CLIMATE-SENSITIVE URBAN SPACE

Concepts and Tools to Humanize Cities

Boudewijn Bach
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During the past several years an increasing interest has emerged in the role climatic comfort plays with respect to improving quality of life. This is all the more relevant in regions which experience rain, fog, wind, ice, and even snow, such as those found in Northern Europe (including all of the Alpine zones) and Canada. Concern for climate has generally been overlooked and the literature has been very sparse for both temperate and northern locations, concentrating, instead, on hot, arid zones of developing countries.

If living conditions are to be improved in urban areas, climatic imperatives will have to be accommodated in innovative ways and be integrated as part of the design process from the very beginning. If town livability is to be sought, then climatically appropriate approaches shall be required. Bioclimatic design - which takes into account a broad range of climate tempering resources such as site selection and planning, urban form and density, use of natural or human-modified topography, vegetation, built-up configuration, orientation, outdoor space characteristics, type and location of openings, building components and materials, surface colours, etc. - if properly applied, can avoid harmful or undesirable effects of climate while taking advantage of its beneficial aspects.

Improvement of thermal comfort can often be achieved through correct bioclimatic intervention. However, in itself, this may not always be adequate, in which case, climatic protection may also be needed expressed directly through built form such as colonnades, canopies, awnings, arcades, passages, gallerias, and total or partial 'roofed-over' solutions combined with windbreaks, trees and hedges.

The initiative for this text came from the Faculteit der Bouwkunde at the Technische Universiteit Delft, where Prof. Norman Pressman was invited as Senior Research Fellow from September until December 1991 to work jointly with Boudewijn Bach of the Town Planning and Urban Traffic Division in the Faculty, while on sabbatical leave from the University of Waterloo. This exposition is part of the fruit of their collaboration which attempted to mesh concerns for traffic management, public urban space, town revitalization, and climatically-sensitive urban design within the broader context of sustainable development.

We wish to extend our thanks to Prof. ir. D.H. Frielings (Chairman OSW) and Prof. ir. J. Heeling (Chair of Urban Design), Faculty of Architecture and Town Planning) for making this invitation possible. In addition, we are grateful for the enriching professional exchange which has been the outcome of our joint discussions and cooperation.

Boudewijn Bach & Norman Pressman
August 1992
Delft, The Netherlands.
1 INTRODUCTION

The present text attempts to act as an exploratory probe with an emphasis upon the organization of public urban space and the need for climatic protection, particularly as this obtains to the needs of both pedestrians and cyclists. It is hoped that there will be a consensus about many of the points made. Above all, it is the aim of the authors that the conclusions and strategies which have been developed shall help to clarify issues which have been under debate for many years.

There is a pressing concern, today, for an improved quality of life. This is partially driven by a host of dilemmas which most city centres face in the wake of automobile-oriented development; urban sprawl; a generally inefficient use of energy, land and resources; and in the presence of an impoverished urban aesthetic.

Among the various factors which will assist in creating a higher quality of urban life, good public transport (including trip interchanges) combined with well designed public spaces, cycle paths and pedestrian movement systems- which are at least partially climate-protected, close to transit stops -will have to be integrated in town planning. A level of protection similar to that found, for example, in intermodal airport movement, should optimally be achieved.

The major reason for developing this hypothesis is the fact that it is probably unreasonable to assume dependence on the private motor car (as we currently know it) indefinitely. Even if there should be available supplies of relatively affordable energy, the amount of usable urban space (mainly consumed by cars) is rapidly disappearing. Cities such as Milan, Athens, Los Angeles, and Toronto are being choked not only by pollution but also by cars competing with pedestrians, transit riders, and cyclists for roadway, open space and parking. When multi-storey parking garages are built, vital space for housing, employment and public space is reduced. If a disproportionate degree of parking exists, (even in the form of underground parking), large infrastructure investments into roads, ramps, and access routes still have to be made, further robbing the city of usable space and of the human animation which it has traditionally fostered. Hence, the necessity, through sensitive policy and design, to ensure: pedestrian movement, public space, cycle paths and extremely efficient public transport - and to design them in a way which will be thermally comfortable and weather-protected.

The intent of this probe is to awaken an interest in and affection for
town living by enhancing those factors which make the central areas of
cities unique 'paths' and 'places' of sensory stimulation and vitality. These
form the basis of a richly textured and symbolically meaningful urban
existence. Development policy and urban design can make significant
contributions toward achieving long-term livability within a framework
possessing human scale. This is needed more than anything else at the
present time.

It is also the authors' belief that public urban space is a critical
ingredient of urban culture. Without well conceived public places,
meeting areas for social, economic, and political exchange would
gradually disappear as would the symbolic attributes of city centres.

The demise of public places, which we witness on an ongoing
basis, is as fundamental in our society as is the problem of
homelessness. Both are indications of a single mode of poverty;
both arise from the lack of sufficient generosity toward the public
realm and from the seriously narrow limitation of the scope of
design to the individual building in a potentially derelict urban
fabric.

The public realm must be much more than simply the spaces left over
between buildings or streets. It must be an integral component of the
urban tissue, designed to last and to be perceived and used in symbolic
ways, linking past, present and future. The city, and its constituent parts,
is the greatest creation of civilization. To enjoy its complexity is one of
the highest goals to which we can aspire. Making it ultimately 'livable' for
everyone would enhance this historic legacy. As architects, engineers,
landscape designers and city planners we have a professional responsibility
to ensure that this occurs.
The Urban Space as a concept has been ignored in 20th-century town planning. Our new cities are a conglomeration of free-standing buildings. Five thousand years of city planning history has taught us that complex matrixes of streets and squares are successful communication networks and means of identification and orientation. Traditional concepts of urban space are still valid today.

Rob Krier
'Ten Theses on Architecture' - 1990
2 THE SOCIAL SIGNIFICANCE OF PUBLIC URBAN SPACE

There is little doubt that serious concern for ‘public environments’ has been dominating discussions pertaining to quality of urban life. In 1987, the theme of the Environmental Design Research Association’s 18th conference, held in Ottawa, was ‘Public Environments’. Numerous books on street life have continuously surfaced throughout the past decade both in Europe and North America.

Five outstanding examples which are indicative of this trend have been:
- Dietrich Garbrecht, Gehen: Plädoyer für das Leben in der Stadt, (Beltz Verlag, 1981);
- Jan Gehl, Life Between Buildings: Using Public Space, (Van Nostrand Reinhold, 1987);
- Anne Vernez Moudon, Public Streets for Public Use, (Van Nostrand Reinhold, 1987);
- William Whyte, City: Rediscovering the Center, (Doubleday, N.Y. 1988);

Others are appearing in addition to the voluminous publications made available through traffic ministries such as Traffic and the Environment (The Road Directorate, Denmark 1987) which won the 1986 Volvo Traffic Safety Award and had as its focus the issue of finding better solutions for environmentally-adapted through traffic.

Very noteworthy is the recently published Bedre Byrum (Improving Urban Spaces) by Jan Gehl, Lars Gemzøe, Bo Grønlund and Steen Holmgren (1992) of the Royal Danish Academy of Fine Arts in Copenhagen. It is a compendium and idea catalogue of pedestrian streets and public spaces in 115 Danish cities and suburban municipalities.

The Netherlands has pioneered the ‘Woonerf’ areas; Western Germany has its ‘Fussgängerzone’ and ‘Verkehrsberuhigung’ programmes; France with its ‘rues libres’ has emulated the Woonerf concept; Switzerland similarly has experimented with the ‘Wohnstrasse’; Denmark proudly displays its walking streets (of which the ‘Strøget’ is especially world-famous) and pedestrian precincts; Norway possesses the ‘gågater’ (walking streets) - a feature characteristic of most Scandinavian countries; and both Canada and the United States have their downtown pedestrian ‘malls’ (open-air) and indoor, climate-controlled shopping centres, often situated in suburban locations.
2.1 The Street as Urban Culture

Streets, as a distinct form of public space, have always reflected the spatial diversity and human scale, so essential to our physical and psychological well-being. They assist significantly in creating environments - in a broader sense - which can become agents of social contact, reflection and vitality. Successfully designed public spaces accommodating collective needs almost always bear witness to the primordial demand for social intercourse.

The street speaks a universal language. Its signals are part of everyday learning; its rules for movement are among the most widely understood of all public codes of conduct; and even its most bizarre variations offer, upon close examination, familiar goings-on in the School of the Street.

Unquestionably, the street is a teacher of urban culture. It helps to remind us of the sensory qualities of the city - those aspects of urbanity which heighten the experiential realm. The city is much more than a ledger book of statistics on land values, uses, modal splits, hectares of open space/1000 inhabitants, number of vehicles/available parking space, population density, and all the other data which are part and parcel of the urban policy analyst’s compendium even if many of these components contribute to life quality. Walking for pleasure (‘spazieren gehen’ as the Viennese call it) has been an old-world tradition. Taking a ‘Sunday drive’ has been the new world equivalent - hardly encouraging sociability. Intensity of public life has always been one of the three most critical characteristics that make a city.

Walking for better health has become one of the great trends toward the end of the 1980s and will undoubtedly continue well into the next century. Urged upon us by the medical profession we take it seriously. But have we not overlooked some very basic notions when we are warned that not-to-walk constitutes a fundamental health hazard? Recently, walking speeds in 36 major American cities were measured as a factor in determining which were ‘fast-paced’ and ‘slow-paced’ cities. On the whole, it was concluded that people living in fast-paced cities were ‘more prone to coronary heart disease than those in slower cities’.

The city, if it is to be successful - especially at the centre - must be a place to gather, to meet people, to socialize and engage in the spontaneity of urban culture, in addition to fulfilling so-called ‘functional’ requirements. After all, ‘feeling comfortable and welcome’ is one of the most important of all urban functions, as an expression of the collective will. It is the variety of experiences attractive to a large number of
inhabitants and visitors alike that constitutes the major criterion of a successful pedestrian area - and a healthy downtown. If people come to the centre just ‘to be there’ - to stand, to sit, to talk, to walk, to play, to gaze, to linger, to eat, to drink, to see and be seen - and if public spaces are provided which have the potential to generate liveliness (and a certain degree of psychological comfort and safety) - then one can securely say that success has been achieved. Upon considerable reflection, these qualities appear to be most easily attainable at the street level where movement can occur continuously and unimpeded (if a special zone is created for pedestrians - and cyclists).

To achieve a healthy urban organism, walking must be considered as an important movement mode. As a matter of fact, walkability can be viewed as a significant indicator of livability, and should be accorded the same attention given to the various modes of motorized locomotion.

Almost all trips commence and terminate on foot. It would, indeed, be wise to create continuous networks of walk-ways throughout parts of the city - and even partially, throughout all of the city - wherever feasible. Giving equal weight to the pedestrian and cycle modes (‘slow-modes’) as to motorized modes would seem a most reasonable and sound objective. This, however, has not been the normal practice although, in many European cities, greater efforts are being made to reduce and even eliminate cars from city centres.

2.2 Public Life and Personal Health

It has recently been demonstrated through a number of authoritative epidemiological studies that new diseases tend to occur ‘most frequently among those with few social contacts, lower hierarchical positions, and those disconnected from their biological and cultural heritage’ 7. Studies further suggest that sickness - often resulting from multiple stress conditions - which attacks with severe consequences most often seeks out those who are ‘out of connection’ and lack meaningful social contact with others 8.
Fig. 1. LEFT  **Paradeplatz - Zurich, Switzerland**  
A gilded mime enjoys public encounter with crowds gathering to see him perform at a 'pivotal' location in the city centre.

RIGHT  **Kungsträdgården - Stockholm, Sweden**  
Macro-chess game attracts an interested group of participants in one of Sweden's famous public spaces.

Clearly, in many of the above instances, disease agents are the primary cause of illness. Factors which engender stress - emotional, physical or otherwise - can exacerbate the difficulties. This is precisely where sensitive environmental design can play an important role. The physical milieu can be structured in ways which enable social connectivity to occur. Although it may not determine such connections, it can act as a modifier of human behavioural response since the location and orientation of buildings and spaces, the proximity determined by placement of urban furnishings and objects (e.g. benches, tables, chairs, etc.) in public space, and the creation of improved micro-climates can, in harmony, either promote or impede the interactions of humans in three-dimensional urban space.

People experience life in three primary arenas:

1 **The home**  
A predictable environment which is normally familiar and comfortable
2 The workplace
A productive setting which provides a means for living and for improving one's standard of living.

3 The social arena
Referred to as 'public spaces', 'third places', or 'open spaces'. Such spaces or arenas host regular voluntary, informal and spontaneous gatherings beyond the realm of home and work.

If urban planning and design can promote social structuring which reinforces an individual's ability to control and regulate socially-driven contact, then urban stress is likely to be somewhat alleviated. Urban design should, therefore, provide social experience and interaction under positive conditions while maintaining a comfortable level of social control. City centres, subdivisions and neighbourhoods will foster a healthier lifestyle and user response, if they incorporate well designed public spaces.

Public space is emerging, with rapidity, as one of the most critically studied fields within architecture, urban design and planning for human well-being. The configuration of this public space, its appropriation, its meaning and content, its connection to nature and the symbolic interpretations accorded to 'genius loci' (sense and spirit of place) have strong implications for affecting and shaping the quality of urban life.

Levels of participation in public events, the relationship among various functions in the city, the siting of 'solid' objects within the spatial 'void', all contain opportunities for attracting or repelling human life; for making people proud of being citizens of certain towns, villages or metropolitan regions or, alternatively, for causing depression and even debilitating illness. So-called healthy places must exhibit a powerful combination of factors enhancing sociability in well-designed space so as to encourage connectedness between people when desirable and to offer a range of choices between the extremes of solitude, on the one hand, and total togetherness, on the other.

Social enjoyment (in the space of which the city is composed), visual delight, climatic comfort, security, strong identity, contact with nature, and sensory stimulation should be viewed as goals toward which the physical organization of the city must be related. 'Genius loci' must occur when ordinary space is elevated, in the minds and hearts of urban dwellers, to a sense of place with very special attributes which are universally recognized and appreciated.

Public urban space can be understood as the areas within the built-up
pattern of the city generally represented by:
- parks
- squares
- civic plazas, malls
- streets, lanes, alleyways
- covered streets (e.g. gallerias, passages, arcades)
- spaces between buildings (e.g. courtyards)
- all other spaces which accommodate pedestrian movement or activity.

It can be defined as any combination of the above elements which, in harmony, produce what can be called the ‘essence of urban life’-- set pieces of the urban stage which make for visually stimulating and socially animated activities usually defined (and sometimes enclosed) by buildings.

Such spaces should have the potential to create opportunities for sitting, chatting, meeting, staying, lingering, playing, daydreaming, reading, eating, drinking, demonstrating, protesting, remembering or celebrating all that is meaningful to human existence. They must be located within urban environments and be used so as to socially and culturally retain their true public character. Most importantly, they must speak a universal language with its signals and resonances being part of everyday learning and echoing the sensory qualities of the city. Socially intensive public space is the ultimate expression of collective territoriality. It epitomizes a sense of place for the whole community and serves as a physical symbol of belonging to a larger entity - the group.

© Annie Lüttgen, Ville de Hull

Fig. 2. LEFT Winterlude/Bal de Neige - Hull, Québec
Revelling in mid-winter festivity at the Canadian National Capital Region annual carnival.

RIGHT Parliament Square - Reykjavik, Iceland
Public space is vital for collective protest regardless of geographic location.
The primary task of public space is to bring people together and set the stage for diverse activities in the urban environment. However, one of the dilemmas is that, today, dead public space is often found in towns and cities. Frequently, the symbolic form of civic space is represented but the requisite functions and their correct relationships are absent. This contributes to the lifelessness of the spaces even when architectural quality is of a high calibre. That alone is not a necessary prerequisite for a truly significant and animated space. Space requires people and there must be multiple reasons for coming there and remaining there. Movement through the space can be helpful and useful in the creation of vitality but 'staying', 'meeting', and 'lingering' are essential characteristics of civilized life-ways.

Four basic hierarchies of socially intensive public space can be catalogued 10:

1 **Formal Spaces**
   These normally take the form of civic and religious plazas, for example, Piazza San Marco (Venice); Place de la Concorde (Paris); and Piazza del Campo (Siena).

2 **Protective Spaces**
   These are usually small-scale, intimate, partially sheltered meeting places for sitting and chatting, for example, Place des Vosges (Paris) in the midst of a residential neighbourhood. They can also assume the form of semi-public courtyards such as those found immediately off the Kalverstraat (Amsterdam), like the Begijnhof, or the Kappelerhof (Zurich) just off the Paradeplatz.

3 **Casual Spaces**
   These take the form of public and informal commercial 'squares'
or 'junctions' such as the harbour in the Vieux-Port (Marseille), or the Bahnhofplatz (Zurich). Nodes in the traffic system which bring together pedestrians and public transport, for brief periods of time, are examples -- a moderate degree of social contact is possible, here.

4 Linear Spaces
These are the more traditional 'shopping' streets (both pedestrianized and non-pedestrianized), arcades, promenades, pedestrian networks such as North African 'souks'; gallerias or passages (Milan, The Hague, 19th century Parisian 'passages' or covered streets, Brussels' Galeries St. Hubert, etc.); the arcades in Bern or other Zähringer towns; the Ramblas in Barcelona; transit malls such as the Bahnhofstrasse in Zurich; and climate controlled, interior shopping malls such as the Eaton Centre (Toronto).

Various combinations of the above types can be created and different kinds of spatial organizations can be linked in complex arrangements of built-up and open urban forms, resulting in a mesh of buildings, streets and public 'squares' of varying architectural configurations.
A master plan must be based on redesigning the traffic system of a larger area and on restructuring residential buildings and uses of public spaces; otherwise, improvements can only result in developing some pleasant spaces at a very high cost.

Boudewijn Bach & Gerard M.M. Alink
'Improvement of Post War Estates' - results of the competition Woonwens-Verkeerswens '85
Urban livability is, to a large extent, determined by the ease of movement accorded to pedestrians, cyclists and car-drivers in addition to the efficacy of the prevailing public transport system. If a shift is to occur from privately driven cars to public transport, then a drastic improvement in the quality of the collective transport, in conjunction with walking and cycling, will have to occur. For this to happen (creating a saving through reduced road-expansion programs and a reduction in energy consumption), the city centre will have to be more effectively organized spatially and arranged in a safer, more comfortable and visually pleasing manner.

The city centre is the place where the most intense activity occurs. Thus it is the area which exhibits the greatest number of problems (e.g. polluted air, congestion, noise, lack of green open space, highest land values, etc.)

Fig. 4. Schematic organization of a typical European urban agglomeration:
LEFT Plan.
MIDDLE Intensity of land-use and all transportation.
RIGHT Intensity of noxious emissions by vehicular means.

However, it is also the symbolic 'heart' which possesses opportunities for social contact and economic exchange which are unequalled in other constituent elements of the urban organism. It is the space *par excellence* which brings people together on foot and bicycle, thus allowing a dynamic which has always been associated with urban culture. Hence the centre is the location at which the greatest attention must be placed.
3.1 Research on Design Interventions and Policy

When an intervention, such as a climate-protected shopping mall, is introduced within an inner-city area, it will act as a magnet attracting people from the surrounding, climatically unprotected environs. Research on the Hoog-Catharijnen Shopping Complex in Utrecht in 1974 indicated that initially, after the opening of the project, the intensity of pedestrian movement in the inner-city grew less slowly. One year later, its growth accelerated again (presumably due to the attraction of the ‘new’ development, from which it received positive spin-off).
By 1977, the inner-city growth returned to its original momentum and thereafter remained unaffected by the newly inserted shopping mall (which was working at full capacity and by 1979 saw a stabilized intensity of pedestrian movements)\textsuperscript{12}.

A mode of movement which also requires weather protection - close to interchange points and destinations - is cycling. In the Dutch context\textsuperscript{13}, about 70\% of cycle trips are shorter than 2 Kms. This makes biking an extremely effective way of moving about in high-density areas and as a means of commuting to regional transportation nodes.

By the early 1980s, cycle use increased again within The Netherlands, as a whole, changing modal split trends. This was spurred through a policy which was promoted by the National Government. A recently released plan (whose objective is to reduce the growth of private car use) of the Dutch Ministry of Transportation and Public Works\textsuperscript{14} provides valuable data dealing with these cycling trends. Some of the more interesting facts revealed were the following:
- By the year 2010, a 30% increase in bicycle use is considered desirable. This situation would tend to reduce overall car use by roughly 12.5% relative to the present condition.

- Throughout The Netherlands, major displacements (defined as those in excess of 500 metres) by cycling are 29% of the total. Close to 47% are by car (with driver-only and driver-plus-passengers), 17% by foot, 3% by bus/tram/metro and 2% by train.

- Of those who use the train, 35% use bicycles to or from the railway stations - a significant percentage.

- From 1950 until 1963, the number of bicycle passenger kilometers per year has risen steadily. Then there was a drop until the energy crisis of 1973 when cycling use increased gradually (with some 'dips' here and there) assisted, in part, by government subsidies which promoted bike ridership.

- 60% of all trips equal to or less than 5 kilometers occur by cycling (making up 29% of all modes).

- The cost of cycling infrastructure is extremely reasonable when compared with road and highway construction costs (e.g. in Delft with about 90,000 inhabitants, the cost for the entire cycle network infrastructure is equivalent to roughly 5-10 kilometers of motorway). The total length of bicycle networks in Delft was 235 Km. By adding 2.5 Km. of 'missing links' the use was increased by a further 10%.
Of surveyed user dissatisfaction, 19% of respondents cited 'stolen' bikes (mainly at railway station) and 34% cited 'inadequate bike-parking facilities'. In the above text, 'climate' or 'weather protection' was never mentioned.

However, in a large scale public research project for the Region of Eindhoven, in The Netherlands, called 'Bevordering Fietsgebruik' (Improving Bicycle Use), May 1990, mention was made that protection from both weather and wind would be helpful and be positively received by cyclists.

This suggests that if either reduction or stabilization of car use is to be integrated within future policy, then improvements in the design of public transport facilities, interchange stations, cycle tracks and pedestrian movement systems will be imperative.

3.2 A Planning Concept for Channelling Urban Movement

One of the characteristics of praiseworthy urban areas and centres is the concentration of people in the collective, public space. Jan Gehl developed a series of 6 strategies to increase and promote outdoor human activities. These are:
- Assemble or Disperse,
- Integrate or Segregate,
- Invite or Repel.

Nowadays, the logic and the simplicity (of measuring drawing) of the grid makes this planning concept the most widespread for built-up areas
and their associated (infrastructure) networks.

Grid-networks dilute the flow. This is excellent for car-traffic and other means of transportation. But by diluting, one loses a special quality people like - the so called 'symbiotic-effect', making things appear much more dynamic when only slightly more people and attractive activities are injected in the public space. Niek de Boer suggests that the best quality of urban life is guaranteed through:

- People meeting People,
- People meeting Information,
- People meeting Products.

One could say that the diluting character restricts the utility of the grid to create 'symbiotic-effects' in public space. The addition of some radial axes and paths will bring more people together at the crossing-points of these radials with the basic grid. Again, diluting will diminish this effect if overdone. Fifth Avenue in New York or the square where Gaudi situated his church in Barcelona are special because there are no other radial public spaces nearby.

Another useful design-tool for creating 'symbiotic-effects' is to locate destinations that 'inject' people in the public space precisely on the movement axes of pedestrians. The pedestrian-exits of a car-park, a railway-station or main bus-stop should be carefully situated on this movement-axis.

Fig. 11.

LEFT Rue des Bouchers - Brussels, Belgium
Mixed-use pedestrian street crossing the Galeries St. Hubert, at right angles, is injected with life from the arcade. Lined with restaurants and cafés on both sides, and having a comfortable width, it is animated 18 hours a day.

RIGHT Concentrated linear organization guides pedestrian movement in a grid. Directly outside of the arcade or mall, activity is diluted as a result of the grid-pattern. © M. 't Hart's 'On-the-Way' registration-system.
Locating bus-stops and car-park exits at the ends of a shopping street results in a more lively and attractive urban street.\(^{18}\)

Because of the slow speed of pedestrians, even partial radial (pedestrian) axes considerably enlarge -in a grid pattern- the catchment area of a central location.\(^{19}\)

In 1980 Jan Wittenberg connected three planning-tools to enlarge the catchment-area of a centre or a railway station within a grid layout. To increase, simultaneously, the liveliness of the public space and the (potential) use of the station, he recommends insertion, at the same time, of:
- Radial pedestrian/cycle-axis towards the main station entrance;
- Increased density of dwellings, and other functions, within an 800 meter radius (optimal for pedestrians with 1250 meters being optimal for cyclists);
- Location of the station in the center of a circular or actual square built-up area.
In summary, to assure and sustain liveliness, it is important to:

1. Concentrate both people and activities.
2. Utilize a linear/axial configuration, wherever convenient.
3. Inject people at the ends of the linear space.
4. Locate 'people-injecting' functions such as parking garages, high-frequency-service transit stops, intensively used public buildings, etc.
5. Increase building density in the area, especially at the 'anchor-points' which 'feed' the system.
6. Combine linear and radial configurations so that they mutually reinforce each other.

### 3.3 Movement through Sheltered Streets and Public Spaces

The city can generally be considered to be composed of 'places' or nodes of activity (often accentuated by architectural landmarks) and 'paths' or movement systems for pedestrians, cyclists, cars and public transport. The first 3 sections of the European Charter of Pedestrians' Rights (adopted by the European Parliament in 1988) state 21:

I. The pedestrian has the right to live in a healthy environment and freely to enjoy the amenities offered by public areas under conditions that adequately safeguard his physical and psychological well-being.

II. The pedestrian has the right to live in urban or village centres
tailored to the needs of the motor car and to have amenities within walking or cycling distance.

III. Children, the elderly and the disabled have the right to expect towns to be places of easy social contact and not places that aggravate their inherent weakness.

This suggests that public urban spaces and streets should be carefully integrated within the urban tissue and that they should not be treated as 'residual' elements or 'spaces left over after planning'. These should form an essential component of the urban structure, be clearly connected to important functions, and possess symbolic representation with clearly defined 'identity'.

Fig. 15. Lloyds Passage - Bremen, Germany
LEFT Structural system holding up the roof of the recent glazed-over, existing shopping street.
RIGHT Entry/Exit point of the Lloyds Passage in Bremen deflects wind thus creating a more comfortable indoor environment.

Pedestrian and cycle movement should be clearly separated. Some vertical indication should be identified such as changing levels for each type of use. These can be integrated within arcades or can retain the interior of the arcade for pedestrians with an attached canopy at the building's edge under which cyclists may ride. Alternatively, an overhead shelter system can be constructed within the right-of-way of the road itself for use by cyclists. In the case of intensively-used narrow streets, consideration might ultimately be given to total covering of the street right-of-way (the newly completed 'Lloyds Passage' in Bremen, Germany is a superb example of a glazed-over existing shopping street in the city centre) especially if its use is reserved exclusively for cyclists and pedestrians. The possible inclusion of public transit of a non-polluting type, e.g. electric tramways or buses, could be considered when the right-
of-way is wide enough.

Fig. 16 SAS City Bus Terminal/World Trade Centre - Stockholm
A superbly conceived overhead shelter system shields pedestrians while waiting for a bus. This special 'sidewalk' is often used as a shortcut.

In extreme climatic conditions, protected space will be essential. When providing such protection, it is imperative that the open channels of the streets and public urban spaces retain their dominant roles (even though occasional aerial walkways or skywalks, and underground passages may be incorporated).

Fig. 17. LEFT Arcade accommodating both pedestrians and cyclists. RIGHT If arcade is too narrow, canopy can be added for cyclists.
An excellent example of ‘galleria-type’ climate-protected pedestrian movement can be seen in Hamburg’s impressive ‘Passagen-viertel’. Here, seven recently constructed passages (of which the Hanse-Viertel is the best known) are combined with the ‘Fussgängerzone’ (pedestrian precinct) which is comprised of open-air, car-free streets and the Colonnaden (built in 1877). Together there are roughly 1.2 Kms. of interiorized passages running through existing buildings in the city centre, meshed with approximately the same length of pedestrian streets resulting in a choice for users of being either indoors or outdoors - or both, depending on the weather and the season. Hamburg, in fact, boasts more arcades (Passagen) than any other major city on the continent - nine in total dating both from the 19th and 20th centuries. These include hotels, shops, restaurants, coffee-houses and department stores woven into the historic fabric of buildings and public spaces along the riverbank of the Alster. As early as the 19th century, the Alster Arcades were completed. They allowed people to stroll, eat, drink, shop and meet friends totally protected from inclement weather (rain or occasional snow). The ‘Passagen’ are viewed as part of Hamburg's leisure activities of walking, gazing in shop-displays and spending free time.

Fig. 18. Alster Arcade - Hamburg, Germany
19th century arcaded walkway lined with shops, cafés and a marvellous view of water is always a popular destination.

Today, the city centre illustrates precisely how the combination of enclosed (privately developed) arcades can be integrated with the city's
network of public streets to produce high-quality environment for inhabitants and visitors alike. In this huge metropolis with an underground subway, there was no need to introduce either above-grade or below-ground paths replacing the traditional street system. In the heart of the town, people have been accorded priority over vehicles without resorting to any vertical separation.

Fig. 19. 'Passagen-Viertel' (Arcade District) indicates the 1.2 Km network of connecting arcades inserted within the pedestrian zone of Hamburg's City Centre; No. 5 = Hansa Viertel, No. 7 = Galleria.

Similarly, in Stuttgart, the Calwer-Passage has been integrated within the Calwer Strasse pedestrian area incorporating housing, religious functions, shops, offices and access to the U-Bahn and S-Bahn transit systems. This multi-use architecture serves as an illustration of aesthetically pleasing and functionally efficient urban redevelopment.
Although weather protection is not generally considered to be a major problem throughout Germany, many German cities have lately adopted an approach which does protect pedestrians - mainly from precipitation in centrally located shopping areas. In Hamburg, overhead canopies continuously shelter people by projecting over the sidewalks from buildings to which they are attached. In September 1989, the City of Wilhelmshaven, situated on the cold, windy North Sea close to Bremen, sponsored a competition for a continuous system of galleries (arcades), canopies and passagen to be connected within the pedestrian zone and the parking areas. The idea was a create what are called 'trockene Wege' (dry paths) making walking more pleasant, comfortable and attractive.
Bern, Switzerland is a particularly noteworthy example of climate-protection from wind, rain and snow. The ‘Lauben’ or linear colonnades/arches which run the entire length of this ancient city’s major streets (slightly raised above the roadway) are integrated within extremely well preserved 17th and 18th century houses under which they are incorporated (the city having been founded in 1191). Within this network of ‘arcaded’ streets accommodating cars and pedestrians alike, mid-block, covered cross-connections and open-air narrow lanes and alleys link the arcades of parallel streets within the old town. Newer ‘Passagen’ were skilfully built within the older network. Many are heated with infra-red lamps during winter and the colder seasons creating desirable micro-climatic conditions both in the mid-block connections and within the arcades themselves. Year-round use for cafés, snackbars, and even vendors’ stalls is possible.

Fig. 22.

**Spitalgasse - Bern, Switzerland**
Continuous arcades and transit-mall provide a choice for pedestrians of walking under the ‘Lauben’ or in the open-air street.

**Kramgasse - Bern**
A multitude of informal activities naturally locate under the shelter of the arcades and take advantage of their pulsating environment.

**Von Werdt-Passage - Bern**
This late 19th century arcade still remains one of Bern’s vital ‘interior-streets’. It forms a link between two parallel arcaded streets close to the main railway station.

**The Ring - Biel/Bienne, Switzerland**
Arcaded buildings with turrets and the Banneret fountain (1546) form an elegant old-town architectural ensemble.
If one were to adopt, as an index of pedestrian comfort, the ratio between the total length of protected pedestrian ways and the number of inhabitants, then Bern (having approximately 8 Kms. of weather-protected walkways) with roughly 300,000 regional population has about 1Km./37,500 inhabitants of climatic protection. The City of Calgary, Alberta, with the largest ‘+15’ (feet) skywalk system in the world, and its 600,000 population supports 10 Kms. of protected aerial walkways, or 1Km./60,000 inhabitants.

If only the actual ‘urban’ population of Bern were used, which is 135,000 then the ratio of protected ways would increase to 1 Km./16,875 persons probably making it the most completely climate-protected system for pedestrians anywhere in the world - certainly unsurpassed anywhere in extent or importance north of the Alps. The ‘Lauben’ of Bern are a living testimony of how arcades can play a truly significant role in the organization of town form and the use of urban space.

The design principles embodied in the arcades of Bern (and in other Zahringer towns such as Murten, Thun, Fribourg, etc.) in its old town are superb examples of how old ideas can, in the present era, structure daily life and have retail behaviour adjust to an historically imposed urban form. Bern is lively, dynamic and full of vitality while offering diverse activities to a broad spectrum of users. The centre has direct access to the centrally located Bahnhof (main railway station) and, as well, makes provision for huge underground parking garages with electronic panels.
displaying information about how many available spaces exist in the city's various parking areas.

Although historic examples cannot readily provide instant solutions to contemporary dilemmas, they can offer guidelines and valuable insights which will serve as a basis for new directions - even when these are little more than the modification of older, time-tested responses. The relationships between density, weather-protection, mixed-land use, the dense network of public transport, accommodation of the car, compactness and the climate-protected pedestrian movement systems, can all be witnessed in Bern's urban structure. This city performs well - within its centuries old container - even when evaluated by the most modern performance standards. Most importantly, it still serves as a potent prototype for inner-city redevelopment designs and proposals.

Modern planners, engineers and urban designers would be well advised to analyze this exemplary case-study. There are probably more lessons to be learned here than from many 'post-modern' approaches to creating humanized public space. The 'outside-inside' urbanism has been produced without resorting to any vertical separation such as aerial skywalks or underground systems which tend to compete with street-level urban life.

The above 'livability' concepts of spatial organization have as their foundation the goal of sociability, public safety, and the preservation of the centre as an important 'place' of personal and collective identity. Their main purpose is not only to accommodate commercial and retail activities but also social and cultural life within a high-quality architectural context.
Fig. 24. **Lange Zelke - Vlissingen, The Netherlands**
Project for total climate protection by glazing-over the entire shopping street reserved exclusively for pedestrians. Completed in 1992, its success has increased the regional shopping radius by an additional 10 Kms.

Fig. 25 **Walstraat - Vlissingen, The Netherlands**
Different streets receive varying treatments for shelter from the weather in this region with abundant wind and rain.
Figures 33/34 are artist impressions by Loek Meenhorst for the design by Wisse, Tuinhof, Slemmer, architects, Vlissingen, The Netherlands.
The starting point of urban composition and, even more so, of urban recomposition must be, not the elementary component, but an accurate idea of public space.

Europan 2
Living in the City: Re-interpretation of urban sites - 1991
4 GENESIS OF THE ‘PASSAGE’

The true impact of the passage was found in 19th century France. Political and social factors were held accountable for their magnificence. During this era, streets were congested by horse-drawn carts, and hence the source of intolerable stench, filth, and disease.

A new wealthy ‘bourgeoisie’ consisting of lawyers, bankers, and businessmen demanded a new, clean, well-lit, elegant environment, in which to shop, meet, mingle, café-sit, discuss politics and literature, and be genuinely isolated from the inhumane life of the street. Passages responded to this need. They were the first public urban spaces removed from the discomforts of the traffic and filth of the street systems. 

The principle of the passage became popular because the street existed without any sidewalks, was dirty and foul, dangerous for walking and window-shopping, poorly paved, and without drainage systems. Thus, the poor state of existing street life played a crucial role in the creation of the passage.

Although France was a leader in its understanding of this idea, other national settings also provided the context for the development of passages. The first passages built outside of France, in London, were the Burlington Arcade and the Royal Opera Arcade.

Between 1820 and 1840, real estate development and speculation flourished and the construction of passages accelerated. Wealthy cities with thriving public street life, including Milan, Lyon, Brussels, and Glasgow would emulate Paris’ leadership in passage design. Italy’s major contribution to passage design included the Galleria Vittorio Emanuele II (Milan), and the Galleria Umberto I (Naples), among others throughout the country. Belgium’s Galeries St. Hubert (Brussels), is considered a worthy example.

The first passages were reflections of the evolution of a newly emerging capitalism. Revenue generators for luxurious shops, restaurants, cafés, and salons; real estate speculation opportunities for developers and businessmen; and show places for the wealthy ‘bourgeoisie’, the passage was, in effect, accessible to the public at large. However, the fashionable passages of the day really catered to the interests of the wealthy and those seeking luxurious surroundings.
Adjacent to the Galleria, both sheltering systems work in harmony, set at right angles to each other.

Passages could easily be developed because large connected plots of land became available at low prices usually as a result of the expropriation of church property and property of the nobility.

The passage was, for the most part, private property accessible to the public. It served both the land developer, and the pedestrian; and was
always the result of private real estate speculation. This was the case until the development of the Galleria Vittorio Emanuele II - the result of an international design competition initiated by the City of Milan in an effort to create a new, strong, vital city centre. This is one of the first examples in history of a ‘passage’ developed and administered by a city.

4.1 Historical Precedent and Design Trends

The historic town teaches us that major axes of movement occurred from the town’s gates to its central marketplace. Most of the shops were situated along the retail corridors encouraging linear movement. A good strategy for rebuilding the modern town, based on historical archetypes, is to designate ‘gates’ such as pedestrian exits from parking garages, and public transport stops (trams, buses, etc).

![Typical historic market town organization indicating Gateways, Market and axial organization of movements and functions.](image)

![Willisau, Switzerland](image)

Fig. 28.

The optimum walking distance in historical towns was, on average, not more than 1.5 Kms. from the wall to the centre. Since these towns all exhibit what is referred to as ‘human scale’, this suggests that average walking distances, today, should not exceed about 1.0 - 1.5 Kms. However, due to excessive dependence on the motor car, our acceptable walking distances - under standard conditions - have been severely diminished.

A factor that may reduce today’s average walking distance is the obstacle created by heavy traffic and high-speed roads. The time pedestrians have to wait, at intersections, for a safe crossing, is perceived as ‘lost’ walking distance. Furthermore, such a loss of time creates feelings of hostility targeted at the motor car increasing the perception of
'lost' time by 60%. Because one can walk in all directions, the potential area a pedestrian can cover, is dramatically reduced with the amount or number of street crossings and the accompanying waiting time at such crossings. This is one of the reasons that the Dutch Ministry of Transport and Public Works strongly recommends creating '30-Km/h.-Zones' which are as large as possible.

![Diagram showing the difference between Reaction time (R) and Stopping time (S) at different speeds of 30 Km/h and 50 Km/h.](image)

**Fig. 29.**

R = Reaction time, S = Stopping time

As vehicle speed increases, the driver's angle of vision decreases making it more difficult to see pedestrians planning to cross the road.

As vehicle speed increases, stopping distance is increased exponentially. This creates a dangerous situation which can be mitigated by enforcing 30 Km/h.-Zones.

Enlarging the area in which car drivers are forced to limit their speed to 30 Km/h achieves greater safety, reduces the braking distance and, as well, widens the angle of vision for the drivers bringing pedestrians more sharply into the view plane. Only the demand for bus-stops and collector roads with more than 400 cars/hour should be permitted to interfere with safe, comfortable, free-flow, pedestrian movement in residential and built up areas.
### Acceptable Confrontation Speed in Built-Up Areas

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Giskes & Vahl 1990

Fig. 30. In the Netherlands, it is established practice that children, the elderly, and the physically-challenged must be able to use streets without any hazard. Acceptable 'confrontation' speeds have been identified in built-up areas so that stopping distances (and driver reaction times) are capable of avoiding fatal accidents.

![Fig. 30](image)

Fig. 31.  
**LEFT** Narrow grid of crowded or high-speed roads reduces the range of pedestrians  
**RIGHT** Enlarging the 30Km/h-Area allows more pedestrians to reach centres of attraction within their 'walking-time-limit' resulting in greater concentration of people in the public space.

The Dutch Railway, as a result of research undertaken, discovered that most people will accept a walking distance of up to 600 metres to a station. At a higher-level station, people will accept a distance of up to 900 meters. Similarly, it has been revealed that under ideal conditions (visually attractive, relatively safe, animated and thermally comfortable with a good surface and weather-protection) an increase of more than 50% in distance will be tolerated.
Fig. 32. Under ideal conditions such as attractive street-facades and climatic protection, walking distance from Origin to Destination can be increased by up to 50% for shopping purposes, once the car is parked.

At present, with increasing emphasis on private living, (more time spent at home, in the workplace, commuting by car, watching television and Video such as VHS/VCR, working-at-home with the aid of microcomputers, etc.), we are witnessing an attempt, once again, to draw people back to city centres, to the public places which once served as the focus of town life. More housing is being built close to the town centres (often through urban redevelopment schemes) and there is greater mixed-land use combining offices with dwellings, surrounded by theatres, cinemas, shops, restaurants, cafés, and a host of functions promoting civic dignity (civitas), social encounter and the joy of urban living.

One of the expressions of this ‘urban renaissance’ is the return of the arcade or ‘galleria’. This is sometimes re-appearing as a glazed-over existing shopping street (e.g. the Lloyds Passage in Bremen, Germany).

Particularly in regions with climatic conditions which reduce the length of the outdoor season, the ‘glazing-over’ trend is quite widespread.

Fig. 33 St. Jacobs Passage - Vlissingen, The Netherlands
A glazed-over existing pedestrian street in the core of a small southern Dutch town creates a new elegant shopping environment.

Alternatively, overhead canopy additions to store-front facades (sometimes in the simple form of awnings) or a geometric insertion of overhead canopy/arcading systems within the central section of a
pedestrian street (currently being constructed at Vlissingen, The Netherlands), echo a need for better weather protection, especially in areas with heavy winds and rain. This is a countermeasure to many of the climate-controlled, enclosed shopping centres or malls which are increasing in extent within city centre redevelopments. The intention is to provide improved thermal comfort while encouraging street vitality.

The revival of the ‘passage’ has a living legacy in the planned ‘climate-protected streets’ and ‘gallerias’ of the 1840s in Brussels, the 1860s in Milan and the 1880s in The Hague. However, Europe’s largest ‘passage’ building era perhaps occurred in Paris, France during the period of 1823 - 1845 when over twenty such projects were built.

Some of these linked the Palais-Royal to the Grands Boulevards while others simply created ‘short-cuts’ between existing city streets creating elegant shopping arcades where the newly emerging middle-class could walk about in safety, comfort and cleanliness. These projects were part of the redevelopment of large parcels of inner-city land awaiting intensification and the ability to extract rentable commercial floor space. Those passages which connected nodes of important activity, function properly. Others attracted low-cost merchandise because they were not located on major pedestrian traffic-flows. What is important is that - perhaps unknowingly - they became the design motif for urban renewal projects more than 150 years later (this can be seen in a project such as Eaton Centre in downtown Toronto). Most of the Parisian ‘passages’ survive although some were closed in the mid-1900s and even as late as 1990 (Passage des Princes) 28. A revival prospects for connecting passages, special those linking to high-speed transit stops (Passage Grand-Cerf reopened 1992).
Today, in The Netherlands, one can witness three basic climate-sensitive development typologies for animating high-density urban areas, e.g. city centres, main railway station environs.

Typologies for animating high-density urban areas

* Glazing-over of a narrow, existing shopping street within the pedestrian zone.

* Insertion of a new, glass roof (or canopies attached to adjoining building facades) within the public space of the street.

* Narrowing of a wide space or street by extending the shop fronts, and then covering the remaining space with a glass roof resulting in a 'passage' or 'galleria' (arcade).
Fig. 37. Better climate-protection in shoppingstreet;
Reconstruction of Cronjestraat '92-'95, Haarlem, The Netherlands;
Design: Thijs Asselbergs, Town Architect of Haarlem and Bastiaan Knuijt;
Construction: Steel, glas, PMMA-plastic;
Pedestrian-research: Bouwdewijn Bach.
It would be better if there were continuity between residential and social activity areas, especially at crucial spots, where environmental capacity should determine the amount of traffic flowing through.

H.G. Vahl & J. Giskes
'Traffic Calming through integrated urban planning' - 1990
5 STRATEGIES FOR TRAFFIC-CALMING

In 1970, the 'Woonerf'(residential street) was introduced in The Netherlands mainly to render residential neighbourhoods safer and more pleasant resulting in local speed reduction for cars; discouragement of car through-traffic in the Woonerf; and in an increase of public open space for pedestrian use and children's play.

5.1 The Dutch 'Woonerf' Policy: Integrating Public Space and Traffic-Calming

By 1976, a legal basis was established for this concept, marking a radical departure from previous traffic management practices in residential zones. Curbs were removed, eliminating separation of sidewalk from roadway, and pedestrians were accorded priority over vehicles for the entire space officially designated as 'Woonerf'. Signs were erected indicating legal entry and exit points of the 'Woonerf' and pavement design resulted in a unique floorscape providing visual clues about the use of the area, e.g. where parking spaces were permitted. Bollards, trees, play equipment, bicycle parking racks, bends in the roadway, speed-reduction bumps ('sleeping-policemen') and other physical obstacles guaranteed a maximum speed of no greater than 18 Km/h. Furthermore, through-traffic by trucks and service vehicles was severely hampered. The street - legally speaking - became a shared space by pedestrians, cyclists and cars, with pedestrians and cyclists playing the major role. Conditions were designed for optimal walking and playing with the motorist being a 'guest' tolerated strictly on the basis of 'good behaviour'.

As a result of these features, 'Woonerven' reclaimed their former social cohesion with added greater safety and a more pleasant appearance. They provided auxiliary play spaces for children from the street and the neighbouring environs making the street part of the social realm while creating a 'gestalt' message that streets belong to the residents. The 'Woonerf' has generally met with considerable success in The Netherlands.
with a national opinion poll indicating 70% of the population considering it to be either desirable or very desirable. As an innovative idea whose time was long overdue, it is an exemplary town planning intervention.

Fig. 39. The Dutch 'Woonerf' concept. (source: Royal Dutch Touring Club, A.N.W.B.)
On July 16, 1988 the concept of 'Woonerf' was replaced by the 'Erf' ('Erven' being the plural form). This took a notion which was formerly applicable only to residential streets and areas and extended it also to shopping precincts, city centres and places of historic interest. The concept of traffic management in residential streets evolved and is now being applied at the broader urban scale.

Developed by the Dutch, and based partially on the research of Prof. Donald Appleyard of Berkeley, California, this brainchild of 'Erven' ('traffic-calmed' streets) has been widely emulated - with various modifications to suit specific cultural and institutional contexts - making a significant impact on the overall livability of European city centres and residential neighbourhoods. Seen as a traffic management tool with landscape improvements, the concept goes a long way toward helping people live in cleaner, quieter surroundings while, at the same time, placing an emphasis on social activity engendered by the re-organization of public space.

5.2 Planning Idea of the 'Woonerf'

- Design Prescriptions

Research carried out by the Province of South-Holland, demonstrated a relationship between traffic speed and hindrances in the road, for example, sharp curves or bumps. It was proved that a car will drive no faster than 20 km per hour when there are obstacles in the street placed at no more than 50 meters from each other. Those 20 km/h are the same pace as a walking horse and a riding bicycle. Therefore designers had to invent discontinuities and irregularities in the street network.

In order to promote the integration of slow-speed traffic and publicly-used space, it was thought that there should be no different lanes for slow and fast traffic. Cars, mopeds, pedestrians, and children playing should use the same pavement. It should be possible to park the car in one's own residential precinct. This is possible only if the road is laid out in order to reduce traffic speed and to prevent cars from approaching the dwellings too closely, for instance, by planting trees in front of the houses.

Furthermore, a Woonerf should not be part of the routes for freight traffic and public transport. For this reason, main roads cannot cross a Woonerf. In order to prevent cars from using all the best space, well-organized parking systems are a necessity.

- Resident Participation

The designers and planners in Delft were the first to acknowledge the
importance of resident participation, because the actual residents tend to have the best understanding of their local needs.

However, it was also found that at a larger scale, politicians and designers have a better view over conflicting interests, such as parking cars in other people's streets. Resident participation had to be restricted to people's own streets and their most immediate vicinity. In the Delft street lay-out, residents were involved in furnishing their own streets and could select the materials and colours of the pavement as well as the best locations for hindrances.

- Legal Considerations

Since a given residential street must meet a number of requirements before it can be called a Woonerf\textsuperscript{32}, legal considerations were prescribed and conformity to them became imperative.

In 1976 the Dutch Ministry of Transport and Public Works formulated a set of design standards and traffic rules applicable in a Woonerf. These standards are to serve two objectives.

**Woonerf Objectives**

a The users of the road will easily recognize that they have entered a Woonerf and thus will know how to behave.

b Designers of a Woonerf shall meet the basic requirements so that the Woonerf in question can obviously be identified and function as such.

Those traffic rules formulated in 1976 mainly deal with traffic signs, pavement and parking. Firstly, traffic signs at the entrance and exit roads of the yard must clearly separate the Woonerf from the surroundings. The residential function is to prevail.

An important principle is that in a Woonerf roads should not have separate lanes for slow and fast traffic. Cars, pedestrians and any other user of the street should participate equally. This is only possible if one cannot develop high speed. Therefore the law prescribes a speed reducing street lay out as described above with hindrances at no less than 50 m\textsuperscript{2} distance in between.

A further traffic rule meant to promote the integration idea is that any traffic participant coming from the right has priority. The normal rule in the Netherlands is that fast traffic has priority over slow traffic and mopeds. In a Woonerf this normal rule is not valid. So cars have to give priority to pedestrians or playing children when they are in a Woonerf.
5.3 Applications of the ‘Woonerf’

- Pre-War Residential Areas

The Netherlands government enabled research groups to carry out test projects in Rijswijk, Eindhoven and in a small town in Utrecht (a province in the central Netherlands). These were ‘Demonstration Projects’.

The goals of this research were to find out how residents appreciated living in a Woonerf, if safety was actually improved; and if the experiments were cost-effective.

It was found that regarding safety, the Woonerf concept works well. Practically no accidents occur within such areas - or possibly as few as one every twenty years. Hence, this topic needed no further research.

These demonstration projects also revealed that in pre-war estates with their narrow streets, parking is practically an insoluble problem. Bumps, humps, street-intersection surfaces, twists and other typical Woonerf objects need more space than in a normal street, and when parking space is lacking, the Woonerf lay-out suffers damage from parked cars.

- Post-War Residential Estates

Post-war residential estates are more spacious than estates built before the war. This means that parking space is not a major problem. Speed, however, is a big problem. The streets are wider, which implies that more pavement is needed to refurnish the streets into a Woonerf. The cost involved is high. Nevertheless, post-war areas offer greater opportunities for designers, because they have more ample space.

- New Residential Estates

Many new residential estates in The Netherlands have been designed as Woonerfs. The only way to slow down motorists was by making driving difficult. The road system had to be reorganized into labyrinths with curves and cul de sacs. People tend to become disoriented in such areas, especially in a large Woonerf. This is not very pleasant for residents receiving guests unfamiliar with the neighbourhood and thus may be a cause of isolation.

5.4 Lessons from Dutch Experience; 20 years of ‘Woonerf’ development

A well-designed Woonerf needs extra urban furniture in order to slow
down traffic. The road must be narrowed at regular intervals and other speed-reducing features must be part of the design. This is most inconvenient to large vehicles such as the garbage trucks, furniture removing vans, and fire engines. For the same reason, it proved to be impossible to introduce public transportation by bus. If this kind of traffic is to be possible, part of the Woonerf idea has to be dropped or modified. Narrow spots in the streets and sharp curves are no longer possible. This would permit cars to speed up again and that is contrary to the Woonerf objectives.

As for speed reducing features, the more vertical they are, the more effective. Their only disadvantage is that they cause damage to a car's suspension system. Another issue is that cars tend to speed up when approaching a narrow point in the road. Motorists don't like to queue up, and want to be the first to traverse the narrowed point if only one car can pass through at a time.

How do residents feel about living in a Woonerf? Those people who usually stay around the house, especially mothers with young children, are quite content with the idea. Furthermore, they would prefer more traffic-reducing features. Working people who have to leave the area by car, however, are less pleased with traffic hindrances.

Cyclists, as a specific group of traffic participants, are not very happy with Woonerfs either. It is very inconvenient to ride a bicycle or moped across raised street-intersection surfaces, twists and humps. Therefore, routes for two-wheeled slow traffic should preferably not pass through a Woonerf.

It was found that residents of a Woonerf tend to use their cars even for short distances since one of the concepts is that residents possess parking spaces extremely close to their dwellings. This seems a pity in a country, like Holland, which is so suited for non-motorized vehicles. The country is flat and weather conditions are moderate enough not to require the protection of a car which might be desirable, for instance, in countries or regions of extended, severe winter conditions.

Three lessons from 20 years of Dutch experience

1. Different goals prevailed during different periods of urban development responding to varying needs and trends. Designs have, therefore, taken on different configurations.

2. The Woonerf has been applied and utilized in areas with weak subsoils.

3. The Woonerf has been extremely useful in high density residential areas, particularly when a fairly high motor-car ownership and use exists.
The main goal of the Woonerf is to allow every car-driver to get as close as possible to the front door of the dwelling, while respecting the needs of others using the public space of the street in a safe and comfortable way. This applies especially to children and the elderly, calling for special measures to reduce through-traffic and to minimize vehicular speeds. This makes both the construction and the maintenance of a Woonerf rather expensive.

Was safety achieved by means of the Woonerf? The test projects indicated that safety inside the street was flawless but, on a larger scale, at the town level, that traffic situations were more or less as before. This is because the Woonerf is a small scale project. Designers concentrated on small scale projects and tended to forget about the rest. A more structural and a less expensive solution to the traffic problem was still to be found.

For these reasons, town planners started to look for cheaper solutions that could be applied on a larger scale than the Woonerf. These formed part of a Demonstration Project at Rijswijk to test three strategies for traffic-calming including 'low', 'moderate', and 'high' cost solutions.

Fig. 40. Large scale TRAFFIC CALMING Demonstration Project at Rijswijk, The Netherlands

Recently a new idea emerged, the ‘30 Km/h. zone’. This is a set of streets where cars are not allowed to drive faster than 30 Km. an hour and which still retain the physical impediments found in a Woonerf. But these 30 Km/h. zones have a more conventional road lay-out with separate sidewalks for pedestrians rather than a shared roadway. The normal traffic rules are valid in such a zone. It is important that roads in a 30 Km/h. zone appear unattractive to fast drivers. Usually traffic signs (to slow down drivers) will not suffice, making extra traffic-reduction features necessary every 70 meter. Here experience gathered from the
Woonerf is extremely useful for application in situations such as school crossings, main bicycle-route crossings, and homes for the elderly.

At present, Dutch town planners use the Woonerf for special occasions, e.g. at school entrances, main shopping streets, and town centres. Woonerf-style detailing can be and is frequently used within 30 Km.- zones.
A synthesis of virtually all traffic-reduction measures in current use has been applied in the newly planned town of Houten (6 Kms. south of Utrecht) where cycling, walking and public transport are fairly widespread. The principle of spatial organization here is based on a main bicycle radial-routing of 1.5 Kms. on each side of the central railway station located in the town centre (supplemented by pedestrian pathways). This structure is deemed to be extraordinarily effective in discouraging car use within the new town, in which approximately 20,000 inhabitants presently reside.

In Houten, an important principle is demonstrated: the catchment area of public transport stops should have at least one or more direct paths. These could be on the radial as such a configuration reduces the walking distance, and collects most pedestrians. The 'radial' paths should head toward the major direction of movement (e.g. the city centre) as this slightly reduces total travel time.

![Schematic arrangement of based on a system of traffic-calming sectors organized around radial cycling/pedestrian axes connecting residential areas to the town centre with its railway station.](image)

![Public Transport can cross the barrier between traffic-calming sectors.](image)

![Unplanned 'radial' shortcuts are the preferred routings for pedestrians. They create such paths by themselves when not provided in the town plan.](image)

![Main public space located in Houten's town centre is the 'collision point' of Public Transport and the 'radial' pedestrian- & cycle- systems.](image)
Typically, two reasons are given for cross-national comparative planning studies. The first is 'increasing understanding' or 'testing hypotheses in new situations'. The other is closely related to planning practice. It concerns the transfer of experience, ideas, instruments, and institutions from one country to another.

Ian Masser
'Learning from Europe' - 1992
6 LOCATING IMPROVEMENTS FOR PEDESTRIANS AND CYCLISTS

Until recently, the attention of transportation authorities was almost exclusively centred on the needs of car owners. In the 1970s the need for traffic safety for slower modes of transport led to the concept of 'Woonerven' and bikeways. Nowadays - as a result of increasing worldwide concern about the environment, and local opposition against car-domination - more and more authorities are starting to examine the possibilities of environmentally-friendly modes of transport.

Fig. 46. Decisions for the A-Variant indicate that reducing the growth of car use means increasing public transportation and walk/cycle modes. Improving climatic conditions will also assist in furthering this objective.

The potential of the bicycle and public transport are set against those of the car. Research has already taken place to determine if the bicycle could form an attractive alternative to the car. This research has not been without difficulties. The analysis of cyclist (and pedestrian) behaviour has proved to be time-consuming and expensive. Sending questionnaires to all road users, or counting all traffic movements in a town, is an exercise few authorities can afford.

In order to determine where to locate interventions such as climatic protection, improved crosswalks, etc. it is first necessary to analyze the historic spatial organization. This provides information about the original pedestrian use of space. When combined with data on existing movement patterns of pedestrians and cyclists, a rational overview of how the urban structure could function is obtained.
Once objectives can be established for the movement directions (e.g. radial) deemed desirable, policy can be formulated for urban development which reinforces them through functional location of activity nodes. This can either support an existing movement system or, alternatively, set in motion a new design direction\(^\text{37}\).

Designers should never forget to apply climatic data and movement analysis patterns when formulating policies or designing movement networks, including public spaces.

![Diagram](image)

**Fig. 47.** High-use, 'Direct & Radial', continuous networks should receive highest priority for protective measures & devices.

It is far better to identify a high-priority continuous network of cycle and pedestrian paths which can be covered (even if over a shorter distance but linking extremely crucial nodes) than to have a system of discontinuous, interrupted covered areas which are scattered throughout the built-up area. The 'continuous' solution is both more cost-effective and comfortable and should induce greater use of 'green mode' transportation\(^\text{38}\).

![Diagram](image)

**Fig. 48.** Desirable locations for investing in sheltered cycle-parking [P] and protected cycle traffic lights [T] are at the intensively used nodes.
Covered cycle-parking with locks (Bus-stop, Metro-station)
Overhead protection for both cyclists and pedestrians is desirable in proximity to tram or bus stations so that cycles can be protected and people waiting for trams have overhead covering especially from rain - or even occasional snow (cold or temperate climate zones) and also from solar radiation in hot or hot/humid climates. The extent of weather protection must be as good as or better than that provided when door-to-door transportation by car occurs.

Fig. 49. The extent of weather protection must be as good as or better than that provided when door-to-door transportation by car occurs. Particularly, at transit stops, protective devices must provide much more shelter than is the current practice.

Well-designed facilities for locking bicycles ought to be provided at interchange stops and destination points. The parking areas should be located so as to minimize walking distances to desired destinations. Any walking which is necessary should be protected. Locking should be easy to access and must deter potential theft. The locking-location should preferably have a device which covers the bike saddle from moisture so that it is comfortable to use at all times (such a design by Larsen and called ‘Cykelgarder’ has been introduced in Copenhagen and works extremely well).

Fig. 50. Cykelgarder, Copenhagen, Denmark
Bicycle parking covers the saddle and locks the cycle in one operation. Cyclists are certain to find their vehicles waiting with the advantage of a dry saddle.
6.1 Dutch Bicycle Network Studies

A number of pilot studies have been carried out in the Netherlands in the last decade, each viewing bicycle networks from a different angle.

**Urban Bikeway Concept**

In Tilburg (150,000 inhabitants) a high quality cycle-way (1989) runs from east to west through the city. It starts at the University in the west, through the city-centre, to a nearby village in the east.

The route is exclusively for cyclists, with confrontations between cyclists and cars being avoided as much as possible. The route was created within an existing built-up area, and succeeded in attracting many cyclists. Unfortunately it only attracted cyclists who had previously used parallel routes. Those who travelled north-south could not make use of the cycle-way.

In other words, the cycle-way did not cover a wide spectrum of users, nor did it have any measurable influence on the city modal split. The cost of developing the cycle-way prevented the authorities from constructing a north-south route.

**Missing Links Concept**

In Delft (140,000 inhabitants), 40% of road users in the 1980s were cyclists. However, they used the bicycle-network haphazardly. Despite an extensive cycle-network, cyclists used parts of the road network, leaving parts of the bicycle-network unused.
In the 1980s, a successful 'missing links' design was implemented. This steered the cyclists towards the bicycle-network, influencing the modal split so that Delft is known as the 'bicycle-city'. Unfortunately, the construction and upgrading of the network was only possible through a governmental grant.

**Bike Spine Concept**

Restructuring built-up areas and city centres into sectors, and realizing Houten (New Town) as a car-free residential area, increased bicycle-use for short distances to schools, public transportation local shopping centres, and recreation, creating the bike-spine concept.

The demonstration-projects show a need for an inexpensive and efficient method of cyclist behaviour analysis, avoiding the construction of a costly and inefficient bicycle-network.

![Various uses of Star Analysis in developing concept projects:](image)

**LEFT** Urban Bikeway Concept (Demonstration Project Tilburg).
**CENTER** Missing Link Concept (Demonstration Project Delft).
**RIGHT** Bike Spine Concept (Houten New Town).

### 6.2 Developing a basic infrastructure network: a User-Group approach

The significant growth in car mobility has not only led to environmental problems and land scarcity but also to reduced accessibility
and livability in our towns. A traffic and transport system needs to be developed that does not cause future generations significant problems in their daily lives. On the one hand, this involves measures that discourage unnecessary car use (parking management, and road pricing for example), and, on the other hand, strengthening alternatives to the car. People will leave the car behind only when there is a viable alternative for their journey. For shorter distances, the bicycle is a realistic alternative, but also for longer journeys, if combined with improved public transport as before- and after-transport. In 1987, the European Parliament passed a resolution (A2-183/86) which stated the need for promotion of cycle use within the transport management policy of local authorities.

Route Optimization versus Network Realization

A hierarchical cycle-network fits well with traditional road patterns and layout of most housing estates, but rarely provides information about the needs of special users or their numbers in a projected network. The grid-layout tends to lengthen the path for cyclists compared with a network based on the location of main cycle-destinations, as well as to create situations of high risk due to increased frequency of traffic crossing manoeuvres. Also, at the beginning of a bicycle promotion scheme, there are no users to define any requirements concerning width, path direction, or quality in constructing sections of the network. To promote use, it is far more important to grant some specific cycle-safe routing for those user-groups that prefer, or can easily switch to, the bicycle. It can be concluded that a partial radial network has the most positive influence in promoting cycle use. The provision of cycle facilities concentrated on a densely used radial route is better than widespread provision at various unrelated points.

User Groups as a source of Design Information

Due to the diverse motives for which the bicycle is used, behaviour of Cycle-User groups varies enormously. Thus cyclists hurrying to work require the shortest, quickest route. Children may react unpredictably and sports and racing cycling behaviour pays little attention to other users. Each group places specific demands on the route, comfort, and directness of the network. There are within each User Group, differences in the levels of acceptable risks at the 'bicycle-car-confrontation'. This makes it impossible to design cycle routes that simultaneously satisfy all the groups. Research carried out by J.Giskes and J.Vahl in The Netherlands, shows the acceptability to User Groups of speed
confrontation differences. From their results, the categories A, B, and C have been developed:

**Group A:**
'Vulnerable to traffic' (10 to 16 years, the elderly, and the hard of hearing):
- movements over short distances;
- speeds lower than 15 Km/h.;
- vulnerable;
- delayed reaction times.

**Group B:**
'Mobile adults':
- speeds less than 30 Km/h.;
- well placed to avoid accidents by avoiding actions.

**Group C:**
'Sport, training, light motorized 2-wheelers':
- speeds higher than 30 Km/h.;
- group forming, with problems for groups A + B.

The main advantages of distinguishing the groups into A, B, and C are: the identification of important user characteristics; the routing requirements per user group based on destination; and the measures necessary to ensure suitability of the route for the user.

It is also worth considering: the shifting of other vehicle uses to the benefit of bicycle stimulation ('Priority plans' for public transportation, local shopping centres, and concentrations of jobs and people); making sure safety is a high priority for vulnerable users; and developing coinciding path use by various groups that need extra-safe paths and junction solutions.

A 'Base Network' can be designed as a summary of all the various potential cycle movements. In the Base Network, it will become clear which parts of the routes need priority.

**User Groups Distinctions**

Regarding plan situation and per 'User Group', there may be considerable similarities in: the number of (potential) cycle journeys; the time periods of the journeys; the destinations; and the acceptable level per user group of the confrontation in traffic situations.

**Vulnerable**
Young children may display unpredictable behaviour and have limited traffic experience. They can only cycle limited distances, and are very sensitive to gradients. Pupils of 12 to 18 years have more experience in
traffic but can get themselves into dangerous situations. They can cycle longer distances because of their increased stamina.

**Mobile adults**

At work locations, most employees are older than 18 and can choose between a bicycle or car. At the local shops, the bicycle is used as a shopping trolley between the shops. Town-, district- and village centres offer more diverse recreational activity, and hence the length of time spent shopping is extended. Journey time and the distance from shop to parked bicycle are accepted as being potentially longer. Halts/stations for frequent, high quality public transport attract cyclists from residential points, in the User Groups 'employees', 'pupils/students' and 'shopping/town centre visitors'. For social activities there is a dispersal both in time and space in small numbers, but concentrated into relatively high intensities in the evening. Origin and destination and points between them are difficult to define. For many there is no alternative mode of transport.

**Recreation & Sport**

There is a distinction to be made between 'touring with the bicycle' and reaching a recreation destination. If these two activities are not split, it is impossible to identify the correct design concept. Sport cycling is based on performance, and leads to high speeds, which may make cyclists more vulnerable.

In principle, cyclists live geographically dispersed in relation to the destinations to which they intend to cycle. Therefore it makes sense to carry out only a general inventory, per User Group, of the origin areas and potential numbers of cyclists coming from those areas. In order to design cycle routes for that group's characteristic destination point or zone, the actual route does not need to extend further than the general centre-point of each origin area. Thus the planning becomes destination based and not 'home based' or 'road hierarchy based'.

The relationship between origin and destination can be visualized in a pattern of desire movements. Collecting all the desire lines together gives a picture of the route sections that offer the most potential for promoting cycle traffic, and also the sections of the network that need to be given special consideration. A railway station attracts a different type of cyclist, over a greater distance, than a shopping street or school. Children and the elderly are more vulnerable and therefore require, stronger traffic safety measures than the average adult. In densely-built historical areas and in concentrated new residential areas (20 Km/h.-zones), categories A, B and C may be mixed. By mixing the categories, the demands of the most vulnerable, i.e. A, must be met. The highest priority goal of most networks will be to promote cycle traffic, so they need to comprise routes with the greatest opportunity of attracting the appropriate cyclists. An
advantage of the identification of the potential routes for the various groups, is the visualization of the occurrence of route sharing by the groups. The Base Network is a selection of the main cycle routes with (potentially) high intensities of cyclist use. In the second phase, the parts of such a network can be integrated into a Base Network. It is important to know the potential routes of the user groups. Basing cycle networks on these routes have advantages, as follows:

- minimizing investment by limiting necessary networks to densely used sections;
- investment is efficient due to identification of specific user-groups and their needs;
- shortest cycle routes exist for the user groups concerned;
- knowledge about cycle use motivation can be directly applied;
- owing to the intensity of use on the main routes, there can be a high level of social control;
- excellent spatial orientation for the cyclist is assured.

Basing cycle networks on these routes, involves steps 42.
Design-steps for economical cycle-network design

**STEP A: Analysis of Potential Cycle Use**

- **A1** Categorization into origin areas of user groups
- **A2** Locating destinations (D) of each user
- **A3** Patterns of journeys to destinations (D)
- **A4** Route definition per (per group) destination
- **A5** User Group related theoretical routes

**STEP B: Analysis of Present Traffic Problems**

- **B1** Traffic intensity, driving speeds, infrastructure
- **B2** Concentrations of cycle accidents
- **B3** Main routes with high parallel (/) car intensities or speeds
- **B4** Main cycle flows across (X) routes with high car intensities or speeds
- **B5** Location of cycle parking facilities
STEP C: Confrontation with the Car Network

C1 Prioritize zones which ensure cycle safety

C2 Prioritize zones which promote cycle traffic

C3 Location, design and specifications for main bicycle network

STEP D: Selection of measures

Step D

[M] = Detailed specification for specific user needs within the bicycle network
Climate, in particular, must be given a mediating role in planning and design. It must assume a pivotal position between socio-cultural requirements and their corresponding built environments.

Norman Pressman
'Cities Designed for Winter' 1988
7 PRIORITIES FOR URBAN-CENTRED CLIMATE-PROTECTION

The highest priority for climate-protection clearly rests with:

1 Pedestrians, and
2 Cyclists.

Undesirable weather induces car use thereby detracting from utilization of the 'green-modes'. All 'waiting zones' e.g. for trams, buses, trains, etc. should preferably be weather-protected as should areas where traffic lights exist and where waiting times exceed 40 seconds.

Fig. 52 Löwen-platz (L), Stadelhofer-platz (R), Zurich, Switzerland
LEFT Tram stop offers excellent shelter in addition to architectural elegance,
RIGHT Newly designed tramway shelter adjacent to regional railway station.

The longer the outdoor exposure time (in unpleasant conditions), the greater should be the effort to provide better conditions, e.g. pedestrians should be the highest priority (the lengthiest time unprotected) followed by cyclists and people waiting at bus/tram stops.

Fig. 53 Highest order of protection proceeds from left to right.

Since not everyone owns or has access to a car, public transport will always remain essential. Children, elderly, physically-challenged and economically disadvantaged are among those user groups which are least capable of moving with the aid of a private car. Transportation policy should aim at securing safe accessibility and be embedded in a strategy of ecologically-oriented urban development. Transit by Walking and Transit by Bicycle should complement one another in the same way that walking and public transport constitute two sides of the same coin. Such systems
are environmentally-friendly, causing virtually no harm or damage to the natural or built environment and, in addition are energy conserving. They clearly promote 'greener' living.

Furthermore, 'destination points' should also be designed with climate-protection in mind. Where ice build-up occurs, melting or sanding of these areas should receive extremely high priority, during winter and the marginal seasons.

Fig. 54 Street Market, Delft, The Netherlands
Temporary awnings make browsing and shopping less unpleasant in inclement weather.

In deciding the levels of priority for weather-protection, the needs of various user groups must be carefully specified. User characteristics vis-a-vis trips (origins and destinations) will determine the movement network, its specific locations and the detailing of the sheltering elements, within the overall framework of the town or district. The extent of protection will have to be seen as a function of both need and cost.

In areas of significant pedestrian activity, consideration should be given to the requirement for weather protection devices such as canopies, awnings, arcades and colonnades 44.

Urban design concept plans should indicate major pedestrian links
between origins and destinations suggesting where climatically sheltered zones might be realized.

Fig. 55 Rathausbrücke, Zurich (L), Ostermalmstorg Stockholm (R)
LEFT Specially designed benches have movable back-rests offering users the choice of sun or shade orientation, with different vistas.
RIGHT Benches always face toward the sun in Stockholm's public spaces. Sunworship has been a popular pastime in most northern regions.

Wherever possible, animated urban activities should surround or line the pedestrian spaces rendering them more visually attractive, drawing people to them and making them safer places. Functions such as shops, cafés, eateries, workplaces, and cultural facilities (cinemas, theatres, etc.) will normally sustain urban life acting as a counterthrust to often dead or sometimes abandoned space. When 'backed-up' by dwellings, providing a resident population in the vicinity, extended use of the public domain will result.

Achieving suitable micro-climatic conditions will undoubtedly enhance the environmental quality of life. Therefore, performance standards which protect pedestrians and cyclists from increased wind speeds induced by design and positioning of buildings must be formulated. These should be combined with measures to guarantee daylighting requirements, proper air circulation and sunlight access - through regulating built form, using front and rear sky exposure planes - especially in areas of intense public use.

The environments benefitting from climate-protection strategies and improved micro-climatic conditions should be those which connect important nodes of activity such as shops and public transport stops, public squares and cycle-parking zones, major institutional buildings and high-use functions (e.g. railway or bus stations). If these strategies also contribute toward energy conservation and environmental protection, they will have made a powerful impact in improving urban quality. Both physical design and social organization have to work together to support everyday life, and urban architecture has an important role to play - the survival of city life depends on meeting the threat of wasteful and
polluting consumption and on reducing private motor car movements\textsuperscript{46}.

\begin{figure}[h]
\centering
\includegraphics[width=\textwidth]{fig56.jpg}
\caption{Schmiedenhof, Basel (L), Storgatan, Luleå, Sweden (R)}
\end{figure}

\begin{description}
\item[LEFT] This intimate courtyard which benefits from an excellent microclimate attracts café patrons throughout the year. It is located next to the major public space - the Marktplatz.
\item[RIGHT] In this town of 50,000 inhabitants just south of the Arctic Circle, the major pedestrian shopping axis is lively even at -30\degree Celsius. Log-burning fire pits add warmth, and light, to the animated winter scene. Pavements are heated thus melting ice and snow accumulation.
\end{description}

Traffic-calming devices such as those applied so successfully in The Netherlands, Britain, Germany, Belgium, Switzerland and other Western European nations can make substantial gains in achieving reduced motor car use if combined with improvements in various forms of public transportation\textsuperscript{47}.

A word of caution should be added: while it may be desirable to improve the micro-climate within the city, it is also possible to overprotect people. One should have the opportunity of being exposed to the beneficial aspects of climate - by choice. This includes being in sunshine (minimizing shadows cast by buildings), having contact with nature and enjoying the various moods created by shifting seasons. Even experiencing bad weather e.g. a blizzard or driving rain shower- on an occasional basis- can be exciting, if one so chooses. What is crucial is to provide choice for all users when walking or strolling, standing or sitting. Detailed site planning and urban landscape design can achieve close to ideal conditions when meticulously applied throughout parts of the urban fabric.

Flexible utilization of the public realm in different seasons will ensure greater livability for users regardless of their needs or trip destinations. Adopting a climate-sensitive approach (in less than ideal climatic regions) is clearly the best strategy (when combined with appropriate design) for achieving a 'green-oriented' lifestyle which will be desirable well into the 21st century.
In general, if livable urban spaces are desired, especially within the city centre, a number of high priority guidelines will have to be respected, as follows:

1 Public Spaces must be readily accessible to a complete range of users. Such spaces should be part of a central area pedestrian and cycling system and must perform a variety of functions including both passive and active activity.

2 Existing and new open, urban spaces should be integrated into a continuous network of movement. These should be linked by means of safe, well-defined walkways using appropriate elements such as unique paving stones (floorscaping), vegetation, lighting and character signage for orientation (wayfinding) and identity.

3 Passages and arcades should connect to the major pedestrian movement axes, using at-grade existing laneways and alleys, public rights-of-way, and other systems possibly through and between buildings to facilitate access, and provide climatic comfort.

4 Corridors, major squares, or nodes and movement networks should inject and 'feed' people into the urban activity zones. Public transport stops, parking garages, and public buildings can serve as such 'feeders'.

5 Sensory intricacy in scale, materials and character is essential to attract people. Mixed uses (e.g. dwellings, shops, offices, entertainment complexes, etc.) assist in extending animation and participation in the pulse of the city -basic to its vitality.

6 High-quality daylighting (and night-time illumination) utilizing natural sources from the sides and the top of buildings and courtyards will create pleasant conditions, especially during the winter (darker) seasons but on a year-round basis, as well.

7 The public space should be designed so that height of surrounding buildings is at least 20% greater than the width of the space thus creating spatial enclosure and definition.

8 Good public visibility ('eyes on the space') should exist for better safety and social control. Splayed building corners or staggered corners can provide views into internal spaces and using vistas can provide visual connections with the street.
9 Shop-frontages should be relatively narrow contributing to greater variety and activity, bringing more people to the activity/shopping foci with resulting liveliness. 4.5 - 6.0 m for facade width is considered excellent for most European conditions.

10 Weather-protection and beneficial micro-climatic areas should be incorporated within the pedestrian zone and in areas of major activity for cyclists and non-motorized users.

11 The comfort-levels of users must be of a high quality extending the outdoor season wherever possible (especially in cold and temperature climate zones) through improving the local micro-climatic conditions by retrofitting existing designs and creating new projects which offer optimum thermal comfort. Reducing windspeed and increasing exposure to sun will significantly enhance environmental well-being.

The above guidelines, when implemented simultaneously, should unquestionably produce safe, lively and comfortable public and semi-public urban spaces which do not have a tendency to become deserted after offices and shops close toward the end of the day. They will strengthen existing urban ‘magnets’ and increase their power of attraction.
Managing of a large scale 'climatic environment' where the sub-components are town and region, involves accommodation to the rhythm of annual seasons. This begins to determine the character of the urban design and structure of the land-use. The criterion for a livable town is its potential to respond to weather agents during different seasons of the year.

Reima Pietilä - on Climate and Place - 1988
8 WIND SHELTER AND SOLAR EXPOSURE (or protection) IN STREETS AND URBAN SPACES

In general, if city centres are to compete favourably with suburban shopping malls, they will have to provide a modicum of climatic protection very close to that which exists in the suburban malls. This protection will have to extend to streets, boulevards and public urban spaces if pedestrians (and cyclists) are to feel both welcome and comfortable. Such thermal comfort must apply to cold-climate and hot-climate areas if they are to be effective and it must take into consideration seasonal variation.

A basic finding pertaining to thermal comfort in public open spaces and alongside sidewalks is that sunlight and wind conditions play a critical role.

During hot, humid summer conditions it is essential to create ventilation corridors for cooling and to minimize sunlight exposure. In the case of winter conditions, it is crucial to offer protection from wind and maximize solar exposure.

8.1 Cold-Climate Areas (circumstances where winter-related discomfort exists)

Shelter from wind should be achieved by the use of planting (vegetation, hedgerows, walls, fences, coniferous trees e.g. pine), in order to reduce wind chill. Overshadowing by buildings should be minimized wherever possible and orientation for maximum reception of solar radiation should be accepted development policy.

Where ramps exist they should be heated, provided the lengths of the ramps are not excessive.

Cycle-paths and areas of intense pedestrian use should not be located close to the corners of high-rise buildings where wind turbulence has a tendency to reduce the comfort level.
8.2 Hot-Climate Areas
(circumstances where summer-related discomfort exists)

In this context, the creation of shade through tree planting should be developed. Another option is to concentrate cycle-movement in a wide path on the north-facing side of the street, thus obtaining a 'cooling effect' through elimination or reduction of southern exposures.

Further cooling possibilities exist by utilizing heat-reflecting materials combined with overhead shelter systems covering primary pedestrian paths and cycling areas. The basic principle is to avoid the absorption of heat and to provide maximum areas of shade.
Additionally, the provision of green areas (with a low ratio of paved surfaces) induces a cooling effect - since through the process of evapotranspiration these have a lower capacity for heat storage.

**Fig. 59.** Trees with a wide crown (to provide maximum shade) should be planted.

### 8.3 Principles for creating optimum micro-climates in cold and temperate regions

When weather-protection by trees or hedgerows (or even fences and walls) occurs, there should be a balance between the use of porous and non-porous material or planting (for protection) for improved visual permeability and resulting public safety as this is an issue which is taken very seriously by non-car users.

Information from scale models placed into a windtunnel can provide useful data on ‘wind-chill’, but this normally occurs too late in the standard design process and should happen at the preliminary design stage.

When several alternative high-quality bicycle routings or pedestrian movement paths are possible, making a choice could be based on the results of a simplified urban geometry wind model. This can indicate the least uncomfortable conditions from the point of view of the user.

Vegetation should be selected in a manner which will minimize the extent of falling leaves or needles/pine cones on the cycle and walking paths in the event that they may create hazardous conditions, especially
during the rainy, autumn period.

Fig. 60.
LEFT Bushwood between dense tree-tops provides extra shelter where a Delft main-bikeway is attacked by fierce winds from nearby high-rise.
RIGHT Temporary overhead sheltering system at Schipol Airport linking the terminal to taxi stands, parking garages and InterCity Rail Station. This area is being redesigned for an expanded public square.

The major principles for creating optimum micro-climates in colder and temperate regions which receive some sort of 'wintry' conditions include the following:

a Protection from the wind especially during winter (cold regions) and also during the marginal seasons of early spring and late autumn.
b Orientation of buildings and open spaces for maximum reception of solar radiation.
c Prevention of overshadowing by both buildings and natural elements.
d Utilization of heat absorbing materials for heat retention.
e Avoidance of cold micro-climatic air pockets.
f Provision of built form or plant material (vegetation) as 'windscreen' protection (usually from prevailing westerly and north-westerly winds).
g Design of south-facing 'sun pockets' which can function as comfortable, outdoor gathering areas during the less desirable periods of the year e.g. during cool spring and autumn days.
h Use of canopies, arcades, gallerias, passages, and other overhead shelter systems which cover primary pedestrian movement areas - in densely built up areas - providing weather protection and retarding outgoing radiation at night.
i Provision of paved surfaces on south-facing slopes to maximize heat gain from solar radiation.
j Pruning and thinning of existing shade trees and plants to permit maximum solar penetration.
Although the improvements can be significant through the application of the above principles there is still much to learn through research about climatically-sensitive design and site planning particularly in colder and temperate regions. Most of the available literature has concentrated on hot, arid zones usually in developing countries. This fact, alone, hampers policy analysts and urban designers working in northern latitudes.

The most important objective is to **extend the outdoor season** encouraging people to be outdoors at times when they might normally withdraw and spend more time inside. Climatic modification of the environment is required if human animation is to be retained outdoors during the 'colder' periods. Even if outdoor social space and the activities which it harbours suffer a reduction during the cold part of the year, social activity can still be supported and maintained.
Public space must be organized, designed and equipped so as to extend the outdoor season, making it more comfortable and thus able to better support social activity and mobility.

As the world grows more complex, as technology creates endless possibilities, as the choice of image and reference increases, primary values become more fundamental not only to enjoyment but to understanding. The search for this basic qualitas is the cornerstone of my approach to architecture: qualities that transcend style, that demand that architecture does not get in the way.
9 CONCLUSIONS

Meaningful policies and designs must not only take into account societal values, attitudes and user requirements but also topographical and climatic constraints, if they are to be effective.

If cities are to become more livable, greater protection from undesirable climate must occur if 'greener' living is to be achieved.

Such a concept has as its foundation the desire to create greater social contact (including perceived and actual public safety) and to preserve the city-centre as an important 'place', with 'genius loci', accommodating not only commerce but also culture and a unique 'joie de vivre'. Coming there and being there can be an end in itself!
The skillful integration of climatic factors into human settlement planning and urban design will be an essential prerequisite for urban livability.

Sensitively conceived 'transition zones' mediating between indoors and outdoors will have to exist if greater thermal comfort is to occur. The public spaces will also have to be equipped with climate-adapted urban furnishings which are not only well located but also comfortable to use (ergonomically) and visually pleasing. All of these factors must complement each other. Streets and public spaces which are both lively and functional will go a long way toward assuring greater public safety and user satisfaction.

Architectural opportunities are almost unlimited today. Technology makes possible what was thought to be unrealistic only one or two decades ago. It would appear that a return to more simplistic forms of urban spatial organization is desirable -- forms which are both easier to use, maintain and comprehend.

If improved bioclimatic conditions and humanized urban planning are to be incorporated within public urban space -including movement systems- then the following issues will have to be accorded high priority:

* Careful decisions must be taken regarding the types and location of vegetation and planting for modifying climatic conditions.

* Multiple use of public space over varying times of the day (or night), week, or even year, will ensure greater activity and animation adding to the perceived importance of the space as well as to user safety and satisfaction.
* A substantial degree of shelter, especially at public transport stops, pedestrian zones, and high-intensity cycle use areas, will achieve greater user comfort and help to shift mobility towards public transport and bicycle use.

* Alternative micro-climates should optimally be possible in the same space (some areas in shade, others exposed to sun - with varying degrees of protection from wind).

* Comfort criteria should be established for all seasons, where possible (especially if considerable seasonal variation occurs).

* The attempt to minimize both travel time and distance for cycle-users and pedestrians constitutes the most important principle if reduction of motor car traffic is desired. The concepts of short-cutting and climatic protection can serve either as determining or modifying factors vis-à-vis movement patterns within the urban fabric.

Managing of a large scale 'climatic environment' where the sub-components are town and region, involves accommodation to the rhythm of annual seasons. This begins to determine the character of the urban design and structure of the land-use. The criterion for a livable town is its potential to respond to weather agents during different seasons of the year.

Recent trends indicate that a strong concern is emerging for climatic protection in urban centres. Combined with functional considerations - which provide the raison d'être of central areas- aesthetic qualities, climatic comfort and programmed events (parades, carnivals, street performers, etc.) are becoming more important in sustaining the urban tempo and rhythm we have come to expect of downtowns and neighbourhood centres, even in suburban locations. In addition to total, or even partial, protection from the elements, a series of principles should be followed when redevelopment occurs in order to improve livability in urban areas.
9.1 Principles to Improve Livability in Urban Areas

1. Provide shelter from the wind.
2. Create an urban form which avoids increased windspeeds.
3. Designate sunny and sheltered open spaces for non-motorized activities.
4. Save existing vegetation (for wind protection); provide windbreaks.
5. Make provision for comfortable walking and ease of pedestrian access.
6. Include ramps and stairs where changes in elevation occur. Heat them in winter.
7. Provide 'transition' zones which mediate between indoor and outdoor spaces to provide choice during the less thermally comfortable times of the year.
8. Furnish public spaces with comfortable, and visually pleasing, well located 'urban furniture' (e.g. kiosks, bus shelters, benches, lighting).
9. Serve the pedestrian zones and networks with highly visible and accessible public transport.
10. Concentrate on the entire district and not only the central area.
11. Ensure an equilibrium between collective concerns and private interests.
12. Design public spaces for users of all ages and physical needs.
13. Plan for bad weather, for noise, and other disturbances.
14. Animate the space with light and graphics, especially during the darker season when daylight is limited.
15. Zone for a mix of uses such as shopping, workplaces, housing and recreation.
16. Educate motorists to pedestrians' needs.
17. Support the growth of public transport systems.
18. Encourage bicycle usage (provide safe, dry lock-up parking areas).
19. Keep streets alive with cultural and recreational activities.
20. People like to be where people are -- ensure that central areas are lively during day and night, thus creating better social control and ensuing public safety.
Flexibility in design e.g. greater protection during winter and the marginal seasons (late autumn and early spring in cold-climate areas) - or during summer and early autumn and late spring in hot-climate areas - will be critical for year-round comfort.

In general it can be concluded that the concept of the bioclimatic city is an underdeveloped research idea that has had little attention. Nevertheless there are many public functions that lend themselves to bioclimatic design, thus designed micro-climatic modification should be a deliberate goal of any city planner or urban designer.

Although we are witnessing a renaissance of the passage and arcade - examples abound especially in German cities like Cologne, Hamburg, Dusseldorf, Braunschweig, Frankfurt am Main, Karlsruhe, etc., as well as in countries such as The Netherlands, Switzerland, Sweden, and Denmark, for instance - these ‘arcades’ or glazed over pedestrian lanes/streets, as commercially vibrant as they are, are still essentially pedestrian islands surrounded by noisy, polluted and sometimes visually unattractive motorized environments. As Dietrich Garbrecht tells us:

If we have pedestrian zones, areas friendly to the pedestrian, does that mean that we have livability with respect to public space? I think not. Because what we then may have are pedestrian islands.

Hamburg’s inner city is perhaps an example of the state-of-the-art in open-air streets combined with ‘Passagen’ largely excluding vehicular movements, but not entirely ignoring them either. In the Fussgängerzone (pedestrian zone), pedestrians are clearly accorded priority. But in the context of public urban space of high quality walking and simply strolling about must be viewed as a major mode of transport. Hence;

We have to adjust planning policy to reflect how important walking is as a means of transportation because our planning policy today doesn’t even face up to the existing modal split which shows 30%-40% of all journeys being on foot.

Clearly, new attitudes - especially in North America - will be required if funding, participatory measures, legislative means and marketing are to evolve with the intent of making serious changes to our behaviour with respect to how we move around. The micro, meso and macro-scales will have to be tackled simultaneously. Solutions developed for an urban region will significantly affect strategies targeted at specific, localized parts of the city. If quality in urban life is demanded, then walking (and cycling) must ultimately be viewed as part of the overall plan, and as a
constituent element of the broader civic space.

The recent wave of underground passages and above-grade skyways linking private ‘atrium-style’ developments and enclosed shopping malls (often connected to railways terminals and subway systems) has created a pseudo-public environment of substantial size in central cities. While offering weather-protection, these projects guarantee social filtering and careful ‘selection’ of patron-users. Commercial objectives are first and foremost on the ‘development agenda’. Hence, increasingly, the traditional role of the city centre - to provide goods, services and amenities to the entire urban population - can no longer be said to prevail, as the newer projects generate incremental privatization, resulting in traditional users being displaced elsewhere to find locations which meet their needs. This dilemma must be offset by opening up more genuinely public space - parks, streets, lanes, green-areas, squares - in order to counteract the erosion of the public domain. Public life for all citizens must be viewed as a legitimate concern of local and national authorities. Attractive and well-managed streets and open spaces - and the activities, both planned and spontaneous, which occur in them, form the essence of urban life. Once off a bicycle, out of the car, or public transportation ................................

..... everyone eventually becomes a pedestrian!

Therefore, it is essential to direct greater attention to the achievement of a milieu in which the ‘slow-mode’ is dominant. This will be the only way to enrich the use - in all seasons - of the city and its region, and to make them economically and socially viable within a framework which is both ‘green’ and ‘sustainable’ well into the long-range future.

It is difficult to refute the fact that weather is among the most important forces influencing our lives. Insufficient attention has thus far, been paid to this fact. Applied climatology can make a powerful impact in the various phases of the planning, building, and design process if taken seriously. It can assist in improving the quality of urban life.
Alternatively, disregard for such an approach may result in harmful effects.

We urgently need to create the trends which will, in the future, offer better climatically-adapted design and planning -- ensuring that all people experience optimum conditions of human well-being, habitation, work and intellectual development in each of the four seasons 57.

Human settlements must always remain symbols of urban vitality incorporating the sense of historic continuity while providing for future demands. Cities have served us well as centres of diversity, exchange, creativity and innovation, work and dwelling, and as places for entertainment and personal fulfillment. They must continue to attract rather than repel their citizens and visitors. How we respect and treat them - as expressed in development policies and design directions - shall determine whether or not their power of attraction will continue to be sustained.
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8. Ibid. p. 17.


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47 For international traffic calming experiences, see the excellent book by Wolfgang Zuckermann, End of the Road, Chelsea Green Publishing Company, Post Mills, Vermont, 1991.


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During the 1991 September-December period, Professor Norman Pressman was ‘Invited Research Fellow’ at the Delft University of Technology, Faculty of Architecture, The Netherlands. With Boudewijn Bach, their research focussed on the relationship between bioclimatic urban space and the promotion of an environmental modal split of urban traffic.

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He has consulted for United Nations agencies orchestrating international colloquia on human settlement planning in northern regions. Since 1984 he has been invited to speak about this issue in the Scandinavian countries, Switzerland, Germany, Austria and The Netherlands.

At the Winter Cities Forum ‘90, Tromsø, Norway, he was a member of the team which received an International Winter Cities ‘Award of Excellence’. He is co-author (with Prof. Jorma Mänty) of the book Cities Designed for Winter and teaches a unique course on winter planning and design at the University of Waterloo.

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CLIMATE-SENSITIVE URBAN SPACE involves the fusion of several elements which enhance livability in human settlements. These include climatically sensitive urban design; attention to public space and collective well-being; a modal split favouring cycling, walking and public transport; and sustainable development.

The authors believe that these can substantially heighten the quality of life. When combined with a reduction in motor car use, resulting in decreased pollution and consumption, there may still be hope for the survival of urban culture.

This small but practical book provides innovative design tools promoting an environmentally-friendly approach. The applications are timely, useful, and not readily available elsewhere.