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A village affected by flooding, Kawa township, Bago Region

BRIEFING PAPER 3: RESPONDING TO CLIMATE CHANGE

A TROPICAL MONSOON CLIMATE

The annual climate pattern in the Gulf of Mottama, and indeed the rest of the country, can be divided broadly into three seasons: a hot, humid season of monsoon rains over May to October, a relatively cooler, drier period over November to February, and then a hot, dry summer over March and April. Until recently, temperatures in Mawlamyine during the hottest periods have reached around 30°C, falling to their coolest at around 18°C in January. The average annual rainfall is around 4,600mm, with most of this falling during the rainy season. Nevertheless, records show considerable inter-annual variability in rainfall[i]. These are the conditions in which current livelihoods and the ecosystem of the Gulf have evolved and are well adapted – but there are clear indications that the climate is changing. This Briefing Paper provides an overview of the current and projected impacts of climate change and the project responses, with further details of activities being given in Briefing Papers 4 to 7.

WHAT THE SCIENCE TELLS US

"In Myanmar, storms, floods and waterlogging are identified as the key drivers of poverty, and poverty is the highest in rural areas. These factors, combined with Myanmar's high exposure to hazards such as floods and tropical cyclones, make it one of the most vulnerable countries to climate change in the world." World Bank Climate Knowledge Portal[ii].

Myanmar's high vulnerability to climate change will inevitably be felt strongly in the Gulf of Mottama, where both flooding and tropical storms are already experienced. Nevertheless, it is a highly complex environment with numerous interacting forces such as tidal bores, coastal erosion patterns, and water runoff from nearby hills as well as significant local topographical differences. Projections of exactly how climate change will impact the area in the future, therefore, cannot be made with a high degree of confidence, although certain tendencies are clear. This overview draws especially from the Climate Information Portal (CIP)[iii], using the site-specific information for Mawlamyine[iv] although other sources have also been consulted. Taking 1981 – 2010 as the reference period, the CIP considers what changes are expected within three subsequent periods up to the turn of this century. Of note is that the projections for both a relatively low to moderate level of global emissions (RCP 4.5) and for a much higher level (RCP 8.5), which is close to the current trajectory, are similar up to the middle of this century but then start to diverge, with significant differences expected for the period 2071 – 2100.

Rising temperature

There is a high level of certainty of temperatures rising in the Gulf of Mottama, whether global emissions stabilize or rise. If emissions continue to rise throughout this century (RCP 8.5), by the period 2071 – 2100, the annual mean temperature is expected to be 30°C higher than the reference period. This is a large change - with both minimum and maximum temperatures being higher.

Schweizerische Eidgenossenschaft
Confédération suisse
Confederazione Svizzera
Confederaziun svizra

Swiss Agency for Development and Cooperation SDC

Similarly, the number of tropical nights, when the temperature remains above 20°C, will increase. Even if emissions are more moderate (RCP 4.5), annual mean temperature is still expected rise, but to 20°C rather than 30°Chigher than the reference period.

Precipitation

There is a high level of certainty of precipitation increasing in the Gulf of Mottama, although the likely increase varies according to whether global emissions stabilize or rise. Assuming current emission levels, by the period 2071 – 2100, annual precipitation is predicted to increase by some 22%. This increase is, however, only likely to be 7% if current emissions stabilize.

Water discharge

Water discharge is also expected to rise significantly within this century. If current emission levels continue, annual mean water discharge is predicted to increase by 31% by the period 2071 – 2100. Even if current emissions stabilize, annual mean water discharge is still expected to increase by 10%.

Sea level rise

Projected sea level rises are a further important factor to take into consideration in the Gulf of Mottama, but this is not currently integrated into the site-specific information given on the Climate Information Portal. According to ClimateLinks (2017)[v], sea level is projected to rise by at least 0.2 – 0.6 m by 2100.

THE LIKELY IMPACTS OF CLIMATE CHANGE

Unfortunately, the likely impacts of climate change are almost wholly negative. Access to freshwater is likely to be increasingly difficult in the coastal area, as ponds and wells are very vulnerable to contamination from tidal surges. Irregular river flows (rapid runoff and then periods of drought) combined with a higher sea level are also likely to result in increased saltwater intrusion. This will impact cropping patterns – most paddy varieties are not very tolerant of saline conditions or of unreliable rainfall. Cyclones, of course, can devastate production. According to ClimateLinks (2017), a 10% decrease in paddy production can be expected for every 10°C rise in temperature. Fish are likely to be stressed by increased water temperatures, impacting small scale fishers (although exactly how different fish species will react is not fully known). Certainly, cyclones can harm or destroy critical spawning grounds. Finally, the ecosystem as a whole is likely to be impacted in numerous ways, some of which are difficult to anticipate in advance.

It is common to distinguish between "rapid onset disasters" such as cyclones, floods, and tidal surges and "slow onset disasters", comprising gradual changes over the years, such as steadily rising mean temperatures, a greater number of tropical nights, and a decreased predictability in rainfall patterns. In subsequent Briefing Papers, this distinction is retained although the different types of disaster merge into one another.

WHAT THE COASTAL PEOPLE ALREADY EXPERIENCE

Based on the available scientific data outlined above, it can already be concluded that whether global emissions stabilize or continue to rise, the coastline of the Gulf of Mottama is likely to become a harsher living environment for humans and other living beings. Adaptation and managing residual risks will be crucial to survival. Yet it should also be noted that the coastal peoples of the area have always had coping mechanisms in response to the vagaries of their environment. Village relocation several times within a lifetime is an accepted part of their lifestyle, as is a seasonal adaptation to changing water levels in their environment. Similarly, part of the uniqueness of the biodiversity of the area is the way that animals and plants have found ways to thrive despite significant diurnal and longer-term changes in salinity, water levels, and soil moisture. The predicted mean rise in temperature may prove to be the most challenging change to overcome.

Amongst the coastal farming and fishing communities, there seems to be widespread awareness of climate change. This may be a result of the various awareness-raising and training sessions they have undergone (see further below) but is reinforced by the changes in the weather they are experiencing themselves. The text box records a variety of observations.

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Coastal erosion, Kawa township, Bago Region

Climate change: local observations and consequences

Rising temperatures

“There is no longer any cool season. Over the past four to five years, we never had to wear warm clothes.” Man (about 40) from Chaungzon

“Normally we would work up to 11 in the morning and then rest until 2 in the afternoon. But now it’s impossible to work outdoors after 9.30, it’s just too hot, and we continue at 3 in the afternoon. So the working day has become shorter.” Young man from Chaungzon

“Because of the heat in this season, workers cannot sleep well – so they come to work tired and irritable, and their performance is poor.” Myanmar Fisheries Federation representative.

“The heat means that there are more diseases. Fish in the ponds get diseases and die; crops in the fields get diseases. And we get diseases too, especially the children - such as itchy skin.” Man, Thanapin.

Water shortages in the dry season

“Because of climate change, every village is suffering from water shortages. The ponds all dry up”. Woman from Bilin

Unpredictability in rainfall

“The rainfall has become so irregular. Sometimes it rains continuously for four to five days, then it stops, and we have no rain at all, with everything drying out and water shortages occurring. This is not how it was in the past.” Older man from Paung

IDENTIFYING THE RISKS AND PRIORITIZING INTERVENTIONS

Risks to the livelihoods of the coastal peoples and the ecosystem on which they depend were assessed through the project using various complementary tools, as summarized below.

Community-Based Disaster Risk Management Plans

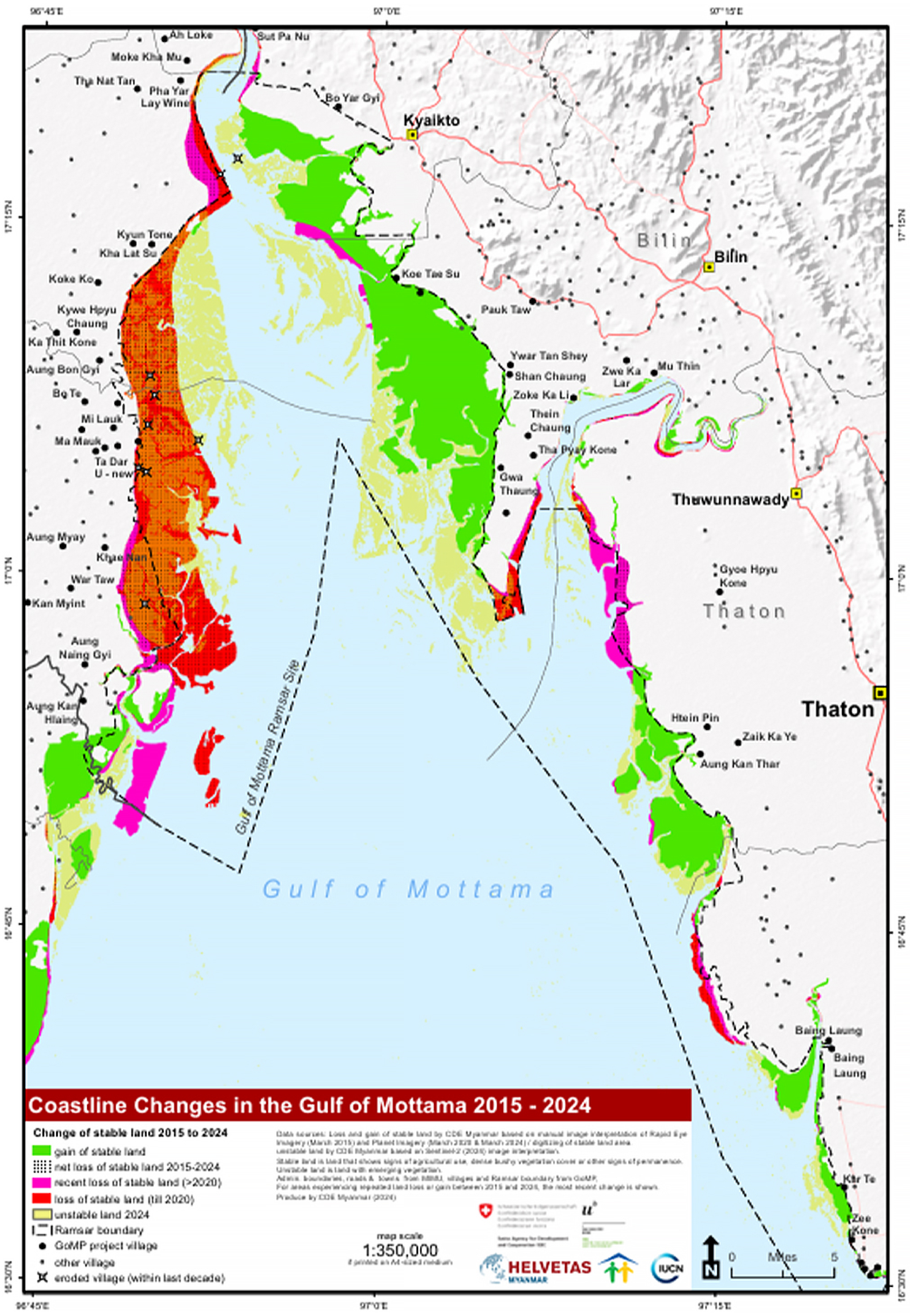
A first step in adapting to a changing climate is identifying and prioritizing the risks faced already today. This was the focus in phase I of the project (2016 – 2018), in which community-based disaster risk management (CBDRM) planning was introduced and conducted in all 30 project villages. This was then expanded in phase II (2019 – 2021) to the additional 30 project villages, making 60 in total (in fact, 59 CBDRM plans were completed). The original CBDRM plans were also reassessed in 2023 and modified if necessary to place even greater emphasis on climate change and ecosystems. As described in Briefing Paper 4, villagers identified a wide variety of responses to disasters under the plans; these showed a strong tendency to focus on infrastructure. Depending on their livelihood strategies, villagers also identified potential activities specifically related to agriculture, fisheries, and the environment.

Mapping coastal erosion

The project has also commissioned or conducted various technical assessments of the climate-related risks along the coast of the Gulf of Mottama. Of note is a study conducted in 2018 by the Dutch consultancy firm Arcadis[vi]. This found that,

“Based on the geological analysis, it is likely that the Gulf of Mottama have [sic] already been exposed to high rates of relative sea-level rise, as a result of the subsidence of the subsurface in the region. Accelerated global sea-level rise will add to the regional effect of subsidence and result in even higher rates of relative sea-level rise.” Arcadis, 2018: 48

(Relative sea-level rise is the combined effect of the rise of the water level and the lowering of the land due to subsidence.)



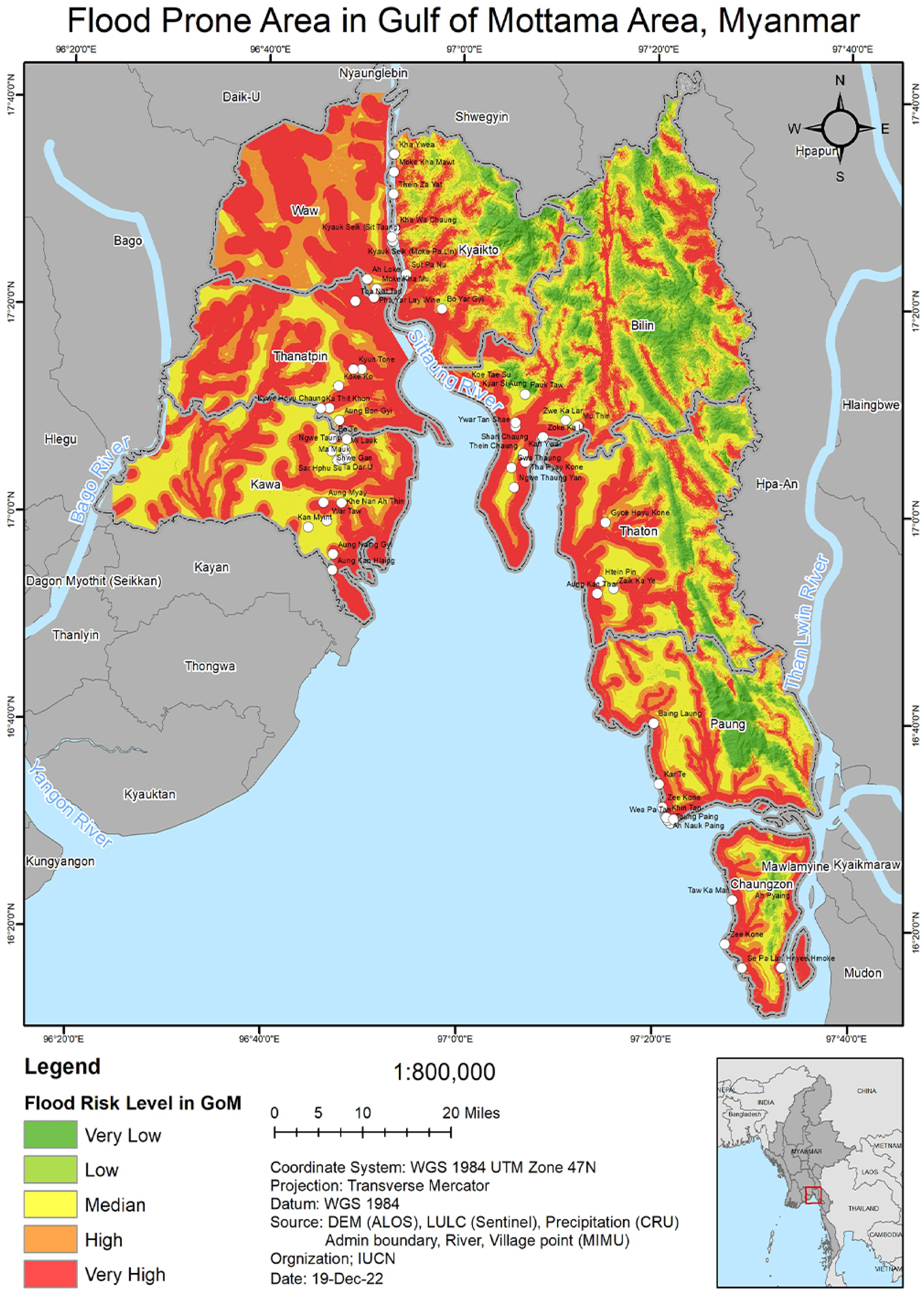
At the same time, the study noted that the pattern of coastal erosion is part of the natural shoreline dynamics determined by the channels of the Sittaung estuary. These in turn are governed by the currents and transport of sediments resulting from the tides and floods (by river waters arriving from upstream) during the rainy season. In other words, climate change is not causing coastal erosion – but it is likely to be exacerbating it. Therefore, Arcadis stressed the need for regular, annual monitoring of shoreline development, “given the rapid and unpredictable changes that occur in the estuary.” This was taken up by the consultant Patrick Oswald (OneMap Myanmar and CDE, Center for Development and Environment, University of Bern), who developed a methodology for regular coastal mapping using remote sensing (Google Earth).

The limitation of maps established using such information is that it is difficult to distinguish stable and unstable/new land (mudflats). Such precisions must be made by trained GIS officers – effectively, a hybrid system of remote sensing and visual verification. Arcadis also recommended a strategy of "managed-coastal retreat with investments in reusable and transportable housing, schools and infrastructure". To the extent possible, this is what the project has aimed to do in its humanitarian support (see Briefing Paper 6).

Mapping flood risk

Following the reassessment of CBDRM plans in 2023, the project also conducted a spatial assessment of risk levels across the Gulf of Mottama . This focused on four main types of events: floods, storms, coastal erosion and drought. This found that flood risk is widespread, with most agricultural areas in both Mon and Bago facing medium risk. Storm risk is also prevalent, with ten villages (those very close to the coast) being at high risk. The risk of drought is comparatively lower. Coastal erosion is experienced at greatest levels in certain Bago villages – although a tipping point seems to have been reached in 2023, with villages on the Mon side of the Gulf now starting to lose land, in reverse of the earlier trend. Most notable was the finding that the Bago townships of Thanapin, Kawa and Waw have the highest combined level of risk. In its final year of operations, the project organized Emergency Response and Recovery trainings through the Red Cross in both Mon and Bago, coordinated by the Disaster Risk Management focal persons. Emergency response kits were also provided to the villages at highest risk.

Flood Prone Area in Gulf of Mottama Area, Myanmar

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Water pots with drinking water along the roadside, Bilin Township, Mon State

CEDRIG

CEDRIG (Climate, Environment and. Disaster Risk Reduction Integration Guidance) is the standard tool used in Swiss development cooperation to assess the risks linked to climate change, natural hazards and environ-mental degradation that may be faced by a project (or program, or strategy). In addition, CEDRIG includes an analysis of any possible (although unintended) impacts, negative or positive, that the intervention may have on GHG-emissions, disaster risks or environmental degradation. Its application is expected to ensure that the planned or existing interventions are as climate, environmental and risk smart as possible and entry points are identified. CEDRIG takes a simple, "light" form for a rapid assessment of risks followed by a deeper, operational assessment if this is shown to be necessary. As CEDRIG was still under development when the project was designed in 2015, it was not applied, although as indicated above, risks were assessed. To be sure that all relevant aspects of climate change had been covered in the planning of the phase III, a CEDRIG operational assessment was applied in August 2021. This confirmed that activities were on the right track and that there were no additional, unforeseen risks.

SUPPORT FOR ACTIVITIES: AN OVERVIEW

Agriculture

As described in Briefing Paper 5, the project has supported coastal farmers in adapting to climate change in a variety of ways – working with and through the Coastal Farmers' Development Association (CFDA). This included promoting the use of locally adapted seed varieties, the application of natural and organic fertilizer, Integrated Pest Management (IPM), water-saving technology, and a reduction in agrochemical use. As a well-established institution, it is expected that the CFDA will continue supporting farmers in sustainable, climate-smart agricultural practices after project closure.

Fisheries

It is through its support for the establishment and growth of the FDA that the project has worked towards greater resilience to climate change amongst small fishers – especially with regard to insurance for or compensation towards losses or damage caused by floods and cyclones. Other activities include the promotion of indigenous fish species, the use of legal and appropriate fishing nets and gear, and fish conservation zones (see Briefing Papers 5 and 7).

Environment - Biodiversity

The main interventions supported through the project to enhance biodiversity and improve ecosystem resilience to climate change are mangrove planting or protection, tree planting for windbreaks, shorebird and marine mammal monitoring - in addition to the complementary measures for agriculture and fisheries indicated above. These are described in more detail in Briefing Paper 7.

Infrastructure

In the CBDRM plans, villagers overwhelmingly prioritized infrastructure to increase their resilience to climate change. This included activities such as the repair or maintenance of roads, ponds, embankments, and irrigation/drainage channels. Although work on infrastructure was not envisaged as a project activity in the first two phases, this changed in phase III due to the new context. Cash for work is a key strategy in the project's humanitarian assistance to coastal communities and fitted well with the needs prioritized in the CBDRM plans. The paucity of government funds currently available for infrastructure works only made this assistance more important.

Water, Sanitation and Hygiene (WASH)

Already in phase I, coastal villagers identified shortages in drinking water supplies as a growing problem – both during the dry season and in times of flooding. The project listened to these expressed needs and incorporated WASH (water, sanitation, and hygiene) activities into phase II, first conducting village-specific Water Use Master Plans (WUMP). These overlapped somewhat with the CBDRM plans, although the latter's focus was at village level, whilst the WUMPs served more to identify which water supply activities should be prioritized at cluster level. With the advent of the Covid-19 pandemic and then the military takeover in early 2021, greater emphasis was placed on WASH and on cash for work as a humanitarian response.

Awareness-raising

Environmental messaging has also been an important aspect of project activities. Over phase II, a set of Communication, Education, Participation and Awareness (CEPA) materials were developed. These comprise a manual for facilitators outlining the content of 10 topic-specific modules, a brightly illustrated comic book for school children, and cards depicting various marine animals and shorebirds. The latter can be used as a game with educational content. Climate change is one of the ten topics covered in the training sessions, which have been conducted in schools and community meetings across some 77 villages in all.

Villagers waiting to collect water during the water shortage period,Paung township, Mon State

ENDNOTES

[i] Climate Profile Myanmar Climate Variabilities, Extremes and Trends in Central Dry, Coastal and Hilly Zones (2017) UN Habitat and UK Aid Prepared by the Regional Integrated Multi-Hazard Early Warning System (RIMES) as part of the Building Resilience and Adaptation to Climate Extremes and Disasters (BRACED) Programme in Myanmar. https://themimu.info/sites/themimu.info/files/documents/-Climate_Profile_Myanmar.pdf

[ii] https://climateknowledgeportal.worldbank.org/country/myanmar

[iii] The CIP is developed by the Swedish Meteorological and Hydrological Institute on behalf of the World Meteorological Organization, World Climate Research Program and the Green Climate Fund (GCF).

[iv] https://ssr.climateinformation.org/ssr?lat=16.49051&lng=97.62825&scenario=rcp45&period=p4&city=Mawlamyine%2C+Mon

[v] Climate Risk Profile Burma 2017 USAID Fact Sheet https://www.climatelinks.org/sites/default/files/asset/document/2017%20CRM%20Fact%20Sheet%20-%20Burma.pdf

[vi] Arcadis, Dealing with Coastal Erosion in the Gulf of Mottama, 2018. Report prepared for Helvetas Myanmar, 31 December 2018.

[vii] Thant Zin Maw, 2023. Report on assessment of disaster risks in the Gulf of Mottama region, December 2023. Internal project report.

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A temple that used to be in the middle of a village is now on the coast, Paung Township, Mon State