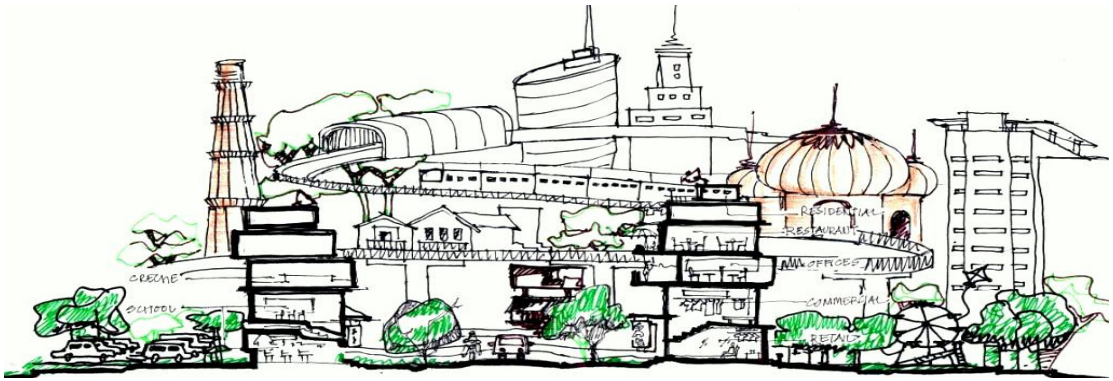
Towards more Livable Indian Cities

Case example Palava



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Introduction

Cities have always been and are even today engines of growth, bringing together innovators, enterpreneurs, financiers as well as academicians. They attract a rising tide of people, hoping for a better life for themselves and their children. Cities provide opportunities, economies of scale - a future with more choices. The success of a city lies in recognizing its natural features and its environment to build on these to ensure the best possible returns that empowers its citizens not only with physical and mental well being, but also bestows economic as well as social empowerment.

By 2050, about 70 percent of the world's population is expected to be urban. The urban population of Asia and Africa is set to double between 2000 and 2031. The world demographics are shifting towards urbanization. India, expected to be an urban majority country (the urban population increasing at a growth rate of 31.8%), is at the forefront of this massive drift. Besides the reformation needed for the existing cities to accommodate this transition, equally indispensable is the need to plan for new urban centres. Hence, it becomes imperative to plan our future cities in a more holistic and sustainable manner, extending beyond the physical and tangible infrastructure planning parameters, to be able to offer the citizens a livable environment.

Palava is a new city being planned in the plains between the Sahyadri foothills and the western seaboard of India. It sits on two parcels of land of about 2800 acres, just 20 minutes from the proposed new International Airport of Mumbai. Palava is being planned with the aim to be classified as one of the most livable cities of India and, indeed, globally as well.

The 'Livability Manual' presents itself as a comprehensive guide towards the planning of upcoming cities to evolve as livable urban environments. The manual takes the case example of Palava to illustrate the applicability of its recommended guidelines.

Understanding ‘Livability’

Livability has been an attribute of cities that is elusive, yet it is what makes a city successful, far more than mere economic success. Many generations of urban planners (starting with Leonardo da Vinci, in his planning for Milan) have struggled with a definition that would make it possible to create a ‘formula’ or a ‘correlation’ for creating great cities that the citizens would be proud of.

As the wave of development and urbanization swirls up in the developing nations, the 20th century approach of the globalized west will not create livable cities in the 21st century globalizing east. They will have to discover their own identity and create their own patterns of achieving livability. Given the limits imposed by the emerging issues of Peak Oil and Climate Change, further urbanization throughout the world can only be sustained, if we adopt lifestyles that rapidly reduce the dependence of our cities on fossil fuels and even more urgently eliminate their emissions of greenhouse gases. Hence, the cities have to be planned and designed within the framework of Livability, adhering to achieve certain functions and a certain level of quality of life for the present as well as for the future generations.

In the present day context, ‘Livability Rankings’ exist that gauge and judge the city in terms of the criteria deemed necessary for it to be classified as ‘Livable’. These have been used extensively by cities such as Vancouver and recently by Shanghai and Schenzen, to attract people with the ‘correct’ profiles; typically, young, upwardly mobile, and entrepreneurial, with specialized education and an ability to create a demand for local cultural goods and products. So far, no Indian city makes it to even the top 50 on these Livability indices. It would make sense in the given context for Palava at some point, to expect to be ranked and lead this transformation by example.

Livability Indices



a. Melboune, city view

'The world's most liveable cities' is an informal name given to any list of cities by the various institutions or organizations working constantly to forge Livability Indices to rank the living conditions of the cities throughout the world based on reputable annual surveys. Two examples are the Mercer Quality of Living Survey and The Economist's World's Most Livable Cities.

Important criteria in these surveys are safety/ crime, international connectivity, climate, quality of architecture, public transportation, tolerance, environmental issues and access to nature, urban design, business conditions, pro-active policy developments and medical care.

The most Livable Cities

At Global level



Melbourne city map
Area : 8806 km² (3,400 sq mi)



Vancouver city map
Area : 114.97 km2 (44.39 sq mi)

Melbourne

Economist Group's Intelligence Unit ranked Melbourne as the world's most livable city in August 2011. It was also ranked in the top 10 Global University Cities by RMIT's Global University Cities Index (since 2006) and in the top 20 Global Innovation Cities by the ThinkNow Global Innovation Agency (since 2007).

Population: 4,077,036
Density: 1566/km² (4,055.9/sq. mi)
The Hoddle Grid street layouts with one mile (1.6 km) long by half a mile wide (0.80 km).All major streets are one and half chains (99 ft. or 30 m.) in width.
Melbourne accomodates one of the highest lengths of road per capita in the world.

Vancouver

Vancouver has ranked highly in worldwide "livable city" rankings for more than a decade according to business magazine assessments and it was also acknowledged by Economist Intelligence Unit as the first city to rank among the top-ten of the world's most livable cities for five straight years.

Population: 578,041
Density: 5,039/km² (13,051/sq. mi)
City of Vancouver differs from its suburbs in its adherence to a simple grid layout of streets.
More recently, the city has been debating "ecodensity"—ways in which "density, design, and land use can contribute to environmental sustainability, affordability, and livability."

In the Indian Context



New Delhi map
Area : 1500 km2 (579 sq mi)



Bangalore City map
741.0 km2 (286 sq mi

New Delhi

New Delhi has been ranked as the best place to live in India, according to the "Liveability Index 2011" prepared by the Institute of Competitiveness followed by Mumbai, Bangalore and Ahmedabad.
According to Mercer, it is the most expensive city in India for expatriates in terms of cost of living.

Population: 249,998
Density: 5,854.7 /km^2
New Delhi has one of the highest road densities in India (1922.32 km per 100 km^2). Private vehicles account for 30% of the total demand for transport. The Delhi Metro rapid mass transit system operated by (DMRC), serves many parts of Delhi as well as the satellite cities in NCR.

Bangalore

Bangalore ranks fourth in the Livable City ranking in India by the institute of Competitiveness report, 2011. Comparing house cost and availability, urban household crowding and household incomes, Bangalore, offers the best housing options as compared to any other metro city across India.

Population: 8,425,970
Density: 11,371 /km2
Bangalore is the 38th cheapest place in the world for expatriates to live, out of a total of 276 international locations. With an economic growth of 10.3%, Bangalore is the fastest growing major metropolis and country's fourth largest consumer goods market.

...Towards more Livable Indian Cities

Why should it be done?

The way forward

A Livable City Offers

Increased

- **Productivity**
- **Participation**
- **Leisure Time & Social life**
- **Security**
- **Health**
- **Safety**
- **Connectivity**

Reduced

- **Congestion**
- **Energy Consumption**
- **Carbon Footprint**
- **Cost of Living**
- **Stress**

...Towards more Livable Indian Cities

How should it be done?

The way forward

The Livability Manual uses theories proposed by earlier urban thinkers as well as the various 'Livability Ranking' criteria to evolve a set of guidelines that are relevant to the present day Indian context. It proposes a set of 9 Determinants to be considered for designing and planning a new town, city or urban centre.

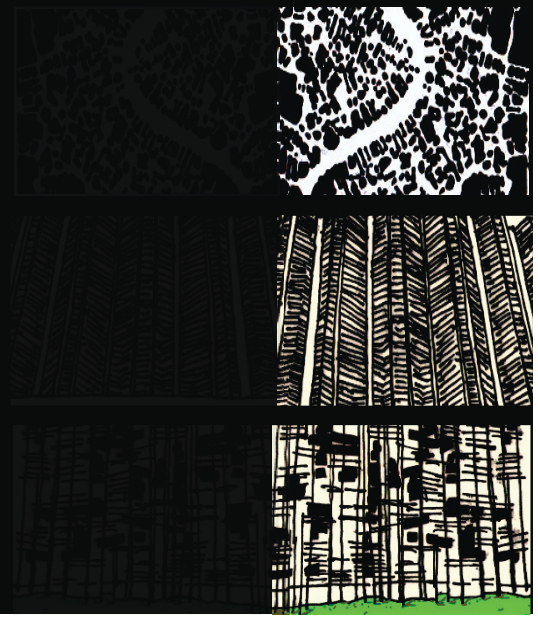
In Section-I, the book will describe the Determinants and set out Guidelines and Performance specifications for each, along with illustrative examples.
Section- II will explore the applicability and do-ability of the proposed guidelines and specifications for Palava.

Section I



The Determinants

Urban Pattern
Envelope Controls
Mobility
Biodiversity
Environment
Energy
Intelligent & Smart Systems
Health, Safety & Security
Materials & Construction Systems



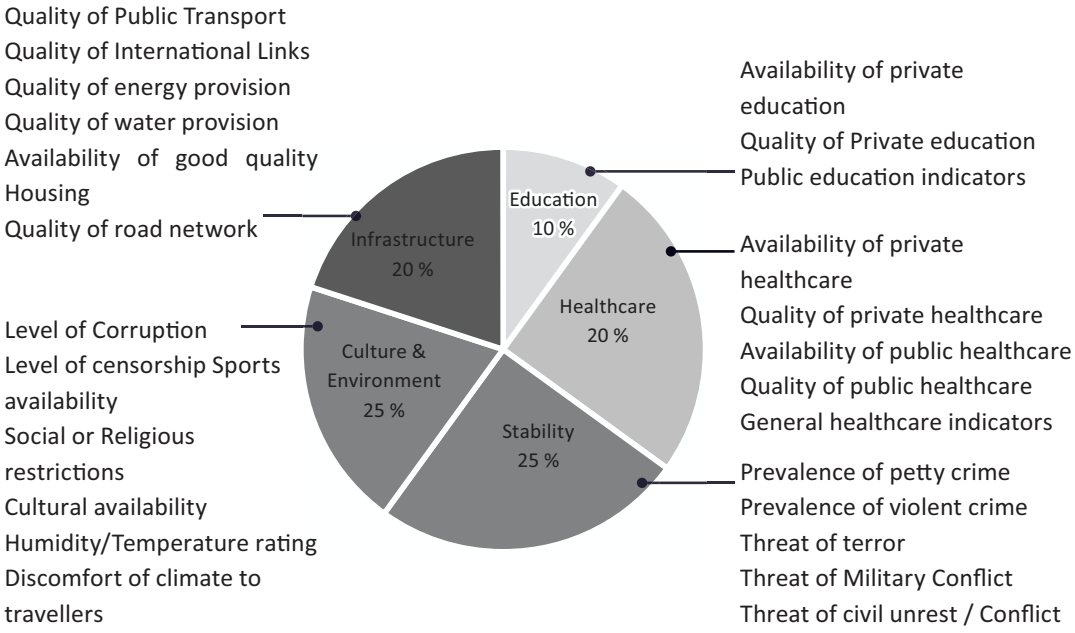
To demonstrate how the determinants relate to the previously postulated livability theories, examples of Kevin Lynch's performance dimensions (1981) & Economist Intelligence Unit (EIU) determinants, have been used to illustrate their inter-relationship.

		KEVIN LYNCH'S DIMENSIONS			
S.NO.	DETERMINANTS	ACCESS	VITALITY	SENSE & FIT	EQUITY
1	Urban Pattern	Density, Street Pattern, Building Volume	Built : Open ratio, Public Realm	Ground Coverage, Density, FAR, Scale, Street Pattern, Land Use, Height	Land Use, Public Realm, Open Spaces
2	Envelope Controls	Orientation, Access, Ventilation, Lighting	Comfort, Safety, Ease,	Adaptive, Thermal -Visual-Acoustical Comfort, Building texture, Colour	Sustainability, Access, Efficiency
3	Mobility	Connectivity, Access, Convenient, Choices, Flexibility, Land Use , Smart Grids	Ease, Comfort, Safety, Efficiency, Flexibility	Street / Road Design, Integration, Density, Compactness , Management, Land use	Diversity, Choices, Equity, Efficiency, Management
4	Biodiversity	Public Realm, Bio-region	Productive Landscapes	Environmental Protection	Sustainability, Efficiency
5	Environment (Air Quality & Noise, Water, Waste,Solid Waste)	Access to infrastructure, Smart / Intelligent options	Adequacy, Quality,	Visual-Thermal & Acoustic Comfort	Distribution, Management, Choices, Substitution, Efficiency
8	Energy	Choices, Smart Energy Grids	Safety, Reliability, Adequacy, Efficiency	Integration, Renewable Energy Sources	Distribution, Management, Sustainability, Efficiency
7	Intelligence, Connectivity etc. & Information Systems	Access, Smart Grids, technological Application,	Safety, Security, Efficiency, Surveillance,	Reliability, Integration	Control, Regulate, Management, Efficiency
8	Health, Safety & Security	Accessibility, Choices, Availability	Quality, Safety,	Reliability,	Equity , Efficiency, management
9	Materials & Construction Systems	Scheduling, Transportation, Technological Application	Efficiency, Safety, Quality,	Availability, Emissions, Embodied Energy,	Sustainability, Efficiency, Labour Employment, Cost-effectiveness

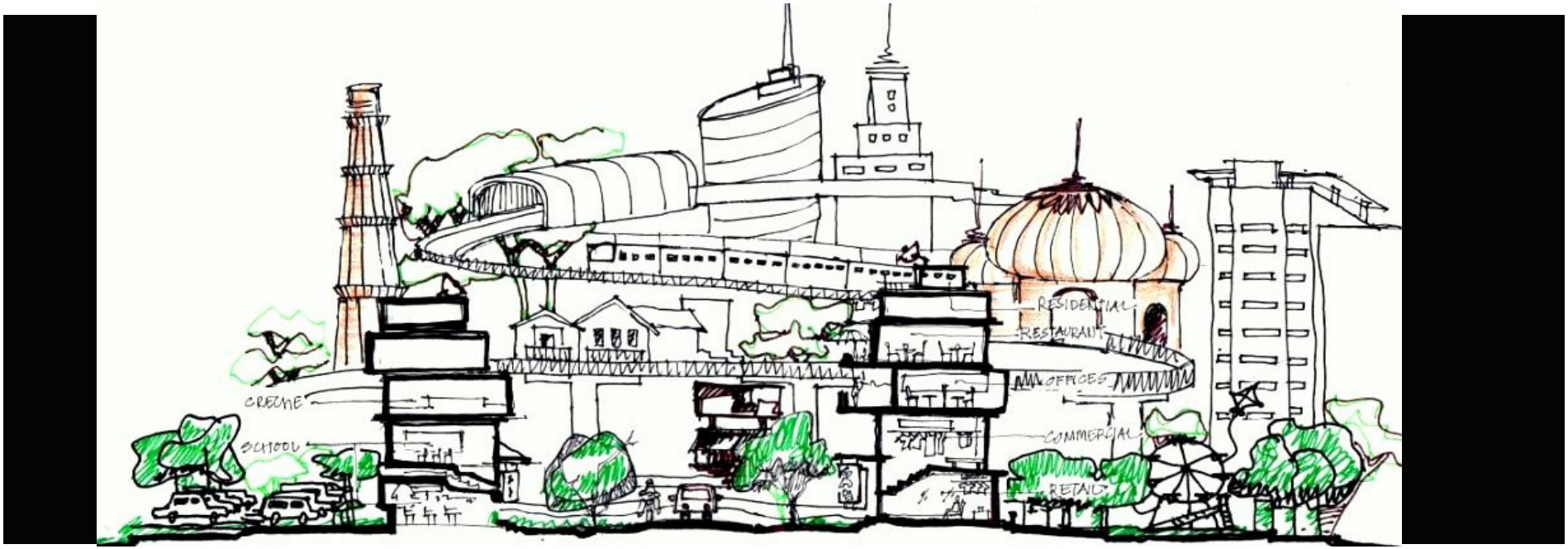
Inter-Relationship Matrix

Lynch's performance dimensions & the determinants.

The Livability criteria used by EIU primarily emphasizes 5 determinants with specific weightages that define their importance.



Urban Pattern



It is the cumulative effect of its various components that influence how buildings are positioned and designed to enclose open spaces and streets. This, in turn defines the experience of the place.

Guidelines

To achieve a sustainable Urban Pattern that enables maximum resource optimization and flexibility to accommodate the future needs.

For a Livable City

1. Promote diversity of land uses

2. Integrate Landuse and Transport planning with a system of attractive public and open spaces

3. Create an Intuitive understandable and compact layout

The planned development shall respect the existing and natural features to decide the street pattern and to evolve an identity of its own. A well-recognizable urban layout gives a better understanding of the place and eases the navigation for the users while walking, cycling or driving.

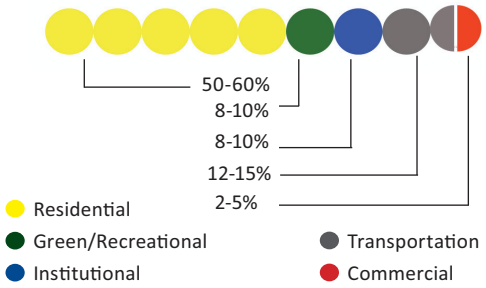
The planning should have an appropriate mix of live, work and play, ensuring a city's long-term economic viability and sustainability. A diverse mix of housing types and neighborhood experiences shall also be promoted.

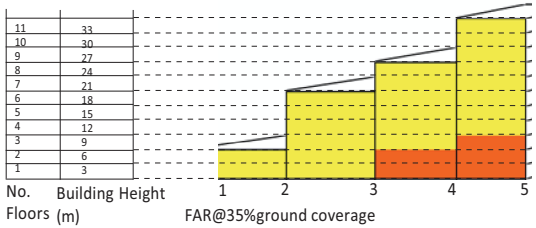
The city shall be planned in a compact manner with a balance in diversity of land uses that would foster long-term economic stability. Compactness optimizes the investment, consumes less territory to accommodate maximum population, enhances walkability and allows the creation of an efficient network of public utilities.



Urban Fabric with a mix uf uses

Performance Specifications





Land Use

Land use shall be planned as per UDPFI Guidelines and norms depending upon the city size. An ideal land use distribution is shown in the diagram.

The ratio of Residential to Non-Residential use shall vary from 50:50 to 70:30

Building Height

Minimum height of 4 storeys is necessary to achieve minimum compact density within the planned development.

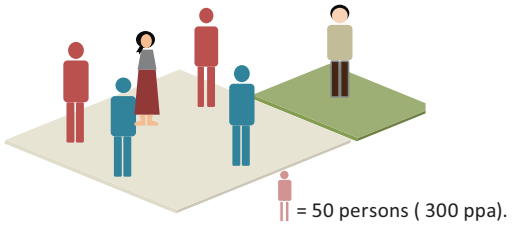
Max. Height for or plots up to 4000 sq. m = 15 m..
Max. Height for plots more than 4000 sq. m.
(For MIG and HIG) = 26 m..

FAR/FSI

For Residential areas, shall not exceed 1.5 and may go up to 3 or 4 for mixed land use.

Building Heights corresponding to the ideal ground coverage and varying FAR.

Performance Specifications



Density

Gross Density to range above the low rise – sparsely spread out cities (up to 200 ppa) and below the multi-storeyed high rise congested cities (above 400 ppa).

Ideal population density for a city up to 8 lakh inhabitants is 300 ppa.

Ground Coverage

Maximum ground coverage for group housing shall be taken as 35%.

Refer Chapter 3-Mobility,Section-I for density, FAR and mix of land use for a compact Transit Oriented Development.



The Example district, Barcelona, Block dimension of 113.3m square. Blocks have 50% Ground Coverage | Maximum height =20m /4 stories. An ideal example of a compact design with enhanced walkability.

Building Block Size

Building cluster design shall maintain walkability within the neighborhood. Ideal Habitable block area = 2250 sqm or the ideal block size: 60m X 180m .

Performance Specifications



A neighborhood level park in a residential area, Lisbon, Portugal

Green/Open Spaces

Recreational area shall be approximately 15–20% of the entire site. City must have green/open spaces @10 – 12 sqm per person. A neighborhood level green and open space should be planned with ensured safety for children, women and is accessible to all of different age groups. Placing parks in open areas that are visually monitored promote a sense of security to the users.
Such spaces offer recreational areas as well as act as platforms for socializing within the city.

Conflicts & How to address them

Inclusivity vs Socio-economic Barriers

Don't disaggregate. Rather Integrate the housing types – EWS or Social housing, LIG, MIG, HIG or Aspirational housing to create equitably distributed housing throughout the city.



A community celebration exhibiting social inclusion within the neighborhoods in Toronto , Canada.

Contemporary Demands vs Historical Context

Preserve the historicity and blend it within the contemporary fabric to weave in the heritage and character of the place.



The CSC building, Austin, complements the Historic Schneider building in scale and articulation.

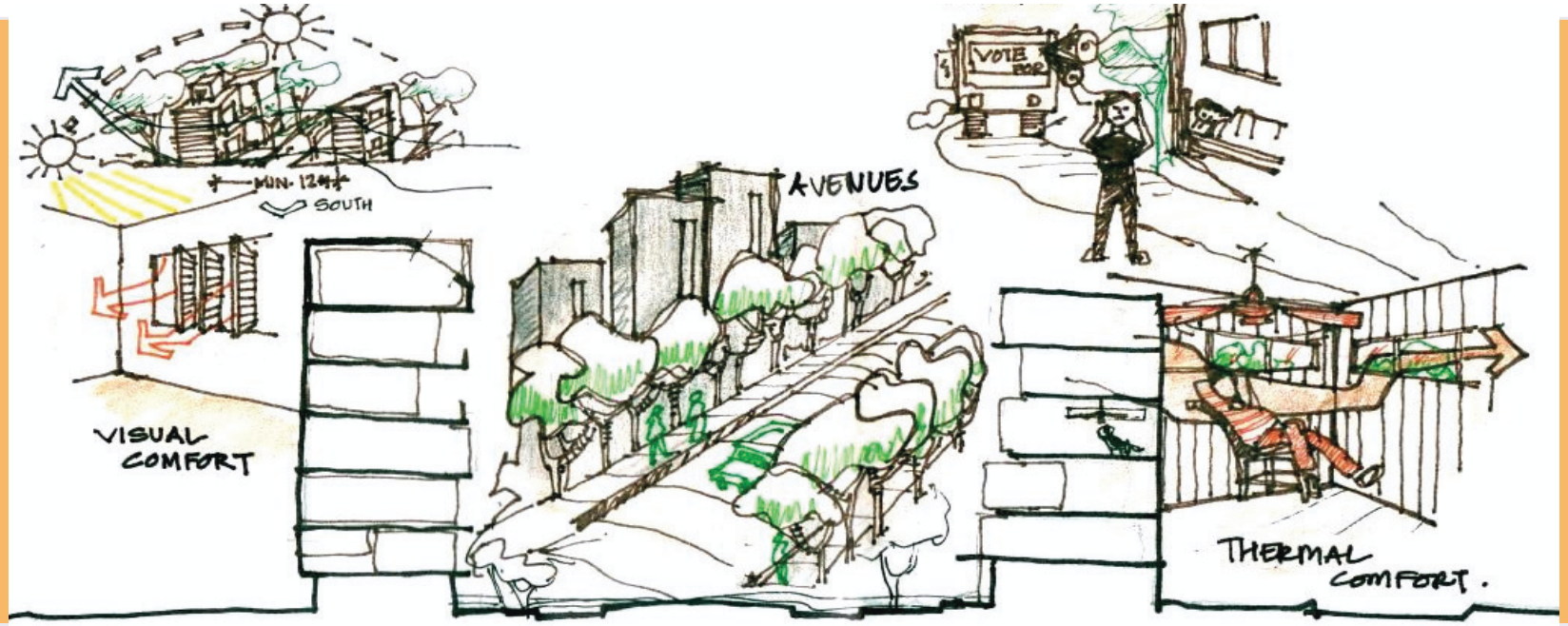
Compact Design vs Open Environment

Considering the guidelines for a compact development, the blocks shall have multiple entries and a neighborhood green/ open space to balance the built up area.



Eco -Compact City, Edinburgh has most of the sight seeing destinations not more than 15 minute walk time.

Envelope Controls



Envelope is the surrounding or the embracing wrap which impacts the microclimate within the site – at the master planning level, the neighborhood level and at the individual building level.

Guidelines

The aim is to achieve an optimum thermal, visual and acoustical comfort inside the building, on the street and also in the surrounding open spaces.

For a Livable city

1. Achieve appropriate site orientation to ensure maximum comfortable living environment

2. Attain the most efficient and the best adaptive design features

The layout planning and designing shall suit the local environs and climatic conditions, ensuring enough access to sun and wind when required and avoid when not. Efforts shall be made to minimize the intervention to the natural resources and orient/re-orient the structures to adapt to the existing features. Enough flexibility shall be ensured for the futuristic expansion or as per the phase-wise development.

An appropriate scale relationship between building heights and street width shall be planned for managing overshadows and access to sunlight.

The necessary and mandatory norms for design like for HVAC, lighting design, surface reflectivity, use of colour and texture, size of fenestration and openings shall be provided to ensure a comfortable environment to live within.

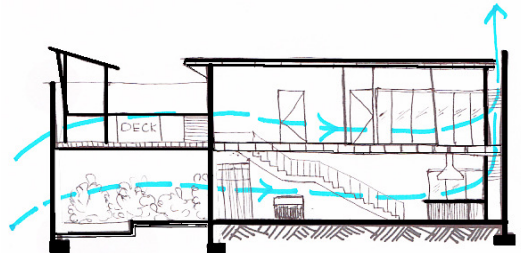


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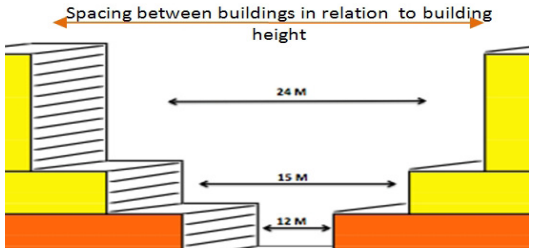
LEED Parking Garage, Santa Monica Civic Center

Performance Specifications

At Neighborhood and Building level



Air circulation through an inner courtyard.



Proportion of building height to the spacing between them.

Common areas/Lobby/Circulation Area

Provide entries to apartments along the length of a long corridor. Max number of apartment units per floor accessible from a common lobby shall not be more than 9.

Increase air exchange rate (Ventilation throughout the day) through ventilated roof construction, courtyards, wind towers and arrangement of openings.

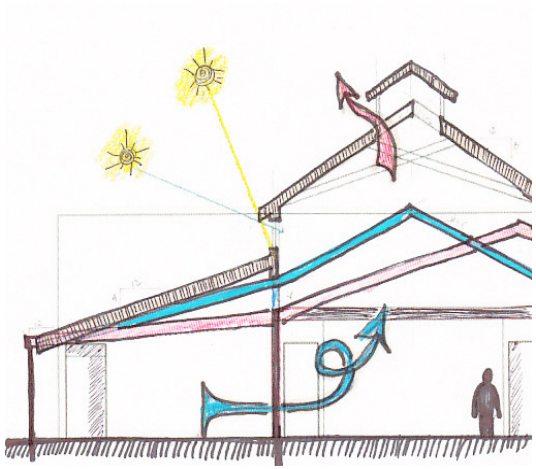
A common lobby area shall have a minimum dimension of 2 m. width in any direction.

Spacing between Buildings - (between window of one building to another)

12 m. spacing - Up to four storeys or 12 m.
18m - Between 5 to 8 storeys or up to 25 m.
24m - 9 storeys and above or over 25 m. high

Building cluster/block size

Building cluster or an individual block size shall adhere to the compact development standards. Refer Urban Pattern for the recommended block size.



The sketch highlights the habitable space design to allow maximum sun and natural day light through indirect access points and cross-ventilation throughout.

Acoustic Performance

Apartments near commercial activities should be designed by locating noise-sensitive spaces, like the living area or the private open spaces, away from the noise producing non-residential activities.
For meaningful sound reduction, the air gap between the outer walls has to be greater than 25 mm or prefer the use of thicker glass.

Fresh Air Ventilation

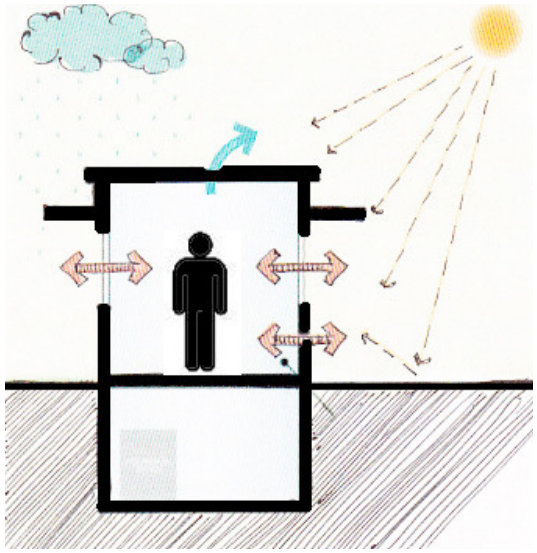
For air-conditioned space, minimum ventilation requirement shall be taken as 5cfm per person. For non-AC spaces, the operable area shall be a percentage of the total carpet area. The standard shall follow the following proportions : For Living Spaces-10%, For Kitchen-8% & For Bathrooms-4%.

Natural Ventilation and Daylight

For Single-sided ventilation, room depth shall be at the most 2.5 times the height of the room.
For Cross ventilation, cross ventilation is effective for a room of depth, maximum five times of the height.

Performance Specifications

Envelope measures



The key components of a building to treat for a comfortable indoor environment are: the external walls, the roof, and the windows / fenestration.

For External Walls

Reflectivity 65% or higher in the visible and infrared spectrum, U value = 2 W/ sqm.K or less
Increase surface reflectivity using appropriate colour and materials preferably Pale colours, glazed china mosaic tiles, etc.

For Windows

U value = 5.7 W/ sqm.K or less (for non-ac areas) and 2.4 W/sqm.K or less (for a/c areas, this will probably be double glazed).

For Roofs

Reflectivity 50% or higher in the visible and infrared spectrum,U value = 2 W/ sqm.K or less (this will require some insulation).

General Considerations

As per IGBC guidelines, For WWR < 20% SHGC Value 0.38 and for maximum U Value WWR 20 – 30% SHGC Value 0.3
Decrease exposed surface area to minimize heat gain. Reflective roof and wall surfaces shall be used to enhance thermal resistance.

Conflicts & How to address them

Maximizing openings vs the need to keep them shut to avoid noise and pollution

Add greens to absorb the clutter.
Provide adequate greens along the streets- both vehicular and pedestrianized , to act as natural barriers and filters to noise, dust and pollution.



Providing greens along the busy streets avoid noise and dust penetration into the buildings.

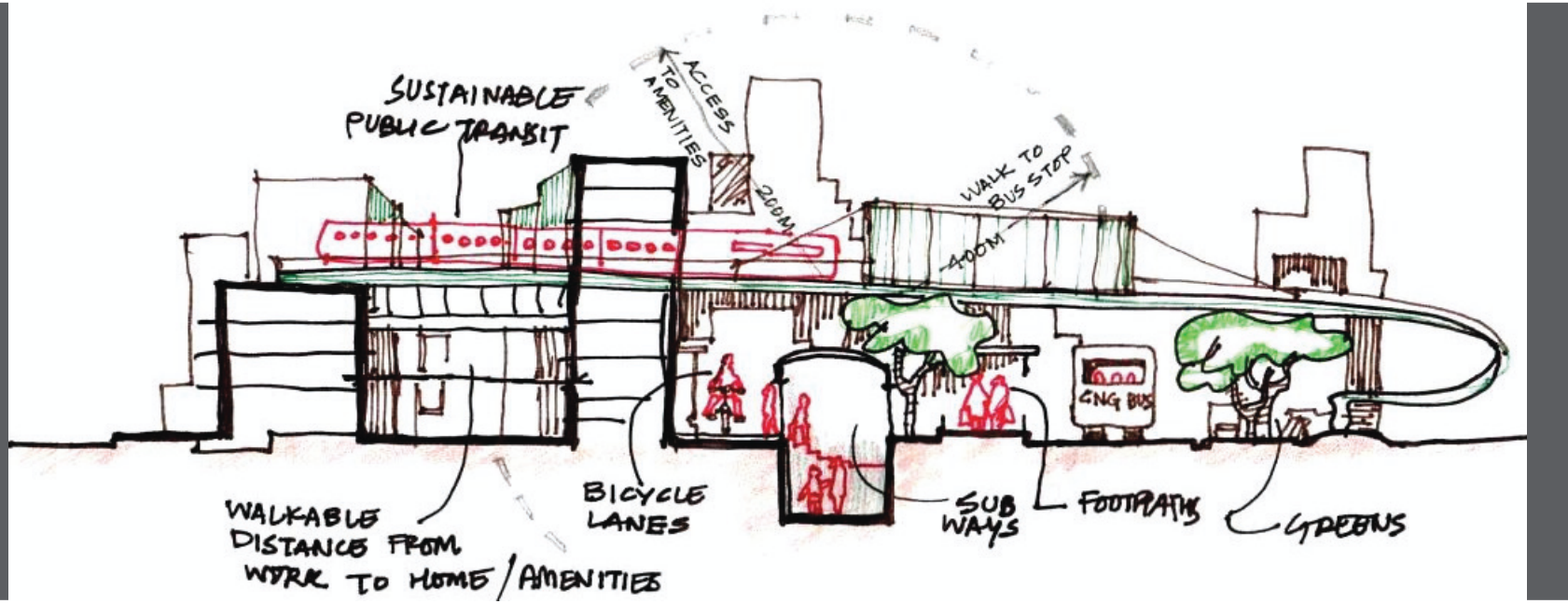
Reduced need for air conditioning vs personal/individual choice

Open up to the greens and vistas.
Besides ensuring comfort inside the habitat, provide for clean and green picturesque outdoor views without any obstruction to prompt the inhabitant to open up to its exteriors.



Greenery and landscaping prompts to open up the inside to the outside.

Mobility


SUSTAINABLE PUBLIC TRANSIT
ACCESS TO AMENITIES
200M
WALK TO BUS STOP
400M
CNG BUS
WALKABLE DISTANCE FROM WORK TO HOME / AMENITIES
BICYCLE LANES
SUB WAYS
FOOTPATH
GREENS

The ability of all people to move in a city facilitated or hindered by the various factors that influence it. It is a field involved with the evaluation, assessment, design and siting of transportation facilities.

Guidelines

The aim is to be able to move in and through the city with minimum delays, maximum comfort and achieve a healthy urban environment.

For a Livable city

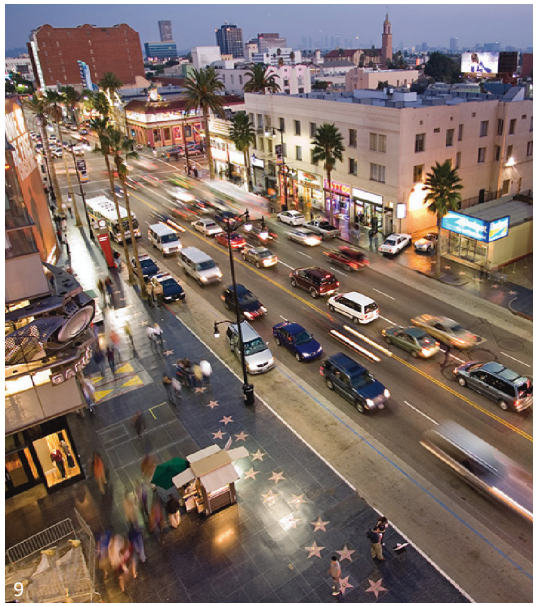
1. Offer a choice of sustainable transport options for people and goods

2. Develop neighbourhoods that promote walking and cycling and support high quality transit

3. Create compact regions with short commutes

4. Shift from un-sustainable mobility to sustainable modes

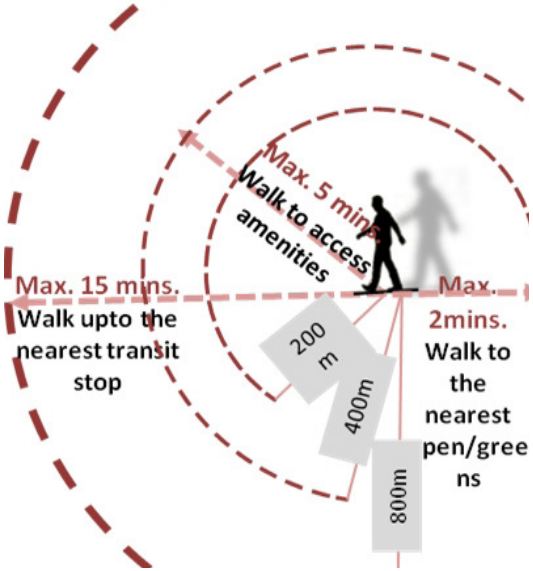
The neighbourhoods should emphasize pedestrianisation and cycling with safety, comfort and convenience on all streets for a clean, safe and livable environment.
An integrated multi-modal system with seamless integration of the physical infrastructure, information and fare levels, shall be planned to ensure frequent, fast, reliable and affordable public transport networks across the city.
Public transport access to the maximum number of people through densification and enhanced connectivity shall drive the mass transit systems planning to maximize their capacities, reliability and accessibility. Various reforms shall be introduced to promote the use of public transport as means of controlling number of vehicles on streets and accomplish free flow of traffic, thereby reducing emissions.



Hollywood Boulevard, Los Angeles, California, United States

Performance Specifications

Focus on people, not vehicles

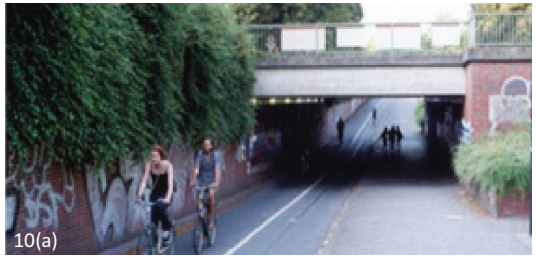


Design and plan for the various amenities and utilities with walkability in mind as illustrated.

Standards for Walkability - for pedestrian safety, comfort & convenience

Roads with ROW >12m, provide min. 2 m. wide footpath.
Provide 1 tree after every 8 m. along the streets.
Dedicate pedestrian road where pedestrian traffic > 8000 per hour in both directions together.
Design barrier free pedestrian facilities.
Min.. 5 safe street-level crossing opportunities per kilometer of street .
Avoid grade-separated structures (foot-over-bridges and pedestrian-subways) to prevent unnecessary detours.

Refer standard Guidelines for Urban Streets (UTTIPEC, DDA, and Delhi) for street designs.
Commercial frontages should have facades with minimum 50% transparency
Compound walls, if present, should be transparent above a height of 100cm.
Space to be planned for vendors as well as for utilities including drinking water kiosks and toilets, so that the walking space is enhanced but not compromised.



10(a)



10(b)

Standards for Cycle Networks

Minimum 2m dedicated and physically segregated bicycle tracks on all streets with motor vehicle carriageway wider than 10m.

At least 5 safe streets crossing per km for bicycles.

Citywide cycle network of segregated lanes or traffic calmed streets that provides access to at least 80% of built plots (should tend to 100%).

At least one cycle sharing system with ≥ 5,000 cycles and automated payment in cities with a population of over 5 lakhs (benchmark census year 2011).

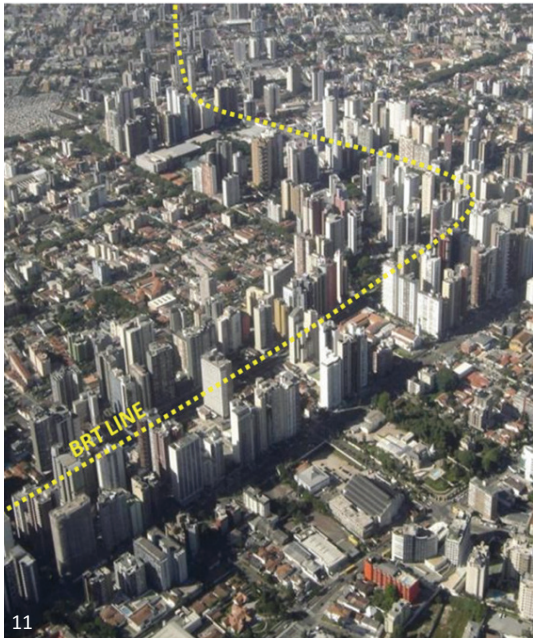
Maximum 150 mm elevation of segregated cycle track above the carriageway.

Example – Houten - a model city in Netherands.

One of the cities with the best road safety. It poses a good example for favoring cycling in the city.

More than 60% of the daily trips are made by bicycle. The roads are designed with have a very few crossings with high flows of motorized traffic and limiting the vehicular speed to 30 km/ha on streets with cycle networks.

Performance Specifications



11

Integrate the modes

Facilitate all public transport nodes with integration of formal public transport, para transit within 200m from each other. Share of formal and informal public transport and NMT (excluding walk) shall be 80% of all vehicular trips.

In Curitiba, building heights depend on the proximity to BRT. The closer, the higher allowing for many people to live right next to public transit, while the less dense neighborhoods are further away.
Curitiba's Integrated Mullti modal Transport Planning has brought a modal shift from automobile travel to bus travel, resulting in one of the lowest rates of ambient air pollution in the country.

Density, Diversity and Compactness

Maximize inhabitant densities, through increase in permissible FSI where appropriate.
175 persons per Ha of developed area should be treated as a minimum standard for an urban density.
95% of residences should have daily needs retail, parks and recreational areas accessible within 400m walking distance.
95% residences should have access to employment by public transport or bicycle or walk or combination of two or more.
At least 85% of all streets in the city shall have mixed use development.
At least 30% residential and 30% commercial/ institutional in every TOD Zone within 800m of Transit Stations.



12

Road use and Parking policy : Dis-incentivize use of personal transport

Eliminate long-term street parking to ease congestion.
Limit off-street parking ratios in job centres with access to public transport to 0.2 spaces per worker.
Remove all parking-space minimums for residential buildings and establish citywide parking-space maximums consistent with targets for private car use.

Institute a congestion-management system (both manual and using ICT) that limits car use in key urban and employment districts at peak traffic hours.
All commercial areas need parking charges by time of day and location to ensure high turnover.
Charge tolls for use of overloaded roads and bridges and use this toll fee collection to support public transport.

CBD workers find the daily charge to park in Baker Street uneconomical, Gosford Town Shopping Centre encourages the users to purchase for a parking space. Free parking around the town is limited and going over the bought time is fined up to $79.00.

Conflicts & How to address them

Shifting the choice from Personal to Public transport vs comfort of driving own vehicle

Making the choice for public transport mode easier by adopting TOD guidelines and enhancing attractive walkable environment with properly enforced traffic control laws shall incite the user to use public modes than driving own vehicle.



Shifting to public modes over private vehicles is a not easy.

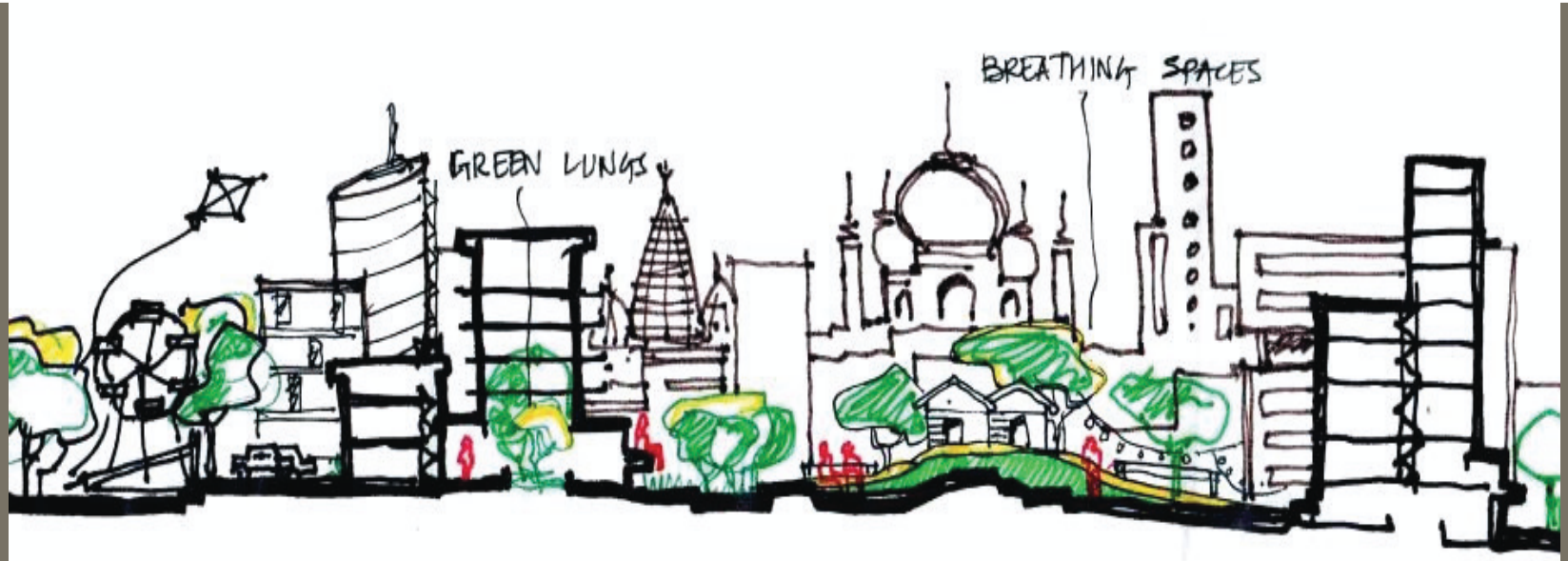
Promoting Cycling & Walkability vs
- Safety on the streets
- Unfavorable Climatic conditions

Induce shades to the pedestrian streets.
Treating the walkable streets with adequate greenery and shade as per the climatic conditions prevalent in the city region enhances walkable conditions all round the year.



Walking is a pleasure with comfortable street design.

Biodiversity



The degree of variation of life form within a given ecosystem (the native flora and fauna) constitutes the biodiversity of the region.

Guidelines

The aim is to develop and sustain a balanced ecosystem that recognizes the relevance of the native flora and fauna and enriching the city's public realm.

For a Livable city

1. Enrich the Public Realm

2. Integrate and promote productive landscapes

3. Enhance the quality of the pedestrian environment

While the quality of urban spaces must provide for identity, pride and a place for forming a sense of community; the first perception of urban space is governed by the experience it provides at the ground level and the micro-climate it imparts. The fundamental guiding principles that can be followed while developing this open space network shall further include response to location, respecting existing characteristics and biotic factors, legibility, protection, invitation, delight and learning from existing open spaces. The design of streets, edges of buildings and spaces between buildings have to respond to the human scale for the pedestrian.

Integrating productive landscapes within the urban design adds to an economic activity, at the same time has an added advantage of providing freshly grown organic vegetables and fruits to people living in a city.



Museumplein, Amsterdam.

Performance Specifications

Design considerations for open spaces

Each of the urban open spaces need to be legible in its own right, as well as shamelessly integrate with the region's existing characteristics of open spaces.
Develop a language for design, material palette, signage, urban furniture that works at all scales, yet allow for flexibility to adapt to specific situations.

PROTECTION	PROTECTION AGAINST VEHICULAR TRAFFIC	PROTECTION AGAINST CRIME & VIOLENCE	PROTECTION AGAINST UNPLEASANT SENSORY EXPERIENCES
	"Traffic Accidents Pollution, Fumes, Noise Visibility"	"Well Lit Allow for passive surveillance Overlap function in space and time"	"Wind/Draft Rain/Snow Cold/Heat Pollution Dust, Glare, Noise"
INVITATION	INVITATIONS FOR WALKING	INVITATIONS FOR STANDING & STAYING	INVITATIONS FOR SITTING
	"Rooms for walking Accessibility to key areas Interesting Facade"	"Attractive and functional edges Defined spots for staying Objects to lean against or stand next to"	"Defined zones for sitting Maximise advantages Pleasant views"
	INVITATIONS FOR VISUAL CONTACT	PLAY, RECREATION AND INTERACTION	DAY/EVENING/NIGHT ACTIVITY
	"Coherent, way-finding Unhindered views Lighting (when dark)"	"Allow for Physical activity, play, interaction and entertainment Temporary activities (markets, festivals, exhibitions, etc.)"	"24-hr city Variety of functions throughout the day Light in the windows"
DELIGHT	DIMENSIONED AT HUMAN SCALE	POSITIVE ASPECTS OF CLIMATE	AESTHETIC AND SENSORY
	Dimensions of buildings & Spaces in observations of the human dimensions, related to senses, size & behaviour	"Sun/Shade Warmth/Coolness Breeze/ventilation"	"Quality design, Fine Detailing, Robust materials Views/Vistas Rich sensory experiences"

'Protection, invitation and delight' :- The aim of all public spaces is, borrowing Jan. Gehl's (Public Spaces for a Changing Public Life; Topos 61 2007; Urban Space) terms; to provide 'Protection, invitation and delight'.



(Example: Pedestrianized streets in Brighton.



Terrace Gardens initiative by Mumbai Port Trust

Qualities of pedestrian environment

The design of streets, edges of buildings and spaces between buildings have to respond to the human scale for the pedestrians.
Provide for appropriate profile for scaling and shading as per the climatic conditions of the place.
Link important nodes with places to pause and take care of sight lines.
Design continuous urban edge/wall.
No setbacks shall be provided (expect for special situations due to location/programme).
While movement lines should bring people into plazas and urban nodes; they should themselves be surrounded on all sides by active edges.

Integrate productive landscapes

Incorporate productive landscapes into the urban design
Plant and retain the suitable plants and trees species to suit to the climatic and soil conditions
Respect existing topography and respond to soil morphology.

The Mumbai Port Trust utilizes its 3000 sq. ft. terrace to produce organic fruits and vegetables. It simultaneously also converts organic waste generated by the kitchen (which caters to 30,000 people everyday) to compost and utilizes it for cultivation.

Conflicts & How to address them

Plant indigenous plants and trees vs Aesthetics of exotic flora (Individual preferences).

Allow choices within the properties.
Landscaping with indigenous flora shall be preferred throughout the city but granting liberty to the individual inhabitants to plant species as per their choices within their property premises.



18 Courtyard / Backyard landscaping within individual plot.

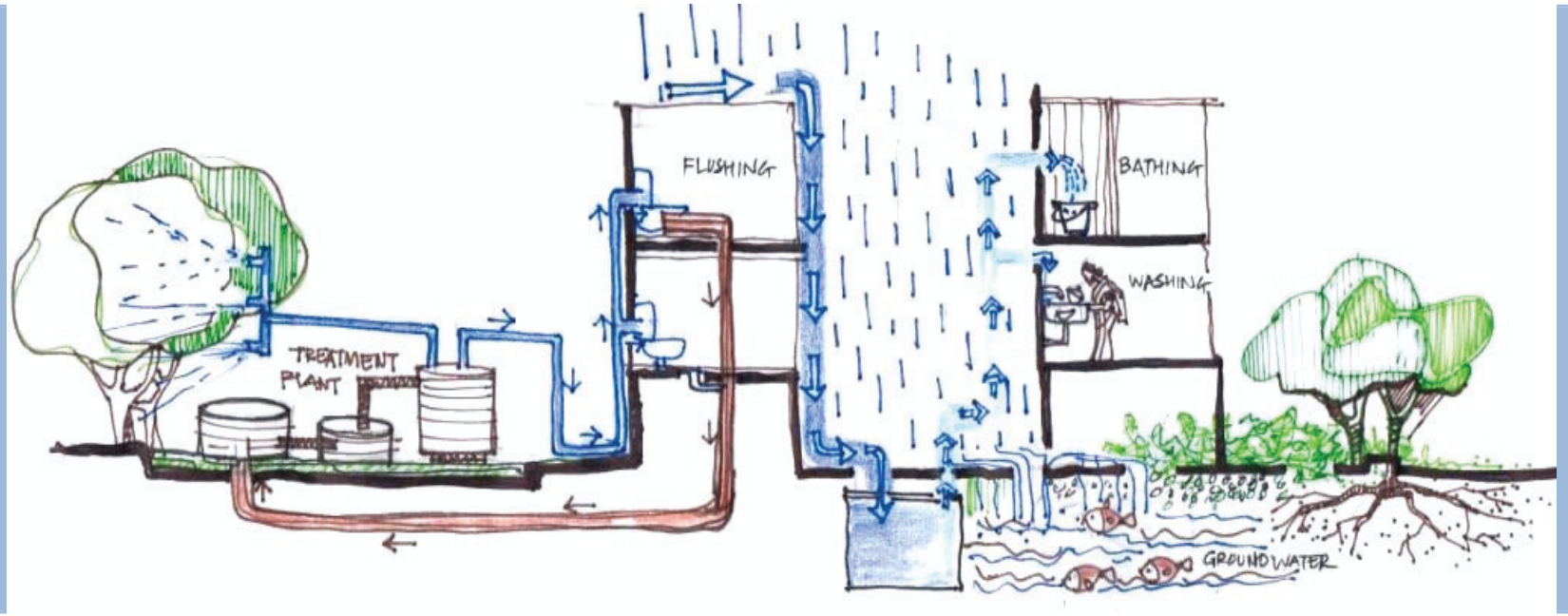
100% Locally grown food (productive landscapes) vs objection to city farming.

In fill the fields within the urban design.
Making productive landscape a part of the city's urban design with carefully knitting in the rural character into the urbanscapes would actually transform farming into urban landscaping.



19 Terrace farms by Mumbai Port trust.

Environment



It is an important indicator of the livable level of a city. The term environment refers to the approach and management of the basic infrastructure of water, sewage, solid waste, storm water together with guidelines for achieving acceptable air quality and noise levels in the city.

Guidelines

The aim of the guidelines is to provide for a sustainable approach to a clean and healthy environment.

For a Livable city

1. Do more with less to achieve water efficiency

2.Integrate storm water drainage and water recycling

3. Maintain the specified standards for outdoor air quality and noise levels

The sustainability principle of Reduce, Reuse and Recycle not only brings huge savings in energy and water, but also reduces the environmental impact of both water, solid waste and sewage disposals.

Application of broad array smart and latest technologies like installing water-efficient fixtures and smart water meters, etc increase the efficiency of the system installed.

Integrate storm water drainage and water recycling.

Environment friendly waste to energy conversion methods like Anaerobic Digester, Composting, etc should be investigated and incorporated within the city.

Besides the initiatives and strategies embraced for improving external environmental quality, the general norms and standards pertaining to the quality of environment like CPCB, AAQ norms, etc shall be followed.



Astonomical photograph of night sky

Performance Specifications



Integrated Tirupur Water Supply and Waste Water Treatment Plant project.
System will supply 185 million liters per day to about 700 textile firms and over 0.8 million residents in Tirupur, Tamil Nadu and surrounding areas.

Water

Provide for :
Up to 100% of recycled water supply for ancillary uses like flushing, landscaping, etc.
Up to 50% saving of domestic water.

Drinking Water:
Total Coliforms Organism MPN/100ml shall be 50 or less, pH between 6.5 and 8.5
Dissolved Oxygen shall be 6mg/l or more.
Biochemical Oxygen Demand 5 days 20°C, 2mg/l or less.

Outdoor Bathing :
Total Coliforms Organism MPN/100ml shall be 500 or less pH between 6.5 and 8.5
Dissolved Oxygen shall be 5mg/l or more.
Biochemical Oxygen Demand 5 days 20°C 3mg/l or less.



22

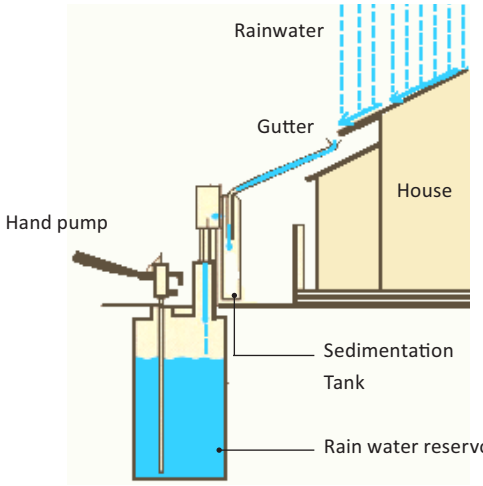
Essex, U.K., in 2003
A 40 million litres per day permanent scheme was implemented to treat the waste waster which provided purified water for irrigation and ancillary uses.

Waste Water

Both two kinds of waste water grey water & black water can be effectively recycled on-site using constructed wetlands or reed bed systems. The recycled water , after properly treated and disinfected , can be used for watering the garden or flushing toilets saving up to 50 % of domestic water.

Solid Waste

About 4% of the total site area should be allocated for pre-treatment of solid waste.
Municipal Solid Wastes (Management & Handling) Rules, 2000 (MSW Rules) applicable to every municipal authority responsible for collection, segregation, storage, transportation, processing and disposal of municipal solid shall be followed.



Tokyo, Japan, Ryogoku Kokugikan Sumo-wrestling Arena, built in 1985 in Sumida City, utilizes rainwater on a large scalw with 8,400 m2 rooftop as the catchment surface of the rainwater. Collected rainwater is used for toilet flushing and air conditioning. Sumida City Hall uses a similar system.

Storm-water Drainage

Minimise surface run-off and maximise ground water recharge
Design for storm sewers to avoid flooding and also choking.
Increase on site permeability.
Develop alternate use and storage techniques to make it available for non potable use.

Other standards to be considered

For Hazardous Waste:- Management, Handling & Trans boundary Movement Rules, 2010.
For Noise Limits:- CPCB and SPCB norms shall be followed.
Ensure that the outdoor noise level from Construction activities does not exceed the CPCB Environmental Standards-Noise and AAQ norms (ambient standards).

Conflicts & How to address them

Collection & Treatment of the waste vs NIMBY (Health issues)

Neighborhood level treatment within the common areas shall be encouraged to reduce the overall demand of 4% of the total land area required for sanitary land fill site.



Solid waste treatment Plant, Vacarisses, Barcelona, Spain, The site has been designed with in-built landscaping and less harmful impact on the surrounding environment.

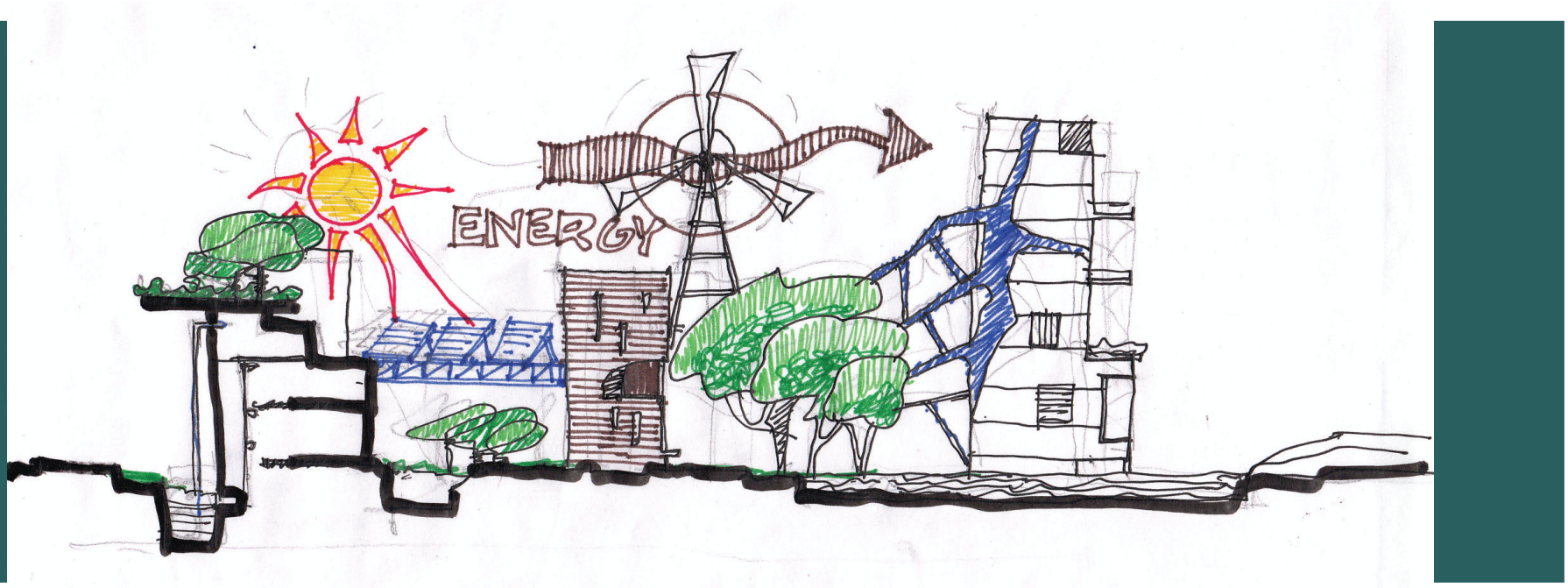
Use of recycled water vs objection to use it (Health concerns)

Strategies like benchmarking the quality of services delivered with international standards, communicating the benefits, etc shall be adopted to encourage to get the clan technologies accepted by the residents.



Dublin San Ramon Services District - Regional Wastewater Treatment Facility - Pleasant on, CA (4 Million litres capacity).Recycled water used in landscaping and flushing..

Energy



Consumption of energy for heating, cooling, and running the appliances at home and at work contributes nearly 2/3 rd of a region's greenhouse gas emissions. Besides the evident energy consumption sources, the indirect and the underlying vehicular fuel consumption due to urban sprawl, also need to be taken into consideration.

Guidelines

The aim is to minimise energy consumption and maximize generation and management of clean, efficient and sustainable energy.

For a Livable city

1. Minimise energy consumption

2. Explore and adopt alternate energy sources

3. Adopt smart energy options

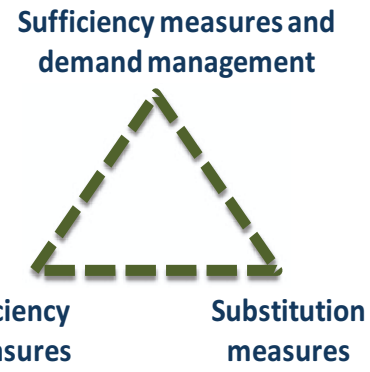
Improving energy efficiency not only saves money in the long-run, but also reduces a region's output of greenhouse gases that contribute to climate change. To ensure on-time, reliable power supply, a combination of grid, on-site generation backed up by appropriate partners i.e. Power utility/ Oil companies shall be adopted.

A Balance cost of capital projects for on-site generation with modalities of grid supply (and operational costs/future demand reduction) needs to be achieved. Deploying the best commercially viable international energy-efficient techniques and setting stringent building efficiency guidelines in areas such as insulation, low-energy lighting specifications, the percentage of glazing (i.e. windows), optimizing natural light. Installing smart appliances, smart meters, smart building management systems, an integrated distribution management system can further optimize the energy usage / demand.



An image capture from environmental film "Koyaanisqatsi"

Performance Specifications



A sustainable approach towards energy efficiency demands a balance between demand and supply management.

Emissions Specifications

Emissions shall be mitigated through :
1. Sufficiency measures and demand management like: appropriate urban form and envelope to reduce demand, reliable supplies, smart tariffs and grids, managing flexible municipal demands at off-peak times, reduced commuting, off-peak ice making.
2. Efficiency measures like:- efficient street and common lighting, easy access to efficient home lighting – of the proper color, power factor limits from ECBC, fuel-efficient devices, especially vehicles.
3. Substitution measures like: -gas generation, cogeneration, waste to energy, grid-interactive rooftop PV (minor), solar hot water, reduced oil-based mobility requirements,etc.

Service Delivery Specifications

Ensure access to adequate fuel and power for all its citizens with a minimum of leakage and loss.
Ensure on-time, reliable supply, by a combination of grid, on-site generation and backup by appropriate partnership with power utilities and oil companies.
Reduce on and off-site emissions to reduce air pollution and exposure to future regulation though the use of clean renewable energy to reduce the use of the electrical grid.



25

In California, nearly two million homes have smart meters installed by the end of 2011. 50,000 smart meters have already been installed in Sweden, with 400 more up and running in Australia.

Alternative energy sources

Various alternative sources augmenting the power base for a city can adopt the following techniques:

1. Building Level Renewable Power Generation (rooftop PV, rooftop SHW).
2. Using Evacuated Tube Solar Collectors to tap solar energy to provide domestic hot water.
3. Concentrated solar and geothermal heat to run single- and double-effect absorption for possible air-conditioning solutions for the city (district cooling).
4. On the supply side, incorporation of a Smart Grid would serve as an important addition to integrate the multiple power generation options.

All of these actions minimize adverse impacts on electricity grids and maximize consumer savings.

Infrastructure Specifications

Reduce capital investments working with or creating ESCOs to provide energy services for delivery and administration of the infrastructure, operations and tariffs.

Balance cost of capital projects for on-site generation with modalities of grid supply (and operational costs/future demand reduction).

Optimize these solutions with a modular phasing strategy that does not over-burden the first phase of the development.

Conflicts & How to address them



Financial benefits of smart grid technology are wide-ranging and significant. Here are a few of the gains smart-grid communities can expect:

Improved maintenance and asset management lengthens asset life and defers capital expenditures.

Load leveling reduces the need for new generation while shifting consumption to non-peak times –maximizing the profitable capacity of current assets.

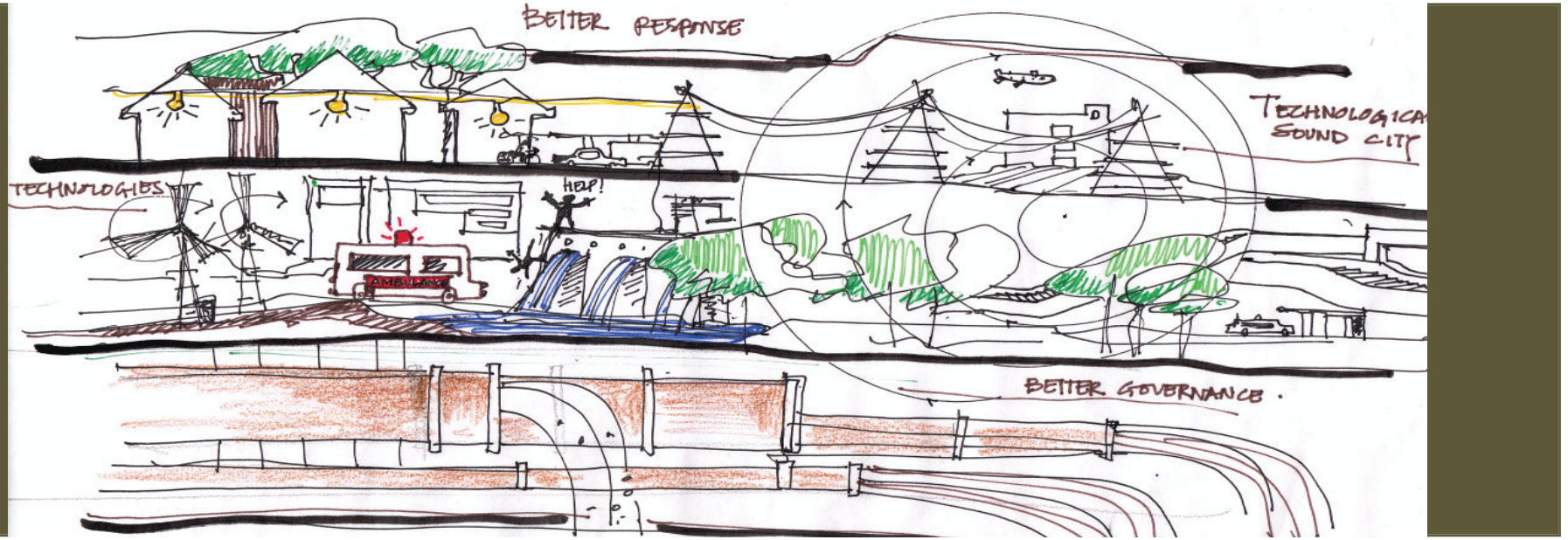
Adopt alternate environment friendly options for demand and supply management
vs Expense of installing alternate technological supply options
vs Redundancy of technology with time

Analyze cost-benefit over the lifetime.
Plug in flexibility with every service / technology adopted
Ensuring flexibility and updating it with the latest technology (benchmarking with global technologies) shall drive the users willingly to adopt for the alternate sources even if available at a little increased costs.

24hrs power supply vs Down time in the supply

Even during the down time in the supply, the city shall have full time back up facility available at least to light up the emergency services and common areas – street lights, stair wells, lifts, parks, etc.

Intelligent & Smart Systems



The Information and Communications Technology (ICT) sector plays a crucial role in addressing the issue of climate change, making the cities livable and positioning them for long term growth by infusing a level of smartness and thus enabling sectors like transport, power etc.

Guidelines

The aim is to ensure optimum resource utilization and better service delivery to the users.

Smart and Intelligent Systems shall

1. Reduce congestion in transport systems

2. Improve public safety by reducing emergency response time

3. Improve efficiency in provision and management of infrastructure like water supply, solid waste management,sewage, drainage etc.

Cities need to balance competitiveness with environment sustainability and quality of life. The new cities which are being planned need to prepare themselves for delivery of new and expanded services through efficient transport, public safety and government services.

The Information Communications Technology (ICT) sector plays a very important role in addressing the issue of climate change, making the cities livable and positioning it for a long term growth by enabling the sectors like transport, power etc. by infusing a level of smartness.

Smarter public safety systems can provide centralized and integrated security surveillance and emergency response systems.

Adopting smart systems can reduce the response time by 50% through pro-active accident and disaster management than prescriptive.

Use of ICT can change the face of the entire information management system in urban infrastructure supply and distribution network.



Smart City and its areas of influence

Applicable areas of ICT

Transport Systems



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Smart Public Parking System

A smart parking management system reduces the average time to find a parking place, enables pre-booking of a parking space, helps in reducing traffic congestion, thereby reducing the fuel consumption and the environmental impact.

SF park, San Francisco, is using ICT in parking system. Sensors installed on parking spaces make the information available to the public through text messages.

ICT System for Road Safety

ICT application installed in the user vehicle which when an accident occurs automatically makes an emergency call to the public service answering point along with the vehicle data and its location reducing response time by 30%.



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Smart Bike Rental System

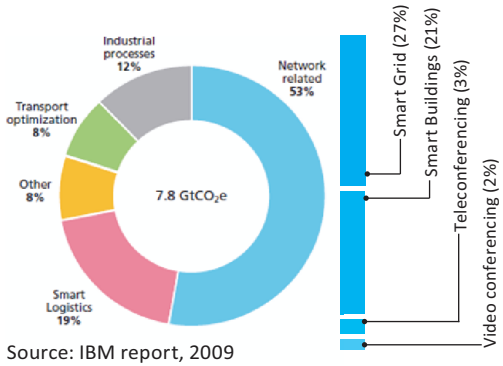
Bike rental systems provide bike rentals through automated systems in cities. Bike sharing can be targeted for the trips which are within 5 Km of range in the city and are too long to walk but too short to drive.

Nice Ride, an organization in Minnesota, USA provides a convenient bike sharing program using a credit card.

Smart Car Pooling System

An ICT based car pooling solution combines user's social networks to match passengers and drivers who know each other or who have common friends and enable car pooling on the similar travel route.

Smart Home Systems



Source: IBM report, 2009



Applicability of ICT at different levels of applications in a city has a considerable impact on the CO2 emissions. The ICT solutions in infrastructure play a vital role in making the infrastructure more efficient and less energy consuming. Low energy consuming building coupled with security and comfort makes a city livable for its residents and a city should strive to provide these facilities to its dwellers.

The New York Times Building has been seen to consume 30% less energy than traditional office skyscrapers. The building is equipped with different ICT enabled lighting and shading control systems.

Energy-saving systems

At a macro level water regulators can help the city water supply systems in urban local bodies to have an efficient water distribution system which checks leakages and inefficient customer billing. At a home level it can help in leak detection, pressure monitoring, filtration and efficient water billing system implementation.

Energy-saving systems

The main components of application are Smart lighting and smart heating, ventilation air conditioning systems. The main components of application are Smart lighting and smart heating, ventilation air conditioning systems. Sensors based technology can reduce the energy consumption up to 30 percent.

Applicable areas of ICT



Comfort keepers is a leading provider of quality in home service to the senior citizens which provides different technology solutions such as personal emergency response system and round the clock monitoring.

Smart systems for Disabled and elderly

For a city to be truly smart it should make sure that it is inclusive and its benefits can be enjoyed by all. Remote or automatic control options can be provided to the old and the persons with disability with the emergency assistance systems.

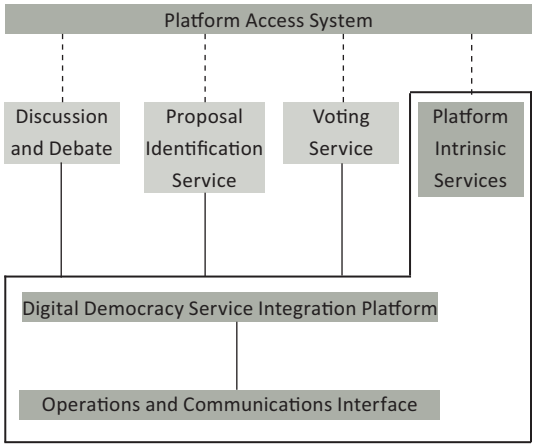
Security against hazards and thefts

Different smart devices like alarm equipment, fire sprinkler and video fire controller available protect disasters from spreading by timely warning to the residents and guiding the necessary steps to combat them if occurred. An access control system enables a user to control the access to his premises.

Smart Building Security Systems

A smart security system ensures safety of the residents of the building through early warning and rescue facilities. It can be used in the areas of fire protection, home security, surveillance and to assist the disabled/old people.

Conflicts & How to address them



The figure depicts platform architecture for an election system which includes various levels of interaction.
It begins prior to the election with a space for debate and discussion. From there, campaign officials create proposals to reflect the citizen inputs. Also, there is a space for voting on the discussed issues.

Technology reduces demand for manpower in city management vs Lack of human contact to handle complaints

Apart from involving RWA's directly into city's management, virtual participation through internet shall also increase citizen's involvement in the functioning, management and evaluation of city's performance.

Increased efficiency and Reliability vs Technological Malfunction

Too much dependence on technology might sometimes lead to complete breakdown in case of a technological malfunction. Hence an immediate back-up plan needs to be kept ready to meet such uncertainties.

Health, Education, Safety & Security



These are the fundamental prerequisites for a sustainable lifestyle in cities. Cities provide the physical, social and environmental framework for the majority of the planet's population and have an important role in promoting the overall well-being of their citizens.

Guidelines

The aim is to foster a healthy and safe environment contributing towards healthy and safe communities and citizens.

For a Livable city

1. Evolve the city within a healthy framework

2. Design with community participation

3. Maximise the security level in the environs

4. In built, pro-active disaster risk management systems

A secure city offers the maximum degree of protection against danger, damage, loss, and crime.

It ensures the state of being “safe” in all aspects - physical, social, spiritual, financial, political, emotional, occupational, psychological and educational or in any event which could be considered undesirable. A healthy city promotes a healthy lifestyle which in turn fosters healthy citizens. Community participation is considered to be a must to be able to create safe and healthy urban environments for citizens.

To achieve the maximum level of resilience, both the design and the functioning of the city need to be taken into consideration. This would include compliance to building safety norms and regulations, providing adequate rescue and response services as well as the formulation of the Rules and Regulations to ensure enforcement and accountability.



Neighborhood greens, Vancouver

Performance Specifications

General Considerations

The city shall be planned in coherence with the health and safety norms, standards and guidelines at all levels of development.
- at city level
- at neighborhood level
- at individual building level

The latest technological advancements shall also be considered while planning for safety and security measures with flexibility for the future.
The Guidelines and Standards with respect to the size, location and number of facilities to be provided are the starting point for developing sustainable and integrated communities. The quality and capacity of facilities, in offering the right range of services for a specific community profile and operated by competent staff, together with good maintenance of the facilities, remain critical to the effective delivery of services.

Related to Transportation

Conform to CPCB norms and AAQ standards for a healthy ad clean environment.
Promote the use of vehicles with lower-emission levels. Encourage environment-friendly-fuel-run transit systems.
Design for maximizing the distances to be walked and cycled.
Promote programmes that target high-risk groups and environments and enhance safety for vulnerable groups.
Implement long-term, sustainable programmes covering genders and all ages, environments and situations.
At the infrastructure level, pedestrian paths and crossings, parking facilities and access to public land uses should be inclusive in their design for differently abled persons.

Standards for Medical Facilities

Besided the medical facilities to be provided as per UDPFI guidelines, provision shall be based on any system of alternative medicine (Ayurvedic, Homoeopathic, Greek, Tibetan, Chinese, Holistic, etc.) up to the level of Intermediate Hospital

The standards and specifications for the various healthcare and medical facilities shall be referred to Section1, Chapter - Urban Pattern and Appendix no I for UDPFI guidelines applicable in India.
Refer Section – Intelligent Systems for the ICT based technologies available). This would be valid for all the categories mentioned above i.e. Health, Safety, Security and Social Sustainability.

Disaster and risk management



Ensure safety against natural and man-made disasters.

Substantially increase public awareness of disaster risk so that the people enjoy safer communities to live and work.

Significantly reduce the risks of loss of life, injuries, economic costs, and destruction of natural and cultural resources that result from disasters.

Develop a comprehensive multi-hazard, techno-legal regime to undertake the actions.

Shift from preventive and perscriptive to pro-active approach for disaster and risk management.

A city level Disaster Management Cell shall be established undertake this aspect.

Disaster management strategies shall include:-

1.Preparedness against the vulnerabilities and risks through design and construction which include vulnerability mapping,risk assessment response structure, etc.

2.Disaster mitigation measures like Infrastructure improvement, communication and Public Information Systems, land use policies and planning.

3.Post –disaster management with efficient emergency and response measures installed – relief and rehabilitation.

Educational standards

The provision for the educational facilities shall be provided as per the set norms specified by UDPFI, based on the population to be catered. (Refer Appendix I for the detailed numbers and the hierarchy of educational facilities to be provided in a city)

In keeping with the demand for thinking, creative individuals, with good ability for team work and cooperation, all educational institutes shall provide all-rounded child-centred learning, with a stress on humanities, sports and the arts. This is a soft parameter that will have to be defined by the educational institutes as they develop.

The institutes may be air-conditioned or not – non-airconditioned but well tempered spaces are generally better for children under 15 years old and contribute to better health.

In addition, the pupil:teacher ratio (counting only teaching staff) shall be:
Pre-primary, nursery: 12
Primary: 16
Middle and senior: 20
Higher and technical education: according to type of institute

The typical size of group that is taught shall be as follows:
Pre-primary, nursery: 18
Primary: 30
Middle and senior: 35
Higher and technical education: according to type of institute

Foster a vibrant cultural and social urban environment

A livable city, particular in Indian context, shall reflect not only physical and evironmental sustainability but also bring out its cultural essence and social bonding. The major role played in this regard is of the community and common spaces developed within the city offfering the most comfortable, safe and pleasing atmosphere.

Refer Annexure I for detailed list of the hierarchy of social amenities (educational facilities, medical facilities, emergency services, community services and others) to be provided for a healthy physical, mental, intellectual and social urban environment.

Conflicts & How to address them


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Pro- active disaster risk management vs the uncertain nature of calamities and disasters

Be more pro-active in planning
Active preparedness measures like evacuation measures, displacement locations, R&R at city's scale shall be taken and planned even for the most unexpected calamities.

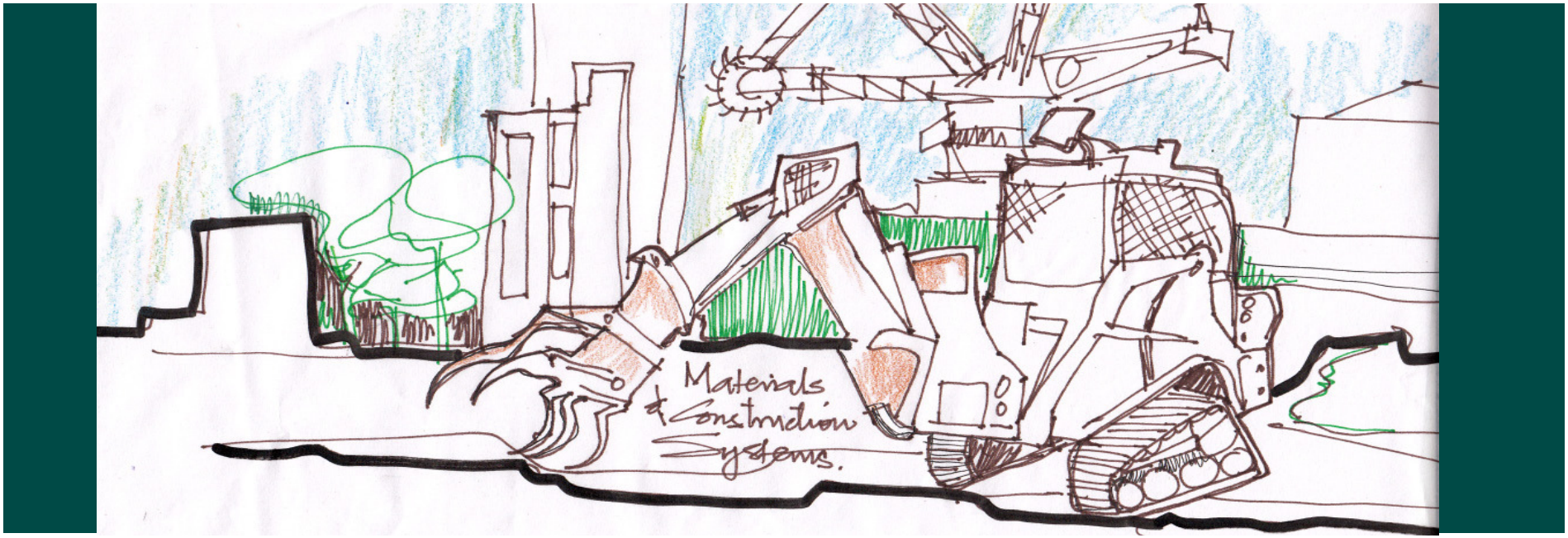
Maharashtra is the first state to prepare a comprehensive State Disaster Management Plan and undertake risk assessment and vulnerability analysis to :

1. Substantially increase public awareness of disaster risk so that the public demands safer communities in which to live and work.
2. Significantly reduce the risks and destruction of natural and cultural resources that result from disasters.

Provision of community and social facilitties vs the non-responsive attitude for their management at city level and neighborhood level

Engage the community in the city management
Normally in cities this problem occurs that there are no owners of these socio-cultural facilities developed. Therefore they tend to become unmaintained and decrepit. By actively engaging the lowest level of community, the provision, maintenance and continual upgradation of these facilities could be ensured.

Materials & Construction Systems



The quality and efficiency of the development during the execution and over its lifetime depends, besides the planning and designing, on the choice of building materials used, their delivery, storage and handling mechanism.

Guidelines

The guidelines aim to streamline the construction process and increase efficiency in terms of time and energy management without compromise on quality.

For maximizing efficiency

1. Encourage the use of construction materials with low embodied energy

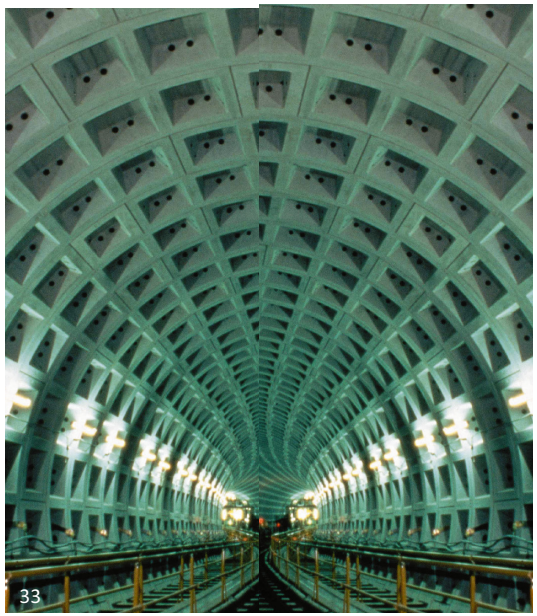
2. Minimize carbon footprint during construction

3. Minimize cost of procurement of materials

4. Ensure on-time execution with quality, safety & strength

Substantially reducing the embodied carbon of the built environment is largely achieved through a detailed product evaluation process that includes environmental, economic (including cost and quality) and social considerations. A city must seek to reduce the overall economic impact of the materials used. At the same time, optimizing the use or demand and supply of construction materials at the right time and in right quantity saves enormous amount of energy involved during the construction process. Hence its imperative to have timely execution and efficient delivery mechanism as a solution to Optimal Construction system.

Setting out achievable targets for construction efficiency, reduce traffic congestion in local site areas and ensure on-time execution with quality, safety & strength , would improve the quality of execution.

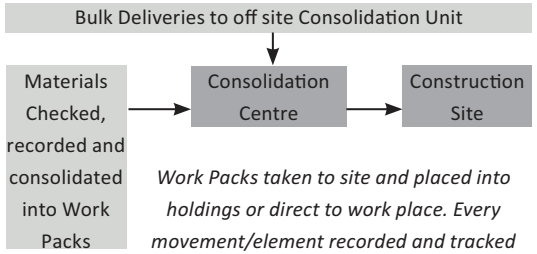


An image of Turkishconstruction

Performance Specifications



A typical Consolidation Centre, New York



Construction Systems

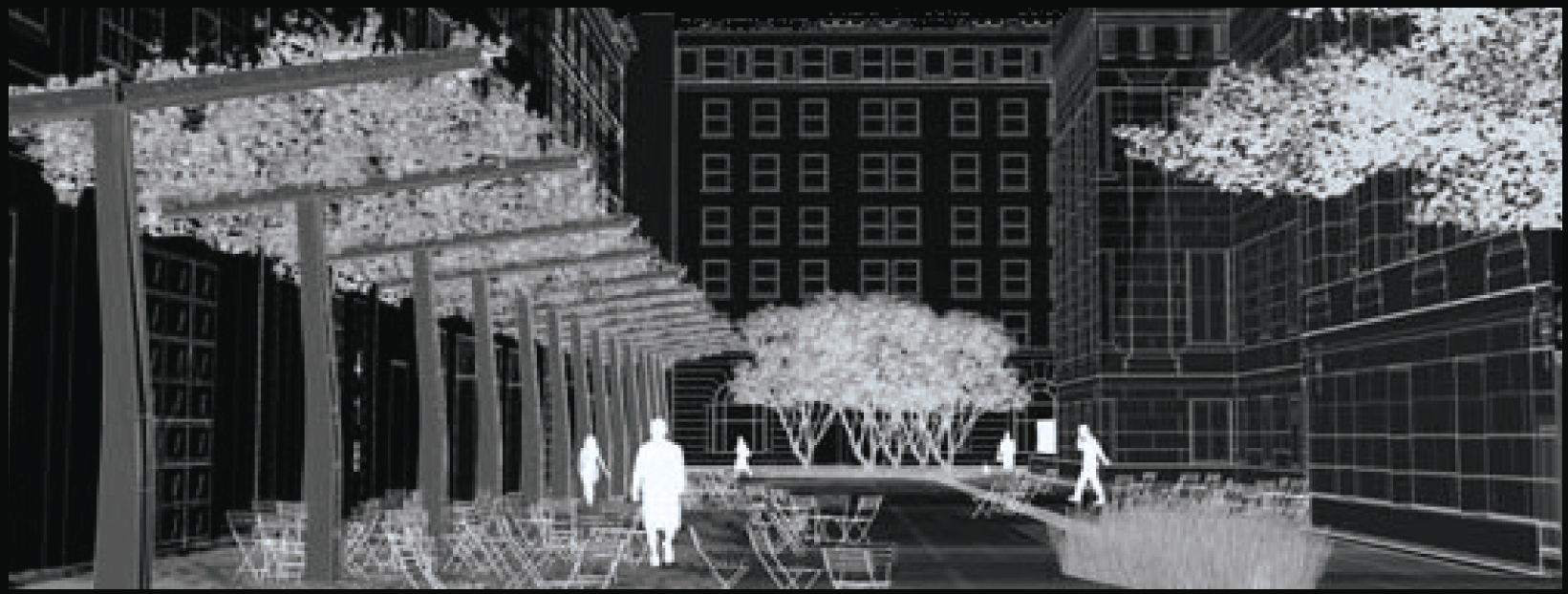
An optimal Construction Management System needs to be in place to achieve the following set targets to achieve :
Efficiency/reliability target of 95%.
Improved on-site productivity.
Damage reduction of 15%.
Number of journey reductions by 68%.
Average supplier journey time reduction of 2hrs.
Increased productivity of project labour force by up to 30 minutes per employee, per day.

One of the best discovered and applied solution is through establishing a Consolidation Centre. To deliver in the safest and most efficient manner, the right materials to the site, at the required time, in active partnership with the Trade Contractors and Project Management, it has been observed as one of the best mechanism.

Construction Materials

Products can be assessed with to the following criteria primarily emphasizing the sustainability characteristics:
1.Energy saving, Water saving and Waste minimization
2. Recyclable material content
3. Renewable energy
4. Volatile organic compound content
5. Embodied carbon
6. Maintenance/cleaning required
7. Availability and Indicative price

Section II



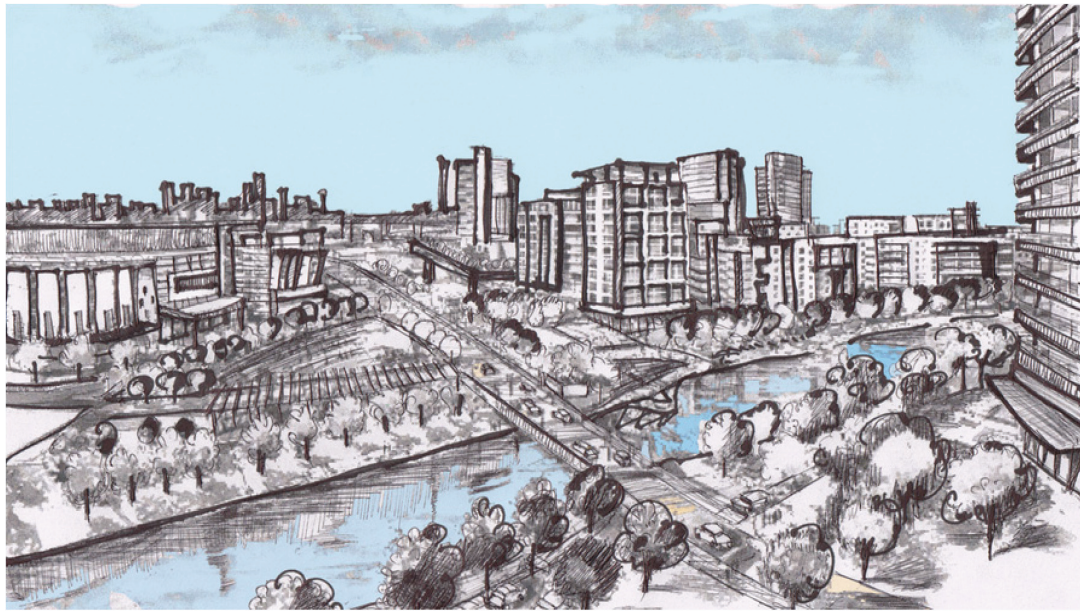
Applying the Guidelines

Case example Palava

Exploring how the proposed guidelines may be applicable to the specific context of Palava, in a bid for it to evolve as one of the most Livable cities of the world.



Values to be imbibed . . .



Identity

Diversity

Adaptability

Flexibility

Walkability

Safety

Equity

Efficiency

Resilience

Plurality

Development Standards

Density, FSI, Ground Coverage


1(a)


1(b)

An ideal example Barcelona, Spain
Population : 2,68,800
Area : 848 acres (748 Ha)
Population Density : 145 PPA/359 PPHa
FAR / FSI : 2.65 for residential use
Street pattern : Homogenous grid-iron pattern
Ground Coverage : not more than 50% of each plot
Building Height : G+4 for Residential area

Gross density[1]

As per MMRDA norms and UDPFI guidelines, for a medium density town or city to be developed tuning to the scale of Palava, the gross density shall be 334 ppa. Considering the same, Palava can accommodate population of about 5,00,000 persons.
Total site area: 2700 acres, Buildable area: 60% of the total site area :1620 acres
@334ppa, maximum population that can be accommodated : 5,41,080

Ground Coverage

The standards as specified By UDPFI guidelines shall be followed for Palava to come up as a group housing multi-storey development going with maximum of ground coverage of 35%.

FAR/ FSI

Palava shall follow the minimum FAR norms as mentioned in Chapter 1-'Urban Pattern', Section I. For Residential areas it shall not exceed 1.5 and may go up to 3 or 4 for mixed land use along the mass transit corridors.

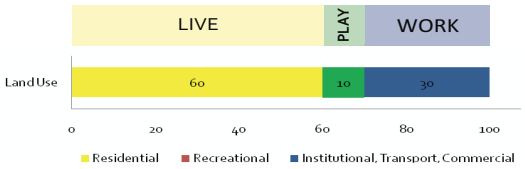
[1] The Density standards conform the ones proposed by BH in Table 1.6.(page no.10). Visitors numbers can be estimated as per the Appendix 1 , BH report.
[2] Gross FSI /FAR applicable is as per MMRDA norms but deviates for special areas along the major transit corridors to achieve Compact Development.

Development Standards

Height may go beyond 26 m. along the transit corridors also as per the norms applicable.



The most applicable and suitable street pattern for a site like Palava which is less undulating and does not have a slope more than 10% anywhere on the site, shall be grid iron pattern.



Land Use distribution for Palava

Building Height [3]

To achieve the density and FSI specified, the development shall be planned with a minimum height of 4 storeys.
Maximum Height for plots up to 4000 sqm (applicable to EWS Units and Affordable Housing) shall be 15m and height can go up to 26m for plots above 4000 sqm (applicable to Aspirational housing).

Street Pattern

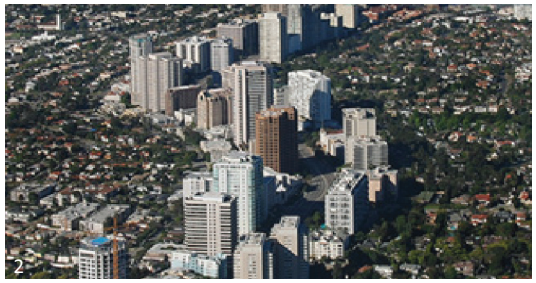
An ideal street pattern shall preserve the natural resources existing on the site with no or minimum intervention to the existing trees, gauchar land, rivers, lakes, water bodies, etc. At the same time the layout shall enforce the contemporary feel of being a 21st century planned city.

Land Use [4]

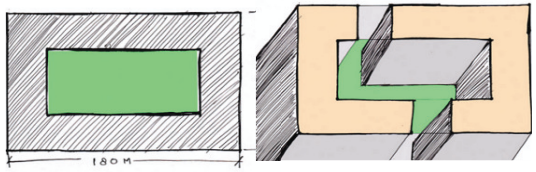
Palava shall aim to ensure that an adequate inventory of lands is available so that the city is able to continue to recruit businesses that provide jobs for residents. The figure gives the land use distribution for Palava - to come up largely as a residential city as well as offering a diverse choice of housing and retail services to maintain the city as a vital community.

[3]The overall built-up area given as given in Table 1.5, page no.10, BH Report could be developed as per the building heights permitted in the manual.

[4] Table 1.5, page no. 10, BH Report gives the landuse distribution with more than 65% of the development under residential category. The proposed distribution as per the guidelines suggest a maximum of 60% residential use.



The urban center of Downtown San Jose,San Jose's North First Street is an example of TOD along the main transit corridor.



An ideal block six 180m X 60 m. (2250 sqm built up area). In built green opens with breaking lengths of the blocks.

A Compact Development [5]

Palava shall aim to build a compact city which is pedestrian friendly and has long term sustainable benefits.
The already specified guidelines with the key designing thrust on walkability accentuate a compact urban form.

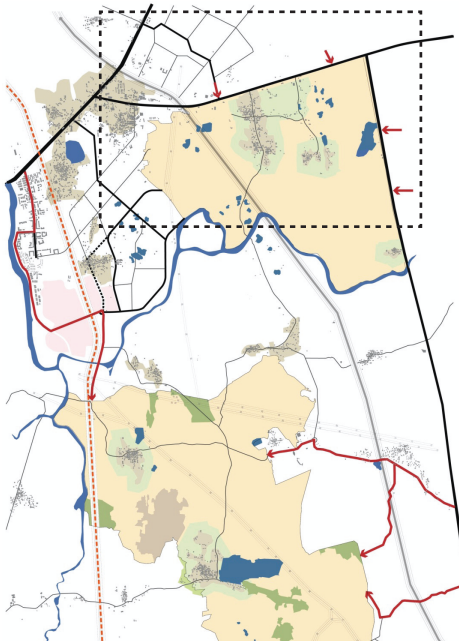
The key parameters would include:
Building Block Size:-The size of a habitable building block area shall not in any case be less than 2250 sqm for optimizing cost of infrastructure.
The minimum block size: 60m X 180m.

Mix of uses: Ratio of Residential to Non-Residential shall vary from 50 – 50 to 70–30.
Increased FSI up to 4 along the main transit,multi modal transit corridors.

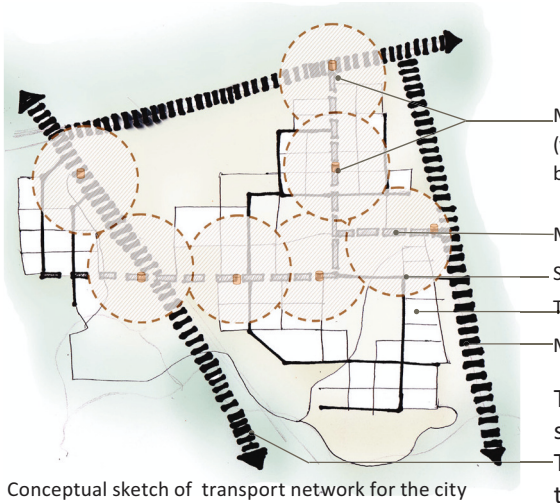
[5] *Besides considering the Transport related planning considerations for a Compact Development, as specified in BH report - Chapter 2, design guidelines at neighborhood and block level need to be referred as specified above.*

Walkability [6]

15 Minutes Walk (800 m. radius) time to a choice of public transport



Location of Parcel 1 in Palava



Conceptual sketch of transport network for the city

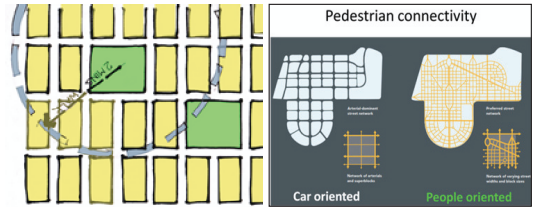
To suit the gridiron pattern, a similar layout as shown in the sketch above would emerge.

To plan the major public transit stations in this layout with a 15 minute walkability, the individual blocks must fit in the radius of 800 m. as illustrated.

The planning emphasizes Transit Oriented Development, use of Public Transport (easily accessible by walking and cycling) and the availability of choices to the users.

[6] Besides walkability standards mentioned above, standards for cycling shall also be considered to minimise use of motorized vehicles.
Planning Cycle ways/Cycle networks to be planned in Palava shall be referred from Chapter 2, page 26, BH Report.





5 Minutes Walk (400 m. radius) time to access most daily use facilities like grocery shop, primary health care and medical store.

Designing for every individual is the essence of an equitable planning process.
Walkable neighborhoods with an easy access to the amenities for daily use through mixed-land use development
Easy vehicular access shall be ensured.
All the mixed use development shall be along the primary transit corridors.

Pedestrianized layouts have a dense but a fine street pattern. Deliberate yet habitually injected walkability in the lives of the users will create a healthy environment.

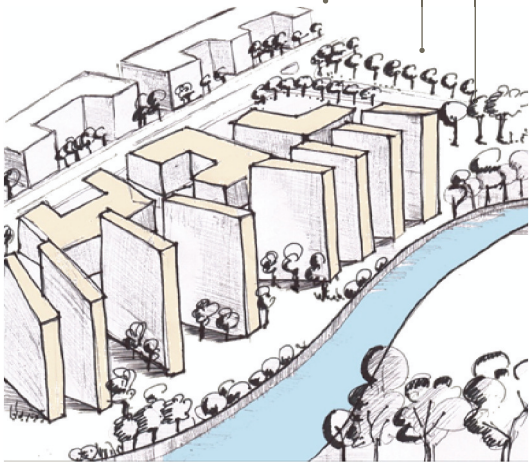
2 Minutes Walk time to reach the neighborhood park.

Close proximity to the nearest green space ensures visual control and safety besides offering green neighborhoods.

BH report, table 2.3, page no. 24, Chapter 2 , transportation shall be referred for details to plan out high-speed mass rapid transit systems in the city.

Ventilation and day-lighting [7]

100 % fresh air



Low- rise housing

High - rise Aspirational housing oriented to maximise wind movement across the site

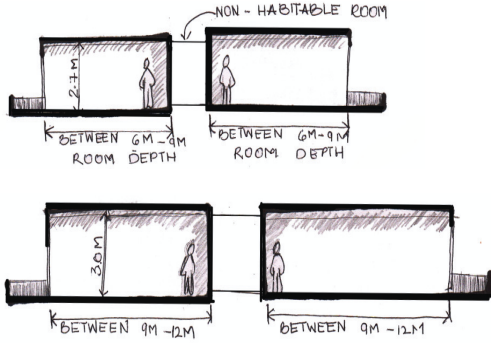
A Perennial river crossing through the Palava site

Best building orientation to suit hot and humid climate
The longer axis should have North-East alignment of buildings to achieve cooling almost throughout the year and minimise surface heat gains.

[7] *Section 3. Energy , page 36, BH Report suggests a few passive energy reduction techniques for envelope control measures.*

The guidelines and performance specifications for envelope controls shall be applied to Palava in context of its climate – warm and humid temperate.
For Palava , to adapt to the climatic conditions, at site planning level, High rise multi storied buildings and structures should be oriented so as not to obstruct the air movement through the site.
For indoor ventilation
As per the specifications mentioned in Section 2.2,for air conditioned space minimum ventilation requirement shall be taken as 5cfm per person and for non-AC spaces the operable area shall be taken as a percentage of the total carpet area with the minimum standards for different space types like :- Living Spaces – 10%, Kitchen – 8% and Bathrooms – 4%.

0 Energy consumption for artificial day-lighting



With appropriate building design, the amount of day light entering the habitable room can be controlled.
For Palava to achieve zero energy consumption for artificial day lighting, the performance specifications applicable shall be applied.
Percentage of openings and fenestration shall range between 15%- 20% of the floor area.

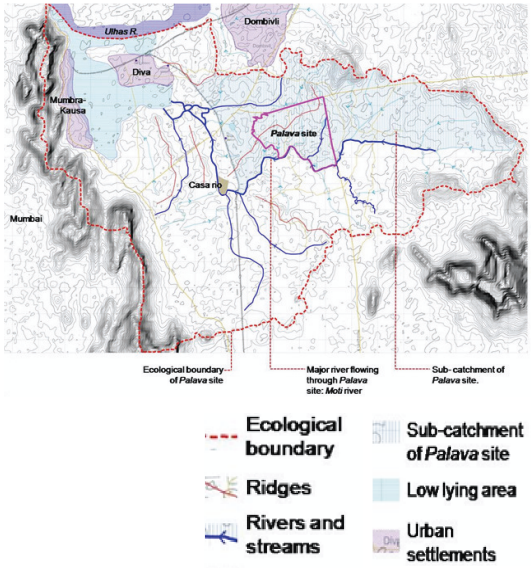
The minimum Room depth: Height proportions shall be maintained as given in the illustrations.


3

Example: Echlin Street Terrace Apartments
With the majority of windows facing north or south, windows are easily shaded by eaves and overhangs.
Low angle sun from the east (in the am) and west (in the pm).Windows and doors opening onto the courtyard allow natural day-light to filter into the rear of the home and air to flow through the length.

Biodiversity

Integrate landscaping and the landscape



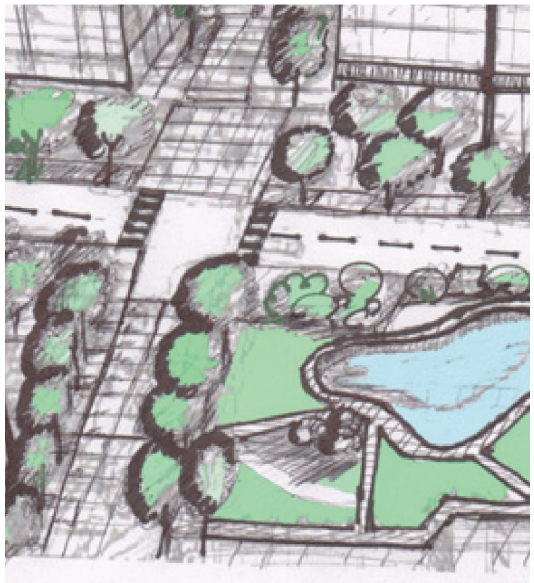
Climate : Tropical-Warm and Humid.
Annual rainfall: 2293.4 mm.
Temperature variation : 17 0C to 34 0 C.
Rock type : Basaltic.
Soil type : Coarse, medium black, clayey, shallow soils.
Main River : Ulhas river.
Agriculture : Mainly paddy cultivation.

Productive Landscapes – integrating agriculture/ cultivation into the urban design- shall be incorporated in Palava to achieve the target of 100% locally grown food.
The ecological boundary within which the Palava site is located is a sub-catchment area measuring 8071.60 acres as shown below.
The Palava site has very specific existing characteristics as a result of the underlying strata and ecological processes. They range from exposed rocks and ten feet deep quarries to seasonal bursts of wildflowers and growth of grasses, as well as a waterfront that varies in its nature from rocky to soft grassland. These factors provide an opportunity to craft a rooted identity for the overall landscape of Palava and need to not just be integrated, but become the conceptual basis for open space design.

[7] *Section 3. Energy , page 36, BH Report suggests a few passive energy reduction techniques for envelope control measures.*

Recreational Greens

10 – 12 sqm green space per person



Strengthening the existing greens and deliberate in fill within the existing environs can create a clean, healthy and beautiful experience altogether for the residents of Palava to live in, to work in and to rejuvenate themselves.
Channelizing the seasonal and perennial rivers across the site can actually enable river front developments to flourish.
City level recreational spaces shall be complimented with neighbourhood level and street level greens.
Each and every structure shall be designed to maximise the interface between the interior and exterior greens

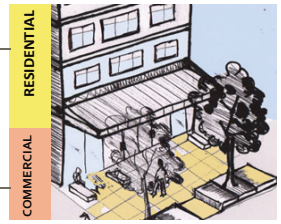
Green spaces shall be planned as per the planning unit as specified below.

Planning Unit	Green / Recreational Space
Housing cluster	3-4 local parks and playgrounds
Sector	3-4 local park and playgrounds
Community	2-3 community level park and open space
District	District level park and sports centre
Sub city centre	1 city level park, sports complex, botanical garden

Safety and Security

Design vigilant streets





Mixed land use along the primary access roads facilitates compact development with safer and active streets.

Palava shall have a safe pedestrian environment with a provision of footpaths on either side of the road, separated by a green buffer from the vehicular carriage way.
The approach shall be to:
1. Place activity at the street level
2. Light up the streets
3. Keep the eyes on the streets - visual stimulation and control.

Mixed use developments along the roads, natural surveillance can be achieved through:-
1. Overlooking balconies on the upper floors
2. Using clear glasses on the windows
3. Designing outdoor seating spaces
4. Minimum or no building setbacks
5. Transparent compound walls if above 100cm high.
6. Well lit streets with no dark edges.

[7] *Section 3. Energy , page 36, BH Report suggests a few passive energy reduction techniques for envelope control measures.*

Minimize the conflicts



Road safety

Slow traffic down.
The speed on urban arterial roads and sub-arterial streets should be limited to 50kmph and on collector and local streets to 30kmph.
Induce traffic calming of all streets with ROW of 12m or less through narrowing of the driveway and meandering path by the use of trees, islands and street furniture.
If separated by heavy traffic roads, appropriate and safe surface level crossings should be provided.
Grade separated structures (foot-over-bridges and pedestrian-subways) should be avoided to prevent too many detours.

Social inclusion

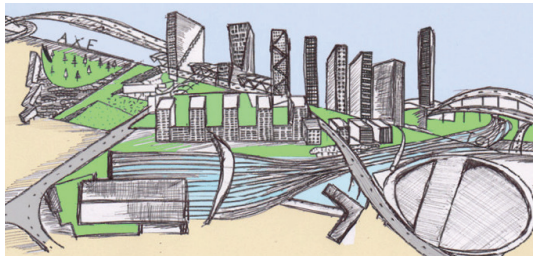
Understand the social dynamics and strengthen the local identity.
Involving people in the design and management of the city ensures inclusion of all.
Palava should be able to foster a sound community sense among its residents.
Encouraged people's participation in asset management, collaborative efforts for maintaining the common/public areas will bring the city an all together high degree of social security and minimize conflicts.

Smart Networks

Build a futuristic Smart city [8]

Palava must not just evolve as a smart city but rather be a truly living and livable city, demonstrating integration of intelligent systems over its lifetime. Besides developing it as a technologically sound and efficient city with smart grids in infrastructure, energy and transportation, Palava needs to be a living city with a nervous system backed by both technology and its citizens for its functioning, management, service delivery and governance.

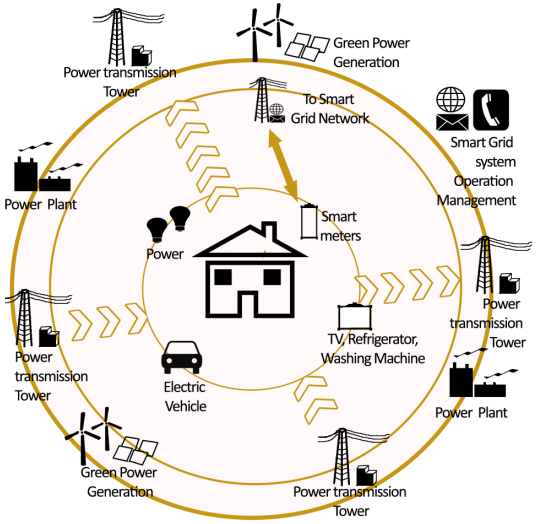
Using the latest technologies being offered by companies like IBM and CISCO and integrating smart grids into the designs,
Palava shall incorporate similar technologies for managing traffic problems, increasing safety, managing efficiency in infrastructure or even for emergency and response.



Singapore's Land Transport Authority (LTA) has successfully encouraged its citizens to use public transport and minimized congestion by leveraging such smart technology to increase ridership and reduce traffic congestion.

[8] *Chapter 6. Telecommunications, page 68, BH Report shall be referred to adopt smart technologies inn telecommunications in the city.*

Plan for the city's sustainability [9]
0 Energy Balance



Palava shall strive to offer its citizens / residents clean, efficient and sustainable energy options that achieve zero energy balance. Generation and distribution shall be planned phase wise conforming to the demands generated.

Palava City shall minimise energy consumption by deploying the best commercially viable international energy-efficient techniques, setting energy efficiency guidelines in areas such as insulation, low-energy lighting specifications, optimizing natural light, installing smart applications.

Smart actions minimize adverse impacts on electricity grids and maximize consumer savings. Example:- Residents of South Bend, Indiana are enjoying the benefits already. 100,000 smart meters are in use by Florida power & Light residential and small business customers.

Alternate power augmenting source :

Building Level Renewable Power Generation, using Evacuated Tube Solar Collectors to tap solar energy to provide domestic hot water.

Concentrated solar and geothermal heat for possible air-conditioning solutions for the city (district cooling).

Incorporation of a Smart Grid to integrate multiple power generation options

Chapter 7-Design Guidelines and LEED, page 75, shall be referred to consider energy efficiency in city planning as per the LEED ratings/standards applicable in India.

Efficient Construction

Adopt efficiency in construction


4(a)


4(b)



4(c)

Palava shall aim to have timely execution and efficient delivery mechanism as a solution to Optimal Construction. This could be achieved by the project managers setting targets and viable options in terms of the no. of consolidation centres required, their location, etc.(Refer Chapter “Materials and Construction Systems”, Section-I for more details on Materials Consolidation Centre).

Incorporate Construction Systems which have reduced energy consumption, less delays and minimum adverse environmental impacts. Use eco-friendly construction materials with maximum economic efficiency and high degree of quality standards.

Chapter 7-Design Guidelines and LEED, page 75, gives the standards to be achieved to adopt Green features in Construction & Technology as per LEED ratings pre-requisites.

These targets need to be measurably achieved using an existing project by the Lodha group as a benchmark.

Recycled materials or those with low embodied energy like Fired Clay Brick, Pulverized Debris based, Industrial Waste based , Aerated Lightweight Concrete Block should be encouraged.

Large scale construction of Masdar City is an example of using recycled materials for construction like:

a) 100% sustainably sourced timber.

b) Green concrete with reduced carbon footprint up to 30-40% of CO_2.

c) Water-based paints.

d) 100% recycled steel reinforcement.

Sustainable Infrastructure

Provide for

24 hours water supply

60 % Potable Water demand reduction

Palava shall adopt sustainable water design - Reduce, Reuse and Recycle- as an essential strategy for safeguarding the future. Maximizing on-site resources through rainwater harvesting and recycling of treated sewage effluent should be the achievable objectives to meet the set targets to maximize efficiency. Incorporating the alternative techniques mentioned in Section I , Chapter “Environment”.

Re-Use the waste

Reduce the burden to Landfill Site

The key strategies for solid waste management shall include:

a) Building-by-Building Recycling : A building-wise recycling.

b) Materials Recovery Facility (MRF) : All solid waste from the development will be directed here, separated into the appropriate waste stream and either processed or sent off-site to landfill sites.

c) Waste to Energy : using Aerobic Digester to produce electricity.

d) Composting : can be used to decompose organic waste.

The Palava City solid waste strategy seeks to minimise waste to landfill and maximise the resource potential of waste materials by reuse, recycling, composting and recovery of energy.

The proposal for Palava would be to optimally utilise/incorporate the conventional sewage plants in the system design which are energy-efficient and environmentally friendly, and can be applied at all scales.

Sustainable Infrastructure

Social Infrastructure

Offer for a healthy physical, mental and social well being

The educational Institutions and the health Infrastucture within Palava shall be developed with the aim of not only sufficing the needs of the students of the city's residents but also of installing the facilities of the highest order that would benefit the adjoining region as well.
Social infrastructure is more than simply the provision of physical facilities. Therefore in considering the broader context of social sustainability, a necessary factor must be the elements known as "soft" infrastructure as well as physical or "hard' infrastructure.

Conform to the quantitative and qualitative standards

At least 20% of the numbers of healthcare facilities above (up to the level of Intermediate Hospital) shall be based on any system of alternative medicine (Ayurvedic, Homoeopathic, Greek, Tibetan, Chinese, Holistic, etc.).
None of the facilities (educational, medical and socio-cultural facilities) shall be gated. That is, free access shall be allowed up to any relevant lobby or point inside for any member of the public who is on the street in Palava.
In Palava, Livability shall be demonstrated through actively engaging RWAs, the provision, maintenance and continual upgrading of these facilities.

A per the standards for the provision of social infrastructure by UDPFI guidelines, refer to Appendix I,for the list of facilities to be provided in Palava, a city for sustaining about 5,00.000 people.
Besides meeting the spatial requirements and the minimum number to cater the poulation (both residents and visitors), Palava shall develop the livability through the intangible standards as well. The modern city shall provide all-rounded child-centred learning, with a stress on humanities, sports and the arts keeping in view the demand for thinking, creative individuals, with good ability for team work and cooperation, all educational institutes (as already mentioned in Chapter 8, Section I, of the book).

Standards for Distribution Services

Considering the standards referred in Appendix I, Distribution Services, and the population to be served in Palava, the following minimum numbers with the considerations listed, shall be provided for.

1. Petrol pump (1 filling station with minimum 2 pumps shall serve 5,000 – 20,000 population, Hence the number adds up to minimum 25). Maximum distance between the consecutive station shall not exceed 3kms.
2. Minimum 200 milk booths (1 milk booth for 5,000 population), usually to be accommodated within the retail and daily needs stores near residential areas.
3. LPG Godown : 2 would serve the purpose with ench one serving upto 50,000 population.
4. Minimum 5 police stations, 1 for every 90,000 population
5. Minimum 2 Fire Station or Sub-Fire Station to be provided, one serving 2 lakh population (one within each parcel).
6. Taxi stands/ bus stops/ Rickshaw stands: Shall be located near Primary roads' intersections. Maximum distance of such facilities should not exceed 0.5 km from the farthest point in any residential area.
7. Commercial activities/Shops : The provision for commercial activities for a city of the scale of Palava falls under District centre planning unit hierarchy of UDPFI guidelines. At city level, minimum area under commercial land use should be 2 to 3 % of the total land area.

Further, 80% of the people employed in these social facilities must have the economic ability to live somewhere in Palava.

City Governance

GOAL: Citizen-centric administration

Governance is good and effective when it subscribes to, promotes and ensures the following nine characteristics :

- Participation
- Consensus Orientation
- Effective & Efficiency
- Strategic Vision
- Responsiveness
- Equity Building
- Rule of Law
- Transparency
- Accountability



While the term 'government' indicates a political unit for the function of policy making as distinguished from the administration of policies, the word 'governance' denotes an overall responsibility for both - the political and administrative functions. It also implies ensuring moral behavior and ethical conduct in the task of governing, i.e., the continuous exercise of authority on both the political and administrative units of governments.

The key activity areas to be looked for a city's governance include formalizing Administrative/Institutional Framework to execute, manage, evaluate and monitor the city's :

- Infrastructure & Environment - Assets -Finance - Law & Order - Resources - People

'The result of good governance is a development that 'gives priority to poor, advances the cause of women, sustains the environment, and creates needed opportunities for employment and other livelihoods'.

(Re-conceptualizing Governance, UNDP, 1997. Pg. 1).

ICT in Governance



The effectiveness in this field can be achieved provided due consideration is given to maximise the flow of Information, exchange of ideas, transparent decision making process, and an underlying commitment to serve the common good. ICT can greatly enhance democratic participation by the citizens of a community, thereby making a city more livable. By enabling a multi-way flow of information and feedback on an on-going and real-time basis, citizens can be empowered to participate,ensure the efficient functioning of city services, influence policy decisions and ensure that their voices are heard. Further, transparency and accountability of government services can be facilitated by ICT leading to a more equitable society.

Mumbai's Citizen Services Portal (CSP)

CSP has transformed the way MCGM works and delivers services to its citizens. Citizen portal ward management module, enables online delivery of over 100 citizen services, such as registration of births and deaths, issuance of licenses and permits, etc. Citizens can make online payment of water bills, telephone bills, etc online.

Cape Town's 'Smart City' Strategy

The city administration launched in 2002 its award-winning 'Smart City' strategy to achieve a city where 80% of residents, businesses and institutions are connected through ICT and are able to interact with the city administration through the use of ICT, allowing citizens to deal with local government services in an integrated manner, via "one-stop-shops".

Aspirational Targets

Overcoming the odds, to achieve the ODS

***O**pportunity*	*1. Opportunities and choices to livelihoods and lifestyles.*
***D**iversity*	*2. Diverse yet balanced social, cultural and economic environment.*
***S**ustainability*	*3. Sustainable living patterns.*



100% employment rate.

To be ranked among the top 10 livable cities of India.

100% inter-city and intra-city accessibility offered with the choices of transit modes.

More than 90% of the users commuting via public transport modes.

Reducing the number of road accidents fatalities to 0.

100% accountability and transparency in the governance system.

Reduction in crime rate to 0.

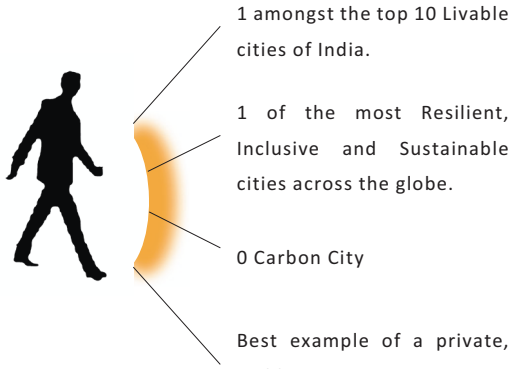
City's GDP increase @ 2% per year.

Incremental reduction in the energy usage and carbon footprint by per year.

Per capita income above Rs 10,000 per month.

100 % safe, comfortable, and interesting environment that encourages walking for pleasure and for transportation.

Globally recognized city for its distinctive livable urban environment.



Emerge as an attractive destination not only for Local Business but also New Investment and Global Trade.

Economically sound city which protects, enhances, increases and densifies employment opportunities.

Flexible development adaptable to the changing technology, age and time.

Full community participation in the city governing and monitoring functions.

Sustain a stable economic base using the available resources and expanding the services.

Livability Checklist for Palava

Evaluative and considering factors

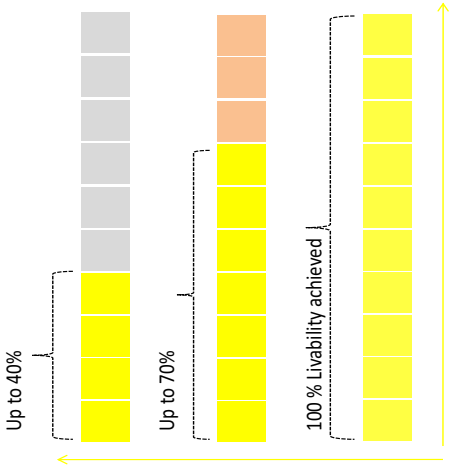
			Options		
1	URBAN PATTERN				
1.1	LAND USE	Land Uses conform to UDPFI guidelines or other applicable planning norms	No	Yes	
		Integration of Land use and Transport Planning	No	Yes	
		Percentage of Land use for Institutional or Workspaces in the city planning	Up to 10 %	10 - 20%	20 - 30%
1.2	COMPACT DEVELOPMENT	Population Density ranges between 200ppa - 400ppa	No	Yes	
		Maximum FAR 1.5 for Residential Use	No	Yes	
		Maximum FAR 3 - 4 for mixed- land Use	No	Yes	
		Minimum building Height along mass transit corridor = 26m	No	Yes	
		Minimum Building block area = 2250 sqm	No	Yes	
		Minimum Building Block Size = 60m X 180m	No	Yes	
		Maximum Ground Coverage achieved	< 35 %	35-40%	> 40%
		Ratio of Residential to Non-residential Use (specifically for a city like Palava)	50 - 50	70 - 30	other
1.3	PROPORTION OF GREEN AND OPEN SPACES	Percentage of areas under green cum recreational use	< 1 5 %	15- 20 %	> 20 %
		Minimum Recreational area planned per person	< 10 sqm	10-12sqm	> 12sqm
1.4	ACCESS STREETS	a building block)	< 50m	50 - 60m	> 60m
		Interconnected and easily accessible Neighbourhoods	No	Yes	
2	ENVELOPE CONTROLS				
2.1	SITE ORIENTATION	Climate responsive site planning (for warm-humid climate)	No	Yes	
		Comfortable Micro climate achieved throughout the year	No	Yes	
		ECBC guidelines followed	No	Yes	
		SHGC considered	No	Yes	
		NBC or other building development code referred	No	Yes	
		Percentage of air circulation achieved through all buildings	Less than 80%	80-95%	95-100%
		Building colour / texture suit to climatic conditions	No	Yes	
		Cross-Ventilation for comfortable indoor environment	No	Yes	
		Build -Void ratio per building block	up to 50 %	50 - 60%	> 60%
		Building orientation with respect to the sun	< 15 degrees	15-25 degrees	> 25 degrees
		Percentage of fenestrations to the floor area	< 15 %	15 - 20 %	> 20 %
2.2	BUILDING BLOCK / BUILDING DESIGN	Minimum distance between windows / balconies of buildings across the streets			
		For Buildings up to 12 m height	< 5 m	5 - 10 m	> 10 m
		For Buildings up to 24 m height	< 10 m	10 - 15 m	> 15 m
		For Buildings above 24 m height	< 15 m	15 - 20 m	> 20 m
		Depth : Height ratio			
		For Single Ventilated building	< 1:2.5	> 1:2.5	
		For Double-Ventilated building	< 1:2.5	> 1:2.5	

		For multiple-Ventilated building	< 1:2.5	> 1:2.5	
		Noise Reduction measures incorporated	No	Yes	
		Need for artificial lighting in habitable rooms during clear weather days	No	Yes	
3	**MOBILITY**				
3.1	**WALK**	Min. Footpath 2m wide for all streets more than 12m ROW	No	Yes	
		Fully pedestrianized streets designated where calculated pedestrian traffic > 8000 per hour in both directions together	No	Yes	
		Barrier free designed streets and structures	No	Yes	
		Max. Distance between consecutive street crossings	< 250 m	> 250 m	
		Max. Speed limit on Arterial Roads	50 kmph	> 50kmph	
		Max. Speed limit on Collector Roads	50 kmph	> 50kmph	
		Max. Speed limit on Local Roads	30 kmph	> 30kmph	
		Traffic Calming measures undertaken in street/road design	No	Yes	
		Street Crossections conform to Standard Street Guidelines (UTIPEC, UDPFI,etc)	No	Yes	
		Transparent Compound walls (if higher than 100m)	No	Yes	
		Well lit street networks (both during day and night time)	No	Yes	
		Safe and secure walking environment for all (children, aged and women)	No	Yes	
3.2	**CYCLE NETWORKS**	Dedicated cycle tracks min 2m wide (streets with ROW >10m)	No	Yes	
		Provision for Cycle sharing system in the city	No	Yes	
		Ease in street crossing through appropriate design (level difference not >150mm)	No	Yes	
		Max.area of blocks not more than for easy pedestrian and cycle access	< 2 Ha	> 2 Ha	
3.3	**CONNECT and TRANSIT**	Multi-modal transit available	No	Yes	
		Mass-transit options available within the walking distance for 80 per cent of the population	No	Yes	
		Public bus service where passenger trips > 1000 phpd	No	Yes	
		Bus- Rapid Transit system where passenger trips >45000 phpd	No	Yes	
		Metro-Rail system where demand > 15000 phpd	No	Yes	
		Max. Distance of public facilities from public transport	< 400m	400-500m	> 500m
3.4	**DENSITY/ DIVERSITY / COMPACTNESS**	Min. Population Density within 800m transit catchment	Up to175 ppHa	> 175 ppHa	
		Transit Oriented Development - TOD - design incorporated	No	Yes	
		Min percentage of mix-land use at city level land use distribution	Up to 70%	70 -85%	> 85%
		Max. Distance up to the transit stations (as measured via cycle trip)	less than 5 minutes	5-10 minutes	> 10 minutes
		Scope for future Redevelopment / Infill	No	Yes	
		MLCP provision provided at neighbourhood level	No	Yes	

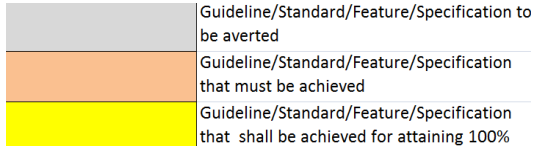
3.5	SHIFT (Traffic Regulatory measures)	NMT promotion / Facilitation within 300 m walking distance	No	Yes	
		Mandatory parking for 2-wheelers and cycles	No	Yes	
		Environment friendly and sustainable transport modes promoted	No	Yes	
4	BIODIVERSITY				
4.1	PUBLIC REALM	Existing Natural resources preserved	No	Yes	
		100% ensured Safety and Security in the public places	No	Yes	
		city residents	70%	70-90%	100%
4.2	PRODUCTIVE LANDSCAPES	Use of Recycled waste in farming / landscaping	No	Yes	
		Terrace garden / Terrace farming incorporated	No	Yes	
		Percentage of Indigenous plants species grown throughout the city	70%	70-90%	100%
5	ENVIRONMENT (further standards to be added)				
5.1	AIR QUALITY & NIOSE LEVEL	Specifications conform to CPCB standards	No	Yes	
		Specifications conform to SPCB standards (Maharashtra)	No	Yes	
		Air Quality Standards conform to NAAQ norms			
		Standards as per Ministry of Environment and Forestry referred	No	Yes	
5.2	WATER, SEWAGE AND DRAINAGE	Per day water Supply hours	24 Hrs	6 hours, two times a day	less than 12 hours per day
		Per capita Water Supply	less than 135 lpcd	135-150 lpcd	> 150 lpcd
		Waste water treatment / recycling methods incorporated	No	Yes	
		Recycled water use for ancillary uses-flushing, gardening, etc.	Less than 70%	70-95%recycled water use	100% recycled water use
5.3	SOLID WASTE MANAGEMENT	Sludge converted to useful material /Bio gas harnessing techniques developed	No	Yes	
		Reduce, Recycle and Reuse Technique adopted	No	Yes	
		At source waste separation methods incorporated	No	Yes	
		Percentage of site area used for solid waste treatment	Less than 4% of the total site area	More than 4% of the total site area	
		Municipal Solid Wastes (Management & Handling) Rules, 2000 (MSW Rules) followed	No	Yes	
		For Hazardous Waste treatment & Disposal :- Management, Handling & Transboundary Movement Rules, 2010 applied	No	Yes	
		Per year Reduction of waste to landfill site	less than 20% per year	20% per year	more than 20% per year
		At source separation methods implemented	No	Yes	
		Composting Percentage of Organic waste produced	Up to 50%	50-80%	80-100%

5.4	**RAIN WATER**	Rain water harvesting techniques incorporated		No	Yes	
6	**ENERGY**					
6.1	**EFFICIENT GENERATION, DISTRIBUTION AND MANAGEMENT**	Continuous Power Supply (24 hrs)		No	Yes	
		Emergency power back up available		No	Yes	
		Alternate Sources of power integrated		No	Yes	
			if yes mention	Solar Energy	Wind energy	Energy from gas
		Partnership from other energy providers		No	Yes	
		Transmission and Distribution loss		Less than 10%	10-25%	> 25%
		Smart Technologies incorporated		Smart Grid	Smart Metering	Smart Monitoring /management
		Integration of Waste to energy conversion methods		No	Yes	
		Conformity to ECBC standards for energy efficiency		No	Yes	
		Conformity to IGBC standards		No	Yes	
7	**INTELLIGENT & SMART SYSTEMS (Applications)**					
7.1	**TRANSPORTATION**	Delays due to Traffic Congestion reduction to 0 second		No	Yes	
		100% on-road Public Safety		No	Yes	
		24hrs traffic ICT surveillance systems		No	Yes	
7.2	**EMERGENCY RESPONSE, SAFETY & SECURITY**	Reduction in emergency response time to maximum 10 minutes		No	Yes	
		Pro-active disaster management Planning		No	Yes	
		Strengthened surveillance systems (24hrs security systems installed)		No	Yes	
		Reduced crime rates (0 incidents of crime, theft and robbery)		No	Yes	
7.3	**City Infrastructure**	Application of smart grid technologies in provision and management of services like water supply, waste management, etc.		No	Yes	
		40% reduced manpower employed for city management (with more mechanised management systems installed)		No	Yes	
8	**HEALTH, EDUCATION, SAFETY & SECURITY**					
8.1	**HEALTH**	WHO standards applicable		No	Yes	
		UDPFI Guidelines followed (number and hierarchy of medical facilities provided as per the population size)		No	Yes	
		Adherence to CPCB norms		No	Yes	
		Adequate healthcare facilities accessible to all residents (within 800m radius)		No	Yes	
		Emergency services available within 10 minutes of response time		No	Yes	
		UDPFI Guidelines followed (number and hierarchy of medical facilities provided as per the population size)		No	Yes	
		UDPFI Guidelines followed (number and hierarchy of medical facilities provided as per the population size)		No	Yes	

		Pre-Primary / Nursery School	Up to 12 students per teacher	Up to 16 students per teacher	More than 15 students per teacher
8.2	EDUCATION	Primary School	Up to 16 students per teacher	Up to 20 students per teacher	More than 20 students per teacher
		Middle and senior Schools	Up to 20 students per teacher	Up to 25 students per teacher	More than 25 students per teacher
		Maximum access distance to reach the facility	Up to 15 mins walking time	Up to 30 mins walking time	More than 30 mins walking time
		Conformity to NBC, UDPFI guidelines and MMRDA planning norms	No	Yes	
8.3	SAFETY & SECURITY	Construction and designing as per the building safety regulations	No	Yes	
		Social Security guarded (0 incident of social conflict/unrest)	No	Yes	
9	MATERIALS & CONSTRUCTION SYSTEMS				
	Use of eco-friendly construction materials		Up to 50%	50-80%	80-100%
	On time delivery of materials and services		No	Yes	
	Reduction in Delays, errors and accidents in construction		No	Yes	
	Use of materials with low-embodied energy		No	Yes	
	Latest technological use in the construction systems		No	Yes	
	Locally available & renewable construction materials used / incorporated		Up to 50%	50-80%	80-100%
10	GOVERNANCE				
	0 incidents of crime		No	Yes	
	0 incidents of social unrest		No	Yes	
	per year GDP Growth Rate		Less than 2%	2-4%	> 4%
	City's Employment rate		Up to 50%	50-80%	80-100%
	Average Per capita income per month		Less than Rs 8000	Rs8,000-Rs10,000	> Rs 10,000
	Dependency on State govt / municipal body for infrastructure -water, sewerage or power.		0 dependency	Up to 30% dependency	more than 30% dependency
	Full community participation in the city governing and monitoring functions.		No	Yes	
	Emerge as an attractive destination not only for Local Business but also New Investment and Global Trade		No	Yes	
	Sustain a stable economic base using the available resources		No	Yes	



Scale o Livability achieved on implementing the guidelines listed in the checklist above.



The checklist is a list of all the parameters that are inclusive of guidlines, standards and specifications (proposed in the entire book), which is a means to not only bring out the key features of the city but alalso acts as an evaluative tool to measure for its Livability over its lifetime.
For Palava to emerge as the most Livable city, must conform to the maximum livable and sustainable standards listed.

If efficiently designed and effectively implemented, the above stated standards would make Palava certainly the first 100% Livable Indian city and the first to be counted amongst the top 10 livable cities in the world.



Appendices

I. UDPFI standards for city planning

EDUCATIONAL FACILITIES		No. as per the population size	Number For Palava	Strength of the school	Area per facility	Additional Requirements
PRIMARY & SECONDARY EDUCATION						
1	Pre primary, nursery school	1 for 2500 population	200	200 students	0.08 ha	Pre primary/ nursery school to be located near a park
2	Primary school (class I to V)	1 for 2500 population	200	500 students	0.4 ha	Play field area with a min of 18m X 36 m to be ensured for effective play
3	Senior Secondary School (VI to XII)	1 for 7500 population	66	1000 students	1.2 ha	Play field area with a min of 68m X 126 m to be ensured for effective play
4	Integrated school without hostel facility (Class I-XII)	1 for 90,000-1,00,000 population	5	1500 students	3.50 ha	Play area should be 2.5 ha
5	Integrated school without hostel facility (Class I-XII)	1 for 90,000-1,00,000 population	5	1000 students	3.9 ha	Play area should be 2.5 ha while min. residential area of 0.4 ha should be provided.
6	School for differently abled	1 for 45 000 population	11	400 students	0.5 ha	Play field area of 0.3 ha should be provided.
HIGHER EDUCATION						
7	College	1 College for 1.25 lakh population	4	1000-1500 students	4 ha	A play area of 1.8 ha and residential area of min. 0.4 ha should be provided.
	University campus Area	Upto 5 lakh population	1		10 ha	Brief to be developed from first principles according to type of university
TECHNICAL EDUCATION						
8	Technical Education centre (A) Includes 1industrial training institute and 1 polytechnic	1 such centre provided for every 10 lakh pop	1	Up to 1000 students	4 ha	Brief to be developed from first principles according to type of institutes

MEDICAL / HEALTH CARE FACILITIES					
		No. as per the population size	Number For Palava	Capacity	Area per facility
1	Dispensary	1 for 0.15 lakh population	33	-	0.08 to 0.12 ha
2	Nursing home, child welfare and maternity centre	1 for 0.45 to 1 lakh population	5	25 to 30 beds	0.2 to 0.3 ha
3	Polyclinic with some observation beds	1 for lakh population	5	-	0.2 to 0.3 ha
4	Intermediate hospital	1 hospital for 1 lakh population	5	100 bedded	3.7 ha
5	General hospital	1 for 2.5 lakh population capacity	2	500 bedded	6 ha

SOCIO-CULTURAL FACILITY				
		No. as per population size	Number for Palava	Area per facility
1	Community room	1 for 5,000 population area	100	660 Sq..m
2	Community hall and library	1 for 15,000 population area	33	2000 sq.m
3	Recreational club	1 for 1 lakh population area	5	10,000 sq.m
4	Music, dance and drama centre	1 for 1 lakh population - area	5	1,000 sq.m
5	Meditation and spiritual centre	1 for lakh population area	5	5000 sq.m
6	Socio-cultural centre	1 for 10 lakh population area	1	15 ha

SPORTS FACILTIES					
		Population Served	Number for Palava	Area per unit	Level
1	Housing Area Play Ground	1 for 5,000 population area	100	0.5 ha	Housing area
2	Neighbourhood Play ground	1 for 15,000 population area	33	1.5 ha	Neighborhood
3	Community level Sports Centre	1 for 1 lakh population area	5	8.0 ha	Community
4	City level Stadium & Sports Complex	1 for 1 lakh population - area	5	24.0 ha	City

Distribution Services

1. Petrol pump
   a.One petrol pump for 150 ha of gross residential areas in residential zone
   b.One petrol pump for 40 ha of gross industrial area
   c.Two petrol pumps in each district centre
   d.One petrol pump in each community centre
2.Milk distribution
   1 milk booth for 5,000 population
3.LPG Godown
   One gas Godown for 40-50 thousand population is sufficient for any size of town. The major concern for its storage and distribution is the location which shall be away from the residential areas
4.Police station (min. area 1.5 Ha)
   1 for every 90,000 population. Area inclusive of essential residential accommodation 0.05 ha additional to be provided for civil defense and home guards
5.1 Fire Station or Sub-Fire Station within 1 for 3 km to be provided for every 2 lakh population.

Miscellaneous Services

1. Cremation/ burial ground: Provision of at least 2 sites for 5 lakh population.
2. Dhobi Ghat: 1 site for 1 lakh population with appropriate arrangements for water and drainage facilities.
3. Taxi stands/ bus stops/ Rickshaw stands :
   a.Should not be located near the road intersections
   b.Maximum distance of such facilities should not exceed 0.5 km from the farthest point in any residential area.
   4.Commercial activities /shops :
The provision for commercial activities for a city of the scale of Palava (upto 5 lakh population) falls under District centre planning unit hierarchy of UDPFI guidelines. At city level, minimum area under commercial land use should be 2 to 3 % of the total land area.

II.Day lighting, WWR, Glazing standards (IGBC. 2009)

CRITERIA		ACCEPT-ABLE	PRE-FERRED
REQUIRED:			
1.WINDOW-WALL RATIO1			
MAXIMUM ALLOWABLE EXTERIOR GLASS AREA AS A %OF GROSS EXTE-RIOR WALL AREA 2, 3	NORTH ELEVA-TION	70% max	50%
	EAST ELEVATION	30% max	22%
	SOUTH ELEVA-TION	30% max	26%
	WEST ELEVA-TION	30% max	22%
2.GLASS PERFORMANCE1, 4			
VIEW GLASS			
Shading Coefficient, SC		0.38 max	0.22
Visible Transmittance,VT		40% max	18%
DAY LIGHTING GLASS			
Shading Coefficient, SC		0.38 max	0.38
Visible Transmittance, VT5		40% max	38%
UNSHADED Shading Coefficient, SC		0.38 max	0.26
Visible Transmittance, VT		40% max	23%

III. Plant list and productivity

The following gives a list of food source plants that can be grown with per hectare yields of the following

Crops & Vegetables

Common Name	Botanical name	Sowing time												Spacing in cm	Harvesting time												Seedrate	Yield
		J	F	M	A	M	Ju	Jl	Au	S	O	N	D		J	F	M	A	M	Ju	Jl	Au	S	O	N	D	(per Hec in Kgs)	(per Hec in Kgs)
Field Crops																												
1. Rice (Broadcast)	*Orzya sativa*													Broadcast													10to 12 Kg	80 to 100
2.Wheat(Dry)	*Triticum durum, Desf.*													22.8 to 30.5													18 to 10 Kg	60 to 80
3. Wheat (irrigated)	*Triticum vulgare, Vill*													17.7 to 22.8 to 30.5													10 to 16 Kg	240 to 320
4.Jowar	*Sorghum vulgare*													38 x 45													15 to 20 Kg	280 to 320 Kg
5.Maize	*Zea mays*													45 x 60													3.2 to4 Kg	200 to240 Kg
6.Millets	*Panicum miliaceum*													22.8x30.5													2 to 2.4 Kg	160 to 200 Kg
7.Barley	*Hordeum vulgare*													22.8x 30.5													8 to 10 Kg	200 to 280 Kg
8.Gram	*Cicer arietinum*													30.5--													10 to 12 Kg	120 to 160 Kg
9.Tur(Pigeon pea)	*Cajanus indicus*													1.2mtx1.8 mt													1.2 to 1.6 Kg	160 to 200 kg
10.Chillies	*Capsicum frutescens*													.9mt to .6mt													100 to 160 Kg	800-1200green;240-300 dry
11.Potato	*Solanum tuberosum*													38 x 22.8;45x 22.8													200 to 240 Kg	2000 to 2400 Kg
12.Sweet potato	*Ipomoea batatas*													22.8x22.8;30.5x 15.24													80000 cutting of 45cm	long 1600 to 2400
13.Mustard	*Brassica juncea*													30.5 x 38													.4 to .8 Kg	120 to 160 Kg
14.Ginger	*Zingiber officinale*													15x15;22.8x22.8;30.5x 30.5													140 to 280 kg	1200- 2000green; 240-400 dry
15.Tomato	*Lycopersicum esculentum*													.9x.6;.9x.75;.9x.9mt													60 to 80g	2400- 3200 Kg
16.Garlic	*Allium sativum*																										60 to 90 Kg	800 to 1800 Kg
17.Indigo	*Indigofera tinctoria*																										2 to2.4 Kg	160 to 2000 kg
18.Sesemum	*Sesamum orientale*													22.8x30.5;45 to 60													.4 to .8 Kg	80 to 160 Kg
19.Castor	*Ricinus communis*													.9mtx1.5mt;1.8mtx 1.2mt.													2 to 2.4 Kg	120 to 160 Kg
20. Groundnut	*Arachis hypogaea*													30.5x45;.6mt x .9 mt													12to14Kg	200 to 280 Kg
21.Cotton(hybrid)	*Gossypium herbaceum*													.6 mt to 1.5 mt													2to 3.2 Kg	
22.Sugarcane	*Saccharum officinarum*																											
23.Broccoli	*Brassica oleracea*																											
24.Parslely	*Petroselinum hortense*																											
25.Cherry tomatoes																												
26.Carrot	*Daucus carota*																										2.4 to 2.8 Kg	2000 to 2400 Kg
27.Raddish	*Raphanus sativus*																										1.2 to1.6Kg	1200 to 1600 Kg
28.Lettuce	*Lactuca sativa*													30.5 x 30.5													200 gm	1200 Kg
29.Cabbage	*Brassica oleracea capitata*													.6x.6;.6x.75 mt													200 gm	3200 Kg
30.Cauliflower	*Brassica oleracea botrytis*													.6x.6;.6x.75 mt													80 gm	4000 Kg
31.Palak,Spinach	*Spinacia oleracea*													22.8 to 30.5													2 to 2.4 Kg	1200- 14000 Kg
32.Cucumber	*Cucumis sativus*													1.2x1.2;1.5x1.5;1.8x1.8 mt													80 gm	800 to 1000Kg
33.Brinijal	*Solanum melongena*	throughout year												.9x.6;.9x.75;.9x.9													80 to 100 gm	
34.Pumpkin	*Cucrbita pepo*													1.5 x .6 mt													.4 to .8 Kg	4000 to 5000 Kg

Fruits

Common Name	Botanical name	Sowing time												Spacing in cm	Harvesting time												Seedrate	Yield
		J	F	M	A	M	Ju	Jl	Au	S	O	N	D		J	F	M	A	M	Ju	Jl	Au	S	O	N	D	(per acre in Kgs)	(per acre in Kgs)
Fruit Crops (Foliage also)																												
1.Mango (graft)	*Mangifera indica*													9x 9 mt														1000 to 3000 fruits per tree
2.Chiko (Sapota)	*Achras zapota*													9 x9 mt														1500 to 2000 fruits per tree
3.Papaya	*Carica papaya*													2.4x 2.4 mt														16 to 20kg per plant
4.Pomegranate	*Punica granatum*													3x4.5mt;3x6mt														100 to 150 fruits,8 to12kg /tree
5.Guava (budded)	*Psidium guajava*													4.5x4.5;4.5x6;6x9.1 mt														400 to 500 fruits,28to36 Kg/tree
6.Lemon (budded)	*Citrus limonia*													5 to 6 mt														600 to 800 fruits
7.Custard apple	*Annona squamosa*																											
8.Phalsa	*Grewia asiatica*																											4 kg per bush
9.Rayan	*Mimusops nexandra*													9 x10.6; 10.6 x 10.6 mt														80 to 100 kgs per tree
11.Jujube, bor	*Zizyphus mauritiana*													6 to 9 mt														30 to 40 Kg per tree
12.Jamun	*Syzygium cuminii*																											
13.Sweet orange (Mosambi) Citrus sinensis														6x6;6x7.6 mt														500 to 60 fruits per tree
14.Orange	*Citrus reticulata*													6 to 7.6;8 to 9 mt														1000 to 1500 fruits per tree
15.Date Palm	*Phoenix dactylifera*													7.6x7.6 mt														30 to 35 Kg per Plant
17.Tamarind (hydird)	*Tamarindus indica*													9.1to 12 mt														80 to 100 Kg per tree
18.Curry leaf	*Murraya koenigii*													4.5x4.5;4.5x3 mt	2-3 years												200 to 250 plants	40 kg per tree
19.Drum stick (Sargvo)	*Moringa pterigosperma*													6x7.6;7.6x7.6 mt	3-4 years													40 to 60 kg

Herbs & Other Important Crops

Common Name	Botanical name	Sowing time												Spacing	Harvesting time												Seedrate	Yield
		J	F	M	A	M	Ju	Jl	Au	S	O	N	D		J	F	M	A	M	Ju	Jl	Au	S	O	N	D	(per Hec in Kgs)	(per acre in Kgs)
Herbs																												
1.Coriander	*Coriandrum sativum*	through out the year													after 1 and 2 month												8Kg	600 to 800 Kg green
2.Mint,Pudina	*Mentha piperita*													Planting in beds														800 to 1000 Kg
3.Tulsi,Indian basil	*Ocimum santum*																											
4.Ardusi	`																											
5.Amla	*Phyllanthus emblica*																											
6.Mehndi	*Lawsonia inermis*																											
7.Lemon grass	*Cymbopogon Flexuosus*																											
8.Akado	*Calotropis gigantea*																											
9.Isabgul	*Plantago ovata*																										.4 to .8 Kg	80 -120 kg
10.Celery	*Apium graveolens*																											
Other important Crops																												
1.Agave	*Agave cantala*													3x3;3x3.6 mt	4 years												450 suckers	30 to 40 leaves;120-160
2.Kewada	*Pandanus fascicularis*																											
3.Sagar gota	*Cesalpinia decapetala*																											

Plant species options

Top storey

Tectona grandis
Terminalia tomentosa
Terminalia bellerica
Adina cordifolia
Anogeissus latifolia
Diospyros melanoxylon
Ougeinia oojeinensis
Lagerstroemia parviflora
Lannea coromandelica
Grewia tiliaefolia
Schleichera oleosa
Madhuca indica
Bombax ceiba
Schleichera oleosa
Albizia procera
Pterocarpus marsupium
Dalbegia latifolia
Miliusa tomentosa
Bridelia squamosa
Stereospermum personatum

Middle storey

Acacia catechu
Bridelia retusa
Morinda tinctoria
Buetea monosperma
Wrightia tinctoria
Casearia tomentosa
Bauhinia racemosa
Emblica officianalis
Elaeodendron glaucum
Aegle marmelos
Bauhinia purpurea
Kydia calycina
Careya arborea
Grewia tiliaefolia
Mallotus philippensis

Under storey

Gardenia resinfera
Wrightia tomentosa
Ziziphus rugosa
Xeromphis spinosa
Meyna laxiflora
Gardenia latifolia
Carrisa congesta
Flacourita indica
Holarrhena antidysentrica
Helicteres isora
Lantana camara
Carvia callosa
Cassia tora
Azanza lampas
Woodfordia fruticosa
Euphorbia nivulia

Bamboo: *Dendrocalamus strictus*

V. Outdoor Air Quality Standards as per CPCB

Sno.	Pollutant	Time Weighted Average	Concentration in Ambient Air Industrial, Residential, Rural and Other Areas	
1	Sulphur Dioxide	Annual	50	20
		24 Hours	80	80
2	Nitrogen Dioxide	Annual	40	30
		24 Hours	80	80
3	Particulate Matter (size less than 10um)	Annual	60	60
		24 Hours	100	100
4	Particulate Matter (size less than 2.5um)	Annual	40	40
		24 Hours	60	60
5	Ozone	8 Hours	100	100
		1 Hour	180	180
6	Lead	Annual	0.5	0.5
		24 Hours	1	1
7	Carbon Monoxide	8 Hours	2	2
		1 Hour	4	4
8	Ammonia	Annual	100	100
		24 Hours	400	400
9	Benzene	Annual	5	5
10	Benzo-Pyrene-Particulate	Annual	1	1
11	Arsenic	Annual	6	6
12	Nickel	Annual	20	20

VI. Ambient Noise Level Standards

1.Daytime shall mean from 6.00 a.m.. to 10.00 p.m..
2.Night time shall mean from 10.00 p.m.. to 6.00 a.m..
3.Silence zone is defined as an area comprising not less than 100 metres around hospitals, educational institutions and courts.
4.Mixed categories of areas may be declared as one of the four above-mentioned.

Area Code	Category of Area/ Zone	Limits in dB	
		Day	Night
A	Industrial	75	70
B	Commercial	65	55
C	Residential	55	45
D	Silence	50	40

VII. Baseline Projections of Energy Requirements

Parcel	Total Connected Load (MVA)	Diversified at Building (MVA)	Diversified at 22-11 kV SS (MVA)	Diversified at 220kV-22 kV SS (MVA)
Parcel 1				
(Buildings)	531	422	295	177
Parcel 2				
(Buildings)	762	616	431	259
Total				
Demand	1,293	1,038	727	436

V. Outdoor Air Quality Standards as per CPCB

Sno.	Pollutant	Time Weighted Average	Concentration in Ambient Air	Ecologically Sensitive Areas
	vv		Industrial, Residential, Rural and Other Areas	
1	Sulphur Dioxide	Annual	50	20
		24 Hours	80	80
2	Nitrogen Dioxide	Annual	40	30
		24 Hours	80	80
3	Particulate Matter (size less than 10um)	Annual	60	60
		24 Hours	100	100
4	Particulate Matter (size less than 2.5um)	Annual	40	40
		24 Hours	60	60
5	Ozone	8 Hours	100	100
		1 Hour	180	180
6	Lead	Annual	0.5	0.5
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7	Carbon Monoxide	8 Hours	2	2
		1 Hour	4	4
8	Ammonia	Annual	100	100
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Parcel 2				
(Buildings)	762	616	431	259
Total				
Demand	1,293	1,038	727	436

VIII. Waste generation Load specific to Palava

Program	Population	Waste generation (kg/capita/day)	Waste quantity (tons/day)	Waste quantity (tons/yr)
PARCEL 1				
IT SEZ	76,933	0.15	11.54	4,212
Office outside SEZ	0	0.15	0.00	0
Affordable Residential	138,742	0.8	110.99	40,513
Aspirational Residential	27,316	1	27.32	9,970
Amenities	9,518	0.15	1.43	521
Sub-Total	**252,509**		**151**	**55,216**
PARCEL 2				
IT SEZ	0	0.15	0.00	0
Office outside SEZ	53,698	0.15	8.05	2,940
Affordable Residential	219,959	0.80	175.97	64,228
Aspirational Residential	37,713	1.00	37.71	13,765
Amenities	25,769	0.15	3.87	1,411
Sub-Total	**337,140**		**226**	**82,344**
		TOTAL	**377 tons/day**	**137,560 tons/yr**

IX. Intelligent systems that can be set up with respect to time

T+5 years

- Vehicle Tracking System
- Real Time Traffic Control and Adaptive Signals
- Real Time Passenger Information System

T+10 years

- Fare Integration through Common Mobility Card
- Integrated Information across modes
- Cashless Toll Collection

T+15 years

- Fare Integration through UID
- Intelligent Traffic Management Systems
- Predictive Traffic Management

X. Other essential safety measures to be considered

1. Exit doors, Exit signs, Early warning systems, Emergency lifts and lighting
2. Emergency power supply, Emergency warning systems, Fire control centers
3.Fire curtains and doors, Fire extinguishers, Fire detectors and alarm system
4. Fire hydrants, Fire isolated stairs, Fire rated materials, Fire windows
5. Mechanical ventilation, Passage ramps, Path of travel to exits, Smoke alarms .

XI. Eco-Friendly Material as Studied by the Nehru Institute of Construction & Enterprise

WOOD ALTERNATES
Plywood Commercial-12mm thickness
Plywood Marine-12mm thickness
MDF- 12mm thickness
Coir Composite MDF Board-12mm thickness
Bamboo Matt Ply Board-12mm thickness
Recycled Laminated Tube Board-12mm thickness
Recycled AluminiumFoil+Paper+Plastic Composite Board
Rubber Wood Finger Jointed Board-12mm thickness
Bamboo MDF board-11mm thickness
Block Board-30mm thickness
Particle Board (B.W.P)-12mm thickness
Single side laminated Particle Board-12mm thickness
Both side laminated particle Board-12mm thickness
Cement Bonded Particle Board
Bamboo Matt Veener composite-15mm thickness
Bamboo Matt Veener composite-12mm thickness

TILES AND BUILDING BLOCKS
Vitrified Ceramic Tile
Marble Flooring
Granite Flooring
Kota Stone-30 mm thick-machine cut,one side polish
Vinyl Flooring
Bamboo board flooring
Terrazzo Flooring
Marble Mosaic Tiles
White Glazed Tiles (dado)
Ceramic (non-vitrified) Tiles
Plain Cement Tiles
Fired Clay Brick
Fly Ash+Sand+Lime
Pulverized Debris based
Industrial Waste based
Cement Concrete Blocks

PIPING MATERIALS
A.C Pipe 100 mm diameter
R.C.C Pipe Np2 class 100mm diameter
G.I Pipe Heavy type 100mm diameter
G.I Pipe Medium type 100mm diameter
C.I Soil Pipe 100mm diameter
C.I Rain Water Pipe 100mm diameter
uPVC Pipe 110mm diameter
Stoneware Pipe 100mm diameter
Lead Pipe 25mm diameter
G.I Medium type 25mm diameter
G.I Heavy type 25mm diamter
uPVC Pipe 25mm diameter
Polymer Plastic (Random) Pipe 25mm diameter

ROOFING MATERIALS
PVC, Plain sheet
Polycarbonate sheet, Acrylic
Galvanized Iron Corrugated sheets on Steel support
Asbestos Cement Corrugated sheets on Steel supports
Aluminum Corrugated on Steel supports
Mangalore Tiles and Primary Wood supports
PVC corrugated sheets on Steel support
MCR tile on Steel support
Bamboo Matt Corrugated sheet on primary wood support

Credits

Palava was planned by top global planning firms: Sasaki Associates, Inc., of New York for the physical planning and Buro Happold (BH) for the infrastructure.

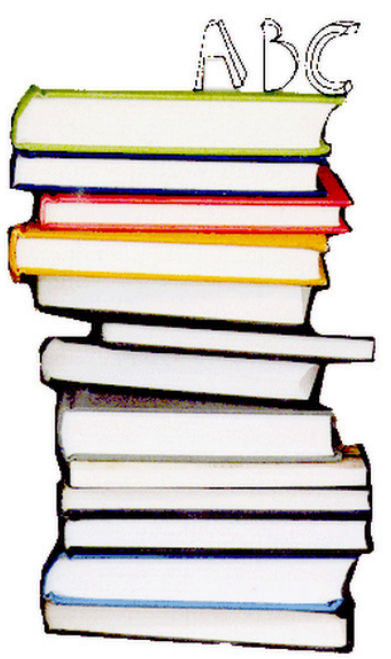
It is being designed by top design firms: KAPL of Mumbai, for Architectural Design, PBB of Ahmedabad, for anchoring master plan, landscape design and infrastructure coordination , TCE for the infrastructure engineering and Anvita Arora for the sustainable Mobility solutions.

This manual, prepared by The Future Institute, attempts to create a set of Livable city guidelines towards the setting up of this new urban centre.

List of Abbreviations

AAQ	Ambient Air Quality
BH	Buro Happold
BOD	Biochemical Oxygen Demand
CPCB	Central Pollution Control Board
DDA	Delhi Development Authority
DMRC	Delhi Metro Rail Corporation
ECBC	Energy Conservation Building Code
EIU	Economist Intelligence Unit
ESCO	Energy Saving Company
EWS	Economically Weaker Section
FAR	Floor Area Ratio
FSI	Floor Space Index
Ha	Hectare
HVAC	Heating Ventilation & Air Conditioning
IBM	International Business Machines
ICT	Information & Communication Technology
MMRDA	Mumbai Metropolitan Regional Development Authority
MPN	Million Per Number
MSW	Municipal Solid Waste
NMT	Non motorized transport
PV	Photo Voltaic
R&R	Rehabilitation & Resettlement
SCB	State Pollution Control Board
SHGC	Solar Heat Gain Coefficient
U value	coefficient of heat transmission
UDPFI	Urban development plans formulation & Implementation Guidelines

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