

Urbanism to Riverine Planning Strategy for Climate Resilient Cosmic Sacred City in India-Varanasi

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1 ABSTRACT

The history of no other city is more fascinating than 4000-year history of Varanasi, which is inherent resilience in adopting itself to an ever-changing urban environment, independent of other religions and the whims and fancies of Indian culture. City is developed between two rivers i.e., Varana and Assi (Varanasi). City develops along the concave bank of river Ganges. Varanasi traces its origin to Anandvana; the forest of bliss where Lord Shiva sits in a yogic posture with his eyes closed listening intently to his wife Parvati playing the veena. He creates the cosmos contained in 'Kashi' with his yogic power and her music. He strikes his trident to hold the city and form three hills Omkareshvara, Vishveshvara, and Kedareshvara and place it beyond the ravages of time. He catches the sacred Ganga in his locks as she pours down from heaven (Kailash Glacier). The city originated with the creation of Manikarnika Kund (pool). Lord Shiva and Goddess Parvati made Vishnu to handover "Kashi" (Kaash). "Who so ever should have died in Kashi shall reach salvation" - myth in Vedas. The name Mani Karnika refers to the jewel of Lord Shiva's earring. The earring was studded with a pearl "MUKTA"- so the sacred place "tirtha" should confer "MUKTI"- salvation. There are hundreds of lingas in the city, however supported by Shiva's trident are greatly revered formed radial arterial road pattern of city space. The Ganga is conceived as the Kundalini power rising through the lotus chakras in Lord Shiva's spine as form of finger shape water channels pour in Ganga. The west bank is visualized as the spine of the primordial 'Purusha'- man-creation of world and (Assi and Varana) Rivers are water channels intermingling with liquid power of Ganga. The city was developed in the square and circle combination. The square includes mostly temples and circle act as the circumambulatory path around the temples. Further the expansion of the outside the square towards the panchkroshi route. The five sacred territories are further explained as the symbol of "gross elements". This is comparable to Shiva's dance symbolising cosmic cycle creation and destruction as the basis of existence - sky, earth, air, water, and fire which creating pilgrimage circuits in the form of garlands consisting of different number of shrines in chain.

Aryan group marched and cleared dense forests, established settlements along the Ganga plains between 1500 B.C to 800 B.C established textile industry, agriculture, brick architecture, crafts and merchantile. In second stage of development during 500 B.C habitant settled along rivers as being mode of transportation of goods for trade. In third stage during 4th Century people settled on the western margin of the ridge that lined the Ganga and also along the streams that lay inland. Most of the ponds and lakes were converted into jalatirthas associated with both Puranic and other deities. In fourth stage from 8th century to 10th century A.D. Pratiharas and Gandavals settled towards west and south-west. Construction of 350 temples confirmed the growth of Vanaras as religious nucleus of North India. City expanded upto Lolarka Kund in the south. The inscriptions of this period mention seven ghats along Ganga. 6 Km. stretch is fascinating with 86 'ghats' – platforms of 12 Km. with wide along the river Ganges performs rituals, cremation, washing, fishing, simply resting etc. Further Chines invasion, conquerers Mughal architectural plethora shows the habitation in Varanasi. Maratha's rule rebuilt the shrines. In 19th century Britishers replaced Maidagin Tank by a company garden in cantonment area. Machodari tank was drained into the Ganga through underground channel and the site was turned into the park. Close by a new market was developed. Bisheshwarganj was established in 1830, today's greatest grain market. Railways, bridges, improved sewage, and drainage system modified urban fabric of Varanasi. City was improved as social, educational, political power centre. Areas adjacent to the ghat and the old city exhibit dense development due to its proximity to ghats and their longevity of existence which has become the cultural fabric of the city. Maze of buildings and narrow streets along the length of ghats, temples, shrines, dormitory for pilgrims, shops, restaurants, and hotels crowded the cramped spaces of the city. Streets just wide for two people to walk. Impact on cultural integrity of old city is due to increased population from 1.2 million to 6 million within 175 Sq. Km area premises in festive seasons. The growth of peripheral areas is likely to be more in comparison to other parts of the city. Most planned development increased in pakka houses which rapid encroachment of vacant spaces, ill-drained areas. Gadaulia drain, Machodari tank disappeared and replaced by parks as a result. River Assi become sewage drain. The city has grown in the north and north-west direction towards Sarnath.

But with all malice the land of Varanasi is considered to be 'blessed land' because it was quite above normal flood level. In the flood plain site between the Ganges River, Ring Road, and Banaras Hindu University, a riverism planning strategy is using a combination of soil from cut and fill operations and dredged river silt to build the 'fingers'. The low-ground areas between the fingers will become capable of draining water to the river during monsoons while serving as ground for urban agriculture during the rest of the year. Infrastructure and transportation is also being proposed along the spine of the fingers, which will enable people formerly living on the low-grounds to have better connections with the city and its infrastructure, and live with resilience, harmony and improved economic opportunity. Restoration of Ghats, schools and temples surrounding kundis will coordinate tree nurseries. Varuna will be a site of community based nurseries to mitigate urban flood and regain its bliss of anadvan. Turning River Assis into a cleaning biotope. Self sustain water management through four water origin clouds (rains), nallahs (flows), kundis (holdings) and aquifers (deep holdings) will be made through productive terracing, trash catchment for resilient sacred cityscape.

Keywords: productive terracing, climate resilient, fingers, cosmic, riverism planning

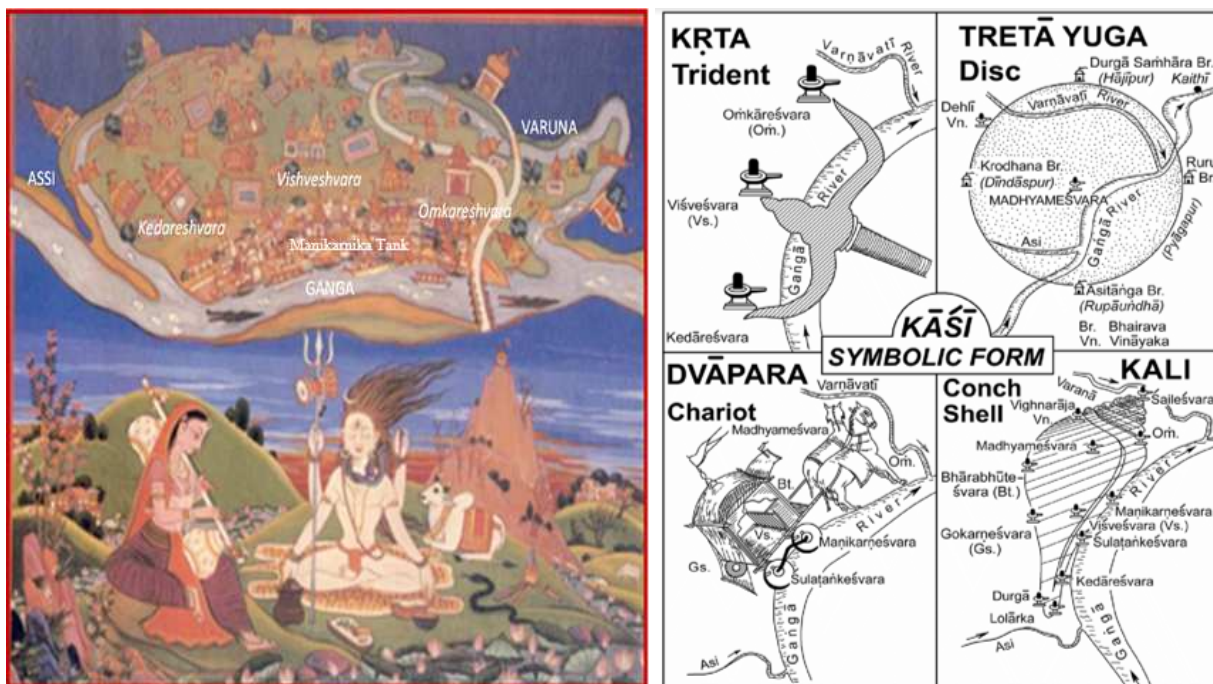


Fig. 1 (left): Origin of Varanasi. Fig. 2 (right): Symbolic form of Varanasi.

2 CITY SCAPE OF COSMIC CITY

Varanasi is developed between two rivers Varana and Assi in the state of Uttar Pradesh. The “sacred city” of India is recognized as the “most ancient continuously living city of the world”. The city is unique in the architectural, artistic and religious expressions of traditional Indian culture and is, even today a living example of this culture. As fast as continuity of cultural tradition is concerned city surpasses all civilization centers. The city is placed at concave slope of longest river in India Ganges. “Myths explain the sacred geography of Varanasi and the embodied practices that give it meaning and value in ways history cannot” (Singh, 1993). Myths occur in absolute space and eternal time. Their enactments impart a powerful and timeless quality to the cityscape. Varanasi traces its origin to Anandvana, the forest of bliss where Lord Shiva sits in a yogic posture with his eyes closed listening intently to his wife goddess Parvati playing the instrument veena. He creates the cosmos contained in Kashi with his yogic power and her music. Kashi i.e. kash is symbolises elliptical shape of earth. He strikes his trident to hold the city and place it beyond the ravages of time. He catches the sacred Ganges in his locks as she pours down from heaven kailash (Glacier) because of sage Bhagirath’s penance to revive the sixty thousand sons of King Sagara-ocean. Ganges purifies and sanctifies, washing away physical dirt and moral sins. In her phenomenal form, the Ganges invites rich visual, tactile, and haptic experiences in everyday, humdrum activities and performances that carry profound meanings. The tradition of ritual bathing at festivals, in the course of pilgrimage and in life

cycle events, has continued through the centuries and carries great significance. Shiva, one among the trinity of Hindu pantheon is the controller of time and the destroyer of the universe; he is Varanasi's patron deity.

The west bank is visualized as the spine of the primordial purusha- man. The Ganga is conceived as the kundalini power rising through the lotus chakras in his spine and 'Assi' and 'Varana' Rivers are water channels intermingling with liquid power of Ganga. At the beginning of time, lord Brahma's austerities resulted in a brilliant shaft of light erupting from the earth and piercing the skies and the numinous sound 'OM' signaling the creation of the world. Lord Vishnu dug a lotus pond and performed austerities there for thousands of years. Shiva and Parvati appeared and gave him a boon for living forever in Kashi. When they were bathing, Shiva's crest jewel (mani) and Parvati's earring (karnika) fell in the pond giving it the name Manikarnika. Close by is the mannikarnika ghat where the dying come to be cremated on the banks of the Ganga and have their ashes immersed in the river that flows through the three worlds-macrocosmos (heaven) into mesocosmos (earth) and further down into microcosmos (the temple, or body). In temples Shiva is worshipped in the form of a linga, the most famous one in Varanasi and its center, being jyotirlinga in 'Vishwanath' temple, the cosmic pillar of light that connects the city with heavenly and anotherworlds. There are hundreds of lingas in the city, however Omkareshvara, Vishveshvara, and Kedareshvara lingas in temples on the three hills supported by Shiva's trident are greatly revered.

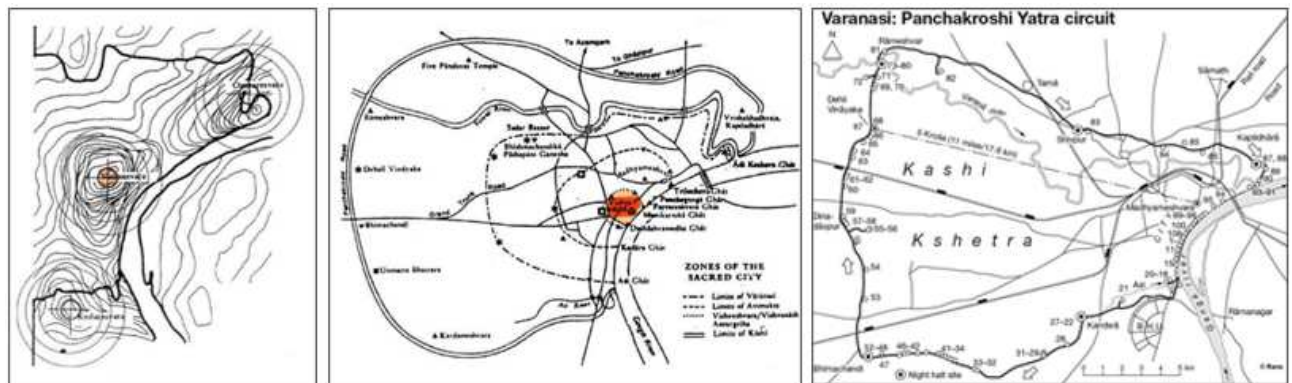


Fig 3: Three major temple in three hills placed in kashi- a sacred mandala-ring.

The meaning of Kashi as a sacred landscape rests as a mandala- ring, a cosmogram or symbol of universe, charged with positive energies. Kashi mandala is equated with the luminosity of Shiva's fiery linga. On the banks of the holy river Ganga, it is the domicile of Lord Shiva who is known as Avimukteshvar, one who never forsakes the city. This is the center where all journeys begin and end. It is the point of origin and of continual renewal though the body's engagement with the landscape in the circumambulatory journeys known as yatras. In obtaining darshan-visit in shrines and temples, bathing in the kunds, walking, performing rituals, chanting, among other activities, the sense of auspicious is enhanced. The holiness of the landscape lies in presenting wholeness through representation of the cosmos. Five circumambulatory circuits—Kashi, Varanasi, Avimukta, Antargriha, and Vishvanath—are traced in pilgrim yatras. They all begin and end with a bath at Manikarnika Ghat. The five sacred routes are also associated with the symbols of fivine body, transcendental power and sheath (Singh, 1991, 9; Singh, 1993, 38). The five sacred above territories are explained as the symbol of "gross elements". This is comparable to shiva's dance symbolising cosmic cycle of creation and destruction as the basis of all existence. As per the five elements comprising of sky, earth, air, water, fire; creating pilgrimage circuits which developed in the form of garlands, consisting of different number of shrines in chain. These five layers of sacred territories in Varanasi are as under:

| Macro cosmos elements | Mesocosmos sacred Route | Microcosmos Divine Body | Transcendental power | Sheath | Number of Shrines (Planets x Direction x Part of Body) |
|-----------------------|-------------------------|-------------------------|----------------------|-----------|--|
| Sky | Caurashikroshi | Head | Consciousness | Mind | 144 (9x8x2) |
| Earth | Panchakrosh | Legs | Action | Legs | 108 (9x4x3) |
| Air | Nagar Pradakshina | Face | Cognition | Breath | 72 (9x4x2) |
| Water | Avimukta | Blood | Wisdom | Intellect | 72 (9x4x2) |
| Fire | Antargriha | Heart | Bliss | Bliss | 72 (9x4x2) |

Table 1: Cosmic Pilgrim Circuit in Varanasi. Source: Singh 1993

The patterns become base for further development of cosmic order. The pattern of traditional and royal cities in India mostly duplicates a celestial archetype, reflecting cosmomagical power. Varanasi five of the various pilgrimage circuits are well developed; taken as a sequence leading from outer to inner space, they reveal

parallels between macro, meso and microcosmos and the related transcendental powers. Kashi mandala articulated in panchkroshi yatra is the largest, going beyond the city limits, while the Antargrihayatra is circumambulating only around the Vishvanath Temple complex. While the Kashi and Varanasi Yatras are loops, Avimukta circuit is a spiral reaching the center, Vishvanath Temple. The temple of Vishveshvara (Shiva as Lord, i.e. Ishvara, of the world, i.e. Vishva) is conceptualised as the pivot site on the cosmos.

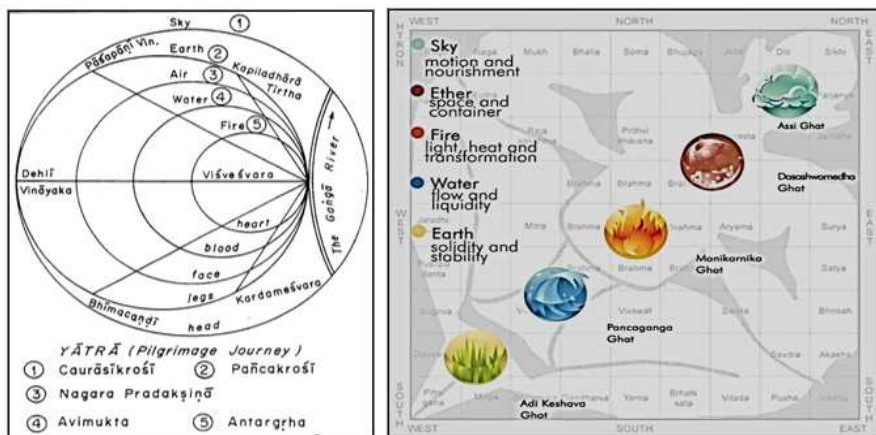


Fig. 4: Pilgrim circuit and symbols of nature's elements.

The land-water interface on the Ganga's banks is fashioned out of the need to access the rising and falling water levels in the monsoon and dry seasons. The cultural land-landscape of this interface ghats (steps and landings) lined by temples and other public buildings, pavilions, kunds (tanks), streets and plazas is layered and kinetic, and responsive to the river's flow. The city was developed in the square and circle combination. The square includes mostly temples and the circle act as the circumambulatory path around the temples. Further the expansion of the city started outside the square towards the panchkrosi route.

3 GROWTH AND DEVELOPMENT IMPETUS

3.1 Spatial Growth

First water structure created by Gods is 'Kund' – manikarnika pond was the inception of Varanasi as myth states. Omkareshvara, Vishveshvara, and Kedareshvara lingas in temples on the three hills supported by Shiva's trident were extension of first stage of spatial growth of place. City develops along the concave bank but not along convex bank in spite of fact, that the concave bank is vulnerable to erosion. The concave bank can cave in and cause destruction and the convex bank prograde by continuous deposition preventing easy accessibility to water. On such a prominent natural levee of the concave (left) bank of a meander of the river Ganga, is situated Varanasi. On the concave bank, the water of the channel flows touching the lower part of the bank natural levee. On the other hand, the water along the convex bank recedes (away from the settlement after once it is established) along with the progradation of the bank due to continuous depositional process. This is exactly the reason why large habitations develop over the natural levees along the concave bank. Of course, it is a different matter, once after a large habitation develops along a concave bank, if the river channel shifts because of cutoff, the habitations end up on the side of convex banks. That means the early habitations like Varanasi developed along the concave banks with a clear understanding of river channel processes. The land of Varanasi is considered to be 'blessed land' because it was quite above normal flood levels. During floods, when everything else is submerged in flood waters, the natural levee with a relative relief of 5 to 7 meters above the lowest level in the flood basin, the surface on which Varanasi has developed, can remain high and dry. Many local natural depressions were deepened and lined with steps; these ponds served as water source for religious as well as domestic purposes. Gradually, with the space getting filled by urban elements, these inlets and outlets got truncated from these ponds. The entire concave bank as it can be seen nowadays from its top margin to its lowest possible water level is lined up by heavy and large stones creating beautiful stone stairs running along almost 12 Km of distance for 6.8 Km stretch. (Raju, K., and Pandey, M. K. (n.d.). pp. 134 to 148).

Indias civilisation was date back with Aryan invasion at saraswati river in northern part of India. Due to dried bed of the Sarasvati river Aryan group marched towards the eastclearing dense forests and establishing "tribal" settlements along the Ganga and Yamuna plains between 1500 BC and 800 B.C. By around 500 B.C.

and reached the bank of the Sadanira (Gandaki) river. They settled towards north region (Varana river) and expanded toward south (Assi river). They establishment of textile industry, agriculture, brick architecture, crafts merchantile. City had connections with distant places as Taxila and this route is presently known as Grand Trunk Road - National Highway – 2 or renamed 19. Remain of Aryan settlements in rajghat region is found in Kashi. (Singh, R. P. 2009). Burnt brick houses,ditches and drains near the house blocks indicated functioning sewerage system and outfall in ditches.

During third stage 4th to 6th Century B.C. (Gupta Period) the Varanasi stone pillari Inscription of Buddhagupta, (B.C. 478), found in Rajghat, promoted the establishment of religious monuments. The main road ran north-south, parallel to the Ganga river with buildings on either side, was regarded one of the main road passing through the heart of the city. The association of the Shivlingas and a ghats along water channel was given religious meaning and ritual. Was thickly populated, prospering, and combination of congested houses separated by narrow lanes, gardens and groves, and water pools with lotus flowers.

Fourth Stage at 8th to 10th Centuray A.D. people settled on the western margin of the ridge, ponds and lakes were converted into jalatirthas associated with both ancestral and other deities. Settlement spreads towards west and south west. Construction of 350 temples confirmed the growth of ‘Vanaras’ as religious nucleus of north India. City expanded upto Lolarka Kund in south. The inscriptions of this period mention seven ghats along the Ganga river.

Fifth Stage during Delhi Sultane and Mughal Period 14th to 17th century A. D. the notable structures in the city and its neighbourhood are the shrines and Idgah at Bakaria Kund, the Arhai Kangura mosque and the mosque at panchganga Ghat. 18th century-Gosains-holyemen merchants organised as disciples around particular gurus i.e. religios teachers. Carvansarai- resthouse and dharamshalas-religious convention centres were built to shelter the visitors and travellers.

In sixtgh stage in year 1794 Varanasi came under British administration and with a limited jurisdiction known as the ‘Banaras State’, construction of several schools, hospitals, water pools and irrigation dams were under the Cantonment area. Establishment of the Banaras Hindu Universityin during 1914-16 in radial pattern makes city sprwal to expand along the riverfront southward and westward through the 20th century. Masonry bridges were built on the Ganga and the Varana river. Many ponds like Benia, Maidagin and Machhodari and Godaulia Nala (drain) were drained and replaced by parks or streets. Houses were demolished to widen the roads in the centre of the city Broad thorough fares were cut thorough the city where formerly there had been narrow lanes.19th to 20th century. Costruction of many eduactional institutions like Sanskrit College, Central Hindu College, Modern Hindu University, Christian Missionararies brought major change in the urban landscape. Opened a church at Sigrā (1817) and another in the centre of the city at Gadaulia crossing. Hospital for women was also constructed.

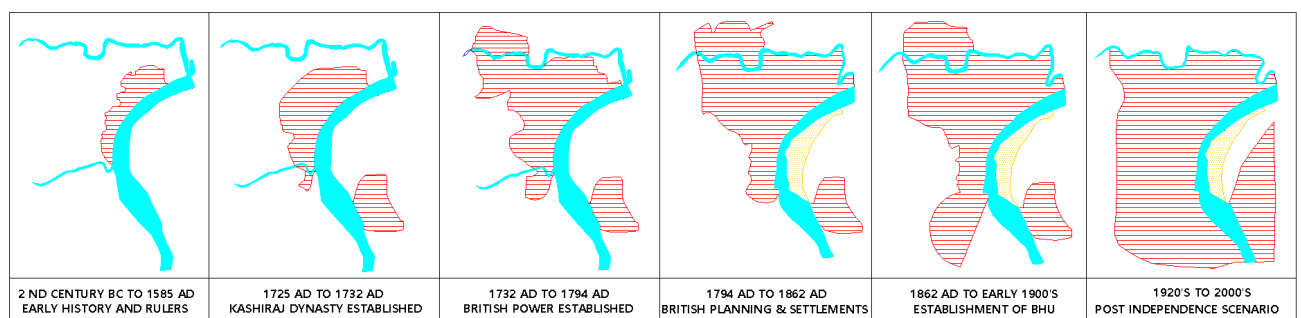


Fig 5: Origin and growth of City varnasi over period

The city of Varanasi has grown along the arc of Ganges with river Ganga as a focal point in one direction and growth of the city taking place in semi-circular direction. The growth pattern follows the origin of radial growth of three hills and fingers shape natural water channel falls in Ganges. The city has a radial development pattern with areas like Banaras Hindu University, Manduadih, Sheopur and Sarnath emerging as new growth centres in all directions. Over a period of time, with the inclusion of a large number of villages and urban settlements, the city development has resulted in irregularly shaped built up areas along peripheries of the central areas of the city. The coming up of the Diesel Locomotive works and residential colonies over an area of 250 Ha in the Southwest and the Soda Ash factory along the GT Road in the East mark the development around the rural city fringe. Dashashwamedha – luxa road was built running west

from the river toward cantonment railway station (now Varanasi junction). The north-south artery called 'chauk' was replaced by business district. Slowly city came to its present shape.

In 1951 master plan was developed by Improvement Trust for the development of the city and form tourist destination for sake of increase in economy. Crunch of availability of infrastructure, good connectivity with surrounding areas, influx of population extends city limit. Complex urban character has undergone transformations over time, still retaining its original character. Areas adjacent to the ghat and the old city exhibit dense development due to its proximity to ghats and their longevity of existence which has become the cultural fabric of the city.

3.2 Population Growth

The population of Varanasi city grew from 1.09 Million in census year 2001 to 1.19 million in Census year 2011 at a growth rate of 10% of decade. In year 2020 it was estimated 4.24 million poulated city in master plan area. The population trend of this city was very much driven of its climatic condition. During the three early decades (1891 to 1921), the population of the city declined by 11.2% mainly due to several unfavourable factors like poor harvest, droughts, irregularities of weather, floods, epidemics and the post-war effects of the World War I. In fact, during 1901 to 1925, Varanasi was one of the most deadly cities in northern India recording high population and unsanitary conditions. Since 1921 the city has recorded constant growth of population, recording a growth of + 28.77 per cent in 1981 to 91. During 1821 to 31 the growth rate was 3.81 per cent, while it reached to 28.10 during 1931 to 41. The closing impacts of World War II had also encouraged city-ward march of population. The post-war developments, the influx of rural population for employment and immigration of refugee population were responsible for a very rapid growth during 1941 to 51, however the abrupt situation had changed in course of time, that is how during 1951-61 the growth rate had slightly declined. This tendency had continued till 1971 to 81. However, again during 1981 to 91 the growth rate became slightly higher, mainly due to impact of tendency of rural to urban migration in search of better livelihood and employment opportunities in the city. The city is also upgraded as metropolis in 1991 by recording population over a million. It is expected that the growth rate would further be increased in spite of measures to check it respectively. In comparison to other metropolises, its growth is slower mostly due to lack of services related to administrative- capital and diversified industrial developments.

The present area under Municipal Corporation of Varanasi (MCV) jurisdiction is 79 km² with a population of 1.2 million in 2001 nad followed by 1.4 million in year 2011 for area of 82.1 km². Owing to its rich tourism potential, the estimated daily flow of tourists and pilgrims to the city is 40,000 to 60, 000 during festive season. The population density of Varanasi is 146 persons per hectare in census year 2011. The population density in 2001 was 133 persons per hectare. The number of wards in the city has increased from 40 in 1991 to 90 in 2001.

| Unit/Year | 1931 | 1941 | 1951 | 1961 | 1971 | 1981 | 1991 | 2001 | 2011 | 2021* | 2031* |
|---|---------|---------|---------|---------|---------|---------|-----------|------------|-----------|-----------|-----------|
| Municipal area (MCV) | 207,650 | 266,002 | 355,771 | 489,864 | 671,934 | 773,865 | 929,270 | 10,103,951 | 1,367,278 | 1,640,216 | 1,835,197 |
| Urban area Addition | | | | | | | 101,593 | 107798 | 205,558 | 344,502 | 511,962 |
| VUA (Varanasi Urban area Agglomeration) | | | | | | | 1,030,863 | 1,211,749 | 1,572,836 | 1,984,718 | 2,347,159 |
| Decadal Growth , VUA% | | | | | | | 29.48 | 17.55 | 29.80 | 26.19 | 18.29 |

Table 2: Population Griowth of Varanasi , 1971 to 2031. Source: Census of India, *Master Plan Estimation

3.3 Critical appraisal of development plans

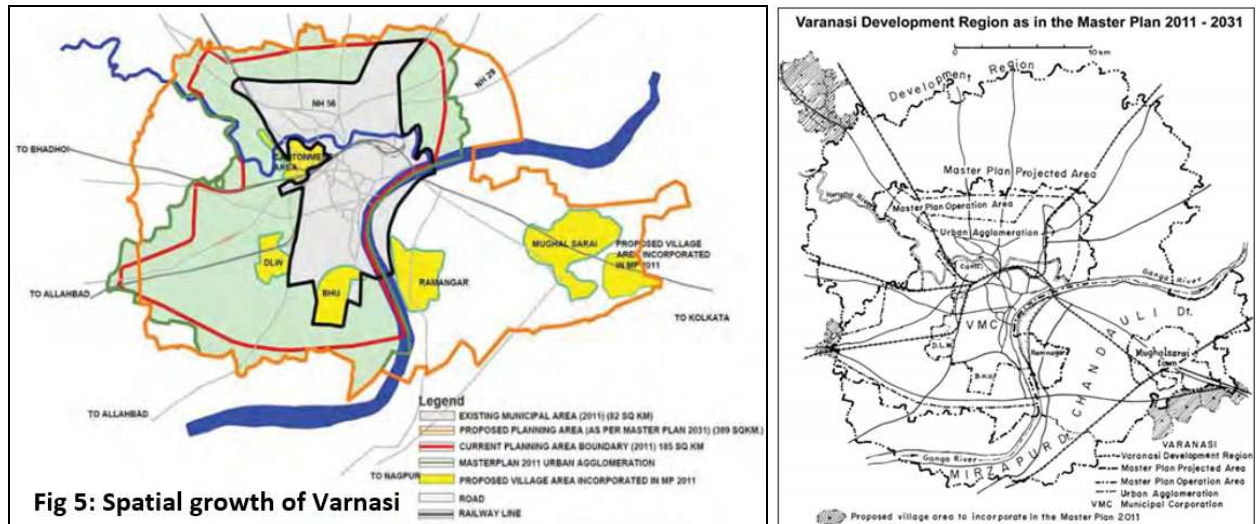


Fig. 5 (left): Spatial growth of Varanasi. Fig. 6 (right): Master plan region 2011–2031.

In 1982 the Varanasi Development Authority (VDA, formed in 1974) made five-tier areal units are of administration and planning strategy, taking Varanasi Development Region, VDR (as in Master Plan 2011). From lower to higher hierarchy they are: Varanasi City Municipal Corporation 84.55 Km², Varanasi Urban Agglomeration, VUA 112.26 Km², Varanasi Master Plan - Operative Area 144.94 Km², Varanasi Master Plan - Projected Area 179.27 Km², and the outer most Varanasi Development Region, VDR 477.34 Km². Under the Master Plan 2011 the expanded area proposed for the Greater Varanasi is 179.27 Km², however no way the land use categories fit to the standard norm of ecological balance. The most noticeable change during first master plan 1991 to 2011 Second master plan is expansion of the area of the city (+112%). The major changes since 1991 as in the Master Plan 2011, introduced after 1988, indicate a catastrophic increase of land under government and semi-government uses (+390.50%), and public and community facilities

| | Landuse Category | 1988 | | MP (I) -1999 | | MP (II) -2011 | | MP (III)-2031 | | % Changes in Master plan area | |
|----|------------------------------------|----------------------|------|----------------------|------|----------------------|------|----------------------|--------|-------------------------------|--------|
| | | Area Km ² | % | Area Km ² | % | Area Km ² | % | Area Km ² | % area | (I-II) | (I-II) |
| 1 | Residential | 26.1564 | 46.2 | 54.5724 | 37.7 | 92.5461 | 51.6 | 98.8654 | 40 | 108.64 | 69.58 |
| 2 | Mixed landuse | | | | | | | 7.5983 | 3 | | |
| 3 | Commercial | 1.7608 | 3.11 | 4.7510 | 3.28 | 6.1823 | 3.45 | 10.9954 | 4 | 169.82 | 30.13 |
| 4 | Industrial | 1.9531 | 3.45 | 9.8137 | 6.77 | 6.5619 | 3.66 | 5.1556 | 2 | 402.47 | -33.14 |
| 5 | Public and Community Facility | 2.6105 | 4.61 | 4.5042 | 3.11 | 13.0907 | 7.30 | 23.3933 | 9 | 72.54 | 190.63 |
| 5 | Recreation (Park & Open Ground) | 0.5304 | 0.94 | 27.0576 | 18.7 | 9.4847 | 5.49 | 46.527 | 19 | 50.0136 | 64.95 |
| 6 | Service and Utilities | | | | | 1.0397 | 0.58 | 1.412 | 1 | | |
| 7 | Govt. and Semi Government | 0.5669 | 1.00 | 2.9218 | 2.01 | 14.3315 | 7.99 | 5.0334 | 2 | 415.40 | 390.50 |
| 8 | (Tourism area) & Heritage Zone | | | | | 4.2373 | 2.37 | 0.924 | 0.14 | | |
| 9 | Transport and Communication | 9.1430 | 16.1 | 13.0027 | 8.97 | 14.6035 | 8.15 | 34.425 | 14 | 42.21 | 12.31 |
| 10 | Other (agriculture and open space) | 13.9379 | 24.6 | 28.3206 | 19.5 | 16.8345 | 9.39 | 5.7105 | 2 | 103.19 | -40.56 |
| | Total Area | 56.6590 | 100 | 144.9440 | 100 | 178.9122 | 100 | 246.4599 | 100 | 155.82 | 23.44 |

Table 3: land utilisation as per Master Plans of Varnasi (1991 to 2031). Source: Master Plans of Varanasi- 1991, 2011, and 2031

(+190.63%). The increasing pace of population results to increase area under residential uses up to 253.63% over 1988 (Table 3). This catastrophic change spoils the ecological system of the land use; the most crucial group is park and open ground that records decrease of over 60% in comparison to 1999. Similarly a great loss of agriculture and open land within the master plan area at the rate of above 40% is again a great warning. The existing urban setting and growth trends of Varanasi can be classified into three main categories. These areas are: (a) The Core or Old City consisting of the Ghat area including Chauk, Kotwali, Adampura, etc., (b) The Central City comprising of the area beyond the old city and bound by NH-2 or 19 now along the western and northern edge. and (c) Peripheral area comprising of the trans Varuna area.

Core City: “The old city of Varanasi is a maze of buildings and narrow streets that run along the length of the bathing ghats, temples, shrines, dormitory for pilgrims, shops, restaurants and hotels crowd the cramped spaces of the city. Some of the important areas are chachori gali, chowk, Vishwanath gali, Haraka Sarai, Chatta Tale, Thatheri Bazaar etc. The streets of this city are just wide enough for two people to walk shoulder to shoulder. This increasing population is over burdening the carrying capacity of the urban environment and the river ecosystem and unplanned mass tourism could potentially have a hard impact on the cultural carrying capacity. Social hygiene and sanitation methods too are beginning to bend under the pressure of a growing resident population and a constant large floating population.

Central City: The areas adjacent to the city core are constantly under great development pressure due to close proximity to the core areas. This is because of availability of all services, cultural attractions and Varanasi is no exception to this. These areas have been categorized as “proximal areas” in developing the growth analysis.

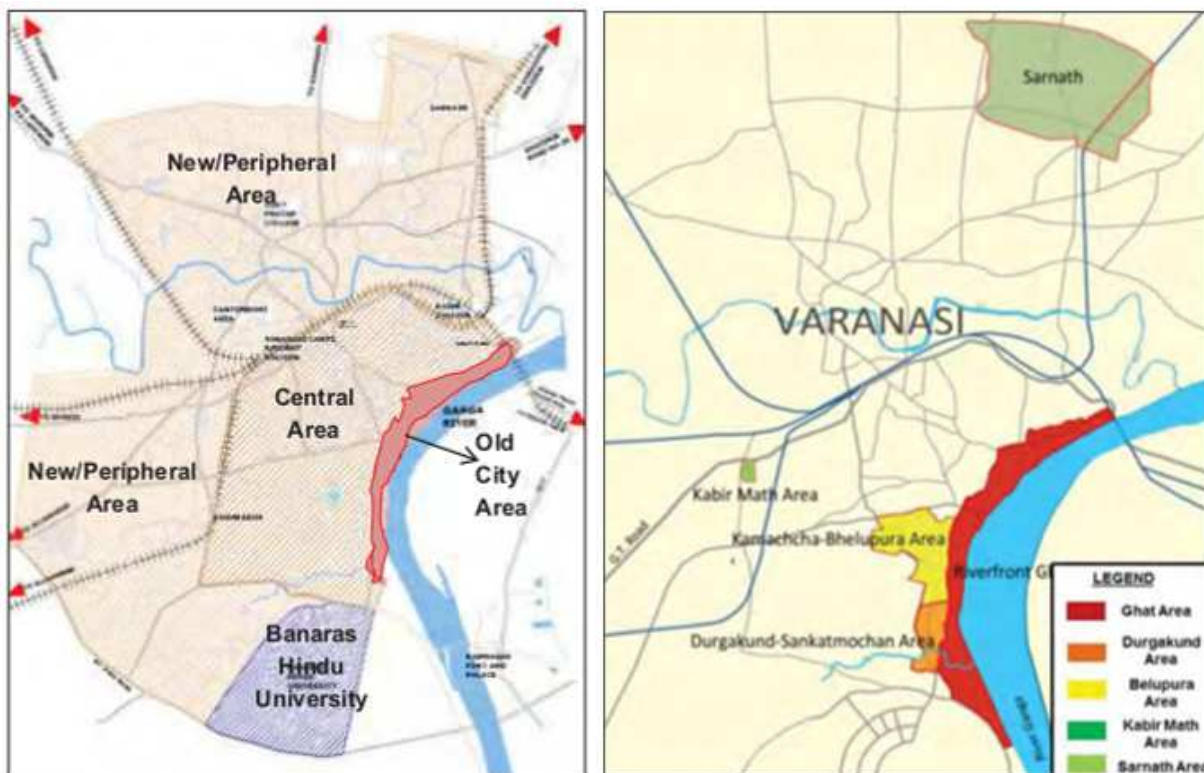


Fig. 7 (left): Classified areas in Varanasi. Fig. 8 (right): Heritage zone in Varanasi.

Peripheral areas: The peripheral areas encompassed by the municipal wards have more organized development pattern with infrastructure being relatively in better conditions. The State Housing Board, through the Varanasi Development Authority undertakes these developments. The demand for such development is increasing and with the participation of governmental and private development groups, the growth of peripheral areas is likely to be much higher in comparison to other parts of the city. The development in this zone is the most planned and organized in the whole city but there is a relative lack of recreational or green spaces in this zone. Major catalyst for urban growth will be development of new ring road to the north of the city. Combined with plans for a transport nagar in the western extremity of Varanasi and the connectivity across the Ganga to the eastern bank (to Ram Nagar and Mughal Sarai) the growth of urban areas and the population of Varanasi outside the municipal wards are likely to continue to accelerate.

Industrial Landscape: The small scale and household industrial was the backbone from Aryan invasion to till date all around Varnasi area. During post-independence period several large scale factories have been developed in and around the city. With the establishment of Diesel Locomotive Works (D.L.W.) during 1961 in the western part of the city, another industrial landscape has emerged. An Industrial Estate has been developed to the west of the city at Lohta where small-scale industries have sprung up. These incorporate manufacturing of chemicals, plastic goods, iron bars and metal equipments, etc. The city has recently developed a specialised industrial wing of bead and carpet manufacturing. Precisely, no industrial zone is

identifiable. The city has grown haphazardly in a natural process. All industrial wastes are outfall through natural drain into river Ganges.

Heritage Scape: There are five heritage zone identified. UNESCO heritage site is also been identified. This city is very important especially for pilgrimage tourism where tourist enjoy morning boat ride, walk in narrow lanes (gali)

- Riverfront Ghats(stairways to the river bank), the crescent-shaped 6.8 Km bank of the Ganga river (Ganges), from the confluence of Asi drain in the south to the confluence of the Varana river in the north, where lies eighty-four. Among the 84 ghats Dashashvamedha Ghat is the most important place for with architectural grandeur for visitors.
- Durgakund-Sankatmochan Area, consisting of about twenty temples and shrines and the historical water pools of Durgakund, Kurukshetra and Lolark kundas.
- Kamachcha-Bhelupura Area, possessing some of the old monasteries, ancient shrines and Jain Tirthankara Parshvanath established here.
- Kabir Math (Lahartara) Area, having monasteries related to the life of Kabir.
- Sarnath, where the Buddha gave his first sermon in 532 BC, and Ashoka developed township in 2nd century BC.

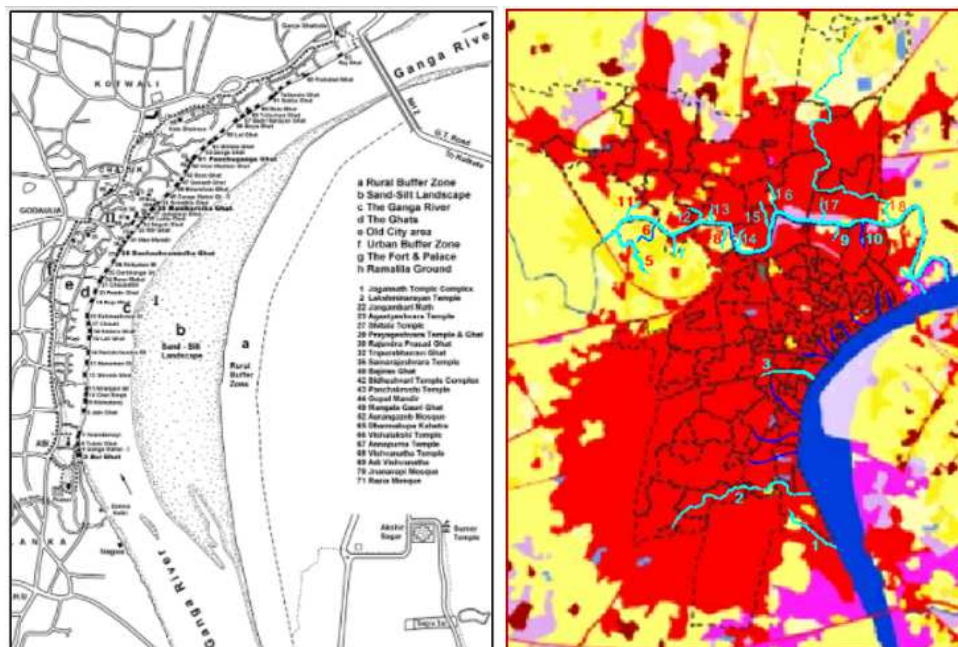


Fig. 9 (left): Varanasi riverfront heritage zone. Fig. 10 (right): Natural drainage channels in Varanasi.

| | Name of Channel/Drain | Point of Discharge | Condition |
|-----|-----------------------|---------------------------|---------------------------|
| 1. | Nakki | Ganaga River | Dry |
| 2. | Assi Drain | Ganaga River | Carrying Sewage |
| 3. | Telia | Ganaga River | Intercepted at sewer Line |
| 4. | Bhainsasur | Ganaga River | Intercepted in sewer Line |
| 5. | Phuwaria | Varana River (Right bank) | Storm water drain |
| 6. | Sadar Bazar | Varana River (Right bank) | Storm water drain |
| 7. | Raja Bazar | Varana River (Right bank) | Storm water drain |
| 8. | Teliabagh | Varana River (Right bank) | Storm water drain |
| 9. | Nakhi Ghat | Varana River (Right bank) | Storm water drain |
| 10. | Konia bypass | Varana River (Right bank) | Storm water drain |
| 11. | Central Jail Nala | Varana River (Left bank) | Storm water drain |
| 12. | Orderly Bazar | Varana River (Left bank) | Storm water drain |
| 13. | Chamrautia | Varana River (Left bank) | Storm water drain |
| 14. | Khajuri Colony | Varana River (Left bank) | Storm water drain |
| 15. | Banaras Drain No.5 | Varana River (Left bank) | Storm water drain |
| 16. | Hukulgang | Varana River (Left bank) | Storm water drain |
| 17. | Nai Basti | Varana River (Left bank) | Storm water drain |
| 18. | Narokhar | Varana River (Left bank) | Storm water drain |

Table 4: Natural Drainage Channel in Varanasi. Source: CDP, Varnasi

Among the above five, of course the Riverfront City is underway of enlisting under ‘mixed cultural landscape’ in UNESCO Heritage List, ultimately there is an urgent need to re-vitalise the city with re-establishing the ecological ordering by promoting riverine planning. The impact of urban sprawl and neighbouring effect is constantly marked by the expansion and growth of two towns across the Ganga river, i.e. Ramnagar and Mughalsarai, lying only at 5 Km and 18 Km east of the main city, respectively, It is further estimated that both of these towns will be directly linked as a continuous urban space by 2031. This tendency will further intensify the demographic and economic pressure on the cityscape of Varanasi.

The nallahs and rivers of the city are in a critical state due to the quantum of untreated sewage, Industrial waste and waste entering the rivers on a daily basis. Quality of water in Varanasi is found to be far below the ISI standards. It is estimated that out of the total pollution load runoff reaching the river stream, the load from point sources (urban wastewater and industrial effluent) is significantly high (94%), including 79% load from municipal sewage and 15% load from industries. The industries that are contributing to high pollution content are mostly dying industry, which is associated with making of Banarasi Saare and are located in old city area. The remaining 6% is observed to be contributed by non-point sources such as agricultural and forestry runoff, livestock, rural households, etc. There are total 18 drainage channel exist in varanasi City. They are all carrying untreated sewage and industrial pollutants. There are some big nallahs in the city, which are very dangerous to human and animal lives. The city is presently divided into four sewerage districts. Central City sewage district draining to Dinapur STP. This area includes the old city, about 1km in breadth and 5km along the Ganga River from Assi to Raj Ghat. Zone 2A is the sub-central district on the CIS-Varuna side west of the city centre and zone 2B is a slice of the Trans-Varuna district along the Varuna River up to the ridge line defined by the Jaunpur road. Trans-Varuna district north of the Jaunpur road. Wastewater in this. BHU/Assi district south of the City. At present this area is mainly the Banarasi Hindu University campus, which is fully sewerage. area generally falls to the north east direction.

4 RIVERINE PLANNING STRATEGY

Like many cities in India and elsewhere, Varanasi is at the intersection of two water systems: One from glacier Himalayas, melting snow and another drawing water from rain. It also extends via an infrastructure of pipes and drains to fields, industries, homes, and entire cities that draw water from it and return waste to it. To make resilient cityscape four major issues of concern are very prominent i.e. waters rising with climate change beyond the already 30 to 40 feet that they do each monsoons; increasing household and industrial waste in the Ganges basin; increasing volumes of silt coming off the Himalayas that buries the ghats and fills the some temples on the ghats under many feet of mud and debris each monsoon; the project already underway to inter-link India’s rivers with siphons, dams, and canals promises to make the flow of the Ganges past Varanasi more unpredictable.

Second water system begins with the monsoons, a wind laden with rain that blows from June to September. It feeds tanks called kunds or pools. These tanks are connected in series by their overflows, called nallahs drains which were water potable points for neighbours. Today this system is disappear. Overwhelmed urban sprawl intercepts natural custodianship systems.

Water supply and drainage system that speaks the language of the river rather than the tanks, but also endangers the river (IIT Report). During British period river hydraulics turned away from rain to rivers, constructing three sides to Varanasi: a) a “front” side on the river which is today the face of the city embellished with ghats populated by tourists and pilgrims; a middle city that Mark Twain on a visit describes as a “vast mass of building, compactly crusting a hill, and is cloven in all directions by an intricate confusion of cracks which stand for streets;” and a periphery of communities around abandoned tanks, many of them built over, made into ill-functioning parks, or lying derelict and polluted.

4.1 From Urbanization to River-ization

Varanasi is situated between two water commons: Varuna River in the north and Assi Drain in the south. The current “Varanasi 2031” Master plan proposed by the authorities is based on ring roads; it does not take into account the actual ground truths of the city’s rich landscape such as natural water bodies, whether in the form of flows or holdings.

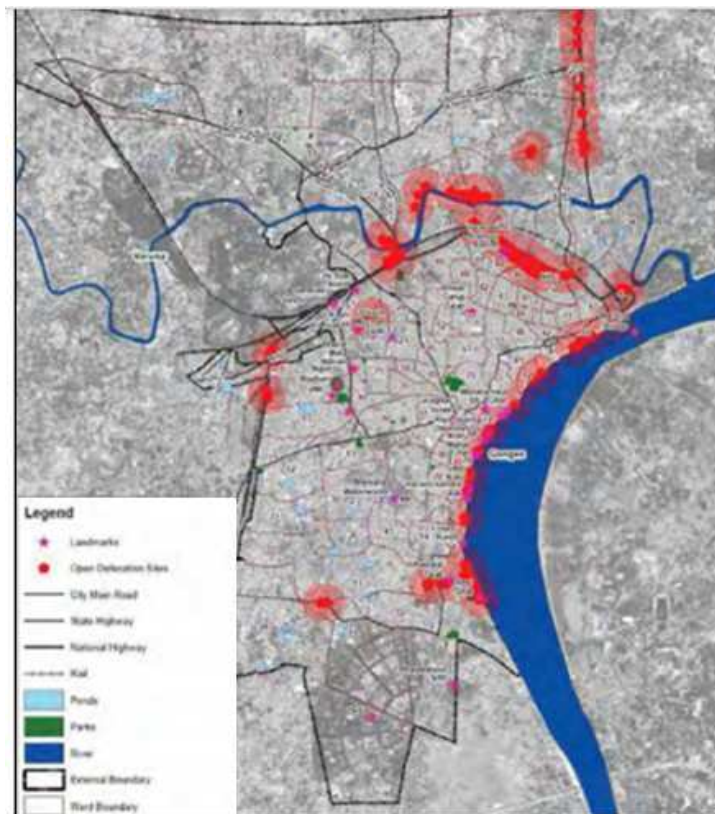


Fig. 11: Identification and location of intervention.

Rejuvenate Assi Nallah: 'If We Want a Clean Ganga, We Need to Start with the Nallahs'. At the origin point of the Assi drain, should decentralized and make biotic sewage treatment system. Since the landscape filtration system cannot treat all the wastewater, sequential platforms will provide initial wastewater treatment by removing the solids and reducing the smell. After this step, bio-filtration takes place to further clean the water. Runoff water is also treated through these folds in the landscape that act as bioswales. This treated wastewater and runoff water is channeled through the site into a larger water body that is designed along the open (maidan) spaces. Water from this water body filters into the existing kund (tank) and filters out to become the starting point of the Assi Nallah. These platforms of biotic sewage treatment infrastructure are expected to be owned and maintained by public health engineering department. At the confluence of the Assi and Ganga, this project celebrates this holy intersection by transforming an existing park into a delta of temporal productive landscape- for use by pilgrims and able to accommodate the flood waters of the monsoons. As Assi receives three billion liters of untreated waste everyday via nallahs which makes enormous untreated sewage pollutants to river Ganga.

4.2 Making room for river flood

The Varanasi Development Authority has prepared a 2031 Master Plan as meant to expand the city to accommodate the growing population. But looking Varanasi not means as fast growing urban centre but try to enhance its carrying capacity to adjust influx seasonal nomads. So, rather than static and linear growth entity, public spaces should be flexible, adaptable and resilient to accommodate the intensifying seasonal flux of people, flora and fauna.

Open space- maidan are always welcome density of users, and adaptability to different seasons. Talabs, parks and the edges of the Ganga River are common public spaces in Varanasi. They are identified as potential maidans which can be transformed into seasonal, adaptable and resilient spaces to absorb the intensifying flux.

Chakra Tal as a Maidan: Chakra Tal is currently an abandoned natural pond that once was an important social space for communities and a flourishing habitat for wildlife. The revitalization of the talabs (ponds) by introducing dams at the entrance of waterways into the talabs to act as silt traps during the monsoon. The residents will be encouraged to harvest this silt during rituals and then use the silt in community gardens along the talab. Service hubs and market stalls are proposed at the periphery to integrate the talab with the

community and to turn it into a front yard rather than a backyard, the way it once used to be. Sewage treatment tanks are proposed to purify the water from the residential developments into the talab and to sustain the talab ecosystem.

Beniya Park as a Maidan: Beniya Park is currently occupied by as temporary shelter, flute makers use it as a shelter and production space, and residents around it use it as a playground. The park is currently enclosed and fenced separating it from the surrounding urban fabric with an unfinished abandoned structure that was supposed to be a fish market and is currently used as a toilet. Beniya Park can be transformed into a productive maidan, with the fences removed to create a direct and continuous access. Trees can define the park and prevent encroachment. This wetlands can be usefor migratory bird hub and in dry season for festive markets.

Dashashwamedh Ghat and the Sandbank as Maidans: Physical barriers along the Ghats prevent continuity of public spaces and soiled water outflow are currently contributing to the pollution of the Ganga River. An extension to the edge of the Ganga River is introduced by adding floating docks and gathering points that will ease the intense crowds and provide a continuity of public spaces along the Ghats. During the monsoon season, Ghat activities can be temporarily shifted inland to seasonal markets and ponds. The kit of parts highlights the temporary elements that correspond to the needs in different seasons.

4.3 Ganga Floodplain Urbanism

In the floodplain site between the Ganges River, the Ring Road, and Banaras Hindu University, ‘fingers of high ground’ may use for combination of soil from cut and fill operations and dredged river silt to build the fingers. This will be followed by an incremental building strategy on top of the fingers and the low-ground areas between the fingers will become capable of draining water to the river during monsoons while serving as ground for urban agriculture during the rest of the year. Infrastructure and transportation is also proposed along the spine of the fingers, which will enable people formerly living on the low-grounds to have better connections with the city and its infrastructure, and live with resilience, harmony and improved economic opportunity.

4.4 Varana River as an Entrance

Varuna should once again become the front of the city. Starting from the railway tracks, situated on a higher level, down to the Varuna River with this goal, series of holdings of water in the form of natural talabs (ponds) as well as kunds (tanks) where water flows through a filtration nallah (waterways) should reclame. The idea is to be able to filter and store water at different locations. At the Varuna, we propose to soften the river’s edge to create different ecological habitat areas as well as constructed wetlands that will help in bioremediation-wastewater treatment for the wastewater that is discharged by the buildings along the river. At the confluence point with Ganga Varuna should have designated delta designed to create a set of floodable islands that serve as the last layer of water-bioremediation as Varuna enters the Ganges. During dry season, these floodable islands can become destination points for boats and tourist flows, hosting various types of public spaces as well as a farmer’s market.

The Ganga river’s severe flooding is increasing proportionally to the depletion of forests. Forests hold wetness and regulate flows. Reversing deforestation will make living in the Gangetic plain more resilient as well as increase biodiversity and provide various services at a local level. The loss of the forest is a tragedy for those to recapitule of myth- Shiva’s Anandavan – forest of bliss. But it is possible to revive Anandavana. The forest will start to grow from alongwetlands toward the countryside aiming to ultimately achieve a single patch of forest cover in the future for the whole Gangetic Plain.

5 TAKE AWAY

Above envisage strategy planning will restore the origin form of Varanasi- a riverine ecological hub for clean spiritual destination, revisitation of god’s water structure Kunds, safe floodplain urbanism. Turning Rivers into a cleaning biotope, self sustain water management through four water origin clouds (rains), nallahs (flows), kunds (holdings) and aquifers (deep holdings) will be made through productive terracing, trash catchment for resilient sacred cityscape. In different ways, by different means, and at different times to restore the value of the Origin of place-Varana River as a spiritual spine, a cleansing biotope. Rejuvenating the glory of Assi makes recognition of nature value as drivers of self sustainable riverism planning in

cityscape.. The residents of Varanasi will, then, benefit from a water oriented city where they will have access to clean water for drinking, irrigation and cattle rearing purposes in an ecological environment that can once again hosts a diverse species of animals and plants like it used to.

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