Policy Paper for Parking

In the Bangalore Metropolitan Region

Directorate of Urban Land Transport, Bangalore
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Abbreviations

ADT	:	Average Daily Traffic
AQI	:	Air Quality Index
BDA	:	Bangalore Development Authority
BBMP	:	Bruhat Bengaluru Mahanagara Palike
BMRDA	:	Bangalore Metropolitan Regional Development Authority
BMRTL	:	Bangalore Mass Rapid Transit Limited
BMTC	:	Bangalore Metropolitan Transport Corporation
BWSSB	:	Bangalore Water Supply & Sewerage Board
CTM	:	Chief Traffic Manager
CDP	:	City Development Plan
CRS	:	Commuter Railway System
CTTP	:	Comprehensive Traffic and Transportation Plan
DULT	:	Directorate of Urban Land Transport
GOK	:	Government of Karnataka
KSRTC	:	Karnataka State Road Transport Corporation
KSPCB	:	Karnataka State Pollution Control Board
KUIDFC	:	Karnataka Urban Infrastructure Development Finance Corporation
LRT	:	Light Rail Transit
LSGIs	:	local self government institutions
MSL	:	Mean Sea Level
ORR	:	Outer Ring Road
P & SP	:	Public and Semi Public
PT	:	Public Transport
PHPDT	:	Peak hour peak direction trips
SPM	:	Suspended Particulate Matter
STRR	:	Satellite Town Ring Road
T & T	:	Traffic and Transportation

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Chapter 1 – Introduction

1. Bangalore, the Capital city of Karnataka is fifth largest metropolis in India and is the fastest growing city of Asia with an annual growth of 3.25 %. The city population is approximately 7.0 million contained in an area of 800 sq.km. The larger region of the BMRDA is around 8000 sq.km with over 13 Million population. See Fig.1.

2. The City will reach the 1.0 Crore mark by 2020 A.D.

3. The Bangalore Metropolitan Regional Development Authority has earmarked areas for development of five townships in its plan and has prepared Interim Master Plan for five towns – Kanakapura, Magadi, Hoskote, Anekal, Nelamanagala and Ramanagara

4. Bangalore city structure is a radial & concentric one with a series of proposed Ring roads – Peripheral Ring Road, Satellite Town rings, Intermediate Ring Road

5. Bangalore city has a vehicle population of about 3.125 million while the city population is about 7 million (Transport Department, 2008).

6. The vehicle to person ratio is less than 1:3, which is, by far highest than any other city in India.

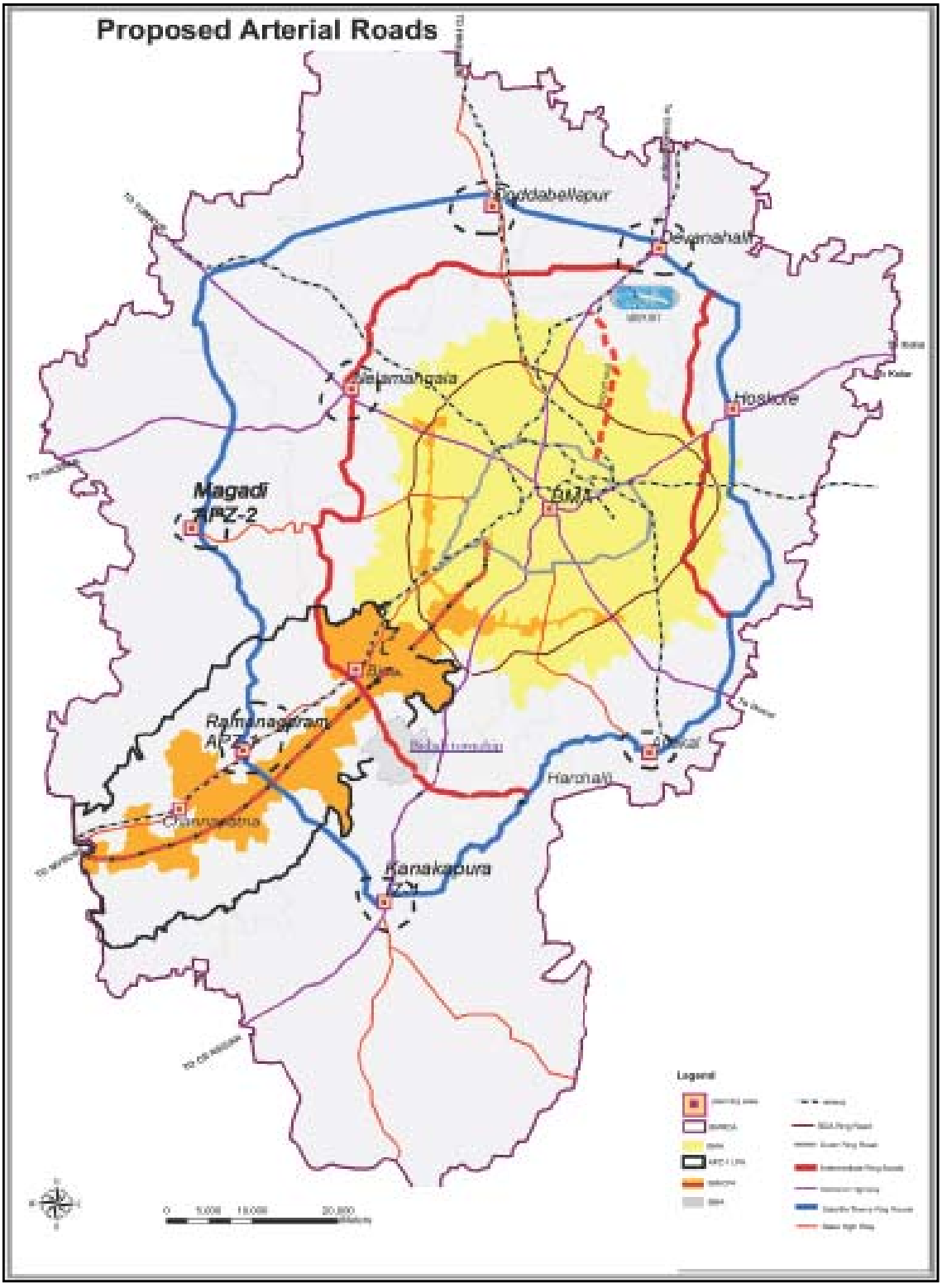


Fig.1: BMRDA – STRR, IRR , BMICAPA and 5 Planning areas

7. The working population in Bangalore is around 2 million and according to the recent estimates, there are about 2.238 million 2-wheelers, 0.505 million motor-cars, 0.092 Million auto-rickshaws, and 0.29 million other vehicles totalling to around 3.125 million vehicles on road.

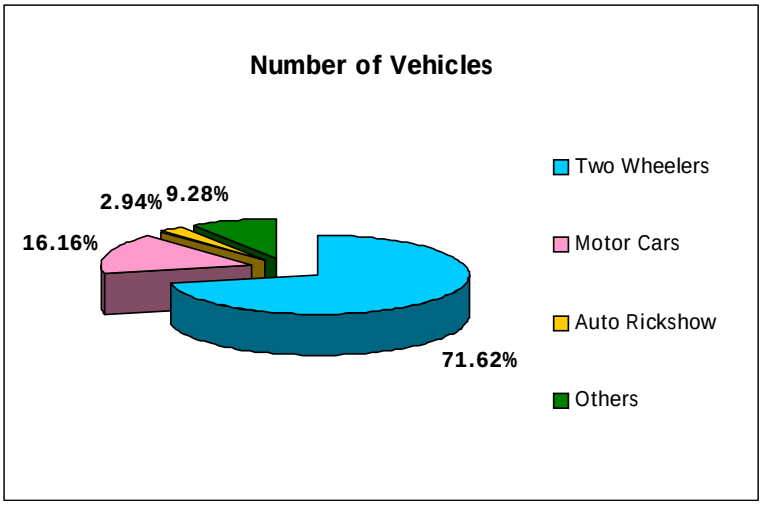


Fig.2: Vehicular - Percentage breakup

There is a considerable rise in the number of two wheelers, which constitute about 71% of registered total motor vehicles. The steep increase in this transportation mode can be attributed to the increase in income levels, change in life style pattern, as the preferred mode for the 20-40 year age bracket. The absence of an effective transport system has further encouraged this trend.

8. In the last year, on an average about 500 new vehicles were registered every day and during the same year, there were about 10000 new 2-wheelers registered every month.

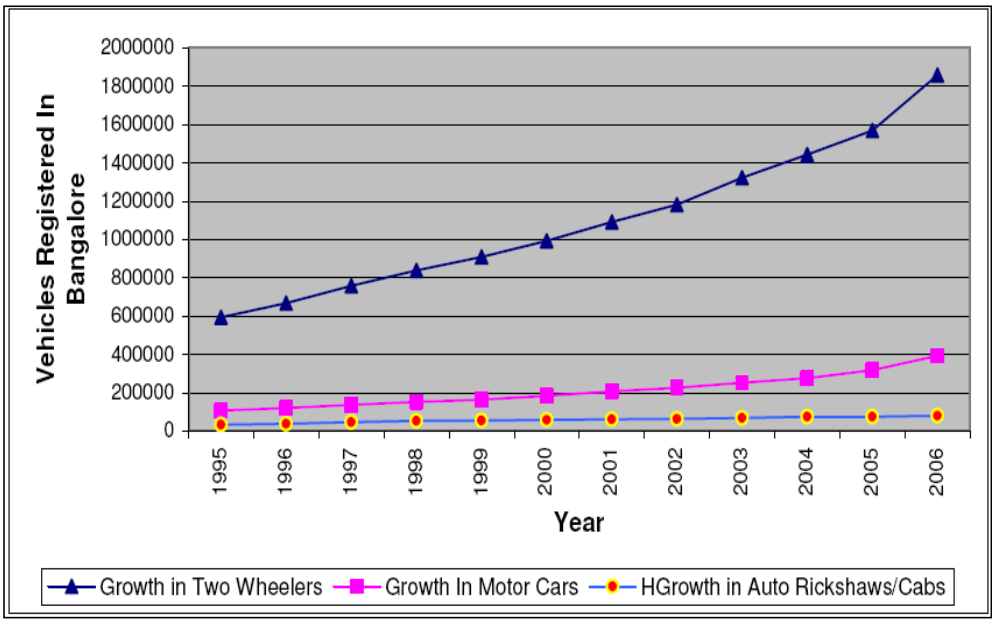


Fig.3 : Growth – type of vehicles

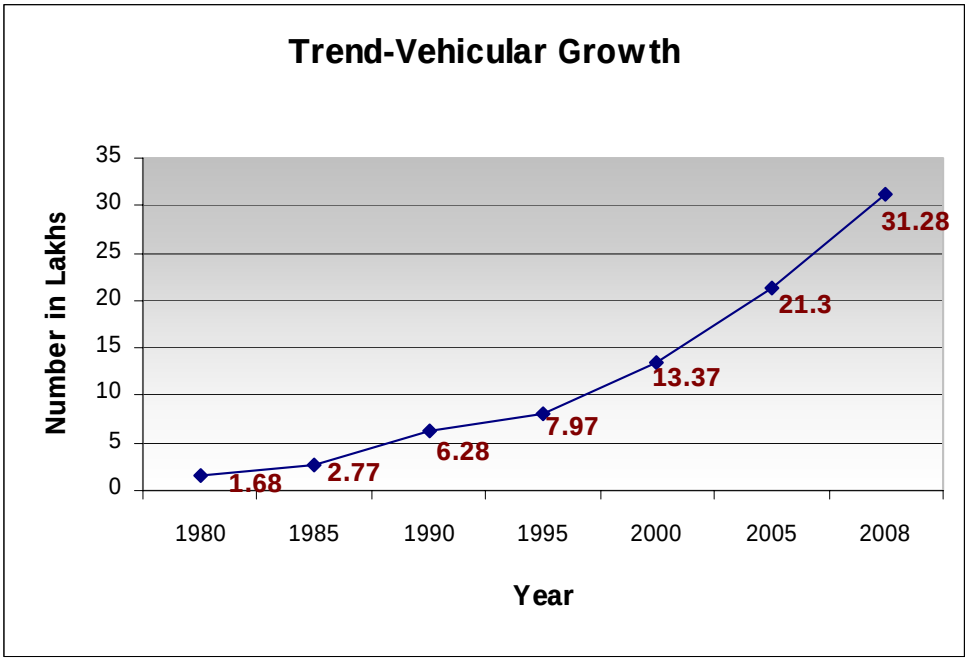


Fig.4 : Vehicular Growth trend

9. The Public transportation is predominantly dominated by the BMTC as service provider operates with 4887 schedules, 5071 buses, 68,885 trips, carry 3.8 million passengers, earn Rs.25.6 million per day and pay Rs.1.413 million to the Govt. as taxes (BMTC, 2008).

   The split between the private and public transport is as follows:

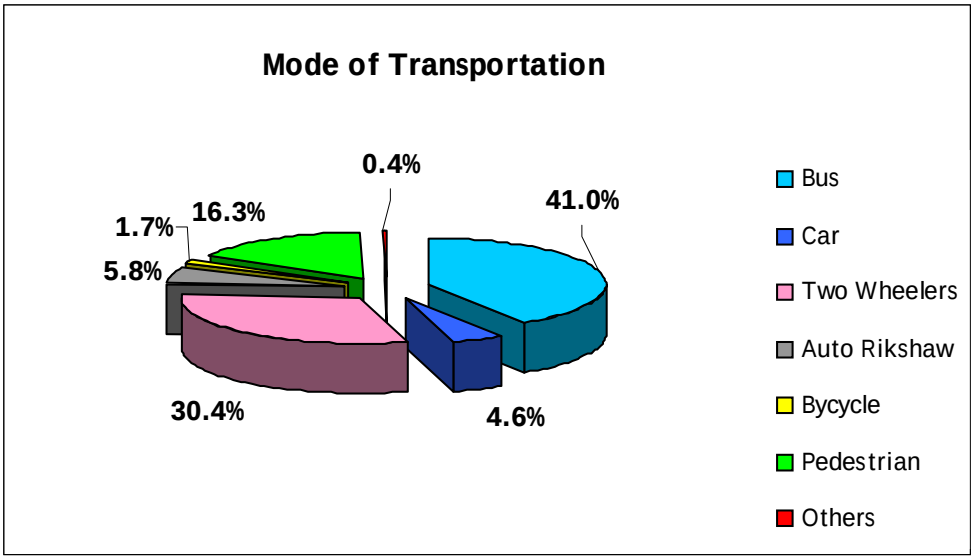


Fig.5: Modal split

10. City Structure: The road network in Bangalore has a star-like structure where all the major roads converge on the centre of the city. The absence of transverse roads coupled with the non optimized public transport leads to severe congestion in the city's core area. It has led to increase in accidents and especially loss of time. See . Fig. 6

    The total road length in the BBMP limits is about 4,500 km of which about 320 km form the important roads as arterial and sub-arterial roads. The existing road length in Bangalore is much less than the normative road length as per the prescribed standards of 17.33 km per sq. km (KUIDFC, 2006).

    The Relatively small addition of road space to the system when compared with the extent of spatial expansion of the city and lack of measures to overcome the restrictive radial/convergent road structure has not helped the city from congestion.

In addition, the extensive development of urbanization and separation of functions forces a dependence on private means of transport.

City structure:

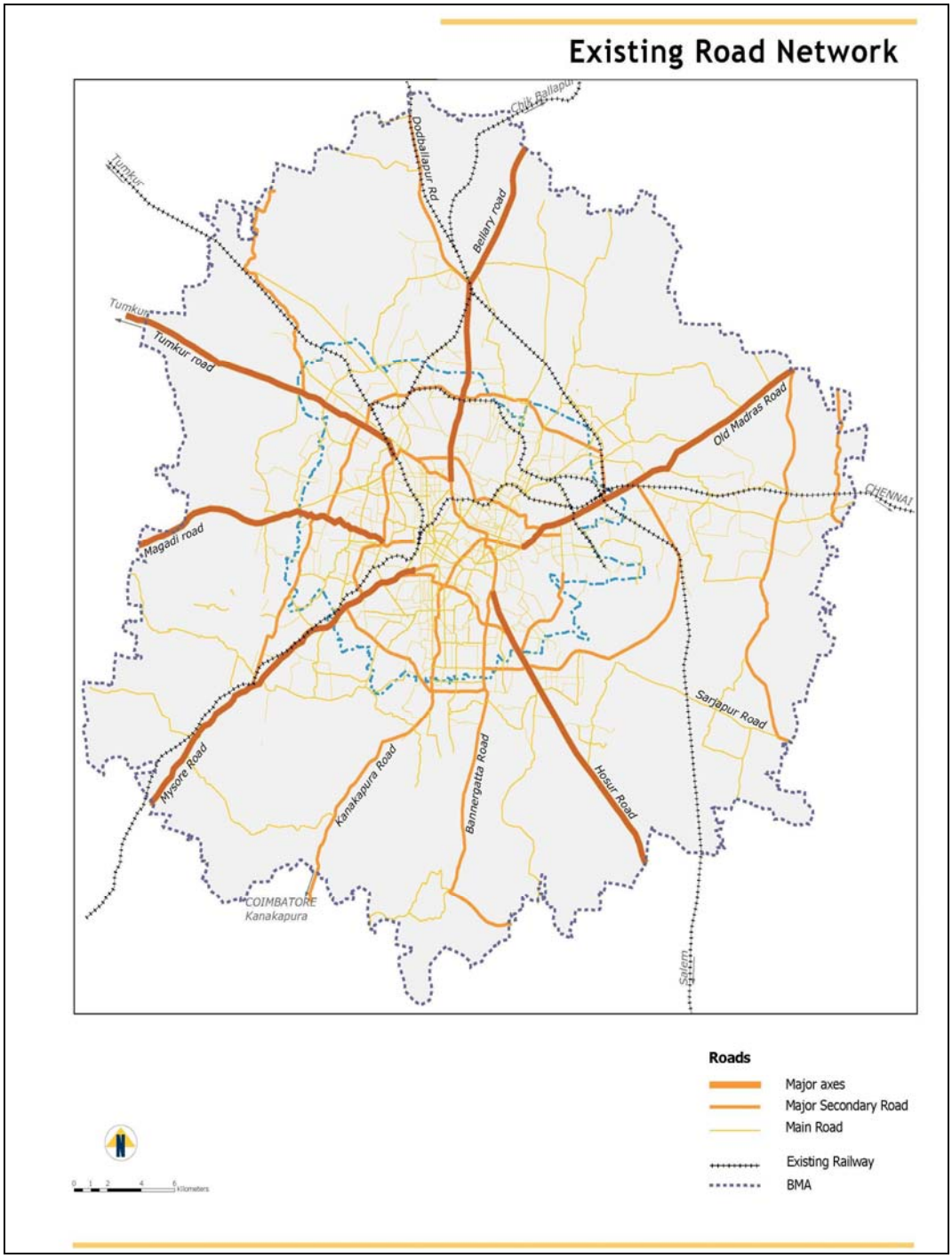


Fig.6: Existing Road network

11. The developments in the city are diverse and have taken place over a period of time sometimes without any planning at all. The formal development is largely restricted to interventions of BDA, KHB and private approved layouts. Informal/ revenue layout developments have been substantial in terms of supply and geography. These developments most often have poor infrastructure facilities such as roads, parking, parks and civic amenities. This has further aggravated the situation. Refer. fig. 7

12. The revised Master Plan 2015 recognises these typologies and based on function accommodated these typologies as zones for planning and zoning Regulation. The main zones are :
    a. Residential Main : Predominantly residential character
    b. Residential Mixed : Areas where activities are linked with residential
    c. Commercial (Central) : this comprises of areas such as Pettah
    d. Commercial (Business) : The Central business district areas
    e. Mutation Corridors
    f. Commercial Axes : Mixed uses based on street in residential areas
    g. Industrial (General)
    h. Industrial (Hi- tech): High traffic generating uses such as IT, BT, ITES
    i. Public and Semi Public
    j. Traffic and Transportation
    k. Public Utilities.
    l. Park and Open spaces
    m. Agricultural Land zone

13. The Central business district of Bangalore and the key activity areas are separate. They are located predominantly in the south, east and the northwest portion away from the CBD. The CBD and the corridors leading to the CBD suffer from congestion. The presence of large open spaces such as Parade grounds, Race course, Golf course, Cubbon Park, Palace

Grounds, underutilised industrial lands & institutions is an opportunity for creating parking.

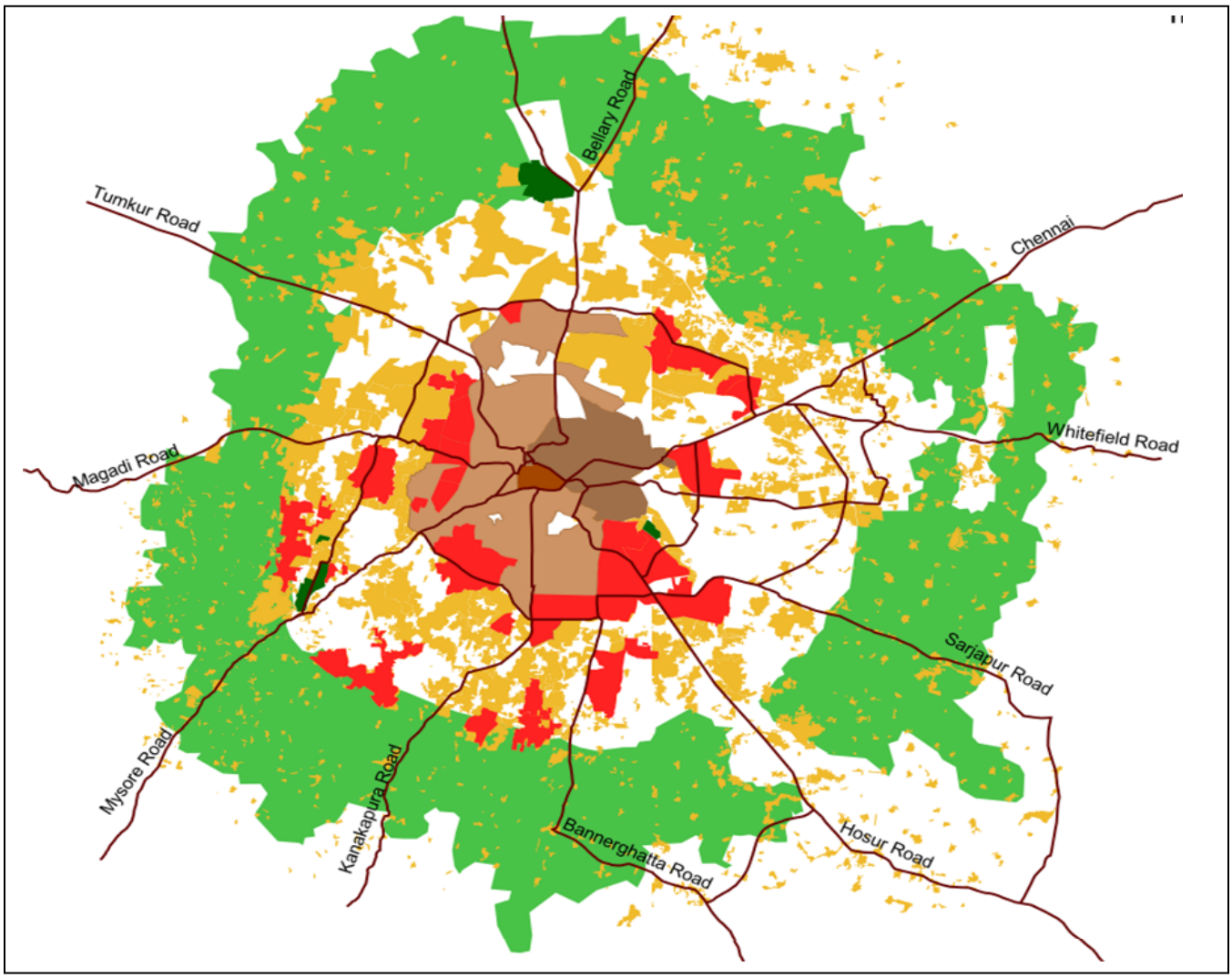


Fig.7: Patterns of Development comprising of both public and private

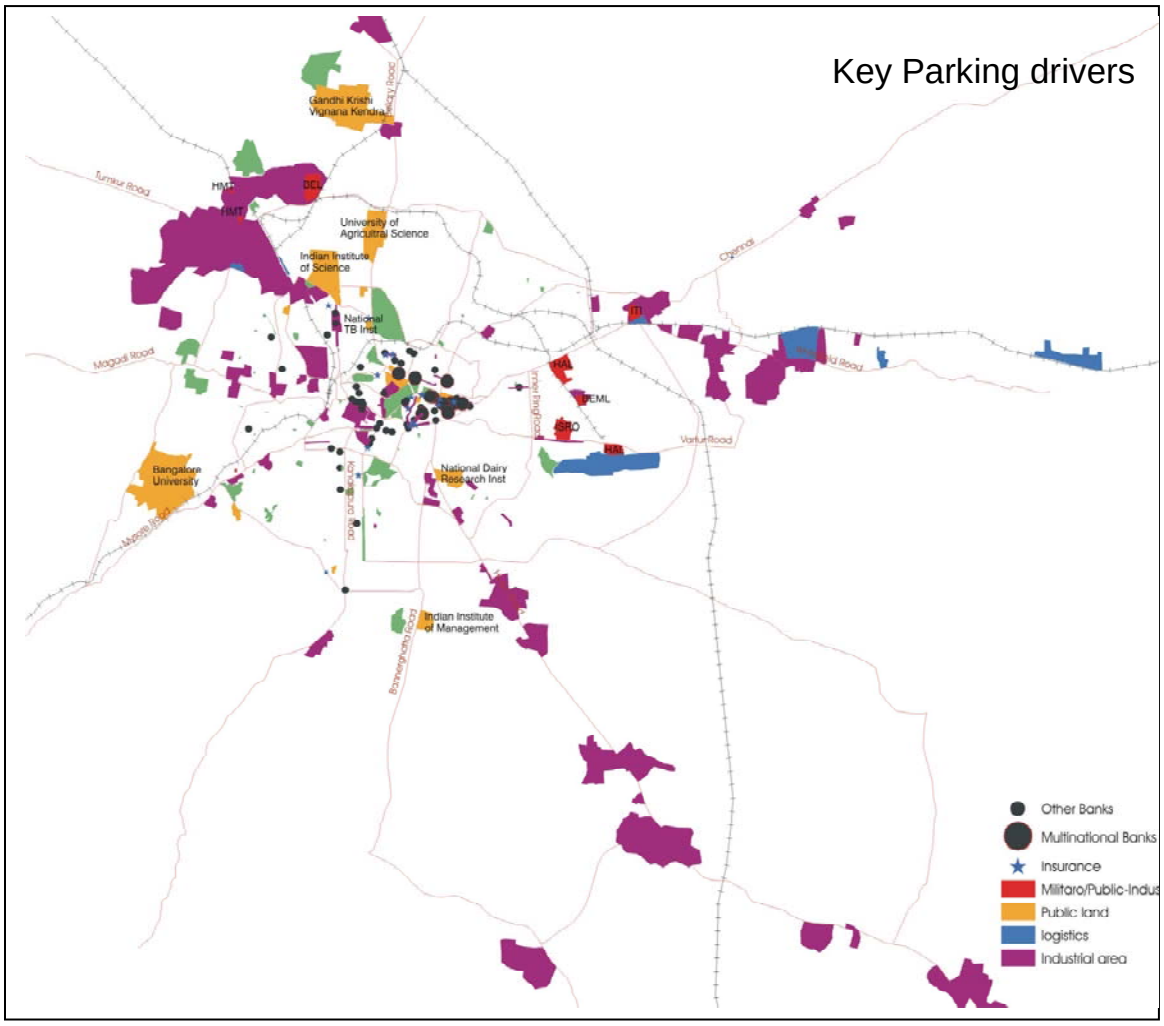


Fig.8: Activity centres and drivers for Parking

14. The Master plan recommends that the development in the city will be spatially organised through the ring structure and radii concentric structures and will occur at certain centres or focal points at the intersection of the important transportation hubs. The revised Master Plan is based on this structure for growth and development. Such hubs are opportunity areas for integrating transportation with land use development.

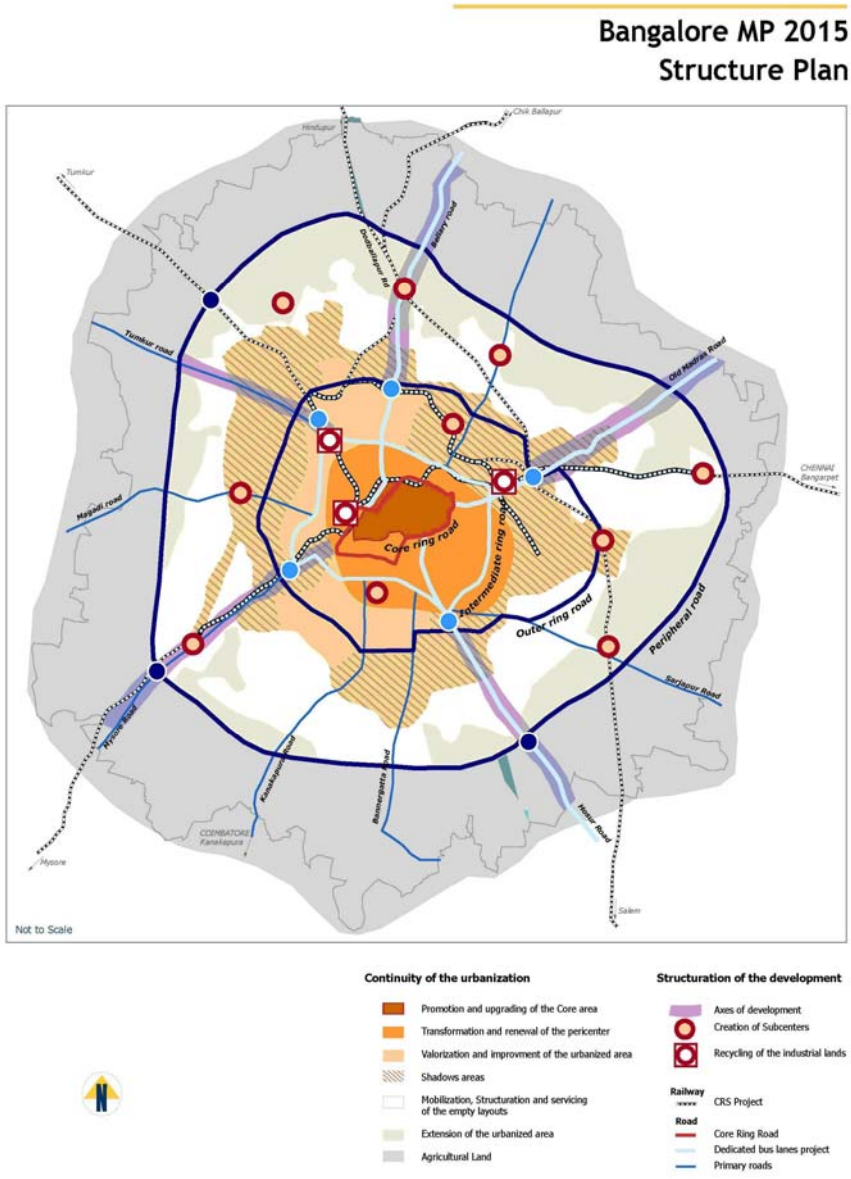


Fig.9: Structure plan – organisation of growth in the city

15. The Master Plan designates "transportation and communication" zone as the total area for roads, rail, and transport infrastructure accurately. The break up of the areas for various land uses are given below.

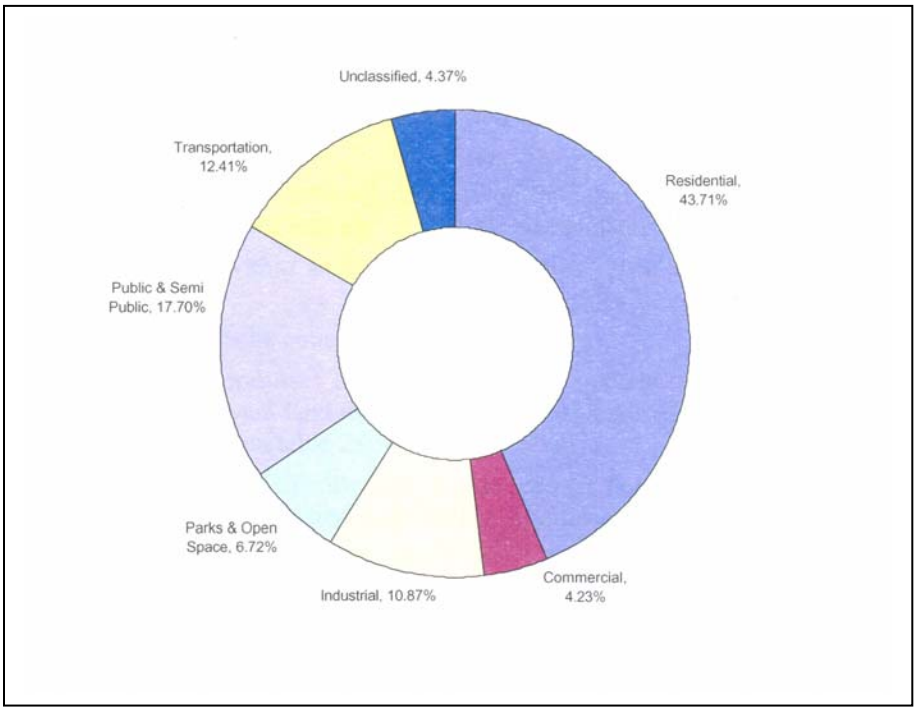


Fig. 10. Land use percentage in the RMP 2015

16. The unprecedented growth in number of vehicles, population and household income has generated large number of trips. Additional disposable household income for buying in more vehicles coupled with weak public transportation system has led to use of private vehicles. This has impacted in form of severe congestion and increased demand for parking.

17. On several roads that are available, the number of vehicles plying on these is greater than the carrying capacity of the roads.

18. Developing a Multi-modal Public Transportation System. The present public transportation system is inadequate to meet the future needs of the city. In view of Bangalore's specific context and existing situation it is imperative that a multi-modal public transport system that offers facilities for collective travel against individual modes of transportation is considered. The multi-modal transport operating systems consisting of road and rail systems, Bus Rapid Transit (BRT), Metro Rail, Mono Rail, Circular Rail and other proven mass rapid transport systems, must respond to all travel needs of households of the City. The multi-modal transport system also would be integrated in such a way that there would be seamless travel across the city. The opportunities to structure urban development offered by such a multi-modal transportation system must be built upon and this particularly includes optimizing the land use pattern along the proposed transportation networks and transport hubs.

19. Keeping the above issues as priority, the Comprehensive traffic transportation studies for Bangalore were carried out by KUIDFC and a fresh CTTS for the entire BMR region is being formulated by Bangalore Metropolitan Regional Development Authority.

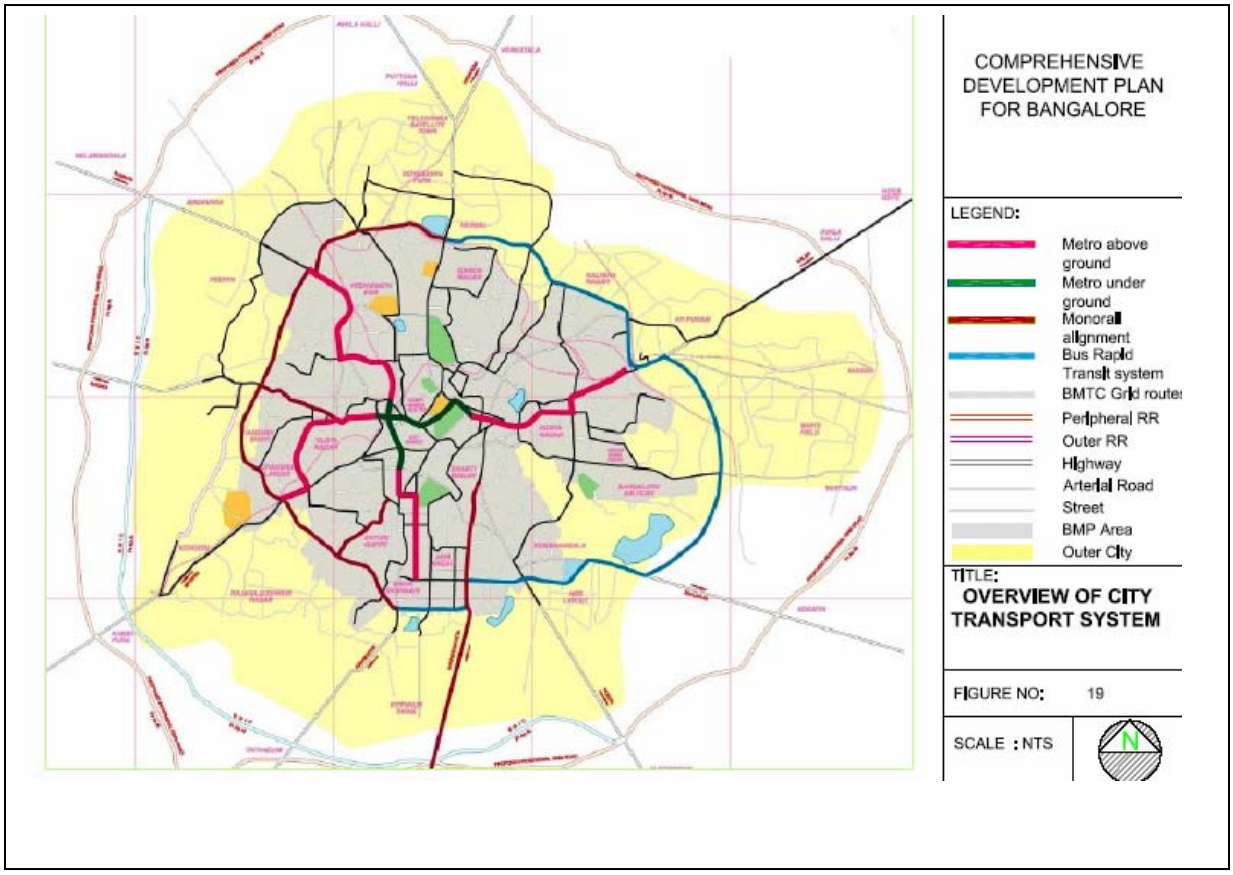


Fig.11: Multi modal systems and proposed integration.

Key Concerns related to Parking:

1. **Growth in number of vehicles:**

   Given the addition of vehicular population to the city – the supply of parking is inadequate. In the long run, the demand will outstrip the supply and will lead to extreme hardship leading to poor quality of life. A policy to minimise and reduce the dependence on the private vehicles is the need of the day.

2. **Need for effective Public transport:**

   The shift from private vehicles to the public transport needs to be facilitated by offering effective transport solutions. Multiple modes need to explored for offering and devising an effective public transport.

3. **Co-ordinated operational urban planning :**

   There is a need for bringing about change through co-ordinated operational urban planning with active support of the institutions involved in Planning. The current planning tools adopted by the city are largely inadequate. The creation of parking and shift to public transport needs to be inbuilt within the statutory and operational planning of projects. This requires a renewed approach to planning.

4. Enforcement of parking restrictions

   Though the Building byelaws mandate the provision of parking in the basement and adequate number of car parks in the buildings, there has been rampant violation.

5. Slow creation of parking infrastructure to meet considerable demand in the dense areas.

6. Effective funding for the creation of parking facilities, transit oriented infrastructure.
7. Policy framework to address wide range of parking issues and problems.

Parking issues: An overview

1. The Parking issues of Bangalore are intricately related to the city structure, infrastructure, traffic and management.

2. The One way system proposed for speedy movement within the city and streamlining the traffic had facilitated clear carriageways with removal of parking from the roads. These have resulted in moving the "on street parking" to the other roads and spaces available surrounding to these roads.

3. The practice of "Pay and Park "has been tried for a few years for about 71 locations, this has been discarded since 2005. Though the Pay and Park has been discarded, this has resulted in the haphazard and unregulated parking, often some illegal collection of fee for parking.

4. Carriage way – road side parking: Unregulated road side parking is being resorted to by vehicle users as the owners and visitors prefer to park the vehicle close to the work place for easy access and safety of the vehicle. Parking of this type must be prohibited.

5. Foot Path Parking: Parking on side walks or foot paths is prohibited by the law.

   5.a. The Parking on foot path by house dwellers: This limits the foot path space for pedestrians and is wide spread in both residential and commercial areas of the city.

   5.b. Parking in front of the shops: Basements which are meant for parking are put to commercial use and the shops/commercial establishments are forced to park their vehicles on roads.

   5.c. Parking by Automobile dealers and repair units : repair vehicles and goods are parked on the road and the sidewalks.

   5.d. Parking of vehicles around schools and colleges: School buses and auto rickshaws used to transport the school children are indiscriminately parked on adjoining spaces including roads around the schools creating utter chaos and confusion.

5.e. Parking around choultries and Business establishments: High intensity uses such as choultries, kalyana mantaps have very little parking space within their property , a majority of the users park their vehicles on the adjacent sites, roads and foot paths.

5.f. Visitor parking for apartments and multi dwelling units are not available and visitor's park indiscriminately on adjacent areas, foot paths and on the roads.

6. Parking at defined lots: The defined parking lots in the city are not effectively utilised as there are no management staff available. At the time of "pay and Park programme, there were parking contractors and their staff available for management. Today, at some places unauthorised fee collection is carried out.

7. PPP initiatives not fully effective: Under the PPP initiative, the development of commercial use was allowed as a concession for improving the viability of the project. Though a novel concept, it has resulted in generation of traffic and private vehicles by the commercial space. This has not served well for meeting the demand for parking.

8. The creation of parking envisaged by BBMP will result in about 2000 parking spaces; these are miniscule numbers compared to the overall demand.

9. Commercial vehicles such as the Lorries, mud tippers and others have no space for the parking in the city. The transport Lorries are parked along side the highway such as the NH4, NH7, etc.

10. The lack of truck terminals and associated facilities allows the vehicles to enter the city, adding to the congestion.

11. Small & non-motorised vehicles such as push carts, hand carts have no space reserved close to the communities. The EWS and informal sector are forced to park their vehicles on the road, side walks.

12. Auto rickshaws park their vehicles as per their convenience and short parking also impacts the smooth flow of traffic and creates accidents. People are allowed to take a rickshaw anywhere and alight at will.

13. The private bus stand in kalasipalyam is unregulated and the space requirement for buses is inadequate. The "spill over of the bus" leads to crowding the Majestic / KG Area. The Private buses now stop at Hosur Road, Tumkur road for users. The location of the bus parking is not convenient to the user or to the vehicles passing on the road.

14. The cabs and taxis, private mini bus which operate on contract are found to be parked at places convenient to the owners, often on civic amenity sites, park areas or any disused private land. These will need to be regulated. Individual taxi owners, etc park their vehicles on the road / sidewalks during the night.

Summary:

The results of such unregulated parking of vehicles have led to the following concerns:

1. Congestion on roads and obstructing the smooth traffic flows.
2. Foot paths and side walks have been encroached leading to reduction of space to pedestrians.
3. Extended Parking hours and indiscriminate parking: The Vehicle owners of commercial establishments, the owners of cab taxis and buses park their vehicles at places for long duration and mostly in haphazard manner.
4. Vandalism and safety: Most of the parking lots are unregulated and safety provisions are unavailable. The vehicles can be subjected to vandalism and theft.
5. Loss of revenue: The potential revenues accrual from Parking fees and charges are unavailable to the urban local body/ Government. The unauthorised collection of fees is rampant and is of nuisance.
6. The Parking and congestion, in general lead to pollution of air and increased noise levels.
7. The Parking problem directly affects the "Quality of life"

Chapter 2 – Principles of Parking Policy:

The total number of vehicles is growing at an alarming pace. The provision of "parking" so as to meet the total demand for both short and long stay is practically impossible.

To quantify the size of the problem, it is roughly estimated that nearly 8,000 acres of land will be required to park all kinds of vehicles at grade, at any given place. Currently, this space requirement is met through parking on roads, apartments, side walks, open spaces, tiny proportion in form of Multi storey parking lots, office buildings and transport terminals (bus stands, terminals). Not only do vehicles require street space to move about, but they also require space to park where the occupants can be loaded and unloaded.

It is also roughly estimated that out of 8760 hours in an year, the cars runs on an average for only 400 hours, leaving 8760 hours when it is parked. Every car owner would wish to park the car as closely as possible to his destination so as to minimize his walking. This results in a great demand for parking space in various areas of the city, where activities are concentrated.

"The overarching principle for parking is to progressively reduce the demand for parking and facilitate organized parking for all types of vehicles"

The formulation of the Policy will be the starting point for the making of programmes and specific plans. Parking demand emanates from consumer behaviour and user requirements and location of markets, utility centres and all public places.

The policy has been devised based on the discussions held with the key stakeholders and review of international/national practices in respect of urban parking problems.

Strategic intent:

The strategic intent of the policy is to:

- Effective management of Parking demand
- Reduction of congestion especially at junctions, vantage points and nodes, to avoid the diversion of open (Public) utilitarian spaces for parking and eventually
- Regulating the growth of vehicle numbers (by framing appropriate rules).

The Parking policy also attempts to cover the following objectives:

1. Relieving the congestion on roads
2. Safety of pedestrians
3. Safe and secure parking – this includes short and long stays.
4. Integration of Parking with the Public transport facilities
5. To promote private participation including private initiatives and project implementation
6. To enable appropriate pricing for the various parking facilities.

Strategy matrix to achieve objectives:

Table.1

Sl. No	Policy Objective	Strategies
1	To relieve congestion on roads	• Banning of parking on the roads • Promotion of public transport • Live work Play concept – integrated model. • Regulated Mixed land use philosophy
2	To ensure the safety of the pedestrians	• Preventing the misuse of footpath for parking. • Ensuring that places for parking of vehicles are used for the purpose. • Clear demarcation between parking and pedestrian facilities through use of

		temporary and permanent structures
3	Safety and utilisation	• Create organised and regulated parking services to defined parking lots • Use appropriate engineering standards – lighting, security, shelter.
4	To prevent misuse of parking space	• Licensing of the Parking lots • Release the parking spaces which are being diverted for other uses. • Promote parking for short duration (hourly duration) • Permit only authorised vehicle parking certificate holders to park in designated lots.
5	Parking facilities to help in mobility and transit.	• Parking lot at every intermodal transport point and at every metro station • Bus services need to be extended to all localities such that people are required to walk less than 250 m to access the transport.
6	To promote private participation in establishment of public parking facility	• Modify building byelaws to promote private and public parking lots • Promote establishment of private parking lots, both on grade as well as at multi level • Encourage land owners to establish facilities through tax, Transfer of Development right for viability. • Private land owners can be involved in development of Transport hubs, Bus stands, bus bays and truck terminals.
7	To use parking management as a tool to reduce the demand for private mode of transport	• Device suitable policies to promote the use of public transport facilities. • Promote use of shared vehicles
8	Awareness and education	• To identify “zero tolerance zones” for creating the sensitisation. Gradually this can be scaled to the entire city.

Pricing:

The Pricing of parking is an important and integral part of the policy formulation. The pricing of parking can impact the vehicle travel patterns and assist in streamlining the traffic flows.

- A variable pricing based on the location of the parking linked to land price is a desirable model – Parking in the centre of city will be costlier than parking in the periphery as the value of the land is different.
- Variable pricing based on hourly basis during the peak hours and lower prices during the off peak periods is recommended.
- Fee collection can be through automated methods or manual means. This must be carried out within the guidelines drawn up by the authority.
- Variable parking fee needs to be based on the size and type of vehicle – the larger the vehicle, the fee will be higher.
- The increase of tariff for the number of hours parked will be cumulative scale with every increase of hour parked- the fee will be higher.

Policy Recommendations:

1. Planning and Design

P&D/01. Integrate the land use and transportation at planning and implementation levels. This should include interventions to reorient land use to direct /influence transport demand.

a) The zoning of land use such as commercial business areas , Mixed land use developments , high intensity land uses are to be centred around the transportation hubs with adequate parking.
b) The Land use documents prepared by BDA primarily depend on the management of the Floor Area Ratio. Transportation hubs such as Metro stations, railway stations, transit centres must be accorded with higher FAR within specified guidelines. .
c) Areas with high density of population must be serviced with public transportation.
d) Projects taken up by BBMP or any other agency (private or public) that induces a large vehicular traffic needs to include transportation needs (To make reservations of space for parking, commuter facilities, etc).
e) Periodic reviews of plans and projects are required to ensure proper compliance of parking norms is met.

P&D/02. Emphasis on Parking in Planning and the regulatory documents to allow multiple level and multi use parking lots at various transit points, commercial centres, such as railway stations, Metro, etc.

(a) The Key transportation hubs with interchange facilities between transportation systems need strengthening at the plan and implementation. The air space and the below grade area should be promoted effectively for parking facilities, for commuter facilities. For instance- Bus station over rail station with public parking facility above can be designed.

(b) Parking facility shall be provided at transit management centres of BMTC and Metro stations of BMRCL.

P&D/03. Mitigate the effects of the newly introduced High intensity/ Higher FAR land uses

(a) It is recommended that authority responsible for implementing the parking policy provide assistance to the project developers during the course of design, engineering and implementation so as to comply with the regulations.

(b) The approvals for such projects should be carried out through a consultative approach.

(c) High intensity land uses shall provide mandatory accommodation for additional parking facilities either at the basements, multi level or through sharing of facilities (both Govt and Private).

(d) In case of non provision, the developers/ owners of the said facilities shall pay an impact fee to BBMP.

(e) In such cases, BBMP and Police should facilitate parking for the users through a co-ordinated plan.

P&D/04. Devise progressive Building byelaws by adapting regulations to meet the ground realities – Old city areas, urban villages, commercial centres, etc.

(a) Many of the Building renewal projects cannot accommodate parking in their plans due to the constraints of space within the site. In such cases, equivalent parking impact fee based on the intensity of the use shall be levied and authorities will facilitate common parking infrastructure.

(b) The old areas of the city do not have enough open spaces for accommodating at grade parking. Vehicle free zones may be planned in consultation with different stakeholders. Wherever feasible multi level parking /underground parking can be created.

(c) In case of old city areas – disused government facilities such as civic amenities may be used for parking.

P&D/05. Accommodate the Mixed Land use regulations and mitigate the "negative externalities" by area level planning and introducing tax for the impact of the mixed land use.

(a) The Area level planning shall be carried out to provide for common parking, creation of pedestrian zones and mitigate the effects of indiscriminate parking.

(b) The owner / allottee / resident / user of the plot / dwelling unit under the mixed land use shall also be liable to pay one time charges for development of parking and such rate for one ECS per 50 Sq. mtr. of plot area shall be as under.

Sl.no	Description	Amount (INR)
1	First Ring	1,00,000
2	Second Ring	75,000
3	Third Ring	50,000

P&D/06. Introduce planning tools to effectively respond to area level requirements.

(a) The current practice of preparing the Master plan is to serve at the City level. As the scale is very large and restricted to land use zoning plan, it cannot fully guide and serve the "area level requirements". It is necessary to introduce an intermediate level of planning and this could serve for redevelopment purpose as well.

P&D/07. Insist on Safety and protection of Residential neighbourhood character whenever community or private parking is provided in these areas.

(a) Nuisance, Fire and Noise effects are to be dealt in a comprehensive manner during sanction and approval of public buildings and facilities in the residential areas. Continuous monitoring of the areas and regulation is necessary.

P&D/08. Insist on optimal Parking infrastructure and encourage management in the new developments.

(a) All newly developed layouts by KHB, BDA, KSCB and private developers shall make necessary plans for the parking infrastructure and management.

(b) In case of large developments, where standards and norms are only a pre-requisite, the provision and management will need to be carried out in consensus /negotiation manner with project promoters.

P&D/09. **Parking near notified or declared areas:**

(a) Areas which are of historical heritage and archaeological importance shall have stipulations for parking in light of the sites' / structures' significance / importance. Visual, aesthetic and environmental aspects shall be given importance.

P&D/010. Parking norms for Low income housing and EWS housing :

(a) As the low income and EWS housing need space for parking their push carts, auto rickshaws, hawking carts, horse carts, tricycles, etc, developments taken up afresh and existing developments shall be provided with adequate parking.

(b) Relaxation on the parking norms shall be provided.

P&D/011. Bicycles parking lot

(a) Bicycle parking should be mandatory in all facilities

(b) Atleast 15 % of the two vehicular parking space reserved in all building plans should be reserved for the bicycles.

2. Transportation

Trans/01. Progressively move away from the concept of using road space for parking of vehicles.

Trans/02. Adopt measures to enhance the services - the existing Sub optimal Public transport system needs up gradation allowing for easy mobility and less congestion.

Trans/03. Contain and regulate the addition and growth of vehicular traffic to the city by Legislation, fiscal disincentives and traffic management measures.

Trans/04. Identification of the zones in the city to be carried out to meet transportation demand, supply and parking infrastructure in a scientific manner.

(a) Based on the land uses, intensity and socio-economic conditions, zones in the city will be delineated. The demand zone wise shall be assessed for estimating the parking demand and detailed plan for implementation drawn involving public & private participation.

(b) Suitable Large public spaces such as Parks, Race Course, Play grounds, stadium and underutilised public amenities and land at select localities can be utilised for off-street parking through use of basements, under ground parking structures. Care must be taken not to disturb the functioning of the space above.

Trans/05. Differentiation of parking demand –

(a) The parking demand in the city is not homogenous, different types of commercial and private, public vehicles depending upon the size and purpose are to assessed before implementation of the policy.

Trans/06. Differential treatment of identified zones in the city:

(a) Identified zones in city require differential treatment while according sanction, approvals, taxation, Transfer of Development rights. The detailing for the same will be carried out after studies and consultation.

Trans/07. Relocation of Bus stands, stops and private vehicles stops to assist decongestion.

(a) The private bus stand in Kalasipalyam and the vehicles parked in Gandhinagar area needs to move to better facility located in the periphery of the city. This will reduce congestion of the centre and better transit options.

(b) The bus stops are located at the critical junctions on the arteries. The buses stop at these points creating obstruction to the smooth flow of traffic. Bus bays and re-location of the bus stands are necessary.

Trans/08. Traffic restraining measures :

a) Limiting the upper cap of vehicles that can ply in the city.
b) Phasing out old vehicles which are more than 15 year old and non compliance to pollution norms.
c) Levy of fees for deterring vehicles entering/exiting the city.
d) Discourage and using fiscal measures avoid permanent parking of sick and unused vehicles occupying road space and other potential parking spaces
e) Introducing area licensing schemes where vehicles other than public transport vehicles are charged for entry into the area.
f) Earmarking the areas of the city into zones and restricting the entry and exit of vehicles into these zones during specific hours of the day.
g) The zones proposed are Zone.A , Zone.B, Zone-C
    i) Zone-A: The areas include the central business areas inside the core ring road where short term parking on hourly basis will be provided between 9 .00 Am and 9 PM with high

telescopic charges increasing with every hour of parking. These areas will be provided with Automatic Mechanical Parking (AMPs) and private parking lots. Beyond these timings, the parking fees could be charged at a lower rate for longer duration of time.

ii) Zone – B: Between CRR and ORR: In these areas a combination of AMPs and CMP can be provided at selected interchanges, especially at the TTMC and other identified locations close to public transport corridors. Parking in these areas will also be short term based but at a slightly lower tariff as compared to zone.A.

iii) Zone.C: outside the ORR – large CMP may be provided at the TTMC s and other locations adjoining the public transport stations of Metro, Monorail / LRT, BRT, etc. These will be long term parking lots of 8 to 12 hour duration at a nominal tariff to encourage the vehicle owners to park at these facilities and ride the public transport system to their destination and back.

Trans/09. Identification, mobilisation of land for Parking in the Periphery through Authority.

a) The truck terminals, bus stand for private vehicles requires modern facilities. To establish these facilities, the various plans have designated landuse at select places. However these lands belong to the Private and compulsory acquisition of the same is cumbersome. It may be recommended that a partnership where land sharing must be encouraged through providing incentives including TDR and other concessions.

Trans/010. Approval shall be accorded to designated parking lots – for auto-rickshaws, Lorries, public/private transport based on actual studies and in discussion with stakeholders.

Trans/011. Large campus form of developments.

a) Large scale developments such as SEZ, campus styled, integrated complexes require to provide parking- the provision of parking space as per norms will result in allocating large areas dedicated for parking. To enable better integration, provision for public transport must be made and a commitment may be sought from the developers on the provision and partnership with the Government.

3. Engineering and Technology

E&T/01. Scientific determination of parking space requirement (Parking Standards) for each type of vehicles requiring parking space and separate determination of space required for manoeuvring at entry, exit and pathways.

E&T/02. Segregation of parking spaces for two wheelers and other vehicles in order to avoid congestion and minimise sub-optimal use of space due to overlapping.

E&T/03. Engineering standards and codes for various parking facilities need to be revised and standardised. Public parking should not be mixed with other uses such as Commercial, etc for sake of viability/ feasibility of the project. The decision making may be on case to case basis.

E&T/04. Provision of separate enclosures within the parking area for vehicles requiring parking space for few minutes from those requiring parking space for considerable time.

E&T/05. Building of boundary walls and other permanent structures for the parking space to insulate the parking space from regular traffic and unauthorised parking movements.

E&T/06. **Technology solutions and preferred development options (such as MLCP, Underground) for various facilities to be adopted after consultation with various players – Police, Fire, Developers, Planners, etc.**

E&T/07. **Provisions made in the National Buildings Code (NBC) shall be adapted for the design of Multi-level conventional and automated car parks.**

E&T/08. **"Fast track" the provision of parking infrastructure for private buses, commercial vehicles.**

E&T/09. **Special privileges for the physically challenged persons in the matters of parking their vehicles as well as using of slots in the parking areas should be provided.**

E&T/010. **Ensure implementation of engineering measures with an emphasis on quality and safety concerns.**

E&T/011. **"No stopping zones" are to be introduced on all arteries and major roads in the city.**

4. Finance:

Fin/01. **Parking charges and fee collected are to be considered as "Disincentives" and not as "Earnings". However the fees collected should be deployed for creating the infrastructure, devising methods and strategies for parking management.**

Fin/02. **Finance and incentives should be made available for creation of parking infrastructure- for land based, multi-storey, Basements or Bus, truck terminals.**

a) Facilitate PPP model with no compulsory land acquisition in designated master plan reservations for public, semi public and traffic & communication land uses.

Fin/03. Discourage vehicular registration through higher registration fees (taxes). This can be done by mandating the rule of one car per household.

- An upper cap of one car per household should be stipulated and any additional car could be charged a one-time fees of about Rs.1,00,000 per car and higher municipal tax in terms of 10 % per year of the assessed tax.
- The Transport Department can issue vehicle parking certificate along with the registration of the vehicle. The fees collected will be in accordance to the Zone to which the owner resides.

Fin/04. Encourage the sharing of facilities and Introduction of Transfer of Development Rights, tax subsidies, capital subsidy, if needed.

- Plot owners are allowed for sharing the parking facilities, a particular building owner can allow for the allocating parking in another plot.

Fin/05. Levy of user fees or impact fee for the parking on roads/ public spaces to ultimately release road space from parking totally). The Fee structure will follow a Cumulative fee model based on the number of hours parked, instead of providing a telescopic tariff scale.

Fin/06. Differential pricing to be adopted in accordance with the zones of the city –This can be in form of rings - in circular manner – the Inner ring , Middle Ring and the outer ring for Bangalore.

Fin/07. Introduction of congestion tax in select high density and business district (zones) of the city. Rationalisation of the fee in accordance with the land use and price is to be followed.

Fin/08. **Creation of Special Purpose Vehicle (SPV) for funding key parking/pedestrian and associated infrastructure through SFC grants (1% of the fund can be allocated for the above).**

Fin/09. **To enhance viability of parking infrastructure projects, the SPV can assist in provision of guarantees to bridge the viability gap, etc.**

Fin/010. **For violations and deviations such as non provision of parking in the buildings, KMC act provisions shall apply such as doubling the tax for collection, till such time the structure is brought to comply with the regulations. Such fees collected shall be kept in separate head of accounts.**

Fin/011. **In order to promote public transportation system, incentives may be given to government staff employees and private sector for utilizing the public transportation system.**

Fin/012. **Parking lots reserved for bicycles will be offered incentives such as municipal tax waiver, capital subsidy. However these will be regulated by the DULTA and BBMP.**

5. Governance and institutional

Gov/01. **Strict Enforcement disallowing deviation of buildings and Land use violations must be insisted.**

Gov/02. **Private sector participation is to be encouraged and this should be regulated. Individual plot owners must be allowed to develop parking for 2, 3 and four wheelers subject to conditions.**

Gov/03. **Clarity on PPP projects for creating facilities is required for overcoming difficulties while according sanctions and clearances.**

Gov/04. **Need for Central regulatory authority for co-ordination and management including enforcement and monitoring.**

Gov/05. **Need for creating a common implementation and roll out plan to enable phase wise activity and effective co-ordination (release of road space from parking in a progressive manner). This is to be supported by the authority to tackle multiplicity of agencies and programmes.**

6. Awareness and sensitisation:

AwS/01. **Create a few zero tolerance zones with all infrastructure such that no violations in terms of pedestrian, parking and traffic occur. Such zones will serve as "model". These zones can be expanded to the entire city in the due course.**

AwS/02. **Need for Advocacy and awareness building – This should cover the education aspects, training and influencing the user behaviour, to inform the rights and duties of the users.**

AwS/03. **Conducting education and awareness programmes to spread the benefits of organised parking and avoiding road space for parking (resultant increased speed of vehicles and increase in productivity)**

AwS/04. **Awareness building and facilitation for enabling the shift from the use of private vehicles to Public transport.**

AwS/05. **Facilitate Car-pooling and sharing of facilities.**

Chapter 3 – Recommendations-phase-1

Recommendations for promoting organized parking in Phase-1:

On-street Parking

- The On -street parking will be allowed on some important roads wherever there is adequate road width and approvals of expert panel comprising of the traffic police. As a policy the management of road side parking will be assigned to the "shop keepers association" of the respective road where Street parking is being promoted. 50% of income earned from shopping will be given back to the associations to pay for the facilities created and the surplus if any will be used for the development of the road on which on street shopping has been provide.
- It will be ensured that while planning the on-street parking primacy will be given for the functions that are expected to be played by different kinds of roads - expressways, arterial roads, sub arterial road, collector road and local streets.
- As far as the arterial and sub arterial roads are concerned, priority will be accorded for traffic movement and elimination of parking at all times will be considered as a long-term strategy. .
- On-street parking restrictions on local streets are necessary to improve the quality of residential environment. On street parking in residential areas will be provided only on cross rods and conservancy lanes which are wider than 12 meters. However, this is to be done with consultation of the residents.
- Provision of sidewalks will be considered as an integral activity, while planning for on-street parking. This is proposed to eliminate conflicts between pedestrians and vehicles on movement.
- While deciding the specific locations for on-street parking and the number of parking spaces shall be provided, due consideration will be given to loss in road capacity in permitting parking.

Short-Stay Parking

Short-stay parking is preferably located in proximity to trip destinations and protected from long-stay packers. Separate short-stay parking facilities may be required for business users, entertainment and tourist visitors, office visitors, visitors to residential unit's etc.

- A short stay parking (Road side, multi level, on grade, Private/ Public) will be created according the area needs.
- Protection from long-stay parker will be ensured by means of time restrictions and/or by appropriate pricing structures.
- Parking of vehicles by owners and employees of establishments in short stay parking lots for long-stay purposes will be discouraged through appropriate pricing mechanism.
- Parking costs will be uniform irrespective of nature of parking or ownership in so for a street is concerned.

Parking in Residential Areas

Public roads are a public resource intended primarily for the movement of vehicles and not for parking. Vehicles owned by residents will not use the roads in residential areas for long-stay parking.

- Building bye laws will be enforced to promote parking in residential areas.
- Parking in private off-street locations will be promoted through necessary amendments to the building bye laws.
- Option of providing exemption from payment of property tax will be explored to promote private parking lots.
- By providing additional FAR steps will be taken to create more parking spaces in residential areas.
- Parking of both owners as well as visitors 0 streets near flats will be prohibited and enforced.

Parking in Public Institutions, Cinema Theatres, etc

- Institutions (e.g. educational institutions), industrial establishments, commercial complexes, cinema theatres, kalyana mandapams, entertainment halls, hotels and restaurants will provide adequate off-street parking facilities for employees, visitors etc.
- Adequate number of off-street parking spaces will have to be made by the establishment to meet the demand of employees and visitors.
- Spill over of parking arising from these establishments to the streets will be discouraged / prevented.

Heavy Vehicle Parking

- Overnight parking of buses, trucks, omni buses, tourist buses, vans, water tankers, container Lorries etc along major roads will be discouraged.
- Specific off-street parking facilities will be made available by the owners/operators of the vehicle for night-time parking or when the vehicles are not in use. Such vehicles will be discouraged from occupying the road space of the major roads for long-stay parking.
- Over night parking of private vehicles will b~ allowed on notified areas and such areas will be brought under the management of private service providers. However, over night parking of commercial vehicles such as Call Taxis, Light Commercial Vehicles, Buses, Trucks etc. in the residential area will be discouraged.
- Long-stay over night parking will be avoided considering the possible nuisance due to noise disturbance and safety hazards, associated with such parking.
- The Vehicle Parking Certificate (VPC) will be made mandatory for all vehicles in the future.

Parking in Railway Stations / MTC bus Terminals

- Commuter parking shall be streamlined at the railway stations and at the MTC bus terminals by the respective authorities to facilitate the commuters to adopt the park and ride concept.
- Design suitable interface facilities enabling the bus and rails systems to work in close co-ordination in respect of operation, fare structure, comfort, convenience etc.
- Depending on demand, parking facilities will developed at railway stations by the railway authorities on priority basis. This would facilitate the commuters to derive maximum benefits of the system operating.
- Development or park and ride facilities at suburban stations and at BMTC bus terminals will be encouraged.
- Agencies operating the bus system and the rail system will periodically review their functioning and if necessary revise, taking into account the aspirations of the commuters.
- Wherever possible, Private initiatives shall be encouraged to achieve the objectives.

Off-Street Parking Lots and Multi level Parking

- "Stand-alone" parking facilities will be promoted by BBMP. This includes Multi Level Public Parking (ramp type and mechanical parking) facilities will be planned and developed at suitable locations.
- Parking lots will be developed both by government agencies and private developers on PPP model. BOT concept may be encouraged in development of parking lots.
- Private land owners shall be provided with licence for allowing development of parking facility. This will have necessary waiver of municipal taxes and other incentives like capital subsidy as it is an infrastructure.

Chapter 4 – Stakeholder Roles and Responsibilities:

As the policy attempts to cover the parking concerns in a comprehensive manner, it will be useful to map the roles and responsibilities of the various stakeholders:

The main players are:

Directorate of Urban Land Transport / Government of Karnataka

- Will ensure that the parking policy is implemented by various stakeholders.
- It will co-ordinate activities at the department through a process of review and appraisal.
- Will offer technical support in detailing any aspect of the Policy to encourage adaptability and implementation
- Will assist in formation of SPV for funding.
- Will organise training and sensitisation programmes.

Bangalore Metropolitan Regional Development Authority:

- Will adopt strategies, measures and actions for integrating public transport, high speed rail links between new developments and to the city.
- Will ensure that adequate planning norms and guidelines are built into the statuatory documents for parking according to the needs of the township requirements.
- The integrated townships will have reduced dependence on motor vehicles- alternate forms for mobility shall be encouraged in their planning and design
- In co-ordination with BDA, BBMP and the National Highways , PWD identify key places for establishment of Truck terminals, high way infrastructure on the proposed STRR. This will prevent the vehicles from entering the main city.
- Will adopt the comprehensive Traffic and Transportation study for the entire Bangalore region.

Bruhat Bangalore Mahanagara Palike :

- Will implement the parking policy for the BBMP area.
- Will carry out necessary studies for detailing and arriving at a consistent framework for various areas- this will include area level planning and development proposals.
- Will revise the bye laws to incorporate the policy recommendations
- Will set up the Special Purpose vehicle for funding, monitoring and enforcement.
- Will propose a set of prices for different areas in line with policy.
- Will involve private participation for creation, management of parking infrastructure and collection of fee/charges.
- Co-ordinate with Police, BDA, Fire department, transport department and NGO, citizen groups for joint programmes.
- Will set up fast track cell for identifying "parking spaces" during special occasions.
- Will undertake measures for allowing incentives such rebate in municipal tax, waiver and issue of Transfer of Development right.

Bangalore Development Authority:

- Incorporation and adaptation of policy recommendations in the zonal regulations.
- Creation of spaces for organised parking in the new developments
- Provision of Multi level car Parking facilities at their shopping complexes.

Bangalore City Traffic Police:

- The Traffic wing of the police department will regulate the traffic at on the street parking locations.
- Enforce the parking regulations and rules by levying penalties, etc.
- Involve in training and educational programmes for road users such as BMTC, auto rickshaws.

- Work with communities, citizen groups, business houses for evolving various action programmes.

Transport Department:

- Develop mechanism for issue of parking certificates on registration by collection of stipulated fee.
- Phase out the old vehicles.
- Regulate the used car market.
- Levy of fees for the vehicles entering the city and exiting the city
- Provision and allocation of space for private bus stand and truck terminals.

Bangalore Metropolitan Transport Corporation

- The TTMC and Multimodal hubs should encourage park and ride facility.
- The transport system should be extended to all parts of the city such that "walk to the bus" should be possible.
- Adoption of pricing strategy to keep the parking fees optimal such that parking becomes an easily available but priced commodity.
- Will advice and set up routing of buses to accommodate high density users.

Bangalore Metro Rail Corporation:

- BMRCL will develop Transfer stations and multi modal hubs. This should encourage park and ride facility.

Chapter 5 – Timelines for implementation

The Policy is envisaged to serve as document for guiding the various stakeholders for co-ordinated development.

The Policy identifies two phases:

1. First Phase: 0-3 years:

In this phase, the focus is responding to three aspects of the policy:

a. To progressively encourage the use of public transport.
b. To create common parking lots that can serve in the high density areas. Initially, the list of roads in the appendix can be covered in the on street parking and multi storey parking lots.
c. Private land owners and private initiatives to be encouraged.
d. Streamlining the fiscal incentives and enforcement.
e. Initiate adaptation of the zonal regulations and byelaws for consistency.
f. To create an awareness programme covering various players.

2. Second Phase: 3- 6 years:

a. To progressively discourage the " On Street Parking"
b. Private initiatives and parking lots created require regulation and enforcement
c. Implementation of the various measures highlighted in consultation of the stakeholders.

The policy will be revised in regular intervals to make it more responsive.

Annexure – 1

Proposed parking fees in Business areas:

The proposed parking fees need to be derived by carrying out detailed studies and extensive consultation with the stakeholders both public and private. The fee will vary according to the zone and will also be based on the duration and time of the day. However, an indicative proposed parking fee table is given below:

Description	Scooter/Motorcycle	Private Car	Van/ Minibus	Lorry/Bus
For first 30 minutes	5.00	10.00		
For next 30 minutes	10.00	15.00		
For first 60 minutes	-	-	30	50 (Bus)
For next 60 minutes	10.00	20.00	15	15
For every Subsequent hour over initial 2 hour				
For the first hour	3.00	10.00	10.00	5.00
Upto two hours	10.00	15.00	15.00	10.00
For every hour after first two hours	3.00	5.00	5.00	10.00

Annexure.2

Roads identified by BBMP for street side parking

1. Hayes Road
2. convent Road : Residency road to Richmond Road
3. Residency Road : Bangalore Club to Bishop cotton
4. Residency Road : Opera circle to Mayo Hall
5. Residency Road : Aashirvadam circle to Brigade road junction
6. Residency Road : Cash pharmacy to st.Joseph college
7. Brigade Road : Wood street cross to All Saints signal
8. St.Marks Road : SBI to Cash Pharmacy
9. Central Street : BRV to Infantry Road
10. K.Kamraj Road : Parade ground to Dickenson Road
11. Kamaraj Road : commercial street to Veerapillai Street
12. Dickenson Road : Kamaraj road to Hasanath College
13. Dispensary Road : OPH road to main Guard Cross Road Jn
14. Town hall
15. Gandhinagar 3 rd main
16. Gandhinagar 5 th main
17. Ali Asker Road : Palace Road junction to Embassy
18. Sadashivanagar Swimming Pool
19. Coles Road : wheelers road Junction to Bank of Baroda
20. SJP Road : City market to Town Hall Junction
21. Vittal Mallaya Road : St.Marks Road to Tiffany Circle
22. Jothi Nivas Road to 5 th Main road
23. Jayanagar Shopping complex and surrounding area
24. Infantry Road and Main Guard Road
25. Hospital Road : Main guard road to Plaine Steet
26. Lady Curzon road: Bowring Hospital to Cubbon Road
27. Main Guard Road : Cubbon Road to Dispensary Road
28. Rest House Road : Brigade Road Junction to church Street
29. M.G. Road : Arts and Crafts Junction to Oberoi Hotel
30. Church Street : Brigade Road to St.Marks Road

31. **Museum Road : M.G. Road Junction to St.Joseph College**
32. **Cunningham road**
33. **Ashoka Pillar to Madhavan Park**
34. **South End Road to Madhavan Park**
35. **Jayanagar 8 th C cross : Canara Bank Circle to 38 th Cross**
36. **Jayanagar 27 th Cross : Canara Bank Circle to 11 th Main**
37. **Kumara Park – surroundings.**

Annexure- 03:

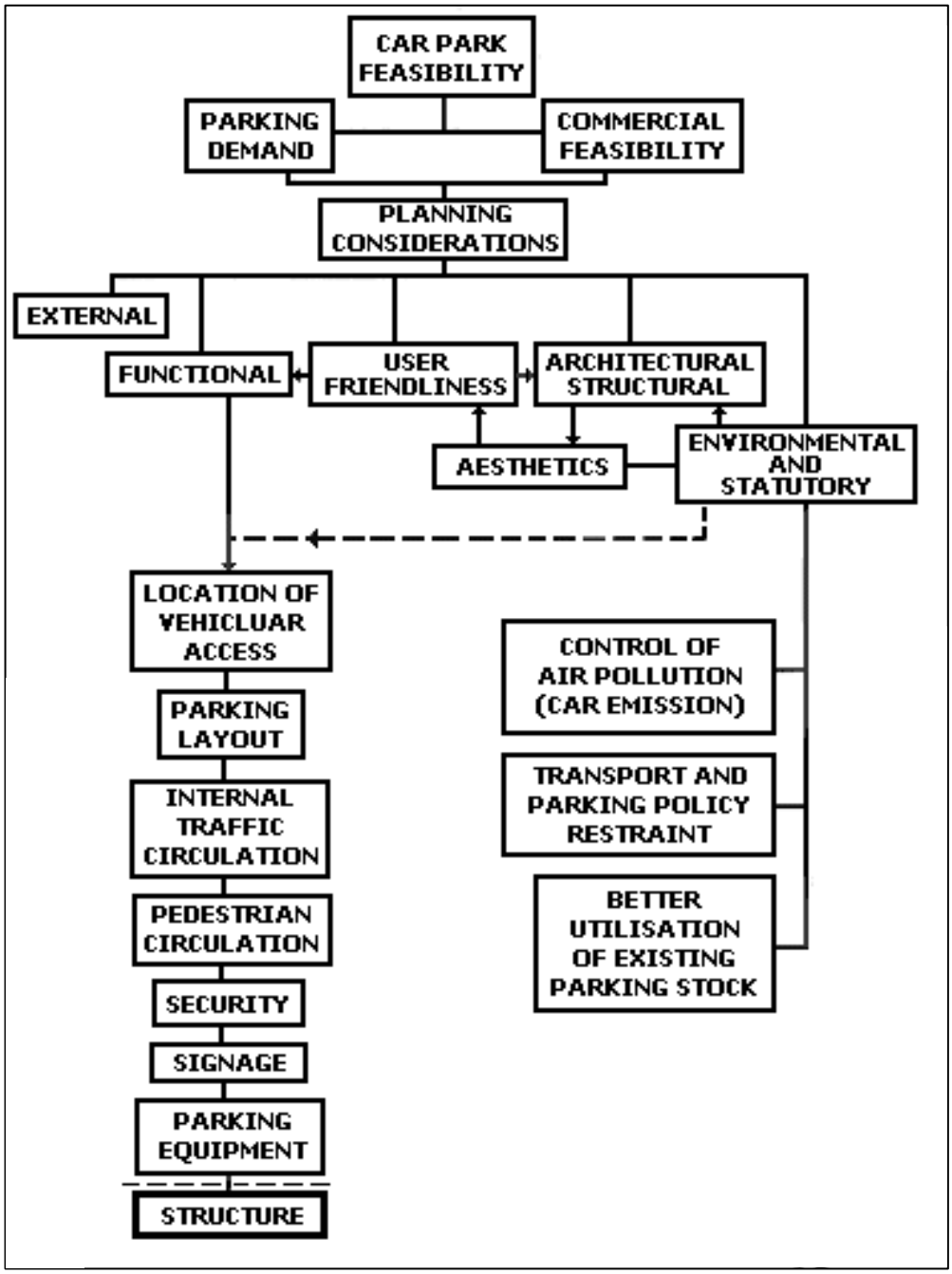
Proposed Multi level Parking Plazas

The major commercial areas in the city are proposed to have parking lots through Private Participation BOOT route. The Parking lots are based on a mechanised system or semi automated with basement and above Grade models of parking. The technical, structural and financial structuring is taken care by the private parties. The Parking lots are proposed to come up on a 500 sq.m to 9680 sq.m of land area. The details of the same are given below:

Proposed Multi-Level Parking Plazas					
Name and Location	**Area in Sq.m**	**No of ECS**	**No. of two Wheeler Parking**	**Commercial Development in Sq.m**	**Status**
Existing Flower Market, Gandhi Bazaar	1652	200	100	430	Draft DPR & Tenders in evaluation
Opp Sukh Sagar Hotel, Gandhinagar	752	225	50	Nil	
Old Central Jail Complex, Gandhinagar	9680	1000	500	500	
Opp Russel Market, Shivajinagar	2140	400	100	100	
SP Road behind LIC Building	512	100	50	50	
Opp Surana College, Kengeri	5130	350	150	150	
Opp Football Stadium, Richmond Town	1080	110	75	75	DPR to be Prepared
Next to Ambedkar College, Outer Ring Road, Nagarabhavi	1180	120	75	75	
Opp RTO Office, Yelahanka	3300	250	140	140	
Santhe Maidan, Yelahanka	3536	300	160	160	
Total		**3055**	**1400**	**1400**	

Annexure- 04 : An overview of Parking Planning, standards and Structures.

PROCESS FOR CAR PARKING

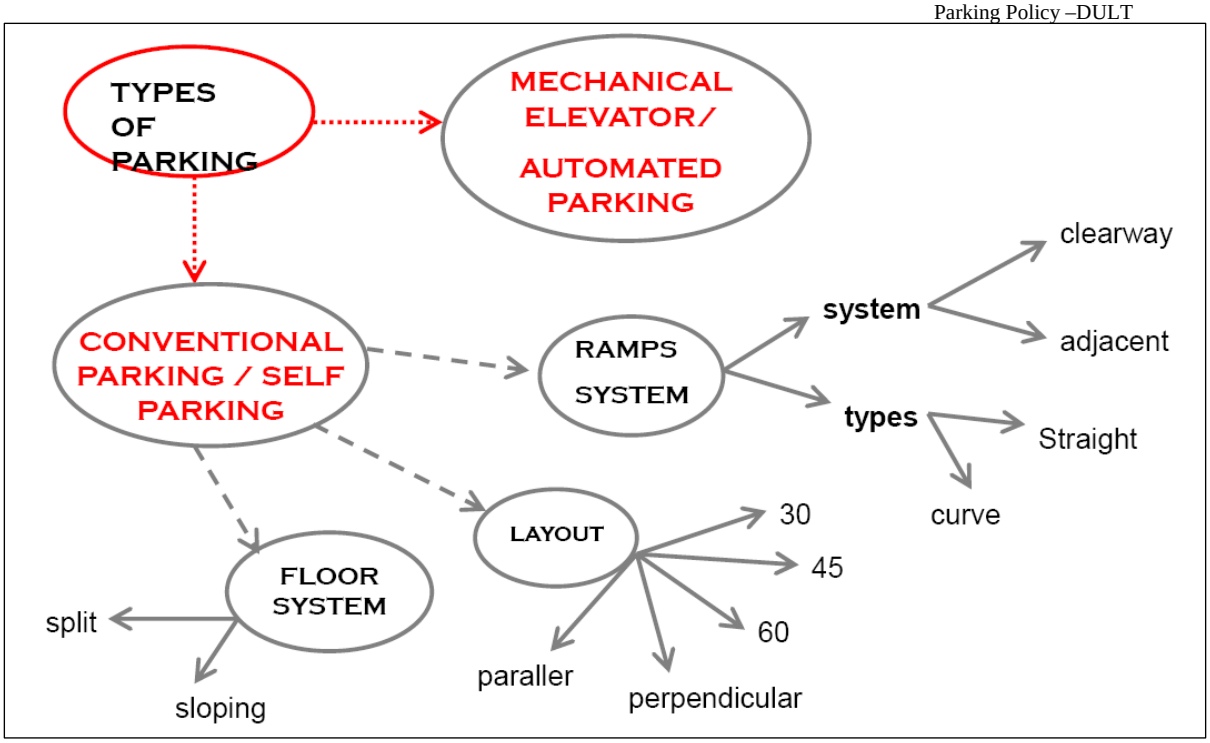


MULTI STOREY CAR PARKING:

- A multi-storey car park or a parking garage is a building (or part thereof) which is designed specifically to be for automobile parking and where there are a number of floors or levels on which parking takes place
- It is essentially a stacked parking lot
- It is limited to 5 till 6 stories with the total capacity up to 500 cars per lot
- Apply multiple access and exit system to avoid traffic congestion in and out.

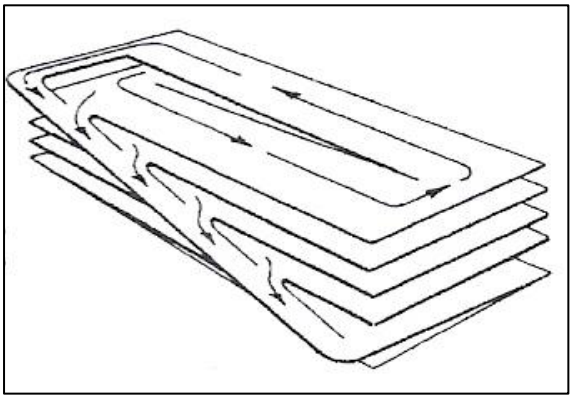
CRITERIA FOR THE QUALITY MULTI STOREY CAR PARK:

- Safety in use
- Clear visibility
- Parking-space marking to enable drivers to
- Remember the location of their vehicles
- Integration into the context of town planning
- Clear views to the outside
- Good natural lighting and ventilation



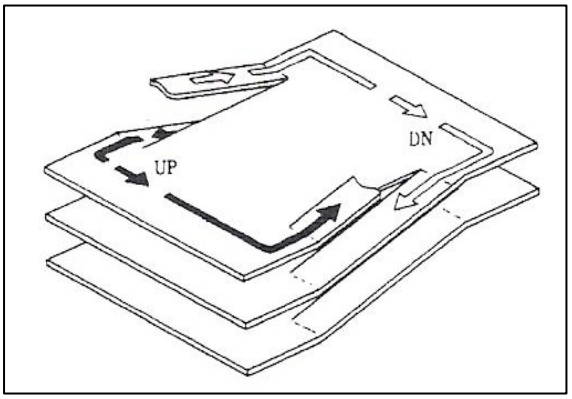
CONVENTIONAL PARKING:

RAMP SYSTEM:

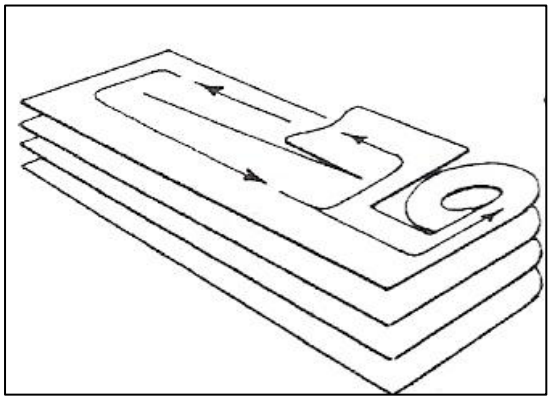


1. CLEARWAY PARKING

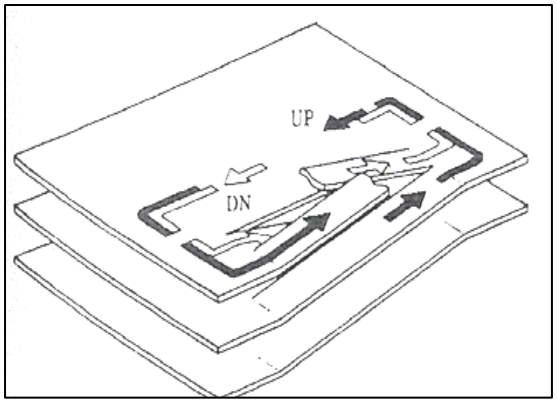
- Interfloor travel path completely separated from potentially conflicting parking –unparking movements
- Provide safest movement with least delay
- Preferred for self park design
- Feasible for small garage sites



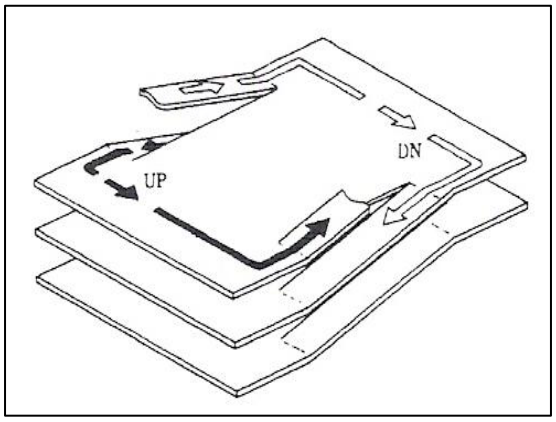
2. ADJACENT PARKING:



- Part or all of ramp travel is performed on access aisles
- Requires less area per parking stall
- Twofold use of travel paths
- Feasible for smaller land parcel
- More susceptible to traffic movement delays
- Has potential in causing accident



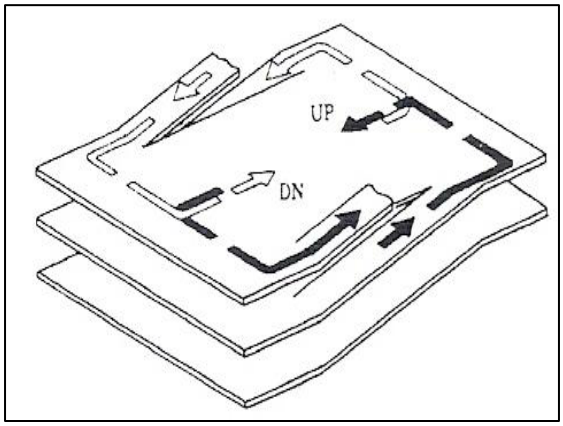
3. OPPOSED RAMP DESIGN:



- Vehicles rotate in the same direction
- Up and down ramps in opposite
- direction
- Required ramp surfaces to be opposed
- The operation is safer

4. PARALLEL RAMP DESIGN:

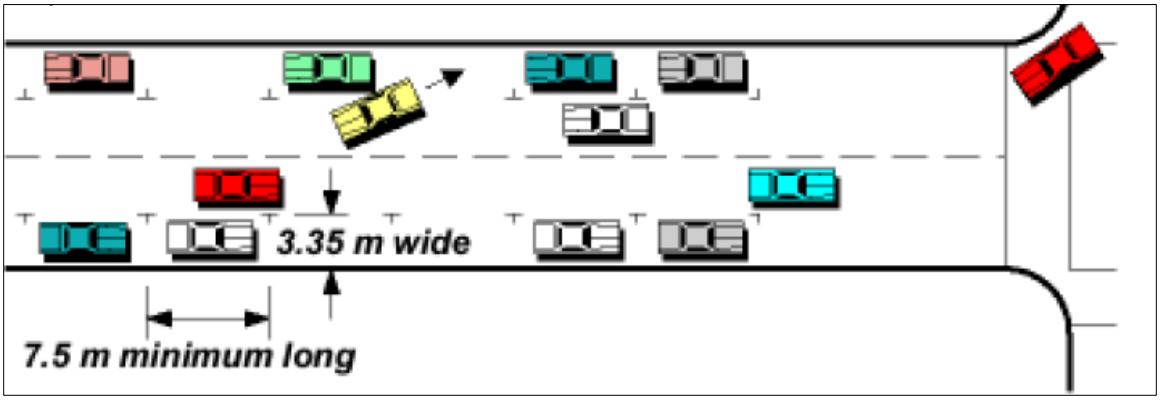
- Up and down ramp slope in the same direction
- Ramp surfaces are parallel
- Vehicles must rotate in opposite direction
- Cheaper to construct



PARKING LAYOUT:

PARALLEL:

- parallel parking requires experience, confidence, and patience
- Parking spaces (min);
- 7.5 meters long
- 2.75 meters wide.



ADVANTAGES:

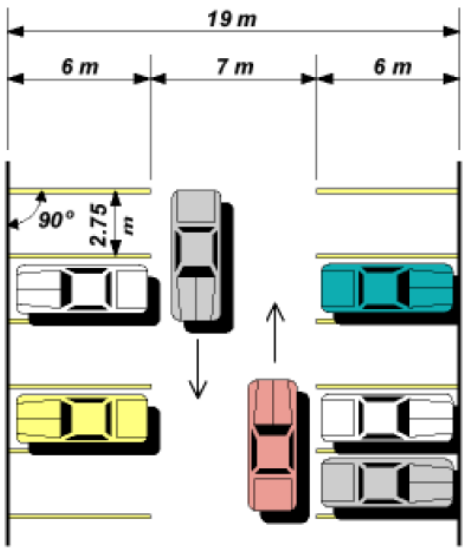
- Works well in extremely narrow, linear spaces
- Requires minimum pavement area

DISADVANTAGES:

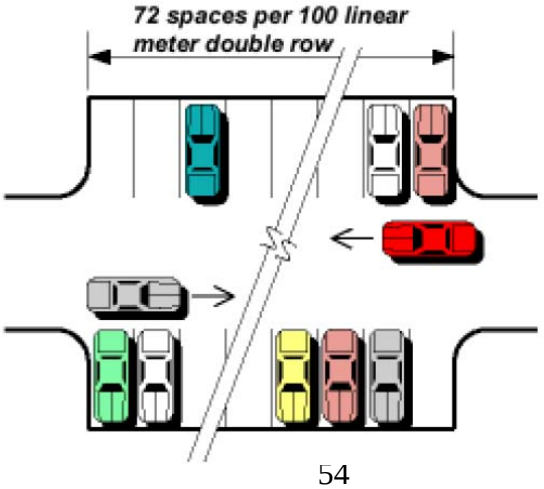
- Difficult maneuvering for most drivers
- Less than ideal visibility of adjacent traffic
- Inefficient use of on-street space

ANGLE 90°:

- Effective in low turnover rate or long term parking areas, the perpendicular, or 90 degree parking configuration is the most efficient and economical since it accommodates the most vehicles per linear meter.
- Standard dimensions for this configuration are:



Description	Dimension
Parking space width	2.75 meters
Parking space length	6 meters
Driving aisle width (2-way)	7 meters
Two rows plus aisle width	19 meters
Vehicles per 100 linear meter double row	82



ADVANTAGES:

- Works well with either one-or two-way aisles
- Handles the most vehicles per square meter of pavement

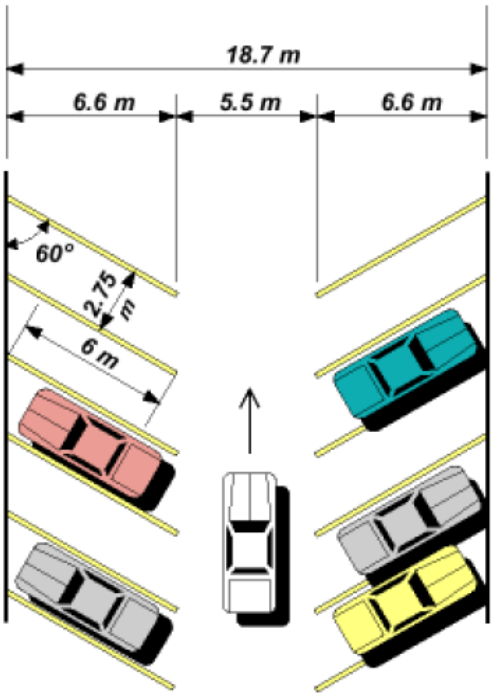
- Handles most vehicles per linear meter

DISADVANTAGES:

- Requires widest area
- Difficult maneuvering for some drivers
- Two-way traffic can create some visibility problems

ANGLE 60°:

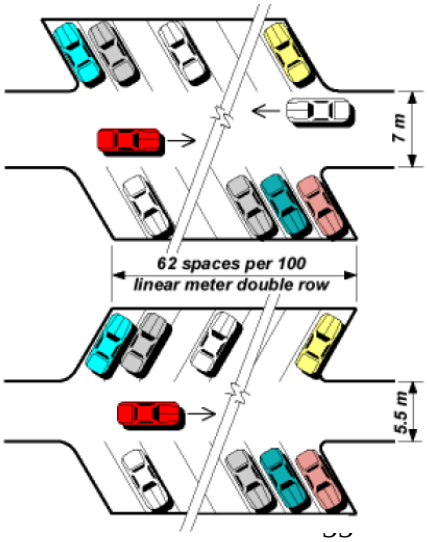
- Ideal for a fast turnover rate or predominantly short term use
- Often offset by difficulties of inefficient circulation patterns and one-way aisles
- Standard dimensions for this configuration are:



Description	Dimension
Parking space width	2.75 meters
Parking space length	6 meters
Driving aisle width (1-way)	5.5 meters
Two rows plus aisle width	16.5 meters
Vehicles per 100 linear meter double row	65.6

ADVANTAGES:

- In and out of parking spaces
- Good visibility
- Lends itself to either one-or two-way aisles
- Most common short term parking configuration

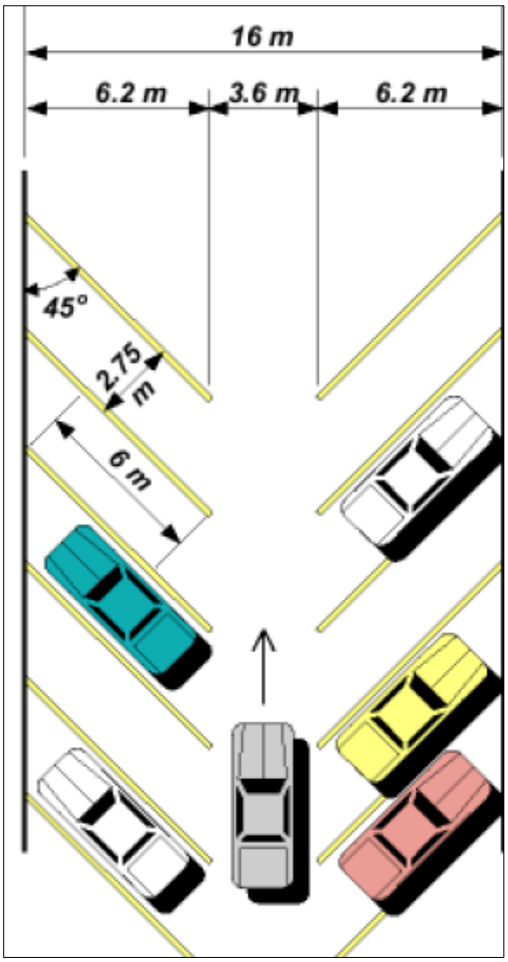


DISADVANTAGES:

- Requires more pavement per vehicle than perpendicular configuration
- Handles less vehicles per linear meter

ANGLE 45°:

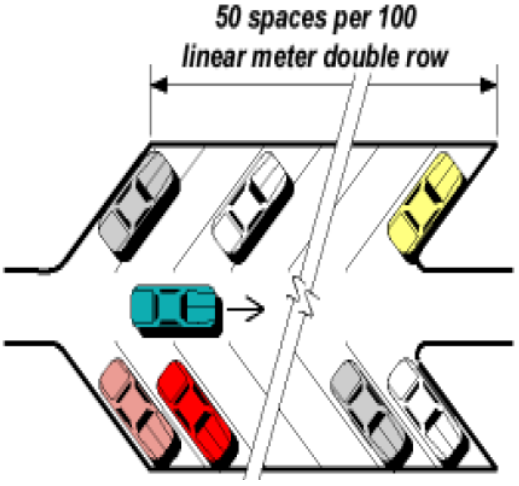
- The 45 degree angled parking configuration displays similar benefits and limitations as the 60 degree.
- Standard dimensions for this configuration are:



Description	Dimension
Parking space width	2.75meters
Parking space length	6 meters
Driving aisle width (1-way)	4.5 meters
Two rows plus aisle width	14 meters
Vehicles per 100 linear meter double row	52.5

ADVANTAGES:

- Reduced width requirements for layout
- Easy maneuvering in and out of parking spaces
- Good visibility to the rear



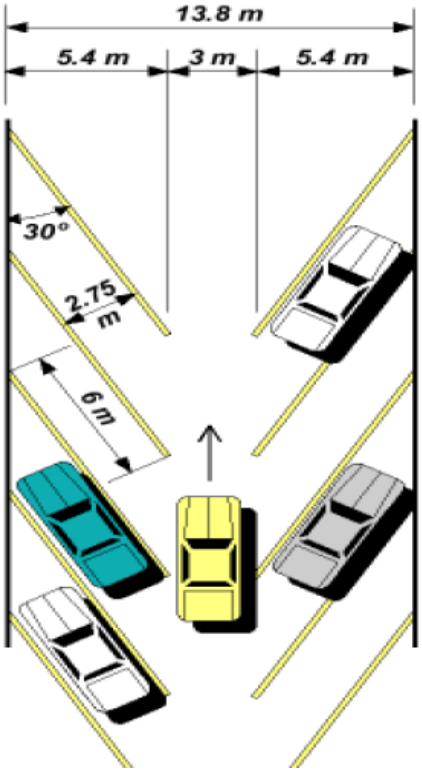
DISADVANTAGES:

- Doesn't work well with two-way aisles
- Requires more pavement per vehicle than perpendicular parking configuration

ANGLE 30°:

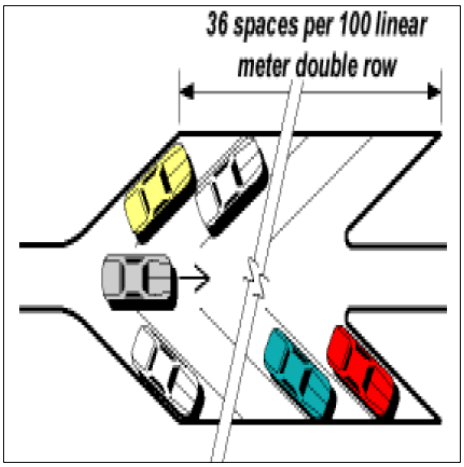
Standard dimensions for this configuration are:

Description	Dimension
Parking space width	2.75 meters
Parking space length	6 meters
Driving aisle width (1-way)	7 meters
Two rows plus aisle width	19 meters
Vehicles per 100 linear meter double row	39.4



ADVANTAGES:

- Easy parking
- Reduced width requirements for layout



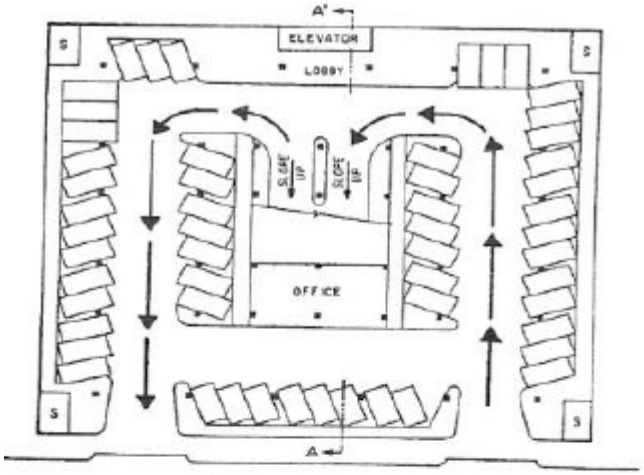
DISADVANTAGES:

- Requires the most pavement per vehicle
- Doesn't work well with two-way aisles

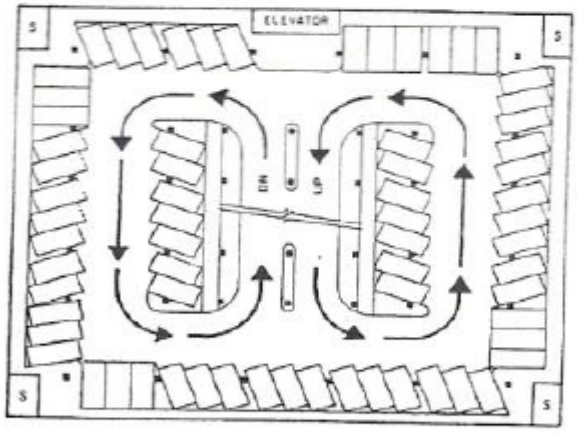
TYPES OF RAMP:

1) Straight ramp

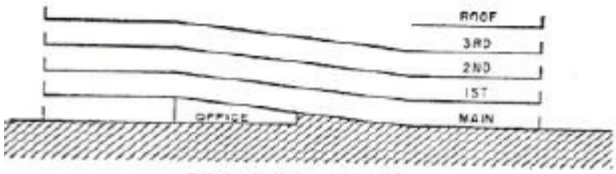
- Usually rectangular shaped with ramp well along the structure's longer side dimension
- more horizontal distance is required to satisfy ramp grade criteria than accommodate vehicular movement between ramp ends
- Requires less floor area and simple to construct
- Economical space on lot that is long and narrow



MAIN FLOOR

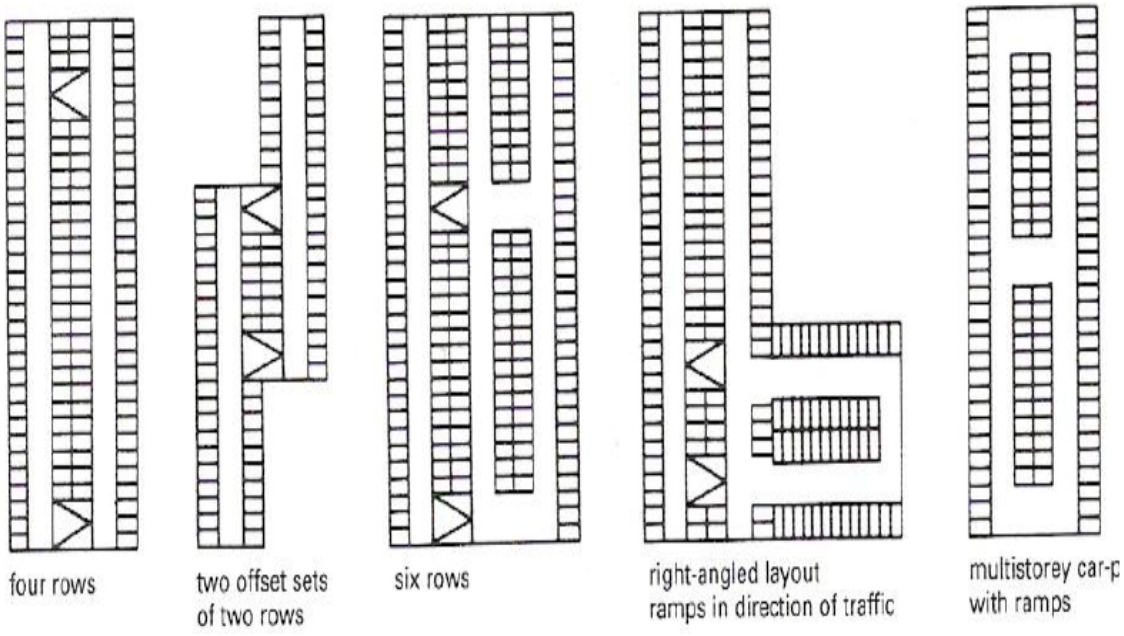


TYPICAL FLOOR



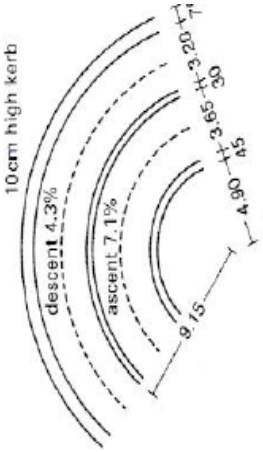
SECTION A-A'

- Cause difficulties to get on and off straight ramp (Sharp turn)
- Having two ways circulation lanes on parking floor may be hazardous
- Up and down circulation lanes intersect on the parking floor unless the floor area is so large that each circulation can be kept within its own half on one-way lanes

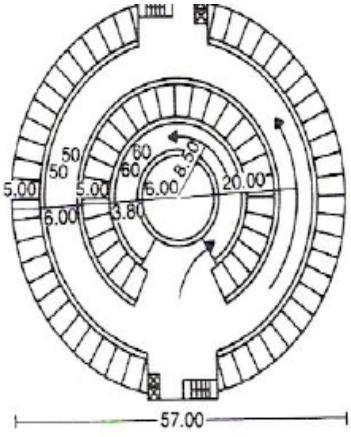


CURVE RAMP:

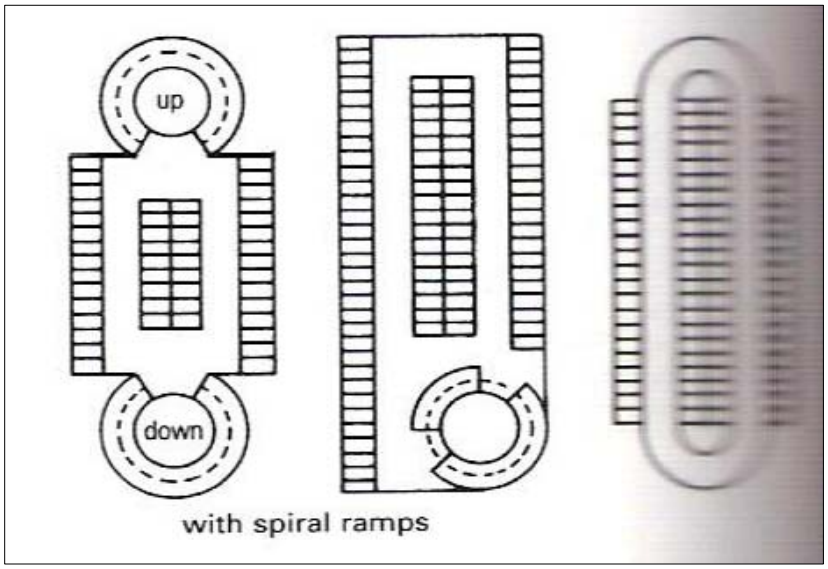
- Single surfaces that permits vehicles to travel on a continuous helical path between parking levels
- Movement;
- Up-counterclockwise
- Down-counterclockwise
- Entrance and exit in the side
- Opposite side of ramp oil
- Directly above each other on succeeding floor
- Should be clearway type
- Continuous-360º of rotation between two parking levels
- Located near corners of rectangular structure to minimize floor space loss but required more space than straight ramp.(fit narrow site but waste more spaces)



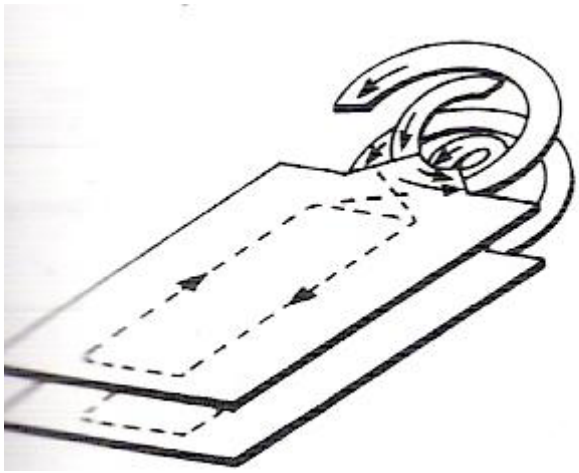
With smaller radius of ramps, larger lane widths

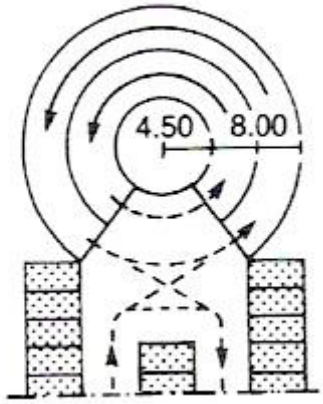


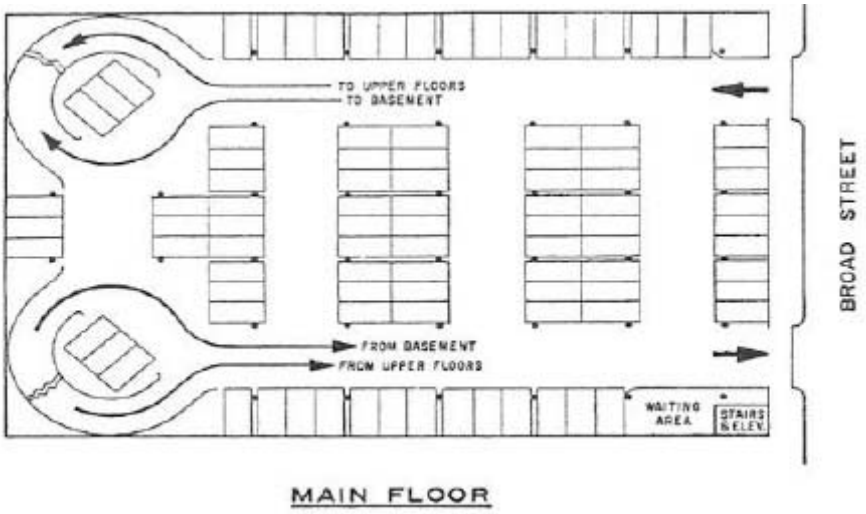
(6) Spiral parking ramp



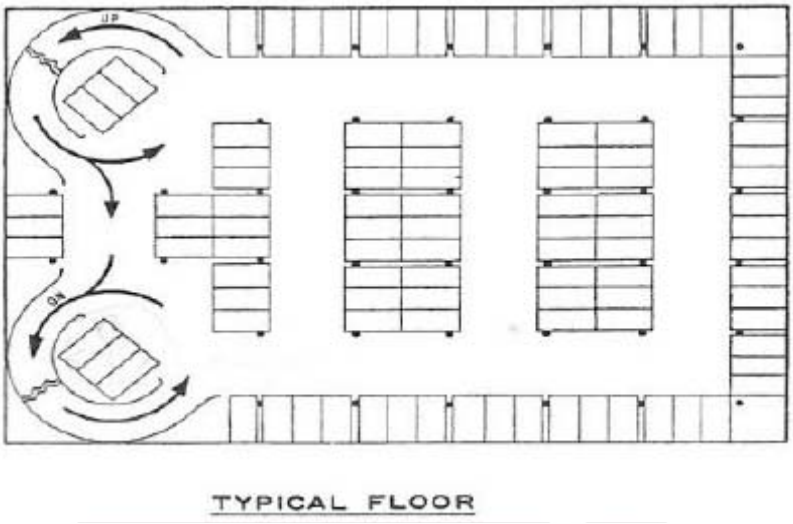
- Costly to construct
- Offer better traffic operation by providing gradual turning as compared to sharp turning movement usually required at ends of straight ramp
- Super elevation at ends of straight ramp create undesirable wrapping of floor areas
- No crossing of up and down traffic, even at parking floor connection
- Each traffic stream confined to its own ramp all the way from the top to bottom of the building
- Diameter of ramp is controlled by required turning radiuS (min 45 ft)
- Driver have a clear view each way even there is a crossing of traffic at each parking floor







MAIN FLOOR



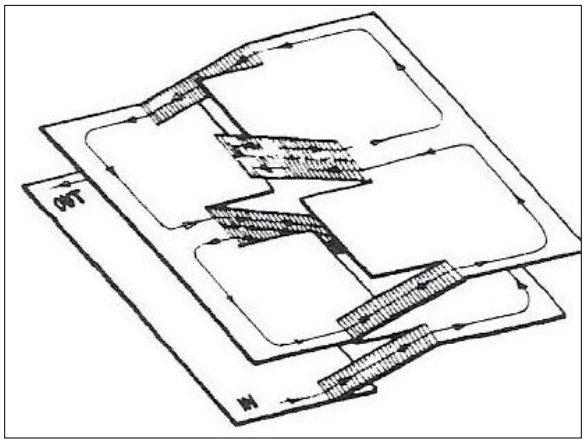
TYPICAL FLOOR

FUNCTIONAL PLAN FOR TWIN-SPIRAL GARAGE

FLOOR SYSTEM:

1. SPLIT-LEVEL OR STAGGERED FLOOR SYSTEMS:

- Floor levels in one section is staggered vertically by one half story from those in adjacent sections
- Applicable to small, high-cost sites where maximum use of space must be achieved



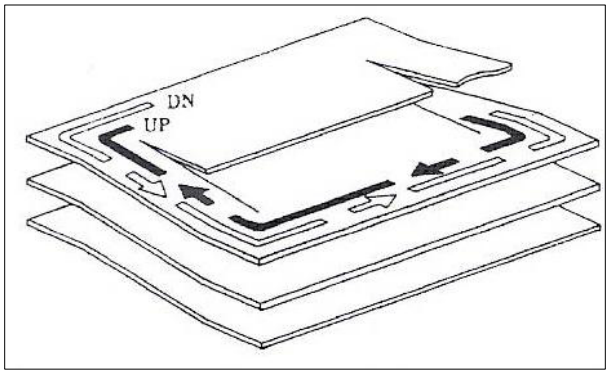
ADVANTAGES:

- Construction is relatively simple
- The design fits well on rectangular sites
- Efficient in terms of floor space per vehicle parking stall

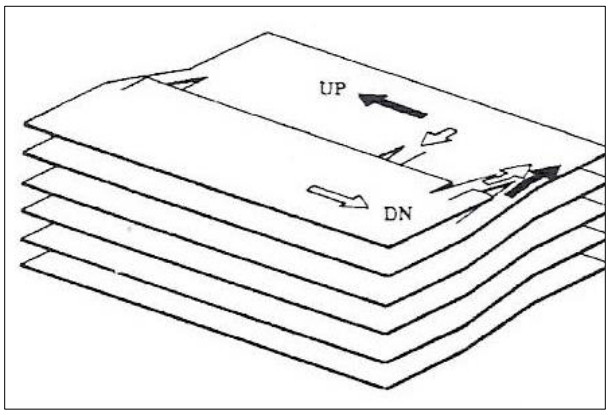
DISADVANTAGES:

- Frequent conflicts may arise between circulating traffic and parking and un-parking vehicles

TWO-WAY STAGGERED-FLOOR RAMP SYSTEM

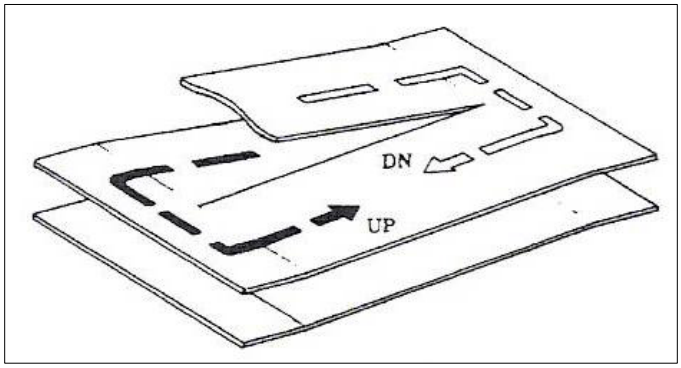


This staggered-floor system provides parking on level floors and desirable one-way traffic flow -**COMMON TYPE**



2. SLOPING-FLOOR SYSTEMS:

- Consist of sloping levels (full width ramp/continuous ramp)
- Contains two adjacent parking modules tilted in opposite directions
- Well-suited to self-park operations



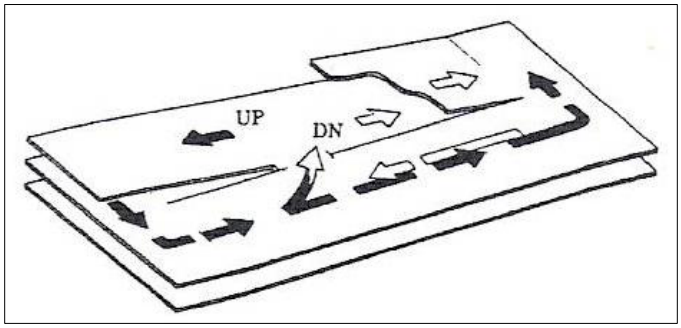
ADVANTAGES:

- The relatively flat floor slope permits comfortable parking and pedestrian walking
- Each entering customer has an opportunity to park in the first available space as parking is adjacent to the interfloor circulation system
- Floor-to-floor travel distance is greater in sloping-floor garages than in other types of ramp garages

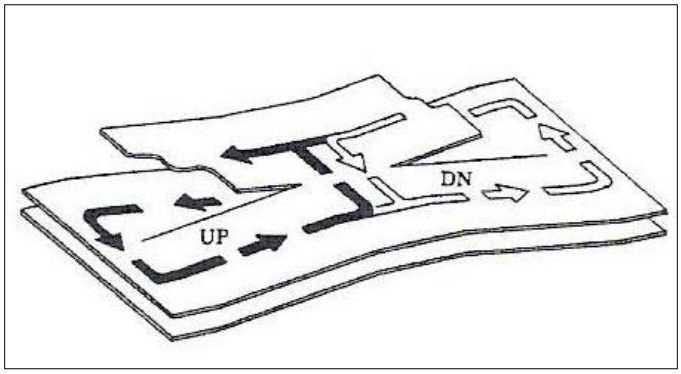
DISADVANTAGES:

- Cause congestion during peak out-bound movements

SLOPING –FLOOR SYSTEM WITH CROSSOVER RAMP OF MID POINT



DOUBLE SLOPING-FLOOR SYSTEM WITH MIDPOINT CROSSOVER



AUTOMATED PARKING

Automated parking is a method of automatically parking and retrieving cars typically using a computerised system of pallets, lifts and carriers. Most suitable on expensive sites and where land is very limited-too small for economical development with a ramp parking.

ADVANTAGES :

- Increase capacity ; high space utilization
- Due to lower ceiling height, dense parking,
- And reduce space width
- No ventilation or hvac required; saving
- Utility costs
- Eliminates stairs, elevators and fire exits
- Enhance safety and security typically

DISADVANTAGES :

- Cost: operation and maintenance
- Many structural and functional types of automated mechanical systems exist, such as
- underground systems as part of the building foundation
- above grade where they can match neighboring buildings in architectural appearance



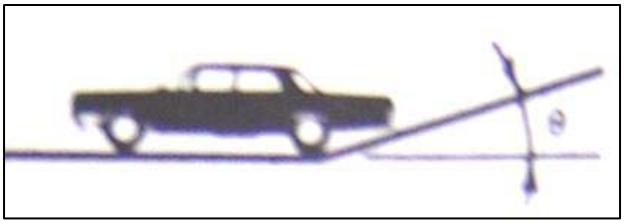
STANDARDS AND REGULATIONS:

RAMP BREAK OVER ANGLE:

- Measure ability of the car to break over the steep ramp either climbing or descending without scrapping (Min 10º)
- Can be altered through design techniques
- Transitional blend top and bottom of ramps composed of two or more break point can multiply the steepness with workable break angles beyond the normal capacities of cars or driver
- Having pad of asphalt or concrete each side of break point so that the cars having low break over angle can negotiate potential critical points without scrapping

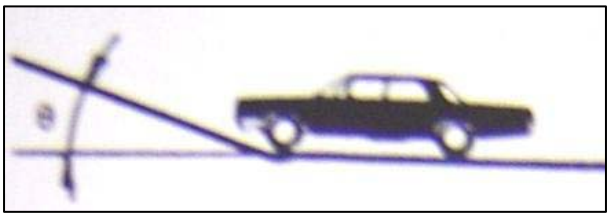
ANGLE OF DEPARTURE:

- Min 10º
- To reduce incident of tailpipe and rear bumping dragging



ANGLE OF APPROACHES:

- Min 15 º



RAMP SLOPES:

- Max 15%
- For slopes over 10%, transition at least 8 feet long should be provided at each end of the ramp at one half the slope of the ramp itself

RAMP GRADES TRANSITION:

- Min 12 foot long = 1/2 of ramp grade

RAMP WIDTH:

- One way straight ramp - min 12 feet
- Two way straight ramp - min 22 feet
- Circular ramp - min 14-18 feet

RAMP RADIUS:

- Single lane helical ramp - min 32 -37 feet
- Must kept min to conserve space and reduce travel distance
- Very sharp can cause dizziness

RAMP TURN SUPER ELEVATION:

- ½ inch/foot of ramp width at sharpest turning
- Ramp curves not too steeply

I. Slow driver-difficult to keep way from inside edge of ramp pavement

II. Fast driver-encourage to speed greater than conditions of grade and sight distance safety permit

DRIVEWAY EXITS:

a) Ramp driveway exit rising up to public sidewalk

- Have transition section min 16 feet long at almost level before intersecting the sidewalk
- Prevent hood of the car from obscuring the driver's view of pedestrians on walk

b) Property line wall

- Must not interfere with the driver's view of pedestrian on public side walk.
- If exit driveway is parallel and adjacent to the property line that extends all the way to side walk, edge of the driveway should physically establish by curbing or railing.
- Min 6 feet from the wall.

RAMP GRADES:

- Computed by : $\frac{\text{floor to floor height} \times 100}{\text{Ramp length}}$
- Max ramp grades:

I. Self Park Design
   - not exceed 15 %
   - not exceed than 10% if had a pedestrian walkway on vehicles ramp

II. Sloping Floor Self Park Design
   - ramp grades max 4%
   - angle parking 60º-minimizes gravity roll back of vehicles

ARCHITECTURAL AND OPTICAL EFFECT:

- Ramp wall
  - Painted with stripes contrasting to wall color
  - Parallel to ramp surfaces or at steeper angles
  - Use paint marking in between vertical column and travel way
  - Built structural features with architectural lines parallel or perpendicular to ramp surfaces

- Ramp structures
  - Open ; to provide sight distance and reduce closed in impression

- Ramp illumination

  - Wall opening are restricted-distract the driver's view
  - Artificial lighting should take form of diffused illumination
  - Reflector should pointed away from the direction of travel

SIGNS AND WAYFINDING:

- Color-coding, numbering, visual cues, music, and even machines for marking your ticket with your exact location to locate your car for easy retrieval
- Locate signs in areas where driver can read in a timely fashion
- Clear, simple, and direct messages
- Floor coding can be useful
- Signage should locate all major internal pedestrian access points as well as external major roads and buildings

VEHICLE CONTROL:

FEE COLLECTION:

- Fixed or variable charged pay on exit

BARRIER CAPACITY:

- 2 barrier types available
  - Rising arm
  - Rising kerb
- Entry barrier: 400 vehicles/hour
- Exit barrier: 250 vehicles/hour

LIGHTING:

- Services illumination for public should be (lux);
  - Parking areas - 20
  - Driveways- 50
  - Ramps - 70
  - Roof - 20
  - Entrance and exit- 150

SECURITY AND SAFETY:

- Open, glass stairwells and glass-backed elevators

- Security devices
  - video, audio and emergency buttons that call into the booth or local police station
  - Public telephones

- Eliminate potential hiding places, such as under open stairs

- Handicap accessibility with vehicles close to stair and elevator cores have a direct path to key movement patterns of the garage

- ventilation
  - Avoid carbon monoxide build-up, designed adequate air flow for through mechanical and/or natural
- Non-slip floor surface
  - Ensure safety of movement of the man and automobile
- Energy efficiency in lighting
  - Balance between day lighting, interior lighting and exterior control especially on the exterior design of the façade while providing adequate lighting within
  - Lights should be vandal resistant and easy to maintain.

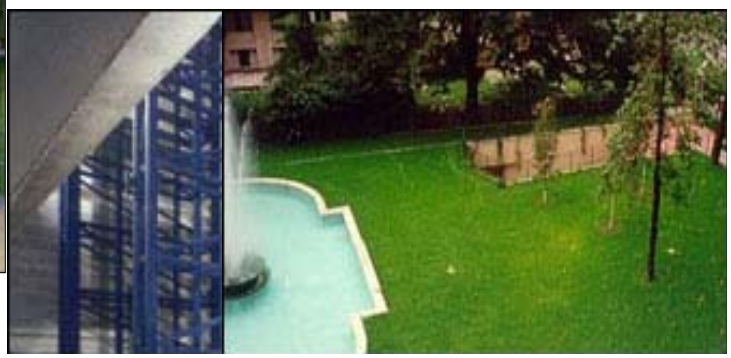
SUVIDHA PARKLIFT:

PUZZLE PARKING SYSTEMS:

INDEPENDENT 2 LEVEL SYSTEMS:

Traspark TM - Inside view

OTHERS:



Traspark TM - Outside view

Turning Shuttle

Ticketing System

Monitoring System and Control Room

Entry Exit with Turntable

Annexure- 5 :

Existing Parking - images