

**The Edible Urban Landscape:  
An Exploration for Urban Agriculture landscape design  
guidelines in Bhopal**

**MASTER OF LANDSCAPE ARCHITECTURE  
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2014MLA015**



**SCHOOL OF PLANNING AND ARCHITECTURE, BHOPAL  
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MAY 2016**

## Declaration

I **DEEPTI SONI** Scholar No.2014MLA015 hereby declare that the thesis entitled **The Edible Urban Landscape : An Exploration for Urban Agriculture landscape design guidelines in Bhopal** submitted by me in partial fulfilment for the award of Master of Landscape Architecture , in School of Planning and Architecture Bhopal, India, is a record of bonafide work carried out by me. The matter embodied in this thesis has not been submitted to any other University or Institute for the award of any degree or diploma.

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Deepti Soni

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This is to certify that the declaration of **DEEPTI SONI** is true to the best of my knowledge and that the student has worked for one semester in preparing this thesis.

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## **A DESIGN THESIS**

**Submitted**

In partial fulfilment of the requirements for the award  
Of degree of

**MASTER OF LANDSCAPE ARCHITECTURE**

**By**

**DEEPTI SONI**

2014MLA015

Under the Guidance of

**THESIS COMMITTEE**



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NEELBAD ROAD, BHAURI, BHOPAL - 462030  
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# योजना एवं वास्तुकला विद्यालय, भोपाल

(मानव संसाधन विकास मंत्रालय भारत सरकार का स्वायत्तशासी संस्थान)

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## ABSTRACT

Urban agriculture (UA) is quite popular now a days globally. It is the practice of cultivating, processing and distributing food within the city. UA has made a significant impact on cities like Detroit, Boston, Bangkok, Thailand and many others. In India we have Delhi, Mumbai, Hyderabad, Pune, etc. which are implementing the practise of UA. Although the UA is important for its food, environmental, social, economic benefits in urban settlements, it is still stressed to get place in urban planning. While sufficient land is not available for UA in cities, there is still vast land area lying vacant. This thesis focus on framing the landscape design guideline in establishing UA in the allocated land and finding innovative solutions for optimum utilization of urban resources.

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## INTRODUCTION

### 1.1 Urban agriculture

Urban agriculture can be defined shortly as the growing of plants and the raising of animals within and around cities. The most striking feature of urban agriculture, which distinguishes it from rural agriculture, is that it is integrated into the urban economic and ecological system: urban agriculture is embedded in and interacting with- the urban ecosystem. Such linkages include the use of urban residents as labourers , use of typical urban resources (like organic waste as compost and urban wastewater for irrigation), direct links with urban consumers, direct impacts on urban ecology (positive and negative), being part of the urban food system, competing for land with other urban functions, being influenced by urban policies and plans, etc. Urban agriculture is not a relic of the past that will fade away (urban agriculture increases when the city grows) nor brought to the city by rural immigrants that will lose their rural habits over time. It is an integral part of the urban system. Urban Agriculture plays an important role for making a city more resilient and safe in term of not only food and economy but also improving standard of living of urban poor by increasing mean of livelihood.( Pranati2013)

### 1.2 Importance of UA

Urban agriculture is probably the largest and most efficient tool available to transform urban wastes into food and jobs. According to Jac Smit, President, Urban Agriculture Network, Washington DC: “there are about 800 million people throughout the world who are engaged in urban food production” (Smitt, 1996). Further it creates a better living environment, social life ,ecological biodiversity , better public health, energy savings, natural resources savings, land and water savings and cost reductions in urban management. UA could enable informal settlements dwellers to turn idle and vacant intra urban land into productive, multifunctional and green infrastructure for the city; while in the other hand, could encourage small scale farmers to preserve and conserve their land, that are at the interface between rural and urban, integrating existing agriculture into the urban growth process. It has a positive impact on city water management, because green spaces with permeable land surfaces allow rainwater and runoff to drain through the soil and also offers the potential to use organic waste for composting, thereby reducing the need for land-fills (Thiago 2011)

### 1.3 Aims and Objective

#### Aim

To frame landscape design guide lines of urban agriculture in Indian cities, a case of Bhopal

#### Objectives:

1. To understand the concept of urban agriculture and its importance in the cities
2. To identify the criteria for site selection.
3. To find the challenges in establishing UA project on selected sites.
4. To undertake an overview of the solution to above
5. To provide landscape design guild lines for the UA for the selected sites and purpose a detailed design option for a patch.

### 1.4 Scope and Limitations

There are hundreds of cities both in rich and poor countries that have set targets to make their cities green and sustainable cities. The cost of greening and cleaning can be borne by urban food production and urban agriculture. Different countries in the world like China, Australia, USA, South America, Europe and many Asian as well as African countries are doing it and constantly improving on this. In India, though the concept of urban agriculture is beginning to become popular, but yet to get momentum. It largely remains an informal sector that is not being integrated in agricultural policies or urban planning; practically none of the master plans in India of metropolitan areas and other towns have a component for urban agriculture. This makes it vulnerable and also jeopardizes its sustainability. Urban agriculture is probably the largest and most efficient tool available to transform urban wastes into food and jobs.

This study focuses on finding the potential sites for promoting edible landscape within the municipal corporation limits and demonstrate a selected site for landscape intervention to creates a better living environment, social life ,ecological bio diversity , better public health, energy savings, natural resources' savings, land and water savings and cost reductions in urban management.

This study includes the identification of space for UA located within the land use plan of Bhopal 2005.

### 1.5 Methodology

UA can be characterised as being prone to change. Indeed, due to the often transitory nature of UA it is often considered to be a new phenomenon. The space and resources available to UA practitioners vary both quantitatively and qualitatively over short periods of time. Research then needs to take a dialectical approach to any situation analysis and impact assessment. Where by the current mode of UA is understood as a response to tangible and untangible factors.

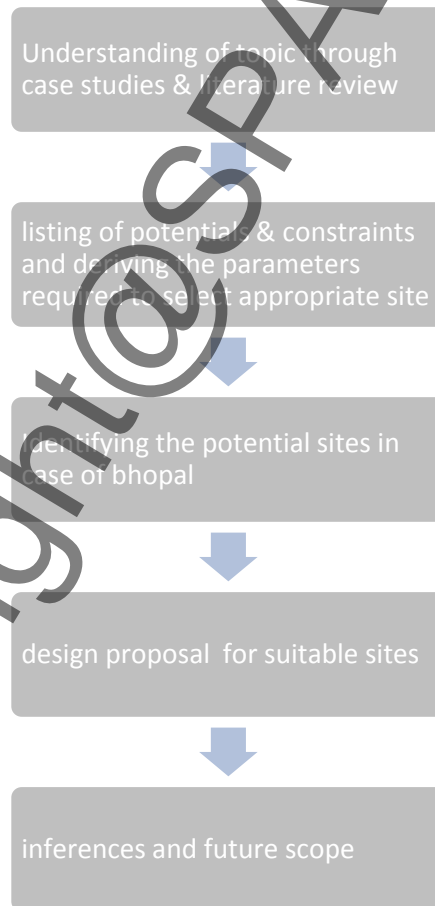


Diagram 1

**TABLE -1 showing the objectives related questions and expected out comes**

S.N	Objective	Questions	Indicators / Data required	Potential sources	Processing and data analysis	Expected Out Comes	
1	To understand the concept of urban agriculture and its importance in the cities	1 What is urban agriculture ?	definitions		studying and compiling the data		
		2 Why importance ?	statistic data, examples	Literature	deciding for the case studies		
		3 What is the global scenario ?	where it is being practise and why	Discussion with academicians	Preparing the out line for future study		A summary in a form of a report.
		4 Why it is important for Indian cities ?	statistic data, examples for India	Media	preparing the questionnaire for interviews		
		5 What are the elements of UA ?	what and who are involved in the process and why	Interviews with experts			
2	To identify the criteria for site selection	1 What are the site requirements ?	Physical and biological needs	Case studies	defining the scope of work and limitations.	A report for scope and limitation.	
		2 What are the services needed ?	Management requirements				
		3 How land use effects the site selection?	Which land is not suitable and why?	Literature	case study analysis		comparative analysis of site study.
		4 Who all are involved ?	Administrative bodies , HR	Discussion with academicians			
		5 what layers are in involved in selection?	What the importance of Geological , hydrological , topography etc.	Media and GIS	categorising and tabulating the data		tables showing the site selection criteria
		6 what approaches can be taken to find potential sites in Bhopal ?	How to start the process for find the site.	Interviews with experts	preparing the approach will be taken for site selection		flow chart explaining the site selection approach
3	To find the challenges in establishing UA project on selected sites.	1 What are different types of challenges faced by the selected sites ?	"site-related", "government-related", "procedure-related" "perception-related" cultural related	site studies and observations	categorising and tabulating the data	tables showing the site grads	
		2 What are the ways to overcome ?	find the solutions	literature	different type of maps and plans	summary in a form of a report	
		3 How to develop a grading system for the sites	how to give points to sites based on all the factors.	various government departments , CTP , BDA,BML etc.	Analysis by overlapping of various maps		maps of different layers for the sites
		4 which sites to be selected for further study?	maps	media and GIS interviews with experts and discussion with academicians	developing sections		Plans and sections for the selected sites

S.N	Objective	Questions	Indicators / Data required	Potential sources	Processing and data analysis	Expected Out Comes
4	To undertake an overview of the solution to above	1 What are strategies for the development?	services , management for operation, security	site studies and observations		site analysis plans sections
		2 What are the types of vegetation can be grown ?	what , how much , what time	various agricultural departments	categorising and tabulating the data	table showing different category for the sites
		3 What are the potentials design elements	water , landform , vegetation	literature	site detailed analysis	vegetation table
		4 What to be conserve and why ?	is site have cultural , historic etc. elements to be conserve	interviews with experts and discussion with academicians	developing sections	summary in a form of a report
		5 What is the good practise ?				
5	To provide landscape design guild lines for the UA for the selected sites and purpose a detailed design option for a patch.	1 What are the design solution ?	site development	site studies and observations	developing concept	table showing strategies for different category for the sites
		2 How to use maximum advantage of site ?	views , public spaces , recreational ,	discussion with academicians		
		3 What are new techniques used for growing ?	soilless , multilevel , vertical landscape	focus group discussion	developing designed sketches	summary in a form of a report
		4 The Visual appraisal	colour , shape , scale , time smell , sound ,	literature		
		5 How this going to effect surrounding		interviews with experts		drawings explaining the concepts and design details for the selected patch.
				media and GIS innovation		

## LITERATURE REVIEW

The objective of this chapter is the understanding and the elaboration to the concepts within the upcoming chapters. At first it will be necessary to get a fundamental overview of the UA and the various elements, challenges, good practices and technologies associated with it. In chapters as we proceed further the application of the knowledge area on a live site, a case of BHOPAL will be analysed.

### 2.1 DEFINITIONS

Whether we agree or not with the phenomenon, the expression “urban agriculture”(UA), or “intra- and peri-UA”, originally used only by scholars and the media, has now been adopted by UN agencies such as the UNDP (Smit et al. 1996b) and FAO(FAO 1996; COAG/FAO 1999). This makes our need to define it self-evident, atleast for our short- and mid-term governance. (Mougeot)

There are many definitions such as

“Urban and peri-urban agriculture can be defined **as an industry** that produces, processes and markets food and fuel, largely in response to **the daily demand of consumers within a town**, city or metropolis, on land and water dispersed throughout the urban and peri-urban area, **applying intensive production methods, using and reusing natural resources and urban wastes, to yield a diversity of crops and livestock**” (Smit et al. 1996, p.3).

Urban Agriculture can be defined as the growing of plants and the raising of domestic animals within and around cities. Urban Agriculture provides food products from different types of crops (grains, root crops, vegetables, mushrooms, fruits), animals (poultry, rabbits, goats, sheep, cattle, pigs, guinea pigs, fish, etc.) as well as non-food products (e.g. aromatic and medicinal herbs, ornamental plants, tree products).(<http://www.fao.org/urban-agriculture/en/>)

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In the same line, the United States Department of Agriculture (**USDA**) affirms that UA has almost as many definitions as locations, **as it adapts and modifies itself to the environment and demography, being sometimes the reflexive response for survival of people, contributing to food security and public health;** and at other times the thoughtful long-term organization of resources to moderate the harshness of the urban environment (Leshner 2009, p.5), since **UA could also be articulated with solid waste and wastewater management.**

**Urban Agriculture (UA)** is a system of producing, processing and distribution of food (including some non-food, such as flowers) in the space available in urban areas using available resources. In such areas, there are alternatives for non-agricultural use of resources. UA exists at all levels from commercial to community farms to small scale homestead gardening. (Satya2012)

**Building blocks of UA** - The more common conceptual building blocks of UA identified are: types of economic activities, food/non-food categories of products and subcategories, interurban and periurban character of location, types of areas where it is practised, types of production systems, product destination and production scale.

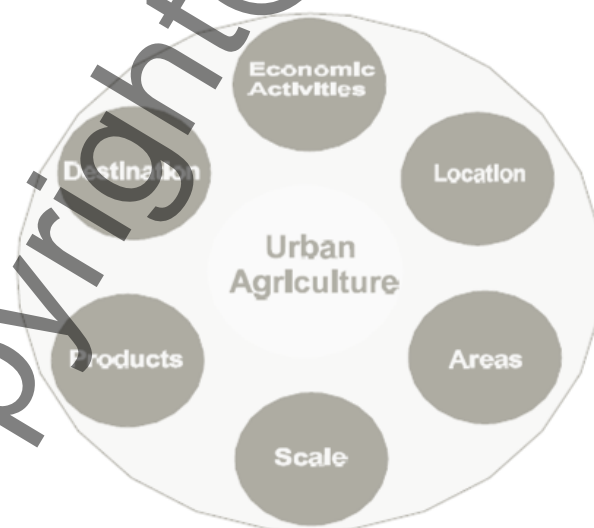


DIAGRAM-2

**Types of economic activities:** It refers to the production phase of agriculture; processing and trade to production and stress interactions between these.



**Food/non-food categories and sub-categories:** The definitions embrace very diverse agricultural productions, though more highlight food productions fit for consumption by either people or livestock; then, mostly cultivated or raised food products (grain, root, vegetable, aromatic and medicinal herbs and fruit crops, and livestock of all shapes and sizes

**Types of areas where UA is practised:** Criteria according to which such areas are typified vary from author to author: location respective to residence (on-plot or offplot), development status of site (built-up vs open-space), modality of tenure/usufruct of site (cession, lease, sharing, authorised or unauthorised – through personal agreement, customary law or commercial transaction); the official landuse category of the sector, where = UA is practised (residential, industrial, institutional, etc.).

**Product destinations:** Most definitions embrace agricultural production for both self-consumption and some trade (sale, barter, gifts, etc.). Both destinations are usually found to be targeted to varying degrees by the producers or households studied.

## 2.2 History

The idea of growing food within city limits is by no means a new one. Garnet reminds us (*op cit.*: 62) that in the nineteenth century, market gardens in Paris produced a high proportion of the fresh produce consumed in the city, using all kinds of waste generated by the city as a growing medium, and until the end of the First World War, they were famous for the abundance of their crops. ‘Victory Gardens’ were planted in America during World War II to reduce the pressure on the public food supply brought on by the war effort and these gardens were also considered a civil ‘morale booster’ in that gardeners could feel empowered by their contribution of labour and rewarded by the produce grown. There are also plenty of people still alive who can remember the wartime Dig For Victory campaigns when backyard and gardens became suddenly very productive in the UK in response to a nationally perceived need to support the war effort (Stephen 2008).

UA is a **relatively new concept**, nevertheless it is an **old phenomenon**. Indeed, virtually all cities in the world have expanded upon fertile agricultural land. It was only in **1996, during the Habitat II Conference** (convened by the United Nations), when the need for researching and supporting UA was recognized internationally. (Marion 2012)

## 2.3 ELEMENTS OF UA



DIAGRAM-3

**Food security** - UA increases the availability and accessibility of food. The food is also adequate being nutritious, safe and produced in an environmentally sustainable manner; is acceptable to the people as it is being produced by them.

**Public health** - UA is important for the health and nutrition of city dwellers, particularly the poor. UA also makes positive contribution to the health of people due to the physical exercise they do in practicing UA. Urban farms also provide good sites for outdoor physical exercise.

**Employment** - UA also provides the low-income urban dwellers an opportunity for employment and additional income generation.

**Environmental benefits** - UA has a number of environmental benefits. It provides habitat for urban wildlife and conserves biodiversity. It reduces the heat island effect of cities, reduces average temperature and contributes to climate change mitigation by minimizing the use of

fossil fuels by avoiding the transportation of food. UA produces less waste due to no or less packaging, and absorbs a substantial portion of rain water, thus putting less pressure on the use of municipal resources for storm water management. It also uses grey water, wastewater as well as bio solids and other organic waste, thereby helping in waste management. UA also improves the air quality and stabilizes soil reducing the susceptibility to flood and other natural disasters

**Other** - UA also provides recreational opportunities for the dwellers; adds to the aesthetic beauty of the cities. Women empowerment is another important benefit of UA, as women are involved in most cases. UA promotes inclusiveness, people-to-people interaction and thus, security. Another benefit of UA is the way it connects people with their food by creating awareness about the food production system. (Satya2012)

## 2.4 FACTORS INVOLVED IN URBAN AGRICULTURE

There are various factors involved in urban agriculture on which impact of urban agriculture depends on and vice versa.

### **People**

Large part of the people involved in urban agriculture is the urban poor. In many cities, one will often also find lower and mid-level government officials, school teachers and the like involved in agriculture, as well as richer people who are seeking a good investment for their capital. Women constitute an important part of urban farmers, since agriculture and related processing and selling activities, among others, can often be more easily combined with their other tasks in the household.

### **Location**

Urban agriculture may take place in locations inside the cities (intra-urban) or in the peri-urban areas. The activities may take place on the homestead (on-plot) or on land away from the residence (off-plot), on private land (owned, leased) or on public land (parks, conservation areas, along roads, streams and railways), or semi-public land (schoolyards, grounds of schools and hospitals).

### **Food Products**

Urban agriculture includes food products, from different types of crops (grains, root crops, vegetables, mushrooms, fruits) and animals (poultry, rabbits, goats, sheep, cattle, pigs, guinea pigs, fish, etc.) as well as non-food products (like aromatic and medicinal herbs, ornamental plants, tree products, etc.) or combinations of these. Often the more perishable and relatively high-valued vegetables and animal products and by-products are favored.

Production units in urban agriculture in general tend to be more specialized than rural enterprises, and exchanges are taking place across production units.

### **Product Market**

Urban agriculture includes agricultural production activities as well as related processing and marketing activities as well as inputs (e.g. compost) and services delivery (e.g. animal health services) by specialized micro-enterprises or NGOs, etc.

### **Technology Used In Urban Agriculture**

In the city, we may encounter individual or family farms, group or cooperative farms and commercial enterprises at various scales ranging from micro- and small farms (the majority) to medium-sized and some large-scale enterprises. The technological level of the majority of urban agriculture enterprises in developing countries is still rather low. However, the tendency is towards more technically advanced and intensive agriculture and various examples of such can be found in all cities. (*Pranati2013*)

## **2.5 CHALLENGES**

More than thirty per cent population of India lives in urban areas and this percentage is expected to grow further. This will result in increasing demand for food items for people living in the urban areas. Traditionally, fruits, vegetables, milk, etc. for the urbanites come from the adjoining rural areas; however, a part of the demand has been catered by urban and peri-urban agriculture (UPA) in many urban centres in India. (*Satya2012*)

### **Land availability for Urban agriculture**

- a) Around the world, land availability is the primary limiting factor for urban agriculture. As land price is high, agriculture many times gives way to other land uses that make more economic sense..
- b) Another challenge related to land is on “Floor to Area Ration” (FAR), which determines the percentage of built up area to non-built area. When FAR is low, it leaves more space to non-built land where farming can take place. However, a low FAR may not necessarily encourage the owner to use the land for farming only. While sufficient land is not available for UA in cities, there is still vast land area lying vacant.

### **Non availability / Scarcity of Water and Other Natural Resources**

Land and water are the most important natural resources required for UPA. The other resources include climate, biodiversity, and renewable energy sources. Efficient natural

resources management will help increase agricultural productivity and increase sustainability of urban agricultural system which is at present missing.

### **Lack of Waste Management practices**

Management of solid waste in most Indian cities is in shambles. There is no proper waste collection system in many cities. In some urban areas, there are waste depots in residential areas where the residents can deposit garbage and compostable organic waste separately. However, people don't care about segregation and put everything together. This not only results in foul smell but also a precious opportunity for making organic compost is wasted.

### **Health and Environmental Risks:**

Urban farming is prone to contamination by gaseous pollutants present in air, such as, sulphur dioxide (SO<sub>2</sub>), nitrogen oxides (NO<sub>x</sub>), and ozone (O<sub>3</sub>), and toxic metals present in air, water and solid waste, such as lead, cadmium, and mercury from industrial sources and automobiles, as well as pathogens present in water.

Most farmers are not adequately educated about pest control methods and fertilizer application. Some of them use higher doses of chemical fertilizers and pesticides than prescribed; may also apply pesticide without using protective clothing. As a result, it affects the health of farmers and the water bodies get contaminated with nutrients and pesticides.

## **2.6 GOOD PRACTISE URBAN AGRICULTURE**

“Development that meets the needs of the present without compromising the ability of future generations to meet their own needs”. Positive socio-economic change which does not undermine the ecological and social systems upon which communities and societies are dependent. (WHO 1996) Biological transformation of urban wastes to food and green is essential for sustainable cities. In Indian cities two areas, which will be most benefited by ‘Good Practice Urban Agriculture’ are low income residential and mixed use areas, and urban fringes.( sumita2011)

**Wastewater irrigation** - As wastewater irrigation is economical and provides adequate nutrition to plants, several steps can be taken to annul its detrimental effect on health

**Organic Farming** - Organic farming is seen as recourse to escape from the deleterious effects of chemical fertilizers and pesticides on human health and the environment. The concept and practice of organic farming has been steadily growing in many urban centres in India.

**Making UPA profitable** -There is a need for generating awareness on Integrated Pest Management (IPM), Integrated Plant Nutrient Management (IPNM), modern micro-irrigation systems, improved seed preservation and nursery production technology, right stage of harvesting, proper cleaning, grading and packing of the produce.

**Integrating UA in to the Development Plans** - UA is an important aspect of 'sustainable development' of cities. Irregularities in land-use planning, unavailability of land for agriculture in urban area, rapid urbanization of peri-urban areas, lack of proper 'waste management' policies and/or implementation, lack of co-ordination between different stakeholders including governments at different levels on 'natural resources management' and insufficient knowledge about safe and scientific technologies lead to unsustainability.

Research institutes and government departments need to intensify education and training programs for farmers on sustainable agriculture methods including improved irrigation practices, rainwater harvesting, organic farming, integrated pest management (IPM), integrated plant nutrient management (IPNM) and post-harvest management.

## 2.7 NEW TECHNOLOGIES

Some soils are poorly textured or shallow, and provide an unsatisfactory root environment because of limited aeration and slow drainage. Pathogenic organisms are a common problem in field soils. When soil can't be used or adverse conditions are found in soil and reclamation is impractical, some form of soilless culture may be justified.

**Hydroponics** is a subset of hydroculture and is a method of growing plants using mineral nutrient solutions, in water without soil.

**Aquaponics** refers to any system that combines conventional aquaculture (raising aquatic animals such as snails, fish, crayfish or prawns in tanks) with hydroponics (cultivating plants in water) in a symbiotic environment.

**Aeroponics** is the process of growing plants in an air or mist environment without the use of soil or an aggregate medium (known as geponics). The word "aeroponic" is derived from the Greek meanings of aero- (air) and ponos (labour).

**Vertical farming** is the practice of producing food in vertically stacked layers, vertically inclined surfaces and/or integrated in other structures. The modern idea of vertical farming uses controlled-environment agriculture (CEA) technology, where all environmental factors can be controlled.



## CASE STUDY

### 3.1 Global Scenario

UA is a relatively new concept; nevertheless it is an old phenomenon. It is increasing in cities in developed countries as well as in developing countries, and the number of cities revising existing policies or formulating new policies and action programmes on UA is growing rapidly (van Veenhuizen, 2006). No doubt a concept that has made significant impact in few cities of world like Detroit, Boston, US, Bangkok, Thailand, Africa and many others

Globally, urban and peri-urban agriculture is gaining attention from governments, and many international organisations like the **UNCED**- United Nations Conference on Environment and Development, **UNCHS**- United Nations Centre for Human Settlements, **CGIAR** Consultative Group on International Agricultural Research, **FAO**- Food and Agriculture Organization of the United Nations, **RUAF**- Resource Centre for Urban Agriculture and Food Security, **UNDP**- United Nations development program, **UNDAF**- United Nations development of Agriculture, **WFP**- World food programme, **IFAD** – International fund for agriculture development, **IDRC** -International Development Research Centre etc.

### 3.2 Indian scenario

According to Census of 2011, India's population rose to 1.21 billion people over the last 10 years — an increase by 181 million. Urbanization is taking place at a faster rate in India. Resources are always limited. And in a developing and highly populous country like India, resources are even scarcer. Population explosion results in the shortage of even the most basic resources like food. The situation is further aggravated with the fast changing climate, the shrinking land and water resources, and the rising food prices particularly in the cities.

Government of India has properly anticipated the present situation and need for provision of access of vegetables / fruits to the people living in urban areas. The growth in urban area is immense therefore department of agriculture cooperation (DAC) has launched a scheme known as vegetable initiative for urban clusters (VIUC) in 2011. The working groups on horticulture constituted by the planning commission for XII th Five Year Plan (2012-17), under

urban and peri –urban agriculture initiatives has advocated attention not only for growing fruits and vegetables , but also for environment services and healthcare.(c&p.k2013)

### 3.3 Primary case study

#### 3.3.1 Mumbai urban railway farms

Mumbai Island is one of the most intensely urbanized and industrialized regions of the world. It is included in the United Nations (UN) list of ‘megacities’. The climate characterized by an oppressive summer, dampness in the atmosphere nearly throughout the year. Average annual rainfall in MMR amounts 2,642mm and mean annual temperature is 26.8°C (averages from 1955–2005; Regional Meteorological Centre Mumbai, 2010).

Mumbai’s local trains are mostly crowded and people inside are usually too busy trying to find a foothold. But if one has the time to look out of the window, it is quite possible catch the sight of vegetable farms along the railway tracks. Farmers growing vegetables along the tracks in the suburbs and inside the city is a common practice in Mumbai.

“To protect the railways’ land from encroachment by slums and to keep the non-utilised land under use, Railways started a scheme in called **Grow More Food**,” “Under this scheme, 238 Class III & Class IV railway employees were allotted land on lease to grow crops. This would help them bring some extra income home and the railways would also generate some revenue out of the unused land.”





### 3.3.2 Nanded City Pune

Nanded City is a township located in the south-west of Pune, India. It is strategically located in Sinhagad Road on the outskirts of Pune City. It is near to Khadakwasla Dam and Sinhagad Fort. Name of the City given based on Nanded Village located on Mutha River, 12 km from Swargate ST Stand Pune. The 700 acres project being developed by Nanded City Development & Construction Co. Ltd. **Eco-Stream Park:** There is a stream which runs through the City site. The developers are going to convert that area into an eco park. The Mangir Baba Nallah which carries rain and waste water from the surrounding villages passes through the Nanded City. They are treating that water as a corporate social responsibility initiative and they are also building a garden along that *nallah* and promoting agro-tourism.



### 3.4 Literature Case Studies

#### 3.4.1 Public Harvest -Expanding the Use of Public Land for UA in San Francisco

SPUR Report was reviewed, debated and **adopted as official policy by the SPUR Board of Directors on February 15, 2012**. Urban agriculture has captured the imagination of many San Franciscans in recent years. Two dozen gardens and farms have sprouted across the city since 2008, and in 2011 the **city changed its zoning code to permit urban agriculture in all neighbourhoods**. Interest in urban agriculture stems from its numerous benefits. City farming and gardening provides San Franciscans with vibrant greenspaces and recreation, education about fresh food and the effort it takes to produce it, cost savings and ecological benefits for the city, sites that help build community, and a potential source of modest economic development. But the city will not fully capture these benefits unless it responds to the growing interest and energy behind the issue. **Urban Agriculture on Public Land**

SPUR's research focuses on the use of public land for urban agriculture because that land is relatively plentiful and because policymakers control it. Public land, abounds throughout the city and can be made available through policy. City agencies control 19 percent of San

Francisco's land. San Francisco have Mediterranean climate , dry summer , moist mild winters .



Source : SPUR201

### 3.4.2 Creating a land inventory and urban food landscape on Vancouver Island .

Vancouver Island Community Research Alliance (VICRA) The goal of Cultivating Food Security: Creating a Land Inventory and Food Landscape on Vancouver Island is to provide information supporting increased food sovereignty in communities across Vancouver Island. Analyses of existing inventories of land appropriate for urban agriculture and a methodology for creating a land inventory in municipalities on Vancouver Island are provided. This report is one of four created as part of VICRA's Local Food Project, a collaboration involving communities and academics.



Source : chloe&chris2011



### 3.4.3 Some more examples from india

#### CASE OF HYDERBAD

Urban agriculture is the new culture that is catching up in Hyderabad city. This time Horticulture department for a change is giving subsidy directly to the citizens instead of farmers , who want to grow of complete nutrients set of vegetables. Horticulture department director K Devamuni Reddy said "We give the citizens who are ready to grow a cluster of vegetables at their home a subsidy of Rs 360 and they have to spend another Rs 1200 from their pockets"

**Challenges faced:** On Paper, on reports, and on official projections, Official records all seems to be attractive and successful, but the realistic scene is completely opposite. As the area mentioned in the report are very crowded houses in these areas have no space for gardening. The result may not have been satisfactory (Pranati2013)

#### CASE OF DELHI

Few of this city's residents know that along the banks of the Yamuna live thousands of urban farmers. Contrary to what one who learns of them might assume, these urban farmers are not recent migrants forcibly displaced from rural areas and only able to find work in Delhi as agricultural laborers. Rather, they have been cultivating vegetables along the banks of Yamuna for several generations. Yet still, since they are without government identification cards and do not own the property on which they farm, these farmers are among the most vulnerable population in urban Delhi -- not only unknown, but also invisible.

**Challenges faced :** The Yamuna farmers present a paradoxical situation. On the one hand, they are a very significant subject for urban agriculture globally in terms of the sheer scale of their production. But at the same time, there is the imminent threat of development and it is unlikely that the farmers will exist in this capacity for much longer

### 3.5 Interviews

**TABLE 2- case study finding**

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**Table-3 -interviews**

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### 3.6 Inferences

Urban agriculture, at first glance, may appear to be a fairly simple topic: Scatter a few plots about the City and let residents start gardening. In reality, however, urban agriculture impacts a community in a variety of ways, from providing food security, environmental benefits, and even modifying a city's urban form. Similarly, in spite of its seeming simplicity, urban agriculture does not just happen. To foster the development and growth of urban agriculture, a city may have to consider implementing techniques that include zoning ordinances, comprehensive plans and, in some cases, state legislation.

1. **Concept of Urban Agriculture** is a phenomenon of multiple activities such as growing food, raising livestock, education, social interaction and they all are associated with the biodiversity, health, economy, and environment.
2. **Criteria for selection of the site:** Land use and public participation are essentials for and establishment of the UA project. Layers such as the soil type, soil texture, fertility, geology, hydrology, vegetative cover are the natural features of the land which can help in categorizing the potential sites.
3. **Challenges:** there are many challenges for project such as land related, site related, services related, administrative related, pollution and contamination, environment and public related.
4. **Solution:** The education and awareness to the public about the importance and need of UA can be the solution for problems. The formation of committee for the management for the UA project which can provide the infrastructure and have the quality to manage the project. Organic farming, waste management, alternate growing technic can add to the solutions for the project.
5. **Design:** The design strategies to be worked out in a way, that they are functional and aesthetical full fill the need of the city and public.

## **BHOPAL**

### **4.1 Background of Bhopal**

Bhopal is the capital of the Indian state of Madhya Pradesh and the administrative headquarters of Bhopal district and Bhopal division. The city was the capital of the former Bhopal State (British India). Bhopal is known as the City of Lakes for its various natural as well as artificial lakes and is also one of the greenest cities in India. Bhopal, with its central location is very well connected to all the corners of the country. With the expanded planning area of 463 square kilometres, Bhopal stands among 15 largest cities of India.

It is said that Raja Bhoj, the famous Parmar king of Dhar, founded Bhopal City in the 11th century at its present site. He created the Upper Lake by constructing an earthen dam across the Kolans River. The Lower Lake was created by Nawab Chhote Khan in 1794. The city remained a capital of a feudal state till it was merged in the Indian union in 1948.

Several dynasties have left their mark on the city. These icons are testimony to the grandeur of past and provide a marvellous treat to the eyes. Even by seeing the remains of the city one can have the glimpse of different cultures, which existed in the past.

Bhopal has not grown as a single city but as discreet townships -BHEL , T. T. Nagar , Bairagarh , M.P nagar .

Bhopal has a humid subtropical climate, with mild, dry winters, a hot summer and a humid monsoon season. Summers start in late March and go on till mid-June, the average temperature being around 30 °C, with the peak of summer in May, when the highs regularly exceed 40 °C (104 °F). Total annual rainfall is about 1146 mm.

### **4.2 Bhopal for UA project**

1. It is the 16<sup>th</sup> largest city in India and one of the cities proposed for smart city development.
2. Rapid urbanization leading to
  - Urban heat island effect by development and exposed rock surfaces. soil erosion
  - Loss of biodiversity
  - Loss of forest land.
  - Need more food
3. Inefficient waste management
  - Polluting the natural resources

4. Increase in antisocial activities on isolated urban patches.
5. For urban agriculture Potential availability of resources such as water, soil, climate etc.
6. As frequent visit to site and various departments are required for the study Bhopal will be most accessible as we are established here.

### Agro-Climatic/Ecological Zone

Agro Ecological Sub Region (ICAR) Malwa plateau, Vindhyan scrupland and Narmada valley

Agro-Climatic Zone (Planning Commission) Central Plateau And Hills Region (VIII) (52%), Western Plateau And Hills Region (IX) (48%)

Agro Climatic Zone (NARP) Malwa Plateau Zone (MP-10) (46%), Vindhya Plateau Zone (MP5) (42%)

### 4.3 Finding Potential sites

To find the potential site in a city a land inventory is prepared, which is based on the case studies.

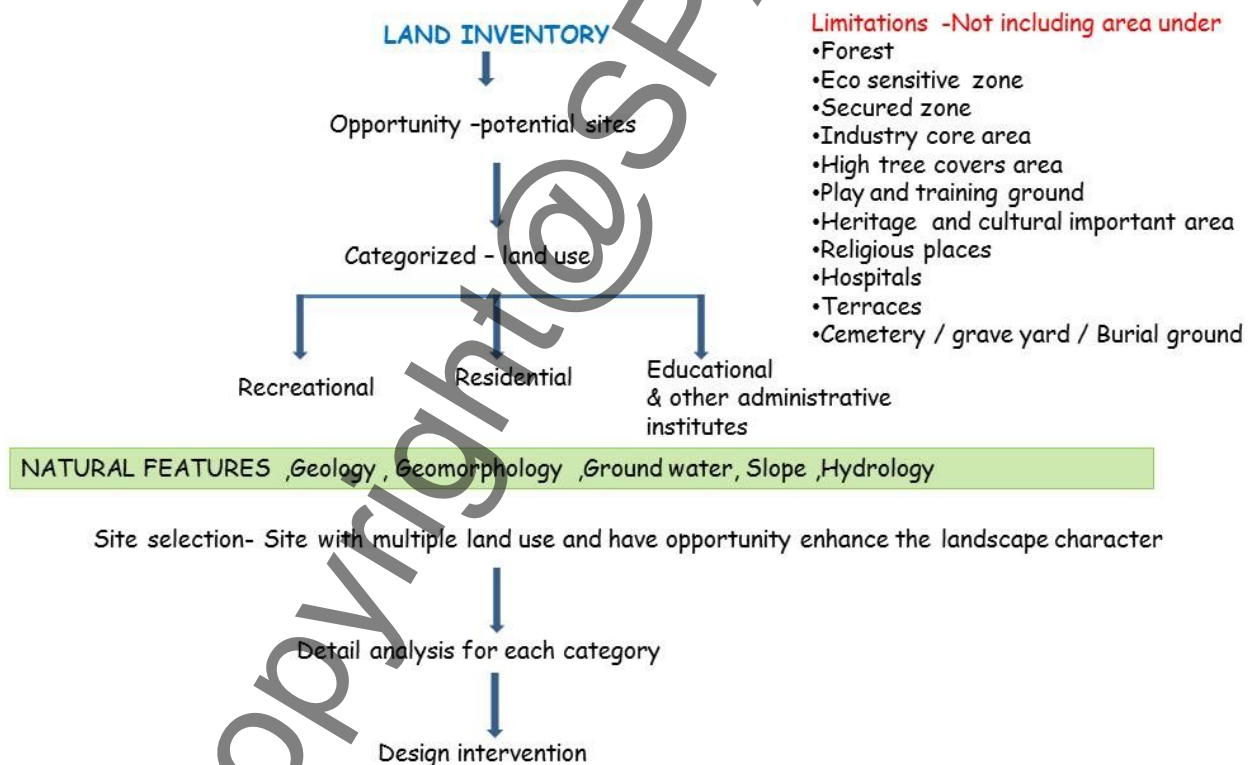


Diagram-4

The selection of potential sites are based on the field survey, observations, interaction with various department officers and public interest.



#### 4.5 Site selection

The site selected on the based on the opportunity to get a multiple land use in proximity, so as to form a network of various activities to support the UA project.

It will help in sharing the services and can mutually help waste management of the area.

This development of local network of urban agriculture will add to the green infrastructure of the area and enhance the landscape character .

The site is selected is shymala hills on the banganaga side. Shyamla hill is one of the major hills of Bhopal; having upper lake on its foothills and to complete the whole ecosystem Van Vihar brings its wild life to the edge of the upper lake. A small rivulet called Banganga get its water from the surface run off of the valleys of two important hills of the city i.e. Shyamla hill and the hill of T.T.Nagar.

#### 4.6 Site Surrounding

The site is well connected to the city and very much accessed as its one of the tourist destination in city. North side of side is upper lake with Vanvihar & Manav shaghralay and south east is the lower lake with old city. The site is in the proximity of new market (commercial area), MANIT (University) and many residential colonies.

**SITE ANALYSIS**

**5.1 SITE POTENTIALS**

The has the various potential such as

**LOCATION:**

The site is well connected to city , so its accessibility is good.

The visual connectivity to the city and for the city add to the aesthetics of landscape.

Tourist destination so its good opportunity to exhibit the culture of urban agriculture .

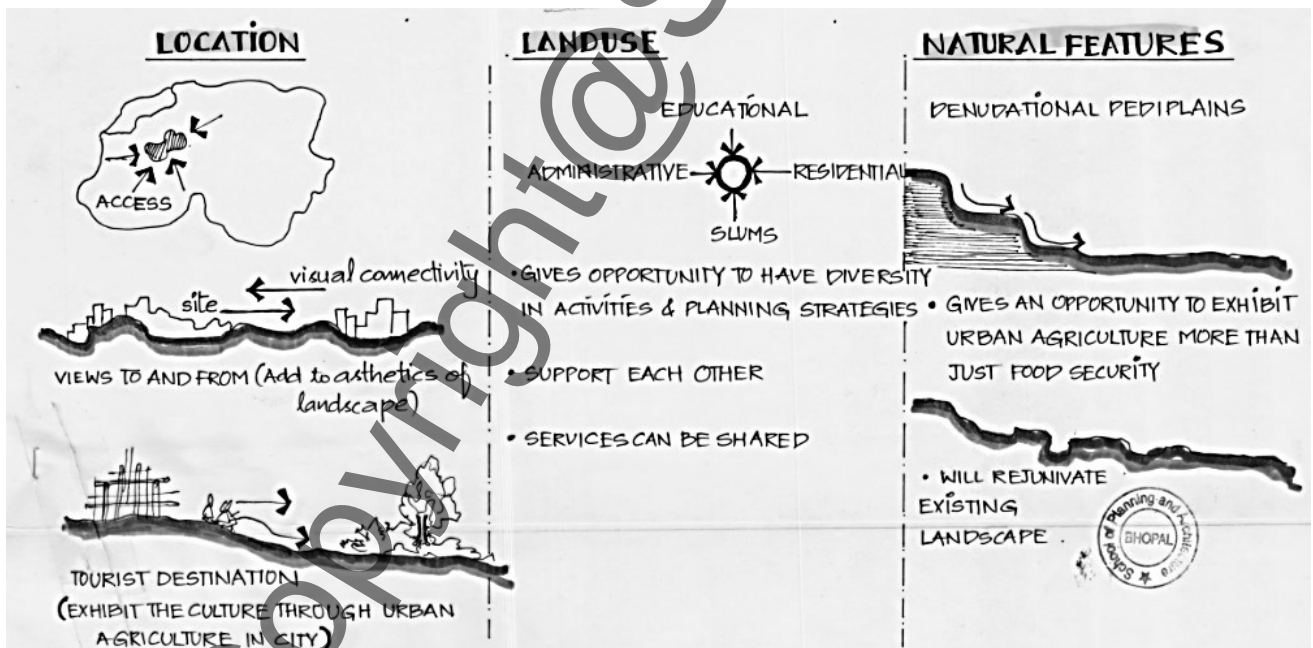
**LANDUSE:**

Various land use such as educational, residential, administrative gives opportunity to have diversity in activities and planning strategies.

Services can be shared and can support each other.

**NATURAL FEATURES**

Denudational and pediplains which is a challenge for agriculture ,which gives an opportunity to exhibit urban agriculture more than just food security and have the potential improve exiting landscape.



## 5.2 SLOP ANALYSIS

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### 5.3 SITE ZONING

The site has been divided into four zones based on their administrative boundary .

#### **ZONE-1 -EDUCATIONAL CAMPUS NCERT**

REGIONAL INSTITUTE OF EDUCATION (RIE), Bhopal is a constituent unit of NCERT, New Delhi. The Institute looks after teacher education and other educational requirements of the States of Chhattisgarh, Goa, Gujarat, Madhya Pradesh, Maharashtra and UTs of Dadra and Nagar Haveli and Daman and Diu.

PSS THE CENTRAL INSTITUTE OF VOCATIONAL EDUCATION is named after Pandit Sunderlal Sharma who was a respected senior freedom fighter from Chhattisgarh.

Mission is to provide research, development and training to a wide spectrum of target groups so as to equip them with knowledge and skills and to prepare them for smooth transition from school-to-work.

#### **ZONE -2 ADMINISTRATIVE FOR EXHIBITION**

The area is surrounded by minister and judge residences along with tourist destination such as tribal and state museums.

#### **ZONE -3- BANGANGA SLUM**

**The Banganga** stream, a feeder channel to the Lower Lake. The stream quality of water has disintegrated due to many reasons such as storm water runoff, release toxic sewage directly, infiltration areas .Due to which it floods the entire slum development.

#### **ZONE -4- RESIDENTIAL POLICE HOUSING BOARD DEVELOPMENT**

A mixed landuse township developed for the police housing by PHBD .the settlement has offices training area and residential development.

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5.4 DETAIL ZONE INVENTORY

ZONE 1 – EDUCATIONAL GARDEN		DETAIL SITE INVENTORY																			
SITE	Landuse	Administrative Body			Availability			Infrastructure			Natural Feature										
		Beneficiary	need	Management by	Months	Area acre	Transport Access points	Water supply	Electricity	Waste management	Slope ratio	Soil depth in mm	Soil Type	Soil Texture	ground water	Vegetation cover					
ZONE1	Educational -BMS recent campus	Resident, Staff, Local public ,children,students urban poor , livestock	health ,education , Awareness , employment	D.M.S , VIFUC,BMC	all months	24	Along the internal road and 3 main road access	BMC	BMC	BMC	1:14 ,1:11,1: 23	250-1000	Chromic haplustert s	y	Poor to moderate	copper pod, babul , neem					
<b>ANALYSIS AND STRATEGIES</b>																					
		LANDSCAPE RESOURCES					GREEN SPACES					PUBLIC / COMMUNITY INTERACTION					MANAGEMENT				
PROBLEMS		<ul style="list-style-type: none"> <li>Sheet erosion</li> <li>Exposed Sandstone rock bed</li> <li>Deforestation</li> <li>Poor ground water</li> </ul>					<ul style="list-style-type: none"> <li>Engemented spaces</li> <li>No out door learning</li> <li>No interactive spaces</li> </ul>					<ul style="list-style-type: none"> <li>No awareness</li> <li>No public interactive</li> </ul>					<ul style="list-style-type: none"> <li>No waste management</li> <li>Formation of UA management team</li> </ul>				
GOALS		<ul style="list-style-type: none"> <li>Stop erosion</li> <li>Re-vegetation</li> <li>Recharge ground water</li> </ul>					<ul style="list-style-type: none"> <li>Creating a continuous landscape-experiences spaces network.</li> </ul>					<ul style="list-style-type: none"> <li>Creating spaces for public camps ,exhibitions... etc which ensures holistic developments of all kinds of user</li> </ul>					<ul style="list-style-type: none"> <li>Sustainable site development for UA.</li> </ul>				
BENEFITS		<ul style="list-style-type: none"> <li>Healthy food &amp; milk supply</li> <li>Campus micro-climate</li> <li>Bio-diversity</li> <li>Ground water recharge</li> </ul>					<ul style="list-style-type: none"> <li>Out door learning for Students and Public</li> </ul>					<ul style="list-style-type: none"> <li>Revenue generation</li> <li>Awareness</li> <li>Employment generation</li> </ul>					<ul style="list-style-type: none"> <li>Reduction of waste generated.</li> <li>Encouragement for UA policy.</li> </ul>				
HOW TO ARCHIVE		<ul style="list-style-type: none"> <li>Functional Zoning of space</li> <li>Introducing artificial water recharging technics for the site.</li> <li>Selection of appropriate edible plant material</li> </ul>					<ul style="list-style-type: none"> <li>Designing the appropriate activities and their best sequence on site.</li> </ul>					<ul style="list-style-type: none"> <li>Creating UA space providing activities: opportunity and challenges.</li> </ul>					<ul style="list-style-type: none"> <li>Landscape management plan for UA .</li> <li>Waste water treatments</li> <li>Segregation of solid wastes.</li> <li>Developing Composts pits</li> </ul>				

Table -4

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DETAIL SITE INVENTORY

ZONE 2- AGRICULTURE PARK

SITE	Landuse	Administrative Body			Infrastructure				Natural feature							
		Beneficiary	need	Management by	Months	Area acre	Transport Access points	Water supply	Electricity	Waste management	Slope ratio	Soil depth in mm	Soil Type	Soil Texture	ground water	Vegetation cover
ZONE2	Administrative and residential	Local public ,children, students , urban poor , livestock	recreational, health ,education , Awareness , employment	VIFUC,BMC,public participation , NGO	all months	15	Along the main road	BMC	BMC	BMC , barren land , some spaces are garbage collection point	01:14	100-1000	Chromic haplustert s	y	Poor to moderate	copper ,pod, babul , neem

ANALYSIS AND STRATEGIES

	LANDSCAPE RESOURCES	GREEN SPACES	PUBLIC /COMMUNITY INTERACTION	MANAGEMENT
PROBLEMS	<ul style="list-style-type: none"> <li>• Sheet erosion</li> <li>• Exposed Sandstone rock bed</li> <li>• Deforestation</li> <li>• Poor ground water</li> </ul>	<ul style="list-style-type: none"> <li>• Barren land losing vegetative cover, as used for garbage dumping and anti-social activities.</li> </ul>	<ul style="list-style-type: none"> <li>• No awareness</li> <li>• No public interactive</li> </ul>	<ul style="list-style-type: none"> <li>• No waste management</li> <li>• Formation of UA management team</li> </ul>
GOALS	<ul style="list-style-type: none"> <li>• Stop erosion</li> <li>• Re-vegetation</li> <li>• Recharge ground water</li> </ul>	<ul style="list-style-type: none"> <li>• Creating a continuous landscape spaces network.</li> </ul>	<ul style="list-style-type: none"> <li>• Creating opportunity for public participation and social interaction, which ensures therapeutic recreational experience for users.</li> </ul>	<ul style="list-style-type: none"> <li>• Sustainable site development for UA.</li> </ul>
BENEFITS	<ul style="list-style-type: none"> <li>• Healthy food &amp; milk supply</li> <li>• Micro-climate</li> <li>• Bio-diversity</li> <li>• Ground water recharge</li> </ul>	<ul style="list-style-type: none"> <li>• Green and healthy recreational space for public use .</li> </ul>	<ul style="list-style-type: none"> <li>• Revenue generation</li> <li>• Public Awareness</li> <li>• Employment generation</li> </ul>	<ul style="list-style-type: none"> <li>• Reduction of waste generated.</li> <li>• Encouragement for UA policy.</li> </ul>
HOW TO ARCHIVE	<ul style="list-style-type: none"> <li>• Functional Zoning of spaces</li> <li>• Introducing artificial water recharging techniques for the site.</li> <li>• Selection of appropriate edible plant material</li> </ul>	<ul style="list-style-type: none"> <li>• Designing the appropriate activities and their best sequence on site.</li> </ul>	<ul style="list-style-type: none"> <li>• Designing the various public activities spaces involving benefits of UA.</li> </ul>	<ul style="list-style-type: none"> <li>• Landscape management plan .</li> <li>• Developing Composite pits .</li> </ul>

Table -5



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ZONE 3 – ENABLED GARDEN – AGRO-CRAFT DETAIL SITE INVENTORY

SITE	Administrative Body			Availability		Infrastructure				Natural feature						
	Landuse	Beneficiary	need	Management by	Months	Area acre	Transport Access points	Water supply	Electricity	Waste management	Slope ratio	Soil depth in mm	Soil Type	Soil Texture	ground water	Vegetation cover
ZONE3	Administrative	Local public , urban poor , livestock, BMC	recreational, health ,education , Awareness , employment	VIFUC,BMC,Urban poor, NGO	all months	36	Along the main road	BMC	BMC	highly polluted area with slum settlement .	1:6-9	250-1000	Chromic haplusteits	y	Poor to moderate	

ANALYSIS AND STRATEGIES

	LANDSCAPE RESOURCES	GREEN SPACES	PUBLIC /COMMUNITY INTERACTION	MANAGEMENT
PROBLEMS	<ul style="list-style-type: none"> <li>• Sheet erosion</li> <li>• Exposed Sandstone rock bed</li> <li>• Toxic sewage and pollutants directly into the stream</li> <li>• Deforestation</li> <li>• Poor infiltration</li> </ul>	<ul style="list-style-type: none"> <li>• No green spaces</li> </ul>	<ul style="list-style-type: none"> <li>• No public interactive</li> <li>• Attitude of the people reflects complete disregard for the stream.</li> </ul>	<ul style="list-style-type: none"> <li>• No management of surplus storm water runoff.</li> <li>• No waste management</li> <li>• Inhuman living conditions for slum dwellers and livestock surrounded , often effected with direct sewage inflow</li> </ul>
GOALS	<ul style="list-style-type: none"> <li>• Erosion control</li> <li>• Stop sewage and pollutants dispose to stream.</li> <li>• Re-vegetation</li> <li>• Re- charging ground water</li> <li>• Revitalization of stream .</li> </ul>	<ul style="list-style-type: none"> <li>• Creating a continuous landscape spaces network.</li> </ul>	<ul style="list-style-type: none"> <li>• Develop an environmental setting that provide a therapeutic horticultural experience which ensures holistic developments of all kinds of user groups.</li> </ul>	<ul style="list-style-type: none"> <li>• Sustainable site development for UA.</li> <li>• Develop a landscape management plan for maintenance ecological and cultural potential of area</li> </ul>
BENEFITS	<ul style="list-style-type: none"> <li>• Clean stream .</li> <li>• Revitalization of the area.</li> <li>• Ground water recharge.</li> </ul>	<ul style="list-style-type: none"> <li>• Overall development of slum dwellers .</li> </ul>	<ul style="list-style-type: none"> <li>• Reduced isolation through social contact gives an opportunity to increased physical or psychological growth</li> <li>• Employment generation</li> </ul>	<ul style="list-style-type: none"> <li>• Slum dwellers</li> <li>• Improves Stream ecological</li> <li>• Adds to the aesthetics landscape</li> </ul>
HOW TO ARCHIVE	<ul style="list-style-type: none"> <li>• Storm water management strategies.</li> <li>• Wastewater treatment strategies.</li> <li>• Introducing artificial water recharging techniques for the site.</li> <li>• Selection of appropriate plant material.</li> </ul>	<ul style="list-style-type: none"> <li>• Overall development of slum dwellers .</li> </ul>	<ul style="list-style-type: none"> <li>• Designing the various spaces gives activities opportunity involving benefits of UA.</li> </ul>	<ul style="list-style-type: none"> <li>• Development of storm water management strategies.</li> <li>• Development waste water treatment and solid waste management strategies.</li> <li>• Developing local sanitation programme.</li> </ul>

Table -6

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**ZONE 4- COMMUNITY GARDEN** **DETAIL SITE INVENTORY**

SITE	Administrative Body				Infrastructure				Natural feature							
	Landuse	Beneficiary	need	Management by	Months	Area acre	Transport Access points	Water supply	Electricity	Waste mangement	Slope ratio	Soil depth in mm	Soil Type	Soil Texture	ground water	Vegetation cover
ZONE4	Administrative and Residential for police housing board	Resident, Staff, Local public ,children, students , urban poor , livestock	recreational, health ,education , Awareness , employment	PHB , VIFUC,BMC	all months	18	2 access point to main road	BMC	BMC	BMC	1:16 , 1:22	250-1000	Chromic haplustert s	Clayey	moderate	copper pod, babul , neem

**ANALYSIS AND STRATEGIES**

	LANDSCAPE RESOURCES	GREEN SPACES	PUBLIC /COMMUNITY INTERACTION	MANAGEMENT
PROBLEMS	<ul style="list-style-type: none"> <li>• Sheet erosion</li> <li>• Exposed Sandstone rock bed</li> <li>• Deforestation</li> <li>• Poor ground water</li> </ul>	<ul style="list-style-type: none"> <li>• Fragmented green spaces</li> <li>• No organized community spaces.</li> </ul>	<ul style="list-style-type: none"> <li>• Less community interaction within the campus.</li> </ul>	<ul style="list-style-type: none"> <li>• No waste management</li> <li>• Formation of UA management team</li> </ul>
GOALS	<ul style="list-style-type: none"> <li>• Stop erosion</li> <li>• Re-vegetation</li> <li>• Recharge ground water</li> </ul>	<ul style="list-style-type: none"> <li>• Creating a continuous landscape experience spaces network.</li> </ul>	<ul style="list-style-type: none"> <li>• To create a UA spaces for social interaction , participation , awareness and empowerment.</li> </ul>	<ul style="list-style-type: none"> <li>• Sustainable site development for UA.</li> </ul>
BENEFITS	<ul style="list-style-type: none"> <li>• Healthy food &amp; milk supply</li> <li>• Campus micro-climate</li> <li>• Bio-diversity</li> <li>• Ground water recharge</li> </ul>	<ul style="list-style-type: none"> <li>• Green and healthy recreational space for community .</li> </ul>	<ul style="list-style-type: none"> <li>• Community health and social life</li> </ul>	<ul style="list-style-type: none"> <li>• Reduction of waste generated.</li> <li>• Encouragement for UA policy.</li> </ul>
HOW TO ARCHIVE	<ul style="list-style-type: none"> <li>• Functional Zoning of space</li> <li>• Introducing artificial water recharging technics for the site.</li> <li>• Selection of appropriate edible plant material</li> </ul>	<ul style="list-style-type: none"> <li>• Designing the appropriate activities and their best sequence on site.</li> </ul>	<ul style="list-style-type: none"> <li>• Creating UA space providing activities, opportunity and challenges .</li> </ul>	<ul style="list-style-type: none"> <li>• Landscape management plan for UA .</li> <li>• Waste water treatments</li> <li>• Segregation of solid wastes.</li> <li>• Developing compesne pits</li> </ul>

Table -7

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## CONCLUSIONS AND GUIDELINES FOR UA

### 7.1 CONCLUSIONS

1. **CONCEPT OF URBAN AGRICULTURE** is a phenomenon of multiple activities such as growing food, raising livestock, education, social interaction and they all are associated with the biodiversity, health, economy, and environment.
2. **CRITERIA FOR SELECTION OF THE SITE:** Land use and public participation are essentials for and establishment of the UA project .layers such as the soil type , soil texture , fertility , geology , hydrology , vegetative cover are the natural features of the land which can help in categorizing the potential sites.
3. **CHALLENGES:** there are many challenges for project such as land related , site related , services related , administrative related , pollution and contamination , environment and public related.
4. **SOLUTION :** The education and awareness to the public about the importance and need of UA can be the solution for problems . The formation of committee for the management for the UA project which can provide the infrastructure and have the quality to manage the project. Organic farming , waste management , alternate growing technic can add to the solutions for the project.
5. **DESIGN :** The design strategies to be worked out in a way, that they are functional and aesthetical full fill the need of the city and public.

### 7.2 Landscape Guild Lines for UA

#### 7.2.1 Land

- a) The land inventory to be prepared for framing the process of finding the potential sites in any city.
- b) The sites to be categorized on the basis of various layers such as land use , soil type , soil texture , soil depth , geology & hydrology etc.
- c) The detail site study is to be done for the selected site such as slop analysis, services, land availability etc.
- d) Framing the requirement of the selected site based on the study.

- e) The strategies are to be prepared in form of zoning of the site based on the need of the public and city.
- f) The design intervention for the same on the bases of site analysis, requirements to be done, which should involve the tangible and intangible accepts.

### **7.2.2 Water development**

- a) Provisions of internationally recognized best practices and national or trans boundary water management plans.
- b) Preserve habitat for wildlife or fisheries
- c) Protect watersheds and water quality within or adjacent to the project area
- d) Preserve surface water hydrology, surface water quality, or water resources adjacent to project area.

### **7.2.3 Agriculture**

- a) A good understanding of the local biophysical and socio-economical and socio-cultural environment.
- b) Use sustainable agricultural practices/approaches/technologies.
- c) Promote the sustainable management and use of biological processes (as agricultural inputs).
- d) Follow the ecosystem approach for sustainable agriculture production and management.
- e) Contribute to protection or conservation of significant areas of land.
- f) Conserve genetic resources/diversity, especially agricultural genetic resources/diversity.
- g) Promote a balanced production system between crops and livestock.
- h) Reduce top-soil losses from erosion and the reduction in soil fertility/soil life. Induce conservation and efficient use of water
- i) Induce low energy consumption technologies or promote bioenergy sources
- j) Avoid changes in water quality and supply downstream of the project area.

#### **7.2.4 Biodiversity**

- a) Integrate the conservation and sustainable use of biodiversity into projects activities.
- b) Maintain the habitats unchanged and avoid the extraction of biotic and abiotic resources.
- c) Be far from a critical habitat.
- d) Avoid the release of chemical substances or the introduction of biologically modified organisms
- e) Avoid the erosion of local genetic resources, varieties, and species; the degradation of natural and agro systems, and/or the diminishment of ecosystem functions.

#### **7.2.5 Livestock and animal husbandry**

- a) Preserve the loss of traditional practices that conform with sustainable management practices.
- b) Avoid the introduction of new livestock types that do not fit with local farming systems
- c) Take into account rotational grazing systems or combined animal husbandry
- d) Avoid unsustainable manure management practices that can result in soil and water contamination

#### **7.2.6 Socio-economic dimensions**

- a) Create stable employment or generate new income in urban agriculture
- b) Facilitate participation, including women, in decision-making that directly or indirectly affects them.
- c) Enhance food security in terms of self-reliance and self-sufficiency.
- d) Increase local and national understanding and knowledge of sustainable development processes.
- e) Develop new models of sustainable management.
- f) Improve local management and technical capabilities
- g) Build upon experience of settlers in particular ecosystems, farming activities or technologies.



- h) Provide for training, extension and economic incentives to aid settlers in new environments and economic settings.

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Annexes

Appendices

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