

Chapter 5. URBAN FORMS AND SETTLEMENT PATTERNS

I. Background

1. The Philippines needs a new way of developing its towns and cities to make them more sustainable. Introducing an alternative to the current practice of planning new communities and redeveloping old inner-city areas is the first step in the chain of actions that will give practical expression to our needs and aspirations, and guide future urban development in the Philippines. The underlying goal of this alternative is to create communities that are more sustainable and function better as places to live and work.

2. Philippine towns and cities face serious issues. Foremost are the worsening problems of poverty and environmental degradation. These include: the high cost of providing services and facilities in answer to continued rapid population growth and urban expansion; the need for greater housing affordability; concerns about safety and security; a desire for greater social, economic and environmental sustainability; the need for more locally based jobs; and the need to provide public transport more efficiently. There is an increasing interest in improving the planning and development of our towns and cities in order to respond to these issues.

3. Community design crucially affects the performance of towns and cities in achieving the objectives of sustainability and a better quality of life. The design and layout of a community are fundamental determinants of urban form and settlement patterns because they:

- set the urban character and design of an area;
- allow or inhibit social interaction and thereby influences the likelihood of community formation;
- force motor vehicle dependence or reduces it by encouraging the non-motor vehicle modes of walking, cycling, and public transport;
- give or deny access to facilities for all users of the urban environment;
- provide or prevent opportunities for locally based business and employment; and,
- conserve or degrade essential natural resources and ecological systems.

A. Objectives of Sustainable Urban Form

4. The challenge of sustainable development is to create an environment that not only suits our present needs but has also the best chance of meeting our needs in the future. It must support social, economic, environmental, and cultural prosperity, while remaining sensitive to local environmental features, balancing our needs for social interaction, jobs, housing, transportation, recreation, and sense of belonging.

5. As our needs and aspirations evolve and as conditions change, we need to facilitate the creation of more sustainable and high quality new urban forms both at the fringes of our growing cities (which are absorbing much of urban growth) and the revitalization and redevelopment of our deteriorating inner city areas. We urgently need a model for urban development that is reflective of Filipinos' economic and social needs, and is specifically suited to our unique environment. This model should serve as a guide for the creation of new

environments that are responsive to our changing social, cultural, and economic needs, and to our natural environment.

6. The specific objectives of this alternative include:

- To create a strong community identity and sense of place;
- To provide equitable access to goods, services, employment, and educational opportunities;
- To create walkable communities that reduce people's dependence on motorized vehicles and thus reduce congestion and pollution;
- To create safe, attractive, friendly and efficient street networks where houses and buildings enhance social interaction and personal security;
- To create neighborhoods that are supportive of public transport;
- To create diverse opportunities within local neighborhoods by allowing a mix of compatible land uses to occur in line with community expectations;
- To provide a variety of affordable housing types and densities to suit a diverse range of needs.
- To build cultural and environmental awareness into the urban landscape while respecting culturally and environmentally sensitive sites.
- To combine urban waste management with the provision of public open space.
- To ensure that the development is as cost-effective and resource-efficient as possible in order to increase the availability of affordable housing and minimize environmental impact.

B. Key Differences from Current Approaches

7. A sustainable urban form provides an innovative approach to planning and design in several aspects by:

- seeking a more thorough analysis of the site and its context to inform community design and graphically explain the basis for the design;
- encouraging the greater use of structure plans as a planning framework;
- providing for an alternative approach to design of neighborhoods and towns that aims to achieve compact, well-defined and more sustainable urban communities; and,
- moving toward a performance approach to community design to encourage innovation in response to market needs.

8. The following sections provide the specific planning and design guidelines of more sustainable urban form and settlement patterns. These are divided into the following aspects:

- Community Design
- Movement Network

- Lot Layout
- Public Parkland
- Urban Water Management
- Utilities

II. Community Design

9. Approaches to urban development at present typically emphasize land use segregation, site engineering, surveying, and lot yield efficiency. An alternative approach to such practice is to design a framework for communities that are sustainable, safe, stimulating, and efficient. This is a response to today's need for a broader and more integrated perspective in addressing design issues at the neighborhood level.

10. This set of guidelines for Community Design sets out the objective with respect to how towns and neighborhoods could be structured, the layout of street networks and block structures, the mixing of uses and facilitation of employment opportunities, and other design issues. They seek to provide safe, convenient and attractive neighborhoods that meet the diverse needs of the community, are adaptable to future change, which fit into the existing and planned urban context, and promote environmental sustainability.

A. Key Differences from Current Practices

11. The proposed approach calls for an urban structure based on walkable, mixed-use neighborhoods. The neighborhood and town centers are located at junctions of arterial routes or important local streets, rather than having such roads define the edge of the development. The town center acts as a district level community focus with a compatible mix of uses which provide a wide range of weekly shopping needs, community facilities, and local employment, whereas the neighborhood center caters more to the daily needs of the community. The proposed approach places greater emphasis upon: responsive design, enhancing local identity; providing an interconnected network of streets with perimeter block development and frontage to streets and open spaces; a wider choice of housing types; a more significant component of other land uses to support daily needs and local employment; and, higher levels of public transport provision.

B. Objectives of Community Design for Sustainability

12. The specific objectives of community design for sustainability are:

- To facilitate an environmentally sustainable approach to urban development by minimizing non-renewable energy use and motor vehicle dependency; encouraging greater self-containment of neighborhoods and towns; and protecting key natural and cultural assets.
- To provide safe, convenient and attractive neighborhoods and towns that meet the diverse and changing needs of the community, and offer a wide choice of housing, leisure, local employment opportunities and associated community and commercial facilities.
- To develop a coherent urban system of compact, walkable neighborhoods which cluster to form towns with a high degree of street connectivity.

- To ensure a site-responsive approach to urban development that supports and enhances the context in which it is located, strengthen local character and identity, and promote a sense of community.
- To provide a movement network which has a managed street layout that clearly distinguishes between arterial routes and local streets, establishes good internal and external access for residents, maximizes safety, encourages walking and cycling, supports public transport patronage, and minimizes the impact of through traffic.
- To provide a network of well distributed parks and recreation areas that offer a variety of safe, appropriate and attractive public open spaces.
- To ensure that the design of neighborhoods takes into account environmental constraints including flooding, soil erosion, urban water management, and other natural hazards.
- To equitably provide public utilities in a timely, cost efficient and effective manner.

C. Sustainable Neighborhood and Town Structure

13. A more sustainable neighborhood structure has the following characteristics:
 - Size and shape are generally defined by a 5-minute walk from the neighborhood center to the perimeter, typically 200 to 250 meters.
 - The neighborhood center acts as a community focus with a compatible mix of uses which provide for a variety of daily needs, and may include community facilities and urban open spaces.
 - The center is located on or at the intersection of important local streets served by public transport in order to assist retail exposure and accessibility.
 - It has an interconnected street network with strong links between town and neighborhood centers that has good accessibility, route choice and detailing to make walking and cycling pleasant, efficient and safe.
 - It has a range of residential densities that increase toward the neighborhood and town centers.
14. The town structure has the following characteristics:
 - It is formed by the clustering of neighborhoods, typically with 6 to 9 neighborhoods needed for adequate population to sustain a town center with public transport and a wide range of goods and services.
 - The town center is central to the cluster of neighborhoods, well linked and within reasonable walking distance of most residents.
 - Major new transport routes are based on desired town and neighborhood structure.
 - For commercial viability and accessibility, the town center is located adjacent to the intersection of arterial routes and has a major public transport stop wherever possible.
 - It has a range of housing types with residential densities that increase toward the center and can, over time, support sufficient population to foster self-containment.

III. Movement Network

A. Emphasis on Connectivity, Amenity, and Integration

15. This section sets out the proposed approach to determining movement networks, street design, and construction. The emphasis is on connectivity, amenity, and integration to achieve safe, efficient, and attractive street networks. The priority is to develop a street network that not only works for vehicles and public transport provision but specifically aims to attract a high level use by pedestrians, cyclists and the disabled.

16. Streets have a significant role to play in relation to social interaction, public safety and amenity, but require continuous development frontage to do this effectively. Development with frontage onto streets provides surveillance, activity and visual interest and, on busier streets, exposure which can assist commercial viability. Provision of frontage helps build community focus and enables streets to act as an integrating element within neighborhoods and towns, rather than as dividers.

17. Design of the street network assists in energy conservation through reduced vehicle travel, management of natural features, provision of business and commercial opportunities, and adaptability to changes in land use.

18. Key differences from current practices include the following:

- The street system is highly interconnected.
- Integrator arterial routes generally form the core or spine of neighborhoods and towns, rather than the edges.
- Service roads or other lot layout techniques enable development to front arterial routes.
- Traffic is distributed more evenly through a flatter hierarchy of streets.
- There are more streets per unit area of land, but lower cost per lot with greater lot diversity and smaller lots.
- There are rear laneways in higher density areas.
- There is increased on-street parking capacity to allow fewer overall parking spaces and to support changes in land use over time.
- Pedestrian access based on streets with development fronting and overlooking them for personal safety through surveillance.
- The street network is designed to accommodate cyclists.
- Parklands and open spaces are fronted by streets.
- Near arterial routes, alternative parallel routes are provided for local traffic, particularly within centers.
- Traffic signal control rather than roundabouts is encouraged on major roads to improve pedestrian crossing opportunities both at the signal lights and in breaks of flow mid-block.

B. Controlling Vehicular Access along Arterial Routes and Neighborhood Connectors

19. The proposed approach encourages development to front arterial routes and neighborhood connector streets rather than back on to them. Vehicles reversing directly into the moving traffic stream should be avoided.

C. Local Streets Classification

20. The local street extends the domestic environment and should be safe for pedestrians (particularly children), cyclists, neighborly meetings and even social events. Street trees contribute to a pleasant walking environment, provide shade and accommodate fauna.

a. Neighborhood Connectors

21. Neighborhood connectors link neighborhoods and towns, are carefully designed to calm traffic, limit noise and facilitate pedestrian use. They have frequent local street connections. They should not attract substantial long distance through traffic, but provide for safe and convenient local travel to and from arterial routes, usually at signal-controlled intersections. They spread local traffic loads and reduce intersection loadings, act as bus or jeepney routes, and support the location and viability of neighborhood centers.

b. Access Streets

22. The access street is the most common street in subdivisions designed under the proposed approach. The environment of the abutting land use dominates, traffic speed and volumes are low, and pedestrian and bike movements are facilitated by the streetscape. Vehicle speeds should be controlled by street lengths, on-street parking intensity, variation in width and alignment of the road, and type of road construction.

23. The width of typical access streets will vary depending on their function. In practice, the wider access streets are the most common access street and will be located closer to the neighborhood center and in streets where there is some demand for on-street parking, existing or future capacity for mixed land uses, larger scale street trees and more flexibility for future use.

c. Laneways

24. Laneways are generally used when smaller lot layouts justify access to garages at the rear of the lots, and where alternative vehicle access is needed for lots fronting major streets or parklands, such in higher density residential and/or mixed land uses.

D. Network Connectivity and Management

25. The local street network should be highly inter-connected with frequent junctions wherever possible with arterial routes to help limit travel distances and to promote walking, cycling, public transport usage, and strong sense of community. In centers, streets should be provided one perimeter street back from arterial routes to facilitate local access and to take the pressure off arterial intersections. These streets may be wide with extensive angled parking to serve the center. They should be designed to make traffic behave appropriately by controlling the speed environment.

E. Control of Vehicle Speed in Local Streets

26. The proposed approach suggests several design components to limit vehicle speeds on local streets, including:

- road width appropriate to traffic volumes and parking demand, so traffic is slowed by parked and opposing vehicles, but capacity is not unduly constrained;
- short leg lengths between street junctions and/or slow points (tight corners, bends or traffic-calming devices) to encourage speeds of 30 to 40 kph or less;

- visually and physically tight intersections;
- promotion of short or local trips; and,
- trees near roads or in parking lane to narrow the road appearance.

F. Intersection Controls

27. Intersection design for vehicle and pedestrian safety has to take account of traffic volumes and type of vehicles on each leg, likely traffic speeds, topography and the need for the junction to act as a slow point in one or more directions. Solutions may range from simple stop signs, narrowed throats and raised pavements, mini-roundabouts, or occasionally more complex traffic management devices.

28. Arterial routes will have signalized intersections in association with pedestrian locations, such as neighborhood and town centers to provide pedestrian safety and convenience. Medians are used to allow staged pedestrian crossing of the arterial routes.

G. Pedestrian Movement Networks

29. In many existing and current development, walking has been made difficult because of the disconnected street system, lack of footpaths, unsafe routes and long distances to most destinations. To encourage people to walk, a place must have high pedestrian amenity and efficiency, be stimulating, legible and safe for pedestrians.

30. The proposed approach recognizes the complexity of daily movement patterns and the need to make pedestrian trips as short and pleasant as possible. The primary pedestrian network is the street system, which should be detailed to support pedestrian movement. Footpaths should ideally be provided on both sides of all streets. However, for cost reasons, footpaths may be omitted from one side of a street where vehicle volumes and speeds are very low, and where use of the streets is considered safe and comfortable by pedestrian and by people with disabilities.

H. Walkable Catchments Measure Efficiency

31. The efficiency of a particular street network layout in providing walking access to centers, stations, bus or jeepney stops, or schools can be measured via walkable catchments. Typically, most Filipinos will consider walking up to 250 meters (5 minutes) to daily activities, or 500 meters (10 minutes) to a major bus station or town center. A well-connected street network should achieve at least 60% efficiency (meaning 60% of the area within a 250 meter radius of the destination can be reached by a 5-minute walk along the streets).

I. Safe Routes to Schools, Bus Stops and Stations

32. A network of quiet local streets focused on schools should be traffic calmed to ensure safe use by young pedestrians and cyclists. Secondary and primary schools should be located to benefit from good public transport access with safe pedestrian routes between transport stops and schools. Safe routes to stations require more consideration of surveillance to provide night-time safety. Main routes should be fronted by housing and land uses that are open at night (e.g., convenience stores, recreation centers), with minimal gaps in surveillance. Bus stops and approaches thereto should be located with good surveillance and provided with adequate lighting.

J. Cyclist Movement Network

33. Good cycling conditions and encouragement of cycling should be designed into the urban fabric. This includes such measures as bike parking facilities, slower vehicle speeds and low traffic volumes, appropriate lane widths along local streets to allow cyclists to share travel lanes with cars and routes parallel to arterials with less traffic.

K. Movement Network for Users with Disabilities

34. Access to and ease of use of the movement network for users with disabilities are important features a sustainable settlement pattern. The needs of the elderly and disabled users should be considered during design. The proposed approach provides for these in several ways:

- Journeys can be carried out on the street network rather than through a separate open space network which is likely to be poorly maintained and lacking surveillance.
- Footpaths are required for most roads on at least one side of the street, making the journeys simpler and safer.
- Access to public transport is easier, more direct and closer.
- Public transport should be more efficient

35. The requirements of the existing rules and regulations pertaining to access by persons with disabilities should be followed.

IV. Lot Layout

36. This section principally outlines the suggestions for residential lots in a planning context where a mixture of compatible land uses are encouraged. There is a range of suggested guidelines that differ from current residential lot layout practice. They include:

- emphasis on greater lot size variety for housing choice and affordability;
- provision of lots in appropriate locations for mixing of compatible uses;
- allowing a variation to the minimum lot size set out in current regulations to achieve diversity; and,
- lot design facilitating development fronting major streets and public open space to support safety and surveillance.

A. Lot Layouts for Housing Diversity and Density

37. A mixture of lot sizes distributed throughout neighborhoods to provide housing choice should be encouraged. A wide range of both lot sizes and housing types is needed to cater to increasingly diverse household types. These may range from those targeted to upper-income households – including conventional larger lots with views – but also well-located higher quality medium density housing, to those at the more affordable end, including smaller lots, duplex lots, and possibly apartments and studio units, sometimes over garages.

38. Medium density housing and small lot development should be made more appealing by placing it in good locations such as close to town and neighborhood centers or overlooking parks. Smaller lots need to predominate near town and neighborhood centers and public transport stops to achieve sufficient density to support facilities. Sites intended for multi-dwellings or future small lot development should be identified on structure plans.

B. Lots for Special Uses and Future Residential and/or Business Intensification

39. Where a structure plan has been produced, areas for business, employment, home-based businesses, schools and other activities should have been identified. Lots with appropriate dimensions and characteristics need to be provided to facilitate these proposed activities. Often, mixed commercial and residential development near centers will be proposed, yet only the residential component will be built in the first phase of the development.

40. Despite this, affected lots should be carefully dimensioned, and longer term Detailed Area Plans specified to facilitate incremental redevelopment. These guidelines should provide for efficient layout and access to rear parking together with, say, large front setbacks that would enable a business to be constructed in front later. In some urban fringe areas, residential land may be developed on sites near proposed railway stations or town centers well in advance of these facilities. In these areas, larger lots could be required to incorporate Detailed Area Plans that facilitate future intensification. For example, a house on a 700 square meter lot could be sited and designed to enable future subdivision of the lot and an additional dwelling to be built.

C. Lot Layout to Front Parks and Natural Areas

41. Streets, with lots fronting them, should edge the majority of parkland and natural open spaces. This provides higher amenity and greater safety for both the open space users and residents. No lot should require a back fence onto a park, or conversely turn its back on the street. When full street frontage is impractical, or where streets on both sides of a linear park are unnecessary, lot layouts can provide development frontage through designs incorporating rear lanes or flag lots, with dwellings to front the park and/or footpath.

D. Lot Layout to Front Major Streets

42. On major streets, careful lot layout is critical to achieving appropriate vehicle access, mixed use potential, noise management, visitor parking, and urban amenity. Back fences along major streets have become commonplace in more recently developed suburban subdivisions. This solution arose as an initial response to prohibit vehicles from reversing out into heavy traffic. It is now recognized that there are many economic, environmental and community safety disadvantages of the back fence response to this problem. Reversing problems can be solved by designing alternative vehicle access methods. Service roads, car courtyards, on-lot maneuvers for frontwards exit, rear lanes and flag lots can all provide solutions.

V. Public Parks and Open Spaces

43. Public parks and open spaces that can be used by a wide range of people living and/or working in urban areas contribute significantly to quality of life. Through careful placement in a site-responsive design, they can also contribute towards legibility, identity, and a sense of place that helps build communities.

44. In current conventional practice, public open spaces are derived from a quantitative calculation and are too often inconveniently located, inappropriately sized, or poorly surveilled. Restraints on local government expenditure with consequent limiting effects on local government's ability to develop and maintain open spaces has resulted in the lack of public parks and public open spaces to meet the needs of all user age groups.

A. Wider Range of Parks and Other Open Spaces

45. A range of site-responsive urban parkland which is surveilled, safe, and conveniently located for the majority of residents should be provided. There should be a balance between neighborhood parks, readily accessible to residents, and larger playing fields to be shared between neighborhoods. Small parks (up to 3,000 square meters) are encouraged for local children's play and as resting places for elderly or disabled people, and where maintenance arrangements can be agreed with the local government.

B. Changing the Current Space Requirements for Public Parks, Playgrounds and Community Facilities

46. Since 1995, revisions to PD 957 and BP 220 have required subdivision developers to cede 3.5% (for density of 20 dwellings per hectare) to 9.0% (for density of above 225 dwellings per hectare) of the gross subdivisible area of new residential neighborhoods for public parks and playgrounds. In addition, these laws also require an area ranging from 1.0% to 2.0% to be set aside for community facilities.

47. To encourage the provision of improved urban areas without increasing development costs, and to achieve quality open space and neighborhood amenity at the time of subdivision, the proposed approach encourages not just a quantified space requirement but also the placement. In effect, the total space requirement may even be reduced by as much as 2% if local and neighborhood parks are developed to at least a basic level of landscaping including earthworks, grassing, tree planting, irrigation and a maintenance program/commitment.

48. Sites for community facilities such as community (barangay) centers, meeting halls, pre-schools and daycare centers are increasingly important for community development. The proposed approach supports the reduction in the total open space requirement within a subdivision upon request of a local government for a community facilities site, where an equivalent area of land is made available free of cost to the local government for the specific purpose.

49. Community facilities sites should be considered for neighborhood and town centers to assist in forming a community focus. They may also be located with open space in particular circumstances, such as where joint use of the facility and park is envisaged. Their proposed location must suit their purpose, benefit the urban structure, and be accessible to likely users.

C. Natural Areas and Cultural Features

50. There may be opportunities for natural areas and cultural features to be incorporated into neighborhood and city parks. Active and passive recreational needs of future residents should be assessed in order to adequately cater to them before the local government agrees to their inclusion within the calculation of public open space.

D. Visual Supervision of Parks – Promoting Safety

51. It is advisable to ensure that the design of subdivisions surrounding parks always results in visual supervision of parkland by residents. Perimeter streets around open spaces are necessary to achieve this. Where a street is not provided, it must be demonstrated that other means have been found to ensure overlooking and surveillance from adjoining development.

E. Joint Parkland and Drainage Provision

52. Parkland should, where practical, be provided in conjunction with the drainage system. The proposed approach suggests that local government grant credits towards public open space provision for urban water management facilities.

F. River Easements, Foreshore Reserves and Regional Open Spaces

53. Current national laws require the provision of easements as flood zone reserves where the subdivision abuts a watercourse, such as a river or a creek, or a body of water, such as a lake or a sea. A subdivision may also include land designated for parks and recreation under a city or regional planning scheme. These circumstances may be covered by existing national and/or provincial laws and regulations, but still need to be enforced by local government units and specifically reflected in the subdivision plan.

VI. Urban Water Management

54. The achievement of appropriate urban water management in a well structured urban environment is one of the key challenges in sustainable urban settlement forms. In many parts of the Philippines, low-lying and flood-prone areas need to be well drained while higher areas also need to be properly protected from erosion and landslides. Many new developments are taking place in lower and sometimes water-logged land which often need to have designated areas for water management. This will require careful trade-offs to achieve efficient use of land, minimize development cost, and provide a good neighborhood and town structure that incorporates environmental protection zones.

55. The design of new urban areas needs to consider key water management issues including stormwater drainage, seasonal inundation, urban water quality and protection of natural drainage, groundwater and aquifer systems. Currently, planning for stormwater management is focused on collection and channeled removal to avoid inundation and inconvenience. In some cases, dual use drainage and recreation reserves have also been provided for the conveyancing and storing of urban stormwater run-off as well as recreational purposes.

A. Water-Sensitive Urban Design

56. A sustainable settlement pattern seeks to introduce water-sensitive design approaches to provide for management of both stormwater quantity and quality, without compromising good urban structuring. Water-sensitive urban design aims are to reduce the impact of rapid stormwater conveyance to streams and wetlands, remove pollutants from the stream flow to improve water quality, retain habitat, conserve water, and integrate recreational opportunities through multiple use drainage systems. The sustainable settlement approach proposes that credits be granted by local government toward public open space contribution from urban water management systems when drainage and open space purposes are shared.

57. Drainage system design for water quality management should attenuate stormwater flow and optimize the interception, retention, and removal of waterborne pollutants from urban run-off prior to their discharge to receiving waters. This will protect the environmental values and physical characteristics of receiving watercourses, watertables and aquifers from degradation by excessive flows of urban run-off and ensure the continuation, in healthy condition, of a wide diversity of wetland environments in the urban landscape.

58. Groundwater recharge through infiltration is suggested where the maximum groundwater level is in excess of 2 meters from the natural surface. Direct and indirect stormwater systems may be used to collect, store and apply physical treatment to stormwater run-off for immediate use and reuse.

59. The specific objectives of water-sensitive settlement design include:

- a. To prevent flood damage to the built and natural environment, inundation of dwellings, and stormwater damage to properties.
- b. To contain nuisance flows and ensure that the street system operates safely during and after storms.
- c. To provide an urban water management system of both stormwater quantity and quality.
- d. To provide for urban water management through multiple use systems where feasible and where efficient use of urban land and structuring principles are met.
- e. To ensure that stormwater discharge does not degrade the quality of surface and underground receiving waters, including aquifers.
- f. To maximize opportunities for local on-site storage where feasible and appropriate.
- g. To avoid adverse alteration to water balance and groundwater depth.
- h. To minimize disturbance caused by draining or filling of natural streams and wetlands.
- i. To provide an urban water management system that can be economically maintained and to ensure that arrangements are in place for continuous maintenance.

B. Design Guidelines for Major Water Systems

60. The following are the suggested guidelines in designing major water systems:

- a. The design of urban water management systems must use recognized and locally accepted hydrological, hydrogeological, soils, hydraulic and residential parameter data, water demand data and design methodologies. The design must be responsive to local conditions particularly where cohesive soils are encountered or regular storms occur.
- b. The major drainage system must be designed to ensure that there are no flow paths which would increase risk to public safety and property.
- c. The design of a neighborhood/town structure plan or subdivision must have regard for both water-sensitive design principles and planning objectives, such as the efficient use of land, urban structuring principles, and the minimizing of development costs.

- d. Water-sensitive urban design may include the following techniques:
- floodways may take the form of a natural waterway, an augmenting parallel channel, a constructed open channel, a roadway reserve or public open space;
 - streets and road reserves may act as floodways or elements of the overland flow route taken by floodwaters, however, flow depths and velocities are limited in the interests of safety, and floodwaters are diverted from streets and road reserves as soon as practically possible;
 - detention and retention basins may be incorporated to reduce on-flow flood peaks and provide increased flood protection for downstream areas;
 - multiple use of public open space corridors and drainage areas;
 - retention and enhancement of natural streams and vegetation where possible;
 - incorporation of less flood-sensitive land uses into the urban water corridor, and the placement of detention and retention basins for amenity and functions; and,
 - temporary stormwater basins and swales which contribute to amenity and provide recreational and play opportunities may be incorporated into city parks.
- e. Permanent or semi-permanent water features may be incorporated into parks providing aesthetic and urban water management functions where landscaping incorporates stormwater and water quality management techniques, and contributes to the amenity and recreational opportunities of the park.
- f. Streets adjacent to public open spaces and in other locations may be designed as temporary floodways provided that vehicular access is possible at slow speeds during major storms, and that waterflow depths and velocities do not create hazards for motorists.
- g. The drainage system must be designed to ensure that flows downstream of the site are restricted to pre-development levels.
- h. The natural alignment of watercourses should be retained, except where feasible adjustments can be made to improve the urban structure without compromising the natural environment.
- i. The drainage system should be designed to return stormwater to the groundwater system, watercourse or lake that is as close as possible to where it first enters the system.
- j. Floodways should only be developed where there is a low risk of property damage, including consideration of downstream and upstream impacts.

C. Guidelines for Minor Systems

61. For minor water systems, the following guidelines are suggested:
- a. The minor storm drainage system must have the capacity to control stormwater flows under normal operating conditions for the relevant design storm without blockage.
 - b. The minor system design must minimize undesirable ponding for a prolonged period resulting from relevant design storm.

- c. The minor system design must allow for the safe passage of vehicles, at reduced speed, on streets which have been affected by run-off from the relevant design storm.
- d. Urban water pits should be provided, where appropriate, to facilitate infiltration into the groundwater aquifer.
- e. Adequate provision must be made for measures during construction to ensure that the land form is stabilized and erosion is controlled.

VII. Utilities

62. This chapter covers contemporary subdivision servicing requirements and emphasizes the need to predetermine through design, the most appropriate way in which the often competing needs for space can be met. Reductions in road widths are encouraged under the proposed approach, provided that the essential requirements for road pavement width, street trees, parking, footpaths, bike lanes and services can all be met. Therefore, reductions may best be achieved through the design process and by the use of techniques, such as common or shared trenching, the use where appropriate of rear lanes for almost all services, and careful placement of trunk services.

63. However, at the present time, trenching of utility services is not a common practice in the Philippines and its application has been limited only to very few developments catering mainly to upper income groups. One of the main reasons cited for this limited use of utilities trenching is the high cost involved. In the very few cases where they have been applied, it has been the private developers who have invested in the costs involved, without any funding support from the local governments concerned. The developer's cost has, in turn, been passed on to property buyers through the land sale price. Thus, only a few developments have applied utilities trenching because of the very small percentage of the market that can afford the added cost.

64. Another reason cited is the difficulty of coordinating the individual efforts of the various utility companies involved. Many developers complain that, while Meralco has guidelines for trenching electric power lines and transformers, other utility service providers, such the telephone and cable TV companies still prefer using overhead cables. As a result, utility posts and overhead wires and cables are still commonly used.

65. This current practice of using overhead wires, however, should not be allowed to go on forever. Aside from the risks of utility service interruptions during typhoons when overhead wires and cables are often cut by falling tree branches or flying debris, the "spaghetti"-like appearance of these overhead wires is unsightly and contributes to visual pollution. With urban populations continuing to grow, there will be an increasing demand for utility services, and the continuous addition of overhead wires and cables to already overloaded systems poses a great danger to the lives and safety of urban residents.

66. It would be beneficial to encourage the development of a "code of practice" for all utility service providers, together with the establishment of the appropriate institutional structure and enforcement mechanism at the local government level. If these are established, developers choosing to use common trenching will know who to approach to discuss the matter.

67. The reduction of tree planting space within street reserves to make way for servicing, street widening requirements or future servicing upgrades should be discouraged as much as possible. Street reservations should, therefore, be designed for all contingencies.

68. Appropriate utilities planning for more sustainable settlement forms should have the following specific objectives:

- a. To ensure that residential areas are adequately serviced with sewerage, water, fire fighting, electricity, street lighting, communications services, and gas (where appropriate) in a timely, cost-effective, coordinated and efficient manner that supports sustainable development practices.
- b. To maximize the opportunities for shared (common) trenching and reduce constraints on footpaths, street trees and landscaping within street reserves.
- c. To provide a sewerage system which is adequate for the maintenance of public health and the disposal of effluent in an environmentally appropriate manner.
- d. To provide an adequate, reliable, safe, efficient and potable supply of water.
- e. To provide public lighting to ensure safety of pedestrians, cyclists and vehicles.
- f. To locate utilities such that all streets, except rear laneways, can have street trees.