Climate, Environmental Degradation and Disaster Risk in Myanmar

MIMU Analytical Brief
May 2022

themimu.info

Background

This Analytical Brief builds on the MIMU-HARP-F study to explore the influence of climate change and environmental degradation on disaster risk in Myanmar.

Globally, climate change is increasing the impact of natural disasters

- Between 2000 and 2019
  - 11,000 extreme weather events - 475,000 deaths, losses of USD 3.54 trillion globally

- Expecting costs to increase looking forward
  - By 2030 – USD 300 billion per year
  - By 2050 - USD 500 billion per year.

- Myanmar is ranked as one of the countries most affected by natural disasters in recent years, and most vulnerable to new disasters in the years to come.
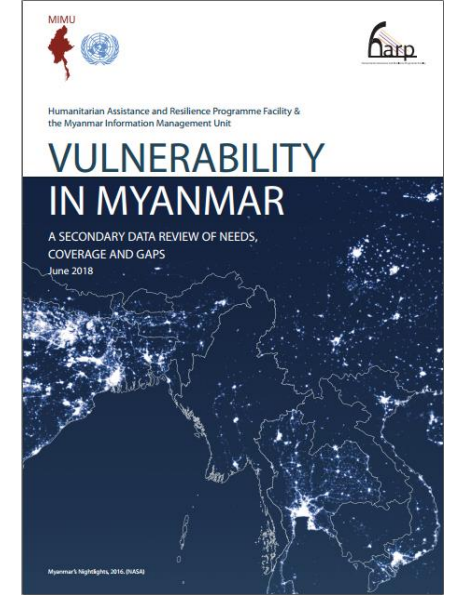
Methodology

❑ Desk review
- Available research and hazard risk modelling
- Vulnerability tools
- Special thanks to colleagues from UNDP and Wildlife Conservation Society - Myanmar

❑ Publicly available data
- **Areas at risk**
  - Floods - SERVIR-Mekong Historical Flood Analysis Tool
  - Cyclones - Global Risk Data Platform
  - Drought – Various data sources (meteorological, agricultural, etc.)
  - Landslides - NASA Socioeconomic Data and Applications Center (SEDAC)
- **Potentially exposed population** – 2021 projections from 2014 Housing & Population Census, adjusted with 2019 Intercensal Survey results
- **Vulnerability**
  - MIMU-HARP-F Vulnerability Index
  - Census data (2014, 2019)
  - Data from ACLED (conflict events), HRP (displacement)

Limitations

Hazards

- Estimates of exposed/vulnerable population are at TS/district level, not by actual affected areas - may over-estimate overall exposed population but enables comparison
- Lack of Cyclone data; calculated on the pixel values

Vulnerability

- Likely under-estimate of vulnerable population due to Census gaps, i.e. some areas/populations under-represented
  - *2014 Census* – Gaps in Rakhine (1.09 million persons not enumerated), Kachin (46,600 persons from 97 villages not enumerated), and Kayin (69,753 persons not fully enumerated).
  - *2019 Intercensal Survey* – Sampling approach. Gaps in coverage of self-administered zones and some districts namely - Maungdaw and Mrauk-U in Rakhine State and Hopang and Matman in Shan State
- Lack of data on new displacement in 2021
- Some info from 2014 Census not included in the 2019 ICS

Myanmar's Changing Landscape

❑ Climate Change
- o Rising average annual temperatures for several decades – expected to continue
- o More intense rainfall, more likely to cause damage in the last 40 years
- o Risks to coastal areas with anticipated sea-level increases.

❑ Deforestation
- o Myanmar has the most forest cover remaining among countries in Southeast Asia, but also one of the highest rates of deforestation- mainly in Shan, Kachin, Sagaing, Chin and Kayin.
- o Forest loss in Myanmar - complete forest removal as well as forest degradation where ecosystems are gradually compromised.
- o Mangroves being lost even more rapidly than other types of forests for at least 25 years – greatest impact on storm surges moving inland

❑ Water Resource Conservation and Management
- o Expanding freshwater ecosystems over the past 15 years (includes paddy and aquaculture).
- o Large but unpredictable effects of existing and planned dams on Myanmar's water resources.

Natural Hazards affecting Myanmar
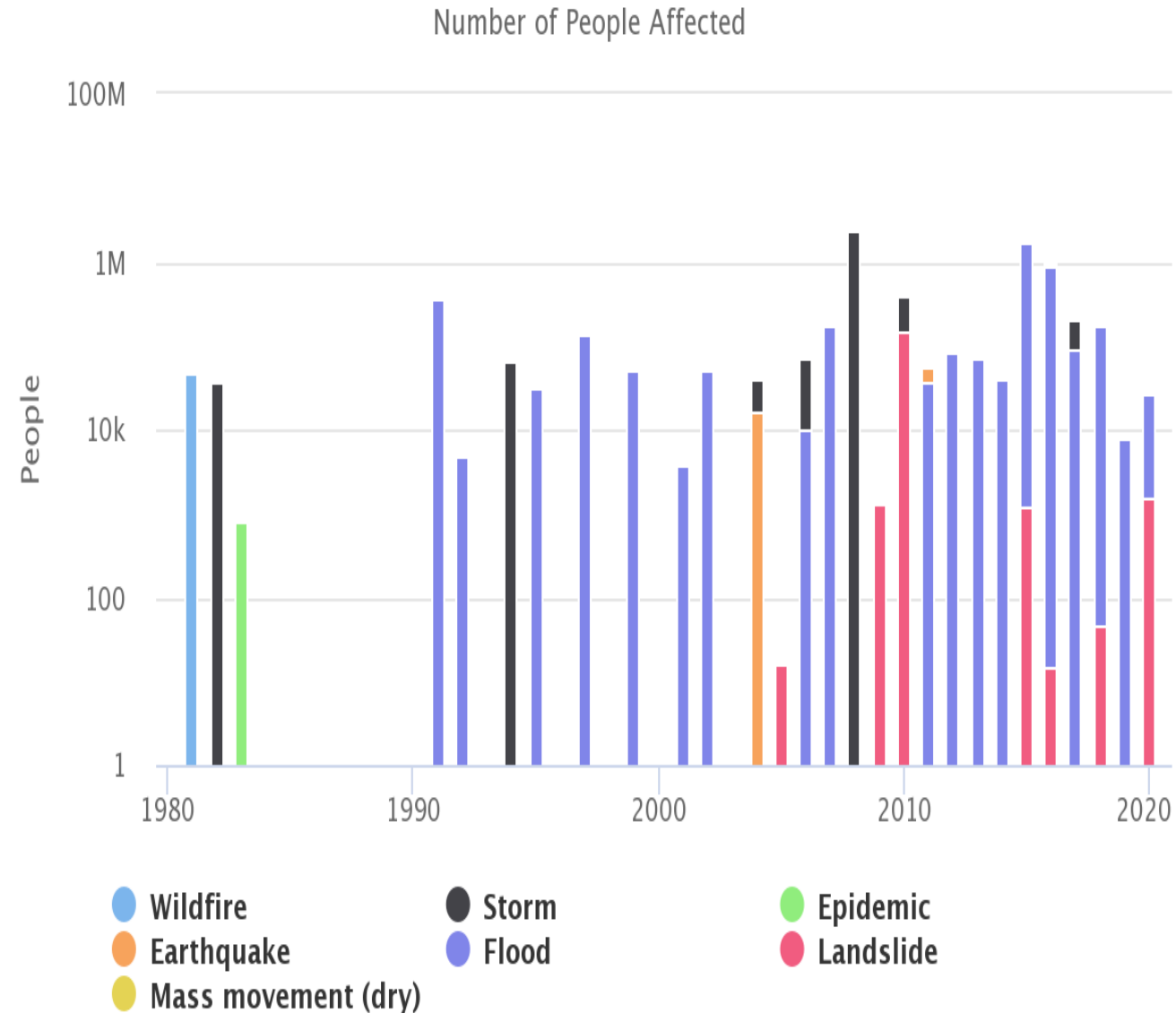
❑ **Disaster Risk** - a combination of
- Hazards
- Exposure
- Vulnerability

❑ **Four types of natural hazards** – high impact, influenced by environmental changes
- Floods
- Storms
- Drought and extreme heat
- Landslides.

Climate change, environmental degradation are adding to these risks

Key Natural Hazard Statistics for 1980-2020

Number of People Affected

Legend:
- Wildfire
- Earthquake
- Mass movement (dry)
- Storm
- Flood
- Epidemic
- Landslide

Vulnerability – an important factor in Disaster Risk

Extreme weather events do not become disasters on their own; the level of impact is influenced by the vulnerability of the affected community

MIMU-HARP-F Vulnerability Study (2018)

❑ No single defining trait
- A diverse range of characteristics
- Individuals, groups - different vulnerabilities at different times
- Differs among districts, even in a state/region
- Need information at the lowest possible level to understand who is affected

❑ Overlapping factors that limit equitable development and resilience
- Exposure to Climate and Hazard risks
- Conflict
- Under-investment, under-development and lack of strong social protection
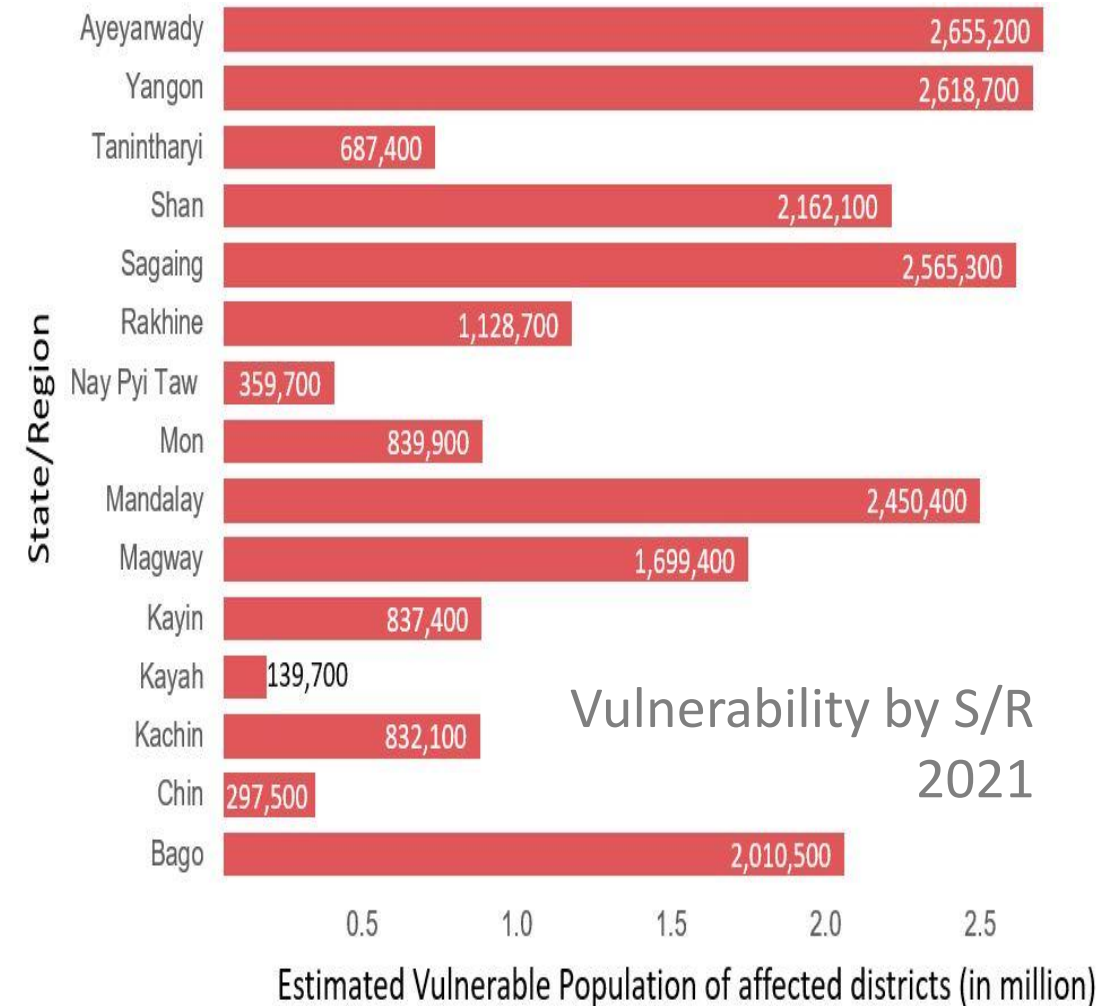
Vulnerability by District

21.2 million persons with some level of vulnerability in terms of:

❑ Living standards – 2019 ICS, 2014 Census
- Quality of housing materials (roof/wall materials)
- Education/educational attainment (female literacy, middle school completion)
- Safe sanitation, drinking water, electricity
- Child dependency, unpaid family workers, ID cards

❑ Direct exposure to conflict 2019-2021 - ACLED
- Incidents of clashes/battles, conflict fatalities, displacement and violence against civilians - underestimates displaced persons who are not located in formally recognized camps
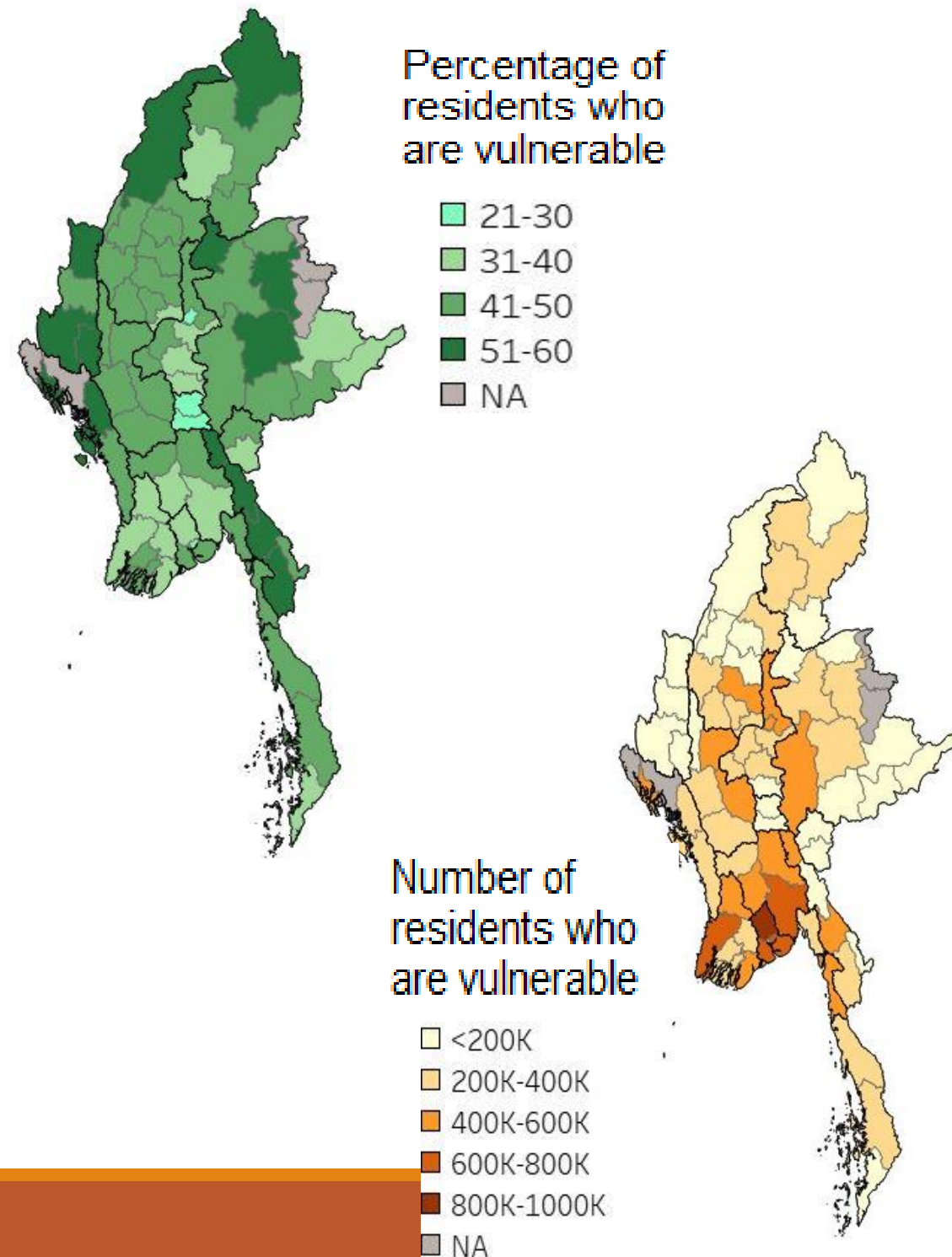

Vulnerability by S/R 2021

Estimated Vulnerable Population of affected districts (in million)

Vulnerability by District

❑ **Changes since 2016**
- Improved Household amenities by 25-88%
- Slight improvement in female literacy rates, child dependency ratio
- 67% increase in direct exposure to conflict

❑ **2021 Index - vulnerable districts**
- **Highest %** of vulnerable residents
  - Chin (Falam, Matupi and Mindat),
  - Kayin (Hpapun),
  - Rakhine (Sittwe)
  - Shan (Loilen)
  - Sagaing (Hkamti)

- **Highest number** of vulnerable residents
  - Yangon (North, South, East),
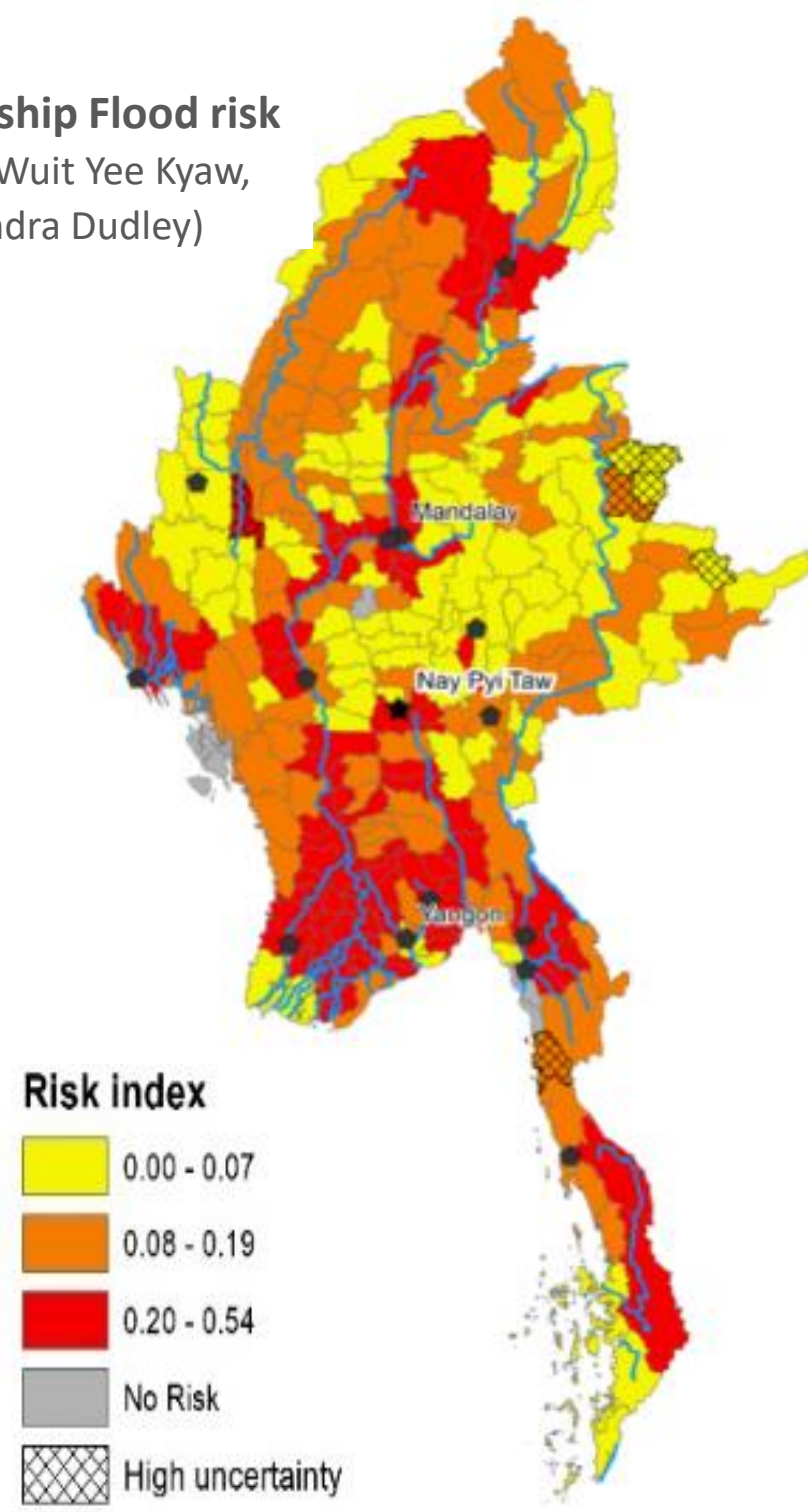 - Bago
  - Ayeyarwady (Pathein)

Percentage of residents who are vulnerable
- 21-30
- 31-40
- 41-50
- 51-60
- NA

Number of residents who are vulnerable
- <200K
- 200K-400K
- 400K-600K
- 600K-800K
- 800K-1000K
- NA

Flood and Vulnerability

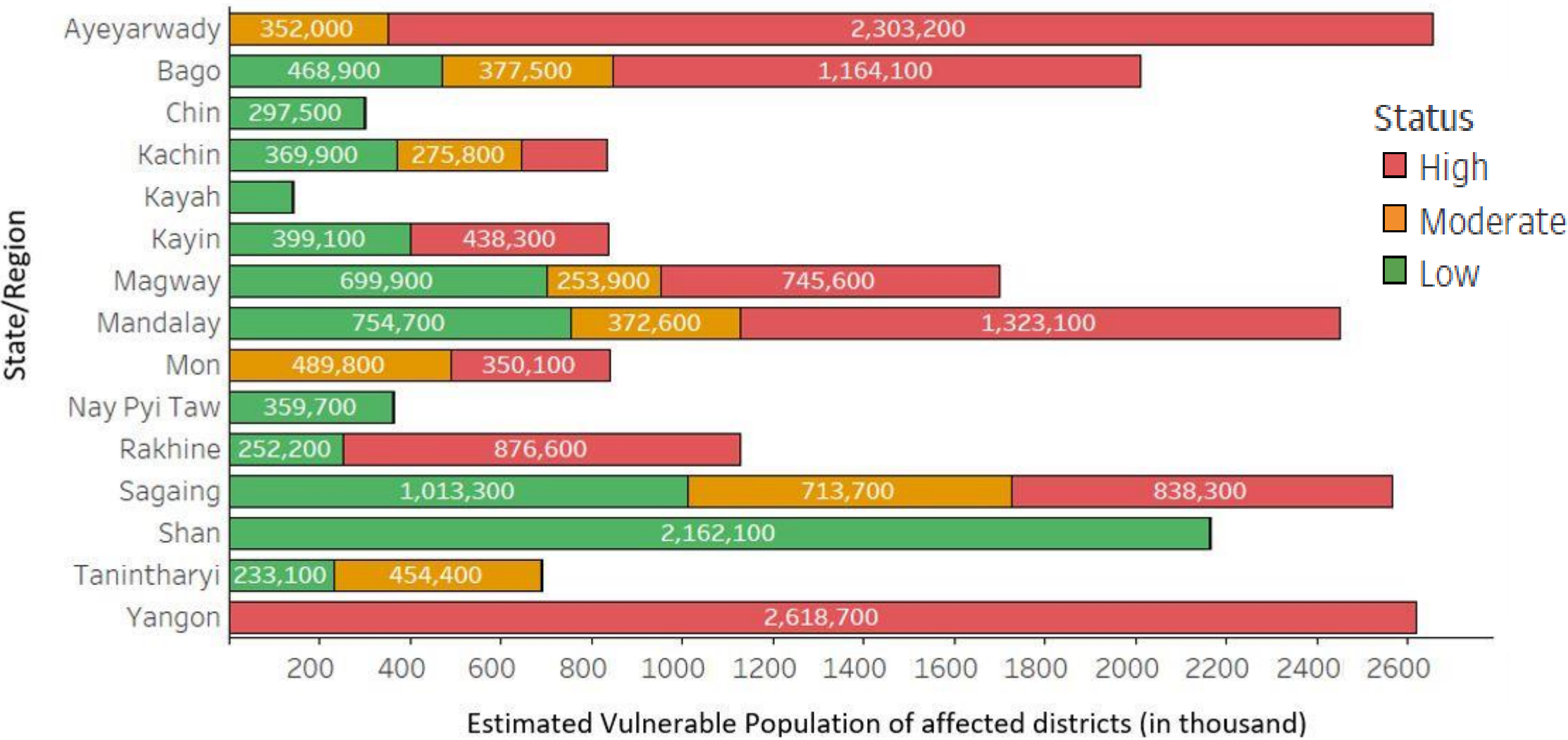**Township Flood risk**
(Hnin Wuit Yee Kyaw,
Alexandra Dudley)

☐ Myanmar's most frequent hazard – mainly riverine

- 51% of recorded natural disasters affecting 100+ persons in 1970-2015

- More frequent extreme flooding over last 10-15 years

- Flood risk increasing due to climate change, environmental degradation (deforestation, farmland expansion)

☐ Districts with the highest risk

- Yangon, Ayeyarwady, Bago and Mandalay regions.

- 28 million people including 10.8 million vulnerable people

Risk index

🟨	0.00 - 0.07
🟧	0.08 - 0.19
🟥	0.20 - 0.54
⬜	No Risk
▨	High uncertainty

Flood and Vulnerability

28 million people including 10.8 million vulnerable people

Chart: Estimated Vulnerable Population of affected districts (in thousand), by State/Region, with Status categories High (red), Moderate (orange), Low (green).

State/Region	Low	Moderate	High
Ayeyarwady		352,000	2,303,200
Bago	468,900	377,500	1,164,100
Chin	297,500		
Kachin	369,900	275,800	
Kayah			
Kayin	399,100		438,300
Magway	699,900	253,900	745,600
Mandalay	754,700	372,600	1,323,100
Mon		489,800	350,100
Nay Pyi Taw	359,700		
Rakhine	252,200		876,600
Sagaing	1,013,300	713,700	838,300
Shan	2,162,100		
Tanintharyi	233,100	454,400	
Yangon			2,618,700

Cyclones and Storms, and Vulnerability

❑ Less frequent than floods, but major damage, loss of life

- 18% of disasters affecting 100+ people 1970-2015

- Different areas at risk - wind/storm surge risk

- Expected to become more intense with rising ocean temperatures

- Vulnerability, mangroves are important in resilience

❑ Districts with moderate to high risk of cyclones - 8.9 million people, including 4 million vulnerable people in Rakhine, Chin, Magway and Ayeyarwady

❑ Residents of Rakhine State - higher likelihood of being affected.
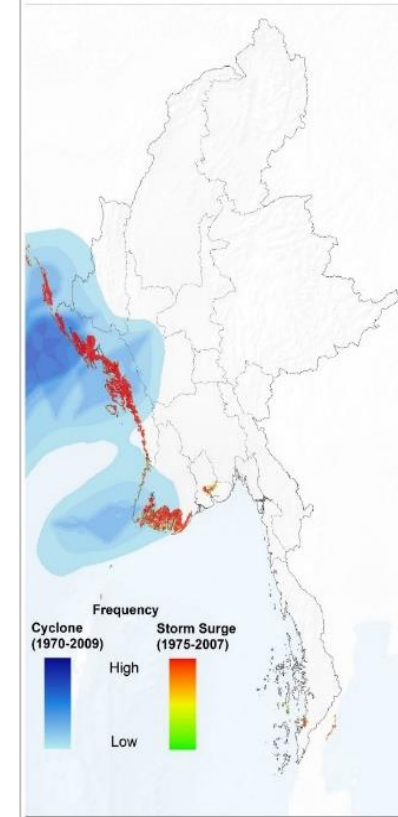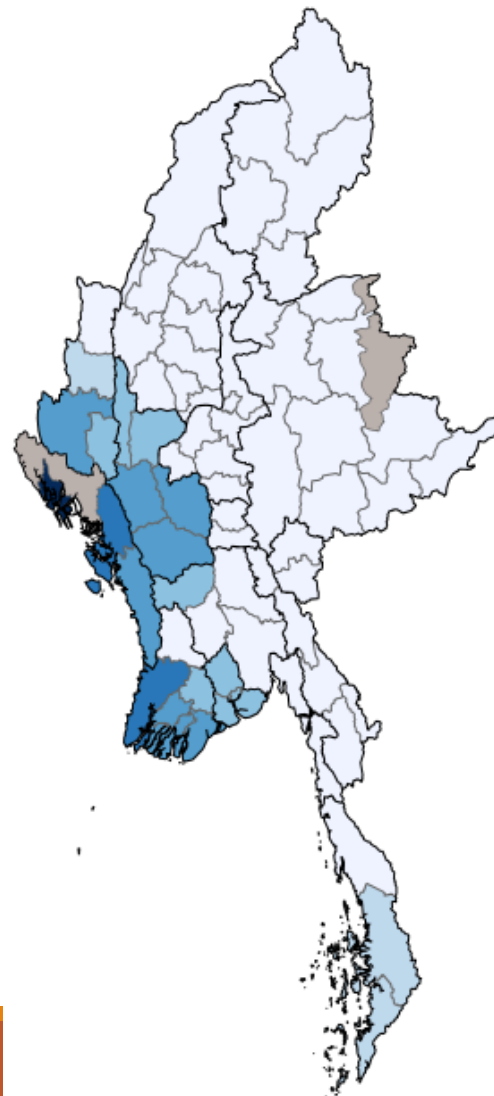
Drought and Vulnerability

❑ Longer duration than other hazards, different types

- Limited available info

- Expect moderate droughts every 10-14 months; severe droughts every 2-3 years

- Even when rainfall, water shortages in many S/R

- More likely with changing climate change, rainfall

- Forests and other natural ecosystems can reduce the probability of all varieties of drought.

❑ Most likely in Ayeyarwady Delta, Central Dry Zone, Northern and Eastern Hilly Regions (Kachin, Shan States)

- 11 million people including 4.5 million vulnerable in the Central Dry Zone alone

- Kayah, Shan - highest risk of negative impacts in severe droughts in 2015/16 and 2019/20

Frequency (%)
- <5
- 5 - 10
- 10 - 15
- 15 - 20
- 20 - 25
- 25 - 30
- >= 30

- no data
- no seasons
- no cropland
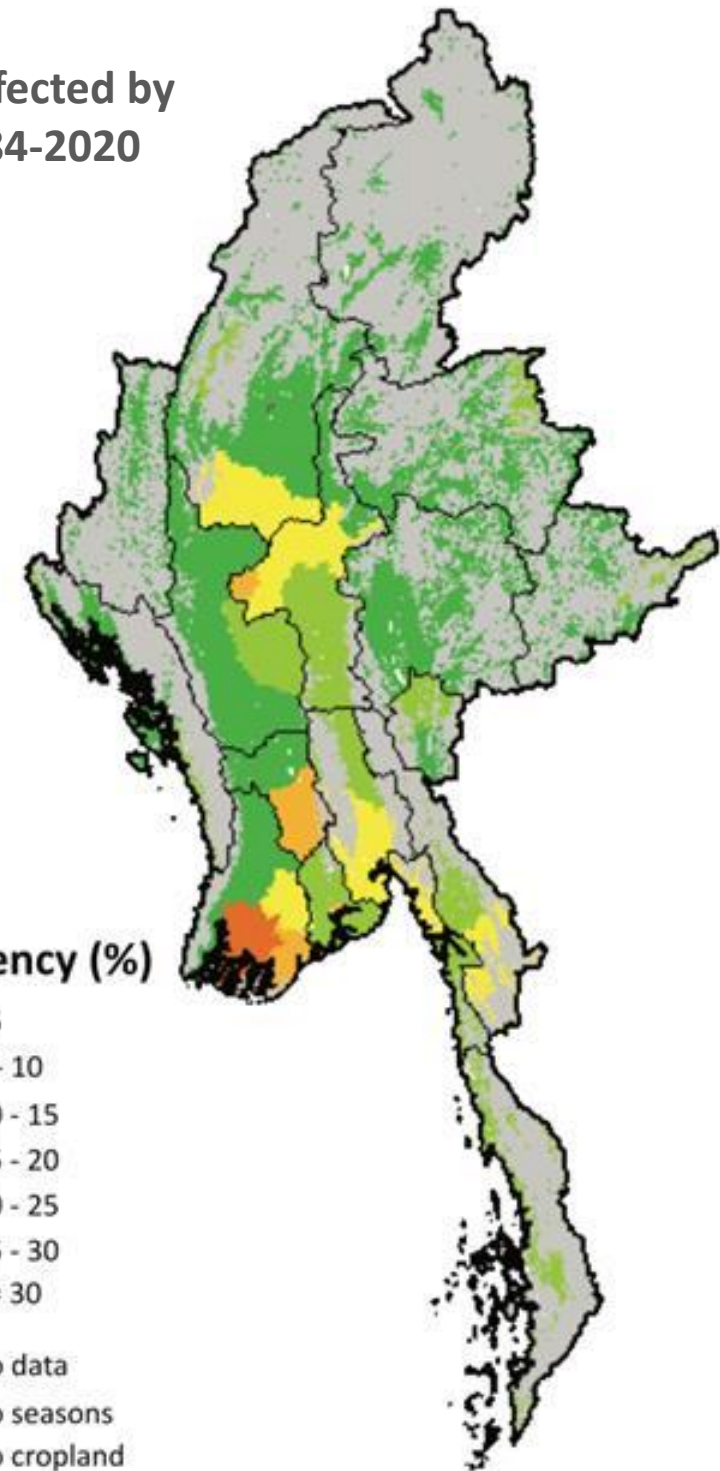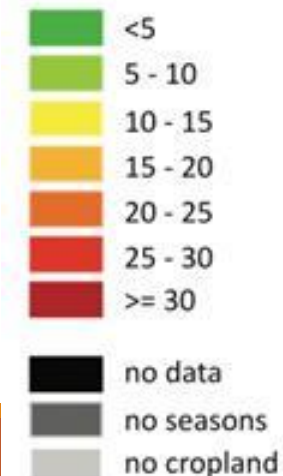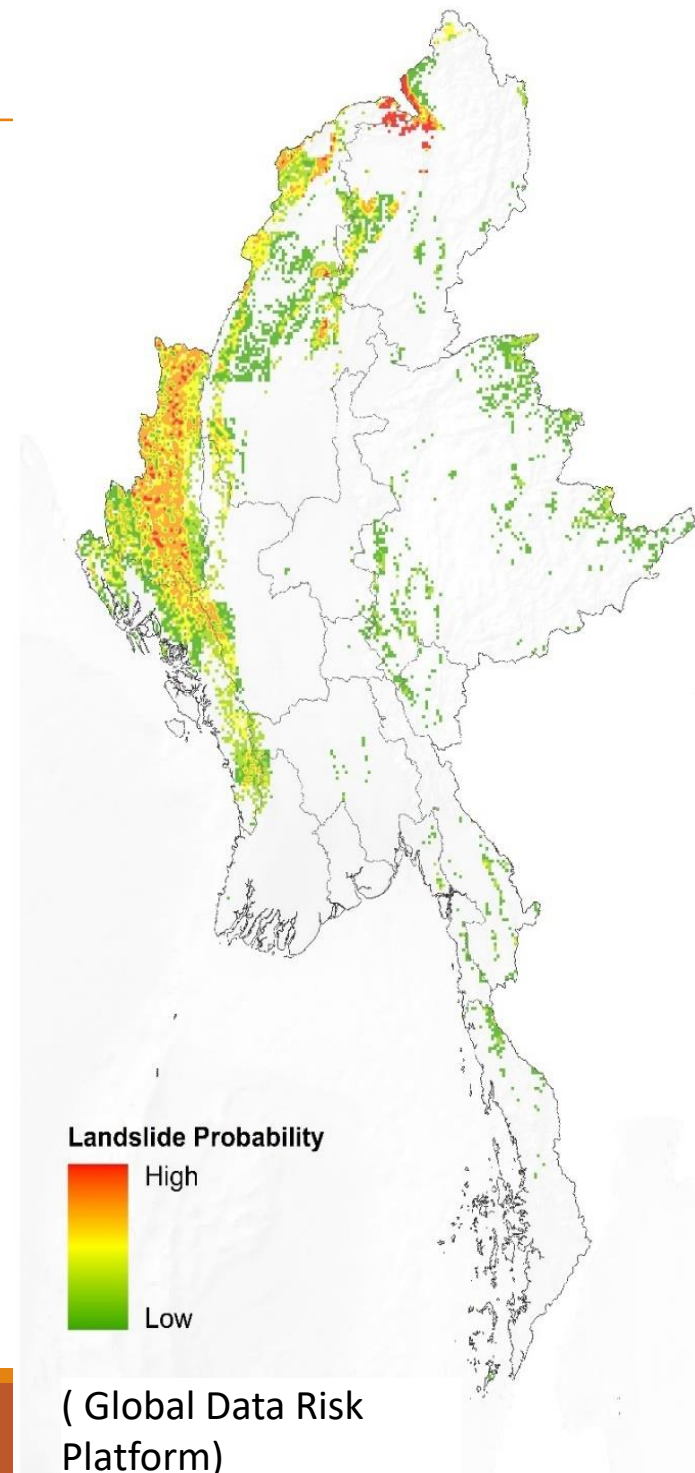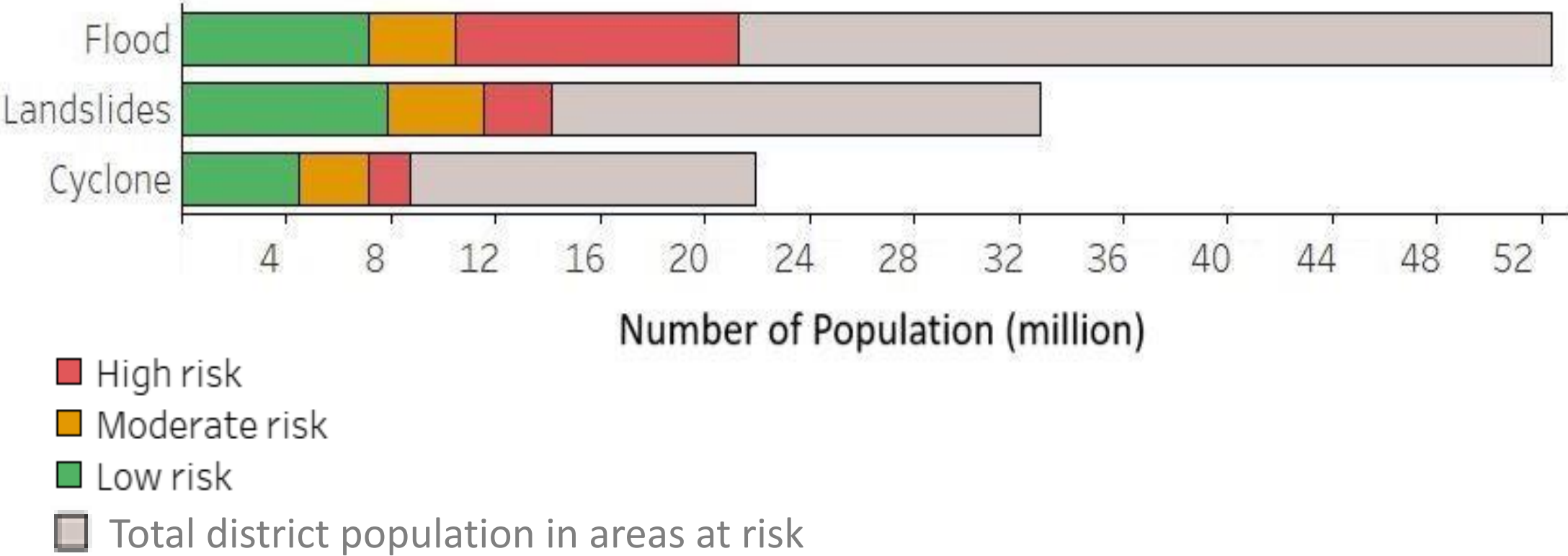
Landslide and Vulnerability

❑ 1970 to 2015 –12% of recorded natural disasters affecting 100+

- Loss of lives, impact on infrastructure, esp transport

❑ Affects mainly mountainous areas

- Triggers – precipitation/flooding, deforestation, mining, ?dams, also earthquakes (not covered in this analysis)

❑ Districts at high risk of landslide exposure

- Esp, Chin State (4 districts) and Sagaing (Hkamti, Mawlaik), every district of Rakhine State except Sittwe
- 5 million people including 2.6 million vulnerable people

Landslide Probability

High

Low

(Global Data Risk Platform)

Comparing Exposure and Vulnerability to common natural hazards

Estimated vulnerable population in districts by risk of natural hazard

Number of Population (million)

- 🟥 High risk
- 🟧 Moderate risk
- 🟩 Low risk
- ⬜ Total district population in areas at risk

Conclusion

❑ **Myanmar is one of the of the world's most affected countries in terms of natural disasters, and among the most vulnerable to new disasters in the years to come**

- Changing frequency and severity of natural hazards due to changing climate, environmental degradation are influencing the in Myanmar.

- Losing protective natural ecosystems that help mitigate the effects of various hazards.

- Extreme weather events are not disasters on their own – depends on vulnerability of the population.

❑ **In planning for disaster response and reducing disaster risk**

- Consider current as well as projected disaster risks.

- More research on effective approaches to reduce the effects of climate change and environmental degradation on disaster risk for communities.

- Various vulnerability indexes - similar findings but would benefit from validation, fine-tuning.