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'Climate Change Vulnerability Assessment of Pakokku Township, Magway Region, Myanmar, 2016-2050: Scenarios for Building Local Resilience ${\bf Copyright @ United \, Nations \, Human \, Settlements \, Programme \, (UN-Habitat)} \\ {\bf First \, edition \, 2017}$

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CLIMATE CHANGE VULNERABILITY ASSESSMENT OF LABUTTA TOWNSHIP, AYEYAWADY REGION, 2016-2050: SCENARIOS FOR BUILDING LOCAL RESILIENCE

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In 2016 the Myanmar Climate Change Alliance, comprised of UN-Habitat, UN-Environment and the Ministry of Natural Resources and Environmental Conservation, in collaboration with WWF and Columbia University conducted a detailed climate change vulnerability assessment of Pakokku Township.

Pakokku is located in the western part of the central dry zone, on the west bank of the Ayeyawady River. 290,139 people live in Pakokku Township, just over 30 per cent of whom live in the town itself. Pakokku has a mostly flat topography, except for some low mountains in the western area of the township, and is characterized by a hot, dry climate. Vulnerability relating to water is the predominant challenge in the township. Areas by the river experience floods, while away from the river drought and access to water is a chronic problem.

The study analyses current vulnerabilities, and by projecting changes in climate, anticipates further vulnerabilities in the future up to 2050. On this basis, it proposes scenarios that describe potential impact of climate change, and issues recommendations for adaptation to avoid the worst case future scenario. It also describes the expected outcomes and results, and prioritized activities that communities identified during the assessment.

The study projects changes in climate for the township, to a 25-kilometre spatial resolution. Projections show an increase in temperatures by as much as 2.7°C by 2050, with up to 17 more hot days per year.

The assessment shows that decision-makers in Pakokku Township will need to plan for variable rain, with increases concentrated in the monsoon season, less groundwater availability in dry areas, greater flood risks near the Ayeyarwady, and more frequent and more severe extreme heat events.

In current conditions, the study demonstrates, Pakokku Township is insufficiently resilient to the present climate conditions, and its vulnerability will increase greatly because of the projected future changes in climate if no adaptation actions are taken. This is mainly due to the current socio-economic; infrastructure and ecological system conditions, and the expected impact of climate change on these systems.



The interplay of these underlying vulnerabilities with ongoing and future changes in the climate will, if not urgently addressed, leave the people of Pakokku more vulnerable to disasters and slow on-set changes. The effects will be seen through more frequent loss of assets and potentially lives, lower incomes that will drive poverty, increased migration, worse outcomes for women and a declining public health situation. Housing and basic service conditions, especially in access to water, will also worsen, driven by changes in the climate and degraded ecosystems.

The business as usual scenario, in which authorities and communities do not recognize the urgent need to address different aspects of vulnerability. Therefore, changes in climate have an exponential effect on the three systems analysed in this report; socio-economic, infrastructure, ecological and ultimately affect people's lives, livelihoods, health, and safety by 2050. In this scenario, insufficient planning capacities and governance, negate mid to long-term planning. Decisions are taken to respond to short-term needs; such as building infrastructure and houses in flood prone areas. Under this scenario, livelihoods, infrastructure and environmental conditions will not allow people to improve living conditions in the township. In addition, projected changes in the climate will interact with and exacerbate the existing vulnerabilities and as they do, new, unforeseen $% \left(1\right) =\left\{ 1\right\} =\left\{ 1$ vulnerabilities may also emerge.



The resilience is built to maintain current living standards scenario, in which the township and communities recognize the urgent need to take action, but also recognize investment, time, economic, technical and skill constraints. In this scenario, an adaptation plan is adopted, and activities that can be implemented without large investment are consistently undertaken, such as the protection of the environment; improving skills and access to credit for more resilient livelihoods and incomes; improvement of water harvesting, among others. Under this scenario, decisions on land-use and town-planning would need to take into account current and projected climate risks, to prevent hazardous situations, such as infrastructure being constructed near flood-prone areas and the need to clean drainage infrastructure inter alia. In this scenario, the township and communities can plan their adaptation needs considering climate constraints, and communicate them to the districts, states and regions, NGOs and development partners. This scenario is the minimum required to prevent increased vulnerability, and to enable continued development.



Resilience is built that enables economic and social development despite changes in climate by 2050, considering the different vulnerabilities of both men and women, in which effective, strategic planning, resources, coordination, and time is assigned not only to maintain basic safety conditions, but to achieve development goals. Based on this assessment, the first of its kind in Pakokku, planning work that follows is strategic, and guides the township planning, the budget request to the district and other authorities. It requests investment from national authorities and international partners, to achieve three main results: 1) To achieve greener healthy environment that supports the living standards of Pakokku in a sustainable manner despite changes in climate, 2) A diversified, inclusive and resilient economy, to enhance the economic conditions of the township; 3) A resilient infrastructure and connectivity, that protects and enables people. In this scenario, efforts are sustained in an inclusive manner over a long period of time, and by a number of actors, but particularly the local and national government.

PURPOSE, PRINCIPLES AND METHODS OF THE ASSESSMENT

The purpose of this assessment is to inform the Pakokku Township, district, regional and national authorities, as well as the development cooperation, of the expected consequences of climate change and, on this basis, to help them to plan and act to adapt to climate change.

Five overarching principles guide the assessment:

- Simplicity, to ensure ease of replication in other townships
- Measurability and availability of data, to ensure ease of update and replication
- · Inclusiveness, to ensure participation of communities
- . Comprehensiveness, to ensure relevance of the findings.
- . Spatial relevance, to guide actual adaptation interventions



To respect these principles, the assessment uses the following:

- Open-source or widely available software, such as Q-GIS.
- Data available at either national or local level, is easily obtained upon written
 request. The assessment does not use satellite imagery. Although this creates
 limitations in developing flood modelling, for example, it enhances the replication
 potential of this work.
- Data from the Census 2014, disaggregated at village-tract and urban ward level, as a key source of information. In addition to being a vast source of information and insight, future census will provide actual monitoring of changes in the structure of the townships, which can be reanalysed in the future. Census data can also be easily accessed for each township:
- Participatory approach, involving communities throughout the whole township through simple questionnaires, community focus groups and participatory mapping;
- Studying the three main systems that define the township; ecological, socioeconomic, and infrastructure. Climate change causes impacts on all three of these systems in Pakokku. A simple analysis of extreme natural hazards does not



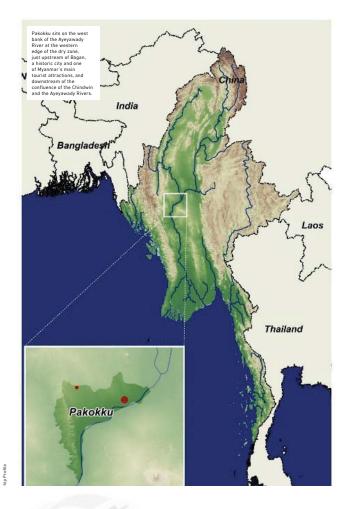
help to understand the extent to which the township will need to adapt. Hence, the assessment is designed to analyse system-wide issues and the interaction between systems.

- Identification of the current and future spatial structure of the township, which is essential to support planning and interventions for adaptation spatially
- Equal participation of men and women and, where possible, using gender
 disagreeated data.
- Representative engagement of young and old people, and consideration poverty drivers such as a lack of access to educational opportunities
- Engagement of the national government and the township throughout the process, to ensure ownership of the results and replication

The methodology works as follows:

- It establishes a basis for analysis by describing the context and key socioeconomic, ecological and infrastructure features and the spatial structure of
 the township. This generates insights on the current situation and sources of
 vulnerability. A vulnerability index is presented, which gives an account of the most
 vulnerable locations in the township;
- It analyses, through both data analysis and community risk mapping, the exposure
 of people and assets to recurrent natural hazards and their potential for rapid and
 slow on-set disaster:
- It overlays downscaled projections of climate change for the township on the current conditions analysed in the assessment and studies how these new climatic conditions will affect people and assets in the township;
- It defines future scenarios that may materialize without adaptive action and contrast them with potential adaptive pathways, which inform adaptation planning.

Pakokku sits on the west bank of the Ayeyawady River at the western edge of the dry zone, just upstream of Bagan, a historic city and one of Myanmar's main tourist attractions, and downstream of the confluence of the Chindwin and the Ayeyawady Rivers.

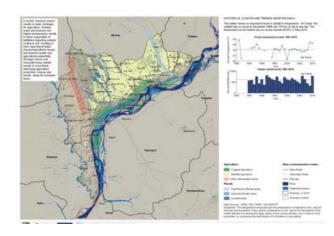


Climatic features, natural hazards and observed impacts

- A shorter monsoon season results in water shortages for agriculture, drinking water,
 and livestack.
- Higher temperatures result in faster evaporation of fertilizers impacting nutrien cycling in soil and lowering agricultural yields.
- Severe heat affects livestock health and agricultural productivity.

Ecosystem conditions

- A history of deforestation and land degradation have reduced the ability of the surrounding ecosystem to provide critical services, reducing crop productivity and yields.
- A naturally highly seasonal, dry climate, and poor water quality limit water security in the township, making it highly vulnerable to any reduction in water availability or quality driven by climate change.
- Combined, these conditions have resulted in highly variable, low crop yields that are likely to further decline with increasing temperatures and changes in rainfall patterns.



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