

Bangladesh Environmental Country Profile

To inform Shelter and Settlements programming

January 2019



Photo: Bangladesh (undated) platform built to protect people from flooding Credit: IFRC

1. Introduction	4
Aim and use of country profile	4
Structure of profile	5
2. Summary of key issues of concern	6
3. Environmental Checklist for shelter practitioners	8
4. Macro level planning	14
Country environment and disaster context	14
The housing and construction context, hazards and environment	14
Shelter Cluster and Environment in Bangladesh	15
Shelter Cluster	15
Environment in the Cluster system	16
Basic country environmental facts	16
Ecosystems	16
Land Use	20
Protected Areas	20
Ecologically Critical Areas	21
Major environmental and natural resource management issues facing Bangladesh	24
Deforestation	24
River Bank Erosion	27
Land Zoning, Land Use and Land Degradation	30
Water Pollution and Salinisation	31
Climate change and predicted impacts	31
Most common disasters and related building guidance for housing in affected areas	33
Major Hazard Zone Maps	33
Regulatory requirements and institutions	35
Post-disaster housing regulatory context	35
Environmental regulatory context	36
Institutional Arrangements	36
Disaster Management	36
Shelter and Settlements	37
Environmental	38
Climate Change	40
Other natural resources	41
National Strategies and Plans	41
Disaster Management	42
Natural resource management, environment and climate change	42
Shelter and Settlements/construction sector including acts relating to commonly used shelter materials	44

Waste Management	46
International Policies and Conventions	47
5. Location And Settlement Intervention Planning	48
Integration of environmental considerations into the project management cycle	48
Key issues in Bangladesh of relevance to site selection and planning	48
Utilizing GIS Data for Enhanced Humanitarian Shelter Programming	50
Security of tenure	52
Links between security of tenure and environment in Bangladesh	53
Environmental Impact Assessment and Shelter and Settlements planning	54
Debris and waste management	56
Access to and management of fuel and natural resources	57
Site decommissioning	57
6. Shelter Design	59
Building practices/reconstruction practices overview	59
Future housing predictions:	59
Building Materials	60
Most common building materials	60
Social & Environmental Implications Of Commonly Used Cover and Supporting Materials	61
Additional information on specific materials	69
Recommendations for shelter practitioners when choosing and sourcing building materials	71
7. Software and technical support	72
8. Household Items	74
Packaging and Reusability	74
Energy	74
9. Resources, local organisations and contact information	76
General Environment in Shelter and Settlements resources	76
Bangladesh Specific Resources	76
Contact Information	77
Relevant ministries	77
International Organisations working in disaster management and/or environment	78
National environment and disaster management organisations:	78
Version control	79
Annex 1: References:	80
Annex 2: Acronyms	81

1. Introduction

Aim and use of country profile

The objective of this environmental country profile is to allow humanitarian shelter and settlement practitioners to access key environmental information relating to emergency shelter and settlement issues in Bangladesh, informing environmentally sustainable programming. It has been produced in response to a lack of compiled information on environmental issues relevant for shelter programming in Bangladesh, and is one of a series of profiles produced by the International Federation of Red Cross and Red Crescent Societies (IFRC) as co-lead of the Shelter Cluster. The prepositioned key information contained in this profile serves as a preparedness measure that will allow sector-wide shelter practitioners working in both coordination and implementation to have a head start in identifying and investigating issues of environmental concern that can be integrated into a response.

BOX OUT: Quality programming includes understanding, preventing and mitigating negative environmental impacts. If environmental issues are not taken into account, shelter and settlement programmes may ultimately be inefficient since short-term outcomes can cause new problems, requiring further investment
– Sphere handbook 2018

BOX OUT: Shelter and settlement standard 7: Environmental sustainability
“Shelter and settlement assistance minimises any negative programme impact on the natural environment.”

This profile covers the country-wide context and is not intended to be exhaustive. It is meant to provide a quick basic understanding of the country-wide context and the most crucial factors that are relevant for environmentally sustainable shelter related operations. It is particularly to support humanitarian shelter actors with little knowledge of Bangladesh. It aims to save the user time in investigating these issues by compiling existing information and pointing to key issues, additional sources of information and further references. After a disaster, the information in this profile will need to be contextualized based on the impacts of the disaster. The information in this document can serve as a baseline of environmental issues facing the country of relevance to humanitarian shelter and settlements interventions.

For more in-depth information on local building practices in Bangladesh, refer to the [Bangladesh Shelter Response Profile on local building cultures](#) created for the Shelter Cluster. In order not to duplicate information from this resource, regular references are made to this profile.

Note: this profile in V1.1 is currently still in DRAFT format.

Structure of profile

This profile follows a structure looking at scale of shelter interventions, starting from macro-level planning through to household level.



This mirrors the Sphere Standards (2018 version). In general, the macro level planning issues are likely to be most useful for coordination and the smaller scale issues more relevant for technical implementation although there is no clear-cut distinction between the two Cluster functions. It is recommended that both coordinators and implementing partners be familiar with the content of the whole profile.

Although this profile focusses on Shelter and Settlements, the issues highlighted here are relevant to other sectors, both because a Settlements approach looks at more than just the physical shelter, and because shelter is necessary to promote health, support family and community life, and provide dignity, security and access to livelihoods. Issues of livelihoods, WASH, food security, energy are referenced, but not presented in the same level of detail.

2. Summary of key issues of concern

Major Hazards¹

1. Floods
2. Droughts
3. Cyclones, Storm Surges and strong winds
4. Earthquakes
5. Erosion (Riverbank and coastal)
6. Sea-level rise

Main issues of environmental concern²

- Deforestation
- River systems (mis)management (erosion, sedimentation and changing patterns of stream flow, sand extraction)
- Increased groundwater salinity
- Urbanization / Urban migration
- Unregulated waste management
- Climate change: 5/178 in the Global Climate Risk Index
- Water pollution and salinisation
- Land Degradation

Key issues for site selection³

- Avoiding ecologically protected and ecologically critical areas (see pages 16 -17 for full list)
- Impact of pressure on natural resources already under strain and causing environmental and social impacts and conflict, including timber and sand.
- Access to a diverse range of natural resources for materials, to avoid pressure on one resource.
- Human wildlife conflict (for example in Cox's Bazar)
- Heavy metal / chemical contamination of site
- Tenure security and environmental protection links (see p 44)

Building materials and key environmental issues

Note: this is a summary. A full table can be found in Section 6 (shelter design).

Material	Impacts/issues
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¹ In order of people affected, highest to lowest. See section 4 for full list

² See page 21 for full list

³ This list is not exhaustive and must be contextualised to the specific emergency response operation. See section 5 for full list.

Timber	Forest destruction, landslides, land degradation, and habitat destruction and can increase flood risk. Illegal logging and social conflict.
Bamboo	Poor practices, as are prone to occur after a major disaster, can devastate crop output for many years or in some cases permanently. The importance of bamboo as a local community resource makes it essential to consider the effect of large scale procurement on regional bamboo stocks and set in place systems that ameliorate potential negative impacts. How bamboo is treated should also be considered, and toxic chemicals avoided.
Concrete	Requires cement, quarried and mined material (e.g., sand, rock chips, and gravel). These are often unsustainably sourced/extracted and have environmental consequences. Often illegally extracted. E.g., sediments in rivers, river dredging. Materials to make concrete such as river sand are often unethical and controlled by the “sand mafia”
CGI	Energy intensive to produce. Dangerous in cyclones. Can cause discomfort and health issues. Too costly for most of the rural poor. Lower quality sheets which are affordable to low-income groups corrode and rust rapidly. This deterioration increases thermal comfort and safety issues,
Bricks	Brick firing is energy-intensive. The brick industry is one of the largest consumers of coal and also a significant air polluter and cause of deforestation. Meeting Bangladesh’s current brick demand requires excavating 60 million tonnes of topsoil, causing dust pollution and degrading land.
Thatching	Without proper management, it may have impacts on forests, natural vegetation exacerbate erosion. Material needs seasoning and may cause water pollution if not properly managed
Plastic	One of the least environmentally friendly materials but plastic tarpaulin sheets are commonly used in response and can have social value when reused. Plastic bags are banned in Bangladesh

Key Government Actors⁴

Disaster Management

- **Ministry of Disaster Management and Relief (MoDMR)** <http://www.modmr.gov.bd/>

Environmental

- **Ministry of Environment and Forests (MoEF)**, <http://www.moef.gov.bd/>
- **Forest Department (FD)**: <http://www.bforest.gov.bd/>

Shelter and Settlements

⁴ See page 31 for full list

- **Ministry of Housing and Public Works:** <http://www.mohpw.gov.bd/>
- **Housing and Building Research Institute** (part of MoHPW): <http://hbri.gov.bd/>
- **National Housing Authority:** <https://nha.gov.bd/>
- **Land Ministry** <https://minland.gov.bd/>
- **Public Works Department:** <http://www.pwd.gov.bd/>
- **Urban Development Directorate:** <http://www.udd.gov.bd/>

Water

- **Ministry of Water Resources (MoWR):** <https://mowr.gov.bd/>
- **Bangladesh Water Development Board:** <http://bwddb.gov.bd/>

3. Environmental Checklist for shelter practitioners⁵

Key issues for initial diagnosis and project implementation

1. Coordination, planning and project management

- Consult and involve local authorities** to develop shelter and settlements plans who may be responsible for future environmental management and service provision - for example the Forest Department (see p. 33). Consultations can highlight key environmental sensitivities, natural resources availability, environmental hazards and tenure rights of the site.
- Identify national/regional/local environmental regulatory requirements** (see page 31)
- Check if the affected area is close to protected or ecologically sensitive areas⁶ and try to avoid them.** Parks/forests/sensitive areas carry the risk that shelter occupants will extract resources from the site (see page 8). If use of this type of site cannot be avoided then activities to limit unavoidable environmental impacts needs to be developed as part of the site plan (see page 42).
- Check if the disaster affected area subject to other hazards** such as earthquakes, or other geological hazards (see page 29 for info on hazards facing the country with maps of where most common)
- Coordinate with other shelter stakeholders** to understand the potential combined environmental risks and impacts and work collaboratively to minimize potential

⁵ It is recognised that a Settlements approach also covers WASH and Livelihoods. These are not touched upon in depth here, but will have environmental consequences that should be assessed and mitigated.

⁶ Ecologically sensitive areas include wetlands, lagoons, lakes, coastal zones (as defined in regulations), animal migratory routes, parks, wildlife refuge and protected areas or areas inhabited by rare or endangered animals.

environmental impacts. One project's small impact might become high risk if replicated many times across the disaster affected area

- f. **Develop an environmental management plan.** It should be a collaborative effort, based on an environmental assessment (see below) and must be monitored by the implementing agency for compliance. For self-reconstruction, adequate ongoing education and supervision should be in place.
- g. **Consider the impact of cash interventions on natural resources** when deciding modalities of assistance. Cash gives more flexibility but can lead to unmonitored impacts on resources as well as safety concerns in reconstruction.
- h. **Include sustainable construction considerations into the project management cycle** (see page 42)
- i. **Introduce longer-term environmental opportunities into recovery planning from the start.** For example:
 - i. Climate risk management and climate change adaptation into the recovery process.
 - ii. Natural and nature-based methods for flood risk management into the recovery process.

2. Site Selection

- a. **Carry out a shelter rapid environmental impact assessment** to assess shelter-related environmental impacts and identify practical local actions to address these impacts. This can be done as part of a broader shelter assessment. For questions to integrate see page 42. Two tool options are:
 - i. [Shelter Cluster Checklist](#): Designed for emergency shelter project managers to quickly assess shelter-related environmental impacts and identify practical actions to address these impacts.
 - ii. [NEAT+](#) The Nexus Environmental Assessment tool has a Shelter module and can be used for a rapid environmental screening while designing shelter and settlements programmes. The tool highlights key areas of environmental concern to consider when designing and implementing the project, and is the first step towards a mitigation plan. It is done in Kobo Toolbox or Excel and produces an automatically generated report.
- b. **Carefully select the construction site** and if:
 - i. **The site has been used for industrial or commercial purposes** in the past: if so, verify that there are no toxic materials present in the ground or water
 - ii. **The site is prone to other hazards** such as flooding, landslides

- iii. **The site has easy access to roads and public transportation** - this will reduce the pressure on local extraction of natural resources
- iv. **There is risk of human /wildlife conflict**, as seen with elephants in Cox's Bazar. Work with environmental organisations and the Ministry of Environment to mitigate risks.
- c. **Avoid using previously unsettled areas** as this will likely increase negative environmental impacts. Clearing and site preparation can lead to loss of biodiversity and land/soil degradation. Siting decisions can influence future interactions with the nearby natural environment, typically through encroachment leading to concerns such as land clearing for agriculture/livestock, deforestation or human/wildlife conflict.
- d. **Assess access to cooking fuel and main type of coking fuel by host and affected communities:** are cooking fuels used by the affected population available at the site without requiring unsustainable harvesting of local natural resources? Identify the cooking fuels to be used as the site and plan for adequate supplies which do not overtax local resources. Assess the pressure that additional harvesting of natural resources will have on the environment and social conflict. Indiscriminate biomass harvesting, either by the users or local vendors, can lead to deforestation and environmental degradation.
- e. **Consider land tenure:** Tenure security provides certainty and protection from eviction, encouraging long-term consideration for the local environment and thus improving the likelihood of sustainable behavior by future inhabitants.
- f. **Assess the main type of cooking fuel used by host and affected communities** and the pressure that additional harvesting of natural resources will have on the environment and social conflict. Indiscriminate biomass harvesting, either by the users or local vendors, can lead to deforestation and environmental degradation.
- g. **Investigate access to the disaster affected area:** Access routes can lead to increased development and activity, however improved accessibility to natural resources can lead to increased and potentially unsustainable rates of extraction.
- h. **Consult the community** who can provide local knowledge of key environmental concerns, potential hazards and natural resource availability in the area. Effective engagement with existing local communities can also minimize the likelihood of future social conflict.
- i. **Incorporate the provision of fuel efficient stoves** and training in their use into site management plans.
- j. **Protect, restore and improve the ecological value** of operational sites such as temporary settlements during and after use⁷.

⁷ Sphere environmental sustainability standard, SHelter and Settlements Chapter

3. Shelter design

- a. **Consider local hazards** in building design (see page 29)
- b. **When replicating local building practices** (which leverages existing extraction, production and supply chain processes which, if previously well regulated, can have lower environmental impacts) ensure supply chains are not overwhelmed in cases of sudden increased demand, potentially leading to unsustainable practices.
- c. **Use materials and construction methods that allow for easy dismantling, transport and reuse** to avoid wasted materials. This is particularly applicable for emergency or transitional shelters due to high likelihood of beneficiary mobility.
- d. **Incorporate functionality for future upgrades** to facilitate future efforts to utilize the existing materials and structures (e.g. from transitional to semi-permanent), avoiding unnecessary consumption of natural resources or demolition.
- e. **Provide shading and maximum ventilation for cooling.** Shelter design can improve comfort and decrease energy consumption required for heating or cooling.
- f. **Provide ventilated areas for cooking:** The exhaust of stoves or heaters should not be into an enclosed shelter as this exacerbates indoor air pollution. Shelters should include a dedicated area with open ventilation or chimney structure to expel exhaust gases.
- g. **Incorporate green areas** to provide natural protection against hazards such as landslides, erosions and/or flooding. Green areas also improve inhabitant satisfaction and can provide natural cooling. Native flora is preferable; the biodiversity impacts of foreign flora should be properly considered and assessed.

4. Building Materials

- a. **Consider the impact of a sudden increase in demand for natural resources for building materials.** Consult the table on page 53 for the social and environmental impacts of the most common building materials in Bangladesh.
- b. **Consider the material lifecycle, from extraction to disposal.** Construction materials can consume non-renewable or low-regenerative capacity natural resources. The initial design should promote future recycling, reusing or repurposing. Materials selection can be diversified to minimize dependencies on a single source.
- c. **Minimise materials used.** Accurate bills of quantities and minimizing the raw amount of material in the design alleviates environmental impacts. Engineering strategies can be employed to optimize structural strength whilst using lower raw material quantities.
- d. **Reuse and repurpose:** Emergency or temporary shelter materials can be repurposed or reused to reduce the amount of raw material consumption and wastage, e.g. tarps can be used to provide additional weather protection or privacy.


- e. **Ensure proper disposal and recycling** where it is not possible to reuse or repurpose.
- f. **Use locally available materials** that reduce environmental impacts associated with transportation and distribution but ensure that for naturally sourced materials, the provisioning and regeneration capacity has been considered to avoid over-extraction.
- g. **Reuse disaster waste.** Available disaster waste can be incorporated into the shelter design, reducing unnecessary material extraction, saving money and reducing the burden of disaster waste. Rubble can be crushed to be used as gravel or filling. Many materials (e.g. metals, timber, bricks, doors, windows, roofing, fittings) can be reused. High level of reuse, recycling, repurposing of building debris possible for transitional shelter and permanent shelter will reduce the need to import shelter materials.
- h. **Avoid the use of hazardous or harmful substances.** In some countries, these substances may still be legal despite being prohibited in others.
- i. **Avoid burnt bricks** as a shelter material of a livelihood activity (see page X) - there are no social or environmental benefits, only negatives.

5. Household items

- a. **Reduce Packaging.** Inappropriate disposal of packaging strains already overburdened solid waste management systems. Packaging may be recyclable but Bangladesh has limited recycling capabilities. Reduce packaging or substitute with more environmentally friendly or reusable alternatives.
- b. **Procure local, sustainable items:** Procuring locally reduces environmental impacts associated with the supply chain while also supporting local livelihoods. Suppliers or manufacturers with sustainability or environmental certifications also have a lower environmental footprint.
- c. **Choose items that can be repurposed, reused, recycled or sold after initial use**
- d. **Avoid items that encourage a dependence on natural resources:** The potential future environmental impacts of an item should be considered. Provide goods that minimize energy consumption or potential environmental impacts.
- e. **Provide training and education on the use of new household items** to minimise unintended environmental consequences.

6. Energy

- a. **Identify and mitigate the impact that energy interventions can have on existing livelihood activities** that involve the collection and sale of fuels, leading to unintended environmental and social consequences.

- 
- b. **Discourage dependence on local biomass (charcoal etc) for energy.** Fuels provided by authorities/organizations or purchased commercially offer opportunities to promote sustainable sourcing and extraction.
 - c. **Provide or replace home made burners with improved burners or green energy stoves** that optimize combustion efficiencies.
 - d. **Use energy efficient lighting.** The energy consumption for lighting can have environmental implications and some lighting options, such as lamps or candles, have safety and health hazards. Technologies, such as LED lighting, promote energy efficiency and are often also more cost-effective in the long run.
 - e. **Scrutinise the source of fuel being procured.** Inappropriately sourced fuels can externalize environmental impacts to another area. Scrutinize the supplier and supply chain to ensure that procured fuels are responsibly extracted, regulated and/or certified.

4. Macro level planning

Country environment and disaster context

For a full general description, physical and topographical data and demographic and socioeconomic data see the [Bangladesh Shelter Response Profile on local building cultures](#) created for the Shelter Cluster, pages 10 - 11.

Bangladesh is highly disaster prone, ranking as the 5th country most at risk of disaster⁸. It experiences frequent natural disasters, which cause loss of life, damage to infrastructure and economic assets and adversely impact lives and livelihoods, especially those of the most vulnerable. Bangladesh has an area of over 147,000 km and a population of over 160 million and is the ninth most populous country in the world. Bangladesh's population increases by about 2 million people a year. The rising population and limited land space have put tremendous strains on the urban ecosystem. The capital Dhaka has seen severe transformations in recent years to catch up the increased rate of urbanisation. This change was paralleled by a boom in the real estate, construction and housing industry. According to the United Nations Population Fund Dhaka is one of the most polluted cities in the world.

Around one third of the country **floods** during the annual rainy season (from June to October) and every four to five years a severe flood affects over 60% of the country. Approximately every three years Bangladesh's coast is hit by a severe **tropical storm and tidal surge**. More than half of the country, including the capital Dhaka with an estimated 20 million inhabitants, has a medium to high probability of being affected by an **earthquake**. 80% of the country is river delta or alluvial plains less than 10m above sea level. The country is also exposed to **river-bank (chars) and coastal erosion** as well as **sea level rise** resulting in a growing number of landless⁹. **Climate change** will exacerbate many of the current problems and natural hazards the country faces, with increased occurrence of storms and cyclones and rising sea levels.

The housing and construction context, hazards and environment

It was estimated in 2014 that since 1970 there have been approximately 300,000 houses fully damaged and 500,000 partially damaged by flood, cyclone, or river erosion every year.¹⁰ The cause of this high level of damage is a mix of the topography of the country combined with the overwhelmingly fragile housing. Only one in every three homes in Bangladesh is made of concrete

⁸ This rating of countries "at risk" of disaster considers different forms of exposure to natural hazards as well as different levels of vulnerability.

⁹ Craterre country profile intro: https://archive.org/details/Bangladesh_shelter

¹⁰ Planning and Implementation of Post-Sidr Housing Recovery: Practice, Lessons and Future Implications, Recovery Framework Case Study, Conference Version, GFDRR, World Bank Group, EC, UNDP, September 2014, Bangladesh, P6

and the rest are made of non-concrete materials and are significantly less resilient to disasters. Consequently, private housing accounts for a major proportion of the economic loss and damage associated with disasters in Bangladesh. A house is the most valuable asset of low income families in Bangladesh. With a rise in the frequency and intensity of disasters brought about by environmental degradation issues such as erosion caused by illegal logging and sand mining in addition to climate change this level of damage to housing is likely to increase.¹¹

There is an increasing demand for construction materials being driven by the rapidly increasing population, urbanization, economic expansion and the emergence of new industrial centers. This increased demand is putting strain on already scarce natural resources used for construction. Reconstruction needs after major disasters only compound this issue. Exponential increases of material extraction, processing and disposal are causing significant environmental and social impacts such as erosion, deforestation, landslides, and floods. This deprive communities of essential livelihood resources and put people, infrastructure, and ecosystems at greater risk of future disasters.

QUOTE BOX

‘Since 1970, on a yearly basis, hazards ranging from floods and cyclones to tornadoes and river erosion have been responsible for fully damaging approximately 300,000 houses and partially damaging about 500,000 houses. A conservative estimate of the Government of Bangladesh (GoB, 2011), puts the damage caused by five major disasters since 1998 at around 15 percent of GDP. Collectively, *half of this economic damage has been caused in the housing sector*. The houses of the poor sustain the maximum disaster losses.’

- Planning and Implementation of Post-Sidr Housing Recovery: Practice, Lessons and Future Implications, Recovery Framework Case Study¹²

Rural construction guidelines exist though they contain little to no mention of sustainable natural resource management or issues of environmental concern. The lack of truly sustainable guidelines standards or procedures in the housing or disaster management and recovery sector compound these issues.

Shelter Cluster and Environment in Bangladesh

Shelter Cluster

¹¹ See page 29 for more detailed info on major hazards.

¹² Planning and Implementation of Post-Sidr Housing Recovery: Practice, Lessons and Future Implications, Recovery Framework Case Study, Conference Version, GFDRR, World Bank Group, EC, UNDP, September 2014, Bangladesh

- Section to be completed with info on history Shelter Cluster in Bangladesh and ongoing emergency
- Main environmental issues the Cluster is involved in linked to environment to date:
 - Treatment of Bamboo

Environment in the Cluster system

The ongoing Rohingya response has an Energy and Environment Technical Working Group chaired by UNHCR and FAO¹³ Activities centre around provision of alternative cooking technology, longer term environmental planning, soil stabilization and reforestation, human/wildlife conflict and sustainable livelihoods activities.

- For a summary of their activities see:
https://reliefweb.int/sites/reliefweb.int/files/resources/environment-2018-5-9_twopage_eetwg_summary9.pdf
- For the calendar of Working Group events see:
<https://www.humanitarianresponse.info/en/operations/bangladesh/events>
- Contact information:
 - Energy and ENvironment technical working group coordinator, Todd Wofchuck, eetwgcoord.cxb@gmail.com
 - UNHCR: Ehsanul Hoque, environment officer, HOQUE@unhcr.org

Basic country environmental facts


Ecosystems

Bangladesh has a wide variety of ecosystems that include over 300 rivers. Bangladesh features a flood plain landscape and several river systems throughout the country. This landscape provides the major natural resources of water, land, fisheries, forests, and wildlife. Over two-thirds of the labour force directly depends on environmental resources for their livelihoods. Bangladesh contains four main types of ecosystems:¹⁴

Coastal and Marine Ecosystems: The western coast of Bangladesh contains part of the world's largest area of mangroves, the Sundarbans. High in biodiversity, they play an important role in maintaining the life cycles of economically important resources such as shrimp, crabs and fish as well as protecting the coastline from cyclones and erosion. The central coast contains the estuaries of the combined drainages of the Ganges-Padma, Maghna and Brahmaputra Rivers. The

¹³ A list of FAO's activities can be found here: <http://www.fao.org/3/i8776en/i8776EN.pdf> - they include activities aiming to curtail environmental degradation and rehabilitate the natural resource base.

¹⁴ from <https://sciencing.com/ecosystems-bangladesh-9551.html>



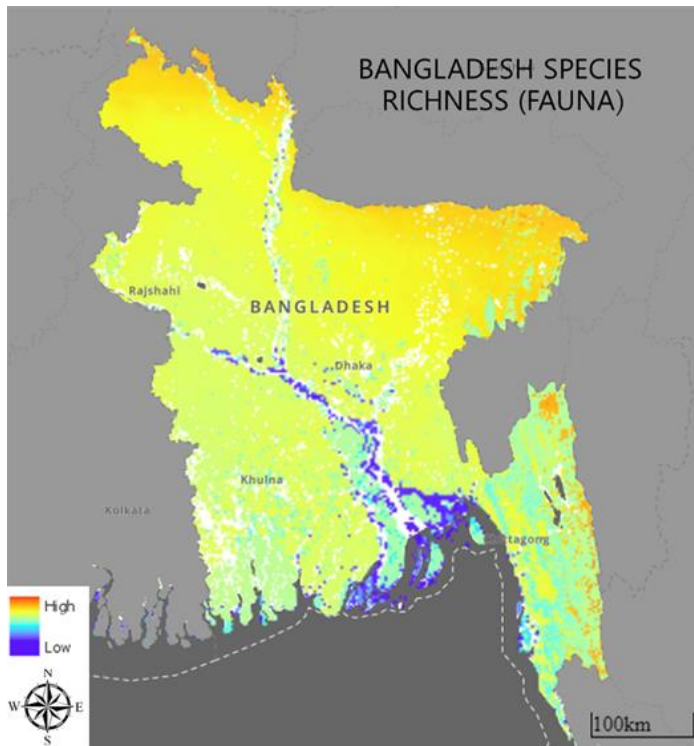
southeastern-most coastline contains muddy flats and sandy beaches. The offshore marine ecosystem contains fisheries with more than 160 species of brackish-water and marine fish, about 65 percent of which are edible.

Inland Freshwater Ecosystems: Two major rivers, the Ganges and the Brahmaputra, unite in the center of the country and continue through the Ganges Lower River Basin to the Bay of Bengal, forming an extensive delta system. Prone to seasonal flooding, much of the land in the delta is submerged for five to seven months annually. Wetlands include shallow lakes in floodplain depressions called beels, oxbow lakes (bends in rivers or streams that become cut off, forming bow- or "C"-shaped lakes) called baors and deeply flooded depressions in the northwest called haors. The freshwater wetlands contain over 40 globally threatened animal species.

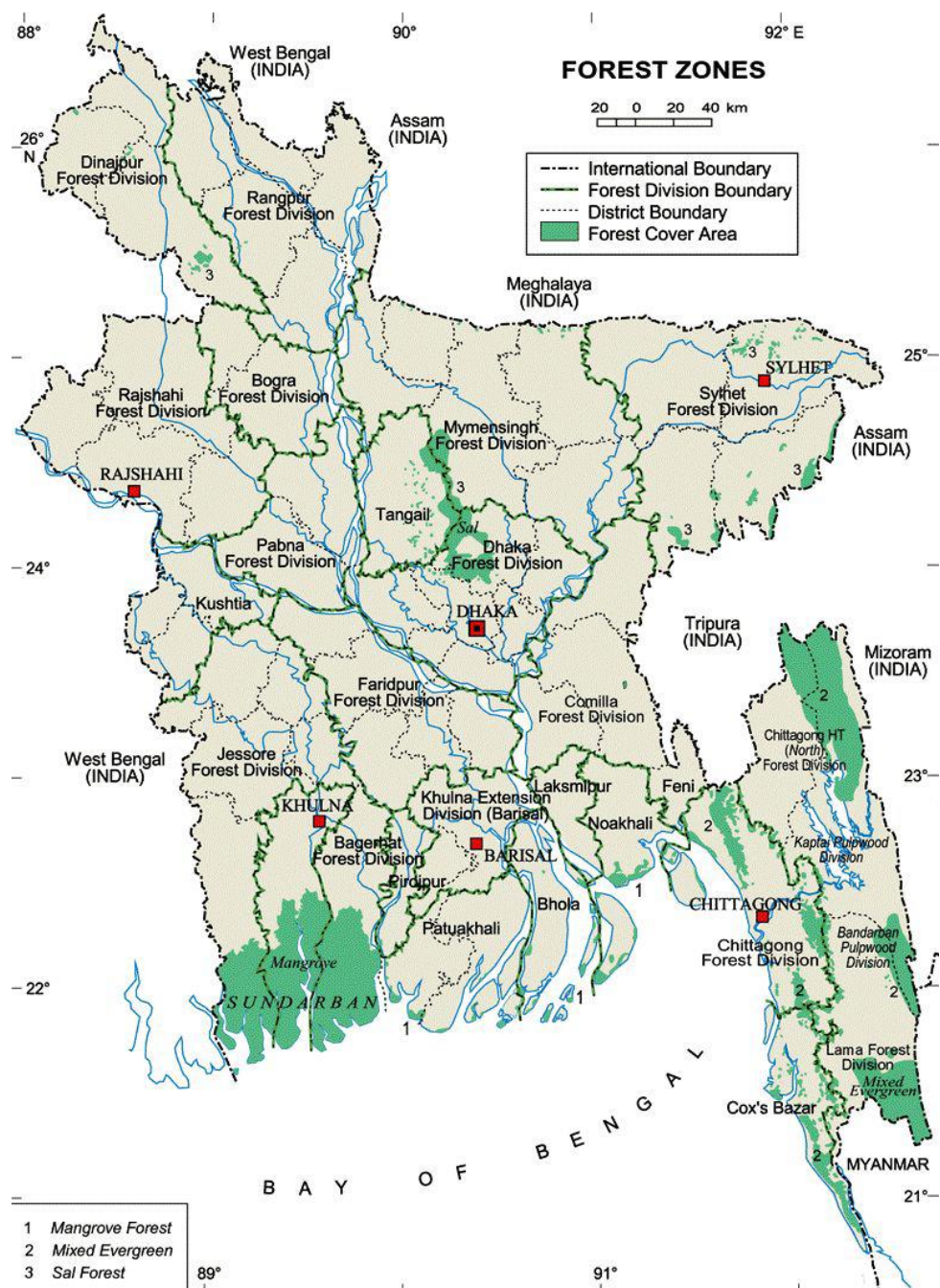
Terrestrial Forest Ecosystems: Tropical evergreen and semi-evergreen forests grow in hilly eastern Bangladesh. With a rich flora of more than 2,000 flowering plants, it is home to 34 globally threatened animal species. Moist deciduous or sal forests, named after the dominant tree species, are located in central and northern Bangladesh and occupy 0.81 percent of the landmass. Degraded and fragmented, the forests have land ridges containing forest remnants and depressions holding rice paddies. Freshwater swamp forests contain flood-tolerant evergreen trees adapted to monsoon flooding.

Man-made Ecosystems: Agro-ecosystems take up 54 percent of the land of Bangladesh and form the largest of the country's ecosystems. With its high population level, Bangladesh holds the highest percentage of cultivated land in South Asia. Diversity occurs in agricultural plants as well, with 6,000 rice varieties grown historically and currently, growing in all seasons. Jute grows in the monsoon or Kharif season and the winter or Rabi season sees cultivation of vegetables, wheat, oilseeds such as soybeans and sesame seeds, potatoes, spices and legumes such as beans and lentils. Since Bangladesh's population increases by about 2 million people a year and rice is the main staple, rice cultivation has increased. Farmers in Bangladesh also raise cotton, sugarcane, livestock, fish, shrimp, flowers and silkworms.

Species Richness (2013), data from MapX¹⁵



¹⁵ Kelly, Maureen. "Bangladesh Species Richness (Fauna)" [map]. 1:10,000,000. November 2018; data from <https://app.mapx.org/?project=MX-3RF-XY9-N1Z-AG7-A1T&language=en&zoom=5.9756&lat=23.911499999999999&lng=90.247799999999987>



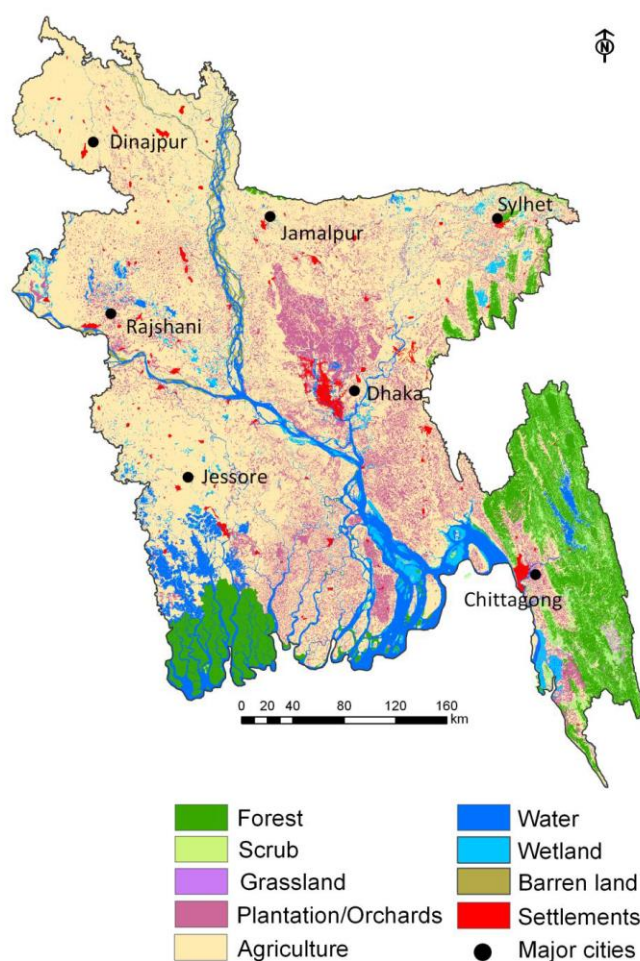
Forest cover map of Bangladesh (2010)¹⁶

¹⁶ <http://www.sisef.it/iforest/pdf/?id=ifor0578-005>

Land Use

In 2015, agriculture comprised around 75% of Bangladesh's land use, totaling 11.5M ha of land, and employed 42% of the working population. Shrublands, wetlands, and water were the next most dominant uses of land, with forest comprising slightly less at 512k ha.¹⁷ It can be difficult to measure land use in Bangladesh due increased inundation levels and more land being covered by water during monsoon season from June to October.¹⁸

*Land use / Land cover map of Bangladesh (2014)*¹⁹



Protected Areas

It is important for shelter- and other humanitarian – interventions to assess proximity to protected or ecologically sensitive areas. Ecologically sensitive areas include wetlands, lagoons, lakes, coastal zones (as defined in regulations), animal migratory routes, parks, wildlife refuge and protected areas or areas inhabited by rare or endangered animals. A site near a park, natural forest or protected area will run the risk that occupants will extract resources from the protected area. This can not only deplete the resources, but cause conflict with host communities.²⁰ If it is impossible to avoid ecologically sensitive areas, as is the case in Cox's Bazar, then activities to limit or remediate unavoidable environmental impacts need to be developed as part of the site plan [see page 42]

¹⁷ <https://www.globalforestwatch.org/dashboards/country/BGD?category=land-use&treeLossTsc=eyloaWdobGlnaHRlZCl6ZmFsc2V9>

¹⁸ <http://en.banglapedia.org/index.php?title=Landuse>

¹⁹ Reddy, C. Sudhakar, S. Vazeed Pasha, C. S. Jha, P. G. Diwakar, and V. K. Dadhwal. "Development of national database on long-term deforestation (1930–2014) in Bangladesh." *Global and Planetary Change* 139 (2016): 173-182.

²⁰ As has been noted in Bangladesh in the Rohingya crisis – e.g. of forestry management projects being ruined.

Protected Areas (PAs) in Bangladesh serve as the source of subsistence livelihoods to the local communities as well as being the repository of biological diversity. All the PAs are managed by the state Forest Department (FD). There have been recent attempts to co-manage protected areas with local communities. Although results have not always been positive, overall there have been positive impacts. One recent example is the FD's community forestry management programme in the forests near Cox's Bazar. The successes seen to date are being heavily compromised by the pressure put on the forest from the massive influx of Rohingya refugees. Pressure from crises are likely to compromise longer term forestry management projects and should be considered when planning campsites and recovery and reconstruction operations. If possible work with the FD to involve disaster affected people in forestry management and conservation as part of recovery efforts.

The [World Database of Protected Areas](#) cites 51 Protected areas in Bangladesh. Protected areas are the source of livelihoods and natural resources used for housing for the local communities as well as being important biodiversity hotspots. These can be viewed on this [map of Bangladesh](#), by zooming into the area of interest. These are mostly [national parks](#) (18) and [wildlife sanctuaries](#) (17). There are two [Ramsar sites](#) (wetlands of international importance): Sundarbans Reserved Forest in the Bay of Bengal and Tanguar Haor located in the Dharmapasha and Tahirpur upazilas of Sunamganj District in Bangladesh. For the full, up to date country profile see: <https://protectedplanet.net/country/BD>.

Ecologically Critical Areas


In addition to protected areas, Bangladesh has 13 Ecologically Critical Areas (ECAs) - environmental protection zones - with one more awaiting declaration.²¹ The DoE is in charge of ECAs. Due to lack of field resources, the ECAs are generally poorly managed.

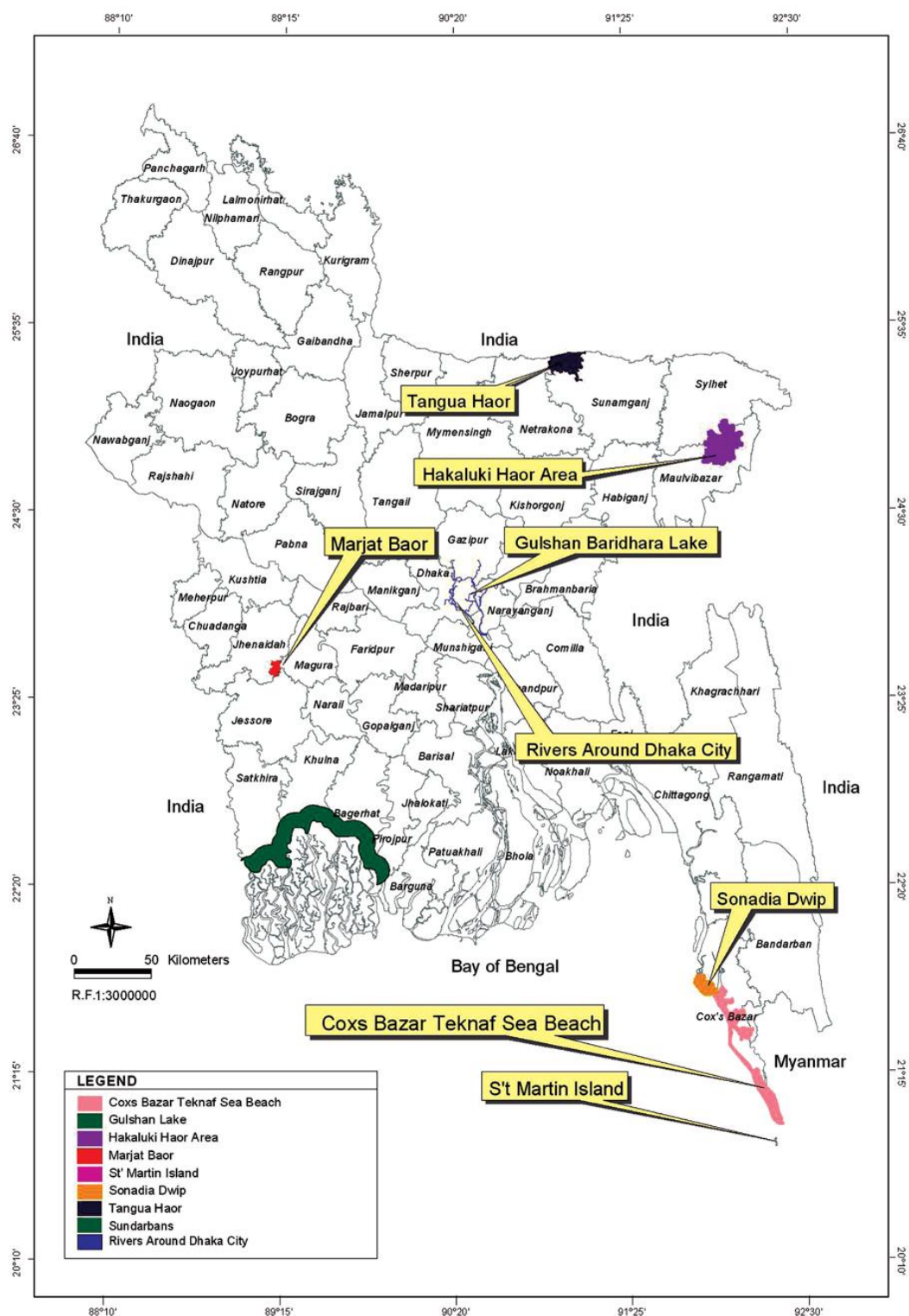
ECAs include²²:

- **Cox's Bazar:** on the border of Bangladesh and Myanmar in the southeast corner of Bangladesh.
- **The Teknaf Peninsula:** 80 km of sandy beach and holds a variety of species as one of the longest beaches in the world.
- **The Sonadia Islands:** home to some of the last mangrove forests that house distinct species that can tolerate the high salinity of the mangrove forests in this area.
- **The Sundarbans:** contain mangrove forests and was named an ECA because it continues to suffer from over-exploitation and illegal urban development.

²¹ Seventh Five year plan, page.426

²² http://en.banglapedia.org/index.php?title=Ecologically_Critical_Area

- 
- **St. Martin's Island** : known for its coral-algal that overwhelms its rocky reefs. The island is a refuge for globally threatened marine species.
 - **Hakaluki Haor**: in greater Sylhet is an ECA because it has an extensive amount of wetland habitats that support a wide variety of life.
 - **Gulshan-Baridhara Lake** was declared an ECA in 2001 and is classified as an urban wetland.
 - **Four rivers around the capital city Dhaka**—Buriganga River, Shitalakshya River, Turag River and Balu River were declared ECAs in 2009 for being biodiversity hotspots in danger of overfishing, deforestation, and pollution



Ecologically Critical Areas of Bangladesh (CEGIS 2009).²³

²³ https://www.researchgate.net/publication/304630300_Community_Based_Ecosystem_Conservation_and_Adaptation_in_Ecologically_Critical_Areas_of_Bangladesh_Responding_to_Nature_and_Changing_Climate

Major environmental and natural resource management issues facing Bangladesh

Bangladesh has suffered extreme environmental degradation in the last decades, with severe impacts on the lives and livelihoods. Human interventions have vastly reduced diversity of plants and it is estimated that around 14% of plant species in Bangladesh are threatened. Wetlands, which support the fishery sector, are also in danger. The degradation of wetlands has led to serious reduction in fish habitat, population, and diversity. Most large fauna are threatened with extinction or are already extinct.²⁴ Unwise use of agro-ecosystems, wetlands and water resources combined with salinity intrusion is posing a serious threat to the country's agricultural productivity and food security. Degraded lands, wetlands, forest areas and other shared natural resources have put extra pressure on the most vulnerable, undermining the poverty reduction measures. Poorly planned development interventions and economic activities are making cities and towns unliveable and limiting the coping capacities of ecosystems.²⁵

In addition to the natural hazards mentioned above, the country currently faces several environmental issues which threaten natural resources and livelihoods and that will be exacerbated by future crises, unsustainable natural resource management and climate change. The main issues include:

- Deforestation²⁶
- River systems management (sedimentation and changing patterns of stream flow due to watershed mismanagement, sand extraction)
- Groundwater metal contamination
- Increased groundwater salinity
- Sprawling urbanization
- Unregulated waste management
- Noise, air and water pollution due to poorly regulated industrialization²⁷
- Climate change
- Salinisation

Proper ecosystem management is required to ensure the sustainability of natural resources without hampering the livelihood of people dependent on the goods and services. The following existing issues should be considered in Shelter and Settlements work within disaster response and recovery to minimize exacerbating them further.

Deforestation

Bangladesh has one of the highest deforestation rates in South and South-East Asia, with deforestation taking place at an annual rate of 2%, and with forest coverage now as little as 10.2%

²⁴ Seventh 5 yr plan p.425

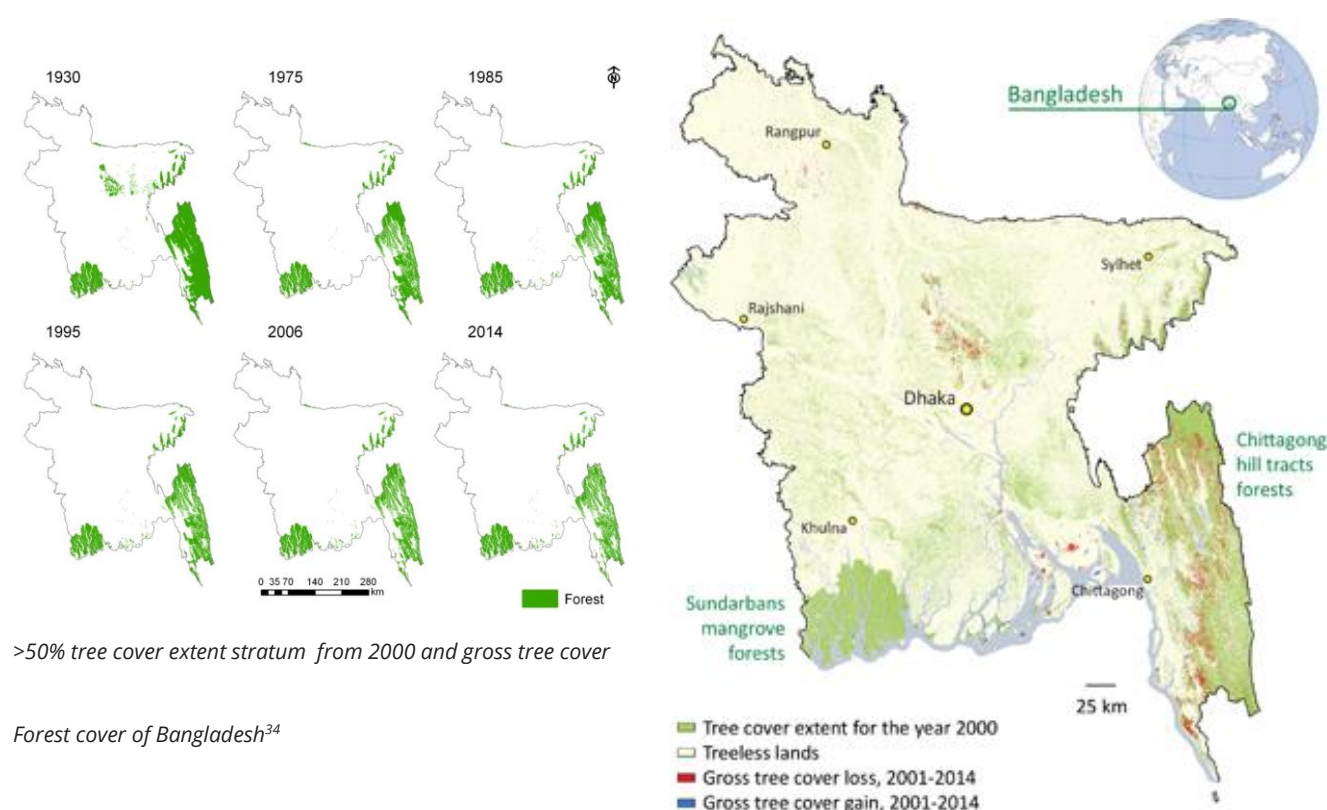
²⁵ p401/402 Seventh 5 yr plan

²⁶ See page 21

²⁷ Seventh 5 yr plan, p401

²⁸ (from 13% in 2010)²⁹. Bangladesh lost 134k ha of tree cover between 2001 and 2017, with a 28.4k ha loss in 2017 alone³⁰. The major driver of deforestation is the demand for firewood. There is a huge gap between the demand and supply of firewood which has led to a firewood crisis across Bangladesh. This leads to illegal forest activities and illegal logging by poor communities living in the rural fringes adjacent to forests. Local people overwhelmingly rely on forests as a source of their firewood.

Firewood is mostly collected in illegal ways to “fuel” the national shortage of firewood across Bangladesh. There are laws and acts that ban illegal logging, including the Forest Policy³¹ (see page 36) and the Forest Act³² (see page 36) but they are rarely enforced and have not proved effective in controlling illegal logging and have also been known to cause conflicts with local forest communities. Deforestation has resulted in several of the man made disasters in the country's history.³³



²⁸ Comparing the effectiveness of forest law enforcement and economic incentives to prevent illegal logging in Bangladesh,. MUKUL, J. HERBOHN,, A.Z.M.M. RASHID and M.B. UDDIN, 2014

²⁹ [Global Forest Watch](#), 2018

³⁰ [Global Forest Watch](#), 2018

³¹ Bangladesh Forest Policy of 1894 provided the main guidelines for the formulation of laws and regulations for managing forests.

³² Forest Act 1927 that was formulated during the British colonial era, with subsequent amendments by the government being made in 1994 and 2000

³³ https://en.wikipedia.org/wiki/Green_building_in_Bangladesh

³⁴ Reddy, C. Sudhakar, S. Vazeed Pasha, C. S. Jha, P. G. Diwakar, and V. K. Dadhwal. "Development of national database on long-term deforestation (1930–2014) in Bangladesh." (2016)



Loss and gain 2000–2014 strata mapped using the Landsat data.³⁵

Since poverty and unemployment are widespread, particularly in the rural fringes adjacent to forests, illegal forest activities and illegal logging are very common and pose major challenges to the sustainability of forest resources and their management.³⁶ Gangs illegally fell trees for profit, and influential locals have been documented violating the law to collect firewood.

Under the Forest Act, illegal logging is treated as a forest offence, and is punishable by imprisonment for a term of between six months and five years, with additional fines that may range between Tk2,0002 and Tk50,000.³⁷ There have been various initiatives to try and protect and increase the amount of land under tree cover, including the Forestry Sector Master Plan (FSMP 1993-2013). There have also been a range of initiatives to try to increase equitable benefit sharing systems with local people, such as the latest Forest Policy of 1994 which has shown some gains in enhancing local participation in forest management activities. However in general decisions are taken by politicians with little attention paid to local knowledge and needs and the value of the forests. This is due to the general weakness of the national forest institution and lack of robust policies. The Forest Department is often cited as lacking the required number of officials and guards to protect forest areas and illegal logging is well documented across the country.

Risks caused or exacerbated by deforestation at local and regional levels include:³⁸

- Negative impact on biodiversity and protected/endangered species
- Increase in human/wildlife conflicts
- Soil erosion risks, include increased landslides and stream congestion
- Increase of conflict with host population, for example in Cox's Bazar, who lost their livelihoods or have less access to their land or natural resources available locally

Shelter and Settlements work should attempt to not put additional pressure on this critical issue. For example, through switching from local to regional/international purchases with treated bamboo to decrease pressure on local and regional forests, while increasing the shelter longevity. This is currently being practiced in Cox's Bazar. In collaboration with GoB, support local forestry programs

³⁵ Potapov, P., B. N. Siddiqui, Z. Iqbal, T. Aziz, B. Zzaman, A. Islam, A. Pickens et al. "Comprehensive monitoring of Bangladesh tree cover inside and outside of forests, 2000–2014." *Environmental Research Letters* 12, no. 10 (2017)

³⁶ Comparing the effectiveness of forest law enforcement and economic incentives to prevent illegal logging in Bangladesh

³⁷ Comparing the effectiveness of forest law enforcement and economic incentives to prevent illegal logging in Bangladesh

³⁸ EMMA report

to improve forest renewal and protection and improve income generating activities - this could be an opportunity for the Shelter Cluster as a preparedness activity.

Deforestation issues by area

Sal Forests³⁹

Out of four categories of forest type in Bangladesh, plain land Sal forests are the most endangered. Illegal logging and forest land conversion are the main causes of deforestation. This is due to local corruption and politics along with weak government policies. The national and local demand for firewood is putting particular pressure on the Sal Forests.

Sundarbans

Poverty and lack of permanent jobs are cited as the major reasons for illegal logging (70%) in the area.⁴⁰ Seasonal flash floods and cyclones are common and the impacts of disasters and increased health concerns and disease exacerbate illegal logging. Illegal timber is also cheaper from the Sundarbans compared to the corresponding prices in the nearest regional market.

For more information specifically related to environmental issues in Cox's Bazar and the Rohingya Crisis, see UNDP REA.⁴¹

River Bank Erosion

River bank erosion is a major issue in Bangladesh that has been exacerbated in recent years by **poor watershed management** and the **over-extraction of sand from riverbeds**. The majority of the rivers are now under threat from encroaching and illegal dredging. **Sand has become an important resource for rapidly increasing construction demand for concrete** along with industrialization in rural areas and land reclamation projects. The sand mining business started off small scale from private ponds, but for some time it has been impossible to meet the demand in the construction sector caused by rapid urbanization around Dhaka. This has led to **in-stream sand mining**, that is documented across the world as one of the principal causes for **rapid channel incision and subsequent bank failure incidents**.⁴² The negative consequences of over-exploiting sand are felt in poorer regions where sand is mined. As the demand for concrete is predicted to rise

³⁹ [Natural Resources, Livelihoods, And Reserve Management](#): A Case Study From Sundarbans Mangrove Forests, Bangladesh, Michael Getzner & Muhammad Shariful Islam (2013)

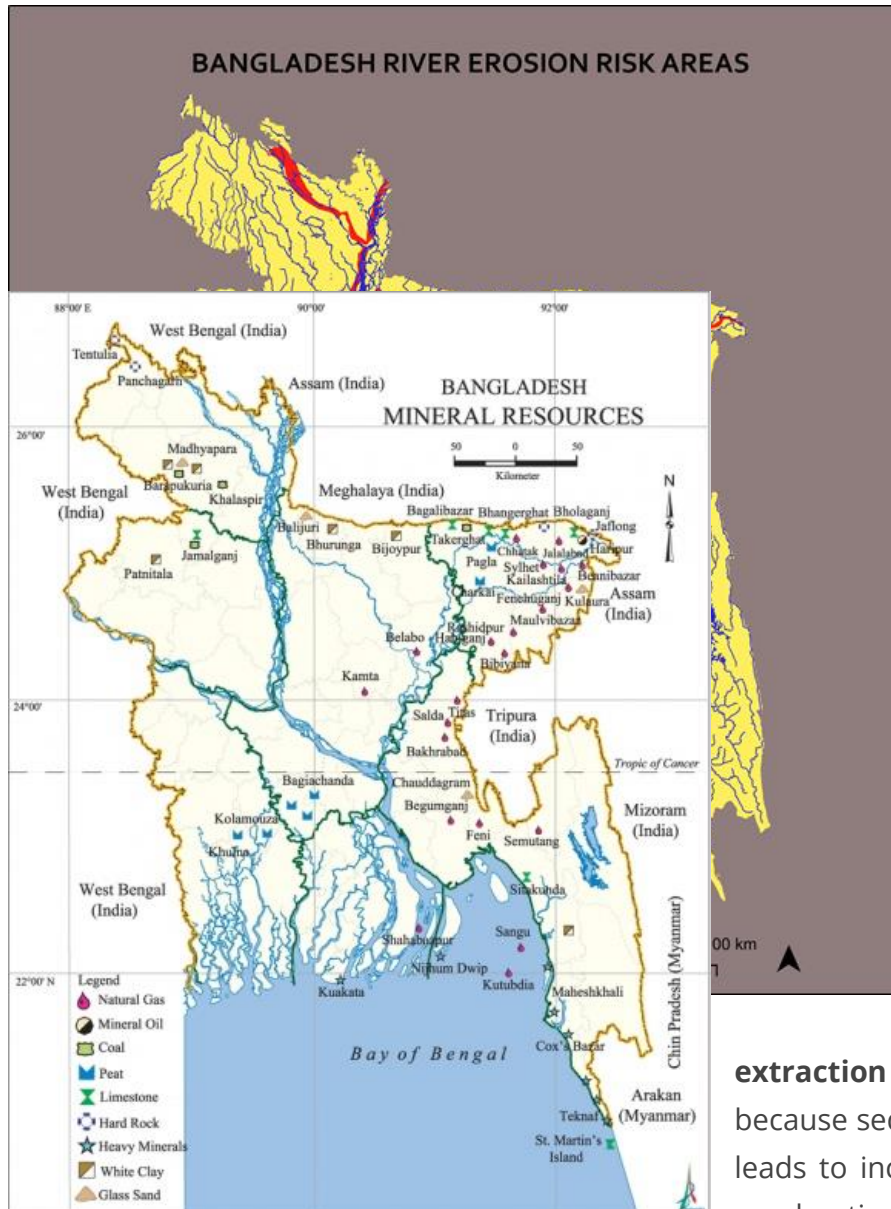
⁴⁰ [Natural Resources, Livelihoods, And Reserve Management](#): A Case Study From Sundarbans Mangrove Forests, Bangladesh, Michael Getzner & Muhammad Shariful Islam (2013)

⁴¹ [Report on Environmental Impact of Rohingya Influx](#), UNDP (2018)

⁴² Sand Mining and Its Social Impacts

sharply by 2050 and the population will continue to increase sharply, this issue will continue to have serious humanitarian and environmental impacts for the foreseeable future.

As indicated by the maps below, unstable river banks do seem to correlate with some of the glass sand deposit locations, particularly Balijuri, and these deposit locations also highlight areas of concern for the future.



River erosion risk (2013), data obtained from HDX⁴³

Mineral resources, including glass sand deposits⁴⁴

Erosion has always naturally occurred in Bangladesh with annual flooding in the rainy season. The low clay matrix sand is prone to easy erosion, washing houses and agricultural land away. This is particularly the case in regions where large sandbars or “chars” are inhabited by vulnerable communities who are displaced on an annual basis and have adapted to this displacement. **River bank erosion** has become a major issue exacerbated by the **over-**

extraction of sand from riverbeds. This is because sediment extraction from river beds leads to increased water flow which causes acceleration of river bank erosion. When the

rate of sand extraction exceeds the replenishment rate, significant and potentially irreversible changes occur in the hydraulic conditions and channel stability, leading to river erosion with severe humanitarian consequences.

⁴³ Kelly, Maureen. “Bangladesh River Erosion Risk Areas” [map]. 1:10,000,000. November 2018. ; data from: <https://data.humdata.org/dataset/bangladesh-hazards>

⁴⁴ http://en.banglapedia.org/index.php?title=Mineral_Resources

Extracting sediments is regulated by law and the rule of BWDB and **extraction of sand for commercial use is illegal if it is removed by over 30m from the site of extraction or if taken from specific parts of the river that will exacerbate erosion.**⁴⁵ However the law is not well known or respected and this lack of knowledge is taken advantage of by companies and influential individuals. Often, elected public representatives are not aware of the damage being done.

The DoE does not have the resources or personnel to properly control the issue although the GoB has recognised this issue and states in their Seventh Five Year Plan that the majority of the rivers are now under threat from encroaching and illegal dredging and that remedial measures are necessary. Some actions that will be implemented under the Seventh Five Year Plan (p.434) include:

- Developing guidelines for environmentally safe dredging that include appropriate distance from river banks and structures
- Stopping illegal dredging/sand mining by developers without licenses

At the same time, the GoB has recently decided to start exporting sand to Maldives and Singapore, after extracting it from the bed of the Jamuna (Brahmaputra) river.⁴⁶

In general, those displaced by river erosion have received very little assistance from the GoB or NGOs. Some displaced people have emigrated to slum areas in Dhaka or other cities. In some slums in Dhaka more than 40 percent of the population named river erosion as primary cause for their migration into slums⁴⁷

Common uses of Sand in Bangladesh

Land reclamation: Piling up sand and soil in lower areas for population increase: Homesteads and houses with mounds of sand and soil are commonly observed in Bangladesh. Homesteads are usually formed by digging ponds and piling up the sand and soil (Miyamoto et al 2010: 854). Sand

is used to fill in wetlands prior to laying claim over it.

Building roads: constructed by banking sand and soil up. To build a structure along with the roads, it is necessary to raise the ground level of a plot of low-lying land. The business of selling sedimentary



⁴⁵ Points of extraction must be in bars in the middle or at the inside of banks of rivers, or in the middle part of riverbeds to smooth the water flow and not accelerate erosion

⁴⁶ The decision was made at the meeting of the National Sand Corridor Management Committee in 2017.

⁴⁷ Seventh 5 yr plan, p.434

sand and soil in ponds and rivers has become common.

Sand mining on the Dharla river in Kurigram (Credit: Sheikh Rokon)

Concrete production: responding to the rapid urbanisation of the country and shift away from traditional building practices to using concrete.

Impacts of sand extraction and riverbank erosion

- The physical alteration of rivers and coastal ecosystems, increase of suspended sediments and erosion.
- Loss of houses and farmland as more people are being displaced by river bank erosion. Some displacement from flooding was always the case, but in areas of sand mining this has increased tremendously
- Displacement
- Migration to cities (usually slums)
- Generation of a floating population
- Coercion of the most vulnerable groups who are displaced
- Conflict between sand miners and local residents
- Exacerbation of wealthy.poor divide as the most vulnerable lose their homes, and the richest and most influential profit from sand mining.

When looking at site planning, road building and use of concrete, the use of sand should be carefully considered to minimise the above impacts. For more on sand and concrete as a building material see page 52.

Land Zoning, Land Use and Land Degradation

The GoB recognises⁴⁸ that land is a scarce resource and there are conflicts from sectoral use and demand and unauthorized land grabbing. Land zoning and proper land use plan is considered a necessity, and the National Land Zoning Project⁴⁹, run by the Ministry of Land, aims to regulate land zoning and tackle the issue of uncontrolled land use across the country. Due to population growth, the share of land per capita is shrinking annually, causing the resource base for agriculture, forests and wetlands to be more vulnerable and exacerbating food security issues. This is mainly due to conversion of agricultural land into urban, peri-urban, industrial uses, and construction of roads, embankment. The National Land Use Policy 2001 of the Ministry of Land is one of the main policies of the government that has highlighted the need, the importance and modalities of National Land Zoning for integrated planning and sustainable management of land resources of the country.

Land degradation due to industrial pollution and loss of soil quality is another concern. Apart from erosion, factors damaging soil quality include salinity intrusion, fertility decline and nutrient

⁴⁸ In the Seventh 5 year plan

⁴⁹ <http://landzoning.gov.bd/>

imbalance are of regional concern. Cropping intensity, loss of organic matter and imbalanced use of fertilizer have degraded soil quality. It is important to conduct an assessment of ecosystem degradation in terms of heavy metal contamination and nutrient loss.⁵⁰

Water Pollution and Salinisation

Bangladesh ranks 86 out of 142 countries for drinking water quality.⁵¹ Drinking water sources, both surface and groundwater are contaminated with harmful metals and pesticides across the country, causing major health problems. This is mostly from industry and agribusiness. The situation is worse in Dhaka as the city faces issues ranging from inadequate sanitation, polluted rivers, and chemical outpouring from the surrounding industries, all resulting from the unplanned nature of urbanisation. There are also pollution problems in coastal areas from oil spillages.

The process of **salinisation**, exacerbated by rising sea levels, is impacting on health and livelihoods due to contaminated drinking water supplies and lower agricultural production. Coastal drinking water supplies have been contaminated with salt, leaving over 30 million people vulnerable to health issues including preeclampsia during pregnancy, acute respiratory infections and skin diseases. Agriculture is also badly affected and crops damaged by rising salinity face twice the risk from the resulting soil degradation. Many regions have already suffered large losses and significant price reductions. Intrusion of saline water in the freshwater rivers, canals, ponds and paddy fields has been on the rise over the last 20 years in the southern coastal areas. The salinity affects water for drinking and cooking, fresh water agriculture and fisheries, forests and other plantations, livestock, and overall livelihoods.

Climate change and predicted impacts

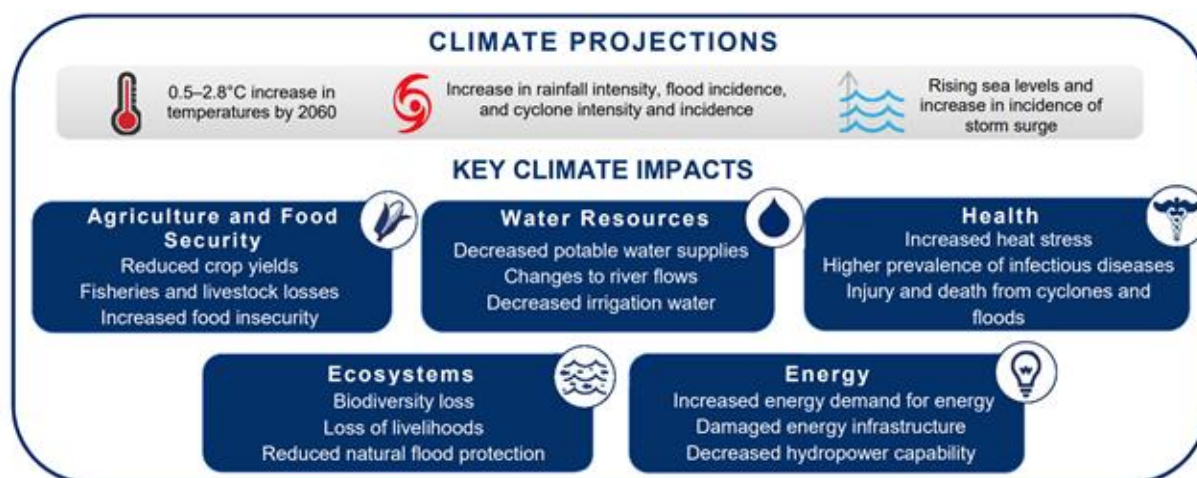
Bangladesh is considered to be one of the most vulnerable countries to climate change because of its geographical location and physiographic features, and low capacity to adapt to change. Climate change has caused many hazards already and will exacerbate many of the current problems and natural hazards the country faces and the predicted higher wind speeds and storm surges will lead to more damage in the coastal region. An additional 14% of the country is predicted to become extremely vulnerable to floods by 2030. Predictions include:

- increasingly frequent and severe tropical cyclones
- heavier/lighter and more erratic rainfall
- higher river flows
- river bank and coastal erosion
- increased sedimentation

⁵⁰ Seventh 5 yr plan

⁵¹ Sources and causes of water pollution in Bangladesh: A technical overview, Arefin and Mallik, 2017

- melting of the Himalayan glaciers
- sea level rises - predicted rises by 2050 would cover 17 per cent of the country
- salt water intrusion



Credit: Bangladesh Climate Links profile, Cadmus, USAID

The housing sector is one of the sectors most impacted by climate change. The housing sector accounts for approximately 50 per cent of the economic damage from disasters. The high density of population will make it difficult to identify effective coping strategies.⁵² Recurrent losses of housing and livelihood due to natural hazards such as cyclonic storms, riverine and flash flooding, earthquakes, landslides, a rising sea water level and river erosion which have a massive impact on the rural dwellings, lead to repeated displacement and widespread migration. The effects are already being felt, as many people from poor coastal communities inundate Dhaka and its suburbs after losing land to soil erosion.

The populations most affected by climate change are women, small marginal farmers, sharecroppers, laborers, urban slum dwellers, indigenous and minority groups and other marginalized groups, such as the disabled.

The Department of Environment (DoE) has taken a number of initiatives to address climate change, for example the Climate Change Cell of the DoE has developed a Climate Proofing guideline for fisheries and livestock sectors, a comprehensive Climate Change Training Manual, established a Climate Change Knowledge Network (CCKN) and established a rich web-based Climate Change Database.⁵³ Overall however, there is low adaptation capacity in Bangladesh, given the extreme number of predicted impacts.

For more information on climate risk issues in Bangladesh, including how climate change will potentially impact five key sectors in the country: agriculture and food security, water resources, human health, ecosystems, and energy, see the [Bangladesh Climate Links profile](#).

⁵² p401, Seventh 5 yr plan

⁵³ p.404 Seventh 5 yr plan

Most common disasters and related building guidance for housing in affected areas

Bangladesh is vulnerable to floods, flash floods, salinity, storm surges, landslides and earthquakes. Flooding, mainly in the period from May to October, occurs almost annually and affects most of the country with the exception of Barind Tract and hilly areas. The western part of the country, including Barind Tract, is a drought prone area which faces severe problems due to a scarcity of water, particularly during the dry season. The southern coastal part of Bangladesh is prone to storm surges and soil salinity while the hilly areas of Bangladesh (Chittagong Hill Tracts, Cox's Bazar and Teknaf) are vulnerable to landslides⁵⁴. due to the impacts of climate change, the frequency of cyclones in the months of November and May over the northern part of the Indian Ocean has increased twofold in the past 122 years (Singh et al., 2007) Using the Bay of Bengal in a hydrodynamic model, World Bank estimates suggest that by 2050, the areas of Bangladesh exposed to cyclones are likely to increase by 26 percent, with the affected population touching a staggering 122 percent (World Bank, 2010).

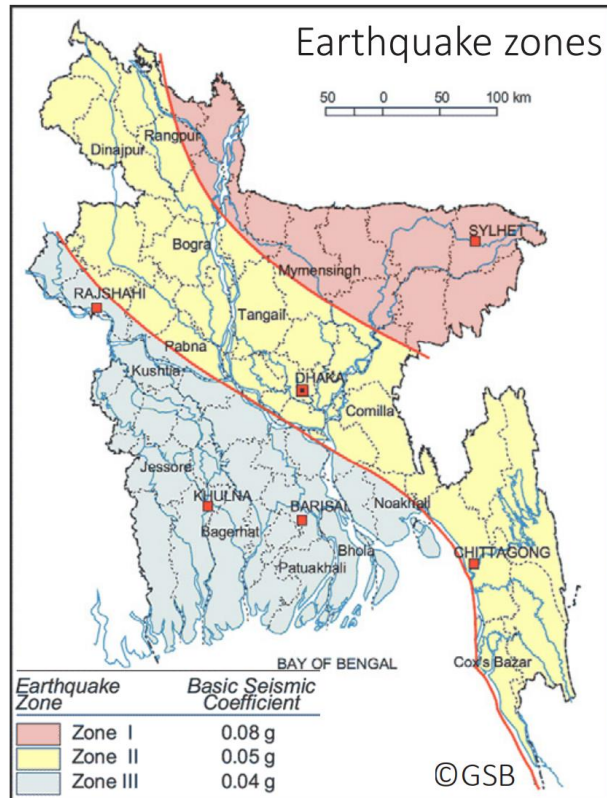
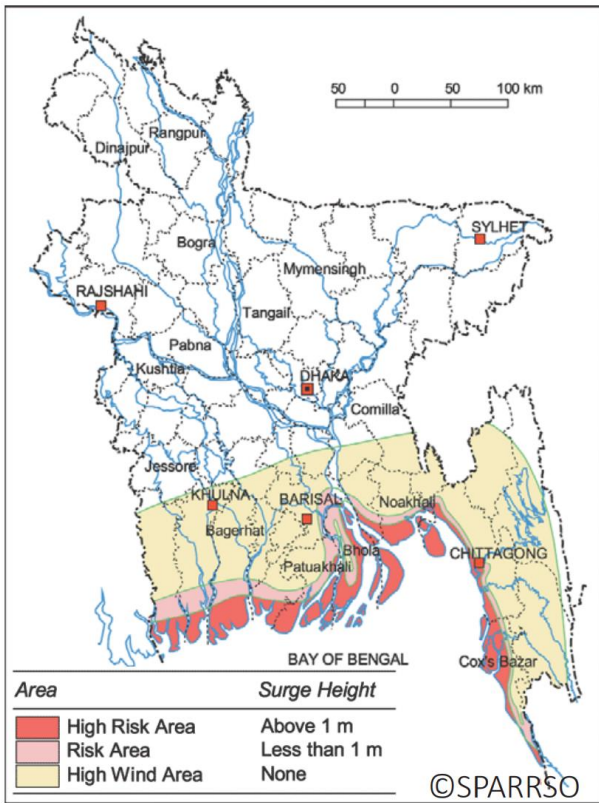
For general design principles for these different threats, consult the Ministry of Housing and Public Works' [Standard Guideline For Rural Housing In Disaster Prone Areas Of Bangladesh](#) from page 39. For building guidelines for strong winds, floods, earthquake, storms surges or flash floods, coastal and river erosion and landslides see pages 39-41. The guidelines also include design for different topographical areas including coastal areas (p.53), flood plain and char areas (p. 112), Haor⁵⁵ areas (p.142), and hilly areas (p.160). For ecological engineering measures for slope protection see p.156 and thatching/grasses section of Buildings Materials Guide on page 53.

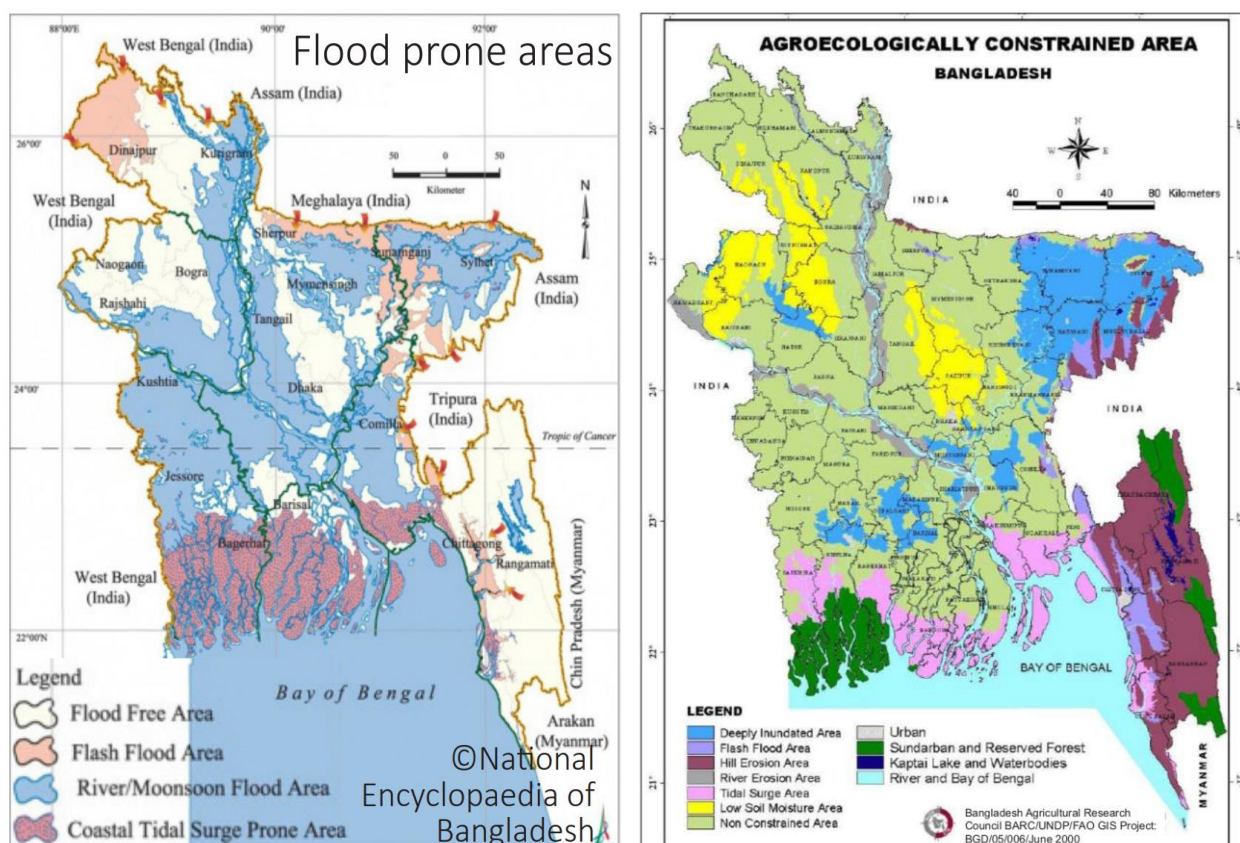
Major Hazard Zone Maps⁵⁶

⁵⁴ [Report on Environmental Impact of Rohingya Influx](#). UNDP (2018), p.29

⁵⁵ The haor are vast stretches of land that are submerged under water during the rainy season, which appears like a sea half of the year and mostly dry during winter.

⁵⁶ Taken from Rural Housing Guidelines and Local Building country profile





Cyclone, earthquake, flood and erosion and landslide affected areas,

Regulatory requirements and institutions

Overall, there are generally sufficient laws that govern the issues relating to environment and shelter, but they are not well monitored or implemented because of weak institutions.

Shelter and settlements impacts on all areas of life and many GoB ministries have a stake in housing. Similarly, environmental issues cut across a large range of ministries. It is beyond the scope of this profile to list all of the relevant policies that could have a link to environment and housing in disaster prone areas of Bangladesh, but the most important ones are listed here. For a full list of regulatory requirements and institutions, (national and international) relating to environment and disaster management, see the UNDP REA pp. 26-29.⁵⁷

Post-disaster housing regulatory context

The GoB is aware of the need to manage the impact of their rapidly expanding population (approximately 2m per year) on the environment and this is reflected in a range of policies looking

⁵⁷ [Report on Environmental Impact of Rohingya Influx](#), UNDP (2018)

to address environmental concerns. These however are not always enforced even in development contexts, let alone disaster contexts.⁵⁸

For a comprehensive overview of the evolution of post-disaster housing policy and practice see the [case study on Cyclone Sidr](#): Planning and Implementation of Post-Sidr Housing Recovery: Practice, Lessons and Future Implications pp.19-20. In summary, there is a gap of lacking regulations for emergency and recovery sheltering and fragmentation within the rural housing sector in Bangladesh. The Sidr response highlighted a big gap in post-disaster recovery efforts, namely the existing lack of clarity in institutional mechanisms to manage housing recovery. Post-disaster housing recovery is not clearly mandated to any one agency of the GoB. While the onus of post-disaster recovery in the larger sense is on sectoral ministries under the overall guidance of the National Disaster Management Council (NDMC), headed by the Prime Minister, the roles of different ministries in housing recovery are not spelled out in the country's main legal framework for disaster management and other instruments. This lack of accountability on post-disaster recovery housing is further exacerbated by the fact that the country's draft National Housing Policy (NHP) has no mention of post-disaster housing. In the post-Sidr period, the Ministry of Disaster Management and Relief (MoDMR) and its associate departments such as the Disaster Management Bureau (DMB) and the Department of Relief and Rehabilitation (DRR) took the lead in coordinating the housing recovery process.

Environmental regulatory context

Bangladesh has a broad range of Environmental Departments and laws which on paper make it look strong in environmental management. The reality though is that the overarching ministry (Ministry of Environment and Forests) received only 0.05% of the government's total revenue and development budget. From this budget, 80% is distributed to the FD while the DoE receives less than 1 percent.⁵⁹ Laws are rarely able to be enforced due to low capacity of these departments, and this only worsens in disaster times.

Institutional Arrangements⁶⁰

Disaster Management

Bangladesh is globally known for its well-developed disaster response system and practice. Due to the frequency of disasters there has been recognition that it cannot afford to disassociate disaster preparedness from its development planning. Therefore the country has developed a policy, procedure, guidelines and an institutional mechanism for responding to disasters spearheaded by two main government bodies:

⁵⁸ Unclear what regulations may be exempt in disaster contexts. Consult IFRC Disaster Law team.

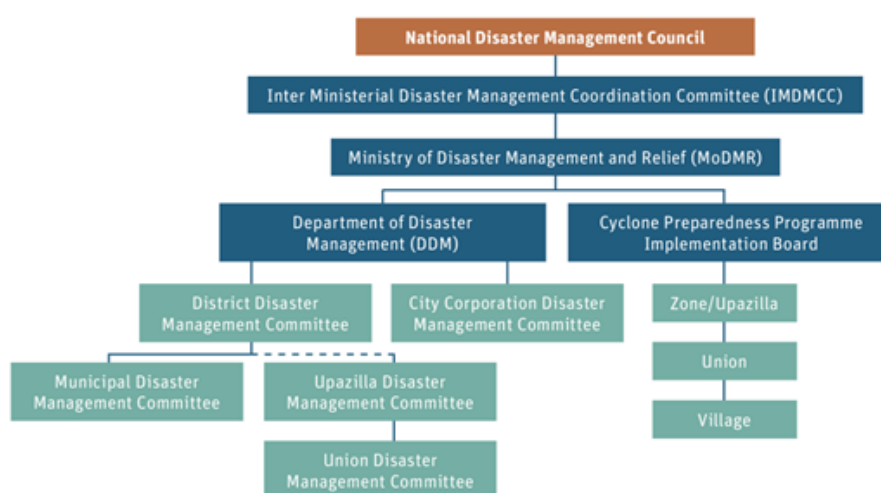
⁵⁹ Seventh 5 yr plan p.408

⁶⁰ Some taken from [Report on Environmental Impact of Rohingya Influx](#). UNDP (2018), p.29

1. **The National Disaster management Council** (NDMC) headed by the Prime Minister, is the body that provides strategic guidance in all aspects of disaster management
2. **The Ministry of Disaster Management and Relief** (MoDMR) is the key agency that implements that policy, oversees its implementation and coordinates the disaster response efforts that the 29 sectoral ministries are expected to undertake. The mandate of the MoDMR is also to drive national risk reduction reform programmes and 'To achieve a paradigm shift in disaster management from conventional response and relief to a more comprehensive risk reduction culture, and to promote food security as an important factor in ensuring the resilience of communities to hazards.'

Two main functions fall under the MoDRM:

1. **Department of Disaster Management**
2. **Cyclone Preparedness Programme (CPP)**



Institutional structure of disaster management in Bangladesh⁶¹

While Bangladesh continues to improve its disaster response system, recovery as a policy measure still remains weak. The GoB has taken a significant step forward by mainstreaming recovery by sectoral ministries. The planning process allows for budget re-appropriation, revision of the Annual Development Plan (ADP) as well as new projects and programmes. However, the GoB's internal monitoring and accountability mechanism for post-disaster recovery requires streamlining under a single recovery policy.⁶²

Shelter and Settlements

Ministry of Housing and Public Works: provides housing and regulates state construction activities.

⁶¹ Taken from "Planning and Implementation of Post-Sidr Housing Recovery: Practice, Lessons and Future Implications" (2014)

⁶² Ibid, p.9

Housing and Building Research Institute (part of MoHPW): This institute has vast research experience in alternative construction techniques. It also plays an important role in the development of the Bangladesh national building code (BNBC). Recently with HBRI it developed the “Standard guideline for rural housing in disaster prone areas of Bangladesh”. The Housing and Building Research Institute (HBRI) has been working on the production of environment-friendly building materials for the past three years.

National Housing Authority: responsible for implementing the national Government's housing policies.

Land Ministry⁶³ is the government ministry of Bangladesh responsible for formulating and implementing national policy on lands. The land ministry is responsible for the exportation of sand (see page 39).

Public Works Department: Construction and maintenance of public schools, government official buildings, hospitals, monuments, etc.

Urban Development Directorate: responsible for administering national planning law and policy

Department of Architecture

Environmental

The Ministry of Environment and Forests (MoEF) is the primary ministry responsible for environmental issues in Bangladesh. It was established after the Government of Bangladesh signed and ratified the United Nations Framework Convention on Climate Change. Prior to MoEF, no ministry was present for tackling environmental concerns in Bangladesh.

Key functions of the MoEF:

- Define overall Government policy regarding forests and the environment
- Ensure environmental matters are considered in development programming
- Review and monitor the impact of development initiatives on the environment across all sectors
- Manage forest resources, and conserve and develop forest land, forest resources and wildlife
- Increase the country's forest resources and meet the demands for these resources
- Environmental improvement and pollution control
- Addressing the impacts of climate change

Six institutions administer the actions of the MoEF:

⁶³ Exporting sand

The Forest Department (FD): ensures management of government owned forests and is responsible for the conservation and expansion of forest and its biodiversity and socio-economic development. The FD works with shelter actors in emergencies where there is a timber or bamboo issue, as in Cox's Bazar in 2017/18. Their role includes to:

- i. manage all the government forests to foster a steady supply of the forest products such as wood, fuel-wood, bamboo and other forest produces towards the demands of the public
- ii. protect and conserve the protected areas to meet the mandate of conserving biodiversity
- iii. enhance nation wide tree cover
- iv. undertake social forestry activities that raise awareness and encourage tree planting
- v. involve members of the public as participants in the conservation of protected areas
- vi. identify and implement forestry management programmes
- vii. implement the forestry policy through acts, rules and regulations

The FD enforces the country's forestry laws. However these some of these laws and taxes are waived in disaster times, for example in the Rohingya crisis in Cox's Bazar,⁶⁴ where officials are strictly enforcing taxes and permits for timber but waiving locally-produced bamboo taxes and permits needed for humanitarian purposes.⁶⁵

The Shelter Cluster has worked with the Forestry Department in past humanitarian crises, for example taking part in a Timber Workshop in 2014 organised by the Shelter Cluster where promises were made to compile a brief summary of the key documentation to clarifying the legal issues surrounding timber sourcing though this documentation has not been found to date. In 2018/19, the Forestry Dept was working with the Shelter Cluster technical working group on the supply and treatment of bamboo.⁶⁶

Cox's Bazar district is divided in two divisions managed by two different forestry department teams, each made up of 250 individuals. They are strictly enforcing taxes and permits for timber, but waiving locally-produced bamboo taxes and permits needed for humanitarian purposes.

The Forest Department is often cited as lacking the required number of officials and guards to protect forest areas. There is insufficient amount of staff and manpower with various crucial positions remaining vacant.⁶⁷

⁶⁴ Forestry department of Cox's Bazar manages 43,000 acres of forest, of which nearly 3,000 acres is occupied by the Rohingya refugees

⁶⁵ Market Mapping Analysis (Emma) On Bamboo And Timber Market Chains In Cox's Bazar District, Bangladesh, December 2017

⁶⁶ More details can be supplied by the Environment & Energy Technical Working Group.

⁶⁷ p.409 Seventh 5 yr plan

Department of Environment (DoE): DOE is the technical arm of the MoE engaged in implementation of Environment Conservation Act and Environment Conservation Rules to ensure sustainable environmental governance. The role of the DoE is to help secure a clean and healthy environment for the benefit of present and future generations through the application of environmental rules and regulations; guiding, training and promoting awareness of environmental issues; and sustainable action on critical environmental problems that demonstrate support and involvement.

The mandate of the DOE lies with the enforcement of the Environment Conservation Act through controlling and monitoring of industrial pollution; environmental impact assessment, and in formulating guidelines for industrial sectors affecting air, soil and water quality, wildlife, critical habitats, fisheries and other natural resources issues. The DoE also manages Ecologically Critical Areas (ECAs)⁶⁸.

Bangladesh Forest Industries Development Corporation (BFIDC): a state owned organization started in 1959 responsible for industrial development of the forest resources of the country. There are two main sectors: Industrial sector and Agricultural sector (Rubber production, processing and commercialization). The BFIDC is involved in rubber production but also in carbon sequestration, reducing degradation and erosion of land as well as creating employment opportunities. BFIDC deals with issues such as extraction of timber (only the trees which have lost their economic life cycle) from reserved forests and rubber gardens, the seasoning and treatment of timber and for manufacturing of furniture.

Bangladesh Forest Research Institute (BFRI): aims to maintain the sustainable productivity of forest land and forest industries without resource depletion. It provides research support to the FD, BFIDC, end-users and others engaged in forestry activities.

Bangladesh National Herbarium: a scientific organisation where plant specimens collected from different parts of the country are documented and preserved as reference material.

Bangladesh Climate Change Trust (BCCT) - see below section on climate change institutions.

Climate Change

Climate change policy is a newer element in national policy. The GoB established two national funds to implement programs under the Bangladesh Climate Change Strategy and Action Plan:

Bangladesh Climate Change Trust Fund (BCCTF) Formed in 2013 to achieve the goals outlined in the Climate Change Strategy and Action Plan. BCCTF is chaired and managed by the MoEF. Bangladesh allocated US\$100 million for the 2010–2011 financial year to implement the BCCSAP. In early 2009, the government approved a policy for the fund and the Climate Change Trust Fund Act

⁶⁸ For a list of ECAs see page 19

was passed in 2010, of the total amount, 66 % can be spent on projects related to climate change and the balance for emergencies.

Bangladesh Climate Change Resilience Fund (BCCRF): This fund consists of US\$110 (annually) million from the EU and Denmark, Sweden, Switzerland and the UK to support implementation of the BCCSAP.

Pilot Programme for Climate Resilience (PPCR) This is one of the three climate investment funds administered by the World Bank.

Other natural resources

Ministry of Water Resources (MoWR): in charge of regulating and developing rivers and river valleys. MoWR governs all matters relating to irrigation, flood forecasting and warning, and flood control. It also conducts basic, fundamental and applied research on river valley projects and flood control works. MoWR is responsible for construction and maintenance of canals and water control structures. MoWR created the Flood Action Plan, Flood Hydrology Study, Flood management Model Study, National Water Policy and Flood Early Warning System. The government has established an operations center in Dhaka to respond and coordinate emergency relief with district committees.

Bangladesh Water Development Board (BWBD): a government agency for water resources management. Extracting sand and sediments is regulated by law and the rule of BWBD.

National Strategies and Plans⁶⁹

Vision 2021 (2012) and Seventh Five-Year Plan (2015): Released in 2012, Vision 2021 outlines a strategic plan to achieve the government's development vision, mission and goals in advance of the 50th anniversary of Bangladesh's independence. Under Vision 2021, the Seventh Five Year Plan (FY2016-FY2020) currently in effect stresses that while national capacity and expertise to address environment, climate change, and disaster management concerns have increased, the challenge remains to effectively implement policies and integrate lessons learnt (9,10).⁷⁰ The Seventh Five Year Plan includes a Green Growth Strategy to harmonize economic growth for better environmental sustainability.

National Sustainable Development Strategy (2013): identifies five strategic priority areas and three cross-cutting areas that are critical to achieve sustainability in Bangladesh. The five strategic priority areas include environment, natural resource and disaster management; urban environment; and agriculture and energy.

⁶⁹ Hyperlinks all in the Cadmus profile: <https://www.climatelinks.org/resources/climate-risk-profile-bangladesh> - Some taken from UNDP REA pp 26-27

⁷⁰ For progress with of Strategies during 6th 7 year Plan see page 403 or Seventh 5 year plan (Environment and Climate change are covered)

Disaster Management

Disaster Management Act (2012): outlining the country's legal framework for disaster management this act is considered a milestone in tackling disaster and climate change impacts. The Act came into existence to coordinate disaster management activities and to formulate rules to build up infrastructure of effective disaster management to fight all types of disaster. The **Department of Disaster Management** was established in November 2012 under the Disaster Management Act. This Department is responsible for:

- Reducing the overall vulnerability of different impacts of disasters;
- Conducting humanitarian assistance programs;
- Strengthening and coordinating programs undertaken by various government and non-government organizations related to disaster risk reduction and emergency response
- Conducting research, organizing workshops and training programs, publishing its reports and documents and providing various policy advisory services to concerned Ministries

Standing Orders on Disaster: this is considered one of the most important policy frameworks prepared with the objective of raising awareness of all stakeholders' responsibilities regarding disaster management at all levels. It emphasizes on the importance of community preparedness, hazard identification and mitigation and recovery to address issues of vulnerability.

Natural resource management, environment and climate change

National Environmental Policy (1992): sets out the basic framework for environmental action together with a set of broad sectoral action guidelines.

National Water Policy (1999): Recognizes that poor water quality results in watershed degradation and deforestation, reduction of biodiversity, wetland loss and coastal zone habitat loss. Relevant policy includes ensuring adequate upland flow in water channels to preserve the coastal estuary ecosystem threatened by the intrusion of salinity from the sea.

The Coastal Zone Policy (2005): A policy of integrated management of the coastal zone through the agreement of different Ministries, Departments and Agencies to coordinate their activities and sectoral policies and provide an integrated coastal zone management framework for all development work in the coastal zone. The goal of this policy is to create conditions in which the reduction of poverty, development of sustainable livelihoods and the integration of the coastal zone into the national process can take place.

Environment Conservation Act 1995 (ECA 1995): currently the main legislative document relating to environmental protection in Bangladesh. The main objectives of ECA '95 are the conservation and enhancement of the environment and the control and mitigation of environmental pollution. The main strategies of the act include the declaration of ecologically critical areas and restriction on operations and processes in them and a ban on hill cutting.

Environment Conservation Rules (1997 with amendments in 2002 and 2003) A set of relevant rules to implement the ECA' 95 was made public in August 1997. Standards are less stringent than those in developed countries.

Environment Court Act, 2000 (Amended 2002): Provides for the establishment of one or more Environment Courts, initially in every division of the country, with specific terms of reference to deal with environmental offences (under the Environment Conservation Act, or any other law specified in the Official Gazette and the rules made under those laws).

Forest Act (1927 and amended 1990, 2000): Empowers the Government to declare any area of forest as reserve and in doing so allows it to take measures for in-situ conservation of biological diversity. Under the Forest Act, illegal logging is treated as a forest offence, and is punishable by imprisonment for a term of between six months and five years, with additional fines.⁷¹

Forest Policy: In 1994, the national forest policy of 1979 was revised and a new forest policy approved. This new forest policy gives considerable emphasis on people's participation in village and community forest as well as in social forestry. It for the first time considers various stakeholders of the forestry sector, e.g. local communities, NGOs and government agencies and showed an equitable benefit sharing systems with the local people, and it also enhanced people participation in forest management activities. However, there was no clear, detailed guideline of participatory/ social forestry approaches and in practice it is common that decisions are made only by the political decision-makers, without taking into account the real needs of forest dependent people and the value of the forest.

Wildlife (Preservation) Order, 1973 & Wildlife (Preservation) (Amendment) Act, 1974 and Wildlife Preservation and Security Act, 2012: Provides for the protection of wildlife as well as their habitat. It defines various protected areas in the form of game reserves, national parks and wildlife sanctuaries and aims to preserve wildlife in those protected areas.

National Biodiversity Act (2017): Regulates biodiversity conservation and sustainable use of its resources and the fair and equitable share of the benefits derived from their use.

Ecologically Critical Area Act (2016): Sets forth the activities that are permitted and banned in ecologically critical areas.⁷²

Environmental Impact Assessment regulations: Strengthening EIA system as environment management tool: Under ECA'95, EIA was accepted as a mandatory tool to identify and predict impacts and undertake proper mitigation measures. However most of the Ministries and agencies do not undertake this process. EIAs do not apply to humanitarian emergency interventions.

Bangladesh Environment, Forestry and Climate Change Country Investment Plan (2017)

⁷¹ Comparing the effectiveness of forest law enforcement and economic incentives to prevent illegal logging in Bangladesh (2015) S.A. MUKUL^{1,2}, J. HERBOHN^{1,3}, A.Z.M.M. RASHID⁴ and M.B. UDDIN⁴

⁷² For a list of ECAs see page 19

National Environment Management Action Plan (NEMAP) in 2005

Country Investment Plan (CIP) for Environment, Forestry and Climate Change sectors.⁷³

National Biodiversity Strategy and Action Plan (NBSAP)

Bangladesh Delta Plan 2100 (2017)

Bangladesh Climate Change Strategy and Action Plan (2009)

Bangladesh National Adaptation Programme of Action (2005; updated 2009)

Shelter and Settlements/construction sector including acts relating to commonly used shelter materials

Bangladesh National Building Code (2008): The major document regulating the technical aspects of construction in Bangladesh is the Bangladesh National Building Code (BNBC). The BNBC is developed to set minimum technical standards for all 'pucca' construction in Bangladesh; meaning all construction that makes use of materials of long durability such as concrete and brick. A large portion of the current rural housing stock is however 'kutcha' and 'semi-pucca' housing. Moreover, the BNBC doesn't particularly address post-disaster reconstruction in rural areas, in which a lot of use is made of local materials that are not considered 'pucca'. Still, for 'pucca' housing techniques and materials proposed in these Guidelines, adherence with the Bangladesh National Building Code is stressed. (rural building guidelines p11)

The Building Construction Act (1952)

The Town Improvement Act (1953)

Building Construction Rules (2008)

Land Development Rules for Private Housing (2004)

National Rural Development Policy (2001): centres on all activities of rural development with a view of alleviating poverty, improving quality of life of poor and economic development of landless and marginal farmers. The housing section of the policy aims primarily on resettlement of families who become landless, displaced or shelter-less due to natural disasters.

Brick Manufacture and Brick Kiln Installation Act (2013): to control activities relating to brick manufacturing and brick kiln establishment. The Act imposes prohibition on establishment of brick kilns within the boundaries of several areas including residential, preserved or commercial areas, City Corporation, Municipality or Upazila headquarters, public or privately owned forests, sanctuary, gardens or wetlands; agricultural land and Ecologically Critical Area (ECA) and adjacent areas. The law states that:

⁷³ The CIP provides a strategic investment framework for national and international investments for the development of those three sectors.

- No person can use soil as raw material in brick manufacturing after cutting or collecting it from agricultural land, hill or hillock.
- Brick manufacturers can only cut or collect soil from dead ponds, canal, swamp land, creek, deep tank, rivers, haor-baor, char land and fallow land with the approval of appropriate authorities.
- The law strictly prohibits the use of wood as fuel in brick kilns.
- Brick manufacturers can only use coal as fuel containing the prescribed standard of sulfur, ash, mercury or similar materials.

To date the government has not determined any standard or quality for coal. As a result Brick kilns across the country are illegally using firewood instead of coal. About 2 million tons of firewood are burned in the brick kilns per year, which facilitates deforestation and pollution. The Act is widely criticised for being ineffective and calls have been made to amend it to take into account the pollution, damage to agricultural land and other environmental threats caused by brick production.

Timber and illegal logging: There are laws and acts that ban illegal logging, including the Forest Policy⁷⁴ and the Forest Act⁷⁵ but they are rarely enforced and have not proved effective in controlling illegal logging. Under the Forest Act, illegal logging is treated as a forest offence, and is punishable by imprisonment for a term of between six months and five years, with additional fines.

Soil/sand and illegal extraction: Extracting sediments is regulated by law and the rule of Bangladesh Water Development Board (BWDB), which states that:⁷⁶

- sediments in rivers are legal public property (whether they are extracted or not)
- points of extracting must be in bars in the middle or at the inside of banks of rivers, otherwise in the middle part of riverbeds to smooth the water flow at the same time not to accelerate erosion;
- sediments extracted from a river have to remain piled at sites of 30m distance from the river
- those whose land is used for the site to pile sediments will be paid compensation.

To sell sand extracted by a company is therefore illegal, as it is legal public property and should remain piled 30m from the river. In reality, many companies and officials take advantage of the lack of information about the law. Often influential community members contribute to this problem by illegally privatizing sand in order to be able to profit from and sales. Administrators who want to stop this are often powerless in the face of politicians demands and elected public representatives

⁷⁴ Bangladesh Forest Policy of 1894 provided the main guidelines for the formulation of laws and regulations for managing forests.

⁷⁵ Forest Act 1927 that was formulated during the British colonial era, with subsequent amendments by the government being made in 1994 and 2000

⁷⁶ Sand Mining and Its Social Impacts on Local Society in Rural Bangladesh: A Case Study of a Village in Tangail District

are often not aware of the damage. DoE officials are said to have complained of a shortage of personnel in dealing with the issue.⁷⁷

Plastics: The Bangladesh Environment Conservation Act revised in 2002, contains a rule stating that a restriction has been imposed in the production and uses of polythene shopping bags. According to the rule, there is restriction on the production and sale of environmentally harmful products. If it is proven that any kind of plastic bags or products made of polyethylene or polypropylene is detrimental for the environment then the government could control/ ban the use of these products to any selected area or all over the country. The rule outlines penalties for production, import and marketing (10 year sentence, or 1 million taka fine, or both); for sale, exhibition for sale, store, distribution, transportation or use for commercial purpose (6 month sentence or 10 thousand taka fine, or both). In reality, Bangladesh is still struggling with enforcing the ban. GoB runs a number of mobile courts, which a few times per year set up at markets to target those breaking the ban by using plastic shopping bags. However enforcement has been lacking and only a small number of fines have been enforced since 2006.

Waste Management

There are national and local levels of legal framework in relation to solid waste management though there is no specific policy.

National Environmental Management Action Plan (NEMAP): has recommended actions in the areas of sanitation, solid waste management, water supply and environmental awareness etc. Based on the findings and recommendations of NEMAP, the government has taken up projects like community-based water supply and sanitation, community based solid waste management and community based wastewater treatment.

National Policy for Water Supply and Sanitation (1998): prepared by the Ministry of Local Government Rural Development & Cooperatives. Emphasis is given to participation of private sector and NGOs in water supply and sanitation in urban areas. The policy states that Local Government Bodies (City Corporations and municipalities) may transfer, where feasible, the collection, removal and management of solid waste to the private sector. It also states that measures should be taken to recycle waste as much as possible and promote use of organic waste materials for compost and biogas production. Private sector participation in sanitation is encouraged, including by NGOs. However the policy does not contain any waste to energy recovery targets, nor does it explain any recycling or reuse targets. There are no provisions for incentives for waste minimization.

⁷⁷ Sand Mining and Its Social Impacts on Local Society in Rural Bangladesh: A Case Study of a Village in Tangail District (2015) Shakil



Hazardous Wastes (Management and Handling) Rules (1989, amended 2003)⁷⁸

Recycling - at time of writing no legislation on recycling could be found.

International Policies and Conventions

Bangladesh is also signatory of various international conventions.

Ramsar Convention on Wetlands of International Importance Especially Waterfowl Habitat (2 February 1971), as amended. Provides the intergovernmental framework for international co-operation for the conservation and wise use of wetland habitat and species.

The Convention of Biological Diversity (1992): Requires each signatory nation to develop national strategies, plans or programmes for the conservation and sustainable use of biological diversity.

UN Framework Convention on Climate Change (UNFCCC): Signatory countries have to submit GHG emission inventory to UNFCCC with mitigation options to reduce emissions contributing to climate change.

The International Tropical Timber Agreement (Geneva, 18 November 1983): Promotes the management of tropical forests on a sustainable basis and provides a framework for co-operation between producing and consuming member states in the tropical timber industry.

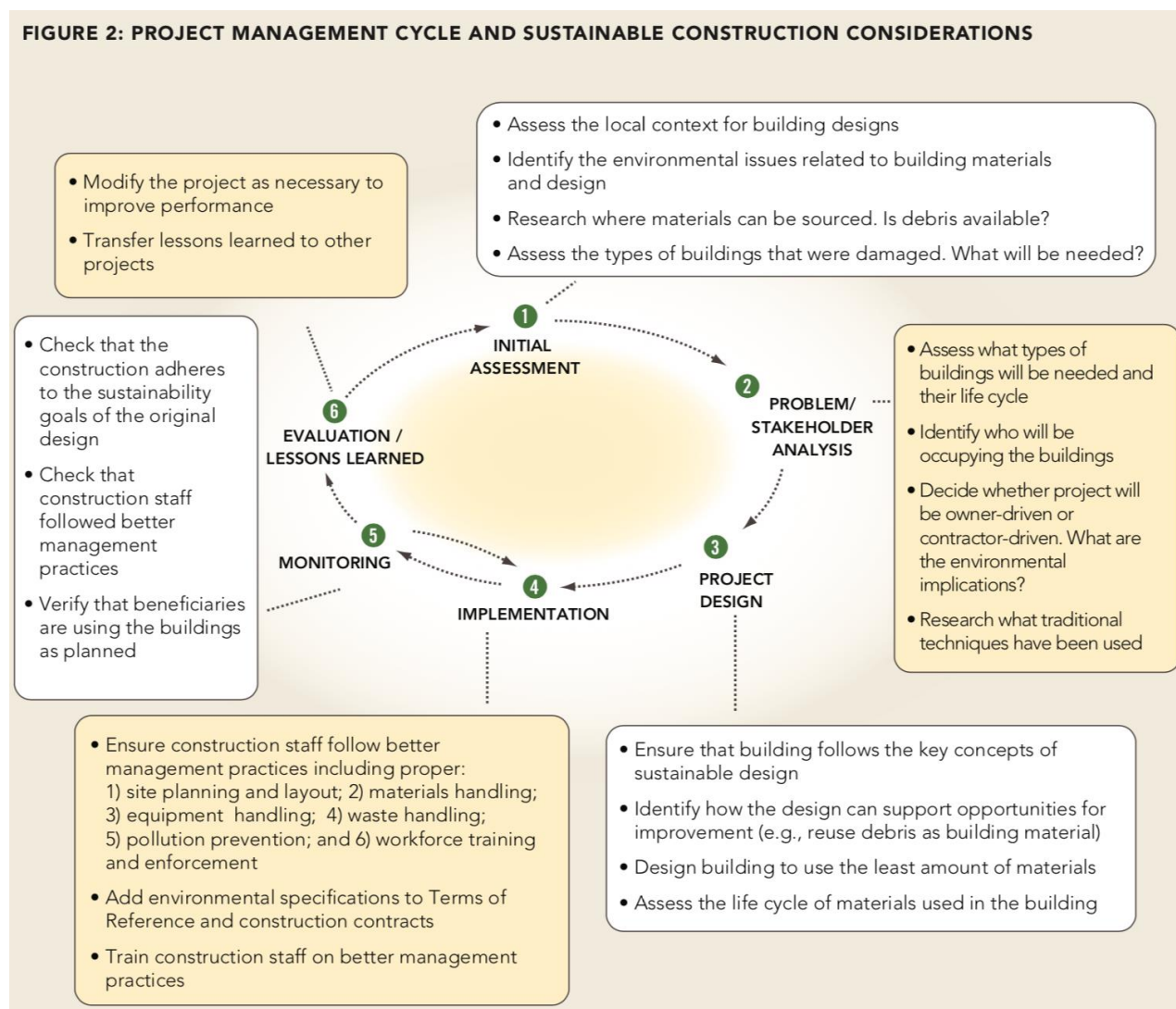
⁷⁸ <http://globalrec.org/wp-content/uploads/2014/03/Hazardous-Wastes-Management-and-Handling-Rules-1989.pdf>

2. Location And Settlement Intervention Planning

Many macro-level issues are very relevant to location and settlement planning and should equally be considered for this phase, in particular consideration of regulatory and social requirements and mitigation of risks from other hazards (see previous section).

Integration of environmental considerations into the project management cycle

Sustainable shelter considerations should be integrated into all phases of the project management cycle. Some illustrative actions for how to do this are presented in the diagram below, taken from the Green Recovery and Reconstruction Toolkit chapter “Green Guide to Construction”.



Key issues in Bangladesh of relevance to site selection and planning

A selection of issues that have been relevant to site selection in the past and should be considered are⁷⁹:

- Avoiding ecologically protected and ecologically critical areas (see page 19 for full list)
- Impact of pressure on natural resources already under strain and causing environmental and social impacts and conflict, including timber and sand.
- Access to a diverse range of natural resources for materials, to avoid pressure on one resource.
- Human wildlife conflict (for example in Cox's Bazar)
- Heavy metal / chemical contamination of site
- Tenure security and environmental protection links (see p 46)

Best practice on environmental sustainability mainstreaming in location and settlement intervention planning include:

- a. **Carry out a shelter rapid environmental impact assessment** to assess shelter-related environmental impacts and identify practical local actions to address these impacts. Two tool options are:
 - i. [Shelter Cluster Checklist](#): Designed for emergency shelter project managers to quickly assess shelter-related environmental impacts and identify practical actions to address these impacts.
 - ii. [NEAT+](#) The Nexus Environmental Assessment tool has a Shelter module and can be used for a rapid environmental screening while designing shelter and settlements programmes. The tool highlights key areas of environmental concern to consider when designing and implementing the project, and is the first step towards a mitigation plan. It is done in Kobo Toolbox or Excel and produces an automatically generated report.
- b. **Carefully select the construction site** and if:
 - i. **The site has been used for industrial or commercial purposes** in the past: if so, verify that there are no toxic materials present in the ground or water
 - ii. **The site is prone to other hazards** such as flooding, landslides
 - iii. **The site has easy access to roads and public transportation** - this will reduce the pressure on local extraction of natural resources
 - iv. **There is risk of human /wildlife conflict**, as seen with elephants in Cox's Bazar. Work with environmental organisations and the Ministry of Environment to mitigate risks.

⁷⁹ This list is not exhaustive and must be contextualised to the specific emergency response operation.

- c. **Avoid using previously unsettled areas** as this will likely increase negative environmental impacts. Clearing and site preparation can lead to loss of biodiversity and land/soil degradation. Siting decisions can influence future interactions with the nearby natural environment, typically through encroachment leading to concerns such as land clearing for agriculture/livestock, deforestation or human/wildlife conflict.
- d. **Assess access to cooking fuel and type of cooking fuel:** are cooking fuels used by the affected population available at the site without requiring unsustainable harvesting of local natural resources? Identify the cooking fuels to be used at the site and plan for adequate supplies which do not overtax local resources. Assess the pressures that additional harvesting of natural resources will have on the environment and social conflict. Indiscriminate biomass harvesting, either by the users or local vendors, can lead to deforestation and environmental degradation.
- e. **Consider land tenure:** Tenure security provides certainty and protection from eviction, encouraging long-term consideration for the local environment and thus improving the likelihood of sustainable behavior by future inhabitants.
- f. **Investigate access to the disaster affected area:** Access routes can lead to increased development and activity, however improved accessibility to natural resources can lead to increased and potentially unsustainable rates of extraction.
- g. **Consult the community** who can provide local knowledge of key environmental concerns, potential hazards and natural resource availability in the area. Effective engagement with existing local communities can also minimize the likelihood of future social conflict.
- h. **Incorporate the provision of fuel efficient stoves** and training in their use into site management plans.
- i. **Protect, restore and improve the ecological value** of operational sites such as temporary settlements during and after use⁸⁰.
 - i. Assess environmental baseline conditions and available local natural resources for each site and identify environmental hazards, including those due to previous commercial or industrial use.
 - ii. Remove immediate and obvious hazards from the area and repair any serious environmental degradation, while keeping the removal of natural vegetation and the disruption of natural drainage at a minimum.
 - iii. Leave the site in a state that will allow the local population to use it immediately, where possible in better condition than before.

Utilizing GIS Data for Enhanced Humanitarian Shelter Programming

⁸⁰ Sphere environmental sustainability standard 7, Shelter and Settlements Chapter

Geographic Information Systems (GIS) data is an incredibly powerful resource for disaster response and planning, and one that is often underutilized by humanitarian shelter practitioners. This data is widely available, and most often free and open source. Users can download geospatial data and input it into GIS software for quick analyses or planning purposes, or have the option to view and analyze spatial data through the increasingly common online mapping platforms. Below are some resources for obtaining and using spatial data:

Data

- The Humanitarian Data Exchange (HDX): Humanitarian GIS data downloads, including at the country level. Includes socioeconomic data, <https://data.humdata.org/>
- Protected Planet: Can be used to find and download GIS layers of protected areas anywhere in the world, <https://www.protectedplanet.net/>
- DIVA-GIS: Repository for countless GIS datasets, including administrative boundaries and water network layers, <http://www.diva-gis.org/gdata>
- IUCN Red List of Threatened Species: Downloadable spatial data of threatened species locations, <https://www.iucnredlist.org/resources/spatial-data-download>
- Free GIS Data: Includes thorough list of resources for many types of data, particularly physical and environmental data, <http://freegisdata.rtwilson.com/#home>
- US Government data: Can be used to search by location and includes elevation and resource extraction datasets, etc., at the global level, <https://catalog.data.gov/dataset>
- UMD Global Forest Change 2000-2016: Downloadable grid data (.tif format) on forest change globally. Requires some remote sensing or image processing knowledge. Can be viewed in QGIS interface, http://earthenginepartners.appspot.com/science-2013-global-forest/download_v1.4.html

Software

- QGIS: Free, downloadable GIS software
Desktop version: <https://www.qgis.org/en/site/> Web-based version: <https://qgiscloud.com/>

Online platforms

- MapX: Cloud-based global geospatial mapping with numerous layers, such as satellite imagery, precipitation, mining activities, and pollution, <https://www.mapx.org/>
- Global Forest Watch: Global deforestation layers of forest loss, gain, and change, as well as land use and conservation layers, <https://www.globalforestwatch.org/map/>
- One Geology Portal: Platform to display global geologic and mineral maps
<http://portal.onegeology.org/OnegeologyGlobal/>

In order to utilize this data however, it is important to understand how it can be used to assist with shelter programming. Below are some ways in which GIS data can be used for decision making and

planning of shelters and settlements, particularly with regards to environmental concerns in the area:

- To assess the environmental conditions of current settlements
- Displaying layers of socioeconomic data at a district or regional level to better understand the social climate of the area of interest
- Understanding natural resource availability and scarcity, including mining and extraction activities
- To aid in establishing new settlements at a distance from potential environmental threats
- Knowing where protected areas and ecologically critical areas (and habitat and species) are located to minimise impact on these areas

For example for settlement planning, a user could add the coordinates of a potential settlement, overlay it with various environmental layers, and use the results to determine if it is an appropriate location. They could also quickly assess multiple site locations and choose the best option. For example, they could see if the proposed settlement intersects with any threats, such as erosion, unstable ground, or flood areas, or can determine if the site is too close in proximity to these or other threats. With GIS, you can measure the actual distance to threats/areas of concern using accurate measuring tools. Elevation datasets can also aid in determining the best location for a site. Other GIS layers such as administrative boundaries, roads, population density, land cover/land use, infrastructure, precipitation, climate, hospitals/health facilities, airports, etc. can all be incredibly helpful for planning. For shelter construction purposes, GIS data can be used to understand what natural resources and building materials are locally available, the level of abundance, and if those resources are threatened and should be conserved. However all of this is dependent on data availability for the region of interest, and data richness can vary greatly from country to country.

Security of tenure

For an overview of tenure security issues in Bangladesh see:

- [Bangladesh Housing, Land and Property Profile](#) (2018) (IFCR, Australian Red Cross, Allens Lawyers)
- [Bangladesh Shelter response profile: Local Building Cultures for Sustainable and Resilient Habitats](#), page 16

Sphere definition: “Security of tenure means that people can live in their homes without fear of forced eviction, whether in communal settlement situations, informal settlements, host communities or after return. It is the foundation of the right to adequate housing and many other human rights. In the humanitarian context, an incremental – or step by step – approach may be the most appropriate. This recognises that displaced people can be supported to improve their living conditions in different types of accommodation. It does not mean prioritising owners for assistance,

nor does it necessarily convey permanence or ownership. Shelter actors have been developing an understanding of what is “secure enough” for the purposes of designing shelter options that support the most vulnerable and tenure insecure.”

In Bangladesh many people do not possess their own land. This discourages them from investing in housing. In normal circumstances, rural people employ local carpenters and masons to build their houses.⁸¹ Evictions and transient, moving populations are common. Many of the reasons behind this lack of tenure security are environmental.

Links between security of tenure and environment in Bangladesh

The links are two-fold:

1. *Tenure security provides certainty and protection from eviction, encouraging long-term consideration for the local environment* and thus improving the likelihood of sustainable behavior by future inhabitants. Transient or moving populations and those at risk of eviction are less likely to protect the local environment.
2. *Lack of tenure security is linked to underlying environmental issues.* In the case of Bangladesh, the most vulnerable populations are often regularly displaced by hazards such as flooding and cyclones. They are also increasingly displaced due to land erosion/loss issues from over extraction of sand in rivers and deforestation. This is in part due to the pressures of rapid urbanisation.

Evictions are most common in Dhaka where each year hundreds and thousands of slum dwellers, who have no formal or legal ownership of the land where they lived for years, face forced displacement from their homes. There have been cases in Bangladesh where regulations on settlement aimed at protecting public health and safety or the environment have been misused to justify eviction in the absence of genuine risk, or when other options are available. This is contrary to international human rights law. **Resettlement** may be consistent with human rights law to protect the health and safety of inhabitants exposed to natural disasters, environmental hazards or to preserve critical environmental resources in genuine cases.

Displacement in Bangladesh is caused by a number of issues, including the environment related issues. Those who live on Bangladesh’s river islands, or chars, are especially at risk. Located within some of the world’s most powerful river systems, chars can be formed or completely eroded over weeks or even days. The population of these islands exceeds four million. Main environmental causes of displacement in Bangladesh are:

⁸¹ Planning and Implementation of Post-Sidr Housing Recovery: Practice, Lessons and Future Implications (2014), p. 13

- **Climate change:** It has been estimated that by 2050, one in every seven people in Bangladesh will be displaced by climate change. Up to 18 million people may have to move because of sea level rise alone.⁸²
- **Riverbank erosion** is the primary cause of climate displacement inland. Up to 50% of those now living in Bangladesh's urban slums may be there because they were forced to flee their rural homes as a result of riverbank erosion from sand mining and deforestation.
- **Salinisation:** this process has been exacerbated by rising sea levels. Coastal drinking water supplies have been contaminated with salt
- **River flooding** is also a cause of displacement inland, and is likely to become more significant with climate change, as rainfall increases and becomes more erratic, and the melting Himalayan glaciers alter river flows.
- **Drought:** a lesser current cause of displacement, but one that will rise with climate change. As rainfall patterns change, north-western regions are at risk of drought, which drives people away through destruction of crops and disruption of livelihoods.
- **Landslides:** not currently a primary cause of displacement, but predicted to become more severe and frequent as a result of climate change. Induced by rainfall, they affect the hilly north-eastern and south-eastern regions of Bangladesh and can cause displacement by destroying homes and property, and disrupting agriculture.

Environmental Impact Assessment and Shelter and Settlements planning

Environmental impact assessment and management should inform site selection and be integrated into shelter and settlement planning.⁸³ For example, locating settlements close to existing infrastructure can reduce the environmental impacts associated with building new infrastructure. Environmental impacts of the crisis and environmental risks and vulnerabilities should be assessed to minimise negative effects of the shelter and settlement options.

Questions can be integrated into a broader shelter assessment, or specific environmental assessment/screenings can be carried out for more detailed information.

Questions to include in assessments⁸⁴

1. What are the environmental concerns regarding the local sourcing of construction materials?⁸⁵

⁸² <https://ejfoundation.org/reports/climate-displacement-in-bangladesh>

⁸³ Sphere Environmental sustainability standard

⁸⁴ Taken from Sphere Shelter chapter assessment questions

⁸⁵ *ibid*

2. What are the environmental concerns regarding the needs of the displaced people for fuel, sanitation, waste disposal and grazing for animals, among others?⁸⁶
3. What initial shelter solutions or materials have the affected people, affected populations or other actors provided?
4. What existing materials can be salvaged from the damaged site for use in the reconstruction of shelters?
5. What are the typical building practices of the affected people and what materials do they use for the structural frame, roof and external wall enclosures?
6. What alternative design or materials solutions are potentially available and familiar or acceptable to the affected people?
7. What design features will ensure safe and ready access to and use of shelter solutions by all affected people?
8. How can the identified shelter solutions minimise future risks and vulnerabilities?
9. What are the opportunities and constraints (in particular environmental concerns) of sourcing adequate supplies of fuel for the crisis-affected and neighbouring populations?

Environmental impact assessment assess shelter-related environmental impacts and identify practical local actions to address these impacts and consist of three elements: a baseline description of the local environment, against which the assessment is occurring; an understanding of the proposed activity and its potential threat to the environment; and an understanding of the consequences if the threat occurs. A range of tools exist that can be used for environmental assessments.

- [Shelter Cluster Checklist](#): Designed for emergency shelter project managers to quickly assess shelter-related environmental impacts and identify practical actions to address these impacts.
- [NEAT+](#) The Nexus Environmental Assessment tool is designed for rapid environmental screening of area before longer term intervention designed. The NEAT+ has a Shelter module and can be used for a rapid environmental screening while designing shelter and settlements programmes. The tool highlights key areas of environmental concern to consider when designing and implementing the project, and is the first step towards a mitigation plan. It is done in Kobo Toolbox or Excel and produces an automatically generated report.
- [Rapid Environmental Impact Assessment](#): A tool to define and prioritize potential environmental impacts in disaster situations. Looks at the overall disaster context, not only shelter and settlements work or one project area.
- [Quantifying Sustainability in the Aftermath of Natural Disasters \(QSAND\)](#) is a self-assessment tool to promote and inform sustainable approaches to relief, recovery and

⁸⁶ ibid

reconstruction after a natural disaster. This tool is more targeted for longer term shelter interventions and takes a broader vision of sustainability.

It may be helpful to consult with environmental agencies as part of this process. See page 32 onwards for list of agencies and their remits.

Key points to consider in an environmental impact assessment include⁸⁷:

- pre-crisis access to and use of local natural resources, including fuel and construction materials, water sourcing and waste management
- the extent of locally available natural resources and the impact of the crisis on these assets
- social, economic and cultural issues (including gender roles) that may influence the sustainability of the response and improve its overall effectiveness and efficiency.

Whatever the form of assessment conducted, use the results to work with stakeholders to identify the most relevant and low environmental impact assistance options.

Debris and waste management⁸⁸

For the legal framework for solid waste management see page XXX.

The main issues of solid waste management in the urban areas of Bangladesh are:

- Absence of national policy to encourage recycling
- Lack of proper handling rules and standards
- Lack of funding and inefficient tax collection
- Inefficient waste collection methods
- Shortage of appropriate sites for solid waste disposal
- Lack of awareness about environmental problems associated with solid wastes
- Lack of partnership between public sector, private sector and community groups

Points to consider:

- Manage solid waste in a safe, timely, culturally sensitive and environmentally sustainable way in all settlements
- Debris removal: Initiate debris management immediately after the crisis. Debris can be reused, recycled or identified for separation, collection and/or treatment. It may provide opportunities for cash-for-work programmes. Key issues include the presence of human bodies, structurally dangerous locations and hazardous materials. Removal of debris may

⁸⁷ Sphere Shelter and Settlement Standard 7

⁸⁸ Sphere Shelter and Settlement Standard 7

require specialised expertise and equipment, so must be planned with other sector specialists.

- Coordinate with WASH, health, public works and other authorities, the private sector and other stakeholders to establish or reestablish sustainable waste management practices.
- Debris management planning immediately after the crisis promotes the salvaging of debris for reuse, repurposing or safe disposal.
- There is potential to reuse or repurpose solid waste found in humanitarian settings. Reuse of materials in humanitarian settings as part of a more systematic solid waste management strategy depends on cultural attitudes to the handling of waste, and the proximity of businesses willing to purchase the separated materials. Humanitarian settings provide opportunities for inventive reuse of materials

Access to and management of fuel and natural resources


Where there are limited natural resources to support a substantial increase in human habitation, a resource management plan is essential. The resource management plan may suggest external fuel supplies and options for livelihoods and shelter activities that depend on natural resources. Large, well-managed settlements may be more environmentally sustainable than numerous smaller, dispersed settlements that are not as easy to manage or monitor. However, large communal settlements may put more pressure on nearby host communities than smaller, dispersed settlements, as is seen in the Rohingya Crisis in Cox's Bazar. Shelter actors should always consider the impact of their interventions on the host population's needs for natural resources.

Rural populations in Bangladesh are generally more dependent on natural resources in their immediate surroundings, compared with urban dwellers. However, urban areas absorb large quantities of natural resources such as timber, sand and cement, bricks and other natural building materials, coming from a much larger catchment area. Informed decisions should be taken when using large quantities of construction materials in urban or other large-scale shelter programmes, where environmental impacts may go far beyond the programme implementation area.

Refer to the list of key environmental issues in Bangladesh (p. 21) and building materials guide and use (p. 53) when planning settlements and shelter interventions.

Site decommissioning

- Think about decommissioning during the planning process. Sites should have a decommissioning plan, ideally developed at the design stage of the intervention
- Appropriate environmental rehabilitation measures can enhance the natural regeneration of the environment in and around temporary settlements.

- 
- Teaching local populations sustainable land management techniques ensures the recovery of the site and the local environment. Use local labour in clearing and decommissioning activities where possible.⁸⁹

⁸⁹ Sphere Shelter and Settlement Standard 7

3. Shelter Design

BOX OUT: *Sphere Shelter and Settlements environmental sustainability standard*

Select the most sustainable materials and techniques among the viable options.

- Prefer those that do not deplete local natural resources or contribute to long-term environmental damage.
- Salvage and reuse, recycle or repurpose available materials including debris.

Building practices/reconstruction practices overview

The following are the current types of houses⁹⁰ and building materials used across Bangladesh:

1. **Jhuprie:** shacks made from branches, bags, tarpaulin, jute etc.
2. **Kutchha:** made of mud, bamboo, wood and corrugated iron sheets (CGI) as roofs.
3. **Semi-pucca:** walls are made partially of bricks, floors are made from cement, and roofs from corrugated iron sheets.
4. **Pucca:** walls made of bricks and roofs of concrete.

Over the last two decades a considerable change has come about in housing patterns in Bangladesh. While primary and natural materials such as bamboo, wood, mud, and clay tiles are still widely used in house construction, corrugated galvanized iron (CGI) sheets have gained popularity as roofing and wall material. In addition, there has been an increase in the number of *pucca* houses as a result of growing formal wage employment and inflow of overseas workers' remittances. Since 2000 the proportion of houses with concrete or CGI sheets increased twofold. A review of Census data from coastal areas indicates that nearly all families with an annual income level of US\$ 470 live in *pucca* houses.⁹¹

For a full profile of building practices by district in Bangladesh, see [Bangladesh Shelter response profile](#): Local Building Cultures for Sustainable and Resilient Habitats pp. 28-37.

Future housing predictions:⁹²

An analysis of the 2001 Bangladesh Census indicates that households increasingly move to *pucca* houses as their incomes rise. It is predicted that by 2050, rising income levels will enable

⁹⁰ [Bangladesh Shelter response profile](#): Local Building Cultures for Sustainable and Resilient Habitats p12

⁹¹ Planning and Implementation of Post-Sidr Housing Recovery: Practice, Lessons and Future Implications (2014), p. 11

⁹² Planning and Implementation of Post-Sidr Housing Recovery: Practice, Lessons and Future Implications (2014), p. 13

approximately 98 percent of households to afford a *pucca* house. Therefore it is predicted that the demand for bricks and concrete will increase dramatically. This will exacerbate the deforestation issue (wood/charcoal as fuel for burnt bricks) and river bank erosion and sand mining impacts that are already displacing rural communities to city slums at rapid rates.

Building Materials

Project Cycle and Materials >>

Material related decisions in a construction project are not all made at one time. Different issues on material selection, sourcing, procurement, storage, use and disposal emerge at different stages of the project cycle. Figure 1 gives the typical building material related decisions you have to make and sustainability tips at different stages of the project cycle.

For example, materials that can substantially impact the cost of construction and project management have to be selected very early at the inception stage even before the detailed designs are done – e.g. bricks versus rammed earth walls. More detailed issues, such as using water-based paints instead of solvent-based paints, can be addressed later in the design stage or construction stage. Disposal of waste material is an issue that arises in the construction stage, but reuse or disposal methods and disposal sites should be identified well ahead of commencing construction.



Source: WWF Green Building Materials Guide

Most common building materials

Earth and sand continue to be the most used flooring materials, followed by cement. Tin is the most common material in roofs with a huge difference with the second one (cement). Tin, cement and

Percent distribution of households by housing characteristics, according to residence, Bangladesh 2014

Housing characteristics	Residence		Total
	Urban	Rural	
Flooring material¹			
Earth, sand	32.5	81.5	67.8
Wood planks	0.4	0.2	0.2
Ceramic tiles	5.6	0.3	1.8
Cement	61.0	17.7	29.8
Roof materials			
Natural roof	0.2	1.7	1.3
Palm/bamboo	0.1	0.1	0.1
Wood plank/card board	0.1	0.0	0.0
Tin	70.0	90.8	85.0
Wood	0.2	0.2	0.2
Ceramic tiles	0.5	0.1	0.2
Cement	28.4	5.3	11.8
Roofing shingles	0.3	1.5	1.1
Other	0.1	0.3	0.2
Wall materials			
Jute stick/palm trunk	0.8	2.9	2.3
Mud/dirt	4.4	14.5	11.7
Bamboo with mud	4.5	8.9	7.7
Tin	30.2	48.3	43.3
Cement	52.6	15.9	26.2
Stone with lime/cement	1.6	0.5	0.8
Bricks	4.9	7.0	6.4
Wood planks	0.6	1.1	1.0

¹“Other” flooring material is a combination of palm, bamboo, parquet, polished wood, and carpet

Housing materials in 2014 (© NIPORT et al.)

earth are the most used materials for building walls. This data may have altered due to the influx of refugees and of the associated demand for materials.

Source: [Bangladesh Shelter Response Profile on local building cultures](#)

Social & Environmental Implications Of Commonly Used Cover and Supporting Materials

This table summarizes the social and environmental implications of the most commonly used building materials in Bangladesh.

Much of the content is adapted from the [Environmental Guide To Selection Of Common Building Materials](#) (2016) and contextualized for Bangladesh. For more detail on other materials not listed here, please see the full guide, a robust and exhaustive list of building materials. For references to key government actors and legal frameworks see p. 31 onwards.

Material	Social and environmental impacts	Social & environmental benefits	Better practices and opportunities
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<p>TIMBER</p> <p>Key facts</p> <p>Major deforestation issue from timber extraction, often illegal⁹³</p> <p>Main use</p> <p>Fuel and construction.</p> <p>Key Govt. actors</p> <p>Forest department</p> <p>Bangladesh Forest Industries Development Corporation</p> <p>Bangladesh Forest Research Institute</p> <p>Related laws/legal framework</p> <p>Forest Act</p> <p>Forest Policy</p> <p>The International Tropical Timber Agreement (1983)</p>	<ul style="list-style-type: none"> • Extraction can cause forest destruction, landslides, land degradation, and habitat destruction and can increase flood risk. • Disasters have an impact on demand for timber for shelter and fuel and can disrupt government forestry programmes (seen in Cox's Bazar in 2017/2018). • Transport of logs can further damage forests and rural roads. • Where processing takes place in timber mills, poorly managed mills cause solid-waste pollution and noise and air pollution. • Requires treatment for pest control. Using toxic chemicals for treatment causes environmental and health hazards. • Attempts to control illegal logging have been known to cause conflicts with local forest communities. • In protected areas such as the Sal forests, gangs are reported to illegally fell trees at great profit, while influential locals are also violating the law to collect firewood. 	<ul style="list-style-type: none"> • A renewable resource, if well managed • Community forestry projects can reduce human/wildlife conflict and provide sustainable livelihoods for neighbouring communities 	<ul style="list-style-type: none"> • Do not over design/over specify— where possible, conduct proper structural design for timber buildings and calculate the timber need accordingly • Minimize cutoffs • Treat timber properly for long-term durability • Minimize the use of timber for formwork and use reusable modular formwork instead • Encourage timber reuse (e.g., door and window frames, roof members). • Timber fallen as a result of a cyclone should be used as a priority to support rapid shelter construction. NB. The lifetime of this timber may not be as long as properly dried and treated timber. • Never dispose of timber in streams, wetlands, or coastal areas. • Chemically treated timber cutoffs should be considered a hazardous material; never use as firewood
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⁹³ See p. 21 for more information on deforestation

<p>BAMBOO</p> <p>Key facts</p> <p>Most bamboo is grown in the Chittagong hill area. The massive scale of the Rohingya crisis and proximity to this area is putting strain on local supplies.</p> <p>Main Use</p> <p>Emergency and temporary construction</p> <p>Key Govt. actors</p> <p>Forest department</p> <p>Bangladesh Forest Industries Development Corporation</p> <p>Bangladesh Forest Research Institute</p> <p>Related laws /legal frameworks</p> <p>Forest Act</p> <p>Forest Policy</p>	<ul style="list-style-type: none"> • The importance of bamboo as a local community resource makes it essential to consider the effect of large scale procurement on regional bamboo stocks and set in place systems that ameliorate potential negative impacts. The voice of the community is important at all stages of procurement of bamboo and bamboo products • Overharvesting means that greener bamboo is being used that it does not meet the quality standard of dryness to extend its longevity (this is currently happening in the Rohingya crisis) • Poor practices, as are prone to occur after a major disaster, can devastate crop output for many years or in some cases permanently. • Given its invasive nature, bamboo can quickly take over nearby forests 	<ul style="list-style-type: none"> • The high strength, low cost, rapid growth and high availability of bamboo makes this an ideal resource • Replenishes rapidly and over-extraction can usually be managed, with the exception of massive pressure put on local supplies as in Cox's Bazar by the Rohingya crisis • Good crop management practices can increase bamboo crop yields by up to 400% • Minimal impact on natural forests • Bamboo harvested during the monsoon season will be of better quality for construction (due to its dryness and resistance to insects). 	<ul style="list-style-type: none"> • Encourage reuse (e.g., door and window frames, roof members). • Never dispose of chemically treated bamboo in streams, wetlands, or coastal areas. • Chemically treated cutoffs should be considered a hazardous material • Never use as firewood. • Bamboo harvested during the monsoon season will be of better quality for construction (due to its dryness and resistance to insects). The construction season is during the “dry season”—from October to March-April—depending of the start of the pre-monsoon and hurricanes seasons. Because of the higher demand during the construction season, and the potential surge of demand after hurricanes, bamboo and timber prices tend to increase⁹⁴
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⁹⁴ Martin, W, Strategic Recommendations For Shelter Upgrade In Response To The Rohingya Humanitarian Crisis, Findings And Results Of The Emergency Market Mapping Analysis (Emma) On Bamboo And Timber Market Chains In Cox's Bazar District, Bangladesh, December 2017, P11

<p>CONCRETE</p> <p>Key facts</p> <p>Massive spike in demand across Bangladesh due to rapid urbanisation & industrialisation in rural areas</p> <p>Main use</p> <p>Construction</p> <p>Slabs for pucca houses</p> <p>Key Govt. actors</p> <p>Bangladesh Water Development Board (BWBD) - regulates extraction of sediments</p> <p>Related laws / legal frameworks</p> <p>Land Ministry (for sand issues)</p>	<ul style="list-style-type: none"> • Requires cement, quarried and mined material (e.g., sand, rock chips, and gravel). These are often <i>unsustainably sourced/extracted</i> and have environmental consequences in Bangladesh. E.g. river sand or river gravel extraction contribute to river bank erosion, loss of adjacent land, destruction of riverine habitats and displacement • Often <i>illegally extracted</i>. E.g., sediments in rivers cannot be extracted and sold by private companies though this is commonplace • The use of concrete in structural elements is challenging: scarcity of good quality aggregates, lack of knowledge and skills to produce good concrete, salinity in coastal areas generating corrosion • Materials to make concrete such as river sand are often unethical and controlled by the “sand mafia” of influential local residents and the most vulnerable subject to coercion/extortion • Components to produce quality concrete not easily available. Non-saline water free from organic materials difficult to source. Aggregates (gravel) scarce in Bangladesh and often burnt brick chips are used, affecting structural performance. • Extraction of rock from quarries involves blasting. Quarries cause noise, dust, air pollution, habitat destruction and vibration if not properly managed. Unplanned rock quarrying can cause landslides and hydrogeological impacts. • Cox’s Bazar is seeing massive amounts of river dredging for 	<ul style="list-style-type: none"> • More resilient to cyclones • No firewood demand • Minimal air pollution 	<ul style="list-style-type: none"> • Use alternatives to concrete/ mortar, e.g., stabilized earth walls • Use premixed concrete instead of in-situ mixing • Use prefabricated concrete items • Never dispose of concrete in the environment. It can be: <ul style="list-style-type: none"> ○ reused on-site/off-site for construction purposes (e.g., filling), ○ safely transported to a construction material recycling facility, ○ safely transported to a sanitary landfill
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	<p>sand to make concrete. This has a big impact on rivers and stirs up sediment.</p>		
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<p>CGI SHEETS</p> <p>Key facts</p> <p>Increasingly used as roofing and as wall elements since the late 1950s.</p> <p>Usually imported</p> <p>Main use:</p> <p>Roofing and walling</p>	<ul style="list-style-type: none"> • Manufacturing process requires large quantities of steel, zinc and other metals. May contribute to mining impacts. • Transport can damage rural roads. • Manufacturing takes place in large scale factories using energy intensive processes. Factories can cause severe air and water pollution, if poorly managed. Manufacturing processes may release toxic heavy metals. • Dangerous in cyclones • Causes discomfort and health issues • Too costly for most of the rural poor • Lower quality sheets which are affordable to low-income groups corrode and rust rapidly. This deterioration increases thermal comfort and safety issues, and can be demoralising for the owners 	<ul style="list-style-type: none"> • No environmental benefits • CGI sheeting is a valuable material and can be useful if the householder needs to raise funds, for example during or post-disaster (provided they are not deteriorated due to the way they are used or fixed). 	<ul style="list-style-type: none"> • Use optimum design calculations to minimize cut wastes • Use certified products and avoid using in corrosive environments • Avoid contact with ground or high levels of moisture if using for wall panels • Encourage reuse of uncorroded sheets from old buildings • Never dispose of CGI in the environment; it can be easily sold as scrap metal.
<p>BURNT BRICKS</p> <p>Key facts</p> <p>Often the worst choice, environmentally</p> <p>Main use</p> <p>Building construction</p> <p>Roads⁹⁵</p> <p>Key Govt. actors</p> <p>Housing and Building Research</p>	<ul style="list-style-type: none"> • Brick firing is an energy-intensive process. The brick industry is therefore one of the largest consumers of coal and therefore also a significant air polluter. Air pollution and the use of good quality agricultural soil are the major environmental concerns related to the use of bricks. Brick kilns may emit toxic fumes (suspended particulate matter, carbon monoxides, and oxides of sulphur—SO_x) that are harmful to eyes, lungs, and throat. • Meeting Bangladesh's current brick demand requires excavating 60 million tonnes of topsoil, causing dust pollution and degrading land. Brick kilns also 	<ul style="list-style-type: none"> • None 	<ul style="list-style-type: none"> • Produce bricks on-site (e.g., stabilized earth blocks) • Encourage reuse of bricks from demolished buildings • Use standardized, quality controlled bricks for construction • Reduce wastage by accurately estimating brick requirement • Use standard lengths and optimal wall thicknesses in design to minimize brick waste • Never dispose of bricks/blocks in streams, wetlands, coastal areas or agricultural lands.

⁹⁵ Currently being used in Cox's Bazar in the Rohingya crisis

<p>Institute, of the Housing and Public Works Ministry</p> <p>Related laws / legal frameworks</p> <p>Brick Manufacture and Brick Kiln Installation Act (2013)</p>	<p>consume 5 million tonnes of coal and 3 million tonnes of wood annually, in the process emitting 15 million tonnes of carbon.⁹⁶</p>		<ul style="list-style-type: none"> • Produce bricks that do not require firing. • The Housing and Building Research Institute (HBRI) has invented a new type of brick that is portable and cost effective. The bricks are made of a river mud composite and cement. The bricks do not require firing in a kiln, but harden in the sun. HBRI has also invented specialised floor, roof and wall materials.⁹⁷ Care should be taken on extraction of mud/sand to make these bricks.
<p>THATCHING and GRASSES</p> <p>Key facts</p> <p>Grasses increasingly used for DRR and hill protection. (different types than used for thatch)</p> <p>Main use</p> <p>Roofing, insulation, traditional craft</p>	<ul style="list-style-type: none"> • Natural or farmed vegetation (e.g., palm leaves, reed, grasses) is used in harvesting. Without proper management, it may have impacts on forests, natural vegetation exacerbate erosion. • Households or small-scale industries process material. Material needs seasoning and may cause water pollution if not properly managed • Thatch may be eaten out by termites, and it may provide a nesting ground for various types of harmful insects and serve as a daytime hiding space for mosquitos. 	<ul style="list-style-type: none"> • No requirement for quarried material or clay • No firewood or energy requirement • Can support indigenous livelihoods and knowledge • Does not harm the environment since it is biodegradable. 	<ul style="list-style-type: none"> • Use local knowledge where possible • Use basic building designs • Support local livelihoods and industries • Consider fire risk in planning and design since thatch is combustible • Planting grasses can be effective for slope protection, taking up heavy metals and removing salinity.

⁹⁶ <https://www.reuters.com/article/us-bangladesh-construction-climatechange/to-cut-brick-kiln-pollution-bangladesh-constructs-new-building-materials-idUSKBN1D81IA>

⁹⁷ <http://en.prothomalo.com/bangladesh/news/159175/Bangladesh-makes-eco-friendly-building-materials>

<p>PLASTIC⁹⁸</p> <p>Key facts</p> <p>Plastic bags are banned</p> <p>Main use</p> <p>Tarpaulins for emergency shelter</p> <p>Related laws / legal frameworks</p> <p>Plastic bag ban in Bangladesh Environment Conservation Act, Rule 6ka of Clause-5 under Section-9</p>	<ul style="list-style-type: none"> • Plastic is considered one of the least environmentally friendly materials but plastic tarpaulin sheets are commonly used in response and can have social value when reused • Chemically processing plastic sheets to recover materials is not usually practicable and depends on the capacity of the local recycling industry • The technical complexity of incineration means it is not possible using less than industrial standard incinerators and not likely in a camp setting due to space, safety, air pollution and other concerns. • There are no specific incineration laws or requirements in Bangladesh. A public awareness campaign is also recommended to ensure that the reasons and safety of the incineration process are understood by those living near the incinerator site. • Burying plastic sheeting is not recommended as it may remain un-degraded for hundreds of years. (It requires sunlight to help it degrade). However, it is relatively inert and so is unlikely to cause contamination of the soil. If it must be buried, do this far away from any water sources. • Plastic bags are banned in Bangladesh⁹⁹, although the ban is rarely enforced. The ban does not apply to tarpaulins or to single use plastics used for wrapping tarpaulins (as is the case in other countries like Kenya). 	<ul style="list-style-type: none"> • Plastic sheeting has value to people and can be reused and recycled • It carries a high value even after its use as many of them can be cut into smaller pieces and be utilized for various household needs such as covering, flooring, etc. 	<ul style="list-style-type: none"> • Clean before re-use. Remove surface dirt and then wash in a 0.2% chlorine solution to disinfect. Ensure cleaning areas are established 50m from any water sources so that run off does not contaminate water sources • If an individual sheet cannot be repaired to make a useable size, then a patch-work sheet can be made for uses such as for sun shields, partitions, covers for barrels or vehicles. Sand bags could also be made from the sheet. • If entire sheets cannot be used, they can be cut into strips or shredded and can be used to make rope, weave baskets, bags, screens or fencing. • Shredding reduces the area of the sheets, which makes them easier to handle and transport. The same can be done with spare plastic bags, bottles, or containers. The shredded sheets can be used in cushions and mattresses, or it can be burnt as a fuel • Income generation: Payments can be provided to collect, clear and package plastic sheeting. Other income generating projects can include making small to large bags, barrel and other covers, sand bags, fences, partitions, screens and
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⁹⁸ [Recycling, Reuse and Disposal of Plastic Sheeting, Operational Guidance Note, Global Shelter Cluster 2018](#)

⁹⁹ See . 38

Age Group	Percentage
18-24	20%
25-34	25%
35-44	30%
45-54	25%

Additional information on specific materials

Wood/timber: The Forestry Department has begun local forestry programmes to involve local residents in managing forest resources sustainably, sharing revenues and reinvesting into the community forestry programme. Participants are usually the poor and vulnerable of the host population that are targeted to create an economic incentive to protect the national forest.

Disasters have an impact on the demand for timber for shelter and fuel and can disrupt these forestry programmes, such as was recently seen in Cox's Bazar. The high demand in particular for fuel wood from the refugee community has directly affected 1,500 local households participating in community forestry programs started in 2003. Because of the deforestation, participants of the community forestry program won't benefit from this critical source of income.¹⁰⁰

Bamboo: Bamboo is frequently used in construction. Borak is the type of bamboo most suitable for building structural elements. Other species are used for matting and wall cladding or to make furniture. Bamboo is vulnerable to attacks from insects such as borers and termites and to rot fungus, so treatment can be useful to improve durability more specifically when bamboo is to be exposed to damp conditions. Bamboo may be soaked in a body of water for weeks, soaked for months in mud or smoked on a fire. It can be treated with a natural Boron salt solution. Painting bamboo with bitumen is also a common practice. Fresh water is often used, which helps washing the bamboo of its sugars (that attract termites). In coastal areas seawater is used, which adds extra protection compared to a fresh water treatment (salt attacks termites by "pumping" their moisture as they have a very thin skin).¹⁰¹


A study was conducted in December 2017 on Bamboo and the Rohingya¹⁰² crisis as part of an emergency market mapping analysis. Some of the findings are specific to Cox's Bazar, but there are learnings relevant across the country. See [here](#) for more info.

The massive scale of the Rohingya crisis and demand for bamboo in Cox's Bazar has had a huge impact on national supply. Because the refugee camps are located near protected local forests, and the bamboo sourcing is concentrated almost exclusively in the Chittagong Hills Tracts, potential negative environmental impacts exist. The national production meets the national demand, as well as the potential demand surge from the Rohingya crisis and environmental impacts are more because of the increase in population taking over the forest areas, and given the growing need for forestry products. Although this new demand for Bamboo did not affect national production (theoretically, it only represents 3.16% of national production) nor the overall supply, it has had a significant impact on the local economy, and potentially the local eco-system. Therefore sourcing should be diversified to limit impact on the local environment.

¹⁰⁰ Martin, W, Strategic Recommendations For Shelter Upgrade In Response To The Rohingya Humanitarian Crisis, Findings And Results Of The Emergency Market Mapping Analysis (Emma) On Bamboo And Timber Market Chains In Cox's Bazar District, Bangladesh, December 2017

¹⁰¹ [Bangladesh Shelter Response Profile on local building cultures](#) created for the Shelter Cluster

¹⁰² Martin, W, Strategic Recommendations For Shelter Upgrade In Response To The Rohingya Humanitarian Crisis, Findings And Results Of The Emergency Market Mapping Analysis (Emma) On Bamboo And Timber Market Chains In Cox's Bazar District, Bangladesh, December 2017



The Forestry department manages forests, collects related taxes for extraction and permits for transportation of bamboo. In Cox's Bazar, the Forestry department is waiving locally-produced bamboo taxes and permits needed for humanitarian purposes.

Recommendations for shelter practitioners when choosing and sourcing building materials

- When sourcing natural resources such as water, timber, sand, soil and grasses, and fuel for firing bricks and roof tiles, be aware of the environmental impact.
- In large emergencies, the best for the environment is to promote multiple materials and multiple sources because any material or source will become environmentally damaging when used at huge scale. The challenge is that this approach takes more time.
- Promote socially acceptable reuse of salvaged materials, where the rights to such material and quality can be confirmed
- A rapid market assessment and analysis and an environmental impact assessment should inform the selection of materials.
- Sourcing materials locally may affect the local economy, workforce or the natural environment. In some situations, adequate quality materials may not be available locally. In those situations, use alternative materials or production processes, or commercial shelter systems, but consider the impact of using materials which are unfamiliar to the local culture.
- Reforestation can be a good way to produce sustainable building materials.
- Strike a balance between locally used materials and minimising environmental impact.

4. Software and technical support

Access to technical assistance


Technical assistance is an integral part of shelter and settlement responses. It supports the self-recovery of affected people and improves the quality and safety of their shelter and settlement. It is essential that affected households or communities are actively involved in choosing their accommodation, the design of shelters, determining the site layout and materials, and supervising or building the shelters and other construction.¹⁰³

Unskilled labour is prevalent in urban areas of Bangladesh and a large percentage of workers are poor migrant women. Severe shortages exist in skilled manual, technical and managerial services in the housing construction industry. There is a need for training of unskilled labour to improve the quality of housing and its production.

The following checklist of key actions is taken from Sphere section 5, technical assistance:

- ☐ Understand the pre-crisis planning and building practices, available materials, expertise and capacities.
- ☐ Consult with affected people, local building professionals and authorities to agree on building practices and materials, and to find the required expertise for quality assurance and environmental sustainability
- ☐ Involve and support the affected people, local government and local professionals in the building process.
- ☐ Comply with the applicable planning and building codes, material specifications and quality standards, as appropriate for the intended lifespan of the shelter, settlement and household intervention.
- ☐ Promote safer building practices to meet current shelter needs and reduce future risks.
- ☐ For damaged or destroyed houses or shelters, identify the structural risks and hazards, the reasons for failure or what may fail in the future.
- ☐ Learn from, improve and innovate local building practices and techniques where possible; facilitate effective knowledge transfer to promote appropriate building practices.
- ☐ Encourage the use of locally available, sustainable and familiar technologies, tools and materials and hire labour locally for maintaining and upgrading shelters.
- ☐ When possible, build a prototype that will allow to make any necessary adjustments.
- ☐ Ensure that traditional mutual help systems are valorised
- ☐ Give priority to local populations and artisans in the building process to ensure a positive impact for the community

¹⁰³ https://handbook.spherestandards.org/en/sphere/#ch008_007



For a full country profile on local building cultures see the [Bangladesh Shelter Response Profile on local building cultures](#) created for the Shelter Cluster.

5. Household Items ¹⁰⁴

Household items should be provided as part of an overall plan. When specifying the type, quantity and quality of the items, prioritise items that are life-saving but consider their environmental impact¹⁰⁵ Decide how to deliver the household item assistance effectively and appropriately.

Consider what can be sourced locally through cash or voucher-based assistance, and local, regional or international procurement for in-kind distribution. This will reduce the carbon footprint of items and support local markets. However, consider the impact on natural resources of an influx of cash for shelter materials that might already be under pressure (in particular in Bangladesh, timber and sand, or secondary implications such as production of burnt bricks that requires large quantities of wood or charcoal.)

Packaging and Reusability

- Choose items with as little packaging as possible.
- Minimise plastic and opt for more durable items such as metal buckets not plastic.
- Choose items that can be reused, as long as culturally appropriate. For example, in dignity kits, provide cloth instead of disposable sanitary pads. However ask women in an assessment if they have safe access to water to wash the cloth, and what kind of packaging they would they like the items to be in? (ideally useful, reusable items like reusable bags or buckets).¹⁰⁶

Energy

Many household item interventions are energy related (lighting, electricity, cooking fuel) with strong links to environment and natural resources dependency and depletion, particularly firewood (see page 21 on deforestation).

Primary energy consumption in Bangladesh is natural gas (56%), followed by traditional biomass and waste (24%), oil (16%), coal (3%) and hydropower and solar (1%). Bangladesh is the seventh-largest natural gas producer in Asia, however gas production is declining and the country is experiencing severe natural gas supply shortages, which cause rolling electricity blackouts. Under than two-thirds of the population has access to electricity. In addition to the traditional biomass and waste that the majority Bangladeshis who live in rural areas rely upon as their main energy source, other renewable energy sources are increasingly being developed. A hydropower plant built in the 1960s provides base load generation to support solar photo-voltaic systems and wind energy. The Ministry of Power, Energy and Mineral Resources' 2008 Renewable Energy Policy aims to increase solar power, solar-powered irrigation, electricity at railway stations and street lighting,

¹⁰⁴ Sphere A4

¹⁰⁵ See Shelter and settlement standard 7: Environmental sustainability.

¹⁰⁶ [Dignity kit guidance note](#), Rohingya Crisis, Bangladesh.

as well as in homes and public buildings. The REP also contains the goal of providing electricity to all by 2020, with the target of 10% of total energy production comprising renewable generation by 2020. As yet, there are no laws deriving from the REP. The Sustainable and Renewable Energy Development Authority Act (2012) aims to increase the production and use of green energy via the establishment of a Sustainable and Renewable Energy Development Authority but its implementation has been slow.

Key considerations for energy in shelter programming:

- ❑ Establish, restore and promote safe, reliable, affordable and environmentally sustainable energy supply systems:
 - ❑ Determine if existing energy supply systems have negative environmental impact on natural resources, pollution, health and safety.
 - ❑ Ensure any new or revised energy supply options meet user needs, and provide training and follow-up as needed.
- ❑ Lighting: consider renewable energy sources, in particular solar. Consider distributing solar household lamps that also act as phone charging stations.,
- ❑ Promote energy-efficient cooking practices, including the use of fuel-efficient stoves, eco-charcoal, fire management, food preparation and shared cooking. Biogas (LPG) has been used extensively in the 2018 Rohingya response to alleviate pressure on deforestation in the Cox's Bazar Area.
- ❑ Consult the crisis-affected people and host community about the location and means of collecting fuel to address issues of personal safety and environmental sustainability.
- ❑ Energy: When working on energy consumption, consider climate, available natural resources, indoor and outdoor pollution and health impacts, safety and user preferences. Where possible, programmes should reduce household energy needs. Energy-efficient design, using passive approaches to the heating or cooling of structures, and using energy efficient household items such as solar lamps reduces household costs and environmental impacts
- ❑ Identify the risks to the public caused by damaged energy supplies; for example, damaged power lines, leaking propane or fuel oil storage tanks.
- ❑ Coordinate with local government and energy vendors to restore, deliver and maintain the energy services. Subsidies or other incentives may be an option for assuring safety and reducing pollution or demands on natural resources.

Resources, local organisations and contact information

General Environment in Shelter and Settlements resources

1. **Sphere Standards: Shelter and settlement standard 7** on Environmental sustainability: <https://www.spherestandards.org/handbook/>
2. **EHA Connect:** Bringing humanitarian and environmental actors together through An online toolkit for mainstreaming environment into humanitarian practitioners. www.ehaconnect.org. Includes a page on Shelter and Settlements: <https://ehaconnect.org/clusters/shelter-and-settlements/>
3. **Green Recovery and Reconstruction Toolkit (GRRT)** (WWF & American Red Cross). The GRRT is a toolkit and training program designed to increase awareness and knowledge of environmentally responsible disaster response approaches. Includes a chapter on Green Guide to construction: <http://envirodm.org/green-recovery>.
4. **Quantifying Sustainability in the Aftermath of Natural Disasters** (QSAND) (IFRC and BRE Global). QSAND (Quantifying Sustainability in the Aftermath of Natural Disasters) is a self-assessment tool to promote and inform sustainable approaches to relief, recovery and reconstruction after a natural disaster. www.qsand.org
5. **Identifying Critical Environmental Considerations in Shelter Site Selection, Construction, Management and Decommissioning** (Global Shelter Cluster): <http://www.sheltercluster.org/resources/documents/shelter-environmental-impact-assessment-and-action-tool-2008-revision-3>
6. **Building material selection and use guide** (WWF Environment and Disaster Management Green Recovery Connect), <http://envirodm.org/post/materialguide>
6. **Shelter Environmental Impact Assessment and Action Tool** 2008 Revision 3. UNHCR and Global Shelter Cluster, 2008. www.sheltercluster.org/resources/documents/shelter-environmental-impact-assessment-and-action-tool-2008-revision-3
7. **FRAME Toolkit: Framework for Assessing, Monitoring and Evaluating the Environment in Refugee-Related Operations**. UNHCR and CARE, 2009. www.unhcr.org/uk/protection/environment/4a97d1039/frame-toolkit-framework-assessing-monitoring-evaluating-environment-refugee.html

Bangladesh Specific Resources

- **Standard Guideline For Rural Housing In Disaster Prone Areas Of Bangladesh** (2018, Ministry of Housing and public works) Objective: Improve the rural housing of Bangladesh,

pre and post disaster, to substantially improve the living conditions of the rural population, to increase resilience to future disasters and to introduce environmentally sustainable model of rural house building.

- **Market Mapping Analysis (Emma) On Bamboo And Timber Market Chains In Cox's Bazar District, Bangladesh**, December 2017
- **Detailed shelter response profile Bangladesh** (2018)
https://archive.org/details/Bangladesh_shelter
- **Dignity kit guidance note**, Rohingya Crisis, Bangladesh (2017)
https://www.humanitarianresponse.info/sites/www.humanitarianresponse.info/files/documents/files/dignity_kit_guidance_note_23_dec_2017_3.pdf
- **Planning and Implementation of Post-Sidr Housing Recovery: Practice, Lessons and Future Implications** (2014)
- **Comparing the effectiveness of forest law enforcement and economic incentives to prevent illegal logging in Bangladesh** (2015) S.A. MUKUL^{1,2}, J. HERBOHN^{1,3}, A.Z.M.M. RASHID⁴ and M.B. UDDIN⁴

Contact Information

Relevant ministries

Disaster Management

- Ministry of Disaster Management and Relief (MoDMR) <http://www.modmr.gov.bd/>
- Department of Disaster Management. <http://www.ddm.gov.bd/>
- Cyclone Preparedness Programme. <http://voldb.cpp.gov.bd/>

Environmental

- Ministry of Environment and Forests (MoEF), <http://www.moef.gov.bd/>
- Department of Environment (DoE): <http://www.doe-bd.org/>
- Forest Department (FD): <http://www.bforest.gov.bd/>
- Bangladesh Forest Industries Development Corporation (BFIDC) <http://www.bfidc.info/>
- Bangladesh Climate Change Trust (BCCT): <http://www.bcct.gov.bd/>
- Bangladesh Forest Research Institute (BFRI): <http://www.bfri.gov.bd/>

Shelter and Settlements

- Ministry of Housing and Public Works: <http://www.mohpw.gov.bd/>
- Housing and Building Research Institute (part of MoHPW): <http://hbri.gov.bd/>
- Department of Architecture. <http://www.architecture.gov.bd/>
- National Housing Authority: <https://nha.gov.bd/>
- Land Ministry <https://minland.gov.bd/>

- **Public Works Department:** <http://www.pwd.gov.bd/>
- **Urban Development Directorate:** <http://www.udd.gov.bd/>

Water

- **Ministry of Water Resources (MoWR):** <https://mowr.gov.bd/>
- **Bangladesh Water Development Board:** a government agency for water resources management <http://bwdb.gov.bd/>

Other

- **Ministry of Fisheries and Livestock:** <http://www.mofl.gov.bd/>
- **Ministry of Power, Energy and Mineral Resources:** <http://www.powercell.gov.bd/>

International Organisations working in disaster management and/or environment

- **Bangladesh Red Crescent Society.** <http://www.bdrccs.org/>
- **Bangladesh Shelter Cluster.** <https://www.sheltercluster.org/asiapacific/bangladesh>
- **UN-Habitat.** <https://unhabitat.org/bangladesh/>
- **UNHCR.** <http://www.unhcr.org/bangladesh.html>
- **UNDP Bangladesh.** <http://www.bd.undp.org/content/bangladesh/en/home.html>
- **International Union for the Conservation of Nature (IUCN):** <https://www.iucn.org/asia/countries/bangladesh>

National environment and disaster management organisations:

- **Bangladesh Environmental Lawyers Association (BELA):** <http://www.belabangla.org/>
BELA was established in 1992 with a group of lawyers with the broad objective of promoting environmental justice and contributing to the development of sound environmental jurisprudence.
- **Bangladesh Disaster Forum (BDF)** <http://www.disasterforum.org/> - a Dhaka-based national disaster preparedness network of 70 humanitarian and development agencies, research institutions, government departments, and independent activists working on various disaster and environmental issues with a special focus on preparedness. Since 1994, BDF has worked to ensure the accountability of humanitarian and development agencies and to promote the rights of all vulnerable people.

For more information and support on environment in shelter and settlements work

For more information on IFRC Shelter and Settlements work or to contribute information to this factsheet, please contact Ela Serdaroglu: ela.serdaroglu@ifrc.org

For more information on the work of the Bangladesh Shelter Cluster please see <https://www.sheltercluster.org/asiapacific/bangladesh>

For additional support on mainstreaming environmental issues into shelter response in Bangladesh please contact:

- The Energy and Environment Technical Working Group, for issues related to the Rohingya Response. Todd Wofchuck | Energy and Environment Coordinator | eetwgcoord.cxb@gmail.com
- The Environment and Disaster Management Green Recovery Connect Helpdesk: <http://envirodm.org/helpdesk>
- The Global Shelter Cluster Environment Community of Practice: <https://www.sheltercluster.org/community-of-practice/environment> / have disastercallkelly@gmail.com

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Annex 1: References:

Include all references in footnotes here

- [Bangladesh Housing, Land and Property Profile](#) (2018) (IFCR, Australian red cross, Allens Lawyers)
- [Bangladesh Shelter response profile:](#) Local Building Cultures for Sustainable and Resilient Habitats, page 16
- [Report on Environmental Impact of Rohingya Influx](#), UNDP (2018)

Annex 2: Acronyms

TBC

GoB Government of Bangladesh

PA Protected Area