



Auroville

MOBILITY

Concept

Auroville
Mobility Concept

August 2001

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Note

In July 2000, I approached the office Billinger, traffic consultant in Stuttgart (Germany), with a lot of information material and a brochure (describing the existing traffic situation), intending to ask for help to work out a mobility system for Auroville.

I was very happy to see that Mr. Billinger was spontaneously attracted by the ideals of Auroville and ready to offer his support.

The following proposal is based on his experiences of more than 30 years working as a traffic consultant. Mr. Billinger enjoys the chance of applying his ideas to a project that “boldly wants to leap towards the future”.

The text I received in May 2001 is translated from German and it contains additions based on notes taken during discussions in Stuttgart in July this year. Also included are two short reports on the car-free towns of Zermatt and Venice.

Helmut

25.08.2001

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Summary

If Auroville wants to be true to its ecological aims it has to look carefully at the development of motorised transport, which, in a liveable city, can no longer have a dominant position. Planning of mobility does not mean one-sided consideration of car and road only - what is needed is an integral approach, giving the appropriate space to all traffic participants, keeping in mind a healthy and vivid city life.

This proposal, by taking the Auroville Master Plan as its starting point, envisages the street as a common space for all, but excludes fast moving vehicular traffic by shifting it to the periphery. An efficient and attractive public transport system is an important precondition.

Energy consumption of different vehicles (in KWh per person per km) :

<i>Vehicle</i>	<i>Energy Consumption</i>
Car / Motorbike	0.75
Train / Tram	0.3
Pedestrian	0.07
Cycle	0.025

Between 1894 and 1994, 9678 people died in railway disasters world-wide. About the same number of people died in a 3 month period in road accidents in America alone.

Upto 40% of the street space in the cities is occupied by parked cars. This figure is increasing.

50% of the world production of crude oil is used for manufacturing petrol and diesel.

1.1 Situation

Mobility is a basic need. “To be mobile” is the most important characteristic of a modern society. It means opportunities for education, work and recreation and assures the delivery of goods and information at the right time and place.

Obviously, mobility also means a lot of traffic. Pollution and threat to individual health and city life seem to be unavoidable consequences.

The ever increasing usage of the private automobile throughout the last century and the “car-centred city” being the ideal of every town planner (working into the hands of the car industry and the real estate managers), led in most cities to the dominance of the technical demands of car-driving in terms of security, speed and comfort.

By giving other traffic participants, such as pedestrians and cyclists, even children playing or going to school, the second priority, the quality of streets and street spaces (which give character and life to a city), as well as the safety and health of its inhabitants has been seriously affected. This development is also responsible for an often inadequate and inconvenient public transport system which is expensive and difficult to finance. Most people regard public transport a third-rate way of getting around suitable only for those who can not afford a car.

The growing avalanche of motorised traffic is also largely responsible for the global environmental threat. Today one of the greatest challenges is to deal with this issue.

Before the advent of the automobile, traffic in the city did not use any fossil fuel. The mobility was entirely based on pedestrian and animal transport with a speed less than 10 km/h. Research shows that people had adapted to a daily radius of action of 30-45 minutes walking. This limited the dimensions of a city to an



Pedestrians in the car-environment

average of 3-6 km diameter (to compare: Auroville has 2.5 km diameter, excluding the green belt). Bigger city agglomerations were organised in a polycentric way, connected by railway lines.

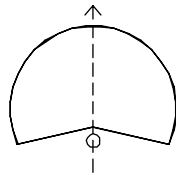
For the greater part of the last century, walking became “old-fashioned”. The car got more and more preference even for shorter trips. This did not always save time - but to find oneself the weakest participant in an environment exclusively designed for the car did not do much to support an alternative mode of transport.

But no city can eliminate walking. It is indispensable as an interface between the parking lot and the destination. In the city centres, it is still the dominant means of movement (80%). However, further out in the suburbs, the car is used even for short trips. Here walking has almost become a symbol of social failure.

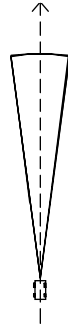
Planners have neglected the qualities of a city experienced by pedestrians. Only a pedestrian enjoys a range of vision of more than 180° and has a vivid interest in the details of his surroundings. The attention of a car driver, already muffled by his steel armour, is always far ahead; his range of vision - depending on his speed - is usually not more than 15°. This also testifies for the situation that walkers care for their environment while drivers are indifferent.

These different groups experience a street differently. For pedestrians, it is rich in details whereas the drivers can only be interested in fast and immediate information, ultimately reduced to the poster and the billboard. They demand distance and separation from the world of the pedestrians. The predominant means of traffic decisively influences a city's architecture and urban design. The cities planned in the twentieth century, e.g. Chandigarh and Brasilia, call for being experienced from a moving car. Their public centres impress by their sheer dimensions. The architects have placed the buildings at ample distances, preventing them from forming urban spaces of a human scale.

Range of Vision



Pedestrian



Car Driver

In these cities, it seems that “space” is not important, but “area”, understood as a platform to display a designer’s sculptural vision. What a difference from a “piazza salone”, a square in a town in Tuscany, entirely designed to be enjoyed by pedestrians and slow-moving carts!

While walking, a person not only supports a sound environment but also maintains his health. The highest percentage of sickness-leave in Europe is due to spine problems, the reason for which is lack of exercise. A small dose of regular walking is recommended by orthopaedic physicians to counterbalance a sedentary work schedule and to maintain mobility right into old age.



Cars



Cycles



Bus

Space requirements for the same number of persons using different means of traffic as compared to pedestrians.

1.2 New Developments

In recent decades (starting in Holland in the seventies), alternatives to the purely car-centred environment of the established city have been tried out. The basic aim was to improve living conditions by eliminating the disadvantages to human beings, to city life and to environment, caused by individual motorised traffic.

This movement has been successful and has spread rapidly throughout European cities, changing town planning acts and bye-laws on the way. This has affected not only newly-planned and old established neighbourhoods but also whole cities.

These alternative developments focus on the following points:

- **Public transport** as the backbone of urban mobility. It is non-polluting, made attractive through frequent service and user-friendly design and can be reached within a short walking distance.
- **Traffic calming** reclaims streets in neighbourhood areas for the use of all (children!) by allowing cars only if they are dead slow and not in an overpowering position. This is possible by rendering the streets unattractive to through traffic.
- **Through traffic** is concentrated to roads where it is neither disturbing nor a safety risk.
- **Speed limit of 30 km/h** is applied for most of the city.
- **City life** is being created through the admixture of living, working and recreation, reducing traffic at the same time.
- **Conscious design** by reviving the art of creating beautiful streets and public spaces based on the requirements and the demands of the people living in the neighbourhood.



Here cars have to adapt to the speed of walking.

Auroville Townplan - Basic Distances :
(In metres and minutes walking time)

		<i>metres</i>	<i>minutes</i>
Crown Road	Rad.	700	10
	Dia.	1400	20
	Cir.	4400	63
Outer Ring Road	Rad.	1250	18
	Dia.	2500	36
	Cir.	8000	114
Green Belt Limit	Rad.	2500	36
	Dia.	5000	71
	Cir.	16000	228
Peace Area - Crown Road		350	5
Crown Road - Outer Ring Road		550	8
Outer Ring Road - Green Belt Limit		1280	18
Outer Ring Road Diagonal		2800	36
Green Belt Limit Diagonal		5000	71

(Speed of walking : 70 m per min.)

2.1 Preface

The Auroville Master Plan, in its “goals and objectives” concerning traffic states:

“Determining the hierarchy of roads and access ways, particularly emphasising where non-polluting movement should take precedence over general traffic.”

This paper aims to work out the mobility-parameters of the Master Plan with more details. Based on the Master Plan’s general considerations on traffic, especially the aim of giving preference to non-polluting movement, a network of roads and pathways has been proposed. A shuttle bus system is recommended to complete the network, connected to the service nodes specially developed for Auroville. In conclusion, some recommendations have been given as to how a motor-free city can be realised in carefully chosen steps.

2.2 Traffic pattern in accordance with the Master Plan

The centre of Auroville is formed by the Peace Area, with the Matrimandir, Amphitheatre and Banyan Tree. In the Master Plan, according to the Galaxy concept, green corridors (containing pedestrian lanes and cycle paths) radiate out from the centre. Within 5 minutes walking distance of the Peace Area lies the Crown Road, which encircles the inner city area. The Crown Road is conceived as a circle with a radius of about 700 m. Within approximately 7 minutes walking distance of the Crown Road, the Outer Ring Road is located with a radius of about 1.25 km. The boundary of the township is also defined in the form of a circle. With a radius of 2.5 km, it encloses an area of about 20 sq.km. (2000 ha.) (Fig.2.1, p.9).

In a similar way, building developments alternating with green areas spiral out from the Peace Area to the Outer Ring Road in an impressive macro-form. The major spirals (called “Lines of Force”) intersect with the Crown Road giving rise to unusual urban spaces of a surprising variety. These intersections are destined to become the focal points for the city’s

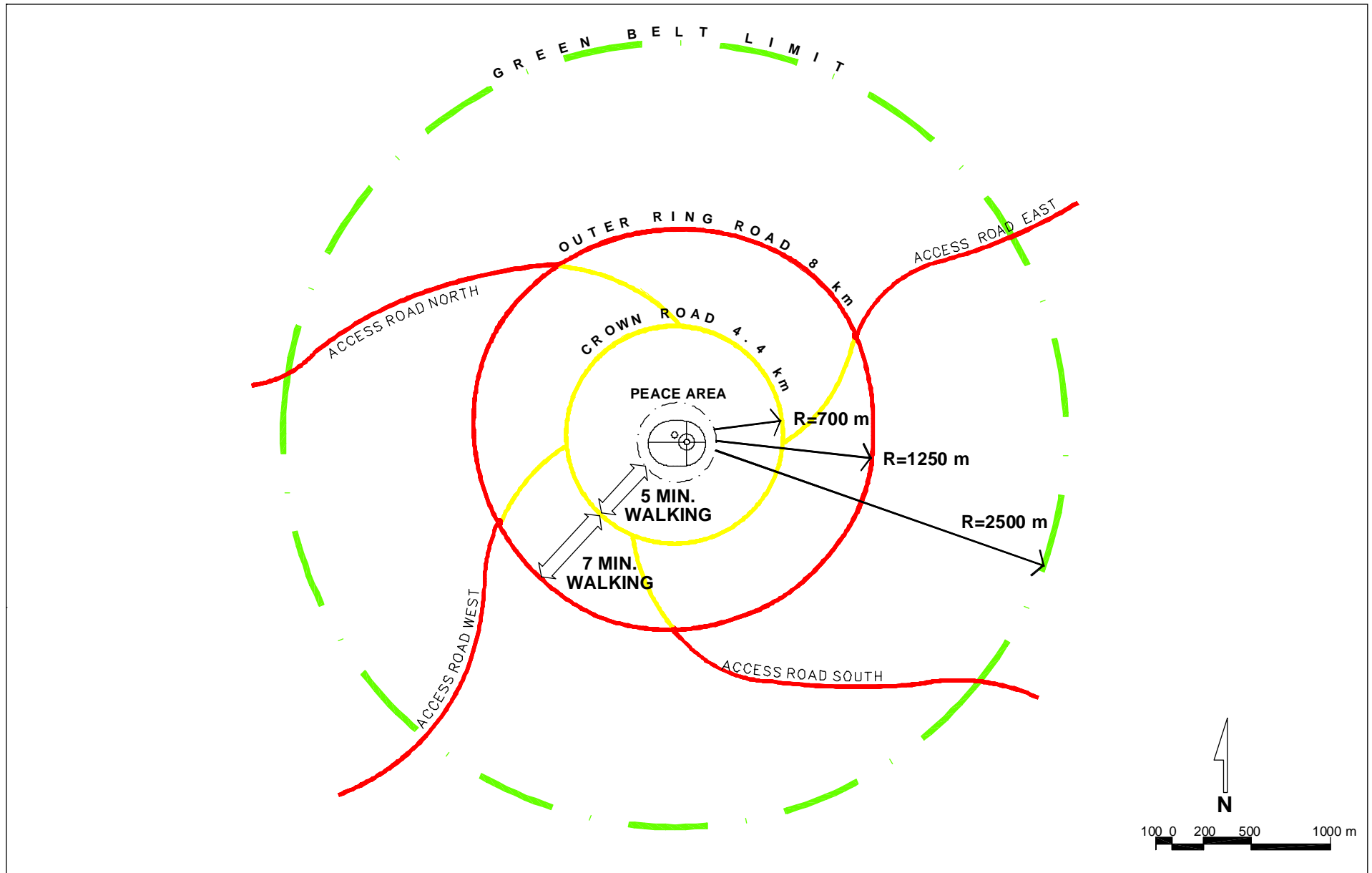


Figure 2.1 Auroville Township dimensions

services. The ring-shaped roads are perceived as bundles of tangential pathways. The Outer Ring Road leads outward traffic via two main access roads in the west and south to the Pondicherry-Tindivanam Road, and via two in the east and north to the East Coast Road connecting Chennai & Pondicherry.

The spiralling arms reach out to the Outer Ring Road, beyond which the Green Belt is located. It is difficult to assess today how far the Outer Ring Road can be considered as the definite limit of any building development. However, the proposed mobility concept would allow for building development beyond the Outer Ring Road where the City Area connects with the neighbouring Tamil villages. (Such a development has not been envisaged in the Master Plan).

According to this proposal, guests and visitors arriving in Auroville in buses, cars or two-wheelers will be received at four nodal points, located at the junctions of the main access roads and Outer Ring Road. These nodal points will serve as **transport mode exchange areas**, offer parking facilities for visitor buses, cars and two-wheelers and distribute the guests and visitors to pedestrian boulevards, cycle paths or Auroville's public transport system, consisting ideally of non-polluting shuttle buses. The possibility to offer cycles for rent at this point ought to be considered. The nodal points will also offer public facilities such as information desks, bazaars, shops, artisan workshops, exhibition areas, health facilities etc. Fig.2. 9, p.20 shows a further development of the service node proposed in the Master Plan (map 9c, Sept 2000).

2.3 Preference for non-polluting movements

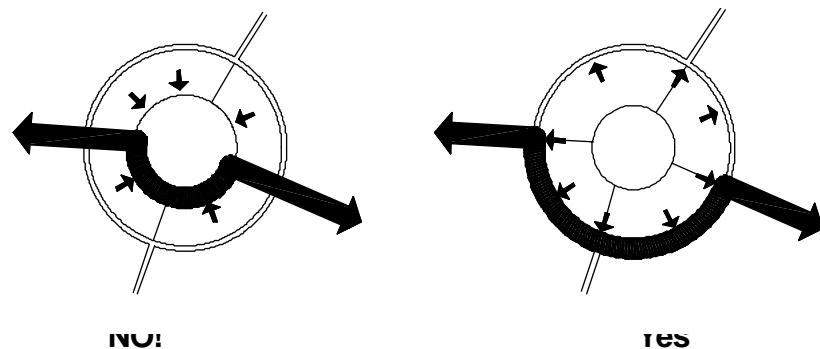
The proposed layout of Auroville is ideal to develop into a motor-free city. From the Outer Ring Road the Peace Area can be reached within 12 minutes walking time (or 4 minutes by cycle). The longest possible distance, i.e., to cross the City Area diagonally requires 36 minutes. In a motor-free city, preference is given to pedestrians, cyclists and to non-polluting movement resulting in a peaceful mix of all traffic participants on street spaces that are non-exclusive and common for all. An

Auroville streets are proposed to be pedestrian-friendly, with broad pedestrian lanes offering a large variety of experiences. With shaded alleyways, spaces to sit and rest, with arcades and passages, children can play everywhere.



Electrically powered individual vehicles do not fit into the ecological aims of Auroville, for they still get their energy from fossil sources. Should these vehicles be able to use regenerative energies (e.g. solar energy), then it would be advisable to make use of these energies on a higher level, e.g. for public transport. Electrically powered vehicles are relatively expensive. It is unlikely that they will ever be used en masse (this would be a serious threat to our aim to ensure street life - a carefully planned mobility concept should render them unnecessary). The individual use of these vehicles should not become a status symbol for the rich and privileged. There is no objection to use them for freight transport or taxis as in Zernatt. (see 3.1, p.29-33)

A Traffic System with Centrifugal Effect :



No through traffic should ever be encouraged to go via the crown.

environment free of noise and other traffic-hazards befits a “peace area”. Children and the elderly can move freely. Thus the city becomes an example of urban design which is reminiscent of older cities and recreates the original urban mobility, while the planning approach points towards the mobility of tomorrow which lays emphasis upon a minimum consumption of energy from non-renewable sources.

Therefore for the city area of Auroville it is recommended to create a zone where pedestrians take priority. Cyclists will be allowed where they do not disturb. Cars and motorbikes will be permitted only when necessary for emergencies, or for delivery and removal. Only those with walking problems will be allowed to use motorised vehicles in the pedestrian zone. Access for vehicles for delivery and removal can be restricted to certain times of the day. All motor-vehicles will have to adjust their speed to the pedestrians. Public transport buses are permitted to use the streets and pathways of the city area. 15 km/h is appropriate as the maximum speed. This results in an average speed of 10 km/h for a bus-line, including the time for stops.

People owning cars and motorbikes (to be used outside Auroville's city area, e.g. to go to Pondicherry) will keep them in garages close to the Outer Ring Road. Thus they will have their private vehicle and the bus stop at the same distance.

2.4 Streets and Pathways (Fig. 2.2, p.12)

There is a hierarchical network of streets and pathways from the centre of the city to the outskirts. The **Peace Area** and the inner city area form a pedestrian zone limited by the Crown Road. Even cyclists will be partly excluded from this zone.

The **Crown Road** will be divided by a line of big trees to form a 4-6 m wide promenade for pedestrians on one side and a 7 m wide road on the other side (Fig. 2.3, p.14). This road, located on the outside of the ring, will be used by cyclists and Auroville's non-polluting bus system. Necessary traffic for delivery and removal will also be permitted here (with a maximum speed of 15 km/h) as well as rickshaws, pushcarts,

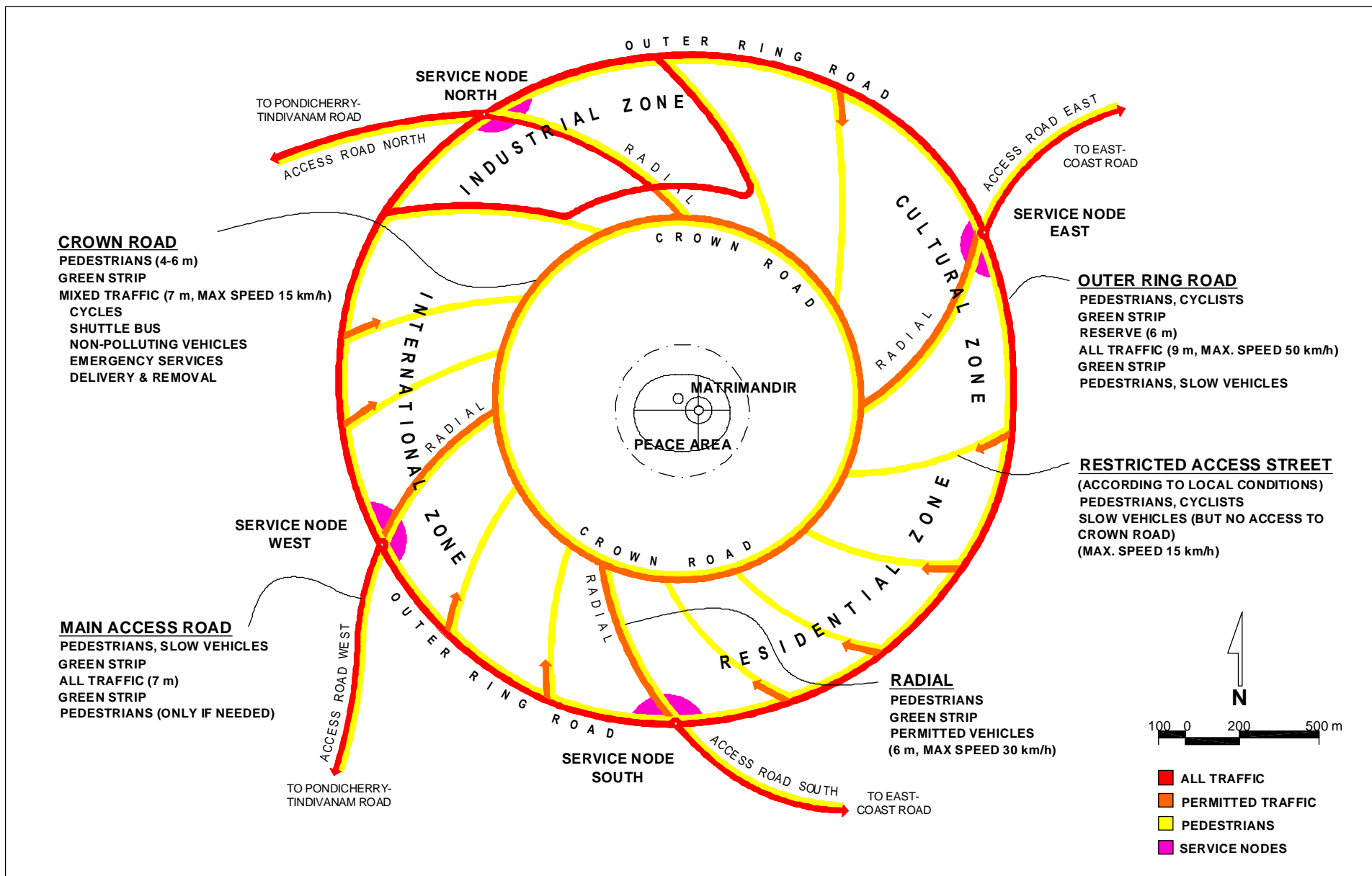
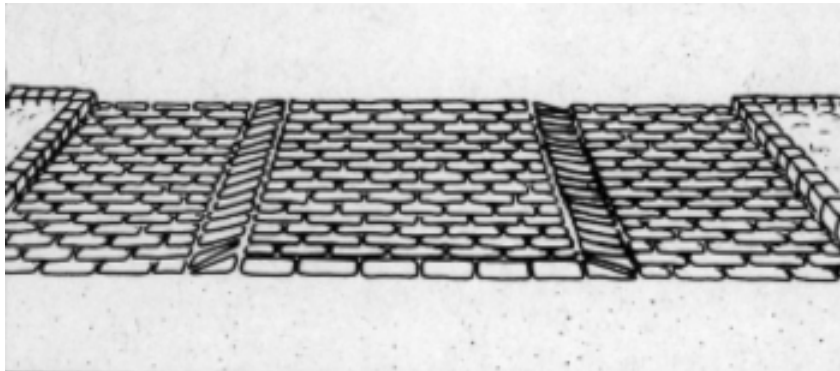


Figure 2.2 General Mobility Pattern



A possible barrier through slight elevation and change in surface material, allowing easy passage for cyclists, as it is often used in Berlin.

Time restrictions help to separate pedestrian and cycle traffic from supply and service traffic. In the city-centres of the West, supply and service traffic is normally not allowed after 11 a.m. This might be different in Auroville and has to be studied in order to avoid unnecessary impositions. Another type of restriction is entirely based on the security of children and aims to concentrate necessary delivery trips at times when children are not playing outside - usually before 11.30 a.m. and after 7 p.m.

bullock-carts, horse-drawn tongas etc. Architectural designs for the Crown have to show in which way the pedestrian boulevard relates to the building development. A much less disturbing Crown Road will even allow for buildings to be placed close to it, forming street spaces of a human scale populated by pedestrians. (see p.23-24)

Four major **Radials**, starting from the Crown Road, will lead to the Outer Ring Road. (Fig. 2.4, p.14) Their section will be similar to that of the Crown Road, allowing similar traffic components. These radials will consist of a pedestrian boulevard normally 3 m wide (ranging between 2.5 and 5 m) alongside a 6 m wide road for permitted vehicles and cycles (with a maximum speed of 30 km/h).

All motor-vehicles will be allowed in the Industrial Zone, but there will be access to the Crown Road only for permitted vehicles. Therefore, only the approx. 100 m long connecting road, linking the main road in the Industrial Zone with the Crown Road, will have the same section as the Crown Road. Cyclists in the Industrial Zone should not be endangered by lorries, so here it is envisaged that they will be share the boulevard with the pedestrians.

In all the zones, the design of **restricted-access streets** will depend upon the local conditions and architectural layout of the area. As a rule preference will be given to traffic security and avoidance of pollution (noise and exhaust). Therefore, for motor-vehicles, a maximum speed of only 15 km/h will be permitted here and they will be allowed to travel only via the Outer Ring Road, not the Crown Road. The drivers will turn back out of their own accord as they will be allowed to drive faster on the Outer Ring Road. (There might be a barrier where the radial meets the Crown Road). The only vehicles allowed on the Crown Road, apart from emergency transport, will be for delivery and removal and these would be restricted to certain hours). Besides the four major Radials, the only direct connections between Outer Ring Road and Crown will be pathways for pedestrians and cycles. The widths of these will be determined according to the local need and architectural design.

Figure 2.3 Section Crown Road

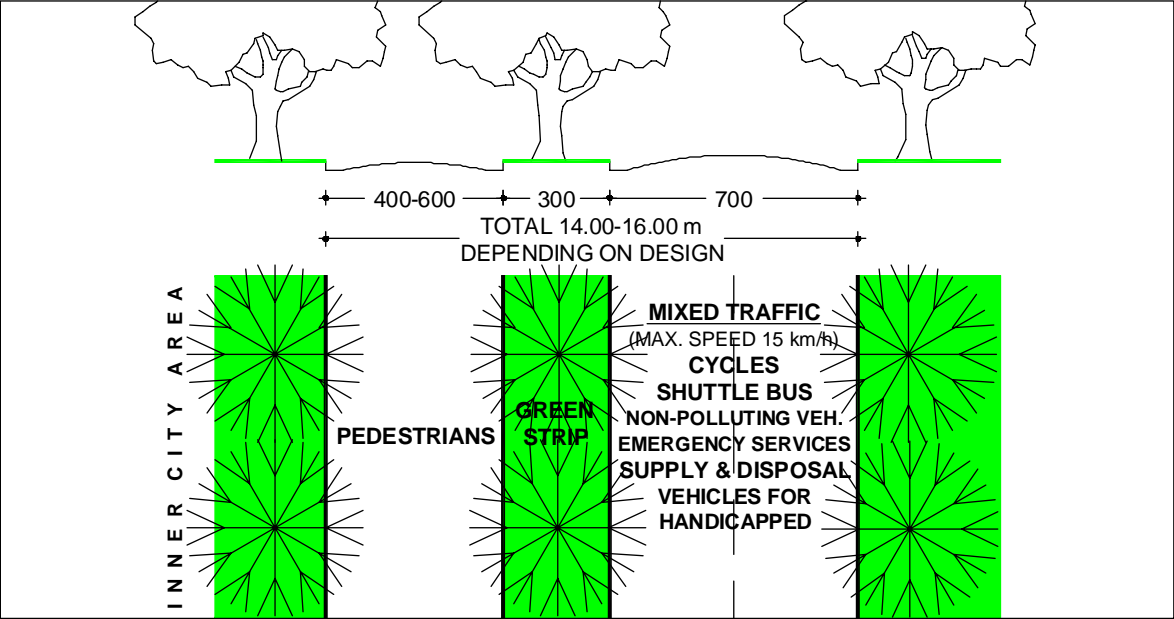
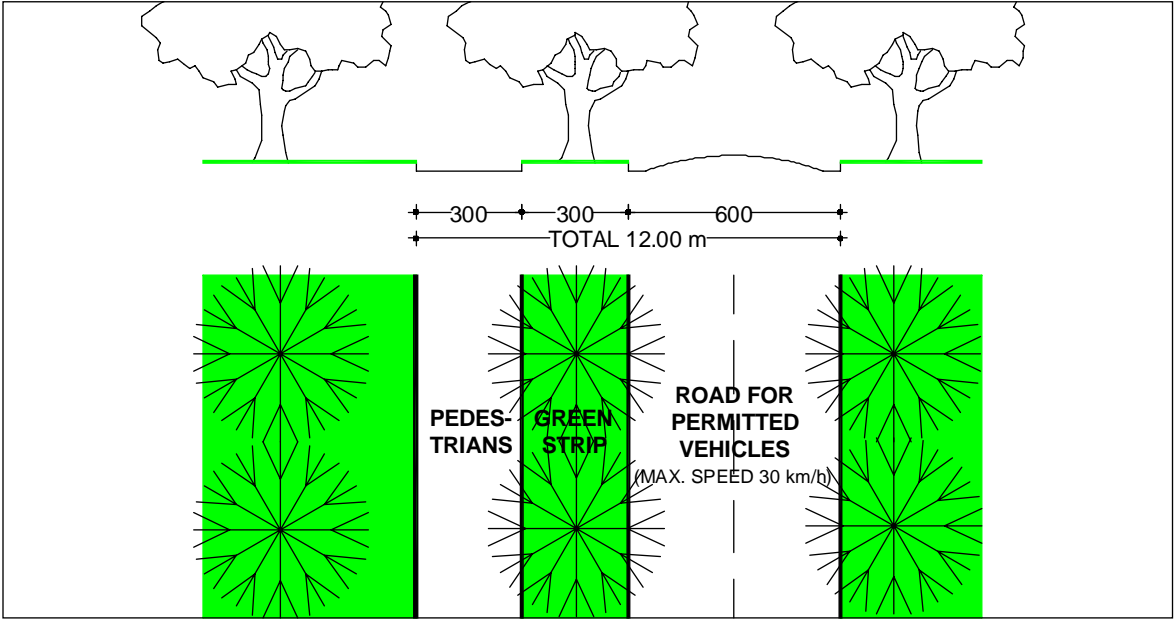


Figure 2.4 Section Radial



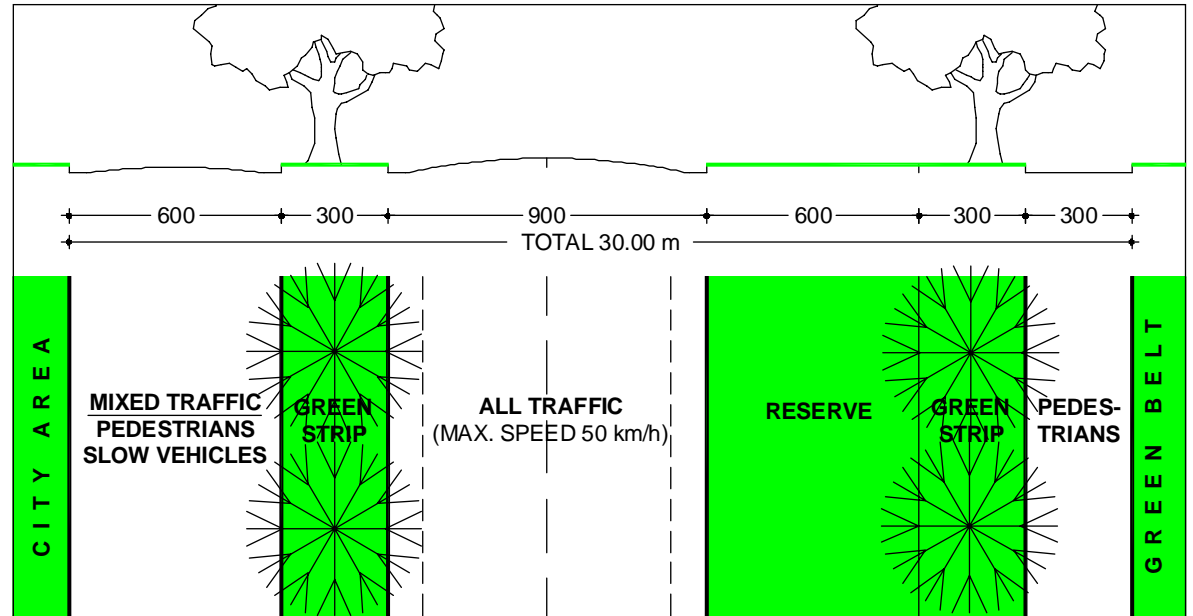


Figure 2.5 Section Outer Ring Road

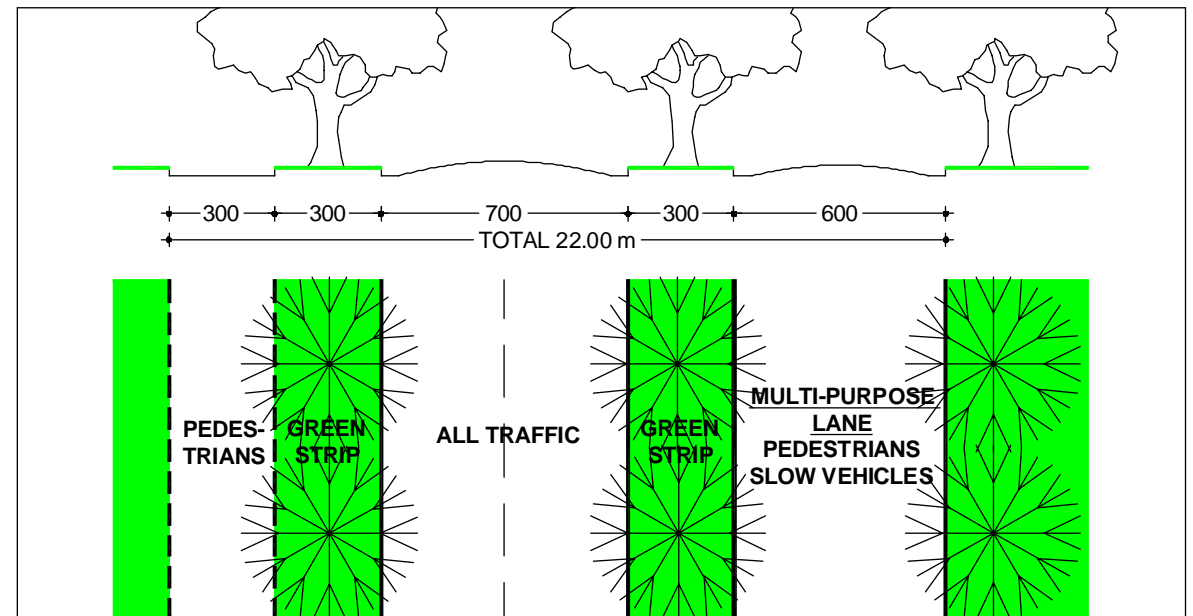


Figure 2.6 Section Main Access Road

Buses in traffic-calmed areas also have to adapt their speed to the pedestrians. But examples prove that they move 15% faster in spite of low speed. They are able to keep their time schedule since they are not subject to frequent traffic-jams.

The **Outer Ring Road** will be used by all types of vehicles (Fig. 2.5, p.15). The main access roads will join the Outer Ring Road via **roundabouts**. These will allow for secure crossing of pedestrians and cyclists and can function without traffic lights. Each roundabout can easily manage 25,000 to 30,000 motor vehicles per day. The traffic system as proposed in Fig.2.2, p. 12, promises to be sufficient even when Auroville reaches its intended population of 50,000 inhabitants, provided that the two bypass roads proposed in the Master Plan are available by that time. It is difficult to assess whether these roundabouts will be sufficient for visitors, since their number and movement pattern in the future is still uncertain.

The four **main access roads**

- to the International Zone,
- to the Residential Zone,
- to the Cultural Zone and
- to the Industrial Zone

are assumed to be roads with two lanes. Fig. 2.6, p.15 shows a possible section providing a high standard of traffic security.

2.5 Auroville's non-polluting Shuttle Bus

In order to adapt Auroville's city area to non-polluting transport, alongwith pedestrians and cyclists, a system of shuttle-buses will be required for the convenience of less vigorous Aurovilians, guests and visitors. The Crown Road will be the appropriate route for a shuttle-bus, as most institutional buildings are supposed to develop along this road. From here to the Peace Area, it is 5 minutes walking time, to the Outer Ring Road 7 or 8 minutes, which is acceptable. As the shuttle-bus line gets better established, it can be decided whether the bus should also connect to the main entrance of the Peace Area (Matrimandir).

The Auroville shuttle bus is also envisaged as a service for guests and visitors. It will start at a service node and pick up anybody arriving there on motorised vehicles who are not willing to walk (8 min. to Crown, 15 min. to the Peace Area), rent a cycle, or take a rickshaw or pony-drawn tonga, all available at the service node.

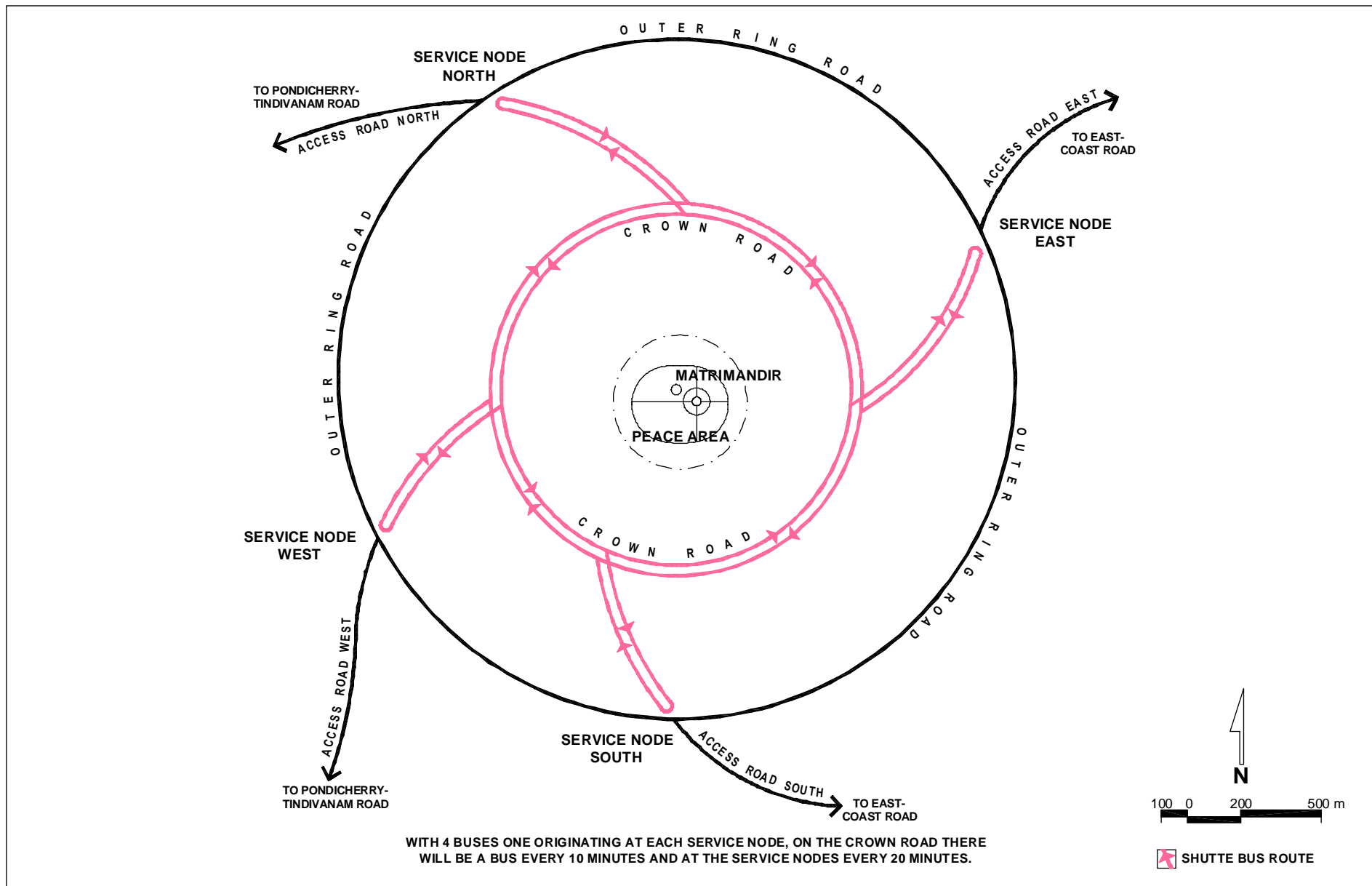


Figure 2.7 Auroville Non-Polluting Shuttle Bus

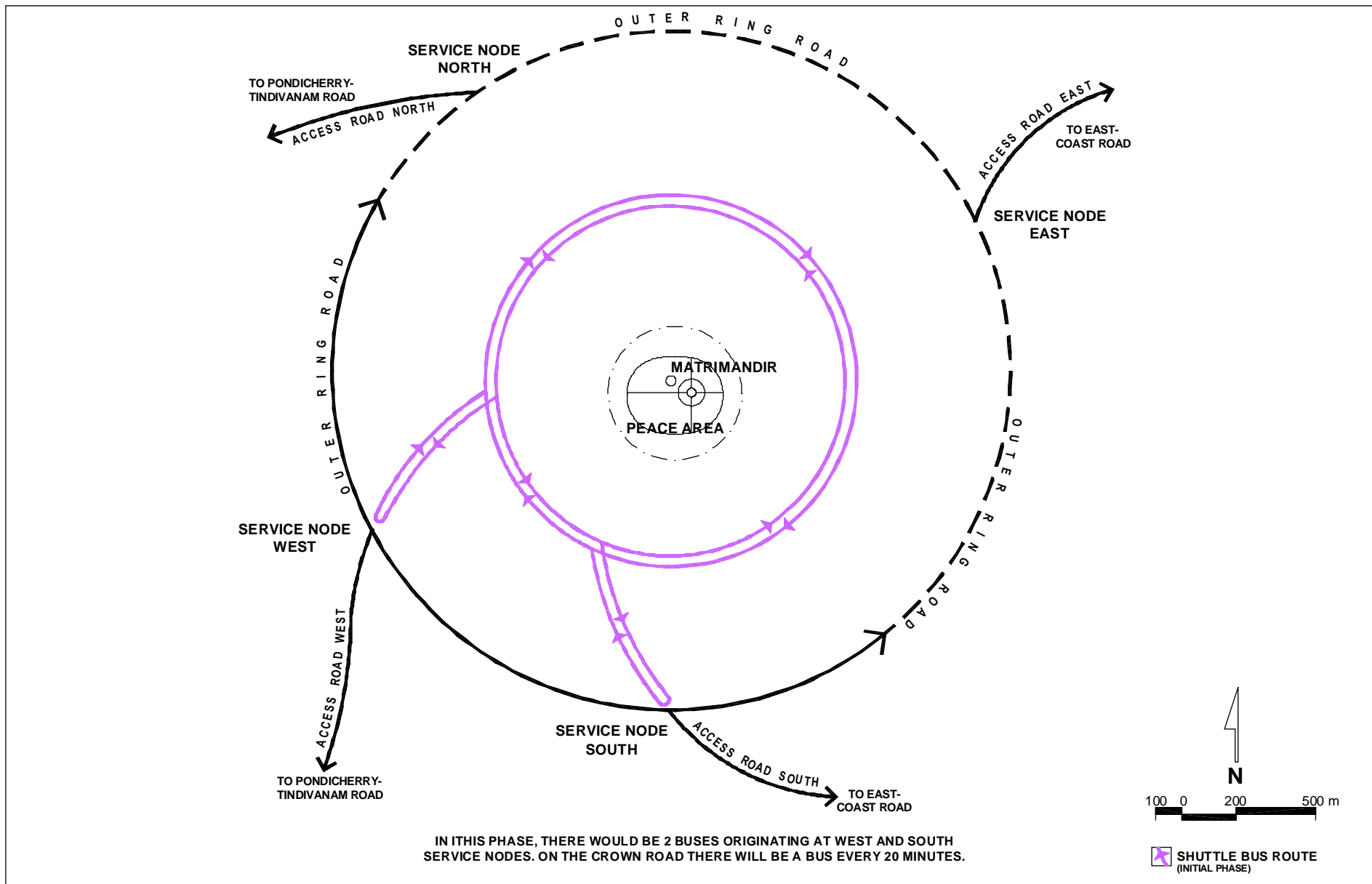


Figure 2.8 Auroville Non-Polluting Shuttle Bus (Initial Phase)

If a train or tram is envisaged as public transport, it is important that it moves within a speed limit of 15 km/h. Such a train can easily operate in the middle of a pedestrian street, amongst other “permitted” vehicles.

One could imagine a tram, cautiously moving with 10 km/h, allowing embarking and disembarking without requiring a stop, except on request by people with reduced abilities.

It would be an excellent project if a team in Auroville starts developing such a system of public transport. This would be a project of great interest not only for Auroville alone. The author would be ready to offer support and participation.

When fossil fuel is used, the problem of CO₂ is inevitable. In case of natural gas (CNG), all other emissions (CO, NO_x, SO₂, Volatile Organic Compounds etc.) including smell are substantially reduced. CNG driven buses reduce pollution in city areas significantly. They are more energy-efficient. New Delhi is a good example.

In the first phase, probably only one bus-line is economically feasible. The first node point that needs to be connected is the main access road to the International Zone close to the Visitors Reception Centre. If the shuttle bus starts here and maintains a maximum speed of 15 km/h (average speed 10 km/h including stops), it will be back within 30 minutes time after circling around the Crown Road (4.4 km : 25 minutes, plus radial 700 m : 2 minutes). Assuming a 10 minutes buffer stay (for loading and unloading plus rest for the driver) a frequency of 40 minutes will be reached. To attain a frequency of 10 minutes, four buses would be necessary.

For the second node point the south access road to the Residential Zone should be considered. In this way there will be a shuttle between the south and west nodes and two buses will circle around the Crown Road every 20 minutes. (Fig. 2.7 & 2.8, p.17-18)

The insistence on non-polluting shuttle buses is a high aim oriented on the basic concept of Auroville as an ecological and sustainable project. But just by giving priority to buses instead of individual motorised transport, an enormous improvement in air quality is achieved; and even more so when the latest standards, e.g. particle filtration, are complied to. Technically, the best developed contribution to pollution-free motors are natural gas (CNG) motors. Even electrically driven buses are inferior to gas driven buses, for though they do not emit harmful exhausts locally, they do add to air contamination on a wider scale.

2.6 Service nodes

The concept of service nodes has been explained before (section 2.2, p.10). Fig. 2.9, p.20 shows the south service node as an example. It needs be mentioned that the areas for parking cars as well as for outside buses could be expanded linearly (according to the need). It will be best to combine a rent-a-cycle station with general cycle parking.

In deviation from the Master Plan (Land Use Plan) the service nodes are proposed to be located not on the outside but on the inside of the Outer Ring Road to better facilitate the transition from outer traffic system to the inner network of streets and pathways belonging to Auroville.

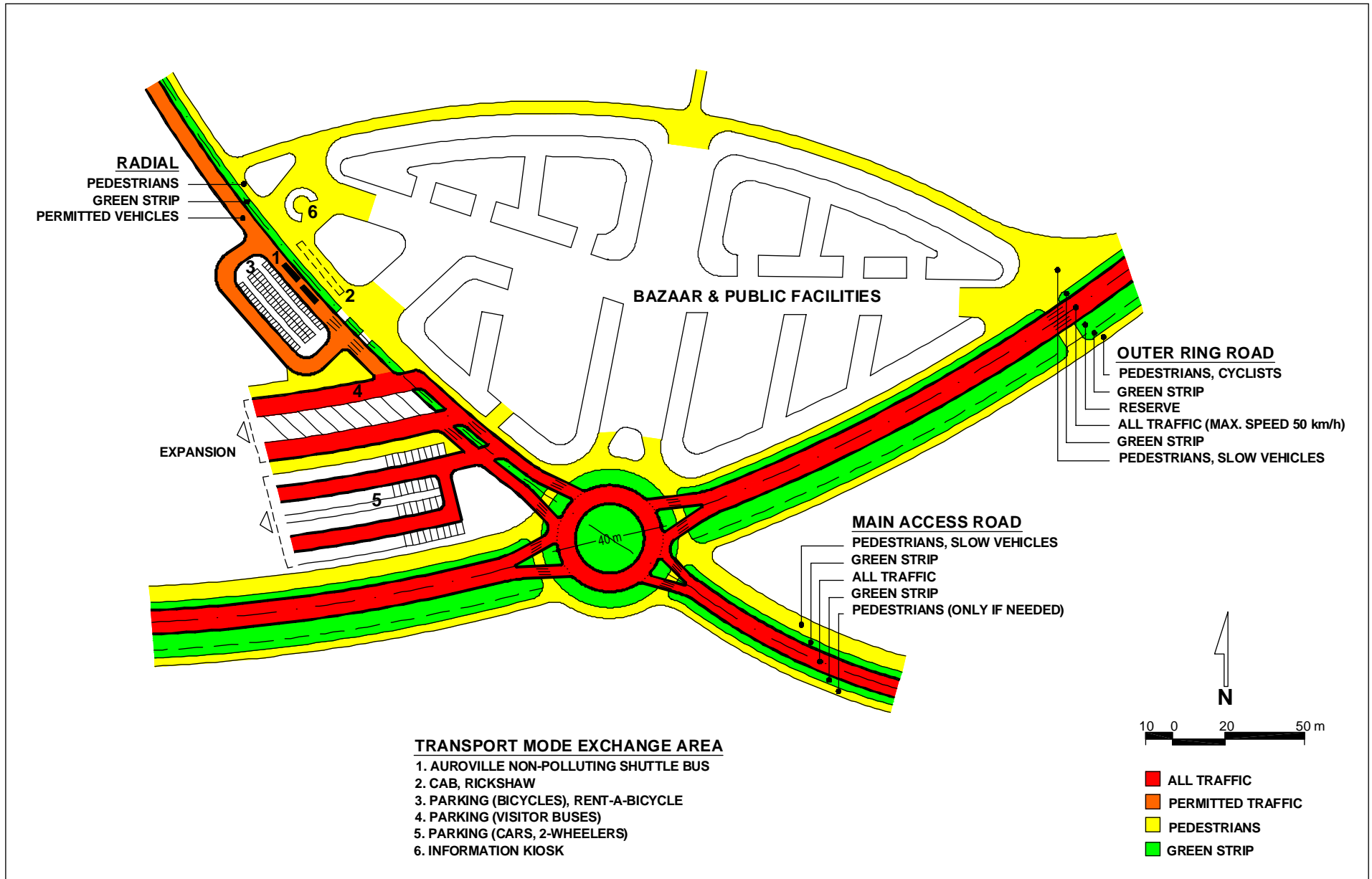


Figure 2.9 Example Service Node (South)

2.7 Careful steps to realise the motor-free city

To scale down the freedom of movement of motor-vehicles (motorbikes and cars) in Auroville requires tact. A majority of Aurovilians need to be convinced of the advantages of a motor-free city. This requires a process of information. If a change is brought about, nobody should be able to claim that they did not know anything about it, or complain of a undercover action. The process of forming public opinion can be supported by realisation of motor-traffic free zones in small steps, which can, if necessary, even be tried out for a time so that ample practical experience can be obtained. Another proven method is to combine a change in traffic-use with a structural improvement of the street, so that after the improvement the new usage is accepted as natural.

This traffic concept is based on the geometrical parameters given in the Master Plan. Many details of this proposal may not be compatible with the existing ground realities; a fine-tuning has to follow in the next stage.

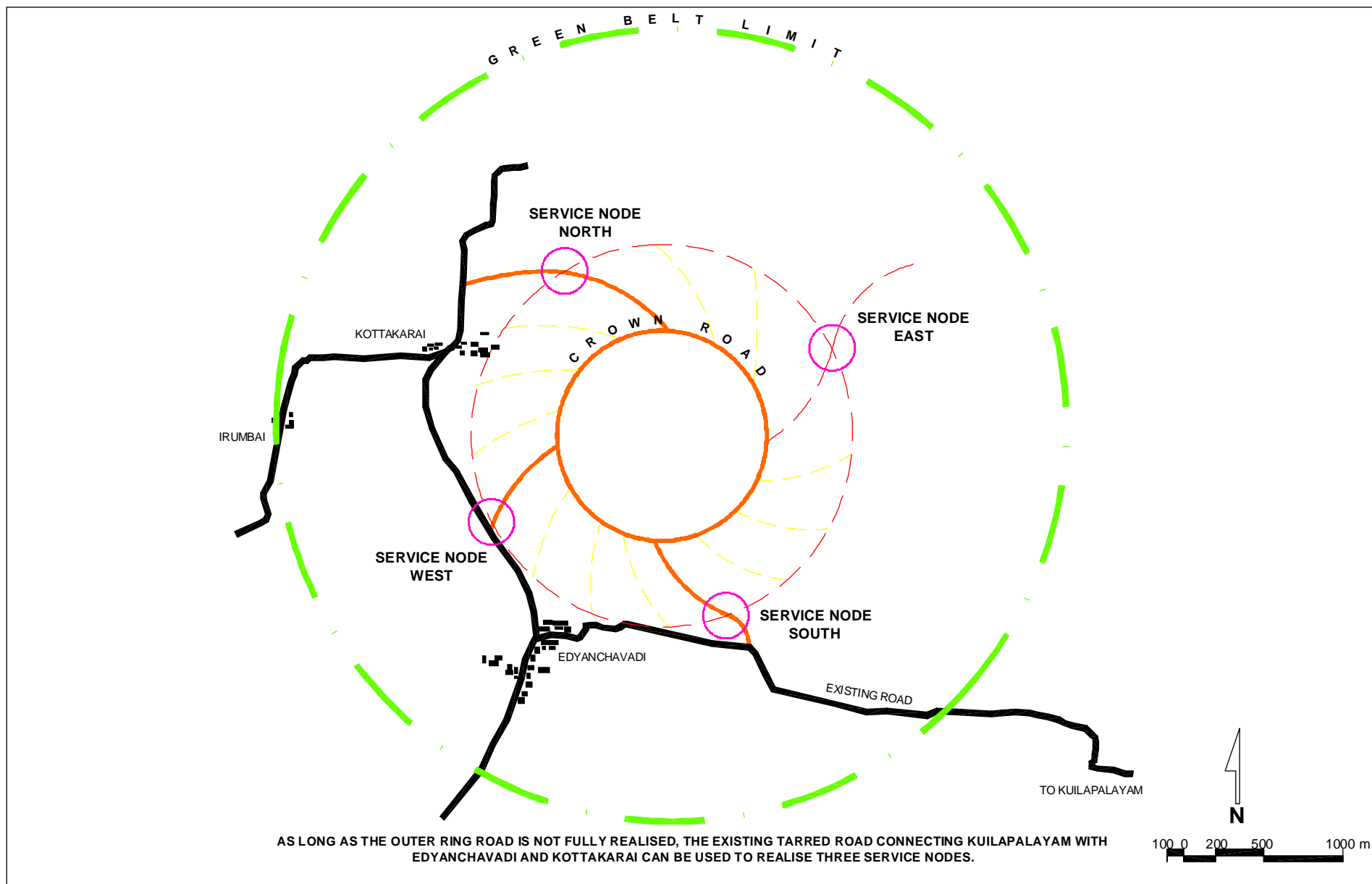


Figure 2.10 Utilisation of the existing road



The Crown Road might look like this...



...or like this depending on design and need.

3.1 Zermatt: An example of a motor-free town

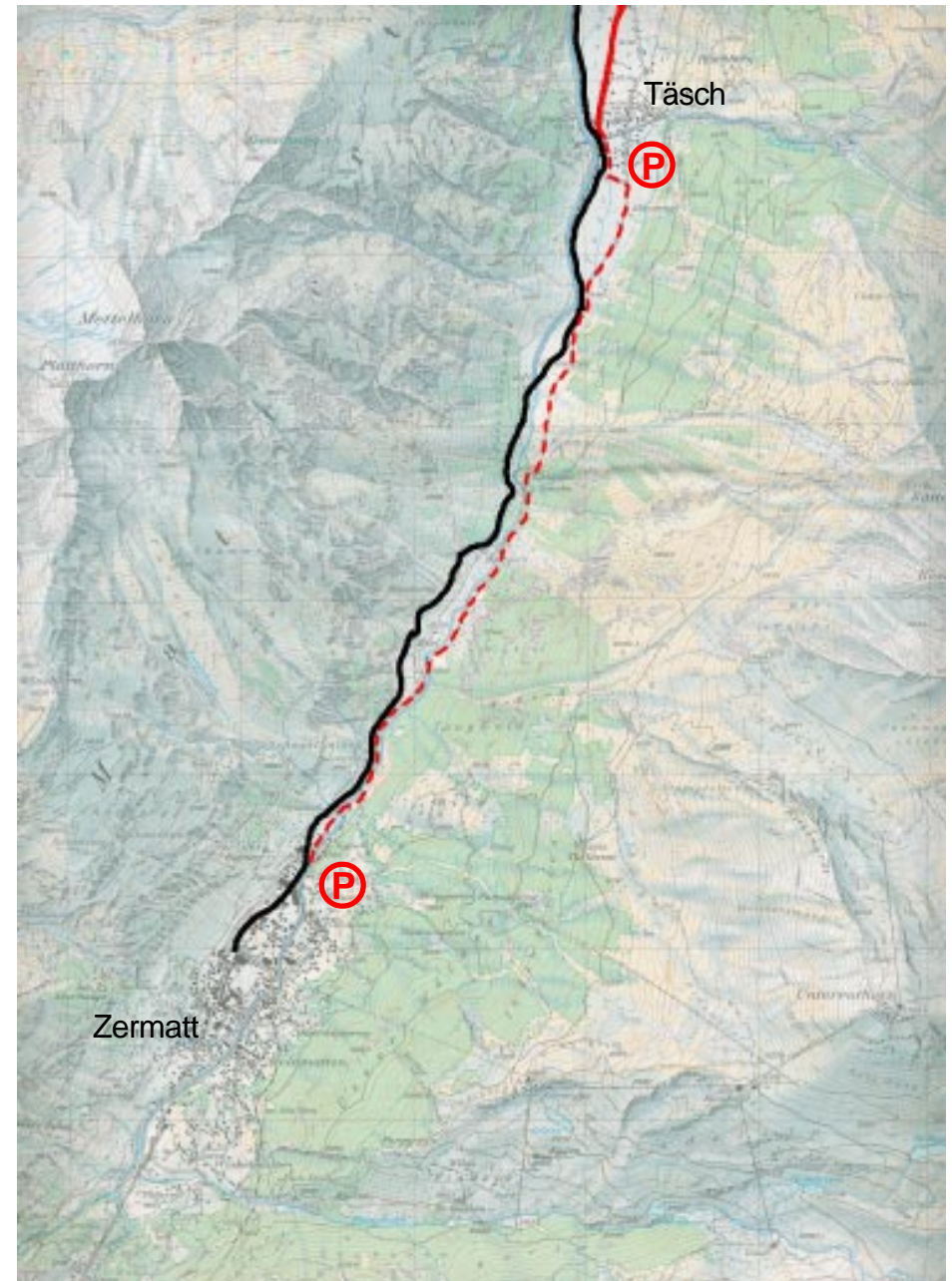
Zermatt is one of the growing number of towns in Switzerland which have gone car-free. It is a ski resort of 3500 inhabitants and receives thousands of visitors every day throughout the year.

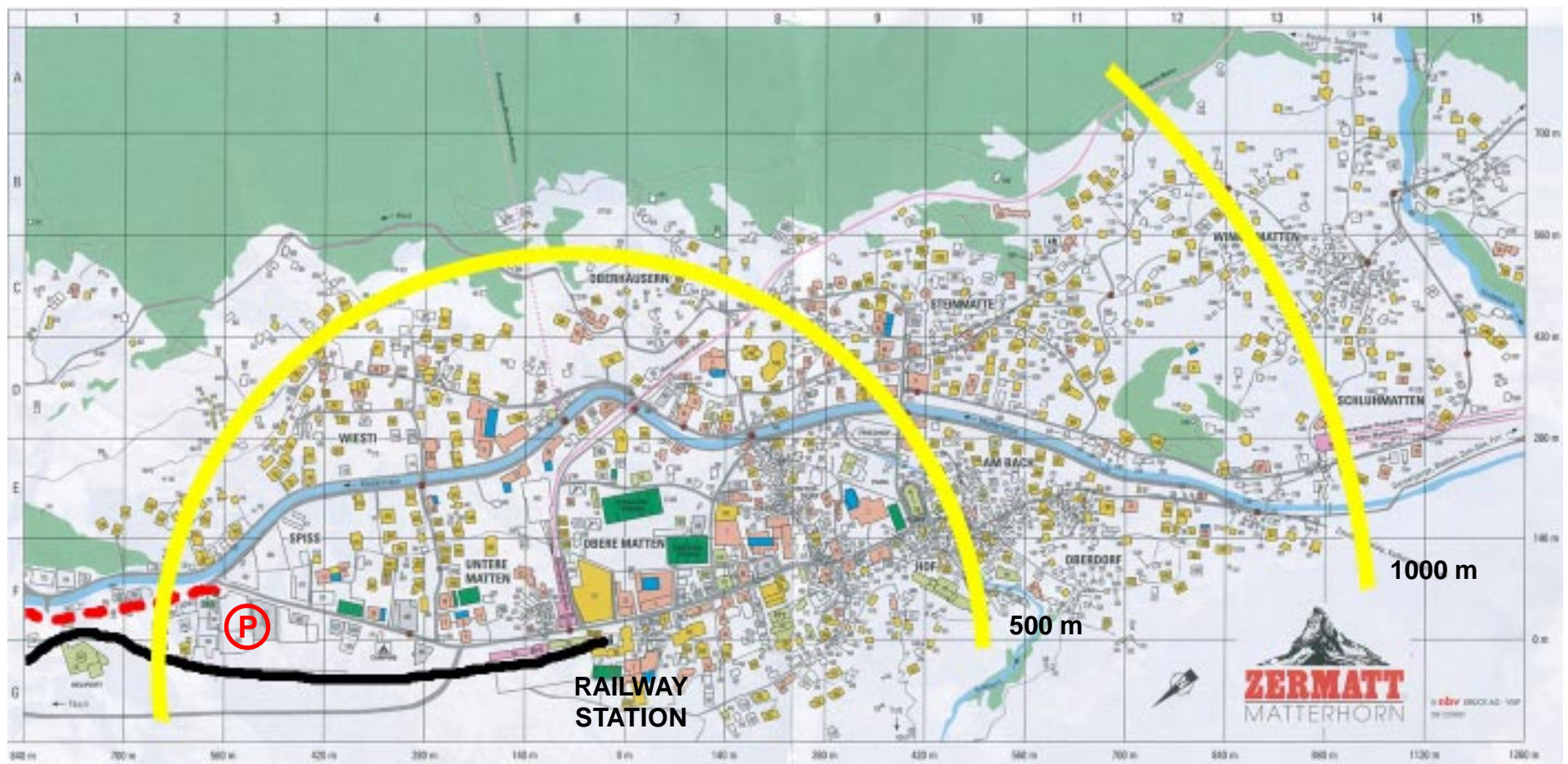
People arriving in cars have to park in Täsch (3200 parking places) about 5 km from Zermatt and change into a train. They can also take taxis to be carried to a utility area at the border of the town. From here, as well as from the railway station, it is walking distance (20-30 minutes) to any destination in the township. Inside the town, horse-drawn carts and slow electro-mobiles (their speed adapted to pedestrians) are the only means of transport. These electro-mobiles get permission only if they are commercially necessary. Bicycles are of course allowed. There are no individual electro-cars. One can find electro driven delivery vans as well as taxis; even police and municipal services use electro-carts. A couple of examples are shown in the attached pictures. All electro carts have the same basic chassis but differ according to their use. It was decided not to allow any 'futuristic' design for these slow moving vehicles but they can be different according to their colour. There is a central station for battery charging or replacement.

There are also electro-buses (see p.31) with a frequency of 10 to 40 minutes (depending on the season) which also move with speed adapted to pedestrians.

Zermatt Valley

Everybody wanting to go to Zermatt has to leave his car in Täsch to change onto a train or a taxi. Only residents are allowed to occupy the garages at the periphery of the town.





Zermatt Townplan, showing distances from the railway station

Electro-taxies at the railway-station



Utility area at the periphery. The residents park their cars in underground garages. From here everyone has to walk, use the electro-bus or an electro-taxi. Freight is transferred to small electric delivery vehicles.



“Beyond this point only permitted electro-vehicles, ambulances, municipal or agricultural vehicles”



“Permitted vehicles with a speed not exceeding 20 km/h”



The electro-bus with an
electro-cart in the foreground.



Electro-Bus route

A simple electro-cart for freight transport



A delivery van belonging to a bakery



An electro-vehicle belonging to municipality's water service



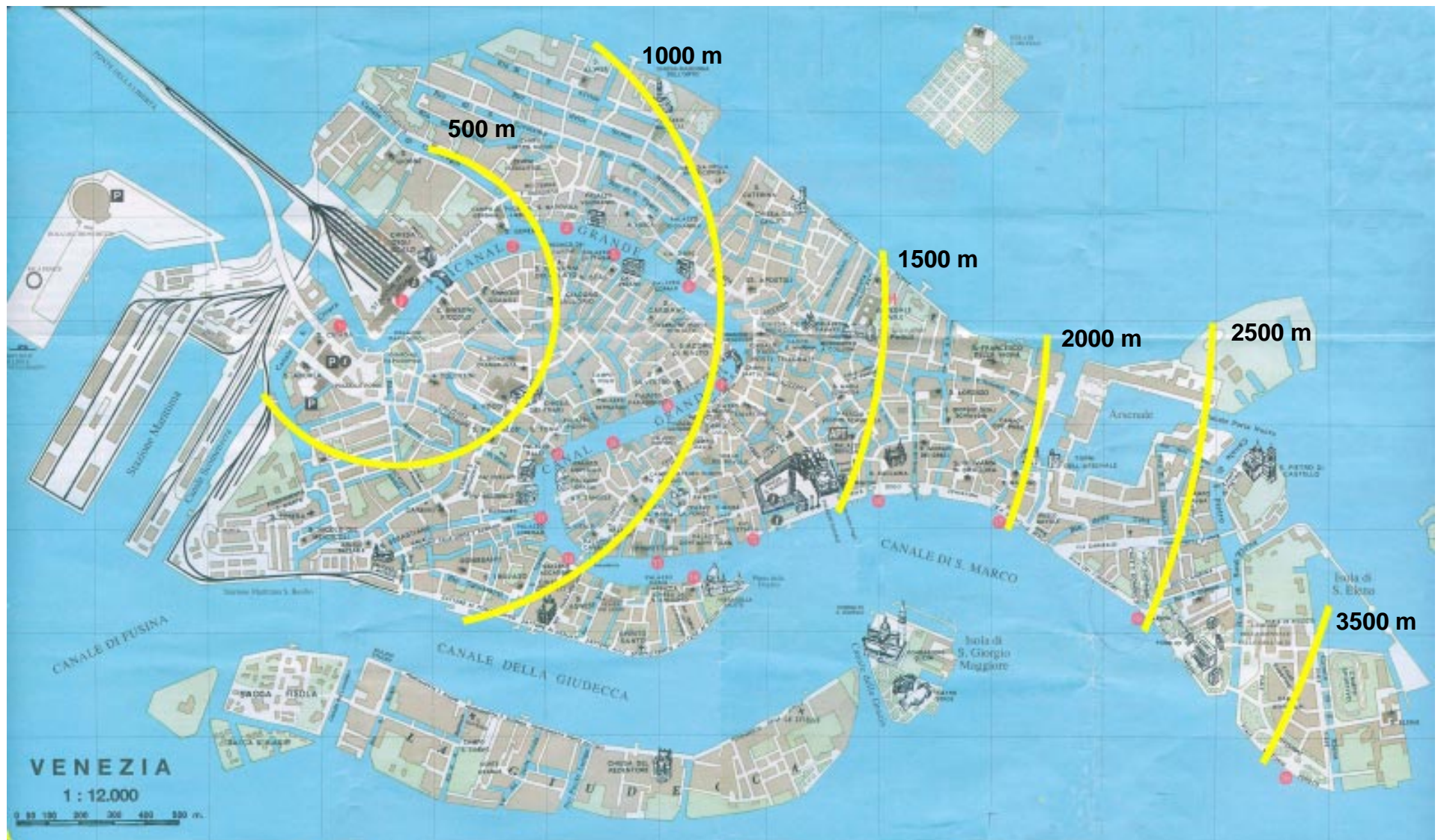
Even the police uses electro-vehicles

3.2 Venice

Venice, being isolated on a couple of islands, is the only city that has escaped the damage cars have done to the quality of urban life. It is one of the world's densest cities (F.A.R.=3 in San Marco district) comprising of medium-rise houses (up to 5 storeys) and narrow pedestrian streets with an average of 4 m width. Freight and public transport is separated from the pedestrians and happens entirely by boat on canals.

Venice can be reached by train, road and boat, that terminate in a railway station, large garages and a harbour. From here one can walk (see distances in attached map) or use the public transport (or "vaporettos" via the waterways). Freight is delivered by boat also using the canal network. Porters deliver it from the nearby landing place to its final destination with the help of carts.

Venice is one of the world's most popular tourist destinations. Housing prices rose so much that many people were forced to live on the mainland, leading to a dramatic decline in population (from 2,00,000 in 1945 to 75,000 today).



Venice - distances from the railway station
 The utility area, accessible by train, road and boat is clearly visible. Public transport and freight delivery takes place on the canals, separated from the pedestrians.



Pedestrian walkways



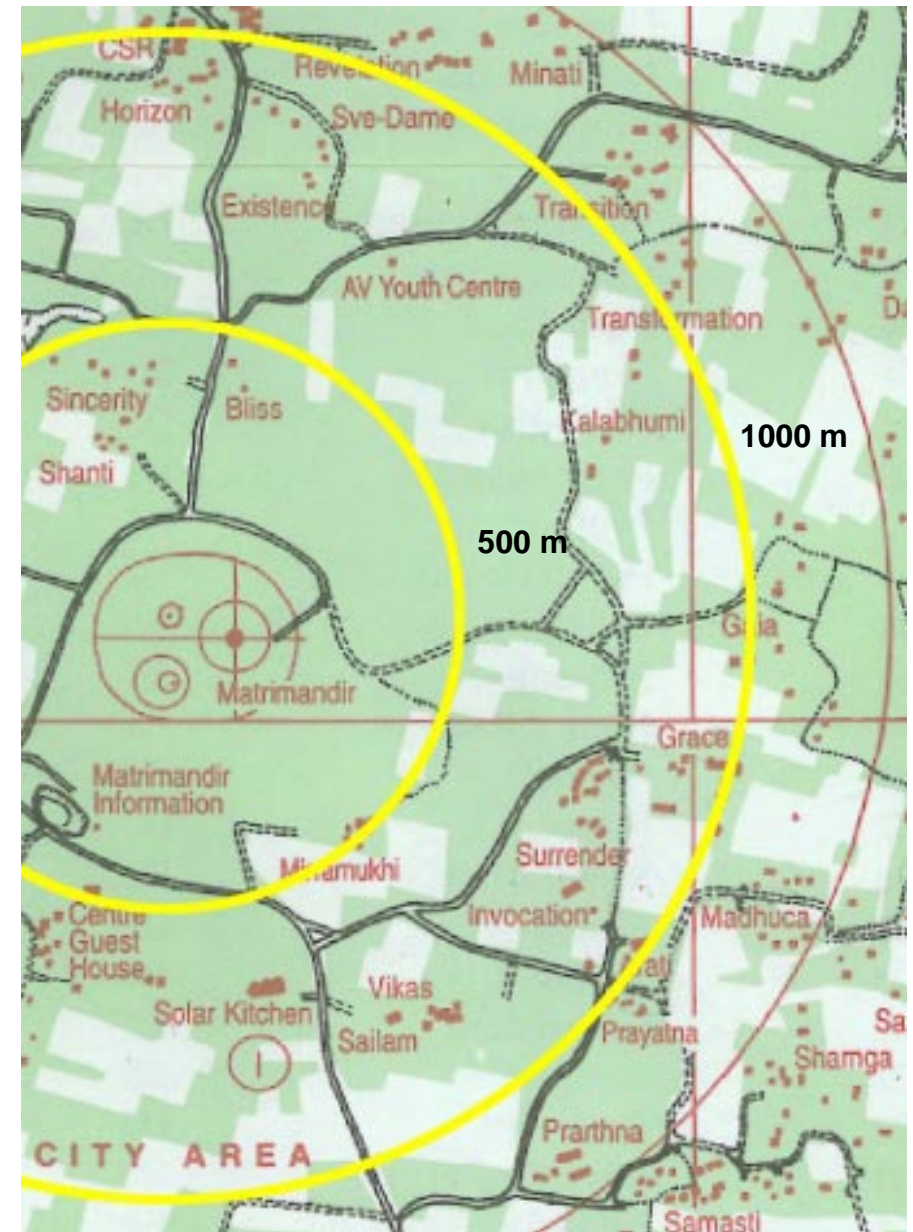
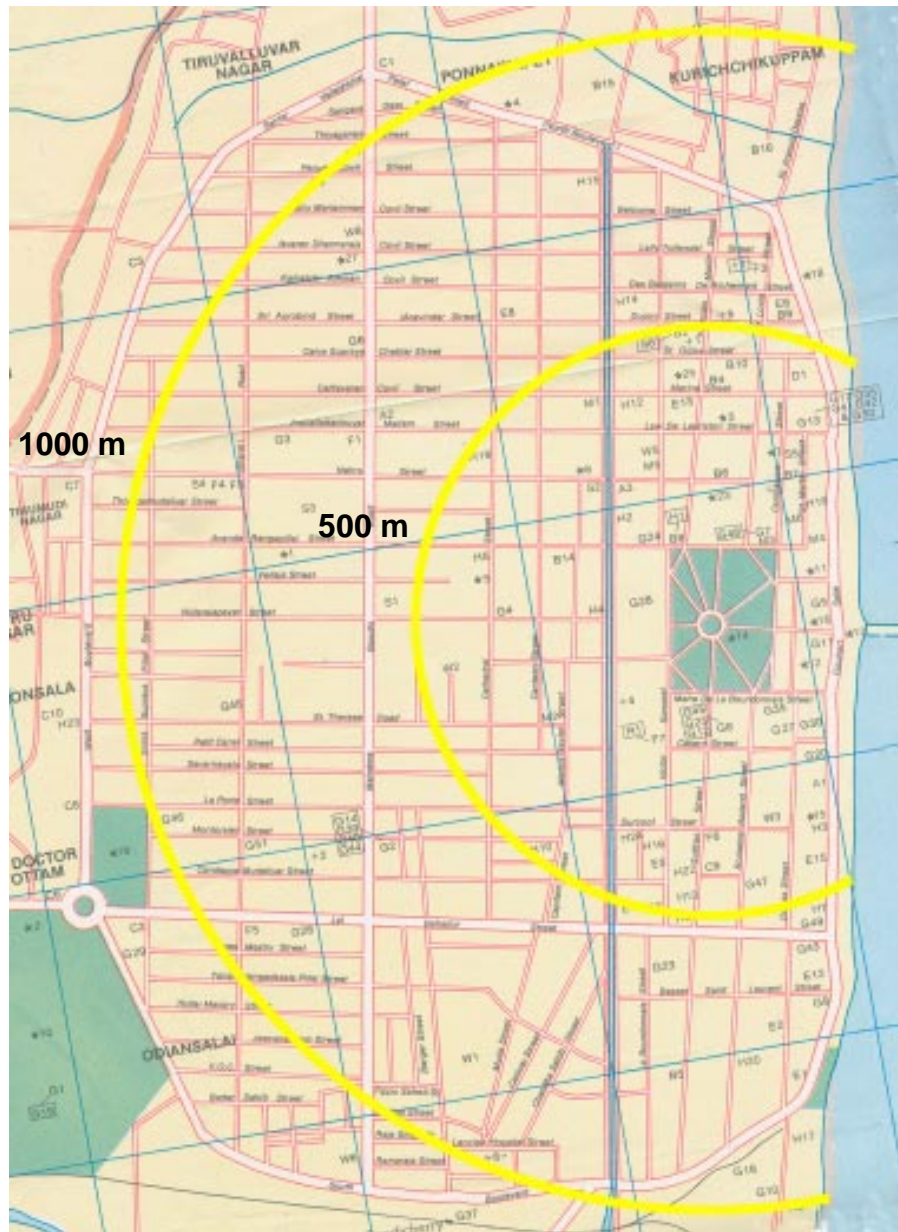
Freight delivery by boat and push-carts



Public transport comprising of water-buses



3.3 Pondicherry and Auroville --for comparison in the same scale



The Author

In close cooperation with town planners and architects, Hans Billinger in Stuttgart (Germany) has been working for more than three decades as a consultant on all aspects of traffic and mobility. Many cities in Germany have realised concepts based on Billinger's ideas. His fields of work comprise a large range from conception to realisation, e.g. comprehensive mobility concepts for whole cities, international fairs and airports, concepts for public transportation, noise protection, research etc. His main emphasis is on traffic calming and pollution control.