

SECTION 1: DEFINING BUILDING BACK BETTER

Introduction

“Building Back Better” (BBB) is a popular term used during post-disaster reconstruction and recovery in recent years with the idea of making communities stronger and more resilient following a disaster event. The “Guide to Developing Disaster Recovery Frameworks” (DRF Guide) produced by the World Bank’s Global Facility for Disaster Reduction and Recovery (GFDRR) in collaboration with the European Union (EU) and the United Nations Development Programme (UNDP) ¹ recognizes Building Back Better as a key policy imperative for recovery² along with Converting Adversity into Opportunity and Pro-Poor Recovery.

This annex on Building Back Better is a supplementary document to the DRF Guide and can be referred alongside to it during recovery planning. It aims to clarify what BBB is; how BBB can be applied in different sectors; and how to incorporate BBB concepts into the recovery process for a successful recovery. The annex has been compiled from studies of disaster recovery efforts in more than 15 countries conducted by the World Bank’s GFDRR and research conducted by international academic research institutions such as the Centre for Disaster Resilience Recovery and Reconstruction at the University of Auckland and Resilient Organisations New Zealand.

¹ GFDRR, UNDP and EU, *Guide to Developing Disaster Recovery Frameworks*, GFDRR, UNDP and EU, 2015, www.gfdr.org/recoveryframework.

² “Recovery” is defined as the restoration, and where appropriate, improvement of facilities, livelihoods, and living conditions of disaster-affected communities, including efforts to reduce disaster risk factors. While, “reconstruction” focuses primarily on the construction or replacement of damaged physical structures, and the restoration of local services and infrastructure. The term “recovery” in this annex encompasses both “recovery” and “reconstruction”.

The annex is designed to be a practical, results-focused, easy-to-use tool to assist policy-makers, recovery institutions, governmental implementing agencies, civil society organisations, non-governmental organisations (NGOs) and private sector organisations with post-disaster reconstruction and recovery planning and implementation as well as pre-disaster planning activities.

The Need for Building Back Better

With the increasing frequency of disasters in the world today, reducing vulnerabilities and increasing resilience in communities has become an important part of development. The time period following a disaster is an optimal time to make changes in a community. After the devastation caused by a disaster when damaged buildings and infrastructure are rebuilt, impacted economies are regenerated and lifestyles and livelihoods of people are rehabilitated, a unique opportunity arises to introduce new ideas, technologies and methods to improve on pre-disaster conditions.

It is with this understanding that the concept of Building Back Better emerged, signifying the use of this window of opportunity following a disaster to introduce resilience into communities and eliminate vulnerabilities.

The Hyogo Framework for Action 2005-2015 (HFA)³ was created in 2005 by the United Nations Office for Disaster Risk Reduction (UNISDR) identifying disaster risk reduction as a global priority. With the completion of the 10 years marked by the HFA, a successive document, the Sendai Framework for Disaster Risk Reduction⁴ was published in March 2015. The Sendai Framework identifies Building Back

³ UNISDR, *Hyogo Framework For Action 2005-2015: Building the Resilience of Nations and Communities to Disasters*, UNISDR, 2005, www.unisdr.org/we/inform/publications/1037.

⁴ UNISDR, *Sendai Framework for Disaster Risk Reduction 2015-2030*, UNISDR, 2005, www.wcdrr.org/uploads/Sendai_Framework_for_Disaster_Risk_Reduction_2015-2030.pdf

Better in recovery, rehabilitation and reconstruction as a key priority for action in the next 15 years. Therefore understanding and incorporating BBB concepts into post-disaster recovery programmes and pre-disaster planning programmes is imperative.

What is Building Back Better?

Building Back Better is defined as a way to use the reconstruction process following a disaster to *improve* a community's physical, social, environmental and economic conditions to create a more *resilient*⁵ community in an *effective* and *efficient* way⁶. BBB differs from traditional approaches to reconstruction and recovery in that it takes an *all-inclusive holistic* approach, where all aspects related to community recovery are attended to *simultaneously* to determine a successful recovery programme that *enhances the overall process*.

International research conducted on understanding and defining BBB shows that building back better requires consideration given to three elements:

1. **Risk Reduction** - or Disaster Risk Reduction (DRR) i.e. reducing disaster risks in the community
2. **Community Recovery** - Supporting the psycho-social recovery of affected people and regenerating the economy
3. **Effective Implementation** - Implementing reconstruction and recovery in an effective and efficient way

⁵ UNISDR defines resilience as “the ability of a system, community or society exposed to hazards to resist, absorb, accommodate to and recover from the effects of a hazard in a timely and efficient manner, including the preservation and restoration of its essential basic structures and functions”.

⁶ Definition of BBB developed from international research.

This is represented using the “BBB Framework”⁷ shown below. The BBB Framework shows the elements and sub-elements required to build back better.

The Build Back Better Framework



⁷ Source: Mannakkara, S. *A Framework for Building Back Better During Post-Disaster Reconstruction and Recovery*. Doctor of Philosophy in Civil Engineering (Disaster Management), University of Auckland, 2014, <http://hdl.handle.net/2292/22357>.

Risk Reduction

Risk reduction (also referred to as disaster risk reduction) is the first element required to build back better as shows in the BBB Framework. It refers to improving the *disaster resilience* in a community by minimising/eliminating disaster risks. Disaster risks include physical and non-physical risks. Physical risks refer to risks posed to a community's built environment⁸. Non-physical risks refer to risks incurred at the community and/or organizational level, such as the impacts of disasters on service delivery, health, education etc.

Increasing resilience to reduce risks in the built environment during post-disaster reconstruction is primarily achieved in two ways. (1) Improving the structural designs of the built environment through the use of revised building codes and construction methods to achieve a level of physical resilience that can resist and withstand current and anticipated disaster risks. (2) Controlling land-use based on hazard risks by updating planning regulations to ensure people are not faced with unreasonable levels of risk that cannot be mitigated using structural measures. Both these methods for BBB require accurate multi-hazard risk assessments to be conducted first, followed by technical expertise from engineers and planners to determine optimal solutions that consider safety, practicality, affordability and impact on local people.

Increasing community and organizational resilience can be achieved through raising risk reduction awareness and by implementing disaster preparedness mechanisms. Education and training on disasters and risk reduction enables communities to understand the importance of risk reduction measures as well as learn how to incorporate disaster capacity into their lives. Risk reduction training is essential to

⁸ Built environment includes infrastructure (transport, water and sanitation, energy, community infrastructure) and buildings (residential, education, health, commercial).

practitioners involved in rebuilding and recovery and development planning. Disaster preparedness plans allow people and businesses to be better prepared to respond to and recover from all ranges of possible disaster scenarios. Disaster preparedness mechanisms include the establishment of early warning systems, disaster management plans, risk-averse future development plans, and methods of alleviating climate change effects.

Community Recovery

A core part of BBB is ensuring that the recovery of affected people is supported as an important part of building community resilience. Although often treated separately from reconstruction efforts, the theory behind BBB supports the inclusion of the people aspect into every stage of reconstruction planning and implementation. This means the psychological, social and economic impacts of every reconstruction and recovery decision made need careful consideration in order to ensure that people's needs are put first. As presented in the BBB Framework, community recovery in terms of BBB includes two factors.

Firstly, the *psychological and social recovery* of people needs to be considered a priority. Support mechanisms for psychological and social recovery such as advisory services to assist with decision-making and guidance with the recovery process, counselling and methods of empowerment to help people recover from disaster-related psychological trauma and re-establish a sense of normality must be incorporated into reconstruction programmes.

Secondly, *economic recovery* through supporting livelihood recovery and regenerating of local economies need to take place to revive affected communities. Being able to return to their livelihoods and seeing their community's economy performing well is integral to encourage disaster-affected community

members to remain in their communities and rebuild their lives. Therefore supporting the livelihoods of people and overall economy through mechanisms such as grants, low-interest flexible loans, business and livelihood support and advisory services, up-skilling programmes and assistance with business rebuilding are essential to building back better.

Effective Implementation

Building back better also implies that the reconstruction and recovery process needs to be carried out smoothly and successfully. Currently due to the lack of pre-planning, knowledge and resources reconstruction efforts are often ad-hoc and inefficient. BBB suggests ways of improving the effectiveness and efficiency in the reconstruction and recovery process, to obtain recovery solutions that are high in quality and well-timed. The BBB Framework shows that effective implementation of post-disaster recovery activities can be improved in three ways.

Adopting an effective institutional mechanism is key. Reconstruction and recovery is multi-faceted and often large scale, involving stakeholders from many different backgrounds such as national and local government authorities, local and international NGOs, the private sector, civil service sector as well as local community members. The chaos, duplication and confusion that can occur with having such a large number of stakeholders involved, implementing different agendas for reconstruction and recovery need to be eliminated. Adopting an institutional mechanism that allows the production of a unified recovery vision and programme, effective management of stakeholders with clear roles and responsibilities, and collaboration is necessary.

Governance plays an important part in enabling communities to build back better. An effective governance mechanism is important to implement reconstruction and recovery in-line with BBB principles. Legislation and regulation and policies can be used to create the mandates of institutional mechanisms put in place for reconstruction and recovery, enforce compliance with risk reduction and community recovery, and facilitate bureaucratic procedures to speed up the recovery process and enhance efficiency.

Monitoring and evaluation (M&E) of the recovery process by putting in M&E mechanisms through all stages of short and long-term recovery serve as a way of ensuring that BBB concepts are complied with. Regular and thorough M&E also brings to attention any issues with recovery activities so that they can be promptly dealt with. The process of M&E also provides a good database with valuable knowledge and lessons that can be retained to assist with and improve future recovery efforts.

Adding to the three key elements required to build back better detailed above, it is important to understand that in reality these three elements are often intertwined and influenced by each other. BBB requires looking at recovery in a comprehensive way, therefore the interrelationships between risk reduction, community recovery and effective implementation require as much consideration as the individual elements. Although BBB literally refers to the reconstruction process following a disaster, it is a good opportunity to initiate pre-disaster planning activities such as adopting early-warning systems and changing future development plans to incorporate DRR and climate change.

Finally, it is necessary to keep in mind that the motivation behind BBB is to first and foremost benefit the local community. Therefore each specific community's needs, preferences, culture and heritage have to

always take precedence. Building a community back better than it was before requires achieving a fine balance between catering to local needs, providing safety and creating a vibrant place which can be considered resilient.

The BBB Annex

This annex is designed to inform how to build back better following a disaster with specific guidance provided for a community's social, production and infrastructure sectors. The social sector includes housing, education and health sectors. The production sector includes the employment and livelihoods sector. The infrastructure sector refers to all types of infrastructure such as water and sanitation, transport, energy and community infrastructure.

There are several cross-cutting sectors that commonly impact all the different social, production and infrastructure sectors. The cross-cutting sectors are disaster risk reduction (referred to as risk reduction in the BBB Framework), environment, gender and governance. Since these sectors apply to all aspects of reconstruction and recovery, careful attention must be given to ensure that BBB practices are applied within the cross-cutting sectors. Incorporating the understanding of what “building back better” means, what it entails in different sectors and how the sectors interrelate allow resilience to be introduced to the recovery process.

The BBB annex is organised into three sections:

Section 1 Defining Building Back Better describes how the concept of “building back better” was conceived. The section defines what BBB means, introduces the BBB Framework and explains the key elements required to BBB.

Section 2 consists of six chapters providing practical suggestions and case study examples on how to build back better in the different sectors.

Section 2.1 Building Back Better in the Cross-cutting Sectors introduces the cross-cutting sectors that need to be addressed during reconstruction and recovery: Disaster Risk Reduction, Environment, Gender and Governance. This section provides recommendations and general case study examples under each of the cross-cutting sectors in order to apply BBB practices in all sectors.

Section 2.2 Building Back Better in the Housing Sector provides practical recommendations and guidance to build back better in the housing sector.

Section 2.3 Building Back Better in the Education Sector provides practical recommendations and guidance to build back better in the education sector.

Section 2.4 Building Back Better in the Health Sector provides practical recommendations and guidance to build back better in the health sector.

Section 2.5 Building Back Better in the Employments, Livelihoods and Agriculture Sector provides practical recommendations and guidance to build back better in the employment, livelihoods and agriculture sector.

Section 2.6 Building Back Better in the Infrastructure Sectors provides practical recommendations and guidance to build back better in the infrastructure sectors.

Section 3 Building Back Better Plans for Recovery concludes the annex by illustrating a list of general considerations that need to be made to ensure that BBB concepts are incorporated when designing a recovery programme.

SECTION 2.1: BUILDING BACK BETTER IN THE CROSS-CUTTING SECTORS

As introduced in Section 1 there are several cross-cutting sectors that apply generically to reconstruction and recovery in the social, production and infrastructure sectors in a community. The cross-cutting sectors are:

- Disaster Risk Reduction – The practice of reducing disaster risks to reduce the vulnerability of communities
- Environment – The restoration and revival of the environment and natural resources
- Gender – The assurance of gender equality and provision of gender-specific support and resources
- Governance – The application of authority and decision-making to plan and implement the reconstruction and recovery programme

Building back better practices such as risk reduction, community recovery and effective implementation in these cross-cutting sectors need to be considered and addressed in the reconstruction and recovery policies of all sectors.

This section provides recommendations and case study examples for building back better in the Disaster Risk Reduction, Environment, Gender and Governance sectors.

Disaster Risk Reduction

Risk reduction is the first element needed to build back better as introduced in Section 1. Disaster Risk Reduction (DRR), a term used interchangeably with risk reduction, is considered a sector on its own which impacts and influences all social, production and infrastructure sectors in a community.

Disasters can cause destruction to various types of physical assets in the built environment in each of the different sectors such as residential housing, health sector facilities, education sector buildings, buildings and infrastructure used for businesses and industries, and infrastructure related to transportation, water and sanitation, energy, telecommunications and community uses. Disasters can also introduce new physical and non-physical risks in the different sectors which can hinder recovery and reconstruction.

In order to BBB it is necessary to reduce the level of risk posed to a community from prevalent hazards to a tolerable level. DRR can be achieved in the following ways:

- Increase the resilience in the built environment
- Minimize/mitigate new and emerging risks and disaster preparedness
- Provide training and education to the community and other stakeholders on DRR

Increasing the Resilience in the Built Environment

In order to reduce risks and increase resilience in the built environment it is necessary to first identify all potential hazard and risk levels posed to the different types of physical assets in the built environment and

understand their current capacity to withstand these risks. This information needs to be obtained from the respective sector Post-Disaster Needs Assessments¹ (PDNAs) before planning for reconstruction is begun.

Disaster risk reduction in the built environment can be achieved in two ways:

1. Improve the structural resilience of the physical assets
2. Control the location of physical assets

The most obvious way to improve the structural resilience of physical assets is through the use of building codes and regulations to ensure that all buildings and infrastructure belonging to the different sectors are built to the required standards to withstand the levels of risk posed. When the levels of risk faced exceed structural interventions land-use planning mechanisms can be used to control the extent of rebuilding in high risk lands. However, to truly build back better attention needs to be given to a range of other aspects such as community needs, affordability, efficiency and quality.

Steps to be taken for disaster risk reduction in the built environment to BBB are:

- Divide land (to be used for reconstruction) into *risk zones* based on *multi-hazard assessments*.

Up-to-date multi-hazard assessments conducted need to be used to understand the risk landscape and divide the land into risk zones. Identifying risk zones provides a clearer picture of what measures can be taken to protect communities.

¹ GFDRR, UNDP and EU, *PDNA Guidelines*, 2014, <https://gfdr.org/pdna-volume-b>

- Revise current *building codes* (or adopt new building codes) based on *up-to-date multi-hazard assessments*.

The use of building codes is important to ensure a uniform standard of design and construction to resist the calculated risks. Building codes need to reflect realistic prevailing levels of risk posed in the environment and the impacts of those risks on buildings and infrastructure with different uses. For example, a building such as a hospital has to be able to function during disaster periods and thus need to have a much higher tolerance to hazard risks.

A common mistake made during rebuilding is to focus on only one major hazard (typically the one just experienced) which can introduce unexpected risks to physical assets from the other hazards present. Therefore inclusion of up-to-date risk levels from ALL possible hazards when designing building codes and regulations is necessary.

Box 2.1.1 Revised Building Codes in Australia

One of the first actions taken following the devastating 2009 Victorian Bushfires in Australia, was the release of a revised building code: “The Australian Standard for construction of homes in bushfire-prone areas” (AS3959: 2009). The revised code contained more stringent measures to improve the level of bushfire protection in homes. Bushfire risk levels were modified to be more specific, and design and construction details corresponding to each bushfire risk level were customized. The code changes highlighted the attention given to sealing buildings for ember protection and the use of flame-resistant materials in construction.

Source: Mannakkara and Wilkinson (2013)

- *Determine appropriate land-uses* based on risk zone maps AND relevant building regulations.

Although it is necessary to structurally upgrade physical assets to be disaster resilient, the improvements need to be within manageable cost and time limitations to ensure that they can be practical. If the structural changes determined from a technical point of view are unaffordable or cause undue complications and delays in the reconstruction of buildings and infrastructure,

alternative methods of disaster risk reduction need to be established. One method of doing so is restricting construction on high risk lands which require costly and time-consuming interventions. Planning controls such as restricting land-use can then be used to respond to risks in place of structural measures. Land-use can be restricted by relocating physical assets and resettlement of communities into lower risk areas.

Box 2.1.2 Risk Zones and Revised Building Codes in New Zealand

The 2010/2011 Canterbury Earthquakes sequence resulted in damage to buildings as well as extensive liquefaction in land sites. First, a land re-classifying exercise was executed where land sites within the city of Christchurch were divided into zones based on the probable levels of liquefaction damage from future earthquake events.

Four risk zones were identified with corresponding building requirements specified for each risk zone:

- Technical Category 1 (TC1) – Areas where future damage is unlikely. Common house foundations meeting standard design codes appropriate.
- Technical Category 2 (TC2) – Areas with minor to moderate damage expected. More robust foundation designs such as timber-piled foundations, suspended timber floors or enhanced concrete-slab foundations required.
- Technical Category 3 (TC3) – Areas with moderate to significant damage expected. Site-specific geotechnical investigations and custom-engineered foundation designs required.
- Technical Category 4 (TC4 or “red zone”) – Areas with highest liquefaction damage and/or landslides expected. Rebuilding in the red zone prohibited.

Structural design standards were altered to increase the probability of earthquake risk (seismic hazard factor) in the region where the earthquakes occurred which translated to the need for higher capacity structural designs.

A new Earthquake Prone Building Policy was also introduced in 2013 with a mandatory assessment and strengthening (as necessary) of all buildings nationwide within a five year timeframe to meet the required structural standard.

Box 2.1.3 Land swap scheme in Grantham, Queensland

Following the 2011 Queensland floods in Australia a compulsory “land-swap” scheme was put in place in the small flood-prone town of Grantham. The entire neighbourhood was relocated to a safer area by providing equivalent blocks of land in exchange for the land previously owned.

Source: Queensland Floods Commission of Inquiry (2012)

Box 2.1.4 Land buy-back schemes in Australia and New Zealand

Both Australia and New Zealand adopted land “buy-back schemes” as a measure of avoiding extravagant design and construction on high risk lands following the 2009 Victorian bushfires and the 2010/2011 Canterbury earthquakes respectively. In both countries the Government opted to buy lands classified as high risk from owners encouraging relocation to safer lands. In both countries the land-use of the bought-back high risk lands was restricted prohibiting future residential construction.

- Ensure building code changes recommended are *practical*.

The cost of building back better needs to be affordable and realistic in terms of the funding available. Disaster situations add pressure on existing resources and create unusual shortages. Building codes need to specify materials and technology that are readily available. It is also important to consider any long-term maintenance issues that might arise from introducing new/different technologies in design and construction. Long-term maintenance of physical assets needs to be affordable for the local community. Therefore it is necessary for building codes and regulations to provide pragmatic alternatives in light of these issues to facilitate adoption.

Box 2.1.5 Resource availability issues during residential rebuilding in Victoria, Australia

The building code revisions made following the 2009 Victorian Bushfires specified specialized products for increased ember protection in high bushfire risk areas. However these specialized products were still under testing by the time the rebuild had commenced and were not available for use. This created major delays in the rebuild and also led some frustrated home-owners to carry on rebuilding without using the correct products. Now using the specified building materials and products lowered the capacity of those rebuilt homes to withstand the prevalent bushfire risk.

Source: Mannakkara (2014)

- Incorporate *traditional technologies* and *traditional materials* to increase practicality of implementation

Understanding and using traditional technologies and traditional materials specific to each country and community increases the practicality and rate of adoption of the suggested structural specifications.

Box 2.1.6 Traditional construction materials and technology used in Nepal

The city of Kathmandu in Nepal has its unique traditional materials and uses in the construction industry.

- Clay – There are many types of clay found in Kathmandu, which have different colours and respective uses. Traditionally, grey and black clays are used for bricks and tiles; grey and brown clays are used for quality plaster; red clays are used to make paves; white clays are used for internal and external paintings; and yellow clays are used for plastering joints and for mortar.
- Bricks – Traditional kilns are used to make bricks in this area. The types of kilns used include the Hoffman kiln, which has a series of chambers and uses a continuous rotational firing process; and the Intermittent kiln, which has a single chamber with no roof where fuel such as straw, wood or coal and the material are loaded and fired at the same time. There are no standard brick dimensions used in Nepal. Walls are built using two brick leaves with the space between the leaves filled with clay soil and broken brick. External wall laves are typically built using a special brick with small displaced joints which ensures greater protection from water during the heavy monsoon rains experienced in the area.
- Wood – The word Kathmandu means “city of wood”, therefore the use of structural wooden frames in the area is a common feature. The types of wood traditionally used for construction come from the local Sal tree species, Gwaisasi, Salla and Utis which all grow on the slopes and hills around the Kathmandu valley. The combination of wood and brickwork is frequently found in multi-storied temples and descends from the “Newar” civilisation in Nepal. The wood structure of the roofs in Nepal also has a unique structural concept.

Such endemic materials and technology need to be utilized during reconstruction to maintain traditions and incite local industries.

Source: Bonapace and Sestini (2003)

- *Enforce* the adoption of building codes and regulations using legislation.

Using a legal framework can ensure that building codes and regulations are adopted. Without a legal basis adoption can tend to be optional thus impacting the quality of the rebuild.

Box 2.1.7 Lack of enforcement of building codes in Sri Lanka

Although a series of guidelines for housing construction in relation to a range of different hazards was introduced in Sri Lanka by institutions and groups such as the Centre for Housing Planning and Building, National Housing and Development Authority, the Technical Advisory Committee and Society of Structural Engineers both before and after the 2004 Indian Ocean Tsunami due to the lack of compulsory enforcement the building stock in the country still remains vulnerable. This was evidenced by the large-scale destruction that was caused to housing settlements in recent disaster events such as the 2010-2011 floods and the 2014 Badulla landslides.

- *Enforce* land-use plans and include in future development plans.

Similar to the adoption of building codes, a legal framework needs to be used to ensure that the land-use plans are adopted in the future as well as during the rebuild.

- Arrange *long-term funding* to cover extra costs for *structural improvements*.

Adopting structural improvements requires extra capital therefore it is necessary to pre-plan and manage funding to be cover these extra costs as well as be available in the long-term to support the on-going needs of the rebuilding effort.

- Provide *incentives* to promote *adoption of structural changes*.

Incentives such as tax reductions and grants can be provided to promote the adoption of risk reduction strategies which should also be accounted for by available funding.

Box 2.1.8 Incentives for making structural improvements

Incentives such as levying tax rebates for residential seismic upgrades, waiving permit fees for retrofitting, and city grants were provided for residents in the Marikina, Philippines and Berkeley, California to promote structural upgrading.

Source: Batteate (2006)

- Ensure *high quality rebuilding* by using *skilled builders* for reconstruction and arranging *quality assurance inspections*.

Certified skilled builders or builders with appropriate training need to be employed to ensure that structural specifications are implemented properly during construction. If there is a shortage of skilled builders, incentive schemes (such as free/discounted accommodation, subsidized building materials, financial aid etc.) can be introduced to attract skilled builders from other regions or countries to participate. Regular inspections should be arranged by local authorities to ensure compliance with building regulations.

- Initiate/identify *institutional mechanisms* to implement disaster risk reduction initiatives.

National and local institutions and governance processes need to be identified/initiated to plan and implement DRR initiatives in post-disaster recovery as well as in pre-disaster planning and development planning. This could involve the creation/selection of a government ministry or a national-level authority to undertake national-level DRR and disaster risk management (DRM) planning supported by legal and policy frameworks for enforcement. Adequate financial

resources need to be allocated for DRR and DRM. Pathways of ensuring adoption of DRR initiatives from national to local levels must be determined. See the Governance Sector below for case study examples reflecting this.

Box 2.1.9 Ten-Year Flood Management Programme in Senegal

Senegal is subject to frequent flooding events due to heavy rainfall. Due to the large percentage of population living in unplanned urban settlements, and the lack of functional stormwater drainage systems, ineffective land-use policies and non-compliance with urban planning, the communities living in these settlements are highly vulnerable to disasters. In recognition of the need to improve the resilience of these communities and implement DRR mechanisms, the Ten-Year Flood Management Programme (PDGI) was launched in 2012 by the Government of Senegal. The Ministry for Restructuring and Managing Flood Zones (MRAZI) was also created in 2012 to promote consistent flood management.

The PDGI has four main components to BBB which are:

- Resettlement of flood victims in furnished and equipped areas, providing an improved living environment
- Installation of stormwater drainage
- Restructuring of urban areas and flood-prone districts
- Improvement of land-use planning policy and development of new urban centres

Minimize/Mitigate New and Emerging Risks and Disaster Preparedness

- *Identify, address and mitigate* new and emerging risks.

New and emerging risks in each sector need to be identified as part of the PDNA exercise and minimized and mitigated as part of building back better. New and emerging risks can include damage to transportation infrastructure such as roads and bridges that prevent access to hospitals, houses, schools and businesses, or damage to water and sanitation facilities which can create and exacerbate illnesses. These types of risks need to be addressed and minimised or mitigated as

part of building back better to prevent disruption to the social, production and infrastructure sectors.

- Establish *disaster preparedness and early warning systems*.

The recovery period is a good time to introduce/establish disaster preparedness systems and early warning systems in different sectors. Sector-specific recommendations and examples of measures used to minimise/mitigate new and emerging risks and incorporate disaster preparedness systems will be provided for the social, production and infrastructure sectors in the following chapters of the annex.

Provide Training and Education on DRR

- Implement public education campaigns on DRR.

An important part of building back better is involving the local community in decision-making and participation of reconstruction and recovery activities to ensure that their needs are met. Therefore, education must be provided to inform local residents on the importance of and requirements for disaster risk reduction in order to build back better. This can involve holding community meetings and training sessions, adopting DRR education into school curriculums and tertiary education programmes, and dissemination of information using media such as television, radio, newspapers, brochures etc.

- *Implement training programmes on DRR* for stakeholders taking part in reconstruction and recovery.

Stakeholders such as planners, designers, engineers, architects, contractors and local and national governmental authorities, and local and international non-governmental organisations who are involved in designing and implementing reconstruction and recovery programmes need to be trained on specific BBB-based DRR techniques prior to commencing work. This allows stakeholders to be well-informed and up-to-date about DRR requirements in their work. Sector-specific recommendations and examples of how to provide training and education on DRR will be provided for the social, production and infrastructure sectors in the following chapters of the annex.

Environment

The environment sector refers to the environmental and natural resources in a community. Damages to the environment sector impacts all the other sectors. Surface/groundwater pollution and damage to sewage systems, sewage treatment plants and waste management plants affect the water and sanitation sector, disabling the services provided to the community. This can lead to increased health risks in the community as well as well as disruptions to businesses. Damage to forests, soils and wetlands affect the agriculture sector and in turn impact local industries and the availability of food and nutrition, which can create health problems. World heritage sites and national parks can become affected by disasters which have cultural significance.

Reconstruction and recovery can also be taken as an opportunity to adopt energy efficient and environmentally-friendly practices in the social, production and infrastructure sectors. Such practices can reduce detrimental impacts on the environment in the future. Therefore the preservation and restoration of environmental and natural resources during reconstruction and recovery is an important part of building back better in all the different sectors.

Steps to be taken in the environment sector to BBB are:

- Rebuild/restore *natural assets* used for risk reduction and social and economic activities.

The reconstruction and recovery plan needs to include measures to restore and rejuvenate damaged natural assets such as forests, coral reefs, wetlands and waterways which are important to local communities for both risk reduction and community recovery purposes. Natural assets are used by the community for their livelihoods and other everyday activities. The restoration of

natural assets can also be used to lessen the impact of hazards and contribute to the social, production and infrastructure sectors.

Box 2.1.10 Restoration of Natural Assets Required for Different Disaster Types

Type of Disaster	Restoration of Natural Assets
Hurricane/Cyclone/Typhoon	Access to fishing grounds Access to beaches and tourism sites Natural rebuilding of fishing and tourism sites Artificial rebuilding of fishing and tourism sites
Tsunami	Access to coastal fishing Access to tourism sites Artificial rebuilding of fishing and tourism sites
Earthquake	Access to common property resources Access to natural systems that provide environmental services Access to buildings and infrastructure that have environmental uses Access to livelihoods using natural resources
Flood	Access to fresh water Access to agricultural sites Soil slopes Regeneration of natural barriers Artificial barriers
Volcanic eruption	Access to common property resources Access to natural systems that provide environmental services Access to buildings and infrastructure that have environmental uses Access to livelihoods using natural resources
Landslide	Access to common property resources Access to natural systems that provide environmental services Access to buildings and infrastructure that have environmental uses Access to livelihoods using natural resources
Drought	Agriculture industry Fresh water
Bushfires	Forests
Sandstorms	Access to common property resources Access to natural systems that provide environmental services Access to buildings and infrastructure that have environmental uses Access to livelihoods using natural resources

Box 2.1.11 Plantations used as Windbreaks for Disaster Risk Reduction

Rows of trees or shrubs planted around the perimeters of fields are used as windbreaks (or shelterbelts) to provide shelter and minimize damage from winds and snowdrifts as well as protect the soil and crops.

The Alberta Agriculture and Rural Development Ministry shares that in order to plant an effective windbreak for a farmstead, it is necessary to:

- Enclose a large area with sufficient protection allowing room for future growth
- Ensure that the windbreak consists of at least three rows of trees
- Include a hedge and a row of evergreens

Box 2.1.12 Slope Stabilization using Trees for Disaster Risk Reduction

Trees can be used as an effective tool to control erosion and stabilize slopes. One of the most common methods of stabilizing hills and slopes is through seeding grass and herb mixtures. Seeding includes dry-seeding where seed and organic fertilizer are scattered on slopes, or bitumen straw seeding where seed and fertilizer are spread and covered with an unstable bitumen emulsion. After a slope is stabilized using seeding, deciduous trees can be transplanted to further secure the soil.

Brush layering is another technique employed to stabilize loose rock slopes using rooted and un-rooted layers of plants. Brush layers can consist of only willow cuttings, a combination of willow cuttings and rooted plants or only rooted plants.

Drain and slope fascines are used to dewater and stabilize wet slopes. Drain and slope fascines are made of live branches of willows which are tied together with wire and layered with dead branch material.

Box 2.1.13 Multi-purpose Wetlands in Uganda

Wetlands are a common feature in Uganda. Wetlands have many uses such as improving natural water quality, flood protection, erosion control and even serve as recreational and aesthetic areas. The most common uses of wetlands in Uganda include tourism, beekeeping, water collection and use, wastewater treatment and fishing.

Most of Uganda's wetlands are seasonal and thus remain wet only during rainy seasons. During dry seasons Uganda's grasslands are used for livestock grazing and for growing crops. Woodlands provide raw materials for construction and fuel, while papyrus wetlands provide materials for crafts.

Due to the importance of wetlands to Uganda's industries, a "National Wetlands Information System" is maintained by the Wetlands Management Department with details on the different uses of wetlands, levels of usage and the impacts of these uses on the wetland systems.

- Rebuild/restore *physical and environmental infrastructure* used to *protect the environment*.

Infrastructure such as waste and wastewater collection and treatment facilities and green infrastructure for stormwater management should be included in the rebuilding effort.

Box 2.1.14 Using Green Infrastructure for Stormwater Management

Stormwater runoff is a major water pollutant in urban areas as it can carry trash, bacteria and heavy metals into waterways. A novel approach to stormwater management adopts "green infrastructure", which is the use of vegetation and soil to assist with stormwater management. Types of green infrastructure used for stormwater management include:

- Bioswales – Vegetated or mulched channels along streets and in parking lots which provide treatment to stormwater.
- Rain gardens – Shallow vegetated basins that collect and absorb stormwater runoff from roofs, sidewalks and streets.
- Planter boxes – A type of rain garden with vertical walls which collect and absorb stormwater runoff from sidewalks, parking lots and streets.
- Green roofs – Roofs covered with vegetation that enables rainfall to infiltrate in and result in evapotranspiration of stored water.
- Urban tree canopy – Trees used as a canopy to reduce and slow down stormwater runoff through the precipitation that occurs in leaves and branches.

Box 2.1.15 Constructed Wetlands for Wastewater Treatment in Malaysia

Constructed wetlands are man-made engineered systems that are built to mimic natural wetlands for water quality improvement, flood control, agriculture and for aesthetic value. Constructed wetlands are new to Malaysia, and provide a cheaper alternative for wastewater treatment using available local resources. The conditions of Malaysia's climate and soil are ideal for growing plants suitable for constructed wetlands. Constructed wetlands are environmentally friendly, can be created at lost costs with low technology methods and tools and have aesthetic appeal.

Malaysia's largest and most popularly known constructed wetland system is the stormwater treatment system in Putrajaya. The constructed wetland provides an effective water filtration system for urban stormwater runoff, serves as habitats for native plants and provides a good environment for leisure and eco-tourism activities.

Source: Wetlands International (2003)

- Use *sustainable, energy-efficient natural resources* and *technologies* for reconstruction.

Environmentally-friendly materials and technologies should be adopted for reconstruction when possible. Rapidly renewable/recycled materials such as bamboo, recycled metals and stones (from damaged/demolished buildings) should be used for construction. Building designs should be energy-efficient and follow “green building” practices such as maximising the use of natural heat and light, using renewable energy and conservation of water.

Box 2.1.16 Recycling Debris for Reconstruction in Sri Lanka

The post-disaster reconstruction and recovery effort following the 2004 Indian Ocean Tsunami disaster in Sri Lanka recognized the potential for re-using debris from damaged/demolished buildings for rebuilding. In 2006 “Construction Waste Management Centres” were established with funding from international NGOs. Debris collected was brought to the centres after which they were manually sorted based on material type. The materials collected such as bricks, concrete, stone are then crushed to obtain building materials such as sand, chips and coarse aggregate, which are sorted mechanically by size using various sieves. These recycled materials were used to construct bricks and roads in the reconstruction effort. Community awareness programmes were also held concurrently to educate locals about the project. The waste management centres were a successful venture resulting in decreased costs for rebuilding, allowing property-owners to dispose of their building debris sustainably and also creating jobs for locals.

Box 2.1.17 Green Building Design in India

Green buildings have gained popularity around the world due its environmentally-friendly design and construction practices, energy-efficiency and low running costs. With India's growing construction industry and correspondingly high energy consumption, green building technology was introduced to the country in 2001 with the establishment of the "Indian Green Building Council" (IGBC). The first green building built in India was the CII-Sohrabji Godrej Green Business Centre in Hyderabad in 2004. Since then there have been 18 LEED (Leadership in Energy and Environmental Design) certified green buildings constructed in India.

Green buildings have operational savings when compared to conventional buildings such as:

- Energy efficiency – Green buildings are typically 25-30% more energy-efficient
- Water efficiency – Green buildings use 20-30% less water
- Waste reduction – Green buildings reduce construction waste by approximately 50%

Green buildings such as the One Indiabulls Centre located in Mumbai include green features such as:

- Steel with recycled metal content
- Recycled material such as rock and rubble used from the building which existed previously on the same site
- 30% of construction materials sourced from a distance of less than 500 miles
- Ultra low plumbing fixtures used to have a fixed flow rate in water fixtures
- Interior paints with low volatile organic compounds
- Solar water heaters
- 100% of water treated by the sewerage treatment plant and re-used for landscaping and air conditioning
- 100% of stormwater trapped by the stormwater drainage system
- Green roof

Source: Roy and Gupta (2008)

- *Enforce* the adoption of environmentally-friendly reconstruction and recovery practices.

Using a legal framework can ensure that measure taken to preserve and restore natural assets and adopt environmentally-friendly practices as part of building back better. Without a legal basis adoption can tend to be optional thus impacting the quality of the environment sector.

Box 2.1.18 Green materials and technology in Singapore

The Building and Construction Authority of Singapore established the Green Mark scheme to evaluate the environmental sustainability of buildings and their carbon footprint. The scheme was introduced in 2009 as a voluntary scheme to encourage contractors to adopt green practices, but as of 2013 the scheme was made mandatory for big construction companies. The construction companies have to get certification by showing the use of green materials and technology.

Gender

The needs between male and female genders² in a community can differ to various extents. Males and females have different capabilities and skills, and need different types of resources. Conditions following a disaster event create different pressures and demands between genders in risk reduction and social and economic recovery. However there is often insufficient attention given to gender-specific needs in the housing, education, health, employment and livelihoods, infrastructure, disaster risk reduction, environment and governance sectors. Different cultural and religious beliefs can create gender biases which prevent all members of the community receiving equivalent support during reconstruction and recovery efforts.

Advocating gender equality and providing gender-specific support to men and women in all aspects of reconstruction and recovery is an essential component of building back better.

Steps to be taken in the gender sector to BBB are:

- Provide *equal treatment, privileges and opportunities* to both genders in reconstruction and recovery activities.

Gender biases need to be eradicated. Both men and women need to be considered as equals in terms of receiving post-disaster support and inclusion in decision-making and participatory rebuilding and recovery activities. Gender equality needs to exist in planning and implementing risk reduction measures, psycho-social recovery and economic recovery. Implementation of recovery in-line with BBB needs to ensure that men and women have equal rights and authorities

² Gender consideration although typically referred to as male and female also includes transgender community members. Specific needs of transgender communities need to be addressed as part of building back better.

in becoming involved with planning, implementation, setting policies and legislation and governance. Reconstruction and recovery can also be used as an opportunity to break pre-existing gender biases in communities and provide equality in sectors such as education, health and nutrition as well.

Box 2.1.19 Gender Equality in Post-Disaster Psychological Support in Australia

Disasters create psychological issues in affected communities due to the trauma experienced from losing loved ones and neighbours, their homes and belongings, and their livelihoods. Men and women are both equally affected by trauma and need equal amounts of support although they hold different attitudes towards emotional expression.

One of the key post-disaster recovery initiatives implemented in Australia following the 2009 Victorian Bushfires was the launch of various psychological support services. Each member of the affected population was given 12 vouchers for free counselling along with education sessions held by a renowned psychologist. A unique and well-received activity launched was the “Women’s Retreats” and “Men’s Getaways”. The women’s retreats catered to gender-specific needs including grief and bereavement support, education on financial management, and meditation and health and fitness programmes. The women’s retreats allowed women to connect with other affected women and build relationships. Similarly the men’s getaways provided similar types of support for grief and bereavement and held activities such as sporting events and barbecues to allow men to relax and establish networks amongst other bushfire-affected males.

Source: VBBRA (2011)

Box 2.1.20 Gender Equality in Reconstruction and Recovery in Peru

The reconstruction and recovery effort following the 2007 earthquake in Peru promoted gender equality and empowerment of women by increasing the participation of women’s organisations in making local risk reduction plans. Equal access was provided to government housing programmes. Support was also provided for livelihood opportunities for women in agriculture.

Source: UNDP (2010)

Box 2.1.21 Gender Equality in Search and Rescue Training in India

Search and rescue training programmes were being conducted in Gujarat for local community members as part of disaster preparedness. Gender equality was assured in training provided by finding women's networks in nearby localities to circulate the message. An effective strategy was using a popular tailoring instructor who holds classes for many women to educate her students on the importance of learning disaster preparedness and response skills. The succeeding search and rescue training programme had a female attendance rate of 59%. These types of gender equality approaches were helpful in breaking the predisposition that disaster management activities were only applicable to men.

Source: UNDP (2010)

Box 2.1.22 Promoting Gender Equality through Education

The key findings on successful initiatives to promote gender equality through education from the "Girls' Education and Gender Equality" report funded by the Department for International Development London include:

- Resource and infrastructural interventions
 - Access to additional resources to cover direct and indirect costs of schooling increases the chance of lower-income families educating their daughters
 - Proximity of schools is an important factor influencing female attendance
 - Provision of "girl-friendly features" such as separate toilets
- Institutional interventions
 - Having well-trained teachers have a significant impact on girls' schooling and performance
 - Gender-training for teachers
 - Gender equality policies in school governance
 - Gender equality in the school curriculum, learning materials and pedagogy
 - Employment of female teachers and supporting women in educational management positions

See

http://r4d.dfid.gov.uk/pdf/outputs/HumanDev_evidence/Girls_Education_Literature_Review_2014_Unterhalter.pdf

- Provide *gender-specific support* for reconstruction and recovery.

The differing gender-specific needs of men and women need to be obtained from the PDNAs in different sectors and used to create tailor-made gender-specific support systems for reconstruction and recovery. Men and women have different needs with regards to risk reduction, psycho-social recovery and economic recovery, which need to be identified and supported to maximize opportunities, effectiveness and long-term sustainability for both genders. Sector-specific case study examples of post-disaster gender-specific needs and support programmes are included in the following chapters.

Box 2.1.23 Gender-specific Needs Following Disasters

Disasters have different impacts on men and women. Gender-specific effects from disasters include:

- Mortality, injury and illness rates – These are usually higher for women and girls
- Economic impacts – Economic losses are usually higher for women as they are often involved with agriculture and home-based businesses. Women also have limited access to aid.
- Post-disaster trauma and stress – Symptoms of trauma and stress following disasters are more frequently reported by women. Men may receive insufficient psychological support due to the lack of expression.
- Sexual and domestic violence – These tend to increase for women and girls in disaster contexts.

These types of specific issues need to be considered when designing reconstruction and recovery programmes for the different sectors.

- *Enforce* gender equality in reconstruction and recovery practices.

The National Disaster Plan and related post-disaster legislation must include provisions to ensure gender equality in reconstruction and recovery. A culture of equality needs to be promoted at the national level through policies, regulations and legislation. New legislation to enforce long-term gender equality practices in the community can be introduced during the reconstruction and recovery effort as part of building back better and improving the overall resilience of communities.

Box 2.1.24 Gender Equality Policies and Strategies in New Zealand

- Legislative frameworks such as the Equal Pay Act 1972, Employment Relations Act 2000 and the Human Rights Act 1993 prohibit pay discrimination between genders.
- Differences between the income earnings of men and women are monitored by the New Zealand Government in order to prevent discrimination.
- The Ministry of Women's Affairs is attempting to improve women in governance by collaborating public and private sector partners to streamline and simplify the appointment process to boards and commissions.
- The Government has appointed several private sector initiatives to improve the participation of women on private sector boards such as:
 - The Institute of Directors Mentoring for Diversity Programme
 - The 25 Percent Group and establishing accolades
 - The "Women of Influence" awards
 - The "Next Women of the Year Awards"
 - The "Global Women and Dairy Women in New Zealand" network

Box 2.1.25 Gender Equality Policy in the United States of America

In 2012 the United States Department of State released a Policy Guidance on Promoting Gender Equality (2012) to promote equality and advance the status of women and girls in America as set an example for the rest of the world.

Efforts to strengthen gender equality include:

- Promoting women’s economic and political participation – Eradicate discrimination against women in economic and political environments and develop female entrepreneurs and leaders.
- Supporting strategic initiatives related to gender-based violence against women, peace and security – Through the implementation of the “US Strategy to Prevent and Respond to Gender-based Violence Globally” (2012) and the “National Action Plan on Women, Peace, and Security” (2011).
- Empowering adolescent girls – Address specific challenges faced by girls, invest in their education and address harmful traditional practices such as forced marriage and female genital mutilation.
- Prioritize gender equality in international fora – Advocate issues affecting females in a worldwide context.
- Lead by example – Integrate focus on gender equality in the Department of State’s strategies, planning, programming and staff.

These initiatives are to be implemented through mechanisms such as:

- Planning and Budget Development – Incorporate gender equality plans in the Department of State’s strategic planning and budgeting process.
- Programming, Monitoring and Evaluation – Identify and address existing gender disparities, capitalize on the unique skills and contributions of women and girls and provide accessible support to females. The Department of State is also working in conjunction with USAID to improve monitoring and evaluation processes to achieve desired outcomes. Bureaus and embassies have been attributed portions of their budget towards ensuring gender equality.
- Management and Training – Training and information dissemination on gender equality issues and develop staffing mechanisms that focus on gender equality.

Governance

The United Nations Development Programme (UNDP) defines the role of governance as “restoring and creating service delivery capacity while initiating economic recovery”³, whilst the World Bank Strategy on strengthening public reform⁴ states that good governance involves robust macroeconomic policymaking, budget management and promotion of equitable investment opportunities along with an appropriate regulatory framework. The governance structure employed needs to enforce and facilitate the adoption of building back better practices in risk reduction, community recovery and effective implementation.

Governance is a sector on its own as well as a cross-cutting sector which applies to all the other sectors. Post-disaster governance entails several characteristics that need consideration when attempting to build back better:

- The types of institutional mechanisms used to deliver reconstruction and recovery solutions
- The political mechanisms used to shape reconstruction and recovery
- The financial mechanisms used to support reconstruction and recovery

Governance within sectors such as housing, education, health, infrastructure and livelihoods encapsulates sector-specific mechanisms used for implementing reconstruction and recovery programmes with local stakeholder participation whilst being in-line with national strategies.

³ UNDP, *Governance for Sustainable Human Development*, United Nations Development Programme, New York, 1997

⁴ World Bank, *Reforming Public Institutions and Strengthening Governance: A World Bank Strategy*, World Bank Poverty Reduction and Economic Management Network, Washington DC, 2000.

Steps to be taken in the governance sector to BBB are:

- Decide the *most appropriate institutional delivery structure* and *its role* for planning and implementing post-disaster reconstruction and recovery.

A well-founded institutional delivery mechanism must be developed in order to plan and implement post-disaster recovery to build back better ensuring effectiveness and efficiency. The implementing body chosen to deliver the reconstruction and recovery programme needs to be a national-level autonomous authority with sufficient capacity, resources, authority and legislative backing to plan, implement and monitor the reconstruction and recovery programme. The authority needs to have an over-arching view of the recovery process including sector recovery plans and projects, project sequences, time-frames and resource allocation information. The institutional delivery mechanism has to be responsible for establishing the guiding principles for the recovery effort in-line with building back better principles, create a tailor-made post-disaster reconstruction and recovery programme suitable for the local community, specify stakeholder roles and responsibilities and put mechanisms in place to monitor and evaluate the recovery effort.

The institutional delivery structure can comprise of using existing government organisations or creating a new dedicated governmental authority to plan and deliver the reconstruction and recovery effort. The important factor to consider in order to BBB is to ensure that the institutional delivery structure chosen works in-line with current local governance structures and regulatory frameworks of the affected communities in order to be effective and practical.

Existing government organisations can be used if they have the capacity, resources, in-house knowledge, expertise and strong partnerships with other government organisations to plan and implement a reconstruction and recovery programme. The use of existing government

organisations is appropriate where comprehensive systems for dealing with post-disaster situations have already been put in place in pre-disaster periods, they have well-established facilitation mechanisms to assist recovery, and pre-existing relationships with national and local-level stakeholders.

The creation of a new or dedicated recovery authority to respond to reconstruction and recovery is the popular choice in most countries where the capacities and capabilities of existing governmental organisations are insufficient. Recovery authorities are usually created by a legislative mandate which gives the recovery authority powers to alter existing implementation mechanisms and legislation and regulation to benefit the recovery process. The newly created recovery authority is usually staffed with employees from government, non-government and private sector organisations with relevant knowledge, expertise and relationships. The recovery authority can have a short-term mandate in response to a specific disaster event, or it can be sustained as a permanent institution responsible for pre- and post-disaster management functions.

- Devise an *effective exit strategy* for short-term recovery authorities.

In the case of a recovery authority established with a short-term mandate, an exit strategy needs to be generated to create a smooth transition back into normal government streams of operation whilst providing sufficient continued support with recovery-related issues. Recovery-related information must be transferred from the recovery authority to the government organisations responsible for different sectors. A few personnel can be dedicated within each government organisation to respond to recovery-related issues following the termination of the recovery authority. The exit strategy must take into account the unpredictable nature of post-disaster environments and remain flexible. It must allow ample time for reconstruction and recovery

projects to be launched and carried out satisfactorily. The recovery authority must only be terminated once its specific services are no longer required.

- Combine *central-level coordination* of recovery with *decentralized planning and implementation*.

Grass-roots level information and knowledge needs to be taken into account to plan and implement recovery programmes that are tailor-made to meet the needs of affected communities for risk reduction and social and economic recovery. Bottom-up approaches can provide valuable insight on local community vulnerabilities, sensitivities and special needs. This involves decentralisation to include local-level organisations and community members in participating and sharing their knowledge and skills. In order to be effective and efficient the recovery needs to be coordinated and managed at a central level by the chosen implementing body.

- *Strengthen the capacity* of disaster-impacted organisations to take part in recovery.

Replace missing staff using people from other cities/organisations, and/or recruit additional temporary staff with proper training. Managerial and technical capacities of staff needed for critical tasks must be strengthened with training programmes.

- Establish *clear roles and responsibilities* for all stakeholders.

All major stakeholders involved in the recovery effort need to be registered with the implementing body with clear roles and responsibilities allocated to them to avoid confusion or duplication of tasks. It is the responsibility of the implementing body to oversee and coordinate the functions of the stakeholders to improve efficiency and effectiveness in order to BBB.

- Foster effective *stakeholder partnerships, collaborations* and *effective communication*.

The implementing body has to facilitate and build partnerships and collaborations between stakeholders to improve the efficiency and effectiveness of recovery. Relationships with civil society and private sector organisations need to be strengthened. Multi-stakeholder partnerships and collaborations can be cultivated through the use of recovery plans and policies enforcing relationships for recovery projects. Effective communication between stakeholders need to be facilitated through holding regular multi-stakeholder meetings and encouraging information sharing. It is especially important to enable consultation between stakeholders and scientific institutions to access technical expertise.

- Use *legislation to enforce* recovery plans and BBB strategies.

Legislation should be utilized to enforce BBB strategies in reconstruction and recovery such as disaster risk reduction (building codes, land-use plans), gender equality, environmental sustainability, community-inclusive recovery practices and quality control.

- Use *legislation to facilitate* recovery activities.

Legislation should also be utilized to facilitate recovery activities by exempting/fast-tracking and simplifying complex bureaucratic procedures to assist recovery without compromising quality.

- Use *past knowledge* in recovery planning.

Lessons learnt from past experiences must be reviewed and incorporated when designing recovery programmes.

- Create a *separate post-disaster recovery fund* and ensure *fair and transparent funding allocations* to reconstruction and recovery projects to build back better.

All funds dedicated to reconstruction and recovery from Government budget allocations and from donors should be directed towards a separate post-disaster recovery fund. The implementing body chosen to coordinate recovery must be transparent to stakeholders and local communities about the funding available. Adequate funding needs to be provided to adopt resilience building practices in all sectors in order to build back better. Feedback on prioritisations from the sector PDNAs should be examined to determine funding allocations for recovery projects in different sectors. Funding disbursement should be regulated and provided in stages linked with results/quality assurance to ensure that recovery projects are completed to the required standards.

- Maintain a *thorough information database*.

Investing in creating and maintaining a comprehensive database to record all information about the recovery effort obtained from the PDNAs and data gathered during the recovery effort is necessary. The information database is an essential tool to keep track of recovery progress, manage stakeholders, manage finances, readily search for information, monitor and evaluate the recovery effort, and extract lessons learnt for legacy reports and future disaster management practices.

- Put in place *long-term monitoring and evaluation* systems.

Monitoring and evaluation (M&E) of the recovery effort must be organised throughout the recovery period by providing sufficient financial and staffing resources. The M&E results should be used to produce regular progress reports and provide recommendations to improve ongoing recovery efforts as well as produce lessons for the future. M&E needs to continue at local, regional and national level after reconstruction and recovery is completed to track the long-term effects of recovery solutions.

- *Retain knowledge and create expert groups* to educate and train personnel for future disaster events.

The knowledge gained from a disaster needs to be preserved in the form of reports and literature, but also by creating multi-sector expert groups including people with practical experience from participating in the reconstruction and recovery effort. These experts should be used to train and educate other staff to expand future disaster management capacity.

Box 2.1.26 Using Existing Government Organizations for Post-Disaster Recovery in China

The Wenchuan Earthquake struck the Sichuan province in China in May 2008 killing nearly 70,000 people. The devastating earthquake resulted in millions of people becoming homeless and damages exceeding US \$20 billion.

The National Development and Reform Commission (NDRC), which is the planning ministry of the Chinese Government for large development programmes with national strategic importance, initiated the preparation of a state recovery plan following the ice and snow disaster that affected the southern areas in China in 2008. Therefore when the earthquake occurred the NDRC took the responsibility of planning the reconstruction and recovery effort following the principles of the state recovery plan that was in progress.

Reconstruction and recovery planning was begun very early on during the response and relief stage. This was helpful in gaining a better understanding of short-term, medium-term and long-term recovery needs. The early planning enabled more accurate resource allocation to meet needs in various stages of recovery.

In order to plan and implement the reconstruction and recovery programme in a collaborative and cohesive manner, the Government of China established a drafting group consisting of 40 ministries, provincial governments and state specialized institutes chaired by NDRC. The central authorities planned for large-scale reconstruction while line ministries in charge of specific sectors began to plan recovery in counties and cities. The results of the needs assessments carried out were evaluated by NDRC and finally the “State Overall Planning (SOP) for Post-Wenchuan Earthquake Restoration and Reconstruction” was finalized and made effective by September 2008.

A management system was developed to implement the recovery tasks in each sector with roles and responsibilities assigned to the local governments and relevant ministries. A coordination committee at the state level chaired by the minister of NDRC ensured that all activities set by the SOP were being carried out. Mid-term and final overall evaluations were conducted to assess the completion of tasks and undertake performance assessments.

Source: UNISDR et al. (2011)

Box 2.1.27 Creation of a Recovery Authority to Implement Post-Disaster Reconstruction and Recovery in Australia

Following the 2009 Victorian bushfires in Australia, the Victorian and Commonwealth Governments decided to establish a new recovery authority called the Victorian Bushfire Reconstruction and Recovery Authority (VBRRA) to coordinate and oversee the rebuilding and recovery programme. VBRRA was chaired by the former Chief Commissioner of Police in the state of Victoria and assisted by a Chief of Operations and a Chief Executive Officer who were appointed to look after day to day operations. A Parliamentary Secretary for Victorian Bushfire Reconstruction was appointed to ensure collaboration between the Commonwealth-State response and bushfire recovery. The Premier of Victoria determined VBRRA's staffing and support structures. A Bushfire Recovery and Reconstruction Committee of Cabinet comprising of Victorian and Commonwealth Government Ministers was appointed for decision-making with regards to reconstruction and recovery policies. An Interagency Taskforce and an Expert Reference Group including key stakeholders from industry, community organisations, Municipal Association of Victoria, the Country Fire Authority, Victoria Police, Members of Parliament, and Victorian and Commonwealth Government officials were formed to provide advice and assistance to VBRRA.

VBRRA established several guiding principles for recovery which included welfare, meeting needs, community engagement, integrity and tailored solutions. VBRRA also created the recovery and reconstruction framework which consisted recovery plans for People (safety, health, welfare, wellbeing), Reconstruction (residential, commercial, rural, public buildings), Economy (individuals, business, infrastructure, government) and Environment (biodiversity and ecosystems, amenities, waste and pollution management, natural resources). Feedback gathered from multi-stakeholder meetings and public meetings held by VBRRA was used to identify recovery needs and design the recovery plans. VBRRA's approach was consultative but decision-making, planning and implementation took place in a centralized manner. This created mixed results as recovery progress was not always in-line with grass-roots level community needs.

The Victorian Bushfire Appeal Fund (VBAF) was established one day following the fires by the Victorian Government in partnership with the Commonwealth Government and Australian Red Cross to collate the funds donated for the recovery effort. VBRRA appointed the Department of Human Services Victoria (DHS) with the responsibility of distributing the VBAF funds with the assistance and instruction of an independent advisory panel consisting of the former Victorian Governor, Vice Chancellor of the University of Melbourne, former Deputy Premier of Victoria, Mayor of Murrindindi Shire Council, Chief Executive of Australian Red Cross, VBRRA's Chair and an official from DHS. The VBAF funds were delivered through various grants and loans for residential and business rebuilding and recovery. VBAF funds were regulated to a certain extent, but personal grants given to residents lacked regulation resulting in the misuse of funds for non-recovery related expenses.

Box 2.1.27 Creation of a Recovery Authority to Implement Post-Disaster Reconstruction and Recovery in Australia Contd.

The Victorian Bushfires Royal Commission (Royal Commission) was set up shortly after the bushfires event to investigate the cause of the fires and evaluate the bushfire recovery effort to provide recommendations for improvement. Eighteen months after the event the Royal Commission published a comprehensive report on its findings including the cause of the fires and recommendations for fire preparation, response and recovery. VBRRA used the recommendations to carry out the reconstruction and recovery programme.

VBRRA was initially given a two-year mandate with the role of by-passing regular institutional delivery systems and legislations to plan and coordinate reconstruction and recovery activities during this period. It was evident by the end of this period that the recovery was behind schedule and needed VBRRA to remain active. Therefore VBRRA was extended until 2011. Most of the special legislations and regulations put in place to assist recovery were also extended. VBRRA's operations were finally terminated by the end of June 2011, 2.5 years following its launch. The local community preferred VBRRA to have been active for a longer period of time until recovery activities were more finalized.

In order to respond to these residual needs the Victorian Government established the Fire Recovery Unit (FRU) within Regional Development Victoria (RDV) as part of VBRRA's exit strategy. FRU functioned as a transitional body to provide ongoing recovery-related assistance to individuals and communities. FRU's mandate specified that it was not a delivery organisation like VBRRA. FRU's role was only to receive recovery-related queries and direct them to normal government streams for resolution. Since VBRRA's documents and records were transferred to FRU when it was terminated, FRU carried out several progress surveys and produced reports establishing lessons learnt. As FRU's work load subsided, it was gradually downsized and closed down by 2014. Following the shutdown of FRU, an organisation called Emergency Management Victoria (EMV) was launched to operate as a permanent overarching body to support disaster event management, response, recovery and resilience in Victoria for the future as recommended by the Royal Commission. FRU's findings were transferred over to EMV to shape its future disaster management plans.

Source: Mannakkara (2014)

Box 2.1.28 Disaster Management Governance in Bangladesh

Bangladesh has a high vulnerability to disasters, being exposed to a range of hazards including floods, cyclones, tornadoes and river erosion on a frequent basis. Therefore the country has adopted the Hyogo Framework of Action 2005 (HFA) and has a well-established institutional mechanism and policy to respond to disasters in place.

All disaster management activities are governed by the National Disaster Management Council (NDMC), which is headed by the Prime Minister of Bangladesh. NDMC provides strategic guidance in disaster preparedness, response and recovery. A Ministry of Disaster Management and Relief (MoDMR) was established under the NDMC, which acts as the key agency that formulates policy and with the Department of Disaster Management (DDM) formed under the ministry, oversees the implementation and coordination of disaster response efforts in 29 sectoral ministries. The ministries are provided with an annual block fund to undertake relief and recovery operations. District and municipal level disaster management committees were formed for local-level implementation.

Following the impacts of Cyclone Sidr and the resulting floods in 2007, further action was taken to strengthen Bangladesh's disaster management environment. In 2012 the Disaster Management Act, 2012 was created outlining the country's legal framework for disaster management adopting a broader definition of recovery covering private and public infrastructure, economy, livelihood and psychosocial aspects of disaster recovery. The Bangladesh Climate Change Strategy and Action Plan was released in 2009 along with funding mechanisms to support the country's disaster management efforts. In 2011 the Sixth Five-Year Plan of Bangladesh (2011-2015) was published outlining a roadmap for disaster-resilient sustainable development and building back better.

Box 2.1.29 Post-Disaster Recovery Governance for Building Back Better in Pakistan

The October 2005 Kashmir Earthquake was a devastating disaster event for Pakistan. The earthquake far outweighed the damages incurred from the types of hazards frequently experienced in Pakistan such as floods and windstorms. The earthquake resulted in 73,000 deaths and impacted 8 districts with estimated overall damages amounting to US\$3.5 billion.

The Government of Pakistan adopted a four-pronged approach for post-disaster recovery planning in review of international best practices. The four-pronged approach initiated simultaneously included:

- Strategy and Standard Setting for Recovery Planning
- Setting up the Institutional Arrangements
- Setting in Motion Consultative Mechanisms
- Undertaking Preparatory Exercises, Surveys and Fieldwork

A Damage and Needs Assessment was initiated and carried out by the Government of Pakistan in partnership with the World Bank and Asian Development Bank immediately following the earthquake. The results of the assessment were released 5 weeks after the event which enabled prompt arrangements of donor pledges to finance recovery as well as develop a strategic vision for recovery. Strategic objectives were developed for the reconstruction and recovery programme including policy standards, strategic priorities, timeframes, identification of stakeholders, geographic delineation, and administrative and functional jurisdictions.

Cross-cutting operating principles and performance benchmarks for multi-sectoral recovery were also set at this stage, which were as follows:

- Central policy making and coordination
- Subsidiarity and local implementation
- Public sector facilitation of private recovery
- Restoration of sustainable livelihoods
- Independent oversight and transparency
- Effective management of public expectations and grievances
- Fostering public private partnerships and availing community capabilities
- Ensuring and promoting longer term disaster risk reduction and climate change adaptation
- Environmental and social safeguards
- Gender-issues and protection of vulnerable groups

Box 2.1.29 Post-Disaster Recovery Governance Approach in Pakistan Contd.

Concurrent with establishing the recovery strategy and standards for recovery planning, the Government of Pakistan started setting up appropriate institutional arrangements for post-disaster recovery. First a quick review and clarification of the pre-existing, multi-tiered and multi-sectoral institutional mandates was conducted. This was followed by a systemic process of developing institutional structures to manage and execute the recovery programme, create or modify legislation to assist with recovery, and identify and mobilize required staff and resources from all levels of government, private, technical and international development organisations.

Early disaster relief efforts were led by the Federal Relief Commission (FRC).

Due to the magnitude of the event and required recovery programme, the Earthquake Reconstruction and Recovery Authority (ERRA) was established a few weeks following the disaster event. ERRA was set up as a time-bound central authority under the Prime Minister's office to undertake residual relief, early recovery and long-term reconstruction activities. Due to the vast scope and variety of work involved in reconstruction and recovery, as well as the range of local and international stakeholders involved, having a centralized oversight body was recognized as essential. ERRA's scope of work included strategic planning, resource mobilization, coordination with all stakeholders, and monitoring and evaluation.

ERRA's apex body was the ERRA Council headed by the Prime Minister which provided strategic policy oversight and sustained financial management. An ERRA Board was established chaired by the Chairman of ERRA with government and civil society representatives. The ERRA Board ensured that the developed policy decisions, annual plans, programmes, projects and schemes were implemented. ERRA's staff comprised of civil servants from federal, state and provincial governments, armed forces, civil society, and national/international consultants. The staff, knowledge and relationships created with locals by the Federal Relief Commission (FRC) who undertook early disaster relief activities were subsumed into ERRA. This allowed ERRA to align reconstruction programmes with the relief work conducted by FRC and develop grass-roots level relationships. Provincial, District and State-level Earthquake Reconstruction and Recovery Authorities were also established replicating ERRA's programmatic planning and implementation models at lower levels. Line Departments were included in the reconstruction programme to ensure that BBB policies would be continued once ERRA's work was completed.

Different sector recovery policies were first designed by an ERRA technical team with input from relevant international agencies (e.g. World Health Organisation for health), which was then reviewed by sectoral Technical Advisory Groups in order to be adaptable for the local context. Input from sectoral implementers and local communities was also obtained, after which the policies were modified and presented to the ERRA board and Council for finalization and release.

Box 2.1.29 Post-Disaster Recovery Governance Approach in Pakistan Contd.

Another function of ERRA was to streamline and manage recovery finances. Having ERRA act as a central body to manage and distribute recovery funds ensured that the funding was dedicated to reconstruction and recovery. Although ERRA collected and distributed funds in a centralized fashion, implementation and decision-making was decentralized to support ownership-building. ERRA created a tiered financial independence system where individual implementing agencies and affected communities were given independence over the types of initiatives to implement using the funding allocated. For example, Provincial, District and State-level Earthquake Reconstruction and Recovery Authorities were given independence on approval of projects within centrally managed ERRA standards.

A Monitoring and Evaluation Wing (M&E Wing) was also established under ERRA at its inception. The functions of the M&E Wing was to focus on results and beneficiaries, lessons learning, transparency and communication. Internal and external parallel systems of monitoring were put in place with monitoring done at project-level. Financial monitoring was done internally. M&E teams were put in place to oversee technical aspects of reconstruction, social impact, construction monitoring etc. M&E was continued over the lifecycle of the projects with monitoring done against Key Performance Indicators (KIPs). Project Implementation Coordination Units (PICUs) were established at the project level to ensure reconstruction progress remained on schedule and maintain links with affected communities. The PICUs reported back to the relevant sections of ERRA regularly.

Key recommendations from experiences in Pakistan's post-Kashmir recovery effort include:

- Put in place ex-ante institutional arrangements for recovery
- Develop national policy standards for informing and guiding disaster recovery strategies
- Consolidate reconstruction and recovery into one agency with a clear legislative mandate that provides oversight and a single point of coordination for all stakeholders
- Decentralize implementation
- Set a clear exit and transitional strategy
- Maintain a strategic and institutional continuum between preparedness, recovery and prevention
- Develop ex-post National Recovery Frameworks to improve future disaster resilience
- Recognize that a Recovery Framework would not replace a PDNA
- Manage and monitor recovery to establish quality control, build capacities and integrate disaster risk reduction in recovery

Box 2.1.30 Post-Disaster Recovery Authority in Yemen

The recovery following the tropical storm that impacted regions of Yemen in October 2008 was undertaken by sectoral line ministries coordinated by the office of the President and the cabinet. However due to the ad-hoc nature of recovery activities that was taking place, in mid-2009 the government established the Reconstruction and Recovery Fund (RRF) to support and coordinate the recovery effort. The RRF was dedicated to achieving national, social, economic and humanitarian objectives using a strong executive management structure and decentralised implementation. RRF ensure transparency in policies, supported effective communication between executives and local-level beneficiaries, prioritized flexibility, and fostered partnerships with local communities, NGOs, and the private sector.

The project implementation process involved projects being selected by the RRF executive branch, which is then discusses with local entities specialized in construction and infrastructure development. A feasibility study would be conducted by the local entities, and then presented to the RRF's review board to obtain project implementation approval. RRF worked in coordination with the local government in every aspect of recovery with regular meetings.

Box 2.1.31 Post-Disaster Recovery Governance for Building Back Better in the Philippines

In 2010 the Philippine Disaster Risk Reduction and Management (DRRM) Act of 2010 was legislated. The Act authorized the establishment of a National DRRM Council (NDRRMC) comprised of the heads of 36 government agencies, and private sector and civil society representatives for policy setting, coordinating and supervising DRRM activities, and conducting monitoring and evaluation (M&E). The DRRM Act mandated the creation of a National DRRM Plan, which then identified the National Economic and Development Authority (NEDA) as the lead agency responsible for carrying out recovery functions, with the support of national government and regional line agencies, local government units (LGUs), and civil society organisations.

However, due to the scope of the recovery effort resulting from the impacts of Typhoon Yolanda in 2013, the President of the Philippines deemed it necessary to create an agency that was exclusively dedicated to the post-typhoon Yolanda recovery effort. Therefore, the Office of the Presidential Assistant for Rehabilitation and Recovery (OPARR) was established with a mandate of two years to develop an overall recovery strategy corresponding to short, medium and long-term recovery plans and programmes, and to unify the efforts of all the stakeholders involved in reconstruction and recovery.

Box 2.1.31 Post-Disaster Recovery Governance for Building Back Better in the Philippines Contd.

OPARR's role includes:

- Coordinating with the NDRRMC , its member agencies and LGUs to formulate plans and programmes for reconstruction and recovery
- Proposing funding support for reconstruction and recovery
- Monitoring and evaluation of recovery with NEDA

OPARR created the Comprehensive Rehabilitation and Recovery Plan (CRRP) which set out its reconstruction and recovery programme asserting BBB principles. OPARR organised five agency clusters for reconstruction and recovery covering infrastructure, resettlement, social services, livelihood and support. Each cluster is headed by a lead national government agency with coordinates with LGUs, civil society, private sector, international and local development partners, and other stakeholders. Philippines already had a decentralised governance system where LGUs have significant decision and policy making authority which aided local-level recovery.

The recovery effort was funded by the national government's own budget and disbursed financing from existing government programmes and mechanisms to finance the LGUs. An M&E framework is still being finalized by the Government of Philippines. Meanwhile OPARR developed a tool called EMPATHY to monitor the progress of reconstruction. Monitoring of recovery funds and its transparency is done using a tool called Foreign Aid Transparency Hub (FAITH).

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SECTION 2.2 BUILDING BACK BETTER IN THE HOUSING SECTOR

Introduction

The housing sector refers to public and private housing in the community. The housing sector is one of the most important sectors determining the success of a recovery effort. Providing safe housing for local communities is a priority.

This section on identifying Building Back Better practices in the housing sector is intended to inform the Post-Disaster Needs Assessment (PDNA) for the Housing and Settlements Sector¹. The PDNA's scope includes collecting information to understand the characteristics of the housing sector, assess damages, determine the effects of the disaster on governance and social processes, analyse the impact of the effects on the housing sector on the wider economy and society, assess coping mechanisms, measure the immediate and recurring risks faced by the population and develop a recovery and reconstruction strategy that reflects the housing and settlement needs of the affected community. Understanding the aspects required to BBB helps shape the PDNA to more effectively capture all the necessary information. BBB considerations need to be kept in mind when assessing sector damages, losses and needs.

As stated in the PDNA for the Housing and Settlement Sector, looking at the housing sector encompasses issues related to:

- Policy and regulatory framework and institutional capacity building

¹ GFDRR, UNDP and EU, *PDNA Guidelines Volume B – Housing*, GFDRR, UNDP and EU, 2014, https://gfdrr.org/sites/gfdrr/files/WB_UNDP_PDNA_Housing_SP_FINAL.pdf

- Land and property
- Financing
- Labour and implementation
- Technology and construction practices
- Architectural design
- Construction materials
- Building codes and compliance mechanisms and quality assurance
- Risk reduction measures related to settlement or construction

It is necessary to comprehensively understand the housing sector environment in order to create a plan to build back better. The baseline information obtained from conducting the PDNA for the Housing and Settlements Sector creates a clear picture of the situation at hand.

Taking into consideration the understanding of “Building Back Better” from Section 1 of this annex and the information provided by the PDNA, the following sub-section will discuss best-practices and recommendations to successfully build back better in the housing sector under Risk Reduction, Community Recovery and Effective Implementation.

Considerations for Building Back Better in the Housing Sector

Risk Reduction

Steps to be taken into consideration for risk reduction in the housing sector to BBB are:

- Put in place *disaster risk reduction* measures to increase the resilience of houses (refer to Disaster Risk Reduction recommendations in Section 2.1).

Many countries do not have building codes or specified building standards for the design and construction of homes. In order to improve the resilience of the housing sector, legislated building codes or building standards for housing construction must be adopted.

Legislated risk-based land-use plans must be adopted to identify lands appropriate for residential settlements. If current settlement areas are too risk-prone and unaffordable or impractical to build on, relocating housing settlements into lower risk areas should be done using mechanisms such as land-swaps and buy-back schemes.

Home-owners need to be able to afford long-term maintenance of their homes. Therefore it is necessary for building codes and regulations to provide pragmatic options to facilitate adoption.

Box 2.2.1 Resource availability issues during rebuilding in Victoria, Australia

The building code revisions made following the 2009 Victorian Bushfires specified specialized products for increased ember protection in high bushfire risk areas. However these specialized products were still under testing by the time the rebuild had commenced and were not available for use. This created major delays in the rebuild and also led some frustrated home-owners to carry on rebuilding without using the correct products. This lowered their capacity to withstand the prevalent bushfire risk.

Source: Mannakkara and Wilkinson (2013)

Box 2.2.2 Lack of enforcement of building codes in Sri Lanka

Although a series of guidelines for housing construction in relation to a range of different hazards was introduced in Sri Lanka by institutions and groups such as the Centre for Housing Planning and Building, National Housing and Development Authority, the Technical Advisory Committee and Society of Structural Engineers both before and after the 2004 Indian Ocean Tsunami due to the lack of compulsory enforcement the building stock in the country still remains vulnerable. This was evidenced by the large-scale destruction that was caused to housing settlements in recent disaster events such as the 2010-2011 floods and the 2014 Badulla landslides.

Box 2.2.3 BBB Recommendations for Resettlement

Resettlement needs to be conducted using a comprehensive and transparent resettlement strategy. The following needs to be considered to ensure that resettlement programmes comply with BBB concepts:

- Use resettlement as an option **ONLY** for housing on high-risk lands where in-situ rebuilding is not feasible
- Collect thorough background information about households subject to resettlement
- Identify potential low risk land sites close to the original settlement location
- Involve the community and provide choices in choosing new land sites
- Provide incentives for relocation such as relocation payments and establishing employment opportunities, recreational, educational and health facilities, and infrastructure at the resettlement sites
- Provide support for resettlement through counselling and advisory services

Source: Mannakkara (2014)

Box 2.2.4 Relocation of housing settlements to build back better in Mozambique

Mozambique is a country exposed to recurring major flood events. The three biggest flooding events took place in 2000/2011, 2007/2008 and in 2013. The flooding events have affected millions of people each time displacing them from their homes and impacting on infrastructure and the economy.

Due to the vulnerability of the location of the housing settlements relocation was chosen as a viable option for vulnerability reduction. A relocation policy approved in 2007 was implemented by the National Institute for Disaster Management (INGC). The relocation policy included:

- Provision of plots of land
- Construction of resilient housing for vulnerable population groups
- Provision of basic social services
- Effort to increase income generation opportunities

The relocation programme was a success with the population visibly facing reduced risks of victimization due to flooding events as compared to previous years. 99 communities were settled along the river basis of Zambeze, Punge, Buzi and Limpopo. Socio-economic infrastructure such as health centres and schools were rehabilitated and repositioned in these areas. Economic conditions in the resettled areas have also improved.

However, the relocation process in Mozambique has generated valuable lessons for future consideration including:

- Understanding that *each relocated community has unique specifications and characteristics*. Thus the amount of time and effort invested in each location is highly variable.
- *Economic opportunity is a critical part of recovery*. People opt to relocate when the socio-economic gains are understood; conversely they may prefer to continue living in (unsafe) flood zones when economic opportunities in the new communities are fragile.

Box 2.2.4 Relocation of housing settlements to build back better in Mozambique Contd.

- *District government must be involved.* Local leaders play a critical role in coordination and interaction between government, communities, and relocation partners. They play a bridging role in identifying (vulnerable) individuals who merit special assistance, and priorities for replacing or repairing damaged infrastructure and equipment.
- *Community participation increases consumer satisfaction.* While the size and allocation of land parcels may not be negotiable, families who customize their housing designs in Mozambique were able to introduce space for chicken coops, animal pens or a terrace and garden.
- *Relocation is more than reconstruction.* Families and households need to recognize the opportunity of relocating to live in a house that is designed to be more resilient and secure than where they previously lived. Social services such as education and health and an accessible market are equally important for helping communities to adjust to life in new locations.
- *Logistics management is critical.*

Box 2.2.5 Land swap scheme in Grantham, Queensland

Following the 2011 Queensland floods in Australia a compulsory “land-swap” scheme was put in place in the small flood-prone town of Grantham. The entire neighbourhood was relocated to a safer area by providing equivalent blocks of land in exchange for the land previously owned.

Source: Queensland Floods Commission of Inquiry (2012)

Box 2.2.6 Land buy-back schemes in Australia and New Zealand

Both Australia and New Zealand adopted land “buy-back schemes” as a measure of avoiding extravagant design and construction on high risk lands following the 2009 Victorian bushfires and the 2010/2011 Canterbury earthquakes respectively. In both countries the Government opted to buy lands classified as high risk from owners encouraging relocation to safer lands. In both countries the land-use of the bought-back high risk lands was restricted prohibiting future residential construction.

- *Provide transitional accommodation* to relieve pressures on rebuilding.

Despite various actions put in place to speed up the rebuilding process, delays are inevitable. Ignoring or curtailing necessary procedures to save time produces poor results. Therefore it is necessary to provide comfortable transitional accommodation options for home-owners awaiting repair and/or reconstruction to relieve time pressure on the rebuild and allow structural changes to be made properly. The focus however needs to still remain on permanent dwellings and long-term reliance on temporary accommodation must be avoided.

Box 2.2.7 Transitional accommodation in Turkey

A three-step housing strategy was put in place in Turkey following its 7.6 magnitude earthquake in August 1999. The housing strategy involved:

1. Tents provided by Turkish military and Red Crescent as temporary shelter immediately following the disaster
2. One year of monthly rental allowance was provided by the Government along with the building of pre-fabricated temporary housing units as transitional accommodation 3-6 months following the earthquake
3. One year following the event permanent housing was financed by the World Bank, European Development Bank, foreign governments and NGOs.

Source: Baradan (2006)

- Ensure *high quality rebuilding* by using *skilled builders* for reconstruction and arranging *quality assurance inspections*.

Housing construction is undertaken by unskilled people in many developing countries. In order for housing reconstruction to be resilient, the use of certified skilled builders or trained locals with strict supervisions needs to be employed.

- Provide *education to home-owners* on risk reduction, building regulation and land-use plan revisions applied to the housing sector.

Putting in place DRR mechanisms to improve the resilience of homes is ineffective if homeowners do not understand their importance and fail to adopt them. The success rate of accepting and adopting DRR initiatives such as resettlement, using building codes, using skilled builders etc. can be increased by educating the community on the implications of adopting/not adopting and by providing training on how to adopt them correctly. Providing this education and training prior to rebuilding prevents confusion and unnecessary delays.

Community Recovery

Considering the needs of the community and supporting the recovery of affected people and the community's economy are equally important to building back better as reducing risks to create a safer community. The social and economic consequences of every decision made in the rebuilding of the housing sector needs to be considered and responded to.

Steps to be taken to support the social and economic recovery of communities when rebuilding housing to BBB include:

- *Understand* the local community's social and economic structure by collecting extensive information from the PDNA.

The social and economic fabric of the local community needs to be understood in order to plan and put in place effective mechanisms to support community recovery during housing reconstruction. These include information about the different types of community groups present, the housing types present, traditional housing and land tenure types, their lifestyles, their livelihoods and other special characteristics indigenous to the specific community. This information must be used to create a housing reconstruction plan which supports social and economic recovery.

- Understand the *impact* of the housing reconstruction plan on the *local economy*.

Housing reconstruction and economic recovery of communities are closely linked. The rate of success of residential rebuilding impacts the decisions made by business-owners on whether to re-establish their businesses. Business-owners are hesitant to rebuild in a community with low numbers of residents, while in turn residents are hesitant to rebuild their homes in a community that is suffering economically. Therefore in order for the recovery of communities following a disaster to be a success, serious commitment needs be provided to encourage business rebuilding alongside housing rebuilding and vice versa. The relocation of housing settlements away from traditional livelihoods also impacts the local economy. Hence, if relocation is considered, arrangements need to be made to support people returning to their traditional livelihoods or provide training and resources to adopt new livelihoods.

Box 2.2.8 Post-disaster reconstruction impacts on livelihoods in Sri Lanka and Samoa

Sri Lanka and Samoa were both struck with tsunami events in 2004 and in 2009 respectively. The coastal communities of both countries were heavily impacted by the disaster. Therefore the reconstruction strategies implemented in Sri Lanka and Samoa involved resettling vulnerable coastal communities inland for protection from future tsunami events and other coastal hazards.

Coastal buffer zones were initiated in both countries where construction along a specified width of coastal strip was prohibited. However this regulation greatly impacted the local economies in countries as the coastal communities earned their income from sea-dependent livelihoods such as fisheries and tourism. Being located far away from the sea was therefore detrimental to their personal recovery, which led many people to illegally encroach back into the unsafe coastal areas.

- Establish *psycho-social support services* to assist home-owners.

It is important to understand that having to reconstruct their lives following a disaster is a traumatic and emotional time period for the affected community. People are under a lot of stress and pressure which is further exacerbated during the rebuilding process. Therefore it is vital that accessible psychological support such as free personal, family and group counselling needs to be provided to the community to assist them with their personal recovery. The housing rebuilding process will benefit greatly from home-owners who are on the path to emotional recovery.

Advisory services which provide personalized assistance and advice to home-owners about the overall recovery process and about housing reconstruction in particular needs to be put in place.

The rebuilding advisory service should be equipped with people who have extensive building and project management experience to help home-owners understand the technical, financial, legal and contractual aspects of rebuilding, assist with decision-making and support home-owners with resolving disputes related to construction.

Box 2.2.9 Community Support Services established in Australia

A few days following the 2009 Victorian Bushfires event, the Victorian Bushfire Reconstruction and Recovery Authority (VBRRA) implemented a case management service. Each affected family were assigned with a personal case manager whose role was to work with families and individuals to assist them with locating and understanding rebuilding and recovery services provided by (VBRRA) and to connect them with services that best met their needs. Community Service Hubs which acted as information centres were established in the bushfire-affected communities for people to visit. Free counselling services were provided for the community at the Community Service Hubs as well. Support groups for specific community groups such as the bereaved, men, women, youth and children were also started.

The Rebuilding Advisory Service (RAS) was an initiative put in place by VBRRA to specifically support housing reconstruction. The RAS was very successful and assisted many people who found themselves in difficult situations during the rebuild due to lack of awareness and understanding. The local community in Victoria as well as Government stakeholders collectively recommend adopting rebuilding advisory services as standard practice.

Source: VBBRA (2011)

- Promote *local community participation, transparency* and *local programme ownership*.

Home-owners should be involved in the housing rebuilding process. Owner-building² is a good option for housing reconstruction provided that extensive support services are provided for the owner-builders. Technical support should be given at all stages during rebuilding to ensure design and construction is undertaken according to the proper standards. Owner-builders require moral support and financial advice to assist them with decision-making and managing finances, which can be provided through established Rebuilding Advisory Centres as recommended above. Some training and education need to be provided to owner-builders before they commence reconstruction to update them on relevant building and planning regulations, building contracts

² Home-owners manage and/or participate in the building of their home.

and finances. If the housing reconstruction programme chooses a donor-driven approach where external agencies undertake building contracts, it is necessary to ensure that home-owners are thoroughly consulted and informed throughout the rebuilding process. Transparency needs to be maintained with home-owners by the government at all times.

Box 2.2.10 Owner-building in Sri Lanka

The housing rebuilding strategy in Sri Lanka following the 2004 Indian Ocean Tsunami took two approaches:

1. Owner-building programme, where home-owners were given funds to repair or rebuild their own homes, typically in-situ
2. Donor-driven programme, where donor agencies funded and implemented the rebuild, usually relocated at a new site

The owner-building programme was deemed to be much more successful with houses produced quickly, with better suitability to local needs and preferences at a lower cost. The homes built were spacious with better designs, layouts and locations. Households who were part of the owner-building programme were very satisfied with their homes. Taking part in the owner-building process also assisted with the psychological recovery and resilience of the people.

The donor-driven programme largely created homes that did not satisfy local requirements due to the lack of consultation and involvement of the home-owners. The relocation process also created social problems due to being away from traditional livelihood locations, services and amenities. A large number of the houses from donor-driven programme remain unoccupied and abandoned.

Box 2.2.11 Participation of Local Villagers in Housing Reconstruction in Indonesia

Owner-building and local community participation was an important component of the housing reconstruction strategy following the 2004 Indian Ocean Tsunami. In Keude, a town situated in Aceh, housing construction was undertaken by village action groups headed by a skilled labourer who provided constant supervision. Each house was constructed by one skilled craftsman, usually appointed by the home-owner, assisted by 2-4 labourers. House owners were also able to participate in the rebuilding process based on their skill level.

The village action group leaders and labourers had to sign community contracts to participate in the rebuild, after which they were briefed at a 1-day seminar about their duties and the participatory approach to be adopted. They were educated about the technical guidelines, specifications and drawings to be used for the rebuild and the preparation of bills of quantities, and were provided copies of all necessary documents. Construction materials were provided to the labourers for the appropriate bill of quantity with approval. The labourers were paid according to the progress that was achieved. If action groups were habitually or permanently absent from their work sites, their contracts would be cancelled without written notice.

The work was supervised on a daily basis by technicians from a local NGO who were permanently stationed in Keude. They also provided technical advice to the labourers and home-owners.

Source: Asian Development Bank (2010)

- Preserve *traditional architecture and housing layouts* and rebuild according to *community preferences*.

Housing should be repaired and rebuilt according to the customary architectural preferences of each local community based on the information obtained from the PDNA.

Box 2.2.12 Donor-drive Programme Housing Design Issues in Sri Lanka

Some of the donors who took part in the donor-driven housing reconstruction programme in Sri Lanka following the 2004 Indian Ocean Tsunami failed to adequately involve locals in the reconstruction process. This resulted in the design and construction of housing settlements which had modern architectural designs and different layouts from the traditional accommodation types of the local communities. Beneficiaries were unhappy with the internal layouts of the houses and the external appearance. This led a large number of these housing settlements to be abandoned, resulting in residents encroaching back to coastal areas and self-constructing non-resilient homes.

- Adopt *environmentally-friendly, sustainable approaches* to housing reconstruction (refer to Environment recommendations in Section 2.1).
- Practice *equality* in housing reconstruction and support *vulnerable community groups*.

Gender, age and minority discriminations must be avoided (refer to Gender recommendations in Section 2.1). Vulnerable community groups identified in the PDNA need to be supported appropriately and diplomatically.

Effective Implementation

Along with reducing risks and supporting social and economic recovery, building back better also requires the adoption of processes which makes rebuilding effective and efficient. Effective implementation can be ensured through better management of stakeholders involved, the use of appropriate legislation and regulation and putting in place mechanisms for monitoring and evaluation of the recovery effort.

Steps to be taken to effectively implement rebuilding in the housing sector to BBB include:

- Create a *comprehensive housing sector recovery plan*.

The first step to implementing a successful housing recovery programme is planning. Local community information collected from the PDNA is significant in understanding the most effective methods of implementation. Existing housing policies, urban development policies, building codes and by-laws need to be considered in order to determine how to incorporate risk reduction and community recovery strategies to build back better need in the housing sector recovery plan. The information from the PDNA along with community consultations can be used to identify priorities in reconstruction. The recovery plan must identify key stakeholders, policy and legislation requirements and implementation arrangements. When creating the recovery programme flexibility is vital. It is important to take into account the psychological state of people and produce a recovery plan that focuses more on quality and less on rigid deadlines.

- Establish an *effective governance structure* to implement housing sector reconstruction (refer to Governance recommendations in Section 2.1).

Ensure that post-disaster recovery and reconstruction is strengthened in policies related to housing, land-tenure and resource allocations. If unskilled owner-building is employed for housing reconstruction, thorough supervision and monitoring and evaluation to ensure compliance with building regulations needs to be put in place.

Legislative facilitations such as simplifying and fast-tracking permit procedures for land selection and rebuilding housing can be implemented. The release of state lands for resettlements operations as well as temporary housing needs to be expedited. The disbursement of funds for the housing recovery process needs to be expedited. Such facilitations need to be in place until the housing rebuilding process is completed.

Box 2.2.13 Legislative provisions to facilitate rebuilding in Australia

The rebuilding process in Victoria, Australia following the 2009 Victorian Bushfires was facilitated using several legislative provisions:

- Planning and building permits were exempted for temporary accommodation
- Planning permits were exempted for rebuilding of permanent dwellings
- Planning permits were replaced with a simplified planning consent

Source: DPCD (2013)

Box 2.2.14 Building Back Better in Pakistan

On the 8th of October 2005 an earthquake measuring 7.6 on the Richter scale struck the northern areas of Pakistan. 73,000 people died in the earthquake with 128,309 people injured, 600,000 homes destroyed and leaving 3.5 million people homeless. Despite the complete devastation the recovery following this earthquake displayed an impressive effort to build back better.

The Earthquake Reconstruction and Rehabilitation Agency (ERRA) was established as a central authority to undertake the recovery process. The rural housing reconstruction programme was the biggest programme in ERRA's portfolio. First a detailed damage assessment and eligibility survey was conducted to categorize the housing units by the extent of damage, determine eligibility and sign Memorandums of Understanding (MOUs) with the verified beneficiaries. This information was used to develop beneficiary lists and to target grant disbursements.

The objectives of the housing programme created included:

1. Ensuring owner-driven housing reconstruction, where an enabling environment was created for builders and homeowners through:
 - Prior training, information and canvassing campaigns;
 - Rebuilding with familiar methods and easily accessible materials ensuring sustainability and cultural preferences in design
 - Providing technical assistance during reconstruction
 - Promoting the use of salvaged material or additional resources such as hired trained craftsmen
 - Ensuring building materials supply chain
 - Facilitating the opening of bank account

Box 2.2.14 Building Back Better in Pakistan Contd.

2. Assistance and inspection for reconstruction and restoration through:
 - Mobilizing a large number of assistance and inspection (AI) teams, for house-to-house outreach
 - Disbursing in tranches, linked to stages of construction and adoption of seismically acceptable standards
 - Disbursement through Banks after progress/quality validation
 - Resources for forming the AI teams and management structures for these resources, to be procured through a public-private partnership arrangement
3. Ensuring seismic safety through:
 - Having in place a review and approval mechanism for designs
 - Construction guidelines and training curricula through the development of reference minimum structural design standards that meet internationally accepted requirements for low cost earthquake-resistant housing such as, thinner walls, lighter roofing, well-connected structural systems and discouraging mud construction
 - Construction and planning to take into account the results of seismic zoning
4. Uniform assistance packages across all programmes and funding sources and maximizing outreach through:
 - Coordinating multiple reconstruction initiatives and standards for equity. EERA was to ensure application of uniform policies across the board; ascertain application of seismic design standards; ensure full spatial coverage; and reduce risks of beneficiary double counting or being missed.
 - Providing cash grants targeting core housing.
 - Reconstructing only where necessary through damage assessment that distinguishes against set criteria between houses needing reconstruction and those only needing economically feasible restoration/retrofitting.
 - Replacing destroyed houses with new seismic resistant core units.
 - Restoring and strengthening damaged houses to seismically acceptable standards.

Box 2.2.14 Building Back Better in Pakistan Contd.

5. Ensuring judicious use of grants through:

- Maintaining consistent damage assessment criteria across all affected districts
- Including land ownership criteria and agreements/authorization to rebuild in eligibility criteria
- Signing MOUs with beneficiaries to ensure the judicious use of grants with penalizing clauses for intentional noncompliance
- Developing and putting in place participatory and inclusive information management and grievance redressal systems

Over 600 teams were formed and trained on the appropriate and consistent application of technical damage-criteria. These teams conducted comprehensive door-to-door visits over a four-month period in all affected administrative units. This was followed by setting an implementation mechanism to meet the housing programme objectives to reconstruction and rehabilitate close to 600,000 houses to improved seismic resistant standards. ERRA prepared a detailed operational manual that provided guidelines on all key aspects of implementation.

The results proved that the housing programme implemented in Pakistan was a success, achieving a rate of seismic compliance of over 90%. The housing programme also created widespread and deep-rooted awareness of the importance of resilience and building back better.

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SECTION 2.3: BUILDING BACK BETTER IN THE EDUCATION SECTOR

Introduction

The education sector is a central part of every community. A well-developed education sector leads to prosperous communities where its people possess knowledge, values and skills for their personal development and employment potential. Education triggers economic, social and cultural development in communities presenting a wide range of opportunities to explore different interests and industries. However, in post-disaster environments it appears that the education sector takes a back seat while the focus remains on recovering the more conspicuous sectors such as housing and infrastructure. Education goals that may have had high priority prior to the disaster event often no longer receive the same attention and support in post-disaster periods. This lack of attention to the education sector during reconstruction and recovery impedes social and economic recovery thus impacting the overall resilience of communities.

Disaster recovery in the education sector requires paying attention to two aspects:

1. Hard elements of education – i.e. physical reconstruction of buildings and infrastructure related to the education sector
2. Soft elements of education – i.e. human recovery

The INEE Minimum Standards for Education Handbook¹ explains the multitude of roles the education sector plays in community recovery:

¹ INEE (Inter-Agency Network for Education in Emergencies), *Minimum Standards for Education: Preparedness, Response, Recovery*, INEE, 2004, https://gfdrr.org/sites/gfdrr/files/WB_UNDP_PDNA_Education_SP_FINAL.pdf

- Offering safe spaces for learning and providing physical protection from the dangers and exploitation of a crisis environment
- Providing the ability to identify and support children and youth who need special assistance
- Mitigating the psycho-social impact of disasters by providing a sense of routine, stability, structure and hope for the future
- Strengthening problem-solving and coping skills
- Helping people think critically about political messages or conflicting sources of information
- Providing essential support beyond the education sector such as protection, nutrition, water and sanitation and health services
- Contributing to social, economic and political stability of societies
- Enhancing social cohesion and supporting long-term peace-building
- Providing the opportunity to teach all members of a community new skills and values (such as inclusive education, participation and tolerance, disaster prevention, environmental conservation and human rights)
- Building a culture of safety and resilience through teaching about hazards, disaster risk reduction and empowering children and youth as leaders in disaster prevention

Therefore it is the aim of this section to bring attention to the need to build the education sector back better as an important part of overall community recovery and resilience development.

This section on identifying Building Back Better practices in the education sector is also intended to inform the Post-Disaster Needs Assessment (PDNA) for the Education Sector². The PDNA's scope includes collecting information to understand the characteristics of the education sector; assess the effects

² GFDRR, UNDP and EU, *PDNA Guidelines Volume B – Education*, GFDRR, UNDP and EU, 2014, https://gfdr.org/sites/gfdr/files/WB_UNDP_PDNA_Education_SP_FINAL.pdf

of the disaster on infrastructure and physical assets, production and availability of/access to goods and services, governance and decision-making processes, and risks and vulnerabilities; estimate the value of the effects of the disaster; assess sector capacity; and develop a recovery and reconstruction strategy for the education sector that reflects the needs of the affected community. Understanding the aspects required to BBB helps shape the PDNA to more effectively capture all the necessary information. BBB considerations need to be kept in mind when assessing sector damages, losses and needs.

It is necessary to comprehensively understand the education sector environment in order to create a plan to build back better. The baseline information obtained from conducting the PDNA for the Education Sector creates a clear picture of the situation at hand.

Taking into consideration the understanding of “Building Back Better” from Section 1 of this annex and the information provided by the PDNA, the following sub-section will discuss best-practices and recommendations to successfully build back better in the education sector under Risk Reduction, Community Recovery and Effective Implementation.

Considerations for Building Back Better in the Education Sector

Risk Reduction

Steps to be taken into consideration for risk reduction in the education sector to BBB are:

- Put in place *disaster risk reduction* measures to increase the resilience of the education sector (refer to Disaster Risk Reduction recommendations in Section 2.1).

It is common to use schools as “safe places” and emergency shelters in disaster situations. Therefore locations with a very low hazard impact probability should be chosen to situate educational facilities (for example, locating school buildings on high elevation grounds away from flood paths and coastal areas). Building codes applying to the education sector need to reflect realistic prevailing levels of risk posed on education facilities and relevant infrastructure (such as roads, water and sanitation). If it is decided to relocate important educational buildings such as schools, it must be ensured that the schools remain within accessible and easy reach of school children in the community.

Re-opening schools as soon as possible following a disaster event is a positive trigger for communities to re-establish a sense of normality in their lives. There are instances where some schools would have to receive an influx of students from more badly damaged areas. Hence there is a pressing need to make sure that the buildings and infrastructure used for education facilities are built to superior standards that are able to withstand disaster events and continue to function providing safety to large crowds. Infrastructure such as roads leading to schools need to be built to provide easy and non-disrupted access during disasters. The water and sanitation systems need to be built to cope with and sustain heavy loads for reasonable periods of time. Revised/new building codes and regulations reflecting these factors need to be adopted when repairing/rebuilding education facilities and infrastructure following disasters as well as when building new facilities in pre-disaster periods.

Box 2.3.1 New structurally resilient schools in Aceh

Close to 1,150 schools in Aceh, Indonesia were destroyed or severely damaged by the 2004 Indian Ocean Tsunami disaster. However a successful school rebuilding programme has yielded a total of 225 permanent primary schools and 1,467 classrooms capable of serving over 44,000 students. The design and construction of the schools were supervised by international and national engineers in accordance with the National Standards of Indonesia and the revised Aceh Building Code. The school facilities were designed to adapt to the specific needs of each community. The designs featured improvements such as separate toilet facilities for girls and boys with washbasins to encourage improved hygiene, an office space for teachers and outdoor play areas.

Source: UNOPS (2013)

Box 2.3.2 Rebuilding of the Peraliya School in Sri Lanka

The 2004 Indian Ocean Tsunami badly affected the coastal town of Peraliya in Sri Lanka. Peraliya became most well-known as the location where the colossal waves from the tsunami hit and completely deformed the famous Colombo-Galle train killing an estimated 2000 people. The town of Peraliya was completely destroyed except for ten buildings that survived.

The Peraliya School was considered an icon in the community. The school too lost all its buildings in the tsunami except one. There were 650 students attending the school out of which approximately 20 students lost their lives in the disaster along with three of its teachers.

Rebuilding the Peraliya School was a priority for the town. The Government awarded the contract to a foreign NGO. The approach taken to rebuild the school can be considered a BBB success in many accounts. First, all the required permissions from the local and national authorities in Sri Lanka such as the Coastal Conservation Department, Urban Development Authority and the relevant provincial councils were obtained. Site inspections and geological data were gathered to inform the school's design and construction approach. The school was structurally designed to withstand tsunamis and constructed well. During the design stage consultations were held with the school board regarding how the school needed to be rebuilt to ensure that the designs were culturally appropriate. The Peraliya School was built to modern standards with modern equipment and books provided.

However the school's principal raised an important issue that needs attention in similar BBB efforts. The principal was worried that the long-term maintenance of the school might be problematic due to the high costs incurred by higher electricity consumption and internet bills that have resulted from modernizing the school. The principal stated that maintenance might have to depend on aid from the government or other donors.

- Use schools and other education facilities to provide *education on risk reduction* to the community.

The education sector is well-placed to introduce knowledge and skills on risk reduction into the community. Any existing education and training programmes on disaster risk reduction education and the current capacity of the education sector to carry out these programmes to educate the community should be determined. This information needs to be obtained from the PDNA before planning for reconstruction is begun.

Schools and education facilities should become key institutions for educating the community on disaster risk reduction and disaster risk management. Teachers should be trained on risk reduction strategies and conducting disaster simulation drills which should then be taught to students as part of the school curriculum. Raising awareness among the community's children will allow messages about disaster risk reduction and disaster risk management to be spread amongst their families as well as the wider community. Schools and education facilities should also hold extra-curricular awareness days and workshops for all members of the community.

Box 2.3.3 Emergency Management Plans for Schools in New Zealand

New Zealand is a country prone to several hazard types, with earthquakes and flooding being two of the most prominent ones. Therefore the Ministry of Education in New Zealand have developed templates for schools to create their own Emergency Management Plans for adoption during an emergency.

See template at:

<http://www.minedu.govt.nz/TheMinistry/EmergencyManagement/Preparedness/EmergencyManagementPlan.aspx>

The Emergency Management Plans are designed to pre-prepare teachers, staff and students at the schools on what to do in the event of an emergency.

The Emergency Management Plan identifies:

- The school's evacuation plan based on type of event
- An emergency contact plan for parents and caregivers
- External emergency contact list
- Checklists on response actions during and after emergency events such as fire, earthquake, tsunami, flooding, volcanic eruption and ashfall, gas leak, chemical spill, bomb threats etc.
- Response actions for serious injury or death
- Response actions for missing students

Community Recovery

The education sector has a large influence on the social and economic environments of a community. Therefore paying attention to supporting the recovery of the education sector is important for building back better.

Steps to be taken to support the social and economic recovery of communities to BBB with regards to the education sector include:

- Understand the local community's *social and economic structure* and the *requirements of the education sector* to support social and economic recovery by *collecting extensive information from the PDNA*.

The social and economic fabric of the local community needs as well as the specific role that the education sector plays in each community need to be understood in order to plan and put in place effective mechanisms to support community recovery. These include information about the different types of community groups present, their lifestyles, their livelihoods, the numbers of students in different age groups requiring primary, secondary and tertiary education, key industries in the community, the types of education facilities present, skills or knowledge shortages and other special characteristics indigenous to the specific community. This information must be used to create a recovery plan for the education sector which supports social and economic recovery.

- Ensure new designs used for education sector buildings and infrastructure are *practical* and *culturally appropriate*.

Rebuilding or repairing significantly damaged buildings provide the opportunity to make changes in the layout and designs of the buildings. It is important that any changes made are checked to be culturally appropriate and practical in terms of daily and long-term maintenance. Consult and involve the local council and professional staff from the educational facilities in the design process to understand the necessary local requirements.

- Identify new *education/training requirements* that will benefit the community.

Depending on the livelihoods, primary industries of the local community and the impact that the disaster event has had on these, new opportunities for up-skilling and training people should be established. This could involve building new education/vocational training facilities or providing resources to set up new programmes at existing institutions.

Box 2.3.4 Virtual Livelihood Schools in India and Africa

Virtual Livelihood Schools (VLS) were launched with the aim of providing capacity building services to key livelihood sectors in a country. The aim of the VLS is to identify the shortages of skilled staff and leaders in these sectors and up-skill them in collaboration with multi-disciplinary collaborative institutions. The schools are intended to support people at all levels of experience. The VLS runs programme to train new skills as well as up-skill.

Currently the VLS is operational in India and several countries in the Africa such as Kenya, Uganda, Mozambique, South Africa and Zimbabwe. In each country the schools are partnered by local and international NGOs, relevant Government ministries, universities, research and private sector institutions. In Kenya three VLS partners co-created training modules that were used to train 17 ToTs who then trained 200 field level extension workers.

Source: (VLSA)

- Provide *psychological support* to students.

Disasters create stress, anxiety and a range of mental health issues. Schools should be equipped with trained guidance counsellors to support students who have been affected.

- Promote *local community participation, transparency* and local programme *ownership*.

Education facilities such as schools bring communities together. Therefore it is necessary that the types of education provided by these facilities as well as the facilities themselves are designed to

suit the specific needs of individual communities. The stakeholder groups related to the education sector need to be consulted and involved in reconstructing education facilities and organising education/training programmes following disasters to ensure that they are current, relevant and suitable for the local communities. Stakeholder groups that need to be consulted include: children and youth (especially those currently in school), students (at all education levels), teachers and instructors, school administrators, community members and parents, district and national education officers, private partners and providers and religious affiliates that provide education opportunities.

- Adopt *environmentally-friendly, sustainable approaches* to education sector recovery and reconstruction (refer to Environment recommendations in Section 2.1).
- Practice *equality* and support *vulnerable community groups*.

Gender, age and minority discriminations must be avoided (refer to Gender recommendations in Section 2.1). Vulnerable community groups identified in the PDNA can be provided special assistance through education programmes.

Effective Implementation

Along with reducing risks and supporting social and economic recovery, building back better also requires the adoption of processes which makes rebuilding effective and efficient. Effective implementation can be ensured through better management of stakeholders involved, the use of appropriate legislation and regulation and putting in place mechanisms for monitoring and evaluation of the recovery effort.

Steps to be taken to effectively implement recovery programmes for the education sector to BBB include:

- Create a *comprehensive education sector recovery plan*.

The first step to implementing a successful recovery programme is planning. Information collected from the PDNA about the existing education sector characteristics and requirements is significant in understanding the most effective methods of implementation. Existing education sector standards, policies, building codes and planning regulations relevant to education facilities and infrastructure need to be considered in order to determine how to build back better in the education sector recovery plan. Recovery and reconstruction following a disaster provides a good opportunity to not only introduce risk reduction strategies, but also raise the pre-disaster standards of education and address shortcomings. The information from the PDNA along with community consultations can be used to identify priorities in reconstruction and recovery. The recovery plan must identify key stakeholders, policy and legislation requirements and implementation arrangements. When creating the recovery programme flexibility is vital. It is important to balance the focus provided to quality with speed.

- Understand and address *cross-cutting issues*.

Recovery in the education sector involves a range of cross-cutting issues during implementation such as disaster risk reduction, infrastructure, governance, livelihoods, gender and human rights. These cross-cutting issues and their corresponding impacts on and from the education sector need to be thoroughly understood from information collected in the PDNA.

- Establish an *effective governance structure* to implement education sector reconstruction and recovery (refer to Governance recommendations in Section 2.1).

Ensure that post-disaster recovery and reconstruction in the education sector is strengthened in policies related to building and infrastructure design and land-use for risk reduction, as well as policies related to education and training to encompass the needs of the community.

The stakeholders involved in the education sector range from local and national government, policy makers, local and national NGOs and private sector organisations to stakeholders in education including teachers, students, school administrators and the wider community. One group of stakeholders will be involved in the planning and rebuilding of education facilities and

infrastructure, while another group will be involved in planning and implementing education and training programmes.

Partnerships must be formed with stakeholders within the education sector as well as with stakeholders from other sectors such as infrastructure, water and sanitation, child protection etc.

The re-opening of schools and education facilities in the community should take place as quickly as possible. Legislative provisions can be put in place to fast-track any long bureaucratic procedures related to planning and building education facilities.

M&E needs to be done through all stages of the education sector recovery process to ensure quality assurance and as a check to confirm that recovery is taking place in accordance with BBB concepts. It is necessary to ensure that education facilities and infrastructure are designed and built to the required standards. The consideration of cross-cutting issues and provision of support to vulnerable groups need to also be monitored.

Box 2.3.5 Schools built back better in New Orleans

Hurricane Katrina was the one of the deadliest hurricanes in the United States. The hurricane resulted in 1833 confirmed fatalities and approximately US \$108 million in damages. The city of New Orleans, Louisiana was the worst affected city from the hurricane as the city's levee system completely failed flooding 80% of the city. 110 out of the 127 schools in New Orleans were destroyed by the hurricane.

The destruction caused by Hurricane Katrina and the poor standard of schools in New Orleans from before the disaster led to an ambitious plan to reinvigorate the city's school system and build back better following the disaster. Shortly after the disaster, the Recovery School District (RSD) took over the responsibility of launching a school recovery programme. RSD recognized the opportunity for change and implemented many different initiatives to improve the schools in New Orleans. One of the major changes made was with regards to school reform. RSD decided to charter most of the schools in the city as independent institutions with open-enrolment admission policies. The Louisiana Association of Public Charter Schools became a legislative advocate for the new reform model. In order to rebuild the capacity of the school sector in New Orleans an independent non-profit reform group called New Schools for New Orleans (NSNO) started to run training programmes to create future school leaders, teachers and directors. NSNO also sponsored a programme to educate parents about the new school landscape in the city in order for students to make informed choices. The charter school programme was a success and showed significant improvements in the standards of schools. Whilst 2/3rds of the schools in New Orleans were rated as "academically unacceptable" in 2004 before the hurricane, the standards in 2010 showed that only 4/10ths of schools received this rating. By 2010 the percentage of students attending low performance schools had decreased from 67% to 34% with 75% of public school students now attending charter schools.

Another positive outcome was the upgrading of schools to be disaster-resilient and environmentally and culturally favourable during post-disaster recovery. The Federal Emergency Management Agency (FEMA) allocated US \$1.8 billion for the post-Katrina reconstruction of schools. A large school construction project was thus launched to construct 85 campuses and demolish 38 campuses in order to accommodate the 45,000 students estimated to be in schools by 2016. The buildings were structurally and aesthetically designed to withstand storm and flooding events. Most schools were elevated above flood levels with ground floors made of terrazzo for easy maintenance in the event of flooding. Electrical systems were originated from the roof in order to reduce impacts from flooding. Apart from disaster-resilient designs, the opportunity was also taken to design and construct the schools as environmentally friendly green buildings which received LEED silver ratings. The air-conditioning and heating systems were zoned to optimize energy usage and costs. A unique feature added to the schools was their design as "multiple-use buildings" which served the surrounding community. Libraries, gyms and health clinics in schools were made with separate entrances to allow access to community members without disruption to the school. Schools were also bundled with other community services such as wellness clinics and community gardens to reinforce community cohesion.

Source: Horne (2011)

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SECTION 2.4: BUILDING BACK BETTER IN THE HEALTH SECTOR

Introduction

The health sector has a central role in every community. The need for health services following a disaster shows a considerable increase. There are usually a large number of people that need to be treated for injuries resulting from a disaster event. Adding to this the conditions following a disaster tend to create other health issues such as communicable disease outbreaks due to the unavailability of safe water and sanitation services and crowding, as well as increased demands for specialized services such as trauma and mental health care.

The health sector consists of many different components that need to work together interdependently.

The World Health Organisation (WHO) lists six key building blocks for a health system:

1. Service delivery
2. Health workforce
3. Information
4. Medical products, vaccines and technologies
5. Financing
6. Leadership and governance

The health sector also works closely with other sectors. Important inter-sectoral considerations for the health sector include:

- Environmental health – i.e. water and sanitation

- Nutrition and food security
- Housing and education
- Age and gender

Building back better in the health sector requires improving the disaster resilience of health infrastructure; improving access, equitability and affordability of goods and services; and enhancing preparation for major public health hazards and future disasters. Current health policies and implementation arrangements need to be modified as needed to meet future demands. It is also necessary to address any underlying pre-existing vulnerabilities in communities that can exacerbate the effect of disasters as part of building back better.

Therefore a post-disaster recovery strategy for the health sector needs to address the following to BBB:

1. Increase the resilience of health infrastructure and assets
2. Reduce the vulnerability and health risks of the affected population
3. Improve the delivery of health services
4. Improve health governance processes

This section on identifying Building Back Better practices in the health sector is also intended to inform the Post-Disaster Needs Assessment (PDNA) for the Health Sector¹. The PDNA's scope includes collecting information to understand the characteristics of the health sector; assess the effects of the disaster on health infrastructure and assets, access to goods and services, governance and decision-making processes, and health-related risks and vulnerabilities; estimate the value of the effects of the disaster; assess health sector capacity; and develop a recovery and reconstruction strategy for the health sector that

¹ GFDRR, UNDP and EU, *PDNA Guidelines Volume B – Health*, GFDRR, UNDP and EU, 2014, https://gfdrr.org/sites/gfdrr/files/WB_UNDP_PDNA_Health_SP_FINAL.pdf

reflects the needs of the affected community. Understanding the aspects required to BBB helps shape the PDNA to more effectively capture all the necessary information. BBB considerations need to be kept in mind when assessing sector damages, losses and needs.

It is necessary to comprehensively understand the health sector environment in order to create a plan to build back better. The baseline information obtained from conducting the PDNA for the Health Sector creates a clear picture of the situation at hand.

Taking into consideration the understanding of “Building Back Better” from Section 1 of this annex and the information provided by the PDNA, the following sub-section will discuss best-practices and recommendations to successfully build back better in the health sector under Risk Reduction, Community Recovery and Effective Implementation.

Considerations for Building Back Better in the Health Sector

Risk Reduction

Steps to be taken into consideration for risk reduction in the health sector to BBB are:

- Put in place *disaster risk reduction* measures to increase the resilience of the health sector (refer to Disaster Risk Reduction recommendations in Section 2.1).

Health sector facilities such as hospitals and pharmaceutical production facilities need to be up and running during and immediately following disaster events to treat people who have been affected. Therefore it is advisable to locate these buildings on lands with a very low hazard impact probability. Building codes need to be updated as necessary to reflect realistic prevailing

levels of risk posed on health sector facilities and relevant infrastructure (such as roads, water and sanitation). If health sector facilities such as hospitals are relocated, it is necessary to ensure that they remain accessible to the local community and maintain a practical distance from manufacturers of medical supplies.

Due to the increase in demand during disaster periods these facilities need to function often at much higher capacities than normal. Hence there is a pressing need to make sure that health sector facilities and infrastructure are built to superior standards that are able to withstand disaster events and continue to function at high capacities. Infrastructure such as roads leading to hospitals need to be built to provide easy and non-disrupted access during disasters. The water and sanitation systems need to be built to cope with and sustain heavy loads. Revised/new building codes and regulations reflecting these factors need to be adopted when repairing/rebuilding health sector facilities and infrastructure following disasters as well as when building new facilities and retrofitting existing ones in pre-disaster periods.

The opportunity presented during post-disaster rebuilding should also be utilized to upgrade and modernize health sector facilities. The effectiveness of the horizontal and vertical layouts of hospitals should be assessed and necessary changes made to enhance operations.

Box 2.4.1 Structural Upgrading of the Christchurch Women's Hospital, New Zealand

The Christchurch Women's Hospital was structurally upgraded in the year 2005 to withstand an earthquake with a 2000 year return period. Base Isolation technology was used to upgrade the hospital building, which is a system used to disconnect a building's superstructure from its substructure thus helping to minimize the impact of an earthquake on a building. The upgrading also involved linking the Women's Hospital to the Christchurch Central Hospital facilities to improve interaction with the main clinical and healthcare facilities.

The successful upgrading of the hospital building enabled the Christchurch Women's Hospital to remain functional following both the 2010 and 2011 Canterbury Earthquake sequences and only sustain basic non-structural damages.

Source: (CCANZ)

Box 2.4.2 Rebuilding of the St. Francoise de Sales Hospital in Haiti

The Haiti Earthquake that took place on 12th January 2010 had a magnitude of 7.0 on the Richter Scale. The earthquake affected approximately three million people with the greatest damage observed in the cities of Port-au-Prince and Jacmel. An estimated 300,000 people were injured from the disaster thus creating a high demand for short and long-term medical care. Due to the destruction of hospitals and medical facilities in the earthquake temporary emergency facilities were set up to treat patients affected by the disaster.

St. Francois de Sales Hospital was one of Haiti's oldest Catholic hospitals situated in Port-au-Prince. The rebuilding effort following the Haiti Earthquake was taken as an opportunity to upgrade and rebuild the hospital to provide quality care to patients especially from low income backgrounds. The St. Francois de Sales Hospital was also redesigned as a modern teaching facility to train medical professionals. The upgraded hospital provides services in paediatrics, obstetrics, gynaecology, internal medicine, surgery, orthopaedics and outpatient emergency care. The hospital was also equipped with an ambulance system and an electronic medical management information system to track patients and monitor their care.

Source: Stipe (2015)

- *Establish temporary structures to provide health services while permanent reconstruction takes place.*

Since the repair and construction of permanent health facilities and infrastructure can take a long period of time it is necessary to establish temporary arrangements to deliver health services while rebuilding takes place. Options including renting a suitable building and/or establishing mobile health units to serve the community.

Box 2.4.3 Foreign Field Hospitals

The urgent demand for health services following disasters especially when existing health infrastructure is compromised has highlighted the need for fast and comprehensive temporary medical care solutions.

The World Health Organisation (WHO) and the Pan American Health Organisation (PAHO) thus collaborated on recognizing the supplying of mobile field hospitals termed “Foreign Field Hospitals” (FFH) as a feasible solution. Foreign Field Hospitals are defined as “mobile, self-contained, self-sufficient health care facilities capable of rapid deployment and expansion or contraction to meet immediate emergency requirements for a specified period of time”.

FFHs can be used to substitute or complement existing medical systems following a disaster and have three functions:

1. Provide early emergency medical care for up to 48 hours following a disaster event
2. Provide follow-up care for trauma cases, emergencies, routine health care and routine emergencies for up to 3 weeks
3. Function as a temporary medical facility for a number of years until repair or reconstruction of permanent medical facilities are completed

See “WHO-PAHO Guidelines for the Use of Foreign Field Hospitals in the Aftermath of Sudden-Impact Disasters”, <http://www.who.int/hac/techguidance/pht/FieldHospitalsFolieto.pdf>.

- Evaluate and determine *prevalent and potential health risks* in the community.

Research needs to be done to understand the types of prevalent and potential health risks in the community; their probability of occurring; the severity of consequences of the identified health risks; and classify who is most at risk. This information can be collected from the PDNA and used to design appropriate risk reduction and response measures.

- Put in place *preventive measures* to address identified *health risks*.

Early detection and rapid response mechanisms need to be strengthened for the health risks identified from the health risk assessments. Free/affordable vaccination must be arranged for

communities where possible for communities at high risk. Vector control exercises should be carried out to manage disease-bearing mosquitoes, ticks, flies, bugs and other vector levels in the community and educate families on how to protect themselves.

- *Increase the capacity and continuity of treatment* for chronic diseases.

The capacity to provide treatment to identified chronic present/potential communicable and non-communicable diseases need to be developed to adequate levels when rebuilding and upgrading health sector facilities and related infrastructure.

- Provide *training and education on disaster risk reduction* and *health risk reduction* to health professionals and the community.

Training and education should be provided to health sector professionals on the importance of disaster risk reduction in the built environment and the need to improve the resilience by undertaking necessary measures. This knowledge will allow health sector professionals to cooperate and participate in risk reduction interventions.

Training and education also needs to be provided to health professionals as well as the community on how to address and reduce health risks. Healthy practices such as safe water, sanitation and hygiene practices need to be communicated regularly and taught to all members of the society. Prevalent health risks and necessary interventions for protection and mitigation of these risks need to be disseminated to the public via local medical professionals, information sessions, door-to-door pamphlets and information packs, and the media.

Box 2.4.4 Disaster health risk communication in Japan

The Great East Japan Earthquake which took place on the 11th of March 2011 was the most powerful earthquake to have impacted Japan. The earthquake which was recorded as 9.0 on the Richter Scale created a destructive tsunami which devastated cities in the Tohoku region. The tsunami created a new disaster when it impacted upon the Fukushima Daiichi Nuclear Power Plant resulting in the explosion of several nuclear reactors. The release of radioactive material from the plant created the largest nuclear incident since the Chernobyl disaster in 1986. Approximately 300,000 people were evacuated from the area and therefore did not suffer from any fatalities due to short-term radiation exposure.

However the World Health Organisation's (WHO) report "Health Risk Assessment from the Nuclear Accident after the 2011 Great East Japan Earthquake and Tsunami based on preliminary dose estimation" published in 2013 declares that the estimated increased risks expected include:

- A 4% increase in all solid cancers in females exposed as infants
- A 6% increase in breast cancer in females exposed as infants
- A 7% increase in leukaemia in males exposed as infants
- Up to 70% increase in thyroid cancer in females exposed as infants

In response to the concerns of the population with regards to health risks resulting from exposure to radiation, several successful systems to communicate information on radiation risks and provide support to residents have been put in place following the disaster. These include:

- Making personal radiation dosimeters commercially available to individuals
- Running learning sessions to educate residents on how to measure and interpret the radiation exposure levels indicated by the radiation dosimeters
- Improving health literacy skills in public health nurses by providing training and workshops to develop the ability of nurses to relay clear and credible information to lay people
- Increasing the decision-making power of public health nurses in the local government system, which has allowed the implementation of new programmes such as mental health support programmes, regular lectures on radiation-related topics for residents and epidemiological assessments of child growth

Source: WHO (2013)

Community Recovery

The health sector is an important part of the social fabric in a community. A community that is suffering from health problems is unable to focus on rebuilding and social and economic recovery. Supporting the recovery of the health sector thus enhances overall community recovery. Successful recovery of the health sector requires consideration given to the social and psychological characteristics of each individual community.

Steps to be taken to support the recovery of communities to BBB with regards to the health sector include:

- Understand the local community's *socio-economic structure* by *collecting extensive information from the PDNA*.

The socio-economic conditions and compositions of the local community need to be understood in order to plan effective health sector recovery programmes that address the specific needs of each community. This information needs to be collected from the PDNA. Information collected should include the different types of community groups present, their lifestyles, their livelihoods, their socio-economic status, their group-specific health statistics and health risks, the types and capacities of health sector facilities present, the knowledge and skill levels of health professionals present and any and other special characteristics indigenous to the specific community. This information must be used to create a health sector recovery plan suitable for the local community.

- Ensure new designs used for health sector buildings and infrastructure are *practical* and *culturally appropriate*.

The rebuilding process provides the opportunity to modernize and increase the capacity of health sector buildings. It is however important that any changes made are culturally appropriate and practical in terms of daily and long-term maintenance. Consult and involve health sector professionals in the design process to understand the necessary requirements.

- *Restore service delivery capacity and access to services* as soon as possible.

Health services need to be restored to be able to function during and immediately following disasters to treat patients who may have been affected by the disaster. Health workers need to be trained in pre-disaster periods on how to respond during the event of an emergency. Emergency protocols must be put in place in pre-disaster periods to identify how health worker capacities can be increased during emergencies. These can include providing incentives to encourage health workers from other areas to be allocated to the disaster-affected areas.

Restoration/establishment of health care facilities and pharmaceutical production facilities needs to be prioritized. Pharmaceutical procurement protocols must also be established to identify how medical supplies can be obtained during disaster periods. Special triage systems need to be established for use during emergencies to increase efficiency in patient care.

Primary health care services such as diagnosis and treatment need to be made available to community members in affected areas as well as at temporary settlement sites. Secondary health care services involving specialists should be provided at appropriate sites.

Box 2.4.5 Health Sector Training Programme in Kosovo

The war in Kosovo took place from early 1998 to mid-1999. Kosovo's health sector was already suffering since before the war due to the lack of access to modern and foreign medical information, but the war caused further damage to the health sector infrastructure and services. Consultations with primary healthcare professionals in Kosovo highlighted that the education and training of primary healthcare workers was one of the major health sector priorities in the country.

As part of the effort to restore and improve the country's health sector following the war, the US-based international non-governmental organisation International Medical Corps (IMC) implemented a training programme. IMC delivered an introductory education and training programme on primary healthcare issues to primary healthcare physicians in 10 Kosovo municipalities. Eight general practitioners, one public health specialist and one medical technician were chosen as local trainers. First the curriculum for the training programme was developed with the assistance from the local trainers to address local needs. Then, a one month initial training course was organized to train the local trainers followed by one-day focused training sessions before each new weekly topic. The training programme was successfully implemented for four hours per week over six months. Each municipality received 32 training sessions. The training programme was well-accepted by local communities and was successful in boosting the knowledge and skills of primary healthcare professionals.

Source: O'Hanlon and Budosan (2011)

- Arrange specialized health services to meet *disaster-specific demands*.

Disasters often create an increase in demand for particular health services such as trauma and mental health; emergency medicine; surgical; and communicable diseases. The capacities for these services need to be increased to meet the demands. The increased capacity of these services needs to be maintained for as long as the community needs it.

Box 2.4.6 Management of Cholera Outbreak in Haiti

Following the 2010 Haiti Earthquake, a sudden cholera outbreak struck the country. In addition to health services required to treat those injured in the earthquake, the cholera epidemic also needed to be dealt with.

Steps taken to manage the cholera outbreak during disaster recovery included:

- Establishing specialized cholera treatment units
- Providing access to clean water, latrines and improved sanitation
- Constructing Haiti's first wastewater treatment facility
- Conducting large-scale public education campaigns to encourage safe hygiene practices

Source: Regnier (2013)

- Support *vulnerable community groups* and eliminate *inequity*.

Gender and age can create a significant difference in how people are affected in a disaster. Different gender and age groups may have different resources available to them and different coping strategies (refer to Gender recommendations in Section 2.1). It is necessary to identify the specific needs of all vulnerable community groups (as identified in the PDNA) and make appropriate health services available to them as part of the health sector recovery plan.

Any discriminations including gender, age and minority discriminations must be avoided in the provision of health services. Equal care needs to be made available to all patients. All community groups need to be equally included in community consultation exercises. Pre-existing constraints of different community groups need to be addressed and dealt with to provide equal access to services for all people.

- Adopt *environmentally-friendly, sustainable approaches* to health sector reconstruction (refer to Environment recommendations in Section 2.1).

Effective Implementation

Effective and efficient rebuilding and recovery practices are needed to build back better, along with risk reduction and community recovery. Effective implementation can be ensured through better management of stakeholders involved; the use of improved governance processes and appropriate legislation and regulation; and putting in place mechanisms for monitoring and evaluation of the recovery effort.

Steps to be taken to effectively implement a health sector recovery programme to BBB include:

- Create a *comprehensive health sector recovery plan*.

The first step to implementing a successful recovery programme is planning. Information collected from the PDNA about the requirements of the health sector and its existing capacity (or lack thereof) must be used to determine a recovery plan that is suitable for the local community. The health sector recovery plan needs to be aligned with the national health strategic plan.

Recovery and reconstruction following a disaster should be taken as an opportunity to improve and upgrade the services currently provided. The information from the PDNA along with consultations with health sector stakeholders and the community should be used to identify recovery priorities. The health sector recovery plan must identify key stakeholders, policy and legislation requirements and implementation arrangements. When creating the recovery programme flexibility is vital. It is important to balance the focus provided to quality with speed.

- Understand and address *cross-cutting issues*.

Recovery in the health sector needs to address cross-cutting issues such as disaster risk reduction, infrastructure, governance, vulnerable community groups and human rights. These cross-cutting issues and their corresponding impacts on and from the health sector need to be thoroughly understood from information collected in the PDNA.

- Establish an *effective governance structure* to implement health sector reconstruction (refer to Governance recommendations in Section 2.1).

The health sector recovery plan needs to be led by the Ministry of Health. The capacity of health authorities at national and sub-national levels need to be restored to continue delivering health sector services. The governance role of national health authorities need to be strengthened. International health agencies assisting with recovery must adhere to national quality criteria. Policies should be administered to enforce risk reduction in building and infrastructure design and land-use, manage and respond to health risks and support vulnerable groups.

The stakeholders involved in the health sector recovery process range from local and national government, policy makers, local and national NGOs and private sector organisations to health sector professionals and the community. The Ministry of Health responsible for implementing the health sector recovery plan needs to manage the different stakeholders involved in the recovery process. International agencies assisting with recovery need to be registered with the Ministry of Health. International agencies need to be informed of the results from the PDNA, the health sector recovery plan and comply with national health standards. Partnerships must be formed with stakeholders involved from all sectors and between implementing health authorities and development partners.

The establishment of temporary health facilities if necessary and the reconstruction and re-opening of permanent health sector facilities need to be done as soon as possible. Legislative provisions can be put in place to fast-track any long bureaucratic procedures that slow down the recovery and reconstruction effort.

M&E needs to be done through all stages of the health sector recovery process to ensure quality assurance and as a check to confirm that recovery is taking place in accordance with BBB concepts. It is necessary to ensure that health facilities and related infrastructure are designed and built to the required structural standards. The consideration of cross-cutting issues and provision of support to vulnerable groups need to also be monitored.

Box 2.4.7 Health Sector Recovery following the 2008 Sichuan Earthquake, China

The Sichuan Earthquake struck China's south-western Sichuan Province with a magnitude of 8.0 on the Richter Scale killing 88,000 people and injuring 400,000. The earthquake caused widespread damage to hospitals and health facilities throughout the Sichuan Province. The recovery process that followed created many positive changes to the health sector in the province.

Immediately after the earthquake health services were provided in tents and temporary facilities and then progressed into temporary pre-fabricated structures until the health facilities were repaired and rebuilt. The spreading of infectious diseases was controlled through widespread medical care and surveillance.

During reconstruction health infrastructure was upgraded and health worker capacities were increased, which has improved access to healthcare for poor and vulnerable populations. A survey conducted in 2010 showed a near 100% hospital delivery rate as compared to 87% in 2007. Training programmes were implemented to train and educate health workers. Educational health information was also distributed amongst the community to raise awareness.

Source: CEA et al. (2010)

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SECTION 2.5: BUILDING BACK BETTER IN THE EMPLOYMENT AND LIVELIHOODS SECTOR¹

Introduction

Disasters disrupt businesses, income-generating industries, livelihoods and employment conditions in communities thus negatively affecting the community and country's economy. Self-employed and informally hired workers are usually most at risk of losing their income during periods of economic inactivity following disasters. A failing employment and livelihoods sector impedes the overall recovery of communities. The struggle to regain income and the lack of goods and services have psychological and social effects on people, which also impacts on the rebuilding process. People are hesitant to live in communities with little employment opportunities and declining access to goods and services. At the same time businesses and employers are hesitant to re-establish themselves in communities with low population numbers.

Therefore an essential role of building back better is to support the recovery of the employment and livelihoods sector in order to provide opportunities for people to remain in their original communities and contribute to overall recovery. Building back better seeks to not only restore, but take the opportunity to rejuvenate the economy of communities by upgrading the employment and livelihoods sector and create a wider range of long-term sustainable opportunities for people to build economic resilience. It is also necessary to provide equal opportunities to men and women and alleviate socio-economic disparities as part of building back better.

¹ Employment and Livelihoods Sector encapsulates all income-generating businesses and industries that provides goods and services to the community as well as sustains the economy of the community.

This section on identifying Building Back Better practices in the employment and livelihoods sector is also intended to inform the Post-Disaster Needs Assessment (PDNA) for Employment, Livelihoods and Social Protection², Agriculture, Livestock, Fisheries and Forestry³, Commerce⁴, Culture⁵, Macroeconomics Impact of Disasters⁶ and Tourism⁷. The PDNA's scope includes collecting information to understand the characteristics of the employment and livelihoods situation of the population including different types of employment and livelihoods, employment and livelihood preferences of the local community, types of community groups present, vulnerable community groups and their employment and livelihood conditions, employment rates, wages and the economics of the community; assess the effects of the disaster on employment and livelihoods sector assets and infrastructure, provision of goods and services, and governance and decision-making processes; estimate the value of the effects of the disaster on the community's economy; assess existing sector capacity to provide employment and income; and develop a recovery and reconstruction strategy for the employment and livelihoods sector that reflects the needs of the affected community. Understanding the aspects required to BBB helps shape the PDNA to more effectively capture all the necessary information. BBB considerations need to be kept in mind when assessing sector damages, losses and needs.

² GFDRR, UNDP and EU, *PDNA Guidelines Volume B – Employment, Livelihoods and Social Protection*, GFDRR, UNDP and EU, 2014, https://gfdrr.org/sites/gfdrr/files/WB_UNDP_PDNA_Employment_SP_FINAL.pdf

³ GFDRR, UNDP and EU, *PDNA Guidelines Volume B – Agriculture, Livestock, Fisheries and Forestry*, GFDRR, UNDP and EU, 2014, https://gfdrr.org/sites/gfdrr/files/WB_UNDP_PDNA_Agriculture_SP_final.pdf

⁴ GFDRR, UNDP and EU, *PDNA Guidelines Volume B – Commerce*, GFDRR, UNDP and EU, 2014, https://gfdrr.org/sites/gfdrr/files/WB_UNDP_PDNA_Commerce_SP_FINAL.pdf

⁵ GFDRR, UNDP and EU, *PDNA Guidelines Volume B – Culture*, GFDRR, UNDP and EU, 2014, https://gfdrr.org/sites/gfdrr/files/WB_UNDP_PDNA_Culture_FINAL.pdf

⁶ GFDRR, UNDP and EU, *PDNA Guidelines Volume B – Macroeconomic Impact of Disasters*, GFDRR, UNDP and EU, 2014, https://gfdrr.org/sites/gfdrr/files/WB_UNDP_PDNA_MACRO_SP_FINAL.pdf

⁷ GFDRR, UNDP and EU, *PDNA Guidelines Volume B – Tourism*, GFDRR, UNDP and EU, 2014, https://gfdrr.org/sites/gfdrr/files/WB_UNDP_PDNA_Tourism_SP_FINAL.pdf

It is necessary to comprehensively understand the employment and livelihoods sector environment in order to create a plan to build back better. The baseline information obtained from conducting the PDNA for the Employment, Livelihoods and Social Protection Sector and PDNA for the Agriculture, Livestock, Fisheries and Forestry Sector creates a clear picture of the situation at hand.

Taking into consideration the understanding of “Building Back Better” from Section 1 of this annex and the information provided by the PDNAs, the following sub-section will discuss best-practices and recommendations to successfully build back better in the employment and livelihoods sector under Risk Reduction, Community Recovery and Effective Implementation.

Considerations for Building Back Better in the Employment and Livelihoods Sector

Risk Reduction

Steps to be taken into consideration for risk reduction in the employment and livelihoods sector to BBB are:

- Put in place *disaster risk reduction* measures to increase the resilience of the employment and livelihoods sector (refer to Disaster Risk Reduction recommendations in Section 2.1).

Up-to-date multi-hazard assessments conducted during the PDNA need to be used to understand the risk landscape of the areas available to build/rebuild buildings and infrastructure required for businesses and industries in the community and locations suitable for agriculture, livestock, fisheries and forestry industries. If reconstructing business and industry buildings and infrastructure on the same lands becomes too costly due to the level of risk posed and/or the structural improvements required, relocation to lower risk areas need to be opted for.

A factor that must be considered if the decision is made to relocate business and industry locations is how favourable the conditions are in the new location for the business or industry to succeed. Businesses and industries need to be located with easy access to both necessary resources (workforce, natural resources and materials) and customers who seek their services. Similarly when residential settlements are relocated for improved safety, it is necessary to create employment and livelihood opportunities close to the new residential settlements. In this situation, businesses and industries may have to relocate to be closer to the new population centres (refer to box 2.2.9 in Section 2.2: Building Back Better in the Housing Sector). Therefore building back better in the employment and livelihood sector requires a multi-faceted approach to balance safety, affordability, practicality, accessibility to resources and customers, and potential for success.

Box 2.5.1 Rebuilding of the Central Business District in Christchurch, New Zealand

The Central Business District (CBD) of Christchurch suffered the most damage from the 2011 Canterbury earthquake sequence, where the ground accelerations were more than twice what was specified in the building code at that time. Due to the extensive damage caused to the multi-storey buildings in the CBD, 24% of these were classified as unrepairable and instructed to be demolished.

The Christchurch City Council's reconstruction plan took this opportunity to redesign the CBD. 1600 buildings were demolished and the CBD's building footprint was modified to be smaller and more compact within a buffer along Christchurch's Avon River. The area within the buffer chosen for the redevelopment poses a lower risk from flooding and liquefaction.

The building code was revised following the earthquake increasing the seismic hazard factor in the region thus requiring commercial buildings to be designed and constructed with a higher seismic tolerance. A new "Earthquake Prone Building Policy" was also introduced in 2013 to conduct a nation-wide mandatory structural assessment exercise for all buildings within a five year time-frame to upgrade non-compliant buildings.

The Christchurch City Council launched a public engagement campaign to maximise the local community's involvement in redeveloping the CBD, to ensure that the CBD will meet the needs and preferences of the local people.

- *Establish temporary structures* for businesses and industries to operate from while permanent reconstruction takes place.

Since the repair and construction of buildings and infrastructure can take a long period of time it is helpful to establish temporary areas where businesses and industries can function from while rebuilding takes place. This relieves pressure on the rebuild allowing the quality of the rebuild to not be compromised for speed.

- *Promote disaster-resilient livelihoods.*

The recovery process should not only restore livelihoods but ensure that the livelihoods are sustainable in the long-term and are able to withstand the risks from disaster events. The resilience of livelihoods can be increased by improving technologies which can minimize the impact of disasters and providing training to upgrade the skills of the workforce so that they have more opportunities.

Box 2.5.2 Resilient construction technology in West Sumatra

Following the West Sumatra earthquake in 2010, a new construction technology was introduced to build houses that were more earthquake-resistant and cheaper using building blocks made of mud or cement which fit together without plaster. The introduction of this new construction technology was taken as an opportunity to create a new and sustainable livelihood.

New building block presses were installed to produce the mud bricks and locals were trained to operate the presses and construct houses using these blocks. This created jobs for locals during the disaster and also in the long-term for building earthquake-resistant homes in the future.

Box 2.5.3 Introducing Resilience into Agriculture, Livestock, Fisheries and Forestry Industries

The following serve as examples for the types of measures that can be incorporated into the employment and livelihoods recovery strategy to promote disaster resilience in agriculture, livestock, fisheries and forestry industries:

- Adopting types of crop, livestock and fish varieties that are more resilient to stresses caused by disasters such as flooding, droughts or saline conditions.
- Resilient animal breeding
- Introducing practices such as “conservation agriculture” which minimizes the disruption of soil structure, composition and natural biodiversity which improves crop yields and improves long-term sustainability of farming.
- Adopting water management and conservation techniques such as rainwater harvesting and water storage.
- Use of agro-forestry systems that make use of trees and shrubs as shelterbelts, windbreaks and live fences.
- Introducing measures to prevent and control animal and crop diseases.

- Introduce *disaster preparedness systems* for employment and livelihoods.

The resilience of organisations needs to be increased to cope with and recover from future disaster events. The post-disaster recovery process can be taken as an opportunity to introduce systems to educate and train the workforce to be more disaster-resilient. Improving disaster preparedness and reducing risks can be achieved through making contingency plans on how to operate if struck by a disaster, build strategic partnerships with other organisations to secure supply chains and collaborate to meet extra demands, back up and store important information online and off-site, introduce capabilities in local enterprises to enable them to participate in reconstruction and recovery efforts, and train the workforce in developing specialized skills that will be needed following a disaster.

Box 2.5.4 Organisational Resilience Attributes

Resilient Organisations (Resorgs) is a multi-disciplinary team of researchers and practitioners based in New Zealand devoted to understand and develop mechanisms to increase the resilience of businesses and industries to successfully survive and prosper through disaster events and other major disruptions.

The research conducted by Resorgs identifies three key attributes for organisational resilience:

- Leadership and Culture

Leadership and Culture creates the adaptive capacity of an organisation. It is shaped by the type of leadership, engagement of staff, situation awareness, decision-making and innovation and creativity.

- Networks

The internal and external networks created and maintained by an organisation allow an organisation to seek assistance and collaboration under special circumstances. Resilience can be built by identifying and establishing effective partnerships, exchange knowledge, break through conventional boundaries and make better use of internal resources.

- Be Change-Ready

Pre-disaster planning to identify how to operate in the event of an emergency/disruption. Being change-ready involves establishing unity of purpose, taking a proactive stance as opposed to a reactive one, designing planning strategies and stress testing the pre-disaster plans.

See www.resorgs.org.nz for more information.

Box 2.5.5 Post-Disaster Organisational Resilience in Christchurch Central Business District Businesses

The 2011 Canterbury Earthquakes sequence caused considerable disruption to businesses that operated in Christchurch's Central Business District (CBD). The CBD was cordoned off until mid-2013.

A survey of the businesses in Christchurch that were located in the CBD conducted in 2013 showed that:

- 15% had downsized (i.e. reduced their number of stores and/or hadn't re-opened a replacement store)
- 32% had moved to new locations
- 2% operated under new names in new locations
- 2% remained in the same location
- 3% operated from home or exclusively online
- 10% no longer operated in Christchurch

The businesses that re-opened soon after the earthquakes faced increased demands for goods and services due to shortages resulted from competitors ceasing to operate. There were also complications with logistics and coordination from damaged infrastructure and disrupted supply chains. These businesses adopted various creative systems to endure the difficult time period following the earthquakes which contributed to their organisational resilience. Examples include:

- Two competing pharmacies shared premises due to building damage and shared the same supplier when one of the pharmacies lost its supplier.
- Competing building supply companies assisted with each other's workload and deliveries to meet increased demands.
- IT organisations in the city formed a collaborative informal group to exchange tips on marketing, development and other post-earthquake business strategies.
- The assistance of family members and friends was utilized for business administration work.
- Suppliers provided special support with material resources.

Box 2.5.5 Post-Disaster Organisational Resilience in Christchurch Central Business District Businesses Contd.

- Larger organisations redistributed work to their branches in other cities or brought in additional staff members from unaffected branches.
- Organisations took recovery as an opportunity to change their business operation models to source skilled workers and expanded their workforce for longer-term business development.
- Businesses integrated new technologies and restructured their operational systems with innovative technologies such as social media, new IT software, satellite phones, web-based seminars, video conferences etc. to manage higher workloads by expanding the workforce and creating new organisational relationships.

Source: Stevenson et al. (2014)

Box 2.5.6 Disaster Risk Reduction in Livelihood Programmes in Nicaragua

In 2004 an Organic Cashew project was launched by Oxfam in collaboration with the Centre for Promotion, Research and Rural Social Development (CIPRES) to introduce new livelihoods in the north-eastern areas of Nicaragua. The project was also launched to strengthen the involvement of women and promote gender equality in employment.

Taking into account the many environmental hazards including floods, drought and water shortages and forest fires that affect the project areas, an initiative to introduce disaster risk reduction (DRR) into the livelihood programmes was launched.

The DRR in livelihoods programme consisted of:

- An awareness-raising workshop for CIPRES management, operative staff and personnel from the National Disaster Prevention System (SINAPRED)
- Training programmes to strengthen existing community-level disaster prevention and emergency response committees
- Capacity building exercises to teach communities how to identify risks, vulnerable areas, draw risk maps and make emergency plans
- Search and rescue and first aid training
- Specialist fire prevention training and provision of firefighting equipment
- Assistance to cashew farmers to build dykes and terraces to protect crops from flooding and landslides

Source: Wilkinson (2011)

Community Recovery

Reconstruction and recovery activities must support the social and economic recovery of affected communities. In order to build back better it is necessary to consider the impacts of implemented initiatives on psychological and social conditions in the community as well as the community's economy. Post-disaster recovery of the employment and livelihood sector needs to encourage growth in the affected towns and cities, be locally appropriate, tailored to local needs, and result in creating a community that is resilient and self-sufficient.

Steps to be taken to support the recovery of communities to BBB with regards to the employment and livelihoods sector include:

- Meet local community needs by understanding the community's *socio-economic structure* and *involving the community*.

Characteristics of the affected community's socio-economic conditions, compositions of the local community, employment and livelihood types, available resources, types of skill-sets found in the local workforce and the disaster's impacts on the sector need to be understood in order to plan an effective economic recovery programme. This information needs to be comprehensively collected from the PDNA. The local community needs to be included in designing and implementing economic recovery initiatives. Regular community meetings, community groups, community-run chambers of commerce and the inclusion of local councils can help to ensure that employment and livelihood recovery initiatives are locally appropriate and meet the needs of the local community.

- Support *vulnerable community groups* and eliminate *inequity*.

Vulnerabilities can cause inequalities in the support offered during reconstruction and recovery. Therefore it is important that the economic recovery strategy addresses vulnerabilities and conceive appropriate schemes to provide targeted assistance to vulnerable populations for

income-generation. For example, creating employment opportunities for females or providing special support to female-headed households.

Any discriminations including gender (refer to Gender recommendations in Section 2.1), age and minority discriminations must be avoided in the provision of assistance for employment and livelihoods. All community groups need to be equally included in community consultation exercises. Pre-existing constraints of different community groups need to be addressed and dealt with to provide equal opportunities for all people.

- *Reactivate the economy* as soon as possible by *using relief and rehabilitation* for *immediate job creation*.

Relief and rehabilitation work should be used for immediate job creation for locals by providing short-term employment to take part in post-disaster relief phase activities. Locals can be employed for jobs such as debris clearance and cleaning roadways as well as for roles in food and material distribution centres. Once the reconstruction phase begins, employment opportunities can be provided for locals to take part in reconstruction, road repair, street cleaning, rehabilitation of irrigation works and other similar jobs using simple tools and some initial training if required. Locals should be given priority to take part in relief, rehabilitation and reconstruction work.

- Support *rapid recovery of enterprises* that offer goods and services.

People are hesitant to remain in towns without goods and services, therefore local enterprises need to be supported to recover as fast as possible. Rapid recovery can be promoted by prioritizing the restoration of electricity and other utilities to enterprises; repair and open roads to provide access to supplies and customers; assist with the replacement of lost equipment; provide compensations to replenish stocks; replace animal stocks and arrange animal food; re-planting of pasture lands; provide tools and supplies for industries; and provide affordable low-interest financing options and government grants. If buildings and infrastructure are unusable temporary stalls and stores should be arranged to enable businesses to resume operations while repair and reconstruction takes place.

Box 2.5.7 Short-Term Post-Disaster Livelihood Programmes in Haiti

The post-disaster response efforts following the 2010 Haiti Earthquake were taken as an opportunity to implement cash-for-work livelihood programmes. These provided short-term employment opportunities for locals to include them in the recovery effort as well as inject money into the local economies. Two months following the earthquakes, close to 76,000 workers had been offered short-term employment, of which 40% were women. The work included removal and disposal of building debris and garbage from streets and cleaning drainage systems and canals. The work was divided into six-hour shifts with workers hired in cycles of 12-24 days per month to provide employment to an optimal number of people. These disaster response cash-for-work programmes were hugely beneficial for local micro and small enterprise owners and employees who were impacted heavily by the earthquake.

Longer-term livelihood support initiatives put in place include supporting micro and small enterprises by providing small grants for asset replacement and skills training for up to 20,000 small businesses. Grants will be provided in stages based on evidence of business plans to regulate the funds provided.

Source: UNDP (2011)

- Use *local enterprises for reconstruction*.

Standard procurement arrangements should be revised to promote and give priority to local enterprises to participate in reconstruction activities. Using local enterprises boosts local economy as well as creates jobs locally. Local enterprises also have the best knowledge of traditional resources and technologies to be used in the rebuild. If local enterprises do not have sufficient capacity to undertake reconstruction work alliancing⁸ or creating partnerships with larger national-level organisations can be a solution.

- Adopt *environmentally-friendly, sustainable approaches* to recovery and reconstruction in the employment and livelihoods sector (refer to Environment recommendations in Section 2.1).

⁸ Alliancing is a type of contractual arrangement used for large complex projects where all project participants (client, designer, contractor etc.) work together as an integrated team. Alliancing takes the approach of making decisions that benefit the project, rather than individual parties. The final profit or loss from the project is shared equally amongst the alliance members.

- Arrange *low-cost training programmes* to *up-skill people* based on skills shortages.

Locals need to be trained to upgrade their knowledge and skills (in disaster risk reduction, business recovery, reconstruction and/or other industries) to increase their chances of finding employment and build a work-force that is skilled and versatile.

- Provide support to *upgrade traditional livelihood* sectors or introduce *new livelihood options* based on *locally available resources and skills*.

Regardless of new livelihood opportunities presented during recovery efforts, community members prefer to return to their traditional livelihoods. Therefore the restoration and upgrading of traditional livelihood sectors need to be a priority. In the case where the revival of traditional livelihoods is not viable (Eg. in the case of relocation), new livelihood options should be introduced that use existing resources and skills-base in the community.

Box 2.5.8 New Livelihood Options in Sri Lanka

The 2004 Indian Ocean Tsunami that struck Sri Lanka's coastal regions causing heavy impacts on the sea-dependent livelihoods such as fisheries and tourism. The disaster also resulted in a large relocation effort where sea-side communities were relocated inland, away from their traditional livelihoods.

In order to compensate for these losses the NGOs that undertook recovery operations in the country introduced various initiatives to support existing livelihoods affected by the tsunami and introduce new livelihood projects.

- Fishermen were supported by providing new boats and introducing boat building industries.
- Lagoon rehabilitation projects were implemented to facilitate lagoon fishing.
- Rain water harvesting was introduced in dry areas.
- Shopping areas were built to enable merchants to start small shopping stalls, market places and boutiques.

- Introduce *large-scale multi-purpose businesses* to boost the economy.

Introducing a new big business such as a shopping mall, a hotel, multi-purpose building or sports stadium can boost the local economy by creating new jobs, providing new services and serving as an attraction for residents as well as tourists.

- Ensure economic recovery initiatives are *practical* and *culturally appropriate*.

The rebuilding and recovery process provides the opportunity to modernize and change the economic environment in a community. It is however important that any changes made are culturally and socially appropriate and aligned with community needs. Changes made need to also be practical in terms of daily and long-term maintenance. The involvement of the local community when making economic recovery decisions is imperative.

- *Advertise and promote* local industries.

The economic recovery strategy needs to include an effective campaign to persistently advertise and promote local industries to attract residents (old and new) and tourists into the community.

- Establish *business support services*.

Support services such as business mentoring services and business advice and counselling services need to be put in place to help business-owners obtain necessary information and resources to assist with decision-making and rebuilding and recovery.

- *Keep the community informed*.

Accurate, transparent and up-to-date information needs to be provided to the community with regards to employment and livelihood sector recovery initiatives being put in place. This information will enable the community to make informed decisions. Newsletters, community meetings, radio, television and social media can be used to disseminate information

Box 2.5.9 Post-Disaster Livelihood Recovery Programmes in Grenada

Grenada was struck by a category 4 storm, Hurricane Ivan in September 2004, resulting in 90% of homes damaged or destroyed. Grenada's agricultural sector and fishing sector suffered extensive damages. Nutmeg plantations which account for 80% of agricultural exports were destroyed and fishing boats and equipment were damaged.

In response to the need to restore the agriculture sector which is an important part of the country's economy, several livelihood projects were implemented to stabilize the sector. Small-scale vegetable farmers were supported with the provision of seeds, tools and fertilizer, as well as information and advice. Local builders and tradesmen were also supported by providing training sessions on hurricane-resistant construction techniques.

Source: IFRC (2008b)

Box 2.5.10 Post-Disaster Livelihood Recovery Programmes in Jamaica

Hurricane Dean caused extensive damage to infrastructure and property in eastern and southern Jamaica in 2007. The category 4 hurricane destroyed more than 3000 homes and affected 160,000 people. The hurricane destroyed banana crops and caused a lot of damage to the fishing sector.

The post-disaster livelihood support programme consisted of the provision of agricultural assistance to farmers and small businesses, fishing nets and lines to fishermen, and start-up supplies for poultry farmers. Local community groups such as the fisherman's cooperative and the banana cooperative were involved to identify specific local livelihood needs.

The livelihood programme also involved providing cash vouchers to selected beneficiaries. Fishermen could use the vouchers for fishing nets, pots and boat repair materials. Poultry farmers could use the vouchers for chicks, feed and medicines. Vegetable farmers could use the vouchers for fast growing vegetable seeds and fertiliser. Several small businesses were provided with small financial contributions to replenish their stocks and support their families. Sidewalk vendors were given training on small-scale financial management. People who lost their previous livelihoods altogether were given training sessions on alternative skills such as photography and hairdressing.

Source: IFRC (2008a)

Box 2.5.11 Economic Recovery following the 2009 Victorian Bushfires

Following the 2009 Victorian Bushfires the Victorian Bushfire Reconstruction and Recovery Authority (VBRRA) created an economic recovery strategy in-line with its overall recovery and reconstruction framework to produce community-centred solutions for the recovery of the employment and livelihoods sector. The economic recovery strategy was designed using information obtained from community consultation workshops conducted shortly after the fires, and from community recovery committees run by local community members. The economic recovery strategy was launched with the release of an AUD 51 million business support package to assist businesses affected by the fires.

The support package included a one-off grant for debris clearance of properties and an AUD 25,000 grant for eligible businesses. A concessionary low-interest loan scheme was put in place to allow businesses to borrow up to \$200,000 at a low interest over five years. A relief grant and emergency fund were also made available for businesses in need. An AUD 10 million Tourism Industry Support Package was provided to boost tourism in the bushfire-affected towns.

In response to the slow economic recovery progress witnessed in the bushfire-affected communities in the first two years following the fires, more flexible concessionary loan packages were offered in 2011. A new Economic Recovery Package and Tourism and Events Package were also launched in 2011 to support the building/rebuilding of tourist accommodation, new rental accommodation, retail and professional services premises and restaurant and food premises. Two key anchor projects were introduced in one of the larger bushfire-affected towns which have been successful in rejuvenating the local economy and boosting tourism. The first anchor project was the upgrading and modernizing of a popular local ski resort. This led to the opening of a number of new ski shops in the town. Secondly, a brand new large hotel and conference centre was constructed. The hotel and conference centre was successful in allowing local businesses to regain confidence in rebuilding and re-establishing themselves. The construction provided employment for locals and the operation of a bar, retail shops and other services in the hotel and conference centre continues to create jobs in the future.

The assistance provided also included non-financial support services. Adult Education Programmes were run in the local communities to teach new skills or help the local community up-skill. The “Small Business Mentoring Service” was established to provide free professional advice and counselling to assist business-owners with decision-making. Telephone helplines were also launched to answer queries and offer support.

Source: Mannakkara and Wilkinson (2012)

Effective Implementation

Successful economic recovery requires effective and efficient planning and implementation of recovery programmes in order to build back better. Effective implementation can be ensured through diligent planning and institutional arrangements; better management of stakeholders; the use of improved governance processes and appropriate legislation and regulation; and putting in place mechanisms for monitoring and evaluating the recovery effort.

Steps to be taken to effectively implement an employment and livelihoods sector recovery programme to BBB include:

- Create a *comprehensive economic recovery strategy*.

Economic recovery needs to be tailor-made to suit each different community. Therefore the creation of an economic recovery strategy that is community-specific, addresses local challenges, capitalizes on local resources, improves local economic resilience and meets community needs is essential. Accurate and thorough information about the local community and its economic conditions need to be obtained from the PDNA in consultation with the community and local authorities. The requirements with regards to risk reduction and community recovery (from the above sub-sections) must be taken into account to create a comprehensive economic recovery strategy that is aimed at building back better. The economic recovery strategy must also prescribe institutional arrangements; stakeholder roles, responsibilities and partnerships; and governance processes that are required to aid implementation. The economic recovery strategy must be realistic, flexible, compliant with community needs and aimed at improving resilience and sustainability in employment and livelihoods in the community.

- Understand and address *cross-cutting issues*.

The impacts of the employment and livelihoods sector on other sectors such as health, education, food security and nutrition, gender, vulnerable populations needs to be considered. It is equally

important to evaluate the impact of recovery in other sectors such as water and sanitation, transport and energy on the employment and livelihoods sector. It is necessary to ensure that the economic recovery strategy contributes positively to other sectors and promotes equality. Inter-sector collaborations (such as with prioritized repair/reconstruction of transport, water and sanitation and energy) are necessary to speed up the ability of businesses and industries to re-establish themselves.

- Establish an *effective governance structure* to implement the employment and livelihoods sector reconstruction and recovery (refer to Governance recommendations in Section 2.1).

Local stakeholders such as local authorities, public and private institutions, chambers of commerce, labour unions, NGOs, micro, small and medium enterprises as well as central government agencies need to work collaboratively to plan and implement a successful economic recovery programme.

Legislative provisions should be used to make temporary arrangements for businesses to re-establish themselves while permanent rebuilding takes place. Appropriate legislation and regulation should be used to prioritize the restoration of electricity and other services to businesses and industries, create inter-sectoral relationships and provide special assistance such as finances and resources.

Monitoring and evaluation (M&E) needs to be done through all stages of economic recovery implementation to ensure that recovery is taking place in accordance with BBB concepts.

Box 2.5.12 Economic Recovery Strategy in Philippines

The Philippines was struck by Super Typhoon Yolanda (also known as Super Typhoon Haiyan) on the 8th of November 2013, impacting nine regions and 16 million people. The institutional framework for disaster risk management in the Philippines is governed by the Philippine Disaster Risk Reduction and Management (DRRM) Act of 2010. The Act establishes a National DRRM Council (NDRRMC) and a National DRRM Plan (NDRRMP) responsible for planning and implementing post-disaster recovery.

Due to the vast extent of the Typhoon's impacts the Philippines Government created the Office of the Presidential Assistant for Rehabilitation and Recovery (OPARR) with a two year mandate to develop a recovery strategy, recovery plans and programmes and unify the efforts of national, regional and local government bodies and other institutions during reconstruction and recovery. OPARR organized five agency clusters corresponding to the recovery effort which consisted of infrastructure, livelihood, resettlement, social services and support.

The livelihood cluster was headed by the Department of Trade and Industry (DTI) which then implemented its livelihood recovery activities through Local Government Units (LGUs), civil society, private sector, development partners and other stakeholders.

The post-disaster economic strategy designed based on community needs identified from consultations included:

- Supporting agriculture through expansion of food and income base, improvement of coconut-based farming systems, rehabilitation of abaca industry, providing seeds for high value crops, rice, corn, vegetable and fruit production.
- Supporting fisheries and aquaculture by providing fishing boats, motor engines, fishing gears, seaweed dryers, and rehabilitation and development of aquaculture farms.
- Supporting industry and services through the Small and Medium Enterprise Roving Academy (SMERA) Programme, financing, business investment, marketing assistance, and product and packing, design and labelling assistance.
- Providing emergency employment and livelihood assistance.
- Providing science and technology support to enterprises.
- Vocational education, technical skills training and capacity development.

The LGUs were decentralized and therefore had decision and policy making authority. This enabled LGUs to align their disaster recovery structures with the sector cluster system prescribed by OPARR, which facilitated consultation and collaboration. The private sector contributed greatly to livelihood recovery by setting up cash for work programmes, implementing cash flow programmes and providing start-up capital and basic financial training to micro-entrepreneurs.

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SECTION 2.6: BUILDING BACK BETTER IN THE INFRASTRUCTURE SECTORS

The term infrastructure represents physical structures, facilities and services that are set up to support and facilitate the lives of people. Infrastructure is used to sustain the health, education, livelihood and environment sectors in a community. Infrastructure can also be used to provide protection to the community from physical and non-physical hazards.

The major infrastructure sectors include:

- Transport Sector – Includes roads, railroads, pipelines, air, postal services, and transport support services such as airports, ports, tunnels, bridges etc.
- Water and Sanitation Sector – Includes water treatment, water supply, wastewater networks, wastewater treatment, stormwater management, stormwater treatment, water resources management and protection, and hydropower.
- Energy Sector – Includes production and distribution of energy such as electricity, gas, and petroleum.
- Telecommunications Sector – Includes services used for communication such as telephone cables, satellite communication, internet, radio etc.

Infrastructure can be categorised as large-scale public infrastructure and community infrastructure. Large-scale public infrastructure is usually funded by national-scale government budgets set up to

contribute to a country's overall economy and well-being. Community infrastructure refers to small-scale basic low-cost structures, technical facilities and systems put in place at the community level that is critical for the lives and livelihoods of people within a community. Infrastructure has applications in different sectors and therefore reconstructing infrastructure is an important part of post-disaster recovery efforts.

This section on identifying Building Back Better practices in the infrastructure sectors is intended to inform the Post-Disaster Needs Assessment (PDNA) for the Transport Sector¹, Water and Sanitation Sector², Telecommunications Sector³ and the Community Infrastructure Sector⁴. The PDNA's scope includes collecting information to understand the characteristics of the infrastructure sectors, assess damages, determine the effects of the disaster on the infrastructure sectors, analyse the impact of the effects on the infrastructure sectors on other sectors in the community, assess coping mechanisms, measure the immediate and recurring risks faced by the population and develop a recovery and reconstruction strategy that reflects the infrastructure needs of the affected community. Understanding the aspects required to BBB helps shape the PDNA to more effectively capture all the necessary information. BBB considerations need to be kept in mind when assessing sector damages, losses and needs.

¹ GFDRR, UNDP and EU, *PDNA Guidelines Volume B – Transport*, GFDRR, UNDP and EU, 2014, https://gfdrr.org/sites/gfdrr/files/WB_UNDP_PDNA_Transport_SP_FINAL.pdf

² GFDRR, UNDP and EU, *PDNA Guidelines Volume B – Water and Sanitation*, GFDRR, UNDP and EU, 2014, https://gfdrr.org/sites/gfdrr/files/WB_UNDP_PDNA_WASH_SP_FINAL.pdf

³ GFDRR, UNDP and EU, *PDNA Guidelines Volume B – Telecommunications*, GFDRR, UNDP and EU, 2014, https://gfdrr.org/sites/gfdrr/files/WB_UNDP_PDNA_Telecommunication_SP_FINAL.pdf

⁴ GFDRR, UNDP and EU, *PDNA Guidelines Volume B – Community Infrastructure*, GFDRR, UNDP and EU, 2014, https://gfdrr.org/sites/gfdrr/files/WB_UNDP_PDNA%20Community_SP_FINAL.pdf

It is necessary to comprehensively understand the different infrastructure sector environments in order to create a plan to build back better. The baseline information obtained from conducting the PDNAs for the infrastructure sectors creates a clear picture of the situation at hand.

Taking into consideration the understanding of “Building Back Better” from Section 1 of this annex and the information provided by the PDNAs, the following sub-section will discuss best-practices and recommendations to successfully build back better in the infrastructure sectors under Risk Reduction, Community Recovery and Effective Implementation.

Considerations for Building Back Better in the Infrastructure Sectors

Risk Reduction

Steps to be taken into consideration for risk reduction in the infrastructure sectors to BBB are:

- Put in place *disaster risk reduction* measures to increase the resilience of physical assets belonging to the infrastructure sector during reconstruction (refer to Disaster Risk Reduction recommendations in Section 2.1).

Infrastructure assets providing access and essential services such as water and sanitation, electricity and telecommunications to residential buildings and buildings and facilities in the health, education and livelihoods sectors need to be able to function during disaster periods. Damaged critical infrastructure related to vital post-disaster sectors such as health and water and sanitation need to be restored or replaced with temporary arrangements as soon as possible and rebuilt to superior structural standards that allow them to withstand prevalent risk levels and remain functional during future disaster events. Therefore land-use planning regulations and building codes must be updated/introduced reflecting these higher risk conditions.

- Implement *new hazard-control infrastructure*.

Reconstruction can be taken as an opportunity to introduce new infrastructure to mitigate emerging risks such as flood-control or landslide protection works.

- *Modernize and upgrade infrastructure*.

Reconstruction can be taken as a development opportunity to renew existing infrastructure with modern features and improved technologies. The capacity of infrastructure should also be reviewed and increased as necessary to reflect current and predicted demands and risk levels.

**Box 2.6.1 Transport, Water and Sanitation and Telecommunications Infrastructure
Betterment in Queensland, Australia**

The Queensland Betterment Fund was launched in 2013 in the aftermath of Tropical Cyclone Oswald with the intent of increasing the resilience of Queensland communities to natural disasters, reducing injuries and fatalities from future natural disasters, improving asset utility during and after future natural disasters, and reducing future expenditure on asset restoration. Gaining access to the Fund was facilitated by the “Framework Proposal for Betterment”, which streamlined the process of determining eligibility, submitting proposals, assessment criteria and funding distribution.

Successful infrastructure projects funded by the Queensland Better Fund include:

- Gayndah Water Supply Intake

The Gayndah Water Supply Intake Station provides the Gayndah town’s only water supply and supports the population of approximately 2000, as well as local primary industries including dairy farming. North Burnett Regional Council estimates \$3.85 million in damage to the asset has occurred due to disaster events over three years. The pumping station was severely damaged in 2011 and was rebuilt at a cost of \$1.22 million. These works were completed just prior to Tropical Cyclone Oswald in early 2013, which subsequently destroyed the new jetty, raw water intakes, pumps and water discharge main. Since rebuilding this infrastructure in the existing location would repeat the same vulnerabilities, the infrastructure was relocated further upstream with enhanced intake designs to improve resilience during and after future flood events.

Box 2.6.1 Transport and Water and Sanitation and Telecommunications Infrastructure Betterment in Queensland, Australia Contd.

- George Bell Crossing

George Bell Crossing is located on a rural road called Ivory Creek Road which services a small community in Southern Queensland. The road is used daily to transport livestock, milk and heavy vehicles. Ivory Creek Road was subject to frequent inundation by floods due to the large runoff flowing through the George Bell Crossing. The damages caused by Cyclone Oswald in 2013 completely washed away the crossing, whilst also causing severe scouring and erosion. Betterment of the George Bell Crossing involved replacing the causeway with a 60 metre long, five metre wide, pre-cast concrete bridge with a new piled bridge abutment and piers that allow for increased flows of water.

- Upper Mount Bentley Road

Upper Mount Bentley Road is located in a remote indigenous community called Palm Island in North Queensland. Upper Mount Bentley Road provides the only on-ground access to vital telecommunications infrastructure to the peak of Mount Bentley which services the health, education and welfare sectors in the Palm Island community. The road was unsealed and frequently impacted by disasters which cuts off access to Mount Bentley, and in turn severely disrupts the local community. Following Cyclone Oswald, the Palm Island Aboriginal Shire Council Betterment Project included a project to upgrade the Upper Mount Bentley Road by surfacing the road with concrete to protect the road and enable vehicle access to the telecommunications tower on Mount Bentley during heavy rains and floods.

Box 2.6.2 Installation of Flood-proof Water and Sanitation Infrastructure in India

Bahraich is a district located in the northern Indian state of Uttar Pradesh. Bahraich is frequently impacted by floods, affecting 450,000 people each year. The biggest concerns with flooding are the availability of safe drinking water and problems with sanitation particularly for women.

The Bahraich district communities access drinking water from hand pumps. These hand pumps get submerged during flooding events which cuts off the sole source of safe drinking water for the locals. A team of engineers were consulted by the Bahraich district administration to design a practical solution for this issue. Taking into consideration the need to raise the hand pumps above flood level, and also protect the hand pumps from being damaged by the force of flash floods, a hand pump on 2.9m plateaued platform with a 45 degree slope was designed and constructed. The new hand pumps were located at the highest points in each of the villages. Thus 800 new flood-proof hand pumps were designed and constructed in the 200 flood-affected villages catering to 400,000 people.

The other major issue in Bahraich during flooding events is sanitation. During flood events large groups of affected people move to occupy higher land until the flooding subsides. These areas often do not have proper shelter or sanitation facilities. The traditional soak pit system used as toilets in some of the relief camps also become inoperable during floods as the soak pits get filled with rain and flood water, along with raised groundwater levels which result in the soak pits overflowing. Such conditions are particularly problematic for women and children. Also result in the spreading of diseases.

As a solution for this, a flood-resistant community toilet using septic tanks was designed especially for the use of women and children.

Source: Bahraich District Administration (2009)

Box 2.6.3 Building Infrastructure Back Better in New Zealand

The 2010/2011 Canterbury Earthquakes did extensive damage to roads, water and wastewater networks, and electricity transmission systems in the city of Christchurch and its surrounds. The rebuilding effort focused on improving seismic resilience within the prevalent time and resource constraints.

Building back better of damaged infrastructure networks included:

- Replacing system components with better materials
- Replacing overall systems with improved technology
- Revising system layouts to avoid hazards
- Minimising failure impacts
- Facilitating easier future repairs

- Implement *training and awareness programmes* to educate stakeholders and the local community on disaster risk reduction.

It is important to educate and train stakeholders involved in reconstruction of infrastructure assets as well as the local community on physical and non-physical disaster risk reduction measures.

- Put in place plans and systems for *disaster preparedness* to *minimize/mitigate the impact* of future disaster events.

Building back better also includes pre-disaster planning. Therefore disaster preparedness plans and mechanisms such as early warning systems, emergency evacuation routes, and strategies for disaster response behaviour should be put in place for the different infrastructure sectors in anticipation of future hazards.

Box 2.6.4 Disaster Preparedness Planning for Transportation Networks in New York

Hurricane Sandy caused severe and unprecedented damage to the East Coast of the United States in October 2012. The transportation networks suffered intense damage resulting in closed roadways, tunnels, bridges, rail lines, and subway services. The capacity of the regional transportation system and electrical, lighting and communication systems were debilitated. As a result of this destruction, the New York Metropolitan Transportation Council (NYMTC) partnered with the Federal Highway Administration (FHWA), the North New Jersey Transportation Planning Authority, the South Western Regional Planning Agency and the Greater Bridgeport Regional Council put in place planning initiatives to apply lessons learned from the Hurricane Sandy recovery.

First, a vulnerability assessment will be conducted sponsored by FHWA to:

- Assess the impacts of Hurricane Sandy and preceding weather events on the transportation assets within the region
- Assess the vulnerability of those assets to impacts from extreme weather events and possible effects of climate change
- Identify adaptation strategies to increase the resilience of the transportation system

NYMTC's strategic plan to improve the resilience of the transportation system includes initiatives such as:

- The New Jersey Climate Change Adaptation Directory, which is a resource that brings together data, models, existing and proposed policy to be shared and applied by cross-sector practitioners.
- New York City's Special Initiative for Rebuilding and Resiliency who produced a roadmap identifying future climate risks to the city's transportation network such as storm surges and high winds, and strategies and initiatives to mitigate the impacts of climate change and increase resilience.
- Westchester County's plan to adapt services and infrastructure to respond to the increasing severity and frequency of storms by identifying detours for bus routes and developing flood mitigation plans to minimise road closures.
- Rockland County's communication links to establish an organized approach to restore transportation and infrastructure in a timely manner. This includes encouraging main power lines to be secured underground, more vigorous tree monitoring programmes, defining more specific staging areas, establishing more widespread power redundancies and encouraging generators in all service stations and food stores.
- Suffolk County's "Connect Long Island" initiative to put in place a Bus Rapid Transit (BRT) to help reduce automobile dependency. Hazard mitigation plans are also being expanded to put in place comprehensive, state-of-the-art flood protection systems that balance buildings, roads, wastewater infrastructure and power grids with natural water systems.

Box 2.6.4 Post-Disaster Transport Planning in New York Contd.

- State-wide plans created by the State Climate Action Council to build new transportation infrastructure inland from or above rising water levels, and to use heat-resistant construction materials that can withstand higher temperatures.

Source: Matherly et al. (2014)

Box 2.6.5 Strategies for Training and Educating Stakeholders on Regional Transportation Emergency Management Plans

Strategies include:

- Conducting multi-year training and exercise programmes and tracking improvements for different target groups (such as first responders, emergency management personnel, general public, private-sector representatives, existing employees, new hire employees etc.).
- Developing training/educating documentation such as situation manuals for discussion-based exercises, exercise plans for operations-based exercises, scenario events list and checklists of critical tasks to be completed by participants during an exercise.
- Determining the format of the exercises (seminars, workshops, games, drills, functional exercises or full-scale exercises).
- Developing evaluation tools to assess the performance of the exercises

Box 2.6.6 Post-Disaster Risk Reduction Measures for the Water and Sanitation Sector

- Put in place contingency plans for service delivery systems in post-disaster contexts
- Risk-proof water and sanitation infrastructure to enable functioning during disasters, and allowing access to parts and tools during emergencies
- Identify gaps in the water and sanitation sector and upgrade during reconstruction
- Train engineers, builders and other contractors on safe and disaster-resilient designs and construction methods
- Pre-train technicians on how to clean water and sanitation infrastructure such as wells and water storages following a disaster
- Run education sessions and disseminate information regularly about sustainable water use and sanitation awareness following disaster events

Community Recovery

Considering the needs of the community and supporting the recovery of affected people and the community's economy are equally important to building back better as reducing risks to create a safer community. The social and economic consequences of every decision made in the rebuilding of the infrastructure sectors need to be considered and responded to.

Steps to be taken into consideration for community recovery in the infrastructure sectors to BBB are:

- *Understand* the local community's social and economic structure by collecting extensive information from the PDNA.

The social and economic fabric of the local community needs to be understood in order to plan and put in place effective mechanisms to support community recovery during infrastructure reconstruction. These include information about the different types of community groups present, their lifestyles, their livelihoods and other special characteristics indigenous to the specific community. This information must be used to create a infrastructure reconstruction plans which support social and economic recovery.

- *Prioritize and sequence* infrastructure reconstruction and recovery based on community needs.

Information from the PDNAs along with grass-roots level involvement and community consultation need to be utilized to prioritize and sequence infrastructure projects to meet the social and economic needs of local communities.

Critical communication facilities, transportation networks, water and sanitation facilities and energy distribution to support relief activities and information dissemination need to be restored as soon as possible within 2-8 weeks. Community infrastructure needed for employment,

livelihood activities, education and community support need to be established in the medium-term within the first year. Long term infrastructure goals include planning and implementing large infrastructure reconstruction and betterment projects for disaster risk reduction and capacity building.

Box 2.6.7 Reconstruction and Recovery Prioritization Strategy in Pakistan

The prioritization of sectoral recovery programmes following the 2005 Pakistan Earthquake was determined using the following criteria:

- Broadest impact – The re-establishment of services and rebuilding of buildings and infrastructure that had the greatest impact on the lives of the affected community were prioritized.
- Accessibility – The buildings and infrastructure that were most accessible were rebuilt first.
- Avoiding legal disputes – Projects with legal clearance were prioritized, while projects that posed legal issues were de-prioritized until disputes were settled.
- Gender balance – Interventions that benefited gender equality and balance were prioritized.

- Put in place *temporary arrangements to provide services* until permanent reconstruction of infrastructure takes place.

Since permanent reconstruction projects can take some time it is important to make temporary arrangements to allow the community to use services.

Box 2.6.8 Transport Sector Post-Disaster Response Effort following Hurricane Sandy

The urgent need to reopen transportation networks in the areas affected by Hurricane Sandy in order to resume activity in other sectors led to the implementation of successful initiatives such as:

- Modifying railroad schedules in Long Island and offering bus services from major stations while the flooded subway tunnels were repaired.
- The waiting room of a major railroad station was turned into a comfort station offering heat, water, restrooms and a charging station for electronic devices.
- The Metropolitan Transportation Authority (MTA) set up a “bus bridge” using more than 300 buses to connect approximately 200,000 daily riders to functioning subways until the subway services were restored.
- Alternative co-operative transportation services such as bus, ferry and rail were provided by the Port Authority of New York and New Jersey.
- Free rides were offered to people in Rockland County’s express bus.
- An interactive GIS mapping tool was used by Rockland County for response agencies at the local, county and state levels allowing them to access and share information about road obstructions and closures. The mapping information was used to prioritize and direct efforts to clear major highways and roads and to plan emergency vehicle and evacuation routes.
- The New York State DOT implemented Incident Command System (ICS) protocols to stage staff and equipment at strategic locations to be easily deployed.

Source: Matherly et al. (2014)

Box 2.6.9 Alternative Post-Disaster Transport Routes in Indonesia

The road networks in Aceh suffered damages from the impacts of the 2004 Indian Ocean Tsunami. One of the road infrastructure betterment projects launched as part of post-disaster reconstruction was the upgrading of a 340km section of a vital national road along Aceh's west coast. The reconstruction of this road was also aimed at assisting the region recovery economically by providing better access.

In order to provide continued access whilst the national road was being constructed, the Lamno-Calang Road Maintenance Project (LCRMP) was launched. The LCRMP was arranged to maintain a temporary road to link the areas that previously used the national road under construction. The LCRMP also included maintenance of other local roads which were part of the temporary connection.

Similar approaches were adopted for other road rehabilitation projects in Aceh. This allowed communities to function normally until the roads were rebuilt.

Source: Multi Donor Fund for Aceh and Nias and Java Reconstruction Fund (2012)

Box 2.6.10 Temporary Post-Disaster Infrastructure Arrangements in New Zealand

The February 2011 Canterbury earthquake event caused widespread liquefaction in affected areas which resulted in the sinking of roads, land shifts and major damages to the water and wastewater systems in Christchurch. The Christchurch City Council had received 36,000 water and wastewater service requests within five months following the earthquake.

The Council and the utility companies worked fast and were able to restore water to 95% of units in the areas surrounding the Christchurch CBD in one month, with a six week boil water order put in place to safeguard against potential contamination from the damaged wastewater system. Port-a-loos were distributed within one week to assist with the recovery of the wastewater system.

Repairs on all the public sewer pipes were completed by August 2011. The water system restoration effort took six months, which included the repair of 60 water supply wells, construction of 12 km of new water mains, repair/reconstruction of 150 km of pre-existing water mains and 100 km of sub-mains.

- *Understand cross-sector impacts and interdependencies.*

All types of infrastructure including transport, water and sanitation, energy and telecommunications are closely linked with the housing, health, education, employment and livelihoods, DRR, gender, environment and governance sectors. There are close interdependencies between the different infrastructure sectors themselves. These can be physical linkages (such as water pumps needing electricity to operate), cyber linkages (such as computer systems relying on telecommunications and internet cables), and geographic linkages (such as pipelines and telecommunications lines located on bridges). It is necessary to evaluate and determine the impacts infrastructure damages and failures have on other sectors and establish contingency plans to support the sectors until the infrastructure is restored.

Box 2.6.11 Cross-Sector Requirements of the Transport Sector

The transport sector directly impacts many sectors such as:

- Health

Safe access to health sector facilities must be ensured during and immediately after disaster events. Transport routes to health sector facilities must be arranged as soon as possible. Delivery routes to transport healthcare supplies need to be repaired and re-opened or re-arranged by alternative means.

- Nutrition

Access to food stores and agricultural lands and factories need to be provided in order for communities to obtain nutritious food. Transportation networks must be arranged to distribute/import food supplies.

- Employment, livelihoods and agriculture

Access to agriculture, businesses, and other industries need to be restored as soon as possible in order to support the recovery of these livelihoods and the income streams of the population, which in turn supports the economic recovery of communities.

- Education

Access to educational facilities needs to be provided.

- Environment

Environmental impacts of rebuilding, replacing or constructing new transport infrastructure needs to be considered.

- Culture

It is necessary to comprehensively understand local community requirements when planning and implementing transport infrastructure projects. Gender equality should be promoted through conducting non-discriminatory consultations and participation in planning and implementation exercises.

Box 2.6.12 Cross-Sector Requirements of the Water and Sanitation Sector

The water and sanitation sector directly impacts many sectors such as:

- Health

Health sector facilities are highly reliant on water and sanitation services and hygiene promotion activities. Apart from provision of drinking water and normal sanitation services, the water and sanitation sector needs to manage special healthcare waste and assist with implementing strategies on communicable disease and vector control.

- Nutrition

Clean water needs to be available for drinking and food preparation, as well as agriculture in order to produce vegetables and meat. Preventing malnutrition caused by diarrheal diseases is important by providing safe drinking water and hygienic sanitation facilities.

- Employment, livelihoods and agriculture

Agriculture, businesses, and other industries all rely on clean water supply and sanitation. Therefore restoration of these services is necessary to support the recovery of these livelihoods, which in turn supports the economic recovery of communities.

- Education

Educational facilities must have safe drinking water and gender-segregated appropriate sanitation facilities.

- Environment

Managing water quality is necessary to prevent water-related diseases. Environmental impacts of rebuilding, replacing or constructing new water supply and sanitation infrastructure needs to be considered.

- Culture

Social, religious and family dynamics as well as gender, age and other vulnerabilities can impact water and sanitation interventions. It is necessary to comprehensively understand local community requirements when planning and implementing water and sanitation projects. Gender equality should be promoted through conducting non-discriminatory consultations and participation in planning and implementation exercises.

Box 2.6.13 Cross-Sector Requirements of the Energy Sector

The water and sanitation sector directly impacts many sectors such as:

- Health

Health sector facilities need uninterrupted energy sources to provide light, heat and run medical equipment. Health sector facilities should be fitted with generators and energy supplies must be restored as soon as possible.

- Nutrition

Freezing/refrigerating meat and produce in stores, hospitals, and homes as well as producing food products in factories need energy, therefore fast restoration of energy or the provision of generators is necessary.

- Employment, livelihoods and agriculture

Agriculture, businesses, and other industries often operate using energy, therefore the provision of generators and fast restoration of energy is needed.

- Education

Educational facilities rely on power for lighting, heating and operating computers.

- Environment

Environmental impacts of rebuilding, replacing or constructing new energy generation and supply infrastructure needs to be considered.

- Culture

It is necessary to comprehensively understand local community requirements and values when planning and implementing energy generation and supply infrastructure projects. Gender equality should be promoted through conducting non-discriminatory consultations and participation in planning and implementation exercises.

Box 2.6.14 Cross-Sector Requirements of the Telecommunications Sector

The water and sanitation sector directly impacts many sectors such as:

- Health

Telecommunications need to be restored as soon as possible to facilitate communication with healthcare professionals, medicine and health supplies manufacturers, patients, other stakeholders and the general public.

- Nutrition

Telecommunications need to be restored as soon as possible to facilitate communication with farmers, suppliers, supermarkets and shops to arrange food and water supplies for affected communities.

- Employment, livelihoods and agriculture

Agriculture, businesses, and other industries need restored telecommunications services to resume their operations and respond to ongoing post-disaster circumstances.

- Education

Telecommunications need to be restored as soon as possible to facilitate communication with parents, students and the wider community.

- Environment

Environmental impacts of rebuilding, replacing or constructing new telecommunications infrastructure needs to be considered.

- Culture

It is necessary to comprehensively understand local community requirements when planning and implementing telecommunications infrastructure projects. Gender equality should be promoted through conducting non-discriminatory consultations and participation in planning and implementation exercises.

Box 2.6.15 New Environmentally-friendly Stormwater and Wastewater Project in Indonesia

Drainage and flood issues have posed problems for communities in Indonesia. One of the post-tsunami reconstruction projects included the implementation of a drainage and flood control project near Banda Aceh. The project took an environmentally-friendly approach by damming mud flats along an estuary, converting it into a stormwater retention basin. This project was coupled with the establishment of a simple wastewater collection and treatment system, which treats wastewater before releasing it into the estuary.

Source: Multi Donor Fund for Aceh and Nias and Java Reconstruction Fund (2012)

- Introduce new infrastructure projects that *boost local economy*.

Post-disaster reconstruction can be taken as an opportunity to evaluate how infrastructure can be used to improve the economic conditions of a community. Current shortcomings in infrastructure that impact business and economic potential of communities such as lack of access to good transport networks, energy supplies, telecommunications facilities and hygienic water and sanitation services should be addressed as part of building back better. Local tradesmen and artisans should be employed for the implementation of infrastructure projects.

- Introduce new infrastructure projects that *support psycho-social recovery*.

Introducing infrastructure projects that improve social conditions in a community should be incorporated into post-disaster reconstruction and recovery. Equal access of clean water and sanitation, transport, energy and telecommunications services to marginalized community groups should be made available. Transport networks should provide facilities for the disabled and aged populations. Local communities should be involved in decision-making, planning and

implementation of infrastructure projects to empower the people, improve community cohesion and support their psychological and social recovery.

- Ensure that reconstructed/introduced infrastructure is *practical, culturally appropriate* and *affordable* to maintain and operate.

The technology used for infrastructure must be user-friendly for local communities and practical in the local context. Training programmes on how to use and maintain facilities can be conducted. Long-term maintenance costs for authorities in charge of the infrastructure assets and the running costs for people using the services need to be affordable. A balance needs to be achieved between modernizing assets and their operability in different communities.

Box 2.6.16 Supporting Local Economies through Rural Transport Projects in Indonesia

Nias Islands were badly damaged by the 2004 Indian Ocean Tsunami as well as the 2005 Sumatra Earthquake. One of the post-disaster reconstruction projects was the improvement of access to remote communities in Nias. Weather-proof roads, bridges and trails were built in 21 sub-districts. Small rural roads and trails were constructed along with rehabilitating and constructing nearly 80 river crossings and bridges for pedestrians, bicycles and motorcycles. The rural road projects were designed to complement the national road reconstruction projects.

The projects gave prominence to local community and local government involvement and the use of local resources and construction techniques. The roads have been designed for low maintenance operation that can be handled at the local village level. Major repairs will need financial assistance from higher levels of government.

The projects were aligned with the Nias Livelihoods and Economic Development Project (LEDP) and aimed to increase productivity and provide access to neighbouring villages, markets and social services.

Source: Multi Donor Fund for Aceh and Nias and Java Reconstruction Fund (2012)

Box 2.6.17 Infrastructure Reconstruction to Support Relocation in Samoa

The devastation caused by the 2009 Samoan tsunami resulted in a mass relocation exercise, where coastal communities were compulsorily relocated inland. The inland locations provided were previously used for plantations and did not have proper water, electricity and transport networks in place.

A proposal that had been put in place several years before the tsunami also addressed the issue of the lack of infrastructure in inland areas, therefore the relocation effort following the tsunami was taken as an opportunity to address this issue. As a result projects to upgrade some inland routes and the construction of ten roads providing access from coastal areas to the resettled zones were implemented.

Source: De (2011)

Box 2.6.18 Understanding the Effects of Water Outages on Businesses using Computer Models in USA

Los Angeles lies in a seismically active region and experiences frequent earthquake events. Studies conducted with regards to seismic events have led to the development several computer models for use in post-disaster scenarios. One model called GIRAFFE (Graphical Iterative Response Analysis for Flow Following Earthquake) uses GIS (Geographic Information System) to model the potential physical damage to the Los Angeles Department of Water and Power (LADWP) network including attributes such as soil liquefaction and landslides events. It also models water flows through the damaged network. Another study led to the creation of a model which illustrated the damage-repair process to estimate the duration of water outages.

Urban planners in Los Angeles were able to use these models to understand the consequences of water outages on different types of businesses, and thus estimate impacts on local economy. Post-disaster environments will therefore greatly benefit from GIS technology, understanding interdependencies between sectors and collaborating with end users to keep them informed and involved.

Source: Chang (2009)

Box 2.6.19 Practicality of a Water Supply Project in Sri Lanka

During the post-tsunami reconstruction period, concessionary rates for household water supply connections were provided to enable beneficiaries to install safe drinking water lines into their homes and discourage the use of common wells and other sources of water. However due to delays, one of the post-tsunami water supply project that was implemented was only completed after the concessionary period was over, which meant households had to pay the normal rate of 17,500 Sri Lankan Rupees to access the connections. Since the population in the local region lived below the poverty line where the average household income was 3,500 Sri Lankan Rupees, this rate was unaffordable which made this water supply project inaccessible and therefore impractical for the local community.

Source: IFRC (2012)

Effective Implementation

Along with reducing risks and supporting social and economic recovery, building back better also requires the adoption of processes which makes rebuilding effective and efficient. Effective implementation can be ensured through better management of stakeholders involved, the use of appropriate legislation and regulation and putting in place mechanisms for monitoring and evaluation of the recovery effort.

Steps to be taken to effectively implement infrastructure sector reconstruction and recovery to BBB include:

- Create a *comprehensive holistic infrastructure sector recovery programme* and *sector-specific recovery plans*.

The first step to implementing a successful post-disaster recovery programme is planning. Local community information collected from the PDNAs is significant in understanding the most effective methods of implementation. Existing sub-sector policies, cross-cutting sector policies, DRR policies, urban development policies, building codes and by-laws for each infrastructure sector need to be considered in order to determine how to incorporate risk reduction and community recovery strategies to build back better. For each infrastructure sector, the information from the respective PDNAs along with community consultations should be used to identify priorities in reconstruction to support risk reduction and social and economic recovery as described in the above sub-sections.

An overall recovery plan which provides a holistic view of the overall infrastructure recovery programme needs to be created, as well as separate plans for the transport, water and sanitation, energy and telecommunications sector addressing sector-specific issues and initiatives. The recovery plans must identify key stakeholders, policy and legislation requirements and

implementation arrangements. When creating the recovery programme flexibility is vital. It is important to take into account the psychological state of people and produce a recovery plan that focuses more on quality and less on rigid deadlines.

- Establish an *effective governance structure* to implement the infrastructure sector recovery and reconstruction programme (refer to Governance recommendations in Section 2.1).

Ensure that post-disaster recovery and reconstruction is strengthened in policies related to infrastructure reconstruction, service delivery and cross-cutting issues. The stakeholders involved in the recovery process of the transport, water and sanitation, energy and telecommunications sector as well as those involved in cross-sector recovery efforts need to be managed in order to avoid ad-hoc procedures and chaos. Strategic partnerships need to be built among the stakeholders involved such as national and local government, private sector, civil society and national and international support agencies involved in sector-specific and cross-sector activities.

M&E needs to be done through all stages of the rebuilding and service delivery process within each infrastructure sector and overall to ensure quality assurance and as a check to confirm that recovery is taking place in accordance with BBB concepts.

The process of resuming service delivery in the transport, water and sanitation, energy and telecommunications sectors and rebuilding infrastructure needs to be made as easy as possible by fast-tracking any long bureaucratic procedures using legislation. Arrangements made to temporarily provide services such as alternate road routes and sanitation facilities until permanent reconstruction takes place need to be expedited.

Box 2.6.20 Institutional Arrangement for Infrastructure Rebuilding in New Zealand

A large-scale infrastructure rebuild was needed in Christchurch following the 2010/2011 Canterbury Earthquakes. Due to recognizing the inability of existing institutional mechanisms to undertake such an extensive task, the central government of New Zealand legislated a temporary authority called the Stronger Christchurch Infrastructure Rebuild Team (SCIRT) with the responsibility of implementing the horizontal infrastructure rebuild.

SCIRT was based on an alliance contracting model, where a commercial/legal framework is established merging the clients, contractors, service providers and non-owner participants into one team to deliver capital works projects. Alliancing facilitates effective collaboration with all public and private sectors harnessing their expertise and providing opportunities for innovation and improved project delivery outcomes. SCIRT's organisational structure consists of the Christchurch City Council, the Canterbury Earthquake Recovery Authority (a temporary institution established to oversee and manage the overall reconstruction and recovery effort) and the New Zealand Transport Agency as the clients or owner participants. The non-owner participants include three major construction companies and two engineering consulting companies. Project delivery is supported by local sub-contractors and suppliers.

Box 2.6.21 Post-Disaster Institutional Arrangements for Transportation Sector Recovery in USA

The post-disaster recovery programme for the transportation sector following Hurricane Sandy was led by the New York Metropolitan Transportation Council (NYMTC). NYMTC is an existing regional council of governments that provides a collaborative planning platform to address regional transportation issues. NYMTC has effective partnerships with neighbouring region planning activities as well. NYMTC has three sub-regional Transportation Coordinating Committees (TCCs) that respond to transportation needs at the local level. This structure and collaborations allowed NYMTC to effectively implement the post-Hurricane Sandy transportation response and recovery activities partnering with transportation agencies, water and sanitation sectors and utility providers.

Source: Matherly et al. (2014)

Box 2.6.22 Pre-Disaster Institutional Arrangements for Post-Disaster Infrastructure Response and Rebuilding in USA

The All Hazards Consortium (AHC) is a non-profit organization established to facilitate multi-state collaborations in post-disaster response and rebuilding activities in the eastern areas of USA. AHC works to build emergency readiness and response capabilities and effective working relationships between stakeholders from government, utility service entities, and the private sector within and between states. These relationships were integral to the recovery effort following Hurricane Sandy.

In the western side of the country, the Association of Bay Area Governments (ABAG) in San Francisco has coordinated the development of the Multi-jurisdictional Local Hazard Mitigation Plan (MJ-LHMP). The MJ-LHMP extensively discusses and describes the interconnectivity among utilities, transportation and communications in the area along with corresponding potential health risks from service disruption following disaster events. This is a valuable tool to be used for infrastructure reconstruction and recovery planning.

Source: Matherly et al. (2014)

Box 2.6.23 Post-Disaster Infrastructure Reconstruction Arrangements in Japan

The 1995 Kobe Earthquake in Japan led to the creation of national lifelines disaster assistance systems. The Japan Water Works Association (JWWA) reviewed its systems for disaster assistance based on lessons from the Kobe Earthquake experience. The revised national and regional disaster assistance systems allocated clear roles for participants of different prefectures and regional branches for post-disaster water supply activities. Emergency response and recovery works are to be carried out in collaboration between regional and prefecture branches.

Source: IRP (2013)

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SECTION 3: PRE-DISASTER BUILDING BACK BETTER PLANS FOR POST-DISASTER RECOVERY

This annex has explained and defined the concept of building back better, and provided guidelines on how to build back better in the social, production and infrastructure sectors in a community. Successful incorporation of these BBB concepts into post-disaster reconstruction and recovery programmes ideally requires pre-planning.

This section urges practitioners using this annex to pre-prepare for building back better by creating the following Pre-Disaster BBB Plans for each sector discussed in this annex. The Pre-Disaster BBB Plans address the BBB elements introduced in the BBB Framework in Section 1, and allow practitioners to adopt the recommendations presented in this annex contextualized to the conditions of different countries and communities. Having these Pre-Disaster BBB Plans completed in the pre-disaster period will allow easier implementation of BBB concepts in post-disaster reconstruction and recovery programmes.

The list of Pre-Disaster BBB Plans recommended for pre-disaster planning is shown below. Practitioners in each sector (i.e. housing, education, health, employment and livelihoods, and infrastructure sectors) need to prepare this list of plans using the guidance presented in sections 2.1 to 2.6 of this annex to be ready for building back better during post-disaster reconstruction and recovery.

Pre-Disaster BBB Plans for Post-Disaster Recovery

Post-Disaster Needs Assessment Tool	
Cross-Sector Relationships Evaluation	
Structural Improvements for Risk Reduction Plan	
Land-use Planning for Risk Reduction Plan	
Risk Reduction Education and Training Plan	
Disaster Preparedness Plan	
Post-Disaster Psycho-Social Support Plan	
Post-Disaster Community Participation and Empowerment Plan	
Post-Disaster Economic Recovery Plan	
Post-Disaster Institutional Mechanism for Planning and Implementation Plan	
Post-Disaster Governance for Planning and Implementation Plan	
Monitoring and Evaluation Plan	