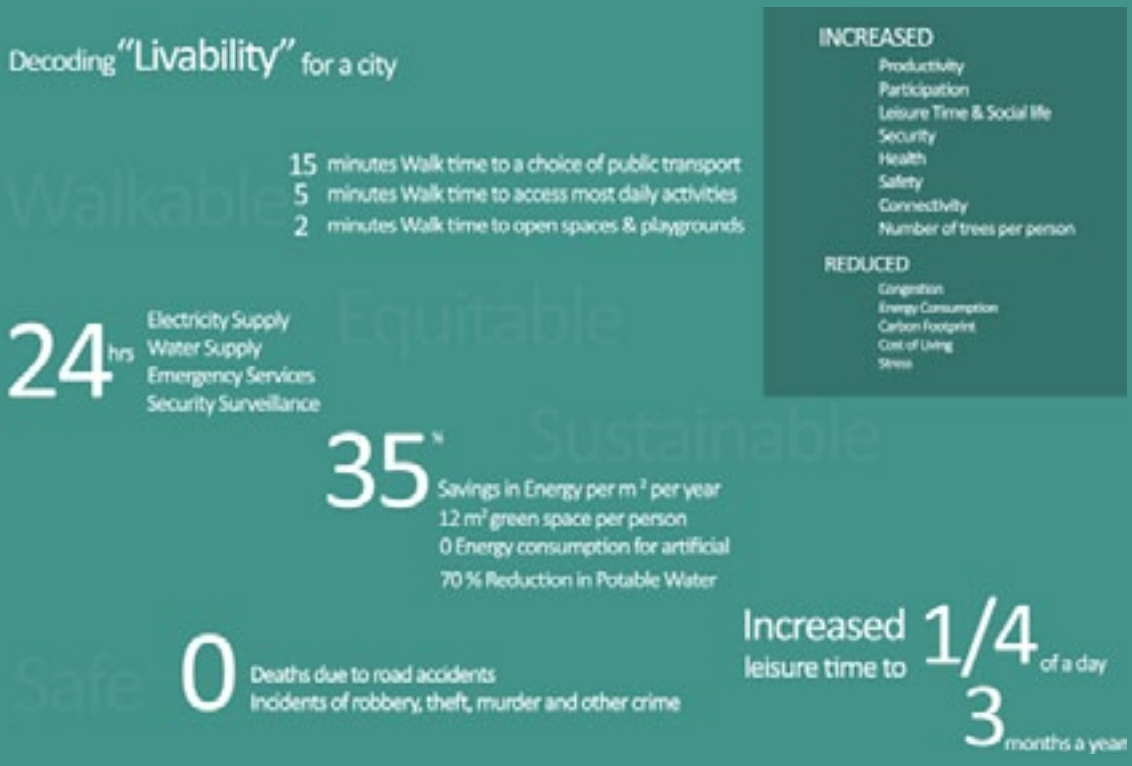
Towards more Livable Indian Cities

Decoding Livability for a City



A future institute Publication

futureinstitute
Corporate Office: 4H, Plaza M6, District Centre, Jasola New Delhi 110025
t: +91 011 42585858 | mail@futureinstitute.in | www.futureinstitute.in

Towards more Livable Indian Cities

Decoding Livability for a City

A Future Institute Publication
4H, Plaza M6
District Centre, Jasola
New Delhi 110025
Telephone: +91 011 42585858
Email: mail@futureinstitute.in
www.futureinstitute.in

Published in 2012

ISBN 978-81-924686-1-7

All rights reserved. No part of this publication may be reproduced, stored in a retrieval system or transmitted in any form or by any means, electronic, mechanical, photocopying, recording or otherwise, without permission of the copyright holder.

Design and Editorial Coordinator
Tanya Khanna

Research Coordinator
Swati Sharma

Mapping and Data Research
Swati Sharma, Mona Madan

Advisors
NASSCOM Foundation (Delhi), Ashish Bhalla, Aniket Bhagwat, Anvita Arora, Sanjay Prakash, Suparna Bhalla

Acknowledgements
The Livability Manual is a report by Future Institute, an initiative by the SI Viridian Foundation. Future Institute is envisioned as a repository pertaining to Indian cities and is concerned with Urbanity in India. The research for this report was carried out from October 2011 to June 2012, and is a part of the ongoing research activities at the Institute. The summary of this report is available at www.futureinstitute.in.

This report is intended as a basis for the ongoing research. All efforts have been made to ensure the accuracy of the material in this report. Future Institute is not responsible for any damage incurred through the use of this report.

Printed at
Samrat Offset Pvt. Ltd.
B-88, Okhla Phase II
New Delhi 110020
t: 46483000-99
e: samratoffset@gmail.com

Contents

1. Introduction 4

1.1 Understanding 'Livability' 6
1.2 The most Livable Cities 8
1.3 The way forward 10

2. The Determinants 14

2.1 Urban Pattern 18
2.2 Envelope Controls 26
2.3 Mobility 34
2.4 Biodiversity 44
2.5 Environment 52
2.6 Energy 62
2.7 Intelligent & Smart Systems 70
2.8 Health, Safety & Security 80
2.9 Materials & Construction Systems 90

3. Applying the Guidelines 96

3.1 Values to be Imbibed 98
3.2 Livability Checklist 100

4. Appendices 104

5. Credits 114

6. List of Abbreviations 116

7. Bibliography 118

1. Introduction

The ‘Livability Manual’ presents itself as a comprehensive guide towards the planning of upcoming cities to evolve as livable urban environments.

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.

1.1 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.



1. City View of Melbourne

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.

'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.



Melbourne city map
Area : 8806 km² (3,400 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.

In the Global Context



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

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, & livability."



New Delhi map
Area : 1500 km² (579 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 /km²
New Delhi has one of the highest road densities in India (1922.32 km per 100 km²). 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.

In the Indian Context



Bangalore City map
741.0 km² (286 sq mi

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.

Why should it be done?

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**

How should it be done?

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 Chapter I, the book will describe the Determinants and set out Guidelines and Performance specifications for each, along with illustrative examples. It then explores the applicability of the proposed guidelines and specifications.



2. The Determinants

Urban Pattern

Envelope Controls

Mobility

BioDiversity

Environment

Energy

Intelligent & Smart Systems

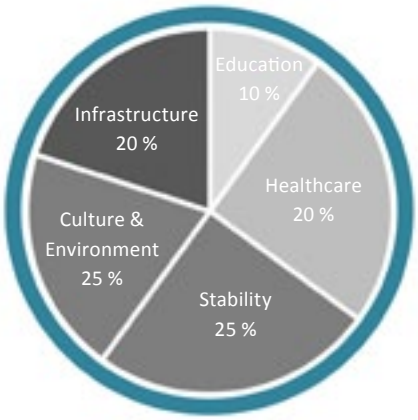
Health, Safety & Security

Materials & Construction Systems

		KEVIN LYNCH'S DIMENSIONS			
.	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.

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.



Culture & Environment 25 %

Level of Corruption
Level of censorship Sports availability
Social or Religious restrictions
Cultural availability Humidity/
Temperature rating
Discomfort of climate to travellers

Infrastructure 20 %

Quality of Public Transport
Quality of International Links
Quality of energy provision
Quality of water provision
Availability of good quality Housing
Quality of road network

Stability 25 %

Prevalence of petty crime
Prevalence of violent crime
Threat of terror
Threat of Military Conflict
Threat of civil unrest / Conflict

Healthcare 20 %

Availability of private healthcare
Quality of private healthcare
Availability of public healthcare
Quality of public healthcare
General healthcare indicators

Education 10 %

Availability of private education
Quality of Private education
Public education indicators

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



b. Urban Fabric with a Mix of Uses

2.1 Urban Pattern

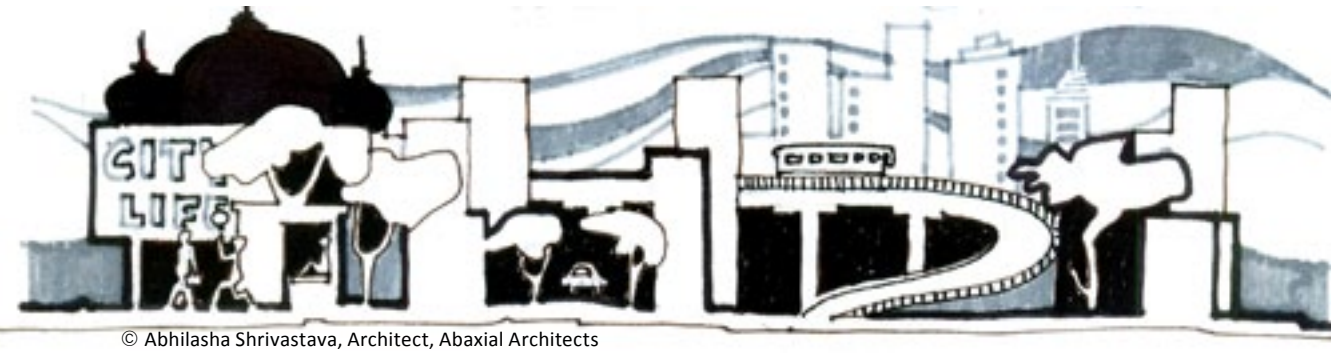
Urban Pattern: A sustainable Urban Pattern that enables maximum resource optimization and flexibility to accommodate the future needs.

The cumulative effect of the various components within the urban environment influence how buildings are positioned and designed to enclose open spaces and streets. This, in turn, defines the experience of the place. A well-planned urban pattern should

1. Integrate and Promote diversity of land uses
2. Evolve its own Identity
3. Integrate well within context and surroundings
4. Create an Intuitive, comprehensible and compact layout
5. Should be socially inclusive

Guidelines

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



© Abhilasha Shrivastava, Architect, Abaxial Architects

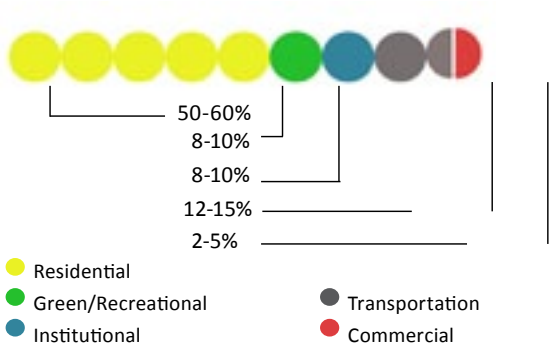
For a Livable City

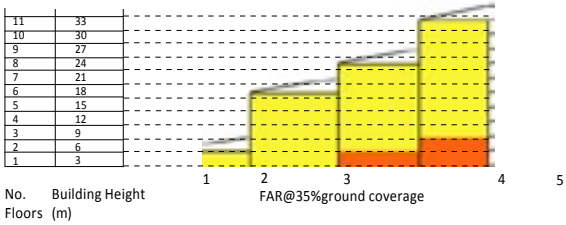
1. Promote diversity of land uses
2. Integrate Landuse and Transport planning with a system of attractive public and open spaces
3. Create an Intuitive understandable and compact layout

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.

Performance Specifications





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

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.

Ground Coverage

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

= 50 persons (300 ppa).



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.



3.

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.

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.



4.

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 and How to address them



5.

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.



6.

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.



7.

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.





2.2 Envelope Controls

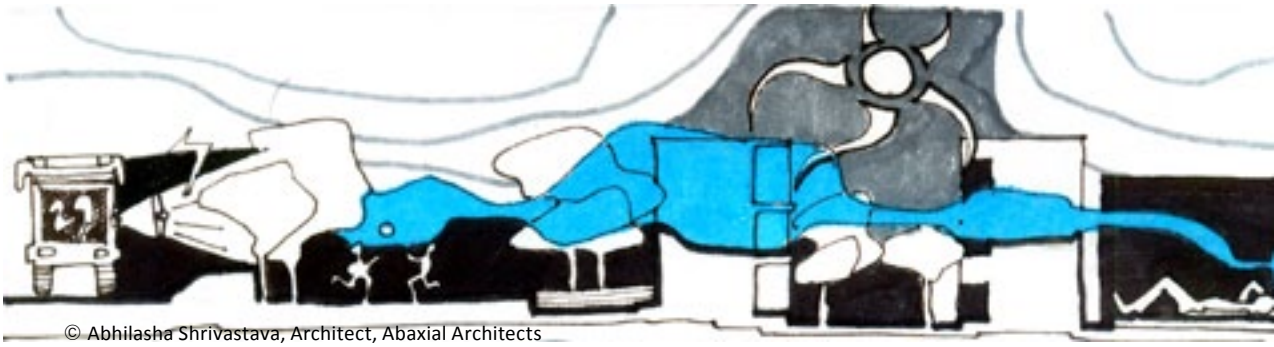
Envelope Controls: Achieve an optimum thermal, visual and acoustical comfort inside the building, on the street and also in the surrounding open spaces.

Envelope is the Surrounding or the embracing wrap, which impacts the microclimate within the site- at the master planning level, the neighbourhood level and at the individual building level. A livable and sustainable envelope for a city should

1. Suit the local environs and climatic conditions.
2. Ensure enough access to sun and wind when required and avoid when not.
3. Minimize the intervention to the natural resources.
4. Achieve an appropriate scale relationship between building heights and street width.
5. Ensure a comfortable environment to live within through best efficient designs for HVAC, Lighting, Surface Reflectivity, Use of color and texture, size of fenestration and openings.

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.



© Abhilasha Shrivastava, Architect, Abaxial Architects

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.

Envelope Measures

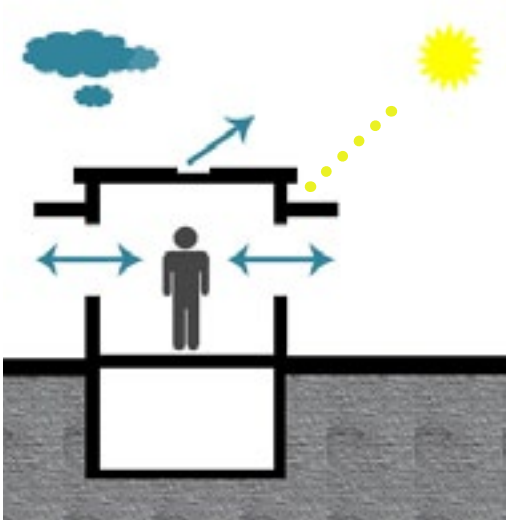
General Considerations

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.

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).

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



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).

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.

9.

Conflicts and How to address them


10.

Maximise 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.


11.

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.



2.3 Mobility

Mobility: To be able to move in and through the city with minimum delays, maximum comfort and achieve a healthy urban environment.

The ability of all people to move in a city is 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. The best mobility pattern should

1. Offer choice of sustainable transport options for people and goods.
2. Emphasize pedestrianisation and cycling with safety, comfort and convenience.
3. Enhance access to the maximum number of people through densification.
4. Promote the use of public transport.

Guidelines

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



© Abhilasha Shrivastava, Architect, Abaxial Architects

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.

Focus on People, Not Vehicles

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.

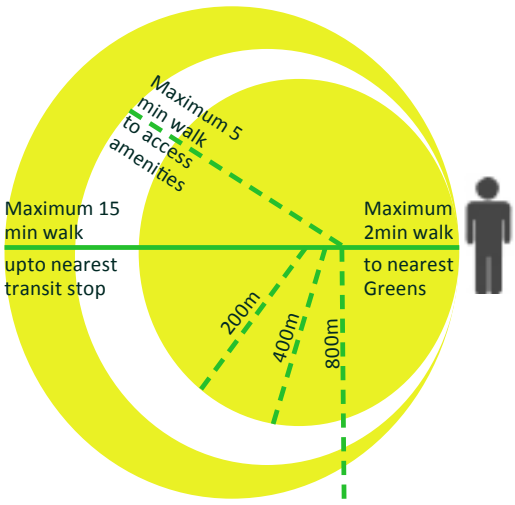
Design barrier-free pedestrian facilities.

Minimum 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.

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





13.

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.



14.

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.

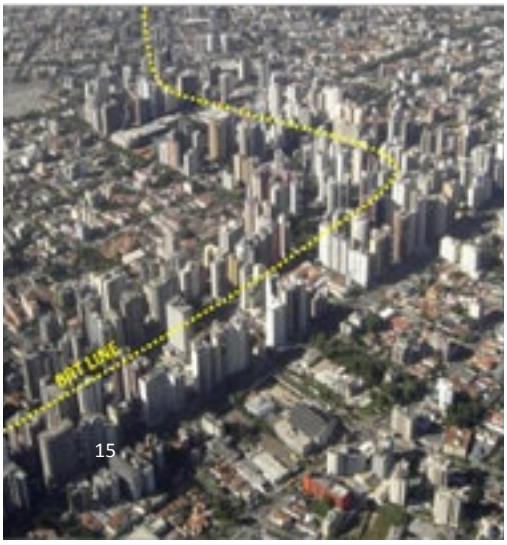
Focus on People, Not Vehicles

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.

Integrate the Nodes

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.

Road Use and Parking Policy: Disincentivize 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.mixed use development.

At least 30% residential and 30% commercial/ institutional in every TOD Zone within 800m of Transit Stations.



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 and How to address them



17.

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.



18.

Promoting Cycling & Walkability vs
- Safety on the Streets
- Unfavourable 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.



2.4 Biodiversity

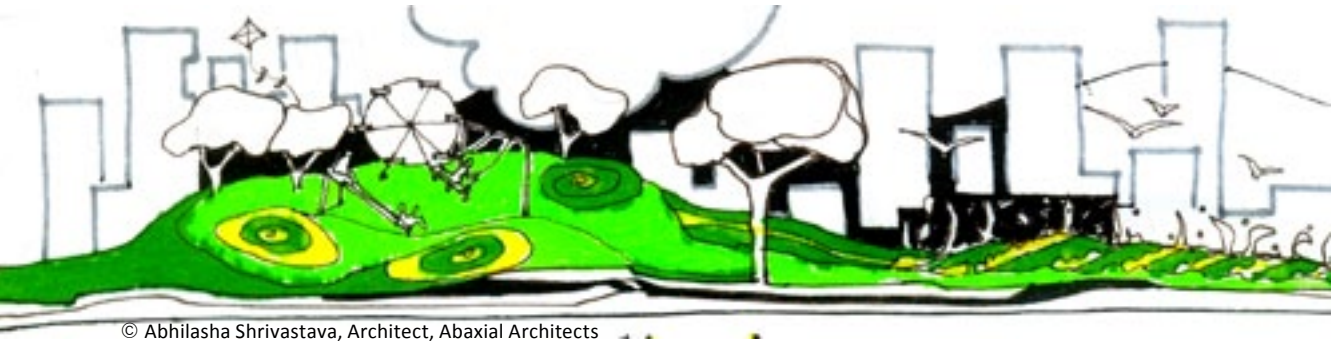
Biodiversity: Develop and sustain a balanced ecosystem that recognizes the relevance of the native flora and fauna and enriching the city's public realm.

Biodiversity exhibits a degree of variation of life form within a given ecosystem (the native flora and fauna) of the region. The quality of urban spaces should provide for

1. Provide for identity, pride and a place for forming a sense of community.
2. Respond to location, respecting existing characteristics and biotic factors, legibility, protection, invitation, delight and learning from existing open spaces.
3. Integrate productive landscapes (agriculture, horticulture and floriculture) 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.

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.



© Abhilasha Shrivastava, Architect, Abaxial Architects

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.

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"
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'.



20.

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.

(Example: Pedestrianized streets in Brighton.

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.



21.

Terrace Gardens initiative by Mumbai Port Trust: 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 and 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.

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.

Terrace Farms by Mumbai Port Trust





2.5 Environment

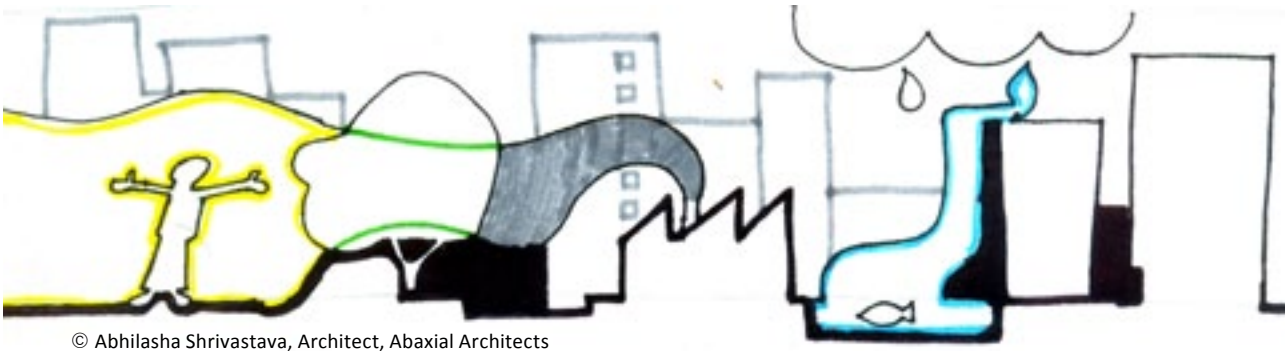
Environment: Provide for a sustainable approach to a clean and healthy environment.

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. Sustainability principles for a livable environment should

1. Adopt the principle of Reduce, Reuse and Recycle.
2. Install broad array smart and latest technologies like water-efficient fixtures and smart water meters, etc to enhance the efficiency.
3. Follow general norms and standards pertaining to the quality of environment like CPCB, AAQ norms, for improving external environmental conditions.

Guidelines

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



© Abhilasha Shrivastava, Architect, Abaxial Architects

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.

Water

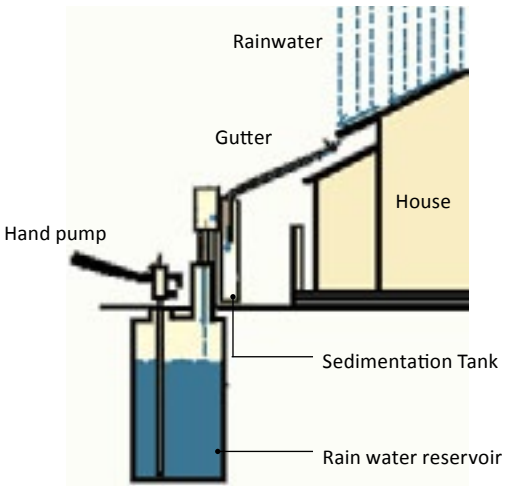
Provide for:
Up to 100% of recycled water supply for ancillary uses like flushing, landscaping, etc.
Up to 50% saving of domestic water.

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.



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.



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.

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.



25.

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.

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.

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.or less.

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).



26.

Collection and 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.



27.

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.



28. Wind Energy Fields in Panana

2.6 Energy

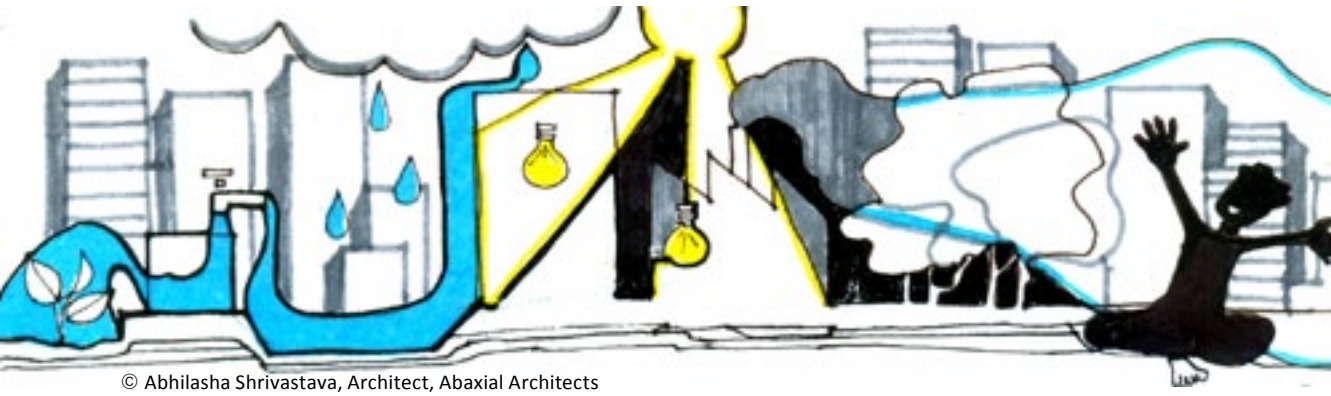
Energy: Minimize energy consumption and maximize generation and management of clean, efficient and sustainable energy.

Consumption of energy for heating, cooling, and running the appliances at home and at work and also the energy being used for vehicular fuel consumption is taken into consideration. Sustainable energy consumption pattern should

1. Reduce greenhouse gases emissions.
2. Ensure on-time, reliable power supply.
3. Adopt alternative and on-site energy production techniques like solar energy harnessing; a combination of grid, on-site generation backed up by appropriate partners i.e. Power utility/ Oil companies.
4. Install smart appliances, smart meters and smart building management systems.

Guidelines

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



© Abhilasha Shrivastava, Architect, Abaxial Architects

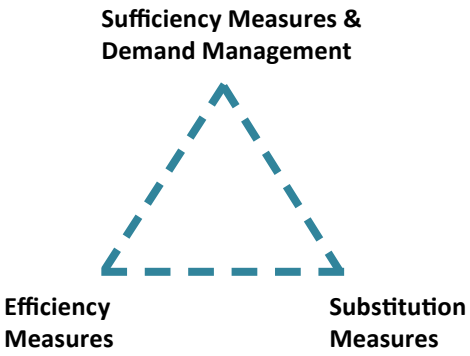
For a Livable City

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.

Performance Specifications



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.

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

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.



29.

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.

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.

Infrastructure Specifications

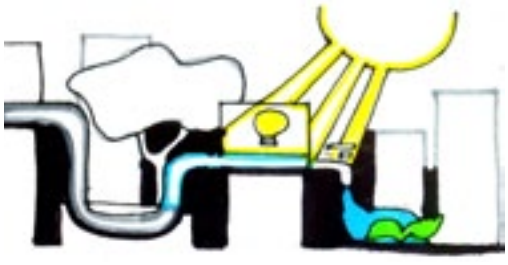
Reduce capital investments working with or creating ESCOs to provide energy services for delivery and administration of the infrastructure, operations and tariffs.
Balance cost of capital projects for on-site generation with modalities of grid supply (and operational costs/future demand reduction).
Optimize these solutions with a modular phasing strategy that does not over-burden the first phase of the development.

Conflicts and How to address them

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.

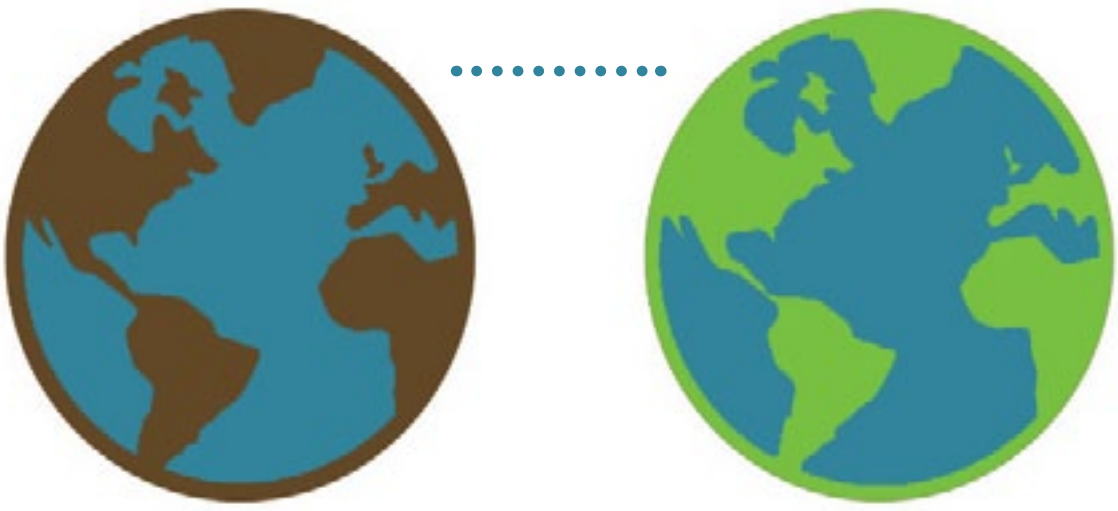
Financial benefits of smart grid technology are wide-ranging and significant. Here are a few of the gains smart-grid communities can expect:
Improved maintenance and asset management lengthens asset life and defers capital expenditures.
Load leveling reduces the need for new generation while shifting consumption to non-peak times –maximizing the profitable capacity of current assets.



24 Hours 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.

Towards a Greener Earth





2.7 Intelligent & Smart Systems

Intelligent and Smart System: Ensure optimum resource utilization and better service delivery to the users.

The Information and Communications Technology (ICT) sector has a multipurpose 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. The sector can play a vital role in city in

1. Security surveillance and emergency response systems.
2. Pro-active accident and disaster management.
3. Urban infrastructure supply and distribution network.

Guidelines

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



© Abhilasha Shrivastava, Architect, Abaxial Architects

Smart and Intelligent Systems shall

1. Reduce Congestion in Transport Systems

2. Improve Public Safety by reducing emergency response time

3. Imrpove 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.

Applicable Areas of ICT: Transport Systems



31.

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.



32,

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.

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%.

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.



33.

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.

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.

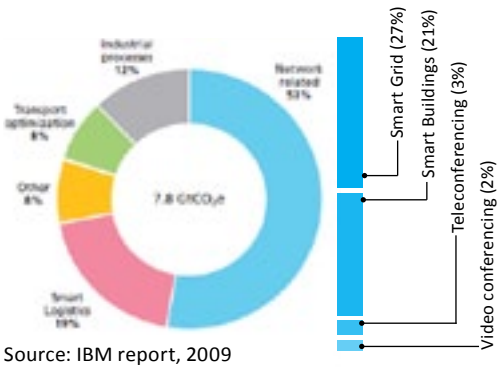
Security against hazards and thefts

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.

Applicable Areas of ICT: Smart Home Systems



Source: IBM report, 2009

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

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.

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.

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.



Conflicts and How to address them

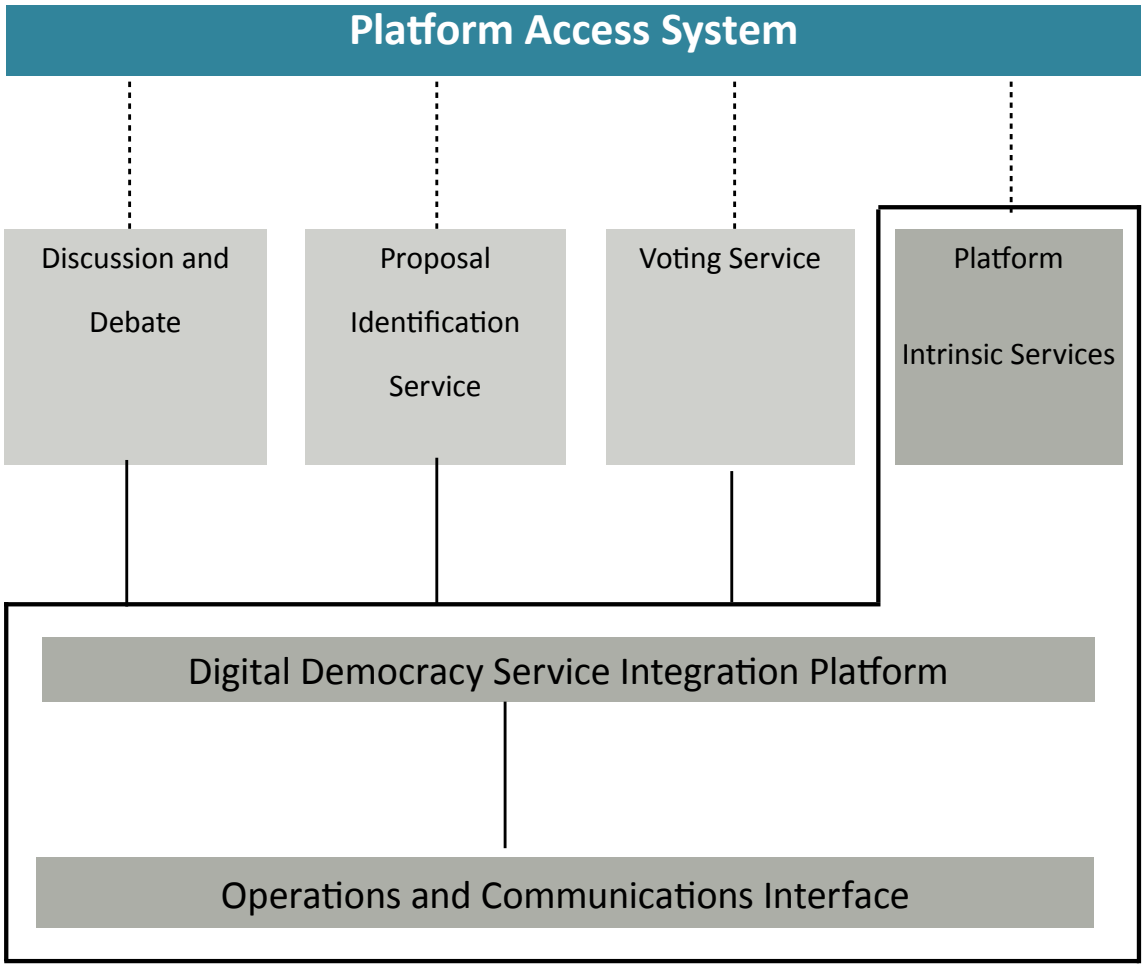
Technology reduces demand for manpower in city management vs Lack of human contact to handle complaints

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.

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.

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.


Platform Access System
Discussion and Debate
Proposal Identification Service
Voting Service
Platform Intrinsic Services
Digital Democracy Service Integration Platform
Operations and Communications Interface



35. Varanasi

2.8 Health, Education, Safety & Security

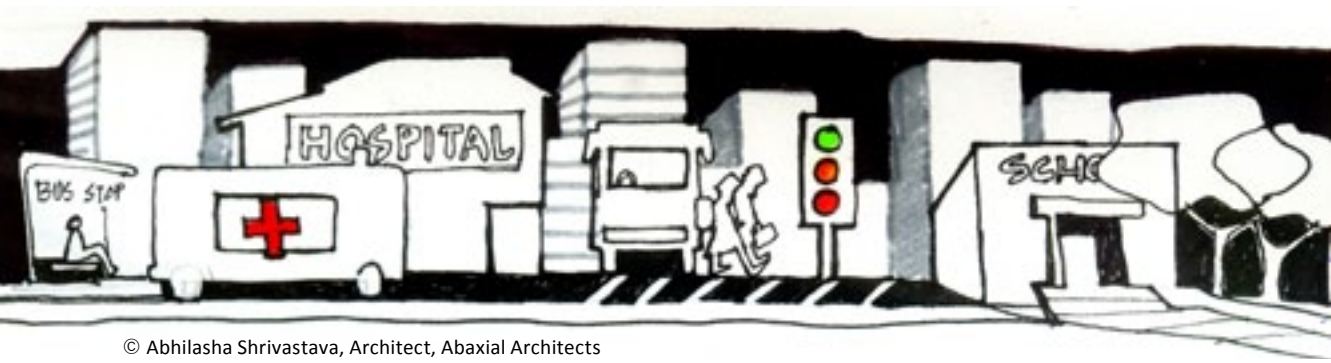
Health, Education, Safety and Security: Foster a healthy and safe environment contributing towards healthy and safe communities and citizens.

Cities provide the physical, social and environmental healthy framework for the overall well-being of their citizens. To achieve this balance, a city should

1. Offer the maximum degree of protection against danger, damage, loss, and crime.
2. Ensure the state of being “safe” in all aspects - physical, social, spiritual, financial, political, emotional, occupational, psychological and educational.
3. Promotes active community participation.
4. Achieve resilience, both the design and the functioning of the city.
5. Ensure compliance to building safety norms and regulations, providing adequate rescue and response.

Guidelines

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



© Abhilasha Shrivastava, Architect, Abaxial Architects

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.

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.

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.



Standards for Medical Facilites

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.

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

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.

Foster a vibrant cultural & 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.

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 facilities vs the non-responsive attitude for their management at the city level and neigbourhood 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.



36.



2.9 Materials and Construction Systems

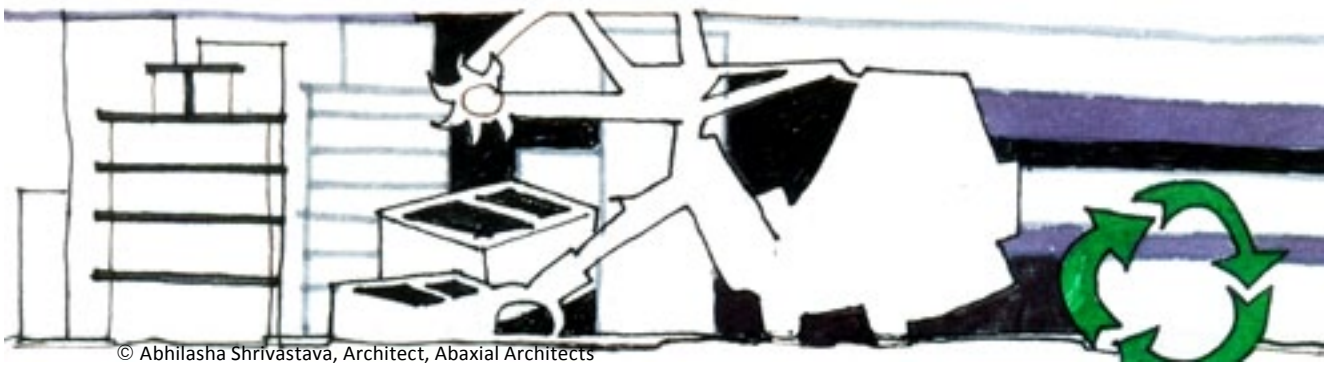
Materials and Construction Systems: Streamline the construction process and increase efficiency in terms of time and energy management without compromise on quality.

Materials and Construction Systems incorporate the choice of building materials used, their delivery, storage/ handling mechanism and also deploying the best possible construction systems. The entire system includes

1. Installing and incorporating best project management skills and resources.
2. Substantially reducing the embodied carbon of the built environment through a detailed product evaluation process that includes environmental, economic (including cost and quality) and social considerations.
3. Optimizing the use or demand and supply of construction materials at the right time and in right quantity.
4. Ensuring on-time execution of the product with quality, safety & strength. (As per the material and structural specifications)

Guidelines

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



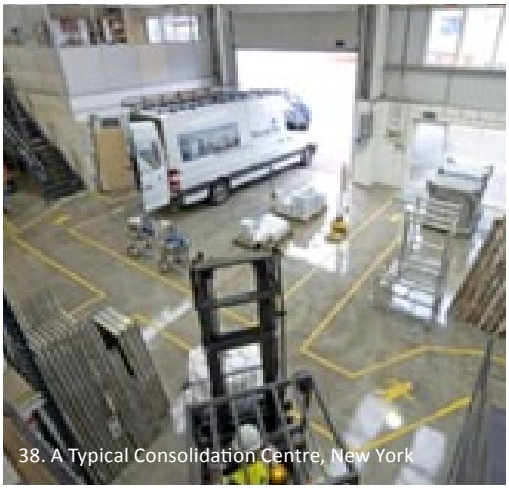
© Abhilasha Shrivastava, Architect, Abaxial Architects

For Maximising Efficiency

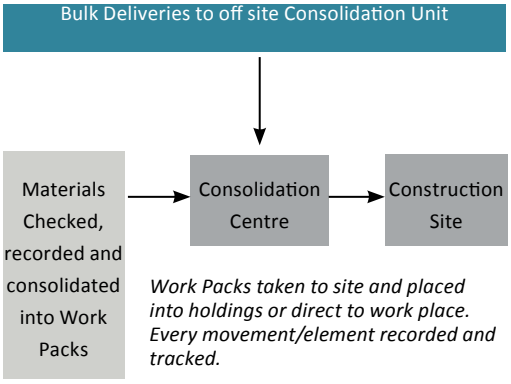
1. Encourage the use of construction materials with low embodied energy
2. Minimise carbon footprint during construction
3. Minimise cost of procurement of materials
4. Ensure on-time execution with quality, safety and strength

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.



38. A Typical Consolidation Centre, New York



Construction Systems

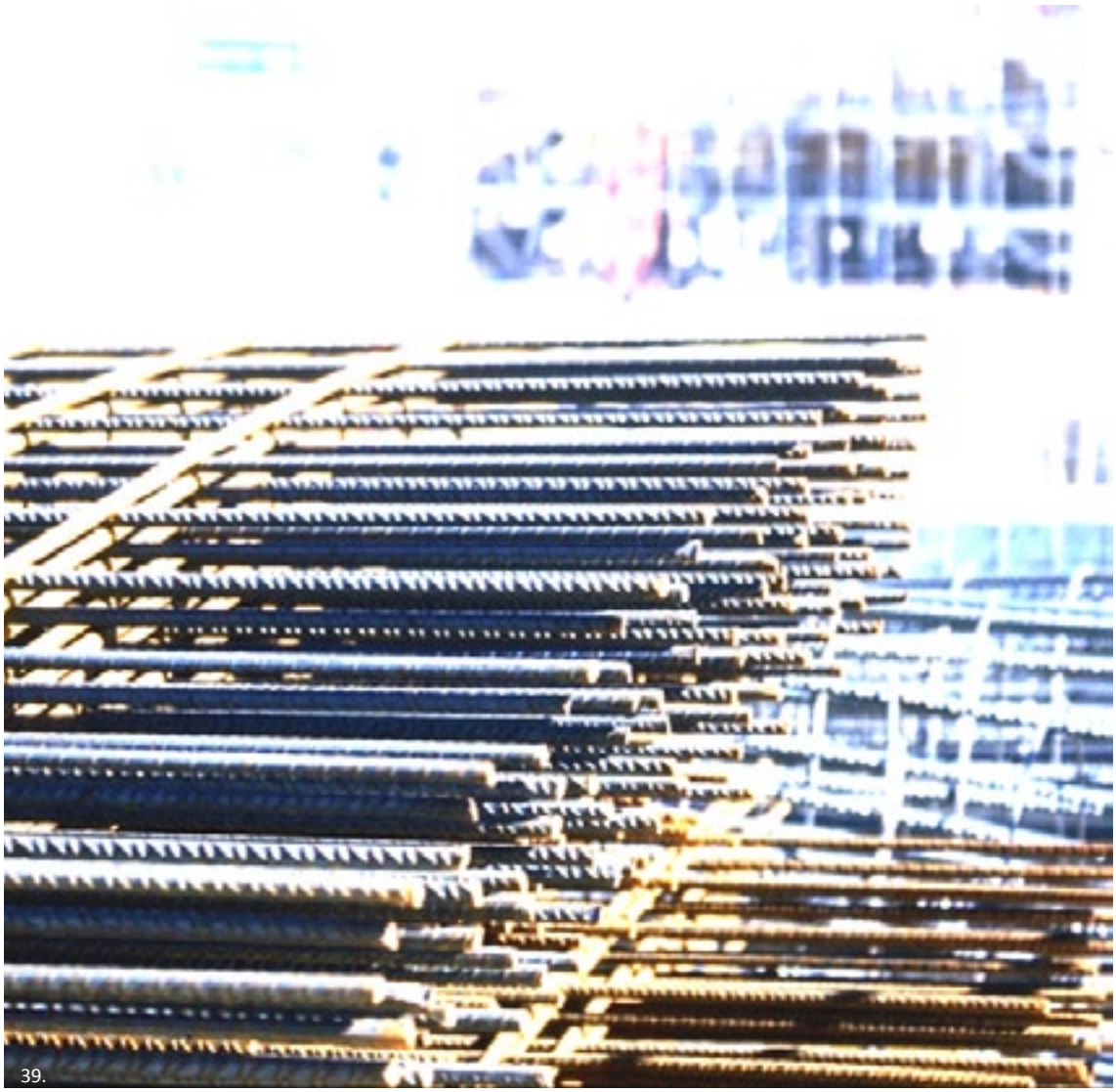
An optimal Construction Management System needs to be in place to achieve the following set targets to achieve :
Efficiency/reliability target of 95%.
Improved on-site productivity.
Damage reduction of 15%.
Number of journey reductions by 68%.
Average supplier journey time reduction of 2hrs.
Increased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





3. Applying the Guidelines

The ‘Livability Manual’ presents itself as a comprehensive guide towards the planning of upcoming cities to evolve as livable urban environments.

Values to be Imbibed

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

Identity

Diversity

Adaptability

Flexibility

Walkability

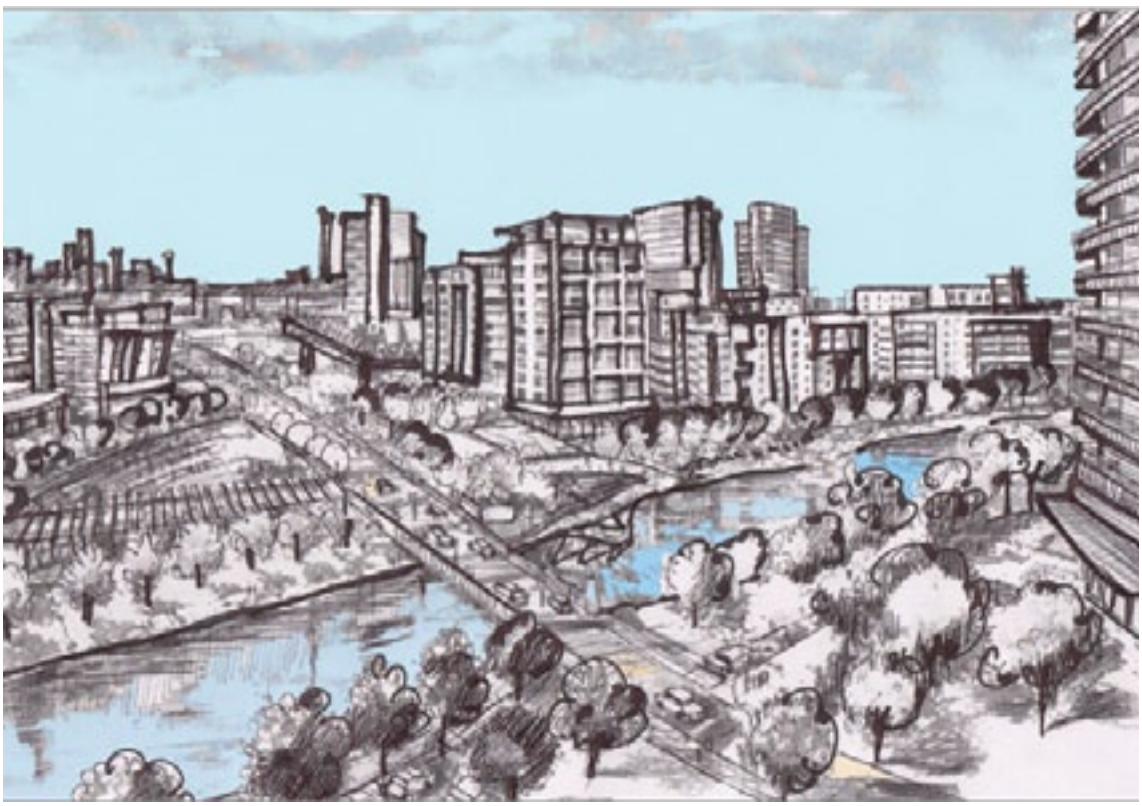
Safety

Equity

Efficiency

Resilience

Plurality



Evaluative and Considering Factors

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. 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.

1	URBAN PATTERN			Options	
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	
3.2	CYCLE NETWORKS	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	
		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	
3.3	CONNECT and TRANSIT	Max.area of blocks not more than for easy pedestrian and cycle access	< 2 Ha	> 2 Ha	
		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	
3.5	SHIFT (Traffic Regulatory measures)	MLCP provision provided at neighbourhood level	No	Yes	
		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%	1
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%	1

Livability Checklist

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	
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				
		WHO standards applicable	No	Yes	
		UDPFI Guidelines followed (number and hierarchy of medical facilities provided as per the population size)	No	Yes	
8.1	HEALTH	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 and expanding the services		No	Yes	

	Guideline/Standard/Feature/Specification to be averted
	Guideline/Standard/Feature/Specification that must be achieved
	Ideal Guideline/Standard/Feature/Specification that shall be achieved for

4. Appendices

I. UDPFI Standards for City Planning

EDUCATIONAL FACILITIES		No. as per the population size	Strength of the school	Area per facility	Additional Requirements
PRIMARY & SECONDARY EDUCATION					
1	Pre primary, nursery school	1 for 2500 population	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	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	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	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	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	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	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		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	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	Area per facility
1	Community room	1 for 5,000 population area	660 Sq..m
2	Community hall and library	1 for 15,000 population area	2000 sq.m
3	Recreational club	1 for 1 lakh population area	10,000 sq.m
4	Music, dance and drama centre	1 for 1 lakh population - area	1,000 sq.m
5	Meditation and spiritual centre	1 for lakh population area	5000 sq.m
6	Socio-cultural centre	1 for 10 lakh population area	15 ha

SPORTS FACILTIES				
		Population Served	Area per unit	Level
1	Housing Area Play Ground	1 for 5,000 population area	0.5 ha	Housing area
2	Neighbourhood Play ground	1 for 15,000 population area	1.5 ha	Neighborhood
3	Community level Sports Centre	1 for 1 lakh population area	8.0 ha	Community
4	City level Stadium & Sports Complex	1 for 1 lakh population - area	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. Daylighting, WWR, Glazing Standards (IGBC 2009)

CRITERIA		ACCEPTABLE	PREFERRED
REQUIRED:			
1.WINDOW-WALL RATIO1			
MAXIMUM ALLOWABLE EXTERIOR GLASS AREA AS A %OF GROSS EXTERIOR WALL AREA 2, 3	NORTH ELEVATION	70% max	50%
	EAST ELEVATION	30% max	22%
	SOUTH ELEVATION	30% max	26%
	WEST ELEVATION	30% max	22%
2.GLASS PERFORMANCE 1, 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%

S. No.	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

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 .

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

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

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

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

5. Credits

The Livability Manual is a report by Future Institute, an initiative by the SI Viridian Foundation. Future Institute is envisioned as a repository pertaining to Indian cities and is concerned with Urbanity in India. This manual, prepared by Future Institute, attempts to create a set of Livable city guidelines towards the setting up of this new urban centre. The research for this report was carried out from October 2011 to June 2012, and is a part of the ongoing reserach activities at the Institute. The summary of this report is available at www.futureinstitute.in. Inputs have been provided by the mentors and the Advisory Board.

This report is intended as a basis for the ongoing research. All efforts have been made to ensure the accuracy of the material in this report. Future Institute is not responsible for any damage incurred through the use of this report.

6. 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

7. Bibliography

Books - Published/ Unpublished/ e-books/Official Publications

Sasaki, Happold,B,.2010. *Palava Infrastructure Master plan Draft Final Report*.2010.

Wintgens,T., Melin,T., Schaefer, A., Khan, S., Muston, M.., Bixio, D. & Thoeye, C. 2005, *The role of membrane processes in municipal wastewater reclamation and reuse.*

WEF & AWWA ,1998. *Using Reclaimed Water to Augment Potable Water Resources.Water Environment.* Federation and American Water Works Association, USA.

Gehl,J.,2007. *Public Spaces for a Changing Public Life. Urban Space* :Topos 2007.

Newman, P., Kenworthy, J., 2000. S*ustainable Urban Form: The Big Picture*. In K. Williams., M. Jenks .,E. Burton., 2000.*Achieving Sustainable Urban Form*. London.

Williams, K., Jenks, M.. and Burton, E.,2000. *Achieving Sustainable Urban Form, E and F N Spon, London, World Commission on Environment and Development (1987) Our Common Future*. Oxford : Oxford University Press.

Lynch,K.,1960. *The Image of the City*. 23rd edition. London:The MIT Press.

Jan,S., Kenworthy, J.,Newman, P., 2006. *Most Livable and Best Connected? The Economic Benefits of Investing in Public Transport in Melbourne.*[pdf] Available at: < http://www.janetrice.com.au/files/report.pdf> [Accessed Jan. 2012].

*Eco-friendly Building Materials in India,*2005.University of Pune. Available at: <http://www.ecohousingindia.org/downloads/EcoFriendlyMaterials_may05/Eco-Friendly%20Building%20Materials.pdf.

Lynch,K.,1981. *Good city form*. 9th edition. London:The MIT Press.

Copenhagen – City of Cyclists.,2006.Traffic Department,City of Copenhagen,2006.[pdf] Available at: http://www.sfbike.org/download/copenhagen/bicycle_account_2006.pdf.

Melbourne takes the crown of most liveable city from Vancouver.2011.Economist Intelligence Unit [news] Available at : <http://www.eiu.com/site_info.asp?info_name=The_Global_Liveability_Report>.

Fact Sheet, Water Recycling – examples from other countries.,2010. Queensland Water Commission,2010. [pdf] Available at : < http://www.qwc.qld.gov.au/prw/pdf/prw-where-else-used-v3.pdf>.

Smarter Cities for Smarter Growth, May 2010.Executive Report, IBM Institute for Business Values,[executive report] Available at : <ftp://public.dhe.ibm.com/common/ssi/ecm/en/gbe03348usen/GBE03348USEN.PDF>.

Sustainable Tomorrow: Harnessing ICT Potential. Jan. 2012. Teri & NASSCOM Foundation.

Green Building Rating System for Core & Shell projects Abridged Reference Guide., 2011. LEED For India.

An Environmentally Sound Approach for Sustainable Urban Water Management: An Introductory Guide for Decision-Makers.,2009. UNEP..,2009 Available at: http://www.unep.or.jp/ietc/publications/urban/urbanenv-2/9.asp *Auckland Transport Plan.,*June 2007, Auckland Regional Transport Authority, 2007, pp. 8.

Stanhope. *Constraints to a perfect Project*.Arup Campus,2008 . www.citiuk.org.

Vancouver EcoDensity Initiative,2006. City of Vancouver, Administrative Department[pdf] Available at : < http://vancouver.ca/sustainability/documents/rr1_ecodensity.pdf>.

The World According to GaWC 2008.GaWC : Globalisation and World Cities. Posted in April 2010. Availabel at : <http://www.lboro.ac.uk/gawc/world2008t.html>.

Susanne,D., Keeling, M.. 2010. *A vision of smarter cities: How cities can lead the way into a prosperous and sustainable future*. IBM Institute for Business Value.

List of Eco- Friendly materials,2010. Nehru Institute of Construction & Enterprise [Report].

Ottawa Charter for Health Promotion,1986. WHO- First International Conference on Health Promotion,1986. Available at: < http://www.who.int/hpr/NPH/docs/ottawa_charter_hp.pdf>.

Policy Instruments for Achieving Sustainable Transport, OECD . Organization for Economic Co-operation and Development ,.2002. Available at: <http://www.oecd.org>.

New Zealand - A Regional Profile – Auckland, 2010. Available at: <http://www.arta.co.nz/assets/board%20papers/2010/MBR%20June%2010.pdf>.

Toward a Sustainable Future: Addressing the Long-term Effects of Motor Vehicle Transportation on Climate and Ecology. 1999. Transportation Research Board. National Academy Press. Available at : <http://www.trb.org>.

Roberts,W.,Todd.,2009. S*mart Growth Guidelines for Sustainable Design & Development.* Jonathan Rose Companies LLC ., Nov 2009. Livable Cities- Health & Well-Being in the Urban Environment., 2010. The Philips Center for Health and Well-being. [Report], Amstelplein 2 : Philips Professional and Public Affairs. Available at: <http://www.newscenter.philips.com/pwc_nc/main/standard/resources/corporate/publications/PCC_publicatie_Livable-Cities.pdf>

Sustainable Transportation and Travel Demand Management: Planning that Balances Economic, Social and Ecological Objectives VTPI ., 2004. Victoria Transport Policy Institute. Available at: <http://www.vtpi.org/tdm/tdm67>.

Palmisano, S., *Smarter Planet: The Next Leadership Agenda*, Nov 2008. IBM Chairman and CEO to Council of Foreign Relations, New York City.

Richardson, B.,1999. T*owards a Policy on a Sustainable Transportation System*. Transportation Research Record.,vol. 1670 pp. 27-34.

Mhaskar,Z.2009. *Eco-Friendly Building Materials Case Study of Pune*.[ppt] Science & Technology Park.

Web Articles

A,Ryan.,2009. *Bangalore: Growth opportunities in the Silicon Valley of India*. www.iadvisory.com.sg,[inews], Available at <http://www.iadvisory.com.sg/upload/market_08july09.html>.

BBC News.2009. *Vancouver and Melbourne top city league*. Available at:< http://news.bbc.co.uk/2/hi/business/2299119.stm>.Retrieved December 2011.

Balazs,K,2011. V*ancouver still world's most livable city: survey* . Reuters Feb 2011 Available at: <http://www.reuters.com/article/2011/02/21/us-cities-liveable-idUSTRE71K0NS20110221>.

*Copenhagen, Urban Planning Timeline.,*2009.[article] Engineering timelines, Available at : <http://www.engineering-timelines.com/why/lowCarbonCopenhagen/planningTimeline.asp>.

Mercer.2011.M*ercer Quality of Living Survey - Worldwide Ranking, 2011*. [e-news] Available at <http://www.mercer.com/press-releases/quality-of-living-report-2011>.

I*ndia's 10 fastest growing cities.*Feb 2008.[inews] Rediff News. Available at: <http://ia.rediff.com/money/2008/feb/06sld2.htm>.

Websites

www.economictimes.com
www.indiatimes.com
www.in.reuters.com
www.timesofindia.com
www.cpcb.nic.in
www.walkscore.org
www.completestreets.org
www.urbanindia.nic.in
www.duac.org
www.ncrpb.nic.in

Image References

1. Submitted by aussiestock., January 2010. Melbourne CBD. Available at: <http://www.freeimageslive.co.uk/free_stock_image/melbournecbd0910jpg>

2. Adapted from Another summer day in Munich, by Manol Manolov

3. Typical Block, Example, Barcelona. Available at: <http://densityatlas.org/casestudies/profile.php?id=139>.

4. Mandell,E.,January 2012. Image for MercyCorps, Lisbon. Portugal. Available at: <http://www.globalenvision.org/countries/china>.

5. September 2011.Image from Official website of Toronto city. Available at: <http://www.torontonicity.com/2011/09/23/word-on-the-street-festival-unfolds-at-queens-park-sept-25-2011/word-on-the-street-toronto/>.

6. Simmons B. Buntin., 2006. Second Street District, Austin ,Texas,2006. Available at: < http://www.terrain.org/unsprawl/19/>.

7. Eco compact city, Edinburgh. Available at: <http://www.ecocompactcity.org/home.html>

8. Adapted from Egocentric by Alessandro Calza

9. Urban Skyline. Source: Unknown

10. Kriscenski,A.,April 2008. 1st LEED Parking Garage: Santa Monica Civic Center.[Blog]. Available at: <http://inhabitat.com/first-leed-certified-parking-garage/>.

11. Ontario, Ministry of Transportation website. Transit-Supportive Guidelines. Available at: <http://www.mto.gov.on.ca/english/transit/supportive-guideline/creating-complete-streets.shtml>.

12. Traffic Streets of Delhi. Source: Unknown

13. Cyclist in Korea. Source: Unknown

14. Petit,D.,July 2010. Houten - A city for cyclists. Available at : <http://iimichigan.wordpress.com/2010/07/22/houten-a-city-for-cyclists/>

15. Claudério,A., April 2010. Available at: <http://www.clauderioaugusto.com.br/2010/04/curitiba-e-eleita-cidade-sustentavel.html>.

16. Grunt,E.,July 2008. The Gosford Grunt. Available at: <http:// gosfordgrunt.wordpress.com/tag/gosford-city/>.

17. September 2011. Simply Solo blog. Available at: <http://simplysolo.wordpress.com/2011/09/15/family-sedan-sans-family/>.

18.Robert Harding Picture Library. Available at: <http://www.superstock.com/stock-photos-images/1890-52756>.

19. Colombo, Sri Lanka. Photograph: Amit Khanna

20. June 2009. Focus on Central Brighton. Available at: <http://www.brightonshortbreaks.com/wp-content/uploads/2009/06/Brighton-055.jpg>.

21. Pendharkar,A., August 2008. Mumbai Port Trust's 'Wild' Kitchen Garden – India. Available at: <http://www.cityfarmer.info/2008/08/22/mumbai-port-trust%E2%80%99s-%E2%80%98wild%E2%80%99-kitchen-garden-india/>.

22. Nascher Sculpture Centre, Dallas. Photograph: Amit Khanna

23. Adapted from The City of Jaipur by Parag Talukdar

24. P. Virot/WHO. Tirupur Water and Wastewater Treatment Project, India. Available at:<http://www.water-technology.net/projects/tirupur/tirupur1.html>.

25. July 2011. Available at: <http://stopchaxhillsmokery.wordpress.com/page/2/>.

26. November 2011. Think Landfill, Now think Green Roof [web article]. Architecturesource website. Available at: <http://designbuildsource.com.au/green-roof-landfill-architecture>.

27. Koyaanisqatsi film capture. February 2012.Available at: <http://www.bath.ac.uk/icia/events/?page=event&art_form=Film&event_id=505>.

28. Adapted from Wind Energy Fields in Panama by Janie_Hernandez

29. Smart Grid Image from Xi'an Central Asia Industrial Co., Ltd website. Available at: <http://www.xazypd.com/Contact.aspx>.

30. Adapted from On the Streets by Kieran Cortes

31. March 2012. San Francisco Installs The Free Market On Parking Meters To Create Parking Spaces[Web News]. New York Times. Available at:<http://dcinsider.com/economy/san-francisco-installs-the-free-market-on-parking-meters-to-create-parking-spaces/>.

32. Collet,A.,April 2012. Sponsor Highlight: Nice Ride Minnesota. [Blog]. Available at: <http://www.northeastride.org/blog/sponsor-highlight-nice-ride-minnesota/ s/>.

33. 2012.Comfort Keepers website. Available at:<http://www.bbbxpress.com/comfort_keepers>.

34. 2004. Courtesy By New York Times and Forest City Ratner company. New York Times Tower, NY, United States of America [Web Article]. Available at : <http://www.designbuild-network.com/projects/times_tower/times_tower17.html>

35. Adapted From Varanasi streets by Philipp Levingeredit

36. Ramesh.,2005.Flolods in Mumbai. Taken from www.photobucket.com Available at:<http://media.photobucket.com/image/mumbai%20traffic/ramesh/Mumbai-Monsoons-July272005/Traffic_Chaos.jpg?o=10>.

37. Source: Author

38. June 2008. S. Lucas Establish Logistics & Consolidation Centre. Available at:<http://www.lucasuk.com/news/index.cfm?item=136>.

39. Source: Author

A future institute Publication