RICCAR
Regional Initiative for the Assessment of Climate Change Impacts on Water Resources and Socio-Economic Vulnerability in the Arab Region

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Impact of Climate Change on Human Health:

A Case Study on Neglected Tropical Diseases

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Climate Change and Health

Lancet Commission on Health and Climate Change, 2015

"The effects of climate change are…potentially catastrophic risk to human health….Tackling climate change could be the greatest global health opportunity of the 21st century"

Health impacts in the Arab region:

- Direct impacts
  - Heat-related illnesses
  - Extreme events
- Indirect impacts
  - Spread of disease vectors
  - Undernutrition
  - Mental health

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CASE STUDY:
Impacts on Neglected Tropical Diseases (NTDs) in the Arab Region

Climate change

- Disease vectors are very sensitive to changes in climate conditions
- Rising T_{min} and T_{max} may result in range changes or expansions of exposure
- Disruptions to ecosystems indirectly impact disease cycle

Other environmental and social changes

- Displacement, desertification, conflict

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Approach

- Water-associated disease index (WADI) used to provide an integrated view of environmental and social disease determinants

Conceptual framework and identification of thresholds for case studies (Leishmaniasis in Morocco; Schistosomiasis in Egypt)

Creation of indicator layers for case studies including RICCAR climate projections for RCP 4.5 and RCP 8.5

Integrated map output of exposure conditions

Methodology: Dickin et al., 2013 PloS One DOI: 10.1371/journal.pone.0063584

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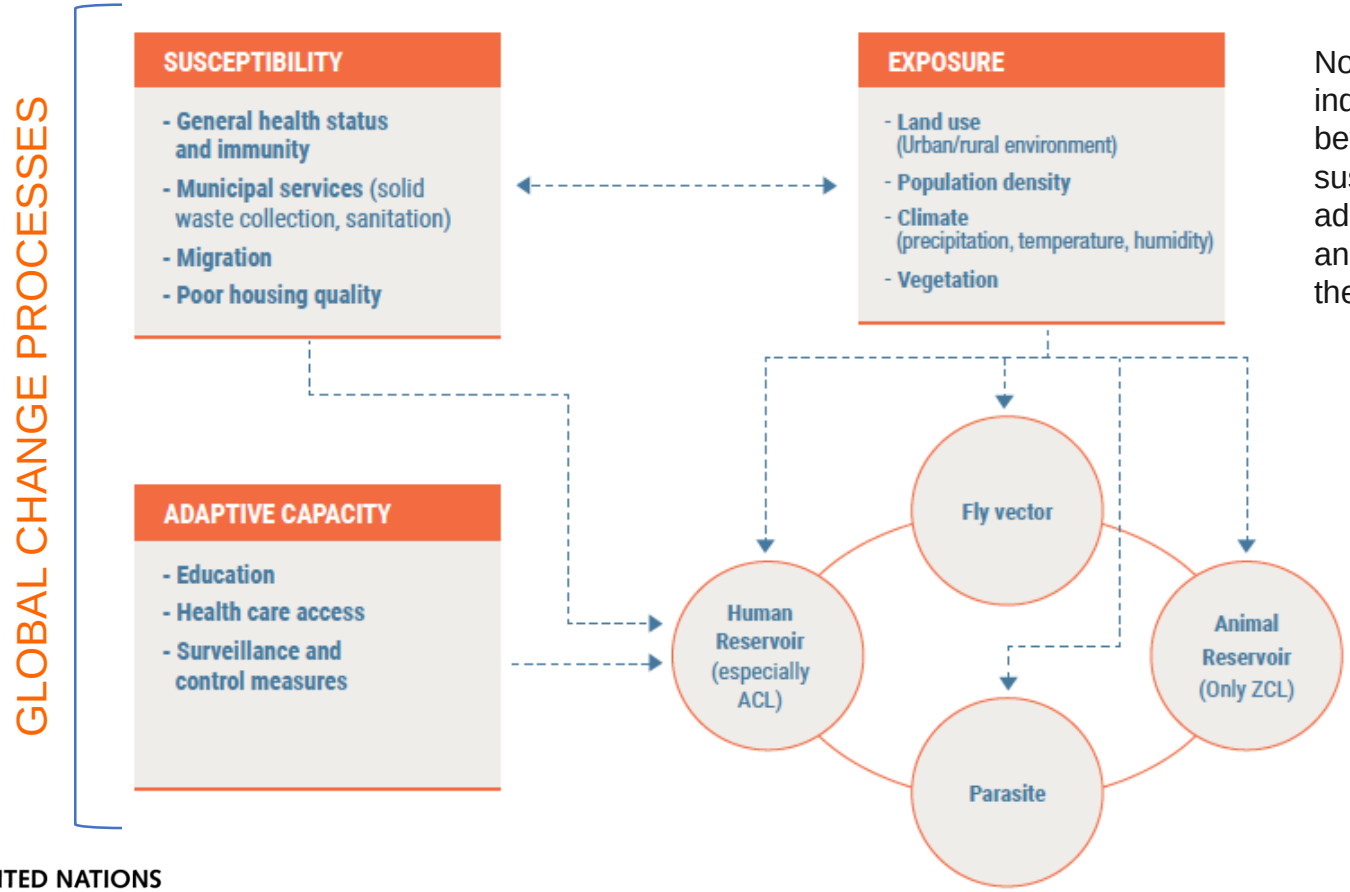
Leishmaniasis

- 1.7 billion people at risk globally
- Endemic in Arab region (e.g. Algeria, Egypt, Iraq, Jordan, Libya, Morocco, Palestine, Saudi Arabia, Saudi Arabia, Somalia, Sudan, Tunisia, and Yemen)
- Two forms cutaneous leishmaniasis and visceral leishmaniasis transmitted by sandfly vector
  - Carried by both humans and animals

The P. papatasi sandfly, vector of Leishmania parasites.
Source: Center for Disease Control and Prevention.

Leishmaniasis

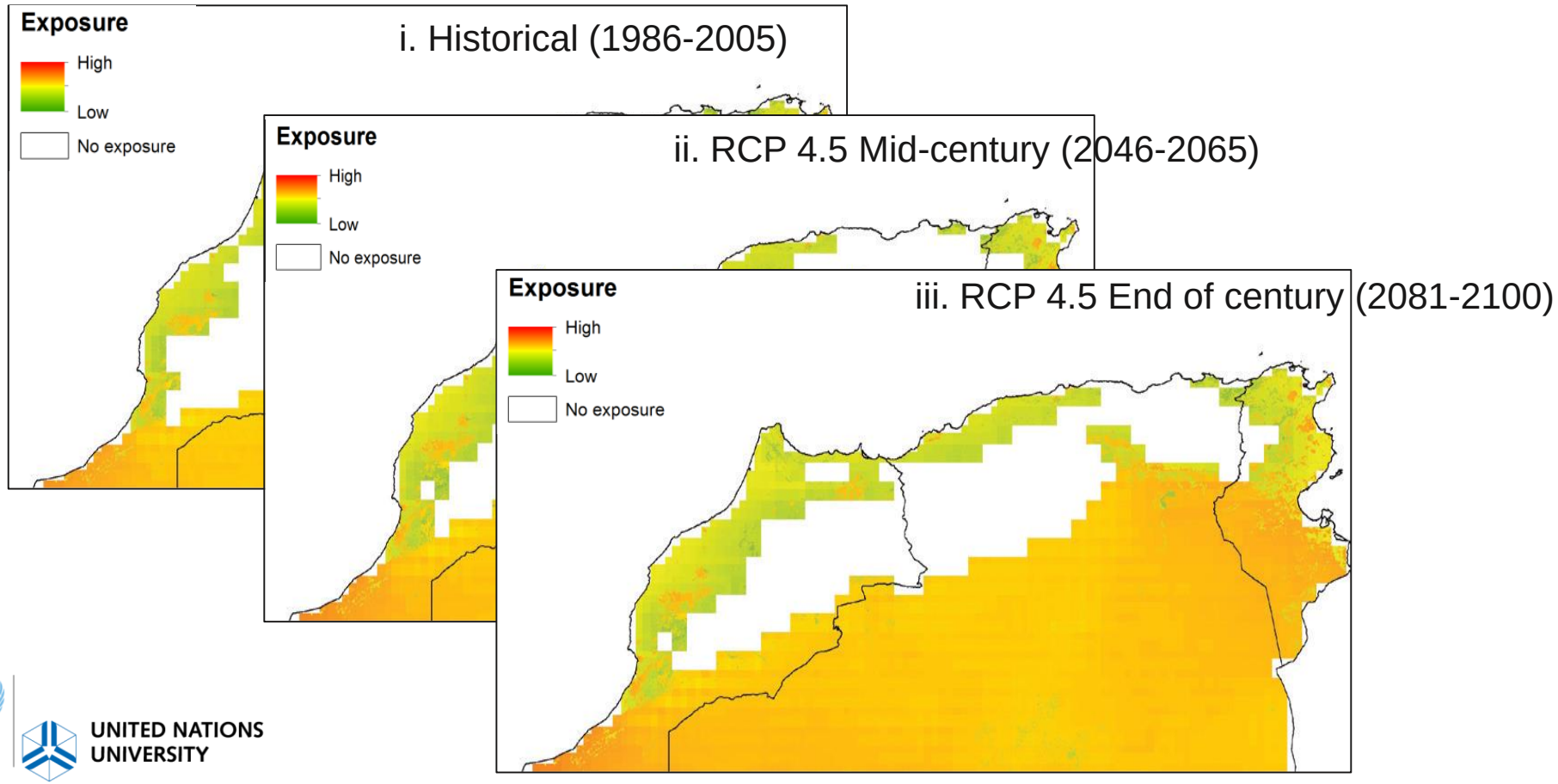
Conceptual framework illustrating linkages between the human, vector, parasite and animal reservoir components of the leishmaniasis disease cycle.



Note: Dashed lines indicate connections between exposure, susceptibility, adaptive capacity and components of the disease cycle.

Applying WADI in RICCAR: Leishmaniasis

November ZCL exposure



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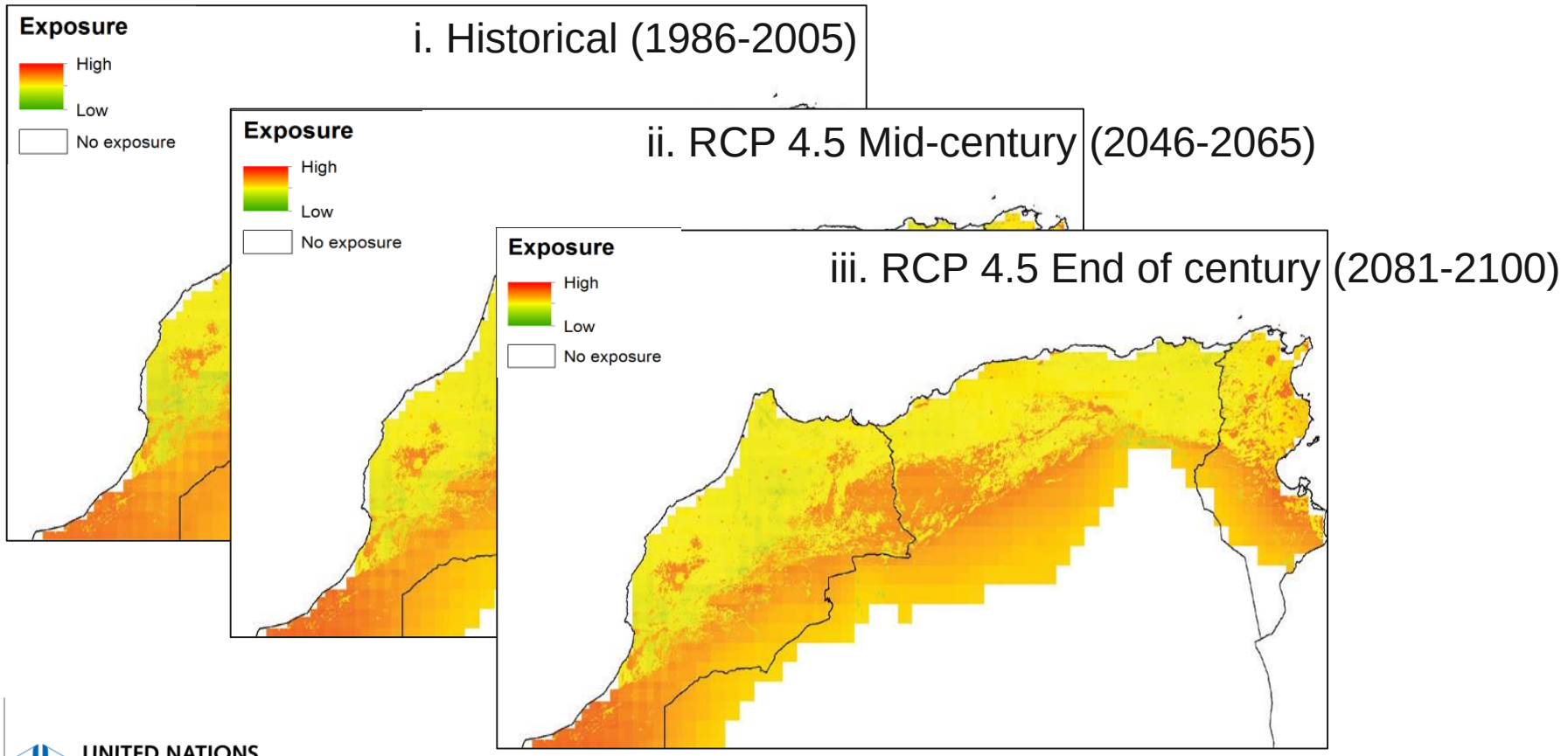
Applying WADI in RICCAR: Leishmaniasis

June ZCL exposure



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Projected climate change impacts
RCP 4.5 and RCP 8.5 mid- and end- of century

- Climate change may have an important impact on the range of leishmaniasis transmission:
  - Increasing T_{min} will increase length of exposure season and geographic range (including higher altitudes) (>10°C)
  - Increasing T_{max} will reduce exposure (>40°C); however, generally occurring in uninhabited desert regions
  - Increasingly dry conditions less favourable for animal host, but projected changes in humidity are small

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Schistosomiasis

- Water-related disease transmitted by parasites released from snails, resulting from contact with contaminated surface water
- Schistosomiasis is endemic in Egypt, Somalia, Sudan and Yemen, with an estimated 12.7 million cases
- Recent advances have been made in eliminating schistosomiasis, but climate change could impact elimination efforts

The Biomphalaria sp. aquatic snails, hosts for S. haematobium and S. mansoni.
Source: Lewis et al., 2008.

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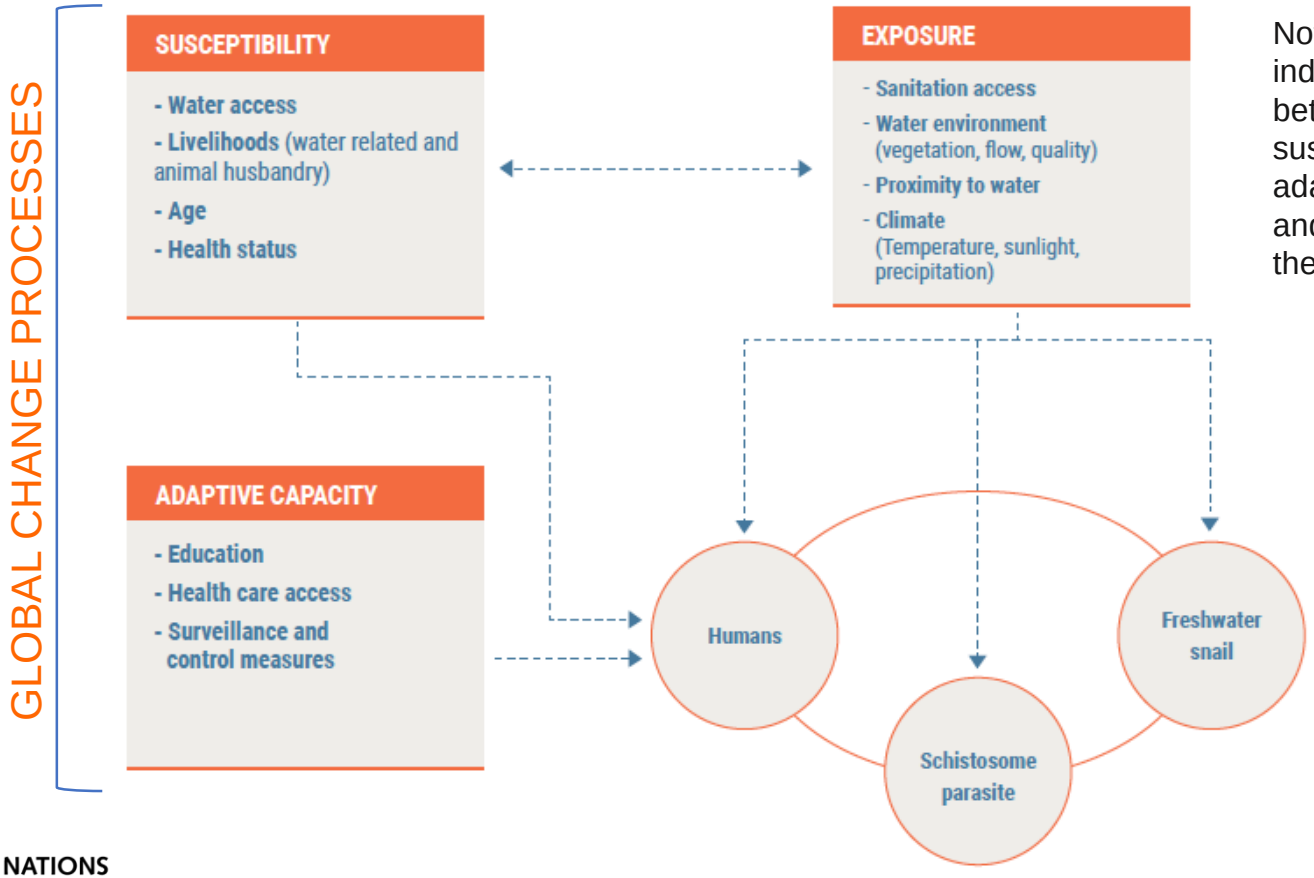
Schistosomiasis

Conceptual framework illustrating linkages between the human, schistosome parasite and freshwater snail components of the schistosomiasis disease cycle.



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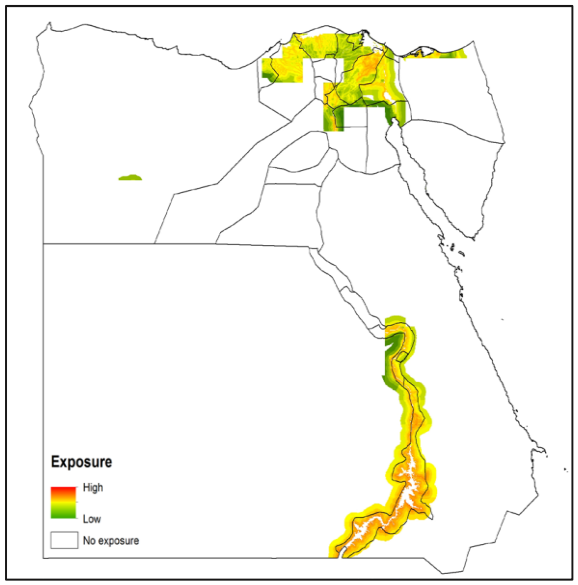
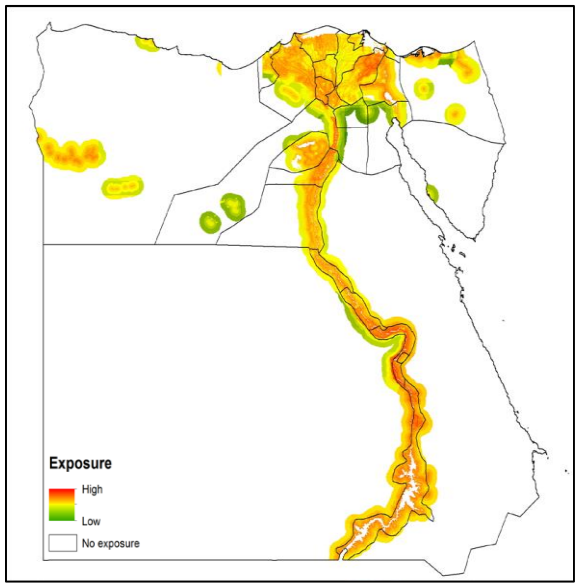
Projected Climate Change Impacts

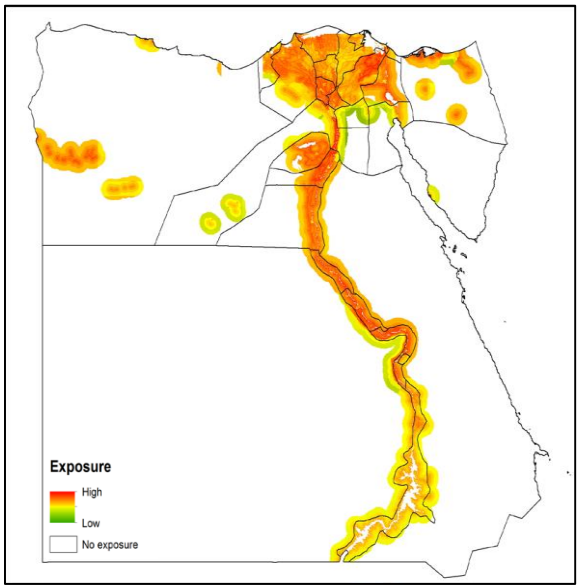
Schistosomiasis exposure in December



i. Historical (1986-2005)



ii. RCP 8.5 Mid-century (2046-2065)



iii. RCP 8.5 End of century (2081-2100)

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Projected Climate Change Impacts
RCP 4.5 and RCP 8.5 mid- and end- of century

Climate change may impact the seasonal range of schistosomiasis transmission:

- Projected warming will create suitable snail conditions during colder months (>12.5^{o}C), when fewer cases currently occur
- Projected warming during summer months may decrease exposure in Upper Egypt

Impacts on public health control measures

- Schistosomiasis control activities currently undertaken during warmer months when most people become infected

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Implications for Public Health

- Transmission seasons could increase in the Arab region due to rising temperatures (historically limited the range of disease vectors)
- Interventions must be sustained for 10-20 years to ensure elimination
- Better (adaptive) health promotion strategies
- Collaboration across water, health and environment sectors; improved surveillance, and reporting of incidence rates

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Implications for Gender and Social Equity

- Leishmaniasis: a greater threat to health and socioeconomic status of women -> work in agriculture, animal care, and water collection;
  - Disfiguring scars can have a severe impact on women's psychological wellbeing and quality of life due to social stigmatization.
- Schistosomiasis: women and girls who spend large amounts of time doing water, sanitation and hygiene-related tasks, and caring for sick members of their families.
- Women's limited access to financial resources may reduce access to healthcare to receive treatment for disease.

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THANK YOU!

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http://inweh.unu.edu/managing-water-related-health-risks/

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