Assessment of Future Social Vulnerability to Climate Change in Sub-Saharan Africa

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Rationale & Aim

Future climate change risks are function of both:
- Future climatic conditions (*i.e.* climatic change)
- Future socioeconomic conditions (*i.e.* socioeconomic development)

→ However, most of the future climate risks and vulnerability assessments are based on climate scenarios superimposed on current socioeconomic conditions only

→ Therefore, the influence of socioeconomic development on future climate risks is not accounted for. Thus, there is a need to explore how different types of socioeconomic development will impact future climate risks through social vulnerability

→ This is particularly crucial in places where socioeconomic conditions are rapidly changing, such as developing countries, *e.g.* sub-Saharan African countries

→ The aim of this study is thus to explore future social vulnerability in sub-Sahara African countries based on different plausible socioeconomic developments

Methodology

Time-horizon

Social vulnerability was assessed for both:

- Current socioeconomic conditions – 2012
- Future socioeconomic conditions – 2050 –, based on three plausible scenarios of socioeconomic development

Socioeconomic scenarios

Three different socioeconomic scenarios were created based on the combination of:

- IPCC-guided scenarios (named the Shared Socioeconomic Pathways – SSPs)
- UNEP Global Environmental Outlook (GEO-4) scenarios

These scenarios have been quantified for numerous socioeconomic variables

Geographical extent

Two geographical extents were considered:

- Sub-Saharan Africa, which comprises 44 countries. The vulnerability assessment is achieved at the national scale
- Tanzania, which comprises 30 regions. The vulnerability assessment is achieved at the regional scale

Indicators

The following indicators of social vulnerability were used (with equal weights):

- Economic conditions (GDP per capita; Government expenditure)
- Education and awareness (Literacy rate; Education among 24-65 years)
- Living conditions (Infant mortality ratio; Population density; Urban population share)
- Demographics (Proportion of elderly; Proportion of children)
- Environment (Proportion of forest areas)

For the regional assessment in Tanzania, Economic conditions and Environmental indicators were not used due to data constraints

Social Vulnerability Assessment

Current situation

- Africa is part of the developing world
- Education and health conditions are very low
- Inequalities are very high
- Economic conditions are slowly improving but still far behind the developing world
- Environmental issues are not considered

Sustainability-focused Scenario

- Global sustainable Development
- Very high health and education investments
- Large decrease of inequalities
- Economic growth is high and fair
- Environmental conditions greatly improve
- World is highly globalized and connected

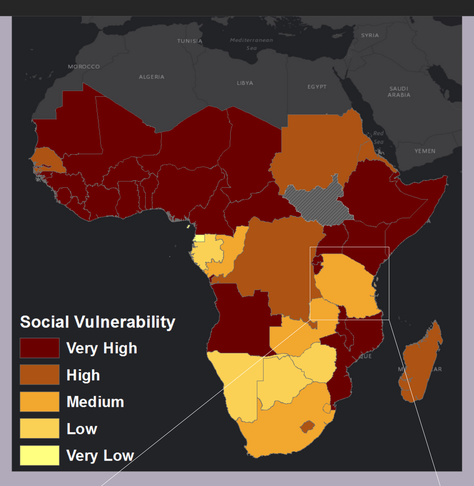
Security-focused Scenario

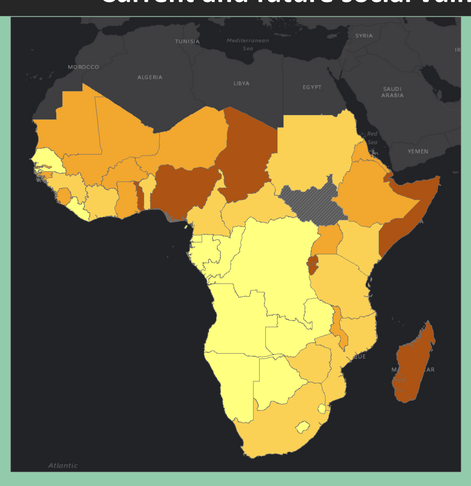
- World of great disparities
- Low health and education investments
- Inequalities and conflicts are reinforced
- Low and unequal economic growth
- Environmental issues are not considered
- De-globalization and nationalization

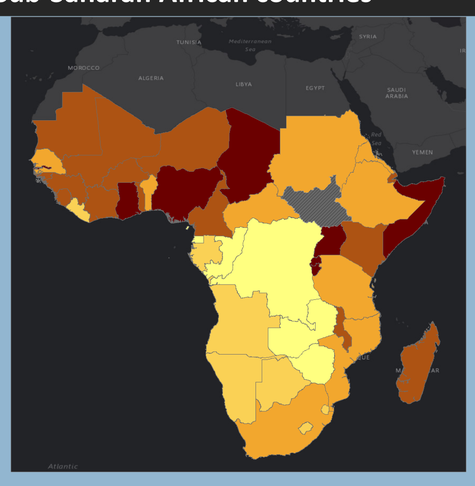
Markets-focused Scenario

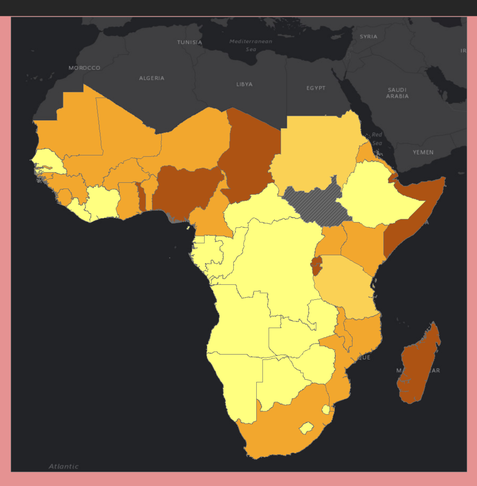
- Market-driven world relying on fossil fuels
- High health and education investments
- Inequalities decrease slowly
- Economic growth is high but rather unequal
- Environment is seen as source of economy
- World is highly connected through markets

Current and future social vulnerability in Sub-Saharan African countries

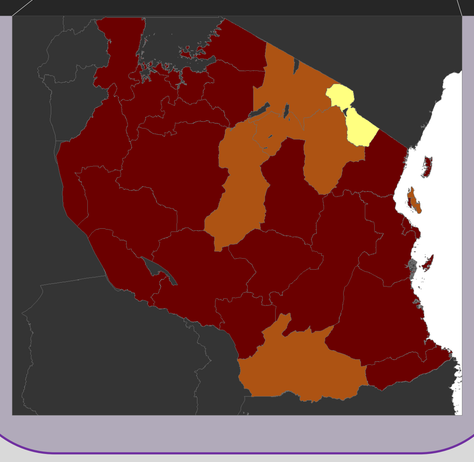


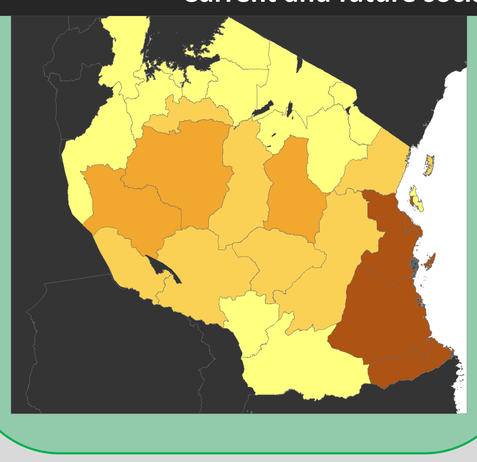


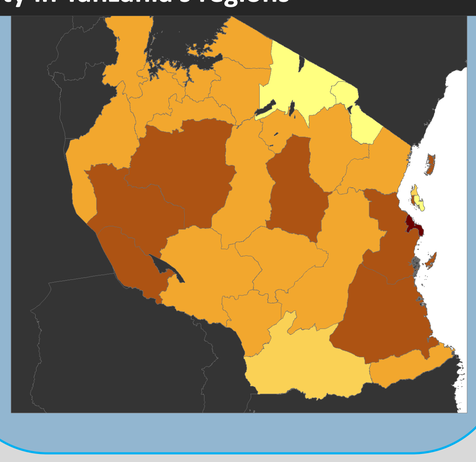


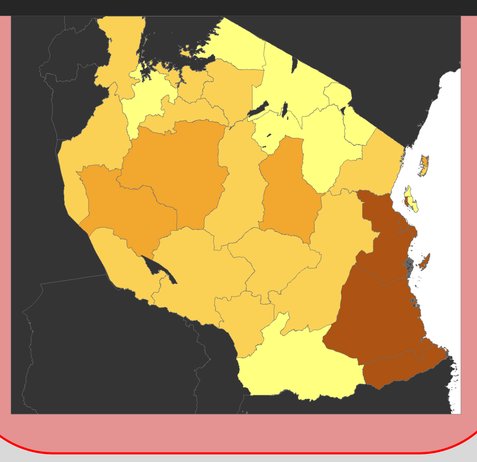


Current and future social vulnerability in Tanzania's regions

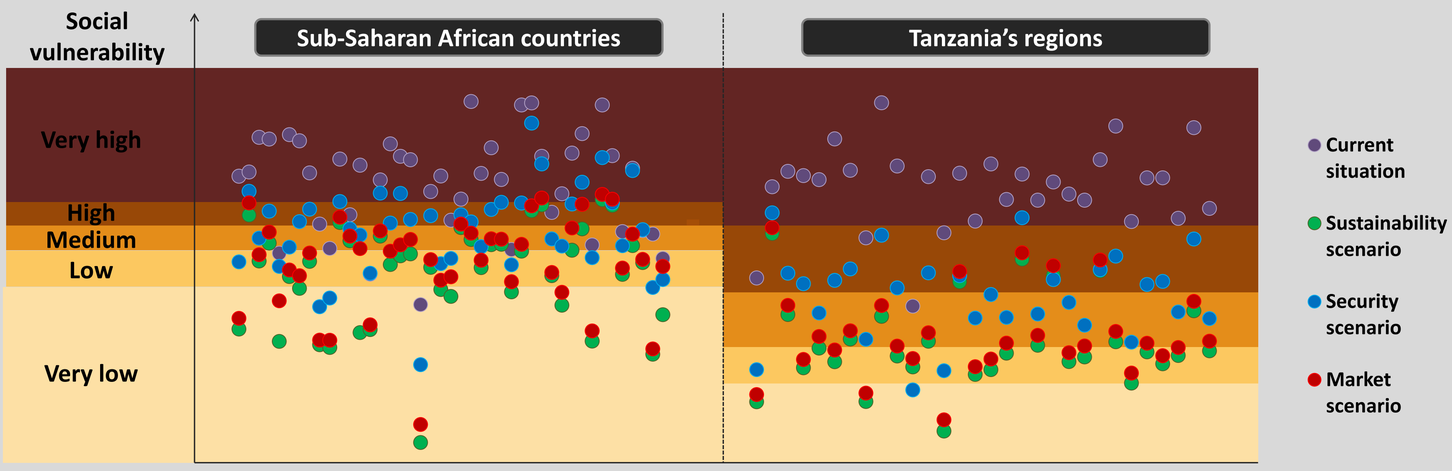








Results Analysis



- For all the sub-Saharan African countries and Tanzania's regions investigated, future social vulnerability is significantly lower than the current one, regardless of the socioeconomic scenario used. This is due to increasing level of education and improvement of economic conditions
- The three socioeconomic scenarios lead to different results: the Security-focused scenario leads to the highest level of vulnerability , while both the Sustainability-focused and Markets-focused scenarios lead to the lowest level of vulnerability. However, the Markets-focused development heavily relies on fossil fuels while the Sustainability-focused development relies on renewable and clean energies
- Certain countries (e.g. Chad, Ghana, Nigeria, Uganda, Somalia, *etc.*) and certain Tanzania's regions still showcase a very high vulnerability in the future; this underlines that existing inequalities across and within African countries are likely to persist over the next decades

Limitations

- Projections of socioeconomic conditions are subject to large uncertainties, particularly in Africa where socio-ecological systems are rapidly changing
- Projections are often available at the national or regional scale only, hence making impossible future vulnerability assessments at higher resolution
- Top-down approaches and global scenarios are lacking of relevance at the local level and largely fail to account for the local context and specificities

Conclusions & Outlook

Future social vulnerability will significantly differ from the current one. In some places like sub-Saharan African countries, social vulnerability may decrease, but it may also increase in other places

→ Assessments of future climate risks should no longer be based on current socioeconomic conditions

Because of the uncertainties surrounding future socioeconomic conditions, scenarios appear to be the appropriate tool to investigate potential future climate change vulnerability and risks. However, methods and tools to quantify socioeconomic scenarios and to include them in future climate risks assessments need to be further developed and refined

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