USAID
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SECTOR ENVIRONMENTAL GUIDELINES

HOUSING RECONSTRUCTION

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Cover Photo: Women speaking at a public meeting for a prospective USAID project in Tanzania. Photo dated September 2012. Charles Hernick.

About this document and the *Sector Environmental Guidelines*

This document presents one sector of the *Sector Environmental Guidelines* prepared for USAID under the Agency's Global Environmental Management Support Project (GEMS). All sectors are accessible at www.usaidgems.org/bestPractice.htm.

Purpose. The purpose of this document and the *Sector Environmental Guidelines* overall is to support environmentally sound design and management (ESDM) of common USAID sectoral development activities by providing concise, plain-language information regarding:

- the typical, potential adverse impacts of activities in these sectors;
- how to prevent or otherwise mitigate these impacts, both in the form of general activity design guidance and specific design, construction and operating measures;
- how to minimize vulnerability of activities to climate change; and
- more detailed resources for further exploration of these issues.

Environmental Compliance Applications. USAID's mandatory life-of-project environmental procedures require that an environmental analysis be conducted to identify the potential adverse impacts of USAID-funded and managed activities prior to their implementation according to USAID Environmental Procedures 22 CFR 216 or Reg. 216. They also require that the environmental management or mitigation measures ("conditions") identified by this analysis be written into award documents, implemented over life of project, and monitored for compliance and sufficiency.

The procedures are USAID's principal mechanism to assure ESDM of USAID-funded activities—and thus to protect environmental resources, ecosystems, and the health and livelihoods of beneficiaries and other groups. They strengthen development outcomes and help safeguard the good name and reputation of USAID.

The Sector Environmental Guidelines directly support environmental compliance by providing: information essential to assessing the potential impacts of activities, and to the identification and detailed design of appropriate mitigation and monitoring measures. When an activity receives a "Negative Determination with Conditions" these guidelines should be used to help establish which conditions are appropriate to the particular activity.

However, the Sector Environmental Guidelines *are* ***not*** *specific to USAID's environmental procedures. They are generally written, and are intended to support ESDM of these activities by all actors, regardless of the specific environmental requirements, regulations, or processes that apply, if any.*

Region-Specific Guidelines Superseded. The *Sector Environmental Guidelines* replace the following region-specific guidance: (1) *Environmental Guidelines for Small Scale Activities in Africa* ; (2) *Environmental Guidelines for Development Activities in Latin America and the Caribbean*; and (3) Asia/Middle East: *Sectoral Environmental Guidelines.* With the exception of some more recent Africa sectors, all were developed over 1999–2004.

Development Process & Limitations. In developing this chapter, regional-specific content in these predecessor guidelines has been retained. Statistics have been updated, and references verified and some new references added. However, this chapter is not the result of a comprehensive technical update.

Further, The *Guidelines* are not a substitute for detailed sources of technical information or design manuals. Users are expected to refer to the accompanying list of references for additional information.

Comments and corrections. Each sector of these guidelines is a work in progress. Comments, corrections, and suggested additions are welcome. Email: gems@cadmusgroup.com.

Advisory. *The Guidelines are advisory only. They are not official USAID regulatory guidance or policy. Following the practices and approaches outlined in the Guidelines does not necessarily assure compliance with USAID Environmental Procedures or host country environmental requirements*

CONTENTS

HOUSING RECONSTRUCTION

The ultimate impact of housing projects extends beyond the construction or reconstruction phase. The existence of housing tends to attract both economic activity and additional settlement. Thus, the environmental and environmental health impacts of the original project are typically amplified by its expansion over time.

INTRODUCTION

Shelter is a basic human need. Thus, providing adequate housing is a fundamental development objective but it is also highly complex. Successful housing activities can rarely be isolated from the development of associated infrastructure–e.g., water, sanitation, transport–and social services.

This section focuses on housing reconstruction after natural disasters that must be carried out in highly difficult circumstances, where there are expectations to be operational very quickly. The section does not address technical standards for construction of housing units, water supply and treatment, etc. Instead, its purpose is (1) to convey the full range of environmental and environmental health issues associated with housing construction, and (2) to provide a guided framework for considering these issues in the siting, design and implementation of housing projects, particularly in post-disaster reconstruction and in risk-prone areas.

Note: It is highly recommended that readers review additional sector environmental guidelines in this series as much of their content has implications for housing activity: *Water and Sanitation, Solid Waste, Rural Roads*, and *Small-scale Construction*.

BRIEF DESCRIPTION OF THE SECTOR

Across the world many human settlements are highly vulnerable to floods, extreme rainfall, cyclones and volcanic eruptions due to geology and geography. Such extreme weather events and other natural disasters can have disastrous effects on houses and other dwellings, and are often accompanied by large loss of life and persistent hardship for displaced persons. Typically, the poor are disproportionately affected by natural disasters—both because they tend to occupy poor-quality housing stock in high-risk areas (e.g., flood plains or steep slopes) and because they lack the resources to rebuild after a disaster.

In 2011 alone the Horn of Africa suffered record-breaking drought, parts of Cambodia, Thailand, Pakistan, Sri Lanka, and Central America were hit with devastating floods while Myanmar suffered an earthquake.

The need for housing reconstruction can arise in urban, peri-urban and rural areas but natural disasters in densely populated urban areas can be particularly devastating because they affect a large population even when they do not affect a particularly large area. Latin America and the Caribbean have an exceptionally high level of urbanization (79 percent in 2010). Africa and Asia, in contrast, remain mostly rural, with between 40 to 50 percent of their populations living in urban areas; however, those continents are expected to have higher urbanization rates than other regions in the coming decades.. Housing reconstruction in rural areas after a natural disaster is an equally pressing issue. Rural reconstruction needs are often more difficult to assess than those in more urbanized areas because of lack of prompt information about the dimensions of the disaster. Even in the absence of natural disasters, living standards in rural areas are lower than in urban ones, increasing vulnerability.

CLIMATE CHANGE

Global climate change is resulting in changes in temperatures, rainfall patterns, sea levels, and extreme weather events that are putting stress on many communities and challenging development efforts. It is becoming more difficult to predict future climate based on historical baseline conditions or trends. This uncertainty is increasing project design risks and community vulnerabilities. In response, project designers should now include a focus on climate change adaptation — defined as adjustment to natural or human systems in response to actual or expected climate change effects. Successful housing projects will include efforts to moderate climate-related risks and vulnerabilities and to take advantage of potential benefits to improve the likelihood of long-term project success. At the same time, project design should assess the potential contribution of a proposed project to greenhouse gas emissions, and implement cost-effective strategies and actions that minimize these emissions. Taken individually, impacts of small activities may appear minimal, but collectively, their scale and magnitude can have far reaching effects on human health and life-sustaining natural systems. This Guideline provides information on the relationship between climate change and housing construction activities.

Those involved in housing projects should consider issues such as where housing should be sited, and how it can be designed to withstand expected climate impacts. Uncertainties embedded in climate change scenarios must also be accounted for, and those involved must and practice adaptive management. Risk management frameworks can be used to understand the implications of uncertainties about climate change impacts when informing planning, investment and operation decisions.

POTENTIAL ENVIRONMENTAL IMPACTS OF HOUSING RECONSTRUCTION AND THEIR CAUSES

A fundamental issue facing post-disaster reconstruction efforts is whether to rebuild/repair housing where it was ("in-place") or develop a new site altogether. In densely populated urban areas, often the decision is to do reconstruction in-place although in high-risk areas other alternatives should be pursued. In either case, the environmental impact of housing development comes from the permanent occupation of the land by built structures and the introduction of domestic waste streams into the environment. Well-planned and implemented housing projects have far fewer impacts and result in much healthier populations than unplanned or poorly planned housing development.

In the case of a new settlement, the housing construction will cause some level of impact. However, the *ultimate* impacts may be significantly larger as new housing tends to attract both economic activity and additional settlement. Thus, the environmental and environmental health impacts of the original project are typically amplified. The expected impacts of climate change should also be considered since they will affect the suitability of an area for settlement. Large new settlements (say, over 25 houses) usually receive a Positive Determination and an Environmental Assessment is required.

Potential environmental impacts of housing projects

- Destruction of important ecological, archaeological or historical areas
- Deforestation
- Contamination of soil or water resources
- Erosion

POTENTIAL IMPACTS

Potential impacts arising from land development, the introduction of human waste streams, and resource demands include:

- Destruction of important ecological, archeological or historical areas. This may be caused either by land clearing for the housing and associated infrastructure, or by the subsequent exploitation of the land and other resources by inhabitants.
- Deforestation, arising from (1) clearing of land for construction and associated infrastructure (e.g., roads); (2) Additionally there can be concerns regarding the eventual land use practices of inhabitants and for each project this has to be properly assessed.
- Contamination of soil, surface water and groundwater from sewage and solid waste (refer to the *Water and Sanitation* sector description in the *Guidelines*); creation of breeding grounds for animal and insect disease carriers.
- Erosion from construction of houses and access roads, resulting in destruction of agricultural land, sedimentation of waterways, etc.
- Destruction/filling of natural drainage channels, thereby increasing flood risk.

CONSTRUCTION IMPACTS

The sector environmental guidelines on *Small-Scale Construction* from this series examine potential environmental impacts and prominent among these impacts are:

- Erosion caused by water or wind and aggravated by sloping terrain when the earth is left barren after the site is cleared, leveled or filled in. Erosion may also be associated with access roads, or with quarry or borrow areas that provide construction material.
- Water contamination, from (1) the dumping of demolition debris or excess soil from land leveling into watercourses; (2) runoff from on-site machine maintenance (oil change, refueling, washing) affecting surface and groundwater supplies; and (3) lack of adequate sanitary facilities for construction workers.
- Airborne dust and particulate contamination, caused by removal of ground cover from access roads, quarries, borrow pits and construction sites.
- Destruction or depletion of local natural resources, such as sand and rock taken from riverbeds, quarries or borrow areas and wood cut from neighboring forests for construction or for firing brick-making.

Environmental damage from housing construction

- Erosion, particularly from quarries or borrow pits
- Water contamination
- Airborne dust and particulate contamination
- Destruction or depletion of local natural resources
- Loss of stability on slopes and hillsides
- Creation of areas where disease bearing insects and animals can breed
- Destroying or damaging scenic vistas

- Loss of hillside stability caused by the removal of vegetation cover, water saturation from altered drainage, and poorly designed quarries and borrow pits; results include landslides and slumping.
- Creation of an environment favoring disease vectors. For example, demolition rubble may serve as a breeding ground for rats; standing water may serve as a breeding ground for insect vectors and harbor water-borne diseases.
- Marring of viewsheds and aesthetic qualities by failure to properly dispose of construction and demolition waste (including trash produced by workers) and by scarring associated with quarries and borrow pits for construction materials.
- Greenhouse gas emissions from equipment usage, transportation of materials and equipment, energy use in the new houses, and loss of carbon stores and sinks (e.g., through deforestation).

IMPACTS OF THE BUILT ENVIRONMENT

As noted above, housing construction changes the natural environment and poorly planned and constructed housing or settlements can create severe environmental health hazards for both the existing population and new inhabitants.

Environmental health issues include:

- Inadequate or absent sanitation facilities (water, sewage and solid waste disposal), leading to higher rates of diseases borne by oral-fecal transmission and by insect and animal vectors (e.g., mosquitoes, rats).
- Possible dangers from rebuilding in risky areas—e.g., landslides and flooding.
- Dangerous prior or ongoing human activity near the site—such as highly polluting industrial, mining or farm operations, military operations, etc.
- Creation of standing water due to poorly constructed drainage systems or abandoned borrow pits, with associated increases in vector-borne disease.
- Unhealthy interior conditions due to improper house design or construction materials that are inappropriate for the local climate and anticipated use of space within the home (e.g., creating interior conditions that are either too hot or too cold, or improper ventilation for heating or cooking).

Quarries and borrow pits can be breeding grounds for disease-bearing insects, contribute to deteriorating water quality, and cause erosion.

IMPACTS ON ENVIRONMENTAL RESOURCES

Creation of a new housing settlement can also affect the environmental resources available to the *existing population* in the area, particularly in rural locales.

Again, impacts on the existing population should consider climate change, which may put additional stresses on those communities. The impacts of a proposed project must be assessed against what would happen without the project. In the case of housing projects, baseline assessment can be a particularly difficult proposition. An unwanted alternative to planned reconstruction may be unplanned and ad hoc resettlement of the site, reproducing—or even worsening—preexisting public health hazards and the poor construction practices which may have contributed to the disaster in the first place.

Environmental damage from built housing

- Inadequate or non-existent sanitation
- Natural disasters, such as floods or landslides
- Dangerous or polluting local industries and activities
- Standing water, creating breeding grounds for disease-bearing insects
- Unhealthy conditions inside houses from poor design or construction

CLIMATE CHANGE

PLANNING FOR A CHANGING CLIMATE

Sea level rise, shifting temperatures and precipitation patterns are climatic changes to baseline conditions that affect housing—and especially the people living within them. These changes can lead to more frequent or more severe droughts, floods, tropical storms and storm surge, and should be considered in housing design, siting, materials selection, construction, use, and maintenance. Therefore, housing—especially permanent structures—needs to be designed to reduce exposure and sensitivity to climate variability and change.

Thirty-eight percent of global population growth now occurs in slums or shanty towns, which are more likely to be located in hazard-prone areas, and where existing lack of sanitation, safe drinking water, and durable housing may be exacerbated by climate change effects such as drought, flooding, heavy rainfalls, or high winds. Improperly or poorly constructed housing presents one of the greatest risks associated with climate hazards, leaving inhabitants highly vulnerable. Relocation of settlements may become necessary due to gradual impacts like sea level rise.

ADAPTING TO CLIMATE CHANGE BY MINIMIZING VULNERABILITY THROUGH PROJECT DESIGN

Adapting planning, design, and project execution to climate change involves ensuring that new housing is able to withstand changes and variations in climatic conditions and especially extreme weather events. This involves incorporating in design both the function of the home as well as the vulnerability of users (e.g., children, elderly, or ill).

Designers and project managers should now incorporate information on climate from past baseline trends, as well as from future scenarios based on the type of investment made and its intended lifetime (e.g., if a house is supposed to be used for the next 20-50 years, then mid-term scenarios should be used). In many cases managing for greater uncertainty and risk associated with potential extreme conditions rather than past historical trends emphasizes the **"no regrets"** principle over "**business as usual**." This type of focus on risk analysis and management is commonly applied by the financial and insurance industries and can also be used in assessing proposed development activities.

For example, design and siting for housing in coastal zones should take into account projected sea level rise, and storm surges. The same principle applies to residences located in or near flood plains, rivers and wetlands. Construction in these areas should be avoided whenever possible. In locations where annual average temperatures are rising, building designs should include passive solar cooling principles and use materials that prevent heat from entering homes, such as mud and brick. For housing located where drought is a concern, greater attention should be paid to incorporating water storage and efficient water systems to conserve water. In areas where heavy rains are projected, construction design should address these through adequate drainage and erosion control measures. Existing buildings should be retrofitted to incorporate these kinds of measures and ensure they are structurally resilient to anticipated stressors.

Climate change adaptation also includes integrating renewable and/or back up energy systems to maintain homes in the event of sudden or intermittent electrical outages or fuel shortages caused by climatic events. Extreme events may also displace entire communities, making it advisable to consider the need for early warning systems and evacuation plans, and identify temporary housing locations for residents in preparation for such events.

From a **risk management** and budget perspective, it is less costly to design for the potential direct and indirect impacts of climate change on housing and residents, than to risk major losses or damage to housing or for communities and residents to face loss of service in the future.

Climate Change Effects	Impacts on Housing	Possible Adaptation Responses
• Sea level rise • Stronger and/or more frequent storms • Increased frequency, intensity and duration of heat waves • More intense rainfall events	• Undermining the housing foundation and contaminating groundwater supplies • Building damage from strong winds and storm surge, and further rain penetration • Higher risk of fire, increased evaporation reducing water supplies, and higher costs for cooling • Flood damage to homes as well as roads /access routes	• Retreat from flood plains and coastal areas – choose less risky building sites • Use water resistant materials • Use wind and impact resistant materials • Use of external shading • Update drainage plans to ensure sufficient capacity

MINIMIZING GREENHOUSE GAS EMISSIONS AND MAXIMIZING SEQUESTRATION

Housing construction contributes to greenhouse gas emissions from equipment use, the transport of materials and labor, and the production of materials. Once in place, housing contributes to greenhouse gas emissions from cooking, heat, and electricity. Siting decisions can also affect greenhouse gas emissions if they increase travel distances to workplaces and schools, or require removing vegetation that would otherwise act as a carbon sink.

Housing projects can minimize greenhouse gas contributions by taking steps to improve project energy efficiency. Emissions reductions can be achieved by requiring practices under contract that include procurement and sourcing of energy efficient equipment and materials; conserving electricity and fuel and using renewable energy sources during construction.

In the practice of EIA, mitigation is the implementation of measures designed to eliminate, reduce or offset the potential adverse effects of a proposed action on the environment.

In the practice of climate change, mitigation is an intervention to reduce GHG sources and emissions or to enhance the sequestration of GHG's by natural means (e.g., uptake by trees, vegetative cover, algae) or the use of technology (e.g., underground carbon storage) to limit the magnitude and/or rate of climate change.

Increased housing energy efficiency can be achieved through green building design, efficient lighting technology, installing heat reflective walls and roofs, and insulating homes. Improved cooking stoves and retrofitting already-existing buildings when possible can also reduce greenhouse gas emissions.

Tree and ground cover removal for housing can be addressed through compensatory tree-planting to replace vegetation lost from housing activities.

SECTOR PROGRAM DESIGN – SOME SPECIFIC GUIDANCE

OVERVIEW

Land tenure. Resolving outstanding land tenure issues is an absolute necessity for any project. Any environmental and health protections put in place by the project can be counteracted by those with legal claims on the land. However, resolving land tenure questions is rarely straightforward. Throughout the developing world, land tenure for poor populations is often unclear or highly informal.

Governance and maintenance. Ongoing mitigation of environmental and environmental health impacts—as well as the benefits and services individuals derive from the built environment—is contingent upon proper maintenance and good community governance. In some cases, reconstruction will occur within a community that already has a pre-existing governance system. In other cases, new community institutions must be established. Large-scale reconstruction efforts, or those that involve building a new community, should include a complete Community Development Plan (CDP), including the following elements:

- **Administration of standard services and maintenance.** This should include responsibility for providing potable water supply systems, sanitation facilities, solid waste disposal systems, transportation, and cooking, educational and health facilities.
- **Provision of social services.** Community counseling in topics such as adapting to change and living in a community (especially important for resettlement/disaster relief-related housing); communal organization services (aid in the formation of civic associations, water boards, etc.); educational activities in water storage and latrine maintenance; in health and nutrition; in the construction, use and maintenance of fuel efficient stoves; as well as job assessment programs that include training and placement. Gaining social acceptance of new technologies or implementing services that require a change in traditional behavior will require additional investment and time.
- **Establishment of a coordinating committee.** This committee should have the technical, organizational and administrative capacity to execute the development plan. Ideally, the committee should include representatives from all relevant stakeholder groups, such as representative from local non-governmental organizations, community representatives, local school representatives, a social worker, possibility local businesses and a municipal authority.
- **Supervision and monitoring program.** Regular on-site visits, surveys and quality testing of the facilities are needed to ensure their proper functioning. The Coordinating Committee should provide necessary oversight.

Starting the design process with sound baseline data. Because the various housing activities—construction, facilities planning, etc.—are highly integrated, and because their impacts depend in large part on the *social and economic behaviors* of stakeholder populations, those designing and implementing activities must develop as complete a baseline as possible, describing both current and historical environmental and social conditions.

Design elements for successful housing projects

- Resolve outstanding land tenure issues.
- Ensure proper maintenance and community governance.
- Begin design with good baseline data on the community.
- Always complete a preliminary project design.
- Use baseline data and project design to anticipate environmental problems.

Two baseline surveys are highly recommended: (1) A social survey, to be administered both to future occupants (if known) and to the existing local population, and (2) an environmental baseline survey of the project site. Samples of these surveys are included at the end of this module.

A housing project must collect baseline data and develop a project design plan that takes site conditions, construction management and community governance into account.

Setting out a preliminary project design. Following the baseline surveys, a preliminary project profile is developed. The profile contains basic information about the preliminary design of the housing project, and should be filled out *before the project plan is finalized and any construction is undertaken.* (A template profile is also included at the end of this module.)

Using the preliminary design and baseline data to identify environmental concerns. Taken together, the baseline surveys and the project profile allow the most critical questions about the project's impacts to be answered. These questions are presented in the checklists found below. The checklists identify the most likely adverse impacts from a proposed project or program, and point to needed mitigation measures.

Those responsible for the project, including stakeholders, MUST be willing to adjust the project to address the critical problems identified by the checklists. *If the project design is not adjusted in response to identified concerns, then the entire environmental assessment process is meaningless.* Mitigation options are identified in the tables immediately following the checklists.

KEY QUESTIONS: SITE AND DESIGN

Note that the surveys and the project design assume construction of new housing units, rather than repair of existing structures. Checklists should be modified for projects oriented toward repair or replacement/rebuilding only.

These checklists should be answered using information from the baseline surveys and the project profile. Adverse impacts can be indicated as significant or moderate. For each **significant** adverse impact, a mitigation measure should be considered mandatory. For each moderate adverse impact, mitigation should be considered. Mitigation measures are presented in the final section of this sector briefing.

SITE AND DESIGN	YES		NO OR N/A
	SIGNIFICANT ADVERSE IMPACT (WITHOUT MITIGATION ACTIONS)	MODERATE ADVERSE IMPACT (WITHOUT MITIGATION ACTIONS)	
Will the project have reasonably foreseeable impacts on endangered or endemic species?			

SITE AND DESIGN	YES		NO OR N/A
	SIGNIFICANT ADVERSE IMPACT (WITHOUT MITIGATION ACTIONS)	MODERATE ADVERSE IMPACT (WITHOUT MITIGATION ACTIONS)	
Are any hazardous or highly polluting activities foreseen, or currently taking place, in the surrounding areas?			
Could previous land use put the future population at risk? • Historic uses/access that may conflict with proposed use (e.g., communal grazing) • Land tenure issues • Soil contamination or stored wastes			
Did the environmental survey identify any other local problems or issues? If so, specify _____			
Is the site at moderate or high risk from natural hazards now or under predicted climate changes? • Flooding • Sea level rise • Wind (including dust, smoke, haze) • Volcanoes and earthquakes • Fires			
Does the site slope exceed 20%?			
Associated construction: Will an access road need to be created or rehabilitated? Will electricity transmission/generation infrastructure need to be constructed? What options are there to use renewable energy sources? Will water supply and treatment infrastructure need to be constructed?			
Does the proposed potable water system meet estimated water requirements for the present and future population, including under climate change scenarios? If no, are complementary water sources available?			
Does the potable water quality meet relevant national or funding agency standards?			

SITE AND DESIGN	YES		NO OR N/A
	SIGNIFICANT ADVERSE IMPACT (WITHOUT MITIGATION ACTIONS)	MODERATE ADVERSE IMPACT (WITHOUT MITIGATIO N ACTIONS)	
Has the lighting source and distribution system been taken into account in the design and layout of the project?			
Is the cooking fuel available proportionate to the demands of the community?			
Has a solid waste disposal system been designed for the site?			
Will the solid waste disposal system meet relevant standards and has it been designed with future growth in mind?			
Has a sewage/gray water disposal system been included in the design?			
Will the effluent from the water disposal system meet relevant national or funding agency standards?			
Are the building materials adequate for the local weather conditions and projected climate changes?			
Does construction embody appropriate wind, fire, or flood resistance taking into account changes due to climate change? Does it embody appropriate earthquake resistance?			
Have provisions been made to ensure adequate occupant comfort in hot and cold seasons, including under projected temperature rise scenarios?			
Has the predominant wind direction been considered in the design of the project houses?			
Has the predominant wind direction been considered in the design of the waste disposal and sewage systems?			

SITE AND DESIGN	YES		NO OR N/A
	SIGNIFICANT ADVERSE IMPACT (WITHOUT MITIGATION ACTIONS)	MODERATE ADVERSE IMPACT (WITHOUT MITIGATION ACTIONS)	
Does the design and layout include the following elements, and do their type and quantity which meet relevant standards? • Internal roads • Green areas • Social and recreational areas • Fire prevention • Transportation			
Does the design accommodate future expansion? (Factors include growth in population, schools, access to employment, expansion of individual houses, and future utility service connections.)			
Is house design consistent with that of other housing projects or existing housing in the area? (Social problems may arise from the differences in quality of the houses and services provided)			

KEY QUESTIONS: CONSTRUCTION MANAGEMENT

If the answer is "no," no further action is needed. For each significant impact, an adequate mitigation measure must be implemented. For each moderate impact, some mitigation should be considered. See the *Small-scale Construction* and *Rural Roads* guidelines for further discussion on construction project management.

CONSTRUCTION MANAGEMENT	YES		NO OR N/A
	SIGNIFICANT ADVERSE IMPACT (WITHOUT MITIGATION ACTIONS)	MODERATE ADVERSE IMPACT (WITHOUT MITIGATION ACTIONS)	
Will construction activities likely produce significant: • Erosion? • Water contamination? • Airborne dust and particulate contamination? • Deforestation? • Loss of habitat or biodiversity? • Effects on threatened or endangered species? • Hillside instability/landslide risk? • Noise? • Obstruction to roads or other existing transportation? • Construction or demolition waste?			
Will on-site water resources be used to satisfy construction needs?			
Are potentially hazardous construction techniques to be employed with serious risk to worker safety? (e.g., felling of large trees, blasting, large-scale excavation, construction of bridges and towers)			
Will laborers coming into the area require food and housing?			
Will laborers coming into the area plausibly increase the incidence of certain communicable diseases in the local population—e.g., malaria, tuberculosis, or HIV/AIDS?			

KEY QUESTIONS: HABITATION AND COMMUNITY GOVERNANCE

Once people move into a housing project, long-term impacts (beneficial or adverse) will develop, affecting the inhabitants, the surrounding communities and the environment. Careful thought must be given to ensure that the project will have a positive and lasting influence on the area. Mark the answer that will best fit the project characteristics. For every "No," a clearly defined plan should be designed and ready to implement before the houses are officially transferred to the new inhabitants.

COMMUNITY GOVERNANCE	YES	NO OR N/A
Will a management structure for the community be in place before the houses are occupied?		
Will the basic facilities (latrines, potable water, gray water and solid waste disposal) be ready for use by the time the houses are inhabited?		
Will there be any training in the use of these sanitary facilities for the project population?		
Have the parties responsible for the operation and maintenance of the facilities been identified and trained?		
Is there an established basic service billing system?		
Has the party responsible for the billing system been identified and trained?		

ENVIRONMENTAL MITIGATION AND MONITORING ISSUES

SITE AND DESIGN

POTENTIAL ADVERSE IMPACT	MITIGATION MEASURES
Change in land use pattern	• Ensure that present land use at the proposed project site is not critical and that the present activities can be carried out on nearby land before the site is selected.
Destruction of important ecological, archeological or historical areas	• Before the site is selected, verify that biodiversity, conservation of endangered or endemic species or critical ecosystems will not be adversely affected. • Likewise, verify that no important archeological, historical or cultural sites will be adversely affected by the project. • An alternative site should be used if the area is identified as critical.
Contamination of soil and water from sewage and solid waste	Sewage: • Site human waste and solid waste disposal systems to avoid surface and groundwater contamination, taking soil characteristics and historical groundwater and surface water conditions into account. Install adequate and appropriate sewage and solid waste disposal systems (e.g., use above-ground composting latrines in areas with high water tables).

POTENTIAL ADVERSE IMPACT	MITIGATION MEASURES
	• Install adequate and appropriate sewage and solid waste disposal systems (e.g., use above-ground composting latrines in areas with high water tables). • Complete sewage treatment is usually required. Latrines are usually inappropriate for larger or dense new settlements. Solid waste: • Install adequate and appropriate solid waste systems. Sanitary landfills and recycling programs are often non-existent in developing countries, and support for their development may be required in coordination with local municipalities (see solid waste chapter).
Risk to residents due to possible natural hazards, or extreme climate events exacerbated by climate change	• Ensure that proposed project site is not located in areas currently or likely to become: o subject to landslides o subject to fires o subject to flooding o with slopes over 20% o below areas likely to undergo significant deforestation or land clearing • If the site is in an area subject to these natural hazards, an alternate site should be used. If no appropriate alternative can be found, mitigation measures must be taken to minimize risk in areas where it is unavoidable (e.g., construct firebreaks, stabilize slopes, construct drainage, elevate housing units on pilings, etc).
Risks to residents due to human activity near site	Before the site is selected: • Ensure that the project will not be located within the area of influence (normally 1 km) of pollution and hazardous waste sources, including factories, mines, military bases, etc. • Ensure that the project is not downwind of a contamination source. • If groundwater is to be used for drinking, test it for chemical and microbial contamination if there is any reason to doubt its purity. • Identify and eliminate sources of noise pollution. • Use alternate site if risk to residents is high.
Excessive use and pressure on existing facilities such as schools and health centers	• Include the expansion or construction of any necessary infrastructure in the layout and design of the project, if needed.
Deforestation in order to implement project	• If forest is dense or forms part of a critical habitat, an alternative site must be found. • A forested area equal in size to one and a half to two times the area deforested must be established and maintained. The location and ultimate use of this protected area will be established in coordination with local municipal authorities.

POTENTIAL ADVERSE IMPACT	MITIGATION MEASURES
	• For each tree cut in a sparsely forested area, plant 20 new native trees. This should be done no later than 6 months after the residents have moved in.
Excessive use of fuelwood as an energy source	• Encourage use of alternative energy sources such as gas, biogas, electricity and solar. • If fuelwood is the dominant energy source, include the planting of fuelwood plots using local species in the project layout and design. • Require all residents who cook with fuelwood to use improved stoves.
Houses inappropriate for local climate; occupant comfort inadequate, including due to increased weather variability resulting from climate change	• Ensure that the design, construction materials, and siting of windows and doors takes local climatic conditions in cool and hot seasons, seasonal variation in precipitation and winds, and anticipated climate changes into account. Use local materials if possible.
Ventilation inadequate	• Design houses to ensure adequate ventilation for the potential heating and cooking sources to be used within the home. Take advantage of wind direction in design.
Inadequate attention to type and location of solid waste disposal	• Prepare and implement a Solid Waste Disposal Management Plan prior to resident occupancy. Include technology and funding for system maintenance and disposal, effects on groundwater, wind direction, etc. in the plan.
Health hazards due to lack of sanitation facilities (water, sewage and solid waste disposal)	• Sanitation facilities must be included in the project design. • Ensure that all sanitation facilities are installed and running before the occupants move in.
Unsafe potable water supplies	• Ensure siting of supply systems and choice of supply technologies to minimize health hazards. • Conduct seasonal testing of water quality, particularly for coliform bacteria and arsenic. Assess long-term and seasonal shifts in water quantity and quality.
Inadequate water supplies	• Estimate water demand (current and future) and identify supplies that can meet the projected demand • Train users to monitor and repair leaks from cracked containment structures, broken pipes, faulty valves and similar structures to ensure efficient use of water supply • Put in place a system for regulating use, such as a local warden or appropriate pricing • Monitor water levels in wells or impoundment structures to detect overdrawing
Hazard due to inadequate earthquake resistance or inappropriate materials	• Understand local risks of earthquake, floods and winds. Ensure that construction meets appropriate standards. Use locally available materials. • Follow, or exceed, official design criteria.
Social impacts within and around the project site	• A social analysis of the beneficiaries and the communities around the proposed site must be conducted implemented before the project is designed.

POTENTIAL ADVERSE IMPACT	MITIGATION MEASURES
	• If the site's location generates too much social conflict, an alternative site must be selected. • Community development programs must be implemented in each community before or during the construction process.
Lack of compliance with mitigation measures	• Collect signed binding agreements from the collaborating organizations and contractors before the project begins. • Each implementing partner or NGO must have an environmental management plan to ensure compliance with the mitigation measures. Have an independent evaluation of the plan conducted annually.
Inadequate electricity supply, or fossil fuel dependency	• Use renewable electricity and battery systems to supply electricity in rural areas (i.e., decentralized power). • In urban areas, utilize renewable electricity to supplement demand and act as a backup power supply.

CONSTRUCTION

POTENTIAL ADVERSE IMPACT	MITIGATION MEASURES
Risk of injury to workers/local inhabitants from construction	• Insure that workers have proper protective equipment (noise and dust protection, boots, gloves, etc.) and follow sound safety practices (e.g., use safety ropes, practice proper blasting safety) as appropriate. • Insure that pits are covered or that access to them is impeded during construction. • Excavate and rebury trenches quickly. • Manage quarry slopes to avoid cave-ins.
Interruption to local transportation	• Schedule construction for low-traffic days or hours; stagger construction to dilute the impacts of road closure. Conduct work to permit at least alternating one-way road passage.
Noise	• Schedule work so as to minimize noise. Use less noisy construction techniques.
Dust or mud	• Spread water to keep dust down. Drain areas prone to mud. If possible, schedule land-clearing, excavation and similar activities to avoid extremely dry and extremely wet conditions.
Breeding grounds for insect vectors (e.g., standing water in borrow pits; demolition debris)	• Excavate and rebury trenches quickly. Arrange for construction or demolition debris to be permanently disposed of away from watercourses. Fill borrow pits or assure their drainage. Use shallow wells or streams for construction water rather than diverting natural flows to the construction site.
Erosion during construction of houses and access roads	• Soil conservation measures must be included in the design and implemented during construction. The exact means will depend on the site and the severity of the impact. Install checks and barriers (e.g., berms, hay bales or other vegetation) to trap sediment runoff and revegetate disturbed areas.

POTENTIAL ADVERSE IMPACT	MITIGATION MEASURES
Lack of compliance with mitigation measures	• Collect signed binding agreements between the collaborating organizations and contractors before the project begins. • Each responsible NGO or other partner must have an environmental management plan to ensure compliance with the mitigation measures. Have an independent evaluation of the plan conducted annually.

HABITATION

POTENTIAL ADVERSE IMPACT	MITIGATION MEASURES
Improper use of environmental and sanitary resources by householders	If applicable, the responsible NGOs and partners must provide environmental and sanitary training for all residents before they move in. Training should address all of the following: • Environmental education for children • Care of domestic animals • Reforestation of green areas • Proper use and maintenance of latrines • Social interactions in housing projects • Proper use and conservation of water • Construction and use of improved stoves • Fuelwood plot management
Lack of compliance with mitigation measures	• Collect signed binding agreements between the collaborating organizations and contractors before the project begins. • Each responsible NGO or other partner must have an environmental management plan to ensure compliance with the mitigation measures. Have an independent evaluation of the plan conducted annually.

RESOURCES AND REFERENCES

DISASTER PREVENTION AND MANAGEMENT

Resources in this section are organizations and websites, rather than specific documents. The websites are intended as portals for accessing a wide variety of documents and technical resources.

- Coordination Center for Natural Disaster Prevention in Central America. www.cepredenac.org.
- Costa Rica National Risk Prevention and Emergency Commission. .
- CRID (Regional Disaster Information Center). http://www.crid.or.cr/ing_index.shtml

  CRID offers a gateway to an extensive technical library in English and Spanish, accessed via database search. Sponsored by six organizations that joined efforts to compile and disseminate disaster-related information in Latin America and the Caribbean, all of the constituent bodies may offer resources of interest to those engaging in post-disaster recovery efforts, including housing reconstruction. Online: www.crid.or.cr.

- Doctors Without Borders. www.msf.org
- International Federation of Red Cross and Red Crescent Societies. www.ifrc.org
- International Strategy for Disaster Reduction, Regional Unit for Latin America and the Caribbean. www.unisdr.org
- Pan American Health Organization (A regional office of the World Health Organization). http://www.paho.org
- UNCHS (UN Commission on Human Settlements) and the Together Foundation. http://www.unhabitat.org/bp/bp.list.aspx

  This partnership maintains free documentation of disaster reconstruction efforts in the Best Practices Database. Documentation of best practice in disaster reconstruction can be accessed via the Best Practices Database, offered by the UN Commission on Human Settlements (UNCHS and the Together Foundation). Access to abstracts is free.

TECHNICAL GUIDANCE

- Practical Action. Disaster risk reduction. http://practicalaction.org/disaster-risk-reduction-8

  This site offers online technical guidance on appropriate and disaster-resistant housing. Practical Action (http://practicalaction.org/) Publishing's online "Development Bookshop" service (http://developmentbookshop.com/) serves as a single point of search (and ordering) for this and other technical, development-related subjects. (Note, however, that books ship by post.)

CLIMATE CHANGE RESOURCES

Note: USAID's Global Climate Change (GCC) Office can provide support on the climate change aspects of this Guideline. To contact the GCC office, please email: climatechange@usaid.gov

- USAID. 2007. Adapting to Climate Variability and Change: A Guidance Manual for Development Planning. http://pdf.usaid.gov/pdf_docs/PNADJ990.pdf

- USAID. 2009. Adapting to Coastal Climate Change: A Guidebook for Development Planners. http://pdf.usaid.gov/pdf_docs/PNADO614.pdf

  The guidance provides information to assist planners and stakeholders as they cope with a changing climate throughout the project cycle.

- USAID. 2013. Addressing Climate Change Impacts on Infrastructure. https://dec.usaid.gov/dec/GetDoc.axd?ctID=ODVhZjk4NWQtM2YyMi00YjRmLTkxNjktZTcxMjM2NDBmY2Uy&rID=MzM2Njkx&pID=NTYw&attchmnt=VHJ1ZQ==&uSesDM=False&rIdx=NDM2MzY4&rCFU=

- U.S. Green Building Council. http://www.usgbc.org/

- Leadership in Energy and Environmental Design (LEED). https://www.leedonline.com/irj/servlet/prt/portal/prtroot/com.sap.portal.navigation.portallauncher.anonymous

- International Association for Impact Assessment (IAIA). FasTips #3. February 2013. Climate Smart Decisions. USAID Sector Guideline Housing 2013.docx http://www.iaia.org/publicdocuments/special-publications/fast-tips/Fastips_3%20Climate%20Smart%20Decisions.pdf

- National Institute of Building Sciences. Whole Building Design Guide. 2013. Passive Solar Heating. http://www.wbdg.org/resources/psheating.php

- Ibrahim, M. Strengthening Climate Resilience Discussion Paper 6. Post-disaster Housing Reconstruction in a Conflict Affected District, Batticaloa, Sri Lanka: Reflecting on the Climate Smart Disaster Risk Management Approach. 2010. http://r4d.dfid.gov.uk/PDF/Outputs/ClimateChange/SCR-DiscussionPaper6-Sri-Lanka.pdf

- Construction Specifications Institute, North American Insulation Manufacturers Association, The Vinyl Institute. Building Design & Construction. High-Performance Reconstructed Buildings: The 99% Solution. 2012. http://www.bdcnetwork.com/sites/default/files/WP_BDC0512_low%20res_3.pdf

- Chartered Institute of Environmental Health. Climate Change and Housing. 2013. http://www.cieh.org/policy/climate_change_and_housing.html

- Snow, Mark and Deo Prasad. Climate Change Adaptation for Building Designers: An Introduction. EDG 66 MSA. 2011. http://environmentdesignguide.com.au/media/misc%20notes/EDG_66_MSa.pdf
- UN-HABITAT. Scoping Paper: Sustainable Building Practices for Low Cost Housing: Implications for Climate Change Mitigation and Adaptation in Development Countries. 2011. http://www.unhabitat.org/downloads/docs/10785_1_594340.pdf

- WHO. International Workshop on Housing, Health and Climate Change. Developing Guidance for Health Protection in the Built Environment – Mitigation and Adaptation Responses. Meeting Report. 2010. http://www.who.int/hia/house_report.pdf

- WHO. Health Co-Benefits of Climate Change Mitigation – Housing Sector. 2011. http://www.who.int/hia/hgehousing.pdf

- Environmental Protection Agency. Sources of Greenhouse Gas Emissions. 2013. http://www.epa.gov/climatechange/ghgemissions/sources/commercialresidential.html

- **National Communications** are submitted by countries to the UNFCCC and include information on country context, broad priority development and climate objectives, overviews of key sectors, historic climate conditions, projected changes in the climate and impacts on key sectors, potential priority adaptation measures, limitations, challenges and needs. http://unfccc.int/national_reports/non-annex_i_natcom/items/2979.php

- **The World Bank's Climate Change Knowledge Portal** is intended to provide quick and readily accessible climate and climate-related data to policy makers and development practitioners. The site also includes a mapping visualization tool (webGIS) that displays key climate variables and climate-related data. http://sdwebx.worldbank.org/climateportal/

- **National climate change policies and plans.** Many countries have policies and plans for addressing climate change adaptation.

GENERAL

- United Nations Department of Economic and Social Affairs, Population Division (2012). World Urbanization Prospects: The 2011 Revision, Highlights. New York. http://esa.un.org/unpd/wup/pdf/WUP2011_Highlights.pdf

DOCUMENTS DISPONIBLES EN FRANÇAIS

- Outils d'intégration de la réduction des risques de catastrophes Notes d'orientation à l'intention des organisations de développement Charlotte Benson et John Twigg, avec la collaboration de Tiziana Rossetto Fédération internationale des Sociétés de la Croix-Rouge et du Croissant-Rouge/consortium ProVention, 2007. http://www.preventionweb.net/files/1066_toolsformainstreamingDRRfr1.pdf

- Programme d'Action Pour la mise en oeuvre de la strategie regionale africaine de prevention des catastrophes (2006-2015). Acceptée lors de la deuxième session de la Plate-forme Régionale Africaine en Réduction des Risques de Catastrophes, qui a eu lieu à Nairobi du 5 au 7 mai 2009. United Nations International Strategies for Disaster Reduction Addis Abéba, Juin 2009. http://www.unisdr.org/files/13003_P0AinFrench140609forWeb.pdf

- Manuel en environnement - Ressources complémentaires — Construction de bâtimentsOutils pour l'identification des effets environnementaux de secteurs d'activités spécifiques, des mesures d'atténuation appropriées et lignes directrices. Agence Canadiene de Développement International. http://www.acdi-cida.gc.ca/acdi-cida/acdi-cida.nsf/fra/EMA-218123618-NNH

- Préparation à une réponse efficace en cas de catastrophe Ensemble de directives et indicateurs pour la mise en oeuvre de la priorité 5 du Cadre d'action de Hyogo Cadre d'action de Hyogo pour 2005-2015 : Pour des nations et des collectivités résilientes face aux catastrophes. Nations Unies New York et Genève, 2008

DOCUMENTOS DISPONIBLES EN ESPAÑOL

- Directrices para la prevención de desastres naturales y medidas de protección en las zonas donde se producen ciclones tropicales. Autor: Comisión Económica y Social para Asia y el Pacífico;OMM; Liga de Sociedades de la Cruz Roja y de la Media Luna Roja. Ginebra, CH; 1977. http://www.cne.go.cr/CEDO-CRID/pdf/spa/doc233/doc233.htm

- Guía para la elaboración de planes de respuesta a desastres y de contingencia. Federación Internacional de Sociedades de la Cruz Roja y de la Media Luna Roja 2008. http://preparativosyrespuesta.cridlac.org/XML/spa/doc18982/doc18982-contenido.pdf

- Estudio sobre preparativos legales para la ayuda internacional en caso de desastre. Hacia la Aplicación de las Directrices IDRL en Colombia. Federación Internacional de Sociedades de la Cruz Roja y de la Media Luna Roja, Ginebra, 2012. http://www.ifrc.org/FedNet/Resources%20and%20Services/IDRL/IDRL%20reports/IDRL%20report_Colombia_final%20web.pdf

- Guía Metodológica 1: Incorporación de la Prevención y la Reducción de Riesgos en los Procesos de Ordenamiento Territorial. Ministerio de Ambiente, Vivienda y Desarrollo Territorial. Viceministerio de Vivienda y Desarrollo Territorial Dirección de Desarrollo Territorial. República de Colombia. http://www.minambiente.gov.co/Puerta/destacado/vivienda/gestion_ds_municipal/Series/Series10.pdf

- Normas Tecnicas de Vivienda Condiciones Minimas de Calidad y Habitabilidad. Ministerio de Desarrollo Económico. Dirección General de Vivienda. Gobierno de Bolivia. http://www.vivienda.gob.bo/web/docs/publica/Normas_tecnicas_de_vivienda.pdf

Social Baseline Survey

SAMPLE

For potential occupants of new housing and potentially affected local populations

Note: This survey assumes construction of new housing units, rather than repair of existing structures. The survey should be modified if for projects oriented toward repair only. Not all elements of the survey will be applicable to all projects or programs. The survey should be modified according to the needs of the particular activity. Some questions—e.g., those pertaining to demographics or land tenure—may be sensitive and should be pursued using the best judgment of the individual administering the survey.

The survey should be administered to the following groups:

- **Where specific future occupants can be identified**, this questionnaire should be completed for at least 10 percent of the future families, with a minimum of 20 families surveyed, even for small projects. Group interviews are acceptable.
- **If specific future occupants cannot be identified**, then representative potential occupants can be interviewed. If interviews are not possible, the survey can be completed for an "average" occupant using expert knowledge.
- **A representative sample (10 to 20 families) in communities (e.g., clusters of more that 50 houses) within a 1 km radius of the project site should also complete this survey.** The sample should include teachers, representatives of municipal authorities and water board members. The questionnaire can be conducted individually or in groups. For this group, "current residence" should be substituted in questions regarding "previous residence."

General Information

Name of the project: _____ Date _____

Location: _____ (District/Municipality/Department)

Name of surveyor: _____

Type of respondent(s): _____occupant or possible occupant

_____potentially affected local population

If local population, name of community _____
Population (est.) _____
Distance from project site: _____

Type of consultation: _____ Organized group _____(name of group)

_____Non-formal consultation

Number of persons consulted: _____

Questions

If respondent(s) are potentially affected local population, ask if they are aware that a housing project is planned nearby. Yes___ No___

1. In your opinion, what are the most important benefits of the project?

_____
_____

2. In your opinion, what are the problems associated with the project?

_____
_____

3. Are there any indications of archeological/historical/culturally important sites in the area of the project? Yes __ No ___

4. What do you cook with? (check all that apply; if multiple fuels, indicate % of time each is used)

Fuelwood	Charcoal	Kerosene	Gas	Electricity

If the answer is fuelwood:

- What kind(s) of trees do you use? _____
- Who collects it? _____
- Where? _____
- Is wood plentiful or scarce? _____
- Average time per day spent obtaining wood?_____

5. Which of the following did your previous (current) residence have? (check all that apply)

Utility or amenity	Y/N	(Hours/day)
Electricity		
Piped water—in home		
Piped water—community tap		
Private latrine		
Community latrine		
Private toilet		

- If latrine, what type? Simple pit_____ Composting _____ Hydraulic_____

6. What were the walls of your residence made of? (check all that apply)

Wattle and daub	Mud Brick	Concrete Block	Wood	Other (specify)

7. What was the floor made of?

Tile	Cement	Dirt	Other (specify)

8. What was the roof made of?

Corrugated metal	Thatch	Tile	Other (specify)

9. What was your source of water? (check all that apply)

River	Stream	Spring	Hand well	Borehole	Piped

- Is water scarce in the dry season? Yes ____ No ____
- **For potentially affected local population**: Do you think there will be enough water for your community and the new project? Yes_____ No ____

10. What are the most common diseases in the area where you live? (check all that apply, solicit detail if possible)

Disease	**Y/N**	**Comments**
Respiratory ailments		
Diarrhea		
Malaria		
HIV/AIDS		
Other		

11. Did you consider any of the following to be problems in your community? (check all that apply)

Issue	**Y/N**	**Comments**
Water scarcity		
Contaminated river or well water		
Standing water		
Sewage		
Solid waste		
Scarcity of fuelwood		
Deforestation		
Erosion		
Decline in land fertility		

Issue	Y/N	Comments
Fires		
Landslides		
Flooding		
Disappearance of fish and game animals		
Insects and animals that carry disease		

12. Household demographics

Datum	#	Comments
# of individuals in household		
# of children <5		
# of children 5–10		
# of children 11–16		
# of children in school		

ENVIRONMENTAL BASELINE SURVEY

General Information

Name of the Project: _____ Date _____

Location: _____

Name of Surveyor: _____

Survey data

1. Land use and tenure

Datum	Surveyor's characterization	Notes
Current land use at proposed site		Change in land use can cause conflict, e.g., if the land is currently being used by a neighboring community for grazing, planting crops, as a source of water, etc.
Previous land use, if different		Past activities such as hazardous waste dumping can endanger the community.
Ecosystem characterization of current site		
What is the current land tenure/title status?		

2. Proximity issues. Is the site located within 2 km of any of the following?

Facility, habitat or activity	Y/N	Comments
Airport		
Military zone		
Protected areas		
Archeological/ anthropological/ cultural/historical sites		
Forested area		
Important flora/fauna habitat, including: ▪ wetlands		
▪ tropical rain forest		
▪ mangrove		
▪ coral reefs		

Facility, habitat or activity	Y/N	Comments
▪ endangered/ endemic species		
Critical biological corridor		
Critical headwaters/ source for local or downstream water supplies		
Highly polluting or hazardous industrial or mining activity		

3. Vulnerabilities

How does your survey rate the site/area's vulnerability to …	Surveyor's characterization High/Medium/Low/ Not Applic.	Comments (note any recent natural disasters)
Flooding and projected changes under climate change		
Sea level rise and projected changes under climate change		
Hurricanes and projected changes under climate change		
Landslides and projected changes under climate change		
Earthquakes		
Forest/Brush fires and projected changes under climate change		
Drought and projected changes under climate change		
Contamination from external sources (industry, agriculture, animal farms, etc.)		
Erosion and projected changes under climate change		

(Medium to high vulnerability will require choice of an alternate site or use of effective mitigation measures)

4. Anticipated source(s) of water

Primary source(s)	Average flow (if well, daily yield)	Lowest seasonal flow*	Drinkable without treatment?	Nature of current utilization	% of flow currently utilized
e.g., spring					

Secondary source(s)	Average flow (if well, daily yield)	Lowest seasonal flow	Drinkable without treatment?	Nature of current utilization	% of flow currently utilized
e.g., spring					

* This is defined as lowest seasonal flow during the driest years; further decreases in flow due to climate change needs to be taken into account.

5. Soil characteristics and topography

Datum	Surveyor's characterization	Notes
Soil composition/type		This is an important design consideration in waste disposal systems.
Permeability		
Depth of bedrock		
Average slope of site		Slopes greater than 20% are generally unsuitable for housing.
Depth of water table		Important design consideration for both water supply and waste disposal systems, such as wells and latrines.
Superficial, seasonal and/or sub-superficial watercourses in the project area?		Specify depth and location.

6. Climate and weather

Datum	Surveyor's characterization	Notes
Average temperature and anticipated average temperature during lifetime of housing asset, under climate change		Hot weather must be considered when designing a house so it may have proper ventilation.
Rainfall pattern and anticipated changes		
Average yearly rainfall and projected changes under climate change		
Predominant wind direction		Important for ventilation and the location of waste disposal systems.

7A. Characteristics of the built environment

Datum	Surveyor's characterization	Notes
Distance to nearest road		

Distance to public transportation		The community must have proper access to work, school and health centers.
Are there other communities within 2 km of proposed site? (Y/N)		If yes, fill out table below.

7B. Facilities and infrastructure of communities within 2 km of proposed site. List the facilities these communities have, including hospitals, health centers, schools (specify levels), waste disposal systems, houses of worship (specify denominations), recreational centers and government offices.

Community name	**Distance**	**Approximate population**	**Facilities and utilities**

8. Topographic mapping. The site must be marked on a topographical map, preferably scale 1:50,000. Water bodies, existing settlements and infrastructure, and facilities, habitats or activities identified under “proximity issues” must be clearly identified.

PRELIMINARY PROJECT PROFILE

Complete the following project profile.

General Information

Name of the project: _____ Date _____

Organization: _____

Contact: _____ (name and position)
_____ (address)
_____
_____ (tel/fax/e-mail)

Survey Data

1. Land title

Has title to the entire site been secured? Yes____ No____

2. Basic characteristics/site plan

Characteristic	Estimate	Comments
Total area (ha)		
Lot size		
Number of houses		
Persons/household		
Total population		
Water/person/day		
Total estimated water demand		
Percent of area designated for: • internal roads		
• green area		
• community/ recreational areas		
• transport facilities		

3. Basic construction of housing units

House element	Material	Comments
Floors		e.g., dirt/cement/tile
Roof		e.g., corrugated sheet, tile, tarp
Walls		e.g., adobe, cement block

4. Planned utilities and sanitation

Utility		Comments
POTABLE WATER • planned potable water source		i.e., community well, community borehole, rainwater collection, spring, stream, pipe-borne/community tap, pipe-borne/private connections, water trucks
• daily source capacity, seasonal low		Consider past climate trends and future climate change projects to account for any changes due to climate change.
COOKING • cooking fuel		Firewood, charcoal, kerosene, electricity, bottled gas
ELECTRICITY • source		National grid/solar battery/local diesel set/none
• source capacity		kW or kW/hr, as appropriate
• availability		All day; all hours; evenings only; etc.
• public lighting? • house connections?		Y/N; anticipated load Y/N; anticipated load per house
SOLID WASTE • mode of collection/transport		
• final disposal		Incinerator, landfill, other
WASTE WATER • gray water		
• sewage		
RAINWATER DRAINAGE		How will rainwater runoff be managed?
SANITARY FACILITIES • communal or individual household?		
• type		e.g., improved pit latrines, composting latrines

5. Administration and funding of utilities and sanitation. Indicate the institution which will administer each of these services and *how they will be funded.*

	Potable water	**Solid Waste**	**Sewage**	**Electricity**
Local government				
Community organization				
NGO				
National, regional or municipal utility				

6. Social services from the built environment

Schools	**Response**
Projected # of school-age children	
Does project plan include a school? (Y/N)	
If no: • distance to nearest school(s)	
• do nearest school(s) have sufficient excess capacity	

Health post/clinic	**Response**
Does project plan include a clinic/health post?	
If no, distance to nearest health post	