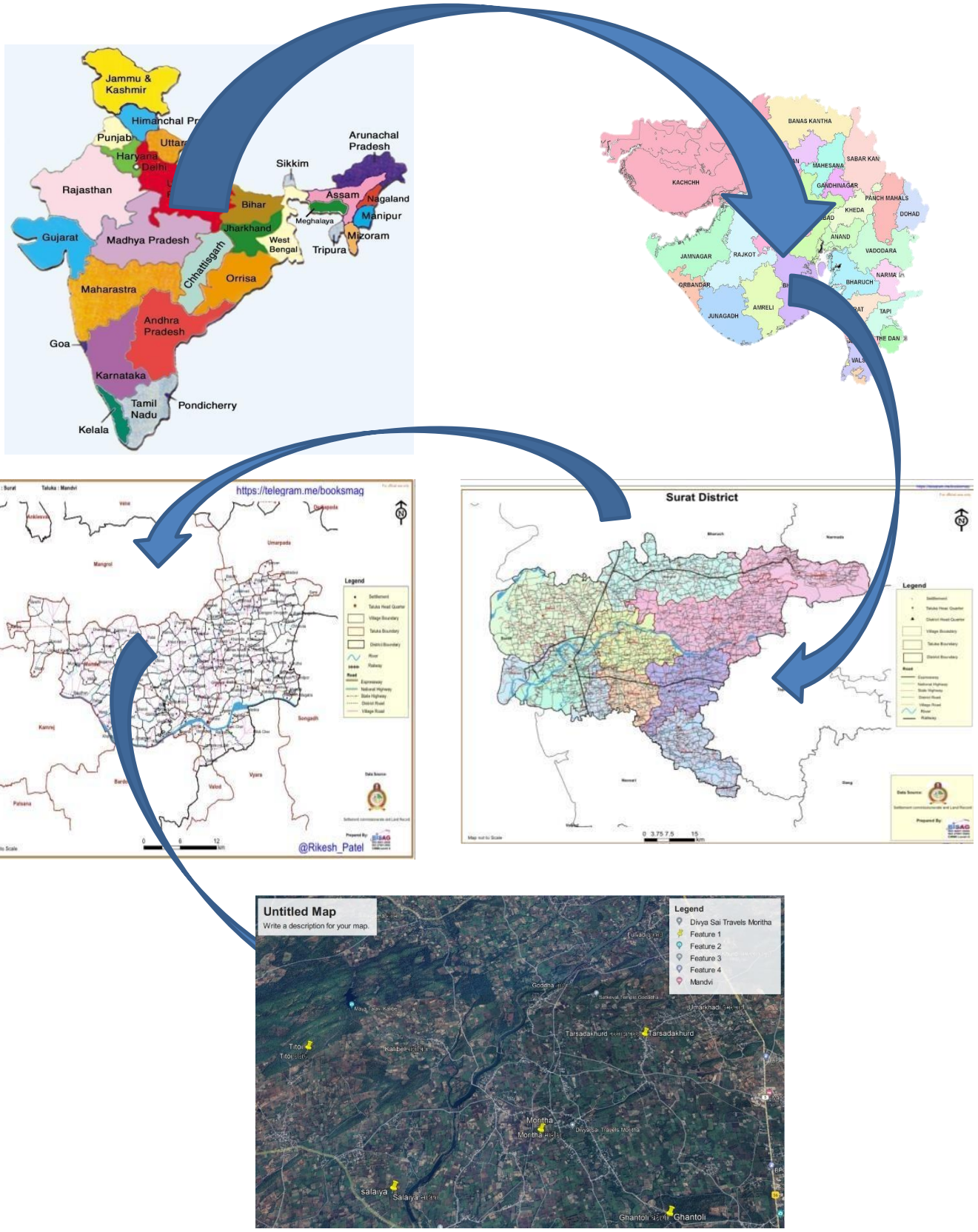
- To research the standards and laws governing infrastructure development and its viability for small and medium communities.
- An analysis and assessment of sustainable infrastructure development techniques.
- To be aware of the challenges involved in creating physical infrastructure and making sure it is sustainable, particularly in case of town.

To establish the standards for formulating plans for the long-term development of infrastructure in small and medium-sized municipalities.

Advanced statistical methods are used to analyze the data. The results of the analytical calculations demonstrate that the majority of regular users and development representatives support the growth of physical infrastructure and sustainability. The alternative hypothesis is examined using Pearson's contingency coefficient for association when the original hypothesis is rejected. A town or village's natural expansion eventually results in inadequate infrastructure. Ramtek, although being a tiny town and taluka centre, is no longer an exception to this rule, showing that Sustainable Development is possible with careful planning and strict oversight.

3. Study Area

The study area is made up of the communities of Kalibel, Salaiya, Khod amba, Titoi, and Regama, which are all situated in the Mandvi Taluka of the Surat District. The tribal area includes all of the communities.



CONCLUSION:

Water Gems is multi-stage hydraulic modelling software developed by Bentley. WaterGEMS working across AutoCAD, GIS & stand-alone platforms. WaterGEMS is most widely application for analysis & designing of water distribution system.With available data of water distribution system of Mandvi, a network was generated in WaterGEMS software. Elevation of each junction, reservoir, & Pump are filled into the system to calculate pressure of junction in pipe.

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