Smart City Resilience: Prioritizing Urban Ecosystems in Shaping Urban Transformation – The Case of Banergaon.

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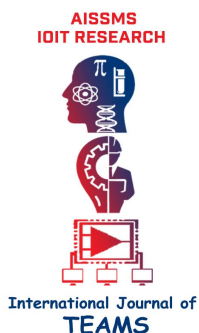**Corresponding Author:** Ar. Shreeya Kanade (s.kanade@sbpatilarchitecture.com)

Article Information	ABSTRACT
  AISSMS **IOIT RESEARCH** **International Journal of** **TEAMS**	The idea of smart city is a step towards urban development focusing on the improvement of the quality of life by support of local development & connecting technology to create smart outcomes. The program is expected to solve the challenge of urban sustainability. Similarly, the importance of nature to the well-being and health of urban populations and the issue of restoring thriving ecosystems deserves similar attention. The current urban transformations under smart city development & development of metro corridors, it becomes a need to keep the ecosystems intact & development to be area specific in shaping the urban form. Attention to ecosystems is must to give an adaptive and flexible roadmap towards sustainable development. This research is based on current planning approach of the smart city focusing on the 'smart' as a terminology neglecting the user preference & ecological sensitivity of the place. Taking the case example of Banergaon; the proposals of smart city would be identified; understanding of the study area with current issues, challenges, potentials will be developed. Public survey will be conducted to understand the needs & aspirations of the people. The paper will conclude with the recommendations based on the people's demand, ecological sensitivity for the development of the area. **KEYWORDS:** smart city, ecology, urban transformation.

1. INTRODUCTION
Cities are always looked as a major source of profitable growth. They also give ample openings to its citizens for jobs; profitable development, better standard of living etc. & thus migration of people take place from towns to cities. Due to years of constant migration, cities have become overcrowded and congested, which has led to a number of issues like increased energy demand, massive waste generation, stress on the existing infrastructure and resources, threats to safety and security, increasing pollution levels, reliance on technology, etc. As a result, efforts are currently being made to take advantage of these technological breakthroughs to lessen the aforementioned problems and create sustainable, resilient, cosy, and citizen-focussed communities, or "smart cities." But at first, it is very important to understand what are smart cities & its framework.

1.1. UNDERSTANDING THE SMART CITY MISSION
It is important to remember that the idea of smart cities is developing and changing. Smart cities, a significant effort of the Indian government, are seen as having potential for tackling important challenges with urban sustainability. The objective is to support urban areas that provide citizens with appropriate living circumstances, a healthy, sustainable environment, and critical infrastructure. The Smart City Mission seeks to improve economic growth and living standards by promoting regional development and the use of technology, especially those that deliver smart outcomes. New areas (greenfields) are created

around cities to accommodate population growth in metropolitan areas.

Fig 1: Smart solutions. Source: Smart City Mission Statement & Guidelines

By adopting intelligent solutions, cities will be able to use technology, knowledge and data to improve infrastructure and services. Using technology to effectively manage urban growth is the key behind this strategy. Especially when considering the development of greenfield areas, the importance of nature for the well-being and health of urban residents and the equally important concern of reinstating healthy ecosystems should be considered. To create a strong, flexible, and resilient route towards better urban sustainability, an organized focus on urban ecosystems must be made through the protection of urban commons. This paper focuses on the current planning approach of the smart city which merely focuses on the 'smart' as a terminology and does not take into consideration the user preference & ecological sensitivity of the place. A smart city can be built in any city. However, depending on the current situation and anticipated smartness traits, different amounts of efforts, investments, and approaches will be used. While investments to achieve competitiveness and environmental goals are sufficient for mature cities, they may not be sufficient for rising cities, which may need addressing urgent issues and seizing opportunities. Despite the fact that Greenfield City demands more investment, there is a chance to carefully plan the city and effectively incorporate all desired characteristics. These elements necessitate effective planning for Greenfield smart city initiatives. Hence, a case example of Banergaon as a Greenfield area will be studied in detail to understand the challenges, current issues, potentials and also a public survey is conducted to understand the people's preferences and aspirations with respect to the current infrastructure development.

1.2 BANERGAON & THE CURRENT SCENARIO

Baner is a suburb of Pune city in between second & third ring. It is transforming from an outskirt area to a prime elite area as it is a connector between Pune city & Hinjewadi IT Park. Pune being a radial city one of the major river connecting Pune core city to NH-4 passes through Banergaon.
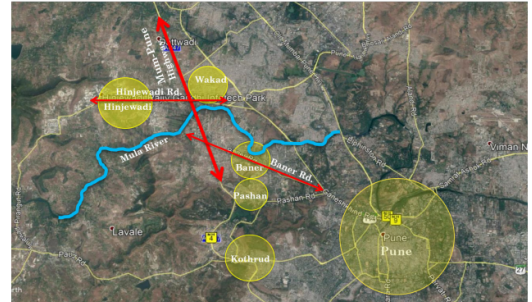

Fig 2: Influence area of Baner gaon and it's over all location in Pune city. Source: Author

It is a Greenfield area with dominance of natural features like Baner hill and Mula River with its streams. Topographically, Baner has a hill on the southern side and has gradual slope towards the north i.e towards Mula River. Hierarchy of water bodies is observed from rivers like Dev nadi (originated from Baner hill) and Ram nadi (origin from Rameshwar, Bhukum) which meet Mula river (origin from Sahyadri ranges and dammed in its upstream at Mulshi dam), and three water streams (nala) which also merges in Mula river.
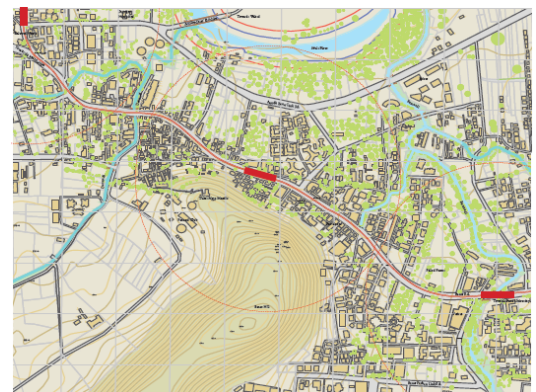

Fig 3: Map of Baner gaon. (Source: SY. M.Arch, Studio – 3, PVPCOA)

Baner was known for its agricultural development till 2005 but now it has lost its status due to the large number of IT firms and residential complexes. Also, fruits like mango, guava and tamarind were the famous fruits of Baner. The residents had their own fruit & vegetable garden beside their home. But today, it is a residential and commercial hub for

the city in which large portions are occupied by various IT companies. The residents had their own fruit & vegetable garden beside their home. But today, it is a residential and commercial hub for the city in which large portions are occupied by various IT companies. Presently, the area of Banergaon is going under transformation, has no direction of growth but potential of planned development due to many vacant plots. Also, as the area currently does not have any context and relation to core city it has a potential of becoming a destination in terms of economic & social welfare for the city. Metro route is also being proposed in the area. Hence it becomes very important to study the implications of this transformation on the urban

form of the area. Also, sensitivity towards the urban ecology needs to be a top priority in the development of the area.
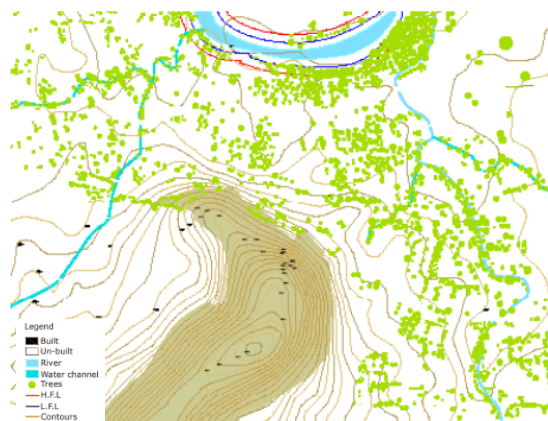

Fig. 4: Ecology map of Baner gaon. (Source: SY. M.Arch, Studio – 3, PVPCOA)

Fig 5: Dried water channel used as shortcut by people. **Source:** Author

Fig. 6: Condition of Ramnadi, Banergaon. **Source:** Author

Fig. 7: Flooding in the Mula River during monsoons. **Source:** Author

Fig. 8: Water logging during monsoons. **Source:** Author

The dominance of natural features such as the Mula River, water channels & Baner hill has the dominance over the area. Various species of plants/trees and presence of water channels make the area ecologically sensitive. But today, due to developments taking place in the area all these sources of water have been vanishing and are facing threat. There are many vacant plots acting as wetlands for the area during monsoons. There have been many instances since the last few years that the area got flooded as there was no proper provision made for the surface water to get drained off. For instance, the wetlands act as sponge areas during heavy rains which can control flooding. As the system is not in place the area always face the issue of flooding and water logging situations.

The land use map shows that the area has majority of residential gated development. There are still many open & agricultural lands near the Mula River which can be utilized as a sponge area to catch excess water during heavy rains to avoid flooding & water logging in the area.

1.3 CURRENT PROPOSALS UNDER AREA BASED DEVELOPMENT PROJECT BY SMART CITY MISSION.

To understand the current proposals

Fig. 9: Existing landuse map. (Source: SY. M.Arch, Studio – 3, PVPCOA)

that are proposed under the smart city mission we need to understand firstly, that this area is considered under the area based development under the Aundh Baner Balewadi (ABB pilot project) hence the further study is carried out understand the development proposed by them. The area was chosen for development because it is expected to be the fastest expanding zone within the PMC boundaries over the next 15 years. This neighbourhood has seen a surge in

construction over the previous decade, with professionals in the IT industry favouring it. There are also remnants of old settlements on the sites of current buildings and impending skyscrapers. The ABB area also has a big waterfront on the Mula River.

Future proposals are assessed according to a set of criteria by citizens, experts, and elected officials based on elements such as the potential for job creation, the potential to have a significant impact, the potential to become the signature of Pune, the potential for socioeconomic transformation, the potential for replication in other parts of Pune, and the feasibility of implementation. There are several significant efforts planned for this sector, some of them are as follows:
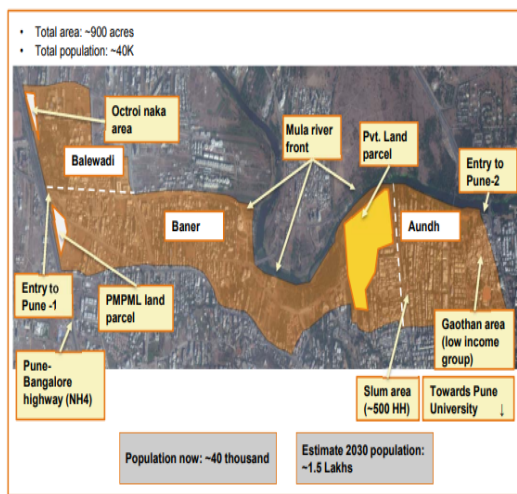

Fig 10: 'Aundh-Baner-Balewadi' (ABB): Identification of potential interventions
Source: PMC - Smart_City - SPC_Part_1

The interventions identified for ABB area are majorly based on the infrastructure development in terms of services, mobility, smart technology and development of high end residential, retail which can there in boost the economic development of the area and generate the revenue.

Fig 11: Riverfront Development proposed in ABB area.
Source: PMC - Smart_City - SPC_Part_1

The riverfront development proposed in the area which is a mixed use development consisting of residential, public & commercial zones attracting people to the area leading to people interactive zones, social interaction spaces and boosting community engagement.

Fig. 12: Proposed transit hub along with commercial development.
Source: PMC - Smart_City - SPC_Part_1

On the primary transportation connection, a commercial development and transit hub are envisaged. This transport hub not only increases regional transportation but also has the potential to create a vibrant neighborhood. All in one, it combines elements of transit-oriented development like retail, office space, and entertainment venues.
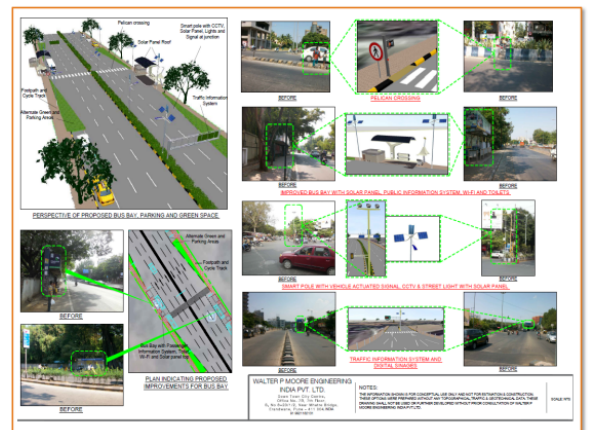

Fig 13: Street redesign, road widening and placemaking
Source: PMC - Smart_City - SPC_Part_1

The street redesign, road widening & placemaking projects under taken include proper vehicular lane management, wide & continuous footpaths, proper street lighting. The place making areas are developed as to the need of the amenities that are required in that particular area. As a result, each Place Making project includes a variety of services and amenities that are appropriate for the location.

Fig. 14: Integrated Solutions proposed for Aundh Baner Balewadi.
Source: PMC - Smart_City - SPC_Part_1

The integrated solutions under smart city ensure fastest connectivity, connectivity with public transport to connect the IT hub of Pune. Ensure the development of NMT (non-motorized transport) with universal accessibility pathways, development of amenity spaces & infrastructure. Ensuring zero waste (RFID tracking of garbage trucks), reducing the energy consumption by adding solar roof tops, and LED smart street lights. Also, introduce smart technology for citizen engagement, grievance redressal & ABB-Punetel card for a connected community.

So, the key Initiatives focused are as follows:

Table: 1 Key initiatives focused

1	Transport and mobility.
2	Water and sewage.
3	Waste and sanitation.
4	Smart grid and solar.
5	Riverfront development.
6	Slum redevelopment.
7	IT connectivity
8	Transit and startup hub
9	Iconic Riverfront Development
10	Urban farming 18 acres
11	Iconic residential mixed use 32 acres
12	Performance gallery and public zone 9 acres
13	River promenade 7 acres.
14	Exhibition retail area 9.7 acres.
15	Public utility and green area.
16	9.4 acres Residential 2 mix used 23.9 acres

All the proposals proposed under smart city focus on the infrastructure development, development of social spaces, improving the mobility and transport connectivity etc. But one of the major concern that is felt today is about the threat to the urban ecosystems that is been developed due to these developments taking place in the area. Attention should be paid to the issues of reinstating of natural values and functioning ecosystems for the well-being and health of local people. Urban ecosystems provide a range of important ecosystem services that are essential for the sustainable growth of a region. To create a strong, flexible, and resilient route towards better urban sustainability, an organized focus on urban ecosystems must be made through the protection of urban commons.

For the development of any area it is firstly very important to understand the demand, aspirations & concerns of the locals and stakeholders and then plan accordingly. So a public survey was conducted for the locals of the area in order to understand their concerns & aspirations.

2. PUBLIC SURVEY.

To conduct the survey a questionnaire was prepared addressing the commuters of the area, residents of both the gaothan area and newly developed area, public representatives and shop owners. Individual stakeholders participate, formally or unofficially. A one-on-one interview guide is used for evaluation in formal interviews. Informal processes are adaptable and can involve ad hoc discussions to get more information from stakeholders. This type was conducted to gather information from Rickshaw drivers and a meeting was conducted in gaothan area, and street vendors. The analysis can be concluded as below:
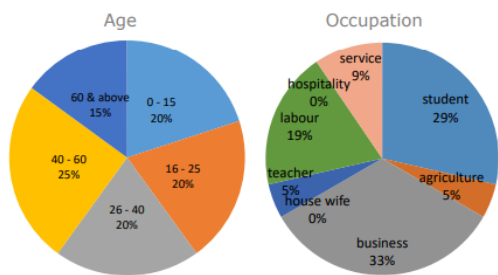
1. Commuters of Banergaon
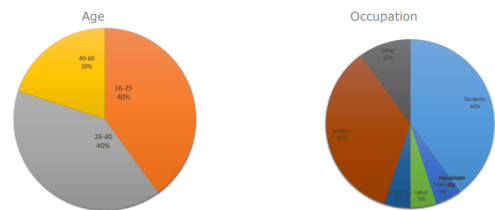
The commuters of this area are basically the students who commute from Baner to various institutions in the area. The other people commuting from here are the working population /service industry who have been working in the nearby industries, offices or the IT sector in Hinjewadi.

Mode of transport

Areas people coming from
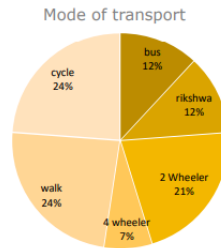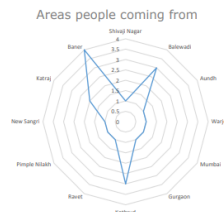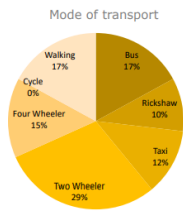
The commuters of the area prefer travelling by two-wheeler due to the traffic congestion on roads. Also, the frequency of public transport is moderate in the area. The majority of the commuter travel from Baner, Balewadi, Kothrud & few from Katraj side as well.

2. Residents of Baner gaothan

Age

Occupation

The residents in gaothan area are in the mixed age group and have in their own business running in a small shop on the ground floor & their residence on the upper floor. The concerns faced by the residents majorly include narrow roads leading to traffic congestion, more number of open plots leading to safety issues, vandalism & degradation of natural ecosystems. Reduction in the number of trees due to the increased number of construction sites there in making the climate warmer.

3. Residents of Banergaon

Vehicles owned

Issues

Age

Occupation

Mode of transport

Issues

The residents of Baner are majoring in the age group of 40-60. The main reason behind staying in the area is the mainly its connectivity to IT park & other industries & also greenery, openness & cold climate as compared to other areas due to its proximity with river, hill & large number of trees. The majority of the population living here tends to commute by two-wheeler due to the traffic congestion & narrow roads.

3.   RECOMMENDATIONS   & CONCLUSION

From the overall study it needs to be understood that before developing any area its positives as well as negative factors need to be studied. The development of any area has to be tailor made suited specifically and cannot be a module to be replicated same everywhere as every area has some speciality or uniqueness associated with it which needs to be preserved in the long run.
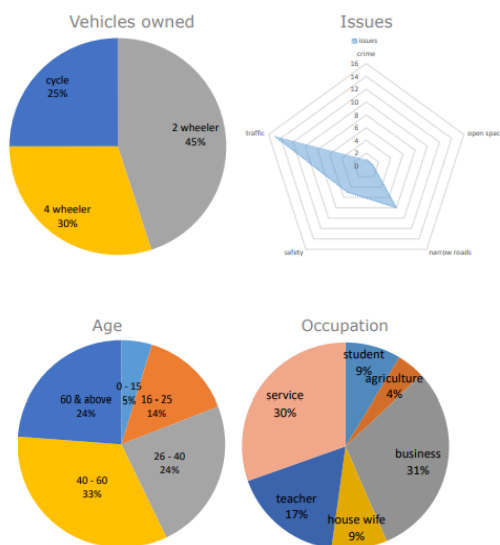
The proposals given under smart city for the area would definitely bring in better transport connectivity, economic gain, better public spaces & smart technology. But what about the ecological sensitivity & taking measures towards it. People need better infrastructure, smart technology applications but they also need fresh air, water for their survival as the basic necessity. Due to these huge residential complexes getting developed many water channels & streams are getting blocked knowingly or unknowingly which is further getting add up to even more water logging & flooding during rains. Hence it is of utmost importance that we preserve our ecosystem first. Important ecological services for culture and recreation are provided by urban ecosystems. Through their religious importance and worship, ecosystems hold a significant role in the cultural landscape of that region. Urban stress can be reduced psychologically and physically by being around green places. Parks, lakes, and other bodies of water serve as significant gathering places for the city's dispersed, anonymous population, forging social ties. As part of this green infrastructure,

we need to strategically plan and manage a network of conservation value habitats, parks, greenways, conservation areas and workspaces to support native species and promote organic growth. It can sustain ecological processes, protect water and air resources, and improve the well-being of communities and the environment & also their standard of living. Additionally, trail networks, cultural and historic treasures, as well as outdoor recreation opportunities, might be included to give the town its unique identity. By elevating air, land, and water to parity with built infrastructure, green infrastructure turns open space from a "nice to have" to a "must have" for the local population. The development of such green infrastructure also contributes to providing a framework for expansion by identifying the places that shouldn't be developed. This eliminates the problems that developers have with regard to open space and the environment on a project-by-project basis. Open space can assist shape urban form and serve as a divider between incompatible uses when it is developed as part of a system of green infrastructure. It can also satisfy a community's desire for parkland and outdoor leisure area. If properly managed, green infrastructure could even lower government expenses for storm-water management, flood control, and other types of built infrastructure. India's increasing urbanization will surely present difficulties for the nation's ecology, society, and sustainability. In order to address these issues, effective policies for ecologically sustainable urban growth must be developed and put into action. A hunt for technology solutions is what motivating India's present interest in smart cities. On the other hand, equal attention must be paid to reinstate the healthy ecosystems as urban commons in order to maintain the well-being and health of many urban residents. Urban sustainability can be improved by paying systematic attention to urban ecosystems, which can offer a relatively simple, adaptable, strong, and resilient strategy. Urban sustainability in the near future will depend on better management, conservation, and use of urban ecosystems.

The most intelligent city that can be imagined is one that is ecologically conscious. Such an approach will enhance the resilience of cities by providing affordable, adaptable and efficient answers to the challenges of providing safe food, clean water and clean air to a growing population. Urban ecosystems must be given systematic attention if we are to build ecologically smart cities, reclaiming their original role as urban commons that offer crucial ecosystem services such as provisioning, regulation, recreation, and

support. These resilient economic communities will be resilient to a range of regional and global environmental challenges, from pollution and food insecurity to climate change.

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5. APPENDIX

Questionnaire for Commuters, gaonthan residents and Banergaon residents.

A. Questionnaire for commuters

1) Name:

…………………………………......

2) Date:

…………………………….........

3) Gender: M ☐   F ☐

4) Age group:
☐ 0-18
☐ 19-29
☐ 30-39
☐ 40-49
☐ 50-59
☐ 60-69
☐ 70 & above
☐

5) What is your occupation?

………………….................

6) Mode of transport preferred by you

   I.   Public transport

   II.   Private transport

   III.   Two wheeler

   IV.   Four-wheeler

   V.   Both

7) Where do you stay?

…………………………………………

8) Purpose of travel?

………………………………………….....

9) What is your destination?

…………………………………….....

10) What is the general travel time required to reach to your destination?

………………………………………………

11) What are your hault points in this area? & for how long do you prefer to wait here?

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12) What are the issues faced by you while commuting in this area?

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13) Why do you prefer to come to this area? Anything specific that attracts you here? If yes, what is it?

…………………………………………………

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B. Questionnaire for Baner gaothan residents

1) Name:

…………………………………

2) Date:

…………………………………

3) Gender: M ☐ F ☐

4) Age group:
☐ a. 0-18
☐ b. 19-29
☐ c. 30-39
☐ d. 40-49
☐ e. 50-59
☐ f. 60-69
☐ g. 70 & above
☐

5) What is your occupation? If employed, where do you work?

…………………………………………

………………...............................

6) Mode of transport preferred by you

   I.   Walking

   II.Public transport

   III.Private transport

7) Vehicles you own

    a. Cycle

    b. Autorickshaw

    c. Tempo

    d. Two wheeler

8) Where do you stay? Since how long?

……………………………………………….

9) Why have you preferred to stay here?

……………………………………………………

10) Are you satisfied with the facilities & services provided to you?

……………………………………………………

……………………………………………………

C.   Questionnaire for Banergaon residents

    1. Name:

    …………………………………………

    2. Date:

    …………………………………………......

    3. Gender: M ☐ F ☐

    4. Age group:

☐ 0-18

☐ 19-29

☐ 30-39

☐ 40-49

☐ 50-59

☐ 60-69

☐ 70 & above

    5. What is your occupation? If employed, where do you work?

    …………………………………………

    …………………………………………

    5.a What is the usual travel time taken to reach your office?

    …………………………………………

    ………………………………………….

    6. Mode of transport preferred by you

I. Walking

II. Public transport

III. Private transport

    a. Two wheeler

    b. Four-wheeler

    c. Both

7. Where do you stay? Since how long?

……………………………………………...

………………………………………….......

8. Why have you preferred to stay here?

…………………………………………

…………………………………………

9. What do you think is the area known for?

…………………………………………

……………….......................................

10. What are the issues or challenges faced by Baner today?

…………………………………………

…………………………………………