Pakistan Environment Protection Agency
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Sectoral guidelines for Environmental Reports— Housing Estates and New Town Development

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1 INTRODUCTION

1.1 Scope of Guidelines

Housing is a fundamental requirement of all human beings and it is a basic objective of any society to attempt to satisfy this need.

Pakistan has very high rates of natural population increase. It is estimated as of 1997 that the population is growing at a rate of 3.7 million a year and this is the equivalent to having to find land for a large new city every year. Almost all major cities and towns in the country are expanding rapidly and there will be an ongoing demand for additional housing and an ongoing need for additional sites for this purpose. The vast acreage of land required will inevitably result in significant impacts and environmental considerations must be incorporated in the approval process for new housing estate developments. Decisions are, however, made concerning the quantity, quality type and location of housing at **three** different levels:

- **policy** is determined at National, Provincial and Local levels: adoption of higher densities can reduce total land requirements and a policy to develop a new town can concentrate development in one centre which may not be able to handle major impacts,
- **programmes** determine the appropriate housing mix to meet housing needs; this will include such options as maintenance and improvement of existing housing stock and squatter settlement upgrading which may, in turn, avoid the need to look for new sites,
- **project** level where decisions are taken at
    (a) the site selection stage; and
    (b) the site infrastructure and layout design stage.

There will be environmental implications at all levels. These guidelines look specifically at environmental impacts at the project level and consider the development of new sites for housing estates and new township development. Site selection and design issues are examined and the guidelines go on to examine the environmental impacts which may be experienced during the construction and operations phases of a project.

Formal housing projects in both the public and the private sectors are addressed in these guidelines, as are new site and service schemes i.e. where housing sites are provided by the public sector for the construction of individual private homes.

The upgrading of existing housing stock both formal and informal is not considered directly in these guidelines. Upgrading should, however, be taken into account as an alternative at programme level to the development of new sites in the context of solving overall housing needs.

New residential estates usually involve schemes with multiple units developed on single tracts of land. A whole range of development types can be adopted from low density owner occupation to high rise rental flats and the scale of development can vary from relatively small subdivisions to entire new towns. The minimum size of estate for compliance with environmental procedures is often difficult to specify. There is a tendency to split housing into a number of development phases for which many separate applications are submitted over a period of time. Ten hectares is often used as the low limit of development for compliance with environmental regulations. This is a good yardstick for low rise, low density schemes regardless of the number of units included in a project. As residential densities increase, environmental impacts are more related to the shear number of units rather than the total

ground coverage of the scheme. For a high density housing scheme anything over 100 units should come under scrutiny. Projects covering more than ten hectares or with more than 100 units would, therefore, automatically need assessment. Care should, however, be exercised in the interpretation of such standards and there should be flexibility to ensure that, where small projects threaten to agglomerate into significant neighbourhoods, that they will be treated as one large project for the sake of environmental assessment.

The guidelines will assist proponents to identify the key environmental issues that need do be assessed as well as mitigation measures and alternatives that should be considered. Readers are advised not to apply a mechanistic approach based on these guidelines. No technique can replace the thoughtful consideration of the proposal, its siting and the physical and cultural environment in which it is proposed.

The environmental issues discussed in these guidelines are not exhaustive and the degree of relevance of each will vary from proposal to proposal. The environmental report should only deal with issues relevant to the specific proposal. The focus of the environmental report should be on key environmental issues.

1.2 Context

This guideline is part of a package of regulations and guidelines which include:

- The Pakistan Environmental Ordinance 1997
- Policy and procedures for filing, review and approval of environmental assessments
- Guidelines for the preparation and review of Environmental Reports
- Guidelines for public participation
- Guidelines for sensitive and critical areas
- Pakistan environmental legislation and the National Environmental Quality Standards (NEQS)
- Sectoral guidelines for environmental reports: ***Housing Estates and New Township Development***

This guideline should not be read on its own, but in the context of the overall package. In relation to this sector the reader is also referred to other specific sector guidelines - *sewerage, roads, highways etc yet to be produced.*

1.3 Linkages between environmental assessment and other relevant planning laws and procedures.

As well as the requirements for environmental assessment under the environmental laws (i.e. the Env Act or Ordinance) there are a whole range of physical planning Acts, Ordinances and Regulations which may be relevant to new housing developments. Such measures for town plans and building controls can operate at Provincial, Municipal, District and even Local Council levels. Many of the considerations in the physical planning approval process are environmental in nature and are aimed at the same objectives as environmental assessment. It is important, therefore, that environmental assessment and physical planning requirements are both addressed during the planning process.

In terms of the reports required to satisfy Government requirements, the same project description material can be used in environmental reports as is used in the submission for physical planning. The town planning and detailed subdivision plans required for physical planning approval will be particularly helpful in identifying the level of spatial impacts in the environmental report.

While Environmental matters are legislated for at both Federal and Provincial level, physical planning is a Provincial function and the Provinces have developed their own Ordinances which allow for the creation of plans and planning controls. Table 1 lists the main town planning and building control laws and regulations which, depending on geographic location, are relevant for the approval and control of new housing schemes. Each of the Provinces and the Capital Territory has enacted its own legislation. In some cases specific Ordinances such as the Quetta Development Authority Ordinance have been enacted. In other Provinces separate Development Authorities have been set up through a main enabling Provincial Ordinances; NWFP has therefore, under delegated powers from the Urban Planning Ordinance of 1978, set up a whole series of Development Authorities who have responsibility for physical planning.

The enabling legislation is in place to allow comprehensive planning from regional to local scales. Master plans and Site Development Schemes have been produced for certain Municipalities and the Provinces are busy adding to the list of townships covered by master plans. For instance, as of 1997 all towns in Punjab with populations over 50,000 have master plans. Where there are approved master plans, large sections of land suitable for residential development will have been identified and the site selection aspect of assessment will have or should have already taken place. A few regional plans also exist for the metropolitan centres of Karachi, Lahore and Rawalpindi.

Many of the existing plans have not, however, had formal approval. Where plans are approved there tend to be no procedures and in the small towns implementation is left in the hands of the District Council who have no trained staff. Cantonment areas cover substantial areas of land in urban areas. They are looked after by Cantonment Boards but there are no enabling provisions at all in the Cantonments Act for master planning or the development of physical planning regulations.

As of 1997 there is little effective physical planning development control in the greater part of Pakistan and many private housing schemes will be considered only in terms of compliance with the Building Regulations. Public sector housing projects are usually designed by the Physical Planning Department of the Province. Approval is required through the Department responsible for the P&D process in the Provinces for the project to be adopted in the Provincial works program. IEE will be incorporated in this process and the review will be undertaken by the Department responsible for P&D.

Table 1: Physical Planning Laws, Regulations and Rules Affecting Housing Estates	
Islamabad Capital Territory	
The Capital Development Authority (CDA) Ordinance	1960
The Capital Territories Local Government Ordinance	1979
Punjab Province	
Punjab Development of Cities Act	1976
Punjab Local Government Act	1996
Sindh Province	
Sindh Building Control Ordinance	1979
Sindh Local Government Ordinance	1979
Karachi Development Authority Order	1957
Karachi Development Authority (Amendment) Order	1962
Karachi Building and Town Planning Regulations	1979
NWFP Province	
North West Frontier Province Urban Planning Ordinance	1978
North West Frontier Province Local Government Ordinance	1979
The NWFP Building Regulations	1985
Balochistan Province	
Balochistan Local Government Ordinance	1979
Quetta Development Authority Ordinance	1978
Azad Jammu and Kashmir	
Azad Jammu and Kashmir Local Government Ordinance	1979
Muzaffarabad Development Authority Act	1989
Pearl Development Authority Act	1992
Katli Development Authority Act	1992
Bagh Development Authority Act	1995
The Northern Areas	
Northern Areas Local Government Order	1979
The Federally Administered Tribal Areas	
Federally Administered Tribal Areas Local Govt Regulations	1979
Cantonment Areas of Pakistan	
Cantonments Act	1924
Cantonments Land Administration Rules	1937

It must, however, be assumed that the current limited capacity of the physical planning system and those of the authorities responsible for environmental assessment will both be expanded so that there can be better control of private sector projects. As already referred to, only with more effective regional planning can adequate site selection take place.

2 TYPES OF ENVIRONMENTAL IMPACT

2.1 General

The level and types of impact from projects in this sector will vary significantly from project to project. New townships on virgin sites can be extremely intrusive and have major impacts on natural resources and existing infrastructure. Larger township projects will by their nature require land use provision for a whole range of community facilities such as water supply, sewerage treatment, solid waste disposal and management, drainage and public infrastructure (e.g. schools and hospitals). Because of the possible wide ranging effects of large new townships, the scope of impacts discussed in these guidelines is equivalently wide ranging.

Many new housing project will, however, be proposed in existing urbanised areas on land already zoned for residential use; in this situation there will be little impact on natural resources and no consideration of alternative sites. The project may then only have to be considered in terms of design and the more immediate construction and operating impacts.

Housing projects aim at providing improved living standards and there should be major positive impacts on human welfare. As the population of Pakistan expands it becomes an increasingly difficult challenge to provide suitable housing sites in the existing cities and towns. There may be good economic reasons why land is in alternative land use. Often there are constraints which mean that it is unwise to develop land for housing. The most acceptable sites for habitation have been settled over many centuries and there may be inherent reasons why some sites are unsuitable for human habitation. Many of the problems associated with providing housing are themselves environmentally related; the development of environmentally valuable land and difficult and hazardous sites will mean additional cost which can in turn make sites unviable. Poorly designed projects such as inappropriate high rise high density schemes, even where they are on suitable sites, can be damaging to health and welfare and may not have the desired positive human welfare impacts.

2.2 Cumulative impact of loss of land to housing projects

The environmental impacts of housing occur at regional, local and site scales. Because of the large land requirement for housing provision already referred to, and the steady incursion and build up of residential projects, there can be a cumulative effects which can have severe regional impacts on certain land uses and valuable environmental resources which are discussed below.

2.3 Direct and indirect impacts

Direct impacts are mainly the physical ones to do with site development, construction and operation of a project; they are described at length in Chapter 3. They are usually site specific while indirect impacts are experienced off site and are more difficult to quantify. In large projects, such as big housing developments, indirect impacts can be very significant. Because they are off site and are not seen to be under the control of the proponent they are often overlooked or ignored in impact evaluation and mitigation.

The likely positive impacts of housing have already been referred to, but the development of large housing schemes can also have substantial indirect impacts on the surrounding value of land and property. Adjoining land is likely to become more attractive for development because of infrastructure improvements and this can mean significant revaluation of local land prices. If there are negative impacts these should be included in the project compensation programme.

The construction phase of the project will place demands on the provision of building materials. Many of these materials will be locally manufactured (e.g. bricks and cement), mined (e.g. sand, aggregates and slate) or harvested (e.g. timber and coral). Although there may be temporary benefit to the local economy, there may also be shortages of material and increased costs for other users. Over exploitation of natural resources particularly forests may result and there may be a distortion in the local labour market causing labour shortages in other sectors of the work force.

Traffic movement patterns can also be much impacted well beyond the immediate area of the site if significant other users (industrial, residential etc.) are forced to relocate in other areas on the periphery of a new housing development.

3 NEGATIVE IMPACTS AND MITIGATION MEASURES

3.1 General

Negative impacts are considered in these guidelines under four distinct areas.

- site selection stage
- design stage
- construction stage
- operations stage

Appendix I is a checklist for proponents of the impacts and relevant mitigation which are discussed item by item below and which must be consider by a proponent when putting together an environmental assessment for housing estates.

The conclusions of impact assessment may result in recommendations to reject a particular site or assist in the choice of alternatives. All the impacts mentioned in this Chapter can be present in varying degrees at a site and if impacts do not rule out the site altogether they may in some way have to be mitigated against.

3.2. Site selection

For impact identification to be effective at site selection level it is important that certain information is available at a regional level. It is important that sites of special importance are first of all identified and the long term value of such sites is recognised. Where possible it will help if some quantification is given to the value of the resource. The loss or disruption of such resources can then be recognised and valued in relation to the need to provide housing. Adequate regional planning policies are required to provide a framework which can assist in the site selection process. Measures which could be employed include:

- zoning or identification of land of prime agricultural importance
- identify sites which have special habitat significance or species diversity
- identify sites of special cultural and historical interest
- identify areas of land with constraints upon development - land liable to flooding etc

To avoid siting of projects in sensitive, difficult or unsafe areas a database should be developed to identify and map the principal environmental resources. This is probably best done at Provincial level. The process would identify and map environmental resources such as major drainage patterns, freshwater and coastal wetlands, forests and other important

natural habitats, prime agricultural land etc. An analysis of this nature can eliminate from consideration the least suitable sites.

3.2.1 Displacement of existing land use and other environmental resources

Important land uses and economic activity can be lost to new housing projects. One of the most common losses is of prime agricultural land and it is vital that such land is identified and mapped to assist planners in making optimal choices. Proper quantification of the existing economic resources and environmental impacts to be displaced must therefore be undertaken.

3.2.2. Destruction of environmentally sensitive and critical areas

Wetlands, forests, major water bodies and other areas containing rare and endangered species can all be threatened by housing estates and urban expansion. Such environments have a value to society as a whole and should be given special consideration. The value of such resources has to be weighed against the positive benefits of housing accommodation. The reader is referred to “Guidelines for sensitive and critical areas” which is part of this package of Guidelines (see Chapter **1.2**)

3.2.3. Existence of adverse natural conditions for housing

There are many site conditions which can make an area totally unsuitable for housing. Such conditions, if they do not make a site unusable may involve such extensive mitigation measures as to make a project not viable. The following are natural conditions which should be identified:

- wetlands, and low lying land, particularly flood plains which are liable to flooding,
- coastal zones liable to inundation from tidal and cyclone activity,
- land with excessive slope,
- unstable soil or subsurface ground conditions,
- highly saline soil conditions,
- land prone to landslide activity,
- land prone to volcanic or seismic activity,
- rocky areas with little topsoil, making underground utility provision difficult.
- land with associated health hazards and particularly sites which favour vector borne disease,
- lack of adequate water in the immediate project area.

This list is not exhaustive and there can be other factors which must be defined through investigation. There may be other local conditions and constraints. An example of this is in semi-arid coastal locations of Pakistan where blown sand conditions exist for many months of the year and this can make residential development prohibitive.

The aim should be to avoid project locations subject to severe natural constraints i.e. land subject to:

- flooding - particularly flood plains,
- coastal inundation,
- steep slopes
- unstable soil or subsurface ground conditions,
- highly saline soil conditions

- landslide activity
- volcanic or earthquake activity
- health hazards and particularly sites which favour vector borne disease.

Where mitigation is viable then measures will be required at both the site and infrastructure level and the house design level. Adverse conditions such as steep slopes can increase the costs of water supply and waste disposal services and problems will be caused for transport infrastructure as well. Equally steep slopes mean additional costs for foundations and supports, and susceptibility to land slips.

Low lying ground may require pumping stations for water-supply and sewerage systems to be effective. At house design level the only solution may be to place a house on a platform or stilts which will impose additional costs.

Although these design measures are relevant to the layout and house design phases of the project; the costs associated with such mitigation measures must be factored into the overall project costs to determine the viability of individual sites and allow the realistic consideration of alternative sites.

3.2.4 Existence of hazardous man-made conditions for housing

A variety of past human activities may make sites unsuitable for new housing. These include land previously used for:

- waste disposal,
- deep mining and which is liable to subsidence,
- previous industrial use leading to ground contamination,
- petroleum extraction or open caste mining,
- groundwater schemes

It is important that such areas are identified and that proper geotechnical or chemical testing is undertaken to assess the severity of impact. The identification of sites and the mapping of areas subject to mining subsidence or which have been used as dumps should be undertaken at a Provincial level.

The existence of severe conditions, where, for instance, mining subsidence is expected for many years to come, or, where liquid or toxic wastes have been dumped, may preclude the use of a particular site; in which case alternatives must be investigated.

It the site is to be developed then extensive site mitigation measures may be required and it is important that funding and technical expertise is made available to address the special conditions.

3.2.5 Existence of hazards from adjacent land uses

The proximity of sources of existing pollution may make sites unsuitable. Background levels of air, water and noise pollution from adjoining land users should all be taken into account. Sources should be identified such as:

- wind shed of significant air pollution sources such as smoke stacks
- noise shed around airports and major roads,
- proximity to major airports with many air traffic movements and the runway alignments and take off and approach corridors.

Potential impacts to the new residential community should be quantified.

Mitigation should aim to ensure sites are chosen as far away from existing sources of pollution as is possible. This is particularly the case where there are emissions where it will be difficult to implement abatement measures. Severe pollution, such as may be in existence in areas of concentrated brick factory kilns, may require the investigation of alternative or new site options.

Site mitigation measures which can be of use at local level include the provision of buffer zones consisting of alternative non residential uses or vegetation belts between residential areas and the source of pollution. Tree belts and other baffles can be used as noise barriers along motorways and busy roads. Any new housing estate should be set back from existing industry by:

- at least 150 metres for medium sized units of light industry and warehousing,
- at least 500 metres for large units of light and general industry
  (these standards are taken from NRMPIS–see Section 1.3)

Measures can also be taken to abate sources of pollution or remove them altogether. A programme to phase out and compensate brick kilns operators adjacent to housing land might be an appropriate measure.

3.2.6 Existence of hazards to residents from air pollution due to frequent temperature inversions

Local micro-climatic conditions can result in temperature inversion which in turn can cause particular severe atmospheric pollution conditions and impacts. If such climatic conditions are found in conjunction with existing local sources of atmospheric pollution then impacts can be serious.

The only solution to a site which has sources that are difficult to abate may be to opt for an alternative site. Where it is decided to go ahead with the development of the site non-polluting technologies for heating and cooking should be designed for and adopted. A reduction in permissible residential densities is also a partial solution in this situation.

3.2.7 Displacement of other site users

Serious consideration must be given to the issues and practical problems involved with any relocation of population occupying the site. Sites on the edge of existing planned communities may have significant unplanned informal types of housing. In severe cases the removal of high density squatter type housing may lead to the displacement of more people than the residential housing subdivision will put back on the site. Where the clearance of existing settlements is involved it is necessary to investigate where such displaced persons will go. It is quite likely that improvement of conditions on and around the housing site in question may result in unanticipated deterioration of the environment elsewhere, as the site users, particularly if they are squatters, find new sites.

Any resettlement should be done in accordance with proper standards. If displacement is on a large scale, a full environmental impact of the wider effects of resettlement on a new site will be necessary. If resettlement is likely to lead to increased densities and pressures on existing services in the immediate urban area, then provision must be made for infrastructure to meet the needs of such increased densities. The reader is referred to Chapter 3 of World Bank EIA Guidelines "Involuntary Resettlement and Induced Development" for a fuller discussion of the issues involved.

3.2.8 Destruction of resources of historic or cultural significance

Sites and areas of importance from an historic or cultural viewpoint need to be identified in the same way as is the case for sites in sensitive and critical areas.

Once historic and/or cultural sites have been identified, it is usually possible to set aside the land required to preserve the particular site and zone the land accordingly. The project design can then be adapted to include the historic or cultural resource.

3.2.9 Availability of existing infrastructure and services

The proximity, quantity and quality of all types of infrastructure should be investigated. Schools, hospitals and transport facilities for example may be already over stretched. Even where there is adequate infrastructure for existing needs, a large new housing estate can mean that certain thresholds are topped and new facilities such as a school may be required. Water may be a constraint and if new water supply schemes are required to enable a new development to proceed, the costs and environmental impacts must be assessed.

Mitigation in this area involves the work of economic and physical planners who must coordinate planning goals and Federal and Provincial programmes. Existing infrastructure and services in the area of the project should be upgraded where possible. The larger the housing scheme the more land must be set aside for other services. Where new towns are concerned the whole range of urban facilities must be planned and funded within the project proposal. This will mean the setting aside of land for shopping centres, open space and recreational areas, schools, hospitals, police stations and other community facilities.

3.2.10 Depletion of resources and overtaxing of traditional industries

Large housing projects can cause excessive depletion of local resources such as timber and fuel. They can also have impacts on traditional industries such as brickmaking. It is important to review the capacity of local resources and industries in this regard.

If it is determined that local resources and traditional industries are not able to cope with the increased demand from the project for materials and construction then it will be necessary to look at the possibility of upgrading the existing facilities. Alternatively the design and selection of project materials should be varied to suit the availability of locally obtainable resources. A study of indigenous customs and building techniques may assist in building solutions which can be incorporated in the project design.

Design can also take into account efficiency in materials and energy use.

3.3 Local site scale issues and project design issues

When it is decided to go to the detailed design phase of a project one or more of the problems identified in the site selection process above may be present. All the impacts identified at site selection stage must now be taken into consideration in the detailed design process. Detailed site investigation studies should be undertaken to look at the particular local conditions which can include all the factors identified in **3.2.** above. The sections on hazards from both adverse natural conditions (**3.2.3)** and adverse man-made conditions (**3.2.4**) are particularly important. For instance construction of housing on land with high water tables can result in susceptibility to vector borne diseases such as malaria. Poor design in low cost housing schemes, with inadequate provision for waste water disposal, can exacerbate such natural background conditions.

Detailed measures can be incorporated in various types of housing programmes to avoid the impacts of natural hazards and unfavorable ground conditions. Detailed discussion of such

measures in not undertaken in this document. Specific mitigation proposals will relate to the specific type of project and can only be made with knowledge of local conditions and detailed information regarding the hazards to be dealt with.

The reader is referred to National Reference Manual on Planning and Infrastructure Standards (NRMPIS) issued in 1986 by the then Ministry of Housing and Works Urban Affairs Division which discuss detailed layout considerations. One area where it is important to specify standards is in the proximity of housing to sources of pollution (effluent emissions, atmospheric emissions or noise). If housing is to be constructed adjacent to existing industrial users there must be buffer zones.

3.3.1 Loss or damage to natural habitat and recreational areas

Damage can occur to project sites and their immediate surroundings as a result of damage to the natural framework of the environment. Existing soils, vegetation and the drainage network will be particularly susceptible.

Fragmentation of important habitats can cause damage far beyond the shear amount of land taken for development. The disruption of the local migration movement corridors of animals (e.g. small rodents and frogs and toads) can put survival of local species at risk.

Equally there may also be an impact upon existing open space and reserves for parks, playing fields and greenbelt land.

Once the basic natural systems of the site and its surroundings are identified, it will be possible through careful design to protect these systems to the maximum by setting land aside for open space, easements and buffer areas. Layout design should be adapted to fit natural landscape features and patterns rather than adopt rigid geometric layouts which have no relation to the on site landscape features. Open space can be designed to follow natural site features such as natural drainage corridors and these corridors can then in turn be connected by linear open space to other local and regional open space systems.

3.3.2 Depletion and pollution of local ground water

The reduction in ground water available to existing local communities and local uses is a likely result of large housing projects. The existing situation must be examined with regard to quality and quantity; the availability of water may, for instance, only be sufficient to meet existing peak seasonal demands.

There should be an overall assessment of the groundwater needs of the project to determine if such needs are within the capacity of the natural system to replenish itself. Other local design criteria which can be incorporated in mitigation are:

- avoidance of "mining" of groundwater particularly in drier climates,
- avoidance of the use of open channel, sprinklers or other wasteful, irrigation techniques for landscaping in drier climates,
- use of indigenous vegetation that requires less water, drip irrigation or shaded plantings,
- ensure soils are suitable for septic tank or other on-site treatment
- design centralised systems to avoid leakage and wastage of water
- incorporate the use of vegetation to retain, recharge and purify stormwater when designing stormwater management systems.

3.3.3 Drainage and down stream water pollution impacts

In designing and constructing house lots and the access roads to them, care must be taken to ensure that adequate drainage is provided. In particular, storm water run-off from residential streets should not be allowed to flow into adjacent house lots.

Changes brought about on site by the project to the surface drainage patterns and to provide for sewage disposal treatment can cause intensified drainage problems and heightened pollution levels downstream. The impacts of extra drainage runoff and the use of water down stream particularly for drinking purposes must be assessed.

If there are major impact on drainage down stream from the project, improvement of community drainage system must be undertaken as part of the mitigation plan.

Where ever possible the existing drainage pattern should be preserved as should existing vegetation and natural habitats.

A storm water management plan must be put in place which should consider strategies such as:

- minimise impervious areas
- increase infiltration to the soil by the use of recharge areas
- use natural vegetation swales instead of pipes or use retention facilities with graduated outlet control structures,
- use soft engineering techniques for soil and bank stabilization using vegetation rather than built structures.

Similarly sewage treatment facilities must be planned carefully to allow adequate treatment and disposal to protect down stream water quality values and rights of downstream users.

3.3.4 Traffic and transport issues

A highway improvement programme will be associated with the project. There will be impacts on local and regional traffic flows which will have effects on traffic congestion, air pollution, smog and noise.

Planning for public transport systems should also be undertaken at this stage. The provision of cycle tracks and pedestrian routes should also be planned.

The transport system may introduce or intensify hazards or increase the likelihood of spills of hazardous materials.

The effects on traffic congestion, smog and noise should be assessed and if there is significant impact then measures can be considered to discourage the private car user. Such measures are generally regarded as more environmentally friendly.

Where the site is large enough for an overall master plan, a segregated road and pedestrian hierarchy should be developed and pedestrian and cycle tracks should be carefully planned to link with local infrastructure and open space areas.

3.3.5 Degradation of habitat from inappropriate or introduction of invasive exotic species

Natural habitat can be destroyed with destructive management and/or maintenance practices such as the removal of undergrowth vegetation from woodlands and the excessive clearance of vegetation from stream banks. There is often the temptation for the landscape planner to plant inappropriate untried species and varieties instead of the those which have adjusted to local conditions and supplying the needs of local flora and fauna.

Careful management practices are required to identify natural habitat and ensure practices are employed to avoid the whole scale clearance of natural habitat. Invasive exotic species should be avoided in landscaping and for any reforestation.

3.3.6 Local infrastructure impacts

Local infrastructure capacity must be examined to determine its adequacy for the needs of new population. Provision of roads, water supply, storm water drainage, electricity, gas and telephone lines is required, and consideration must be given to both headworks and distribution networks. Certain infrastructure may be capable of coping with increased demand but there may be need to expand existing facilities or develop new ones.

Social infrastructure must also be planned, including sites for shopping centres, community facilities, schools and the like.

To provide the needs of the new community land must be set aside. Provision of the necessary facilities must be co-ordinated with the Municipal or relevant planning authority. New townships will require a comprehensive range of public service and entertainment facilities to be provided such as fire station, post office, library, police station, jails, mosque grave yard and petrol station. Education (kindergartens, primary and secondary schools) and health (hospitals and health centres) are essential basic services that must also be considered and provided for. The National Reference Manual on Planning and Infrastructure Standard goes into details for planning and space standards and the reader is referred to this volume in this regard

3.3.7 Solid waste management

As with other infrastructure, existing solid waste management arrangements will come under increased pressure with the added population from a new housing estate. The capacity and current system should be investigated and any propensity for the new development to intensify or overload the existing system should be determined.

The provision of solid waste management facilities for the new township is essential—rarely will existing facilities be available, and where they are, they will need to be improved or expanded. The new project may have such impacts as to indicate the need for the preparation of a comprehensive plan for solid waste management in the metropolitan area.

3.3.8 Co-ordination of utilities

It is essential that the planning and design of new townships is undertaken in a comprehensive way, so the provision of all necessary utilities and infrastructure is provided at the same time. The adequacy of supply of electricity, gas, water and telephones to the area should be assured, and suitable connections made to the road (and rail, if relevant) network outside the estate. The capacity of the trunk system for transporting storm water and sewerage, and the provision of suitable treatment facilities, also needs to be checked.

The development of new sites can allow for the proper co-ordination of utilities. Careful planning using the same trench can avoid regular disruption of the street scene but careful planning is required to minimise impacts.

The NFMPIS recommends that services be placed under slow-moving lanes and cycle tracks and recommendations are made with respect to the co-ordination of utility services to be provided in conjunction with the proposed road network. Careful planning is required to implement NFMPIS standards and ensure that services are co-ordinated. In new housing developments electricity services should be underground where ever possible. Water and sewer pipes should only be placed in the same trench where proper design, construction and

maintenance supervision is assured.

3.4 Construction issues

Construction is the time when impact can be most severely felt and when the project site is particularly vulnerable to environmental disturbance. The reader is referred to ADB Environmental Guidelines Annex III/1 Environmental Constraints for Projects Involving Major Construction Operations for a full list of considerations which should be taken into consideration at this stage of the project. The main factors to bear in mind are as follows:

1. run off erosion during rains from unprotected excavated areas resulting in excessive soil erosion
2. dangers to workers from accidents, hazardous materials, quarrying, communicable disease and emissions
3. local flooding from watering of excavations, flushing of pipes etc.
4. loss or degradation of vegetation from unnecessary removal or mechanical damage,
5. disruption of local traffic patterns, congestion and blocking of access to adjoining activities.

Mitigation during the construction stage must be carefully planned and measures to minimise impacts must be tied to monitoring and management plans. Proper phasing of activities can help reduce disruption and degradation.

Temporary erosion control plans must be put in place; such plans should include:

- temporary silt fencing,
- temporary ponding or silt trap basins,
- short term seeding or mulching of exposed soil areas and particularly on sloping land,
- limitation of access for heavy machinery and the storage of materials to avoid soil compaction.

Topsoil must be properly stripped and stored for future use and not illegally removed from site.

It is important to identify significant stands of vegetation. This may include large contiguous stands of forest or other natural habitat, vegetation on steep slopes and vegetated stream corridors. Such areas can then be incorporated into the project design layout and/or the open space system in the plan.

Areas can be protected by temporary fencing and limitation of access for heavy machinery and material storage. This will help protect vegetation and avoid exposing larger areas to erosion and run off risks.

3.5 Operation stage issues

Impact mitigation in the operation stage of a residential project is complicated by the change of ownership from the developer of the scheme to the individuals concerned and this is discussed in Chapter 4 of the report. When housing estates actually become residential accommodation the environmental impacts are those resulting from the habits of the residents and the possible nuisances, pollution and health hazards that are associated with the provision of services (sewerage systems and treatment and solid waste disposal). If there is inadequate operation and management of such facilities then nuisance levels will be exacerbated.

The other main impact to be considered is occupational health of workers involved in service provisions.

Monitoring during the operation of the life of housing estates is closely linked with management and public participation of concerned residents and this is discussed in Chapter 4.

Monitoring for the environmental impacts involved in town service provision (sewerage treatment and solid waste disposal) and occupational health issues are covered in other sector guidelines and the reader is referred to them.

4.0 MONITORING MANAGEMENT AND TRAINING

4.1 Baseline conditions

The potential for impacts in townships schemes is large and it is important that baseline conditions are determined at the earliest possible time i.e. prior to the design stage of the project. Data should be collected with respect to each significant impact identified and it will then be possible to gauge and assess impacts once project implementation is underway.

Baseline data collection methodology is covered in Section 3.4 of the "Guidelines for the Preparation and Review of Environmental Reports".

4.2 Construction monitoring and reporting

Monitoring should be restricted to what is essential to protect the environment. The list of environmental parameters to be monitored should be specified. The design and management for a monitoring plan is discussed in Section 5.2 of the "Guidelines for the Preparation and Review of Environmental Reports".

The parameters which must be considered for inclusion in the monitoring report are discussed in .**3.4 Construction issues** of this report and in more detail in ADB Environmental Guidelines Annex III/1 Environmental Constraints for Projects Involving Major Construction Operations. Temporary erosion control plans and project development phasing plans should be included in the construction monitoring plan. There should also be regular reporting to the Responsible Authority during the construction phase.

4.3 Monitoring management and training during operations

The on going monitoring of environmental measures for housing estates and new town developments is complicated by the wide ranging impacts which may occur and by the nature of housing development. Housing estates are planned and developed by Government organisations or private developers and then handed over to individual occupants on a rental or sale basis. In the case of private developers this means that once construction is complete the proponent passes on overall responsibility for the site to:

(1) many individual owner occupiers; and

(2) the concerned local authority for the development and maintenance of any infrastructure and services on the site.

In the case of private developments, any stake the proponent has in the scheme is lost as the site transfers to multiple ownership. Owner occupier families then take on this role and the responsibility for certain local environment impacts.

New house occupiers should be encouraged to take on this environmental responsibility for

their residential neighbourhood. Awareness raising and support for local residents groups will be important; such groups should be educated with regard to monitoring plans and requirements. Management of the urban environment (residential areas and the associated infrastructure such as schools and hospitals) must become a joint responsibility of the users i.e. the public and the concerned Government Agencies. After the project is complete therefore residents, managers, maintenance people and local officials should be instructed in the purpose of its design and its recommended maintenance. Simplified guidelines for operation and maintenance should be distributed to encourage continuing support and understanding of the design and to build a sense of community in the new project.

Where public sector projects are concerned the relevant Provincial Department (usually the Planning and Housing Department) will be responsible for design of housing schemes while the monitoring and management plan will be handled by the Department responsible for Planning and Development (P&D) in the Province. It is important that environmental cells in the P&D's are developed and/or strengthened in the Provinces. Environmental capacity must also be increased in the implementing agency i.e. the Planning and Housing Department. Again it must be emphasised that the effectiveness of environmental measures can be greatly increased by building grass-roots understanding and support of the affected communities is vital.

The private sector is becoming increasingly important in providing housing in Pakistan and the effectiveness of monitoring of new private housing estates is the responsibility of Metropolitan and District Councils and Cantonment Boards. It is important that these agencies are strengthened to allow the implementation of the existing land use control planning process. This would allow the implementation of effective plans and for instance prevent illegal land use in new residential areas. The strengthening of environmental institutions must therefore be complemented with an equivalent strengthening of physical planning.

References

This, and other guidelines in the package, rely heavily on existing sources, which include:

- Government of Pakistan EIA Guidelines 1986
- ADB Guidelines 1993
- World Bank EIA Guidelines 1994
- The UNEP EIA Training Resource Manual June 1996
- National Reference Manual on Planning and Infrastructure Standards 1986 **(NRMPIS)**

Checklist of Environmental Parameters for Housing Estates APPENDIX I

Actions Affecting Environmental Resources and Values	Damage to Environment	Recommended Feasible Measures
A. Problems Related to Site Selection	A. Depends on Nature of Problem	A. Depends on Nature of Problem - Reject site if inappropriate
1. Displacement of existing land use e.g. agricultural land	1. Loss of economic resource	1. Proper quantification of impacts.
2. Destruction of sensitive areas	2. Loss of natural habitat	2. Proper valuation of impacts.
3. Natural adverse site conditions	3. Impact on human welfare	3. Design accordingly.
4. Existing hazardous man-made conditions	4. Impact on human welfare	4. Design accordingly.
5. Existence of hazards from adjacent land	5. Nuisance/hazards to workmen & residents	5. Abate pollution adequate buffer areas
6. hazards from air pollution due to temperature inversions	6. Impact on human health and welfare	6. Design accordingly use non-polluting technologies
7. Displacement of other site users particularly people & businesses	7. Social inequities	7. Adequate resettlement planning and budgeting
8. Impairment of historical/cultural resources	8. Loss or impairment of these values	8. Careful planning/design, plus offsetting measures
9. Availability of existing infrastructure and services	9. Overloading of existing infrastructure	9. Expanding infrastructure where possible
10. Local and traditional industry	10. Interference to existing patterns of activity and resource use	10. Review and adapt the design; consider indigenous building techniques
B. Problems Related to Design Phase	B. Depends on Nature of Problem	B. Depends on Nature of Problem
1. Impairment of natural habitat & recreational areas	1. Loss of habitat and recreational areas	1. Careful layout and design sympathetic to natural characteristics
2. Depletion/pollution of local ground water	2. Loss of water supplies for human & other use	2. Careful planning and monitoring.
3. Downstream effects of drainage and pollution	3. Health and safety of down stream users	3. Careful design/ O&M, & operation monitoring
4. Traffic and transport issues	4. Air pollution & noise affect human health	4. Careful traffic and circulation planning
5. Degrading habitat - introduced species	5. Loss of habitat	5. Careful planning and management practice
6. Local infrastructure impacts	6. Deteriorating services for local community	6. Careful regional planning

7. Solid waste management	7. Impacts on human health	7. Careful planning, O&M and monitoring
8. Co-ordination of utilities	8. Disruption of services and safety	8. Careful planning and standards compliance
C. Problems During Construction Stage	C. Unnecessary Environmental Damages	C. Careful Construction Planning & Monitoring
1. Silt runoff from construction operations	1. Soil erosion with damage to property and aesthetic values	1. Erosion control planning and careful monitoring
2. Dangers to workers from accident, disease quarrying, & emissions	2. Injuries to workers and nearby residents	2. Careful construction planning and monitoring
3. Local flooding from watering excavations, flushing of pipes	3. Local flooding damages	3. Careful construction planning and monitoring
4. Loss/degradation of vegetation from mechanical damage	4. Loss of vegetation, forest and habitat in general	4. Careful construction planning and monitoring
5. Traffic congestion and blocking of access	5. Loss of time and fuel and accidents	5. Careful construction planning/monitoring
D. Problem During Operation Stage	D. Depends on Nature of Problem	D. Careful O&M, plus Operation Monitoring
1. Occupational health inadequacies	1. Damage to worker safety and health	1. Occupational health plan plus monitoring
2. Inadequate O&M performance	2. Damage to worker safety	2. Occupational health plan plus monitoring
3. Nuisance, pollution hazards poor O&M	3. Nuisance/damage to workers & residents	3. Competent O&M