

Introduction

The term travelling concept was coined by Bal to reference a concept that moves through time, space and disciplines and thereby changes and evolves (Bal, 2002). To understand how resilience has emerged within the discipline of health sciences, and how it is relevant, the three dimensions within which a concept travels should be addressed: space, time and disciplines. This study aims to:

1. Provide an overview of the various concepts under the umbrella of 'resilience', including how they relate between fields and definitions of resilience.
2. Establish how resilience travels across cultures and what that means for the usability of the concept in different contexts.
3. Explore models and frameworks used for resilience.
4. Introduce a case study on the health system in Tigray using the model of critical transitions.

Resilience across space and cultures

We also looked into the geographical distribution of resilience research (countries were selected based on author affiliations). The results show a very skewed map towards the Global North, leaving little research on resilience published in the Global South. This is problematic because understandings of resilience differ between cultures. Translating "resilience" into different languages already shows potential bias, as often there is not a single word to fully translating the complexity of the term. When asking three people to translate resilience into Luganda, three different terms were presented. Similarly, three terms were identified in Tigrinya which related to the previously identified conceptualisations of resilience: coping, adaptation and transformation.

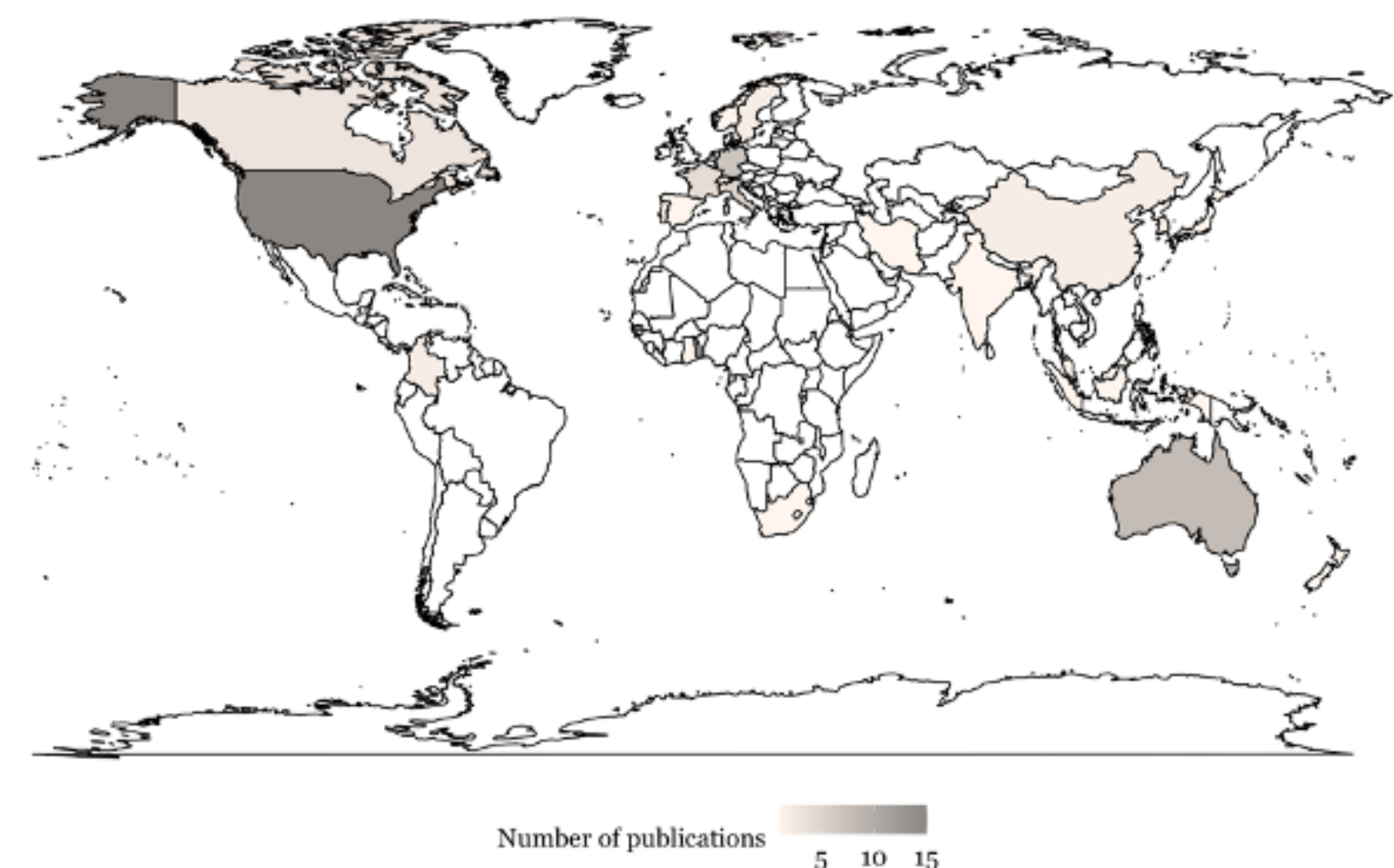


Figure 1. Geographical distribution of resilience research

Definitions and conceptualisations of resilience

Resilience has been defined in a multitude of ways. Folke (2006) creates an overview of three different conceptualisations of resilience; recovery and bounce-back; persistence and robustness; adaptation and transformation. While these categories are useful to understand why the concept of resilience is used in such different ways, many definitions are a combination of categories, sometimes focusing on one, while others find themselves in the middle of all categories.

Table 1. Overview of conceptualisations of resilience (Folke, 2006)

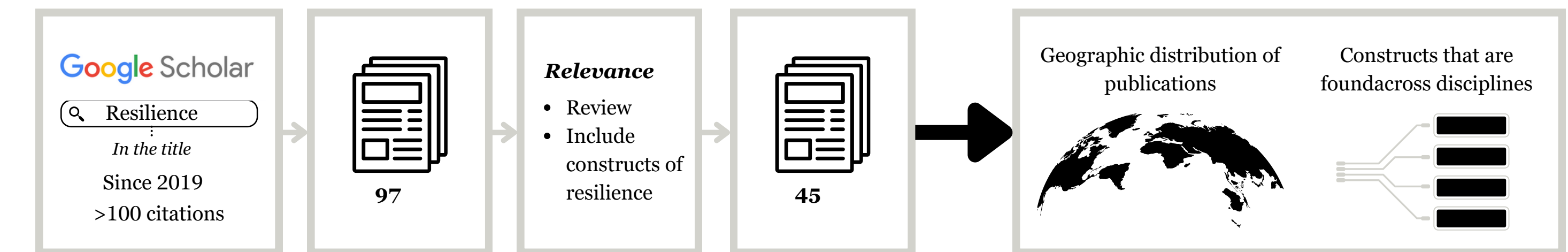
Resilience concept	Characteristics	Focus on	Context
Engineering resilience	Return time, efficiency	Recovery, constancy	Vicinity of a stable equilibrium
Ecological/ecosystem resilience social resilience	Buffer capacity, withstand shock, maintain function	Persistence, robustness	Multiple equilibria, stability landscapes
Social-ecological resilience	Interplay disturbance and reorganisation, sustaining and developing	Adaptive capacity transformability, learning, innovation	Integrated system feedback, cross-scale dynamic interactions

The different conceptualisations of resilience has led to a plethora of concepts related to resilience. The 45 reviewed articles covered 10 disciplines: in the fields of health science (1), medicine (1), sustainability (11), psychology (9), business/management sciences (8), environmental sciences (2), engineering (6), disaster sciences (4), economics (2), and data science (1). The 53 constructs most commonly mentioned in the literature (more than 3 times) are identified below. Many of the constructs have overlapping meanings.

Table 2. Abundance of resilience concepts. The colours identify concepts that have some overlap.

Adaptation	Coping	Information sharing	Preparedness	Restoration	Transformation
Agility	Diversity	Learning	Prevention	Risk	Transition
Anticipation	Dynamic	Maintaining	Recovery	Robustness	Understanding
Bounce Back	Efficiency	Management	Reduce impact	Scale	Variability
Buffering capacity	Equilibrium	Mitigation	Redundancy	Stability	Velocity
Change	Exposure	Optimism	Resistance	Stress	Visibility
Collaboration	Faith	Organisation	Resourcefulness	Survivability	Vulnerability
Connectedness	Flexibility	Persistence	Response	Tolerance	Withstanding
Control	Functionality	Plan			

Methodology



Snowballing was used in addition to the systematic literature review which was conducted as indicated above. Additional search words were used to investigate resilience models, including: "cultural entropy" and "critical transitions". The international research network GAIC was used for input on the understanding of resilience in different languages and cultures.

Resilience models

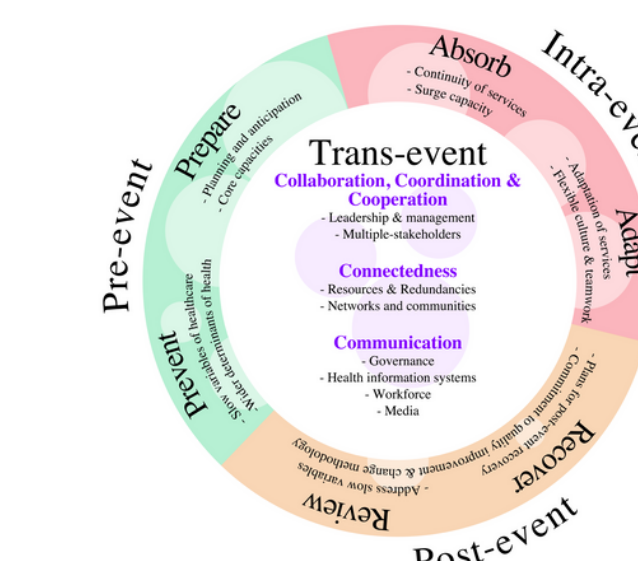


Figure 2. Framework for health care resilience by Tan et al. (2023)

The following model was introduced by Tan et al. (2023), comprising different conceptualisations of resilience at various stages related to a disturbance (in this case depicted as an event). It is similar to the model of critical functionality (figure 3) by Ganin et al. (2016), in which the functionality of a system is measured before and after a disturbance.

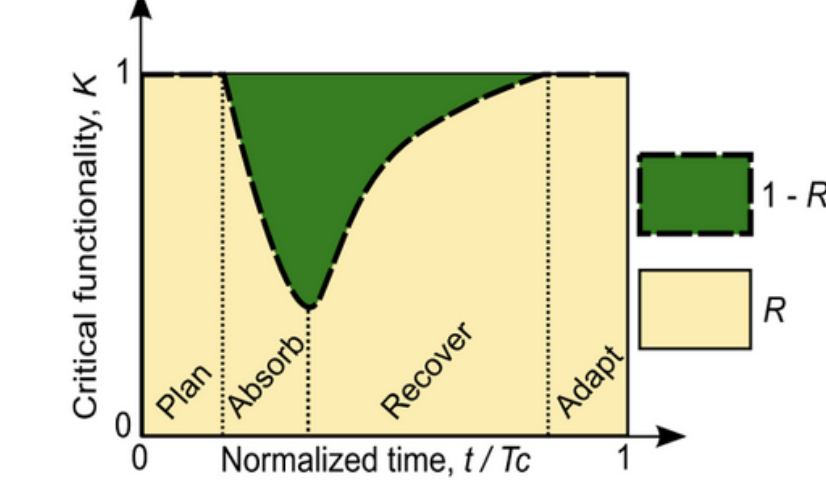


Figure 3. Critical functionality as a function of time (Source: Ganin et al., 2016)

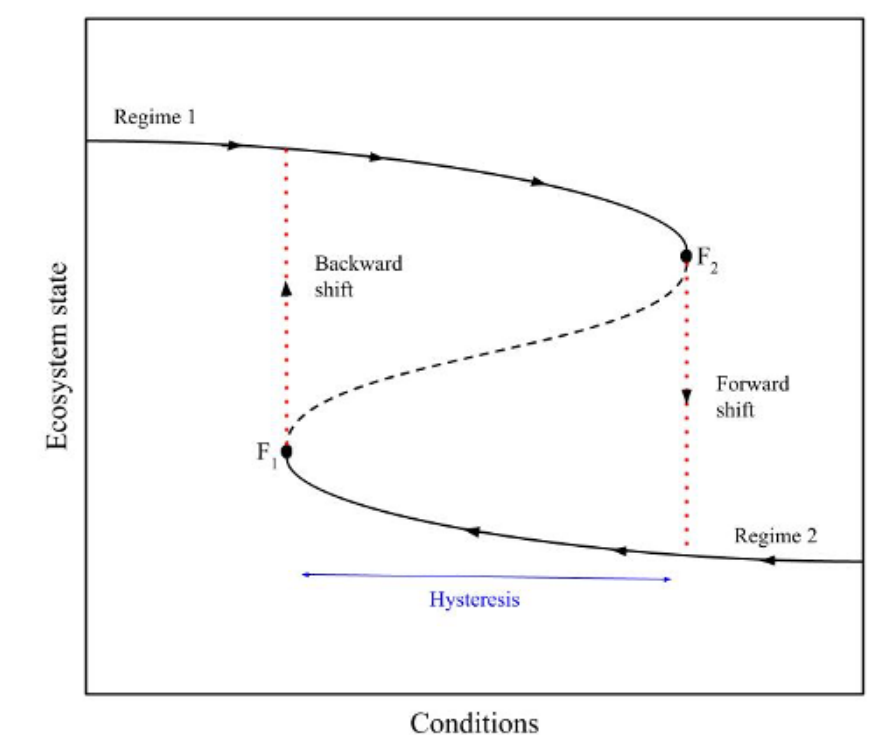


Figure 4. Visualisation of a critical transition (Source: adapted from Scheffer et al., 2012)

The shift from one regime to another leads to a change in the dynamics and relationships within the system. There are few model which deal with transformation or collapse, yet, it is important to consider this when discussing resilience.

Case study: a critical transition in the Tigray health system during the war

Conditions that influence the health system state:

1. Availability of medicine, testing kits and vaccines
2. Availability of health care
3. Hospital capacity
4. Transportation capacity
5. Abundance of rape
6. Sanitation/ water and food scarcity

Clear tipping points occurred in all six of these conditions with 90% of the hospitals destroyed, extensively documented rape, destruction of crops and food leading to food insecurity, etc.

Example of conditions by Gesesew et al. (2021)

- Functional status of health facilities
- Functional status of ambulances
- Number and employment status of health workers
- Antenatal care (ANC)
- Deliver care
- Postnatal care
- Immunisation
- Food insecurity
- Rape and gender based sexual violence

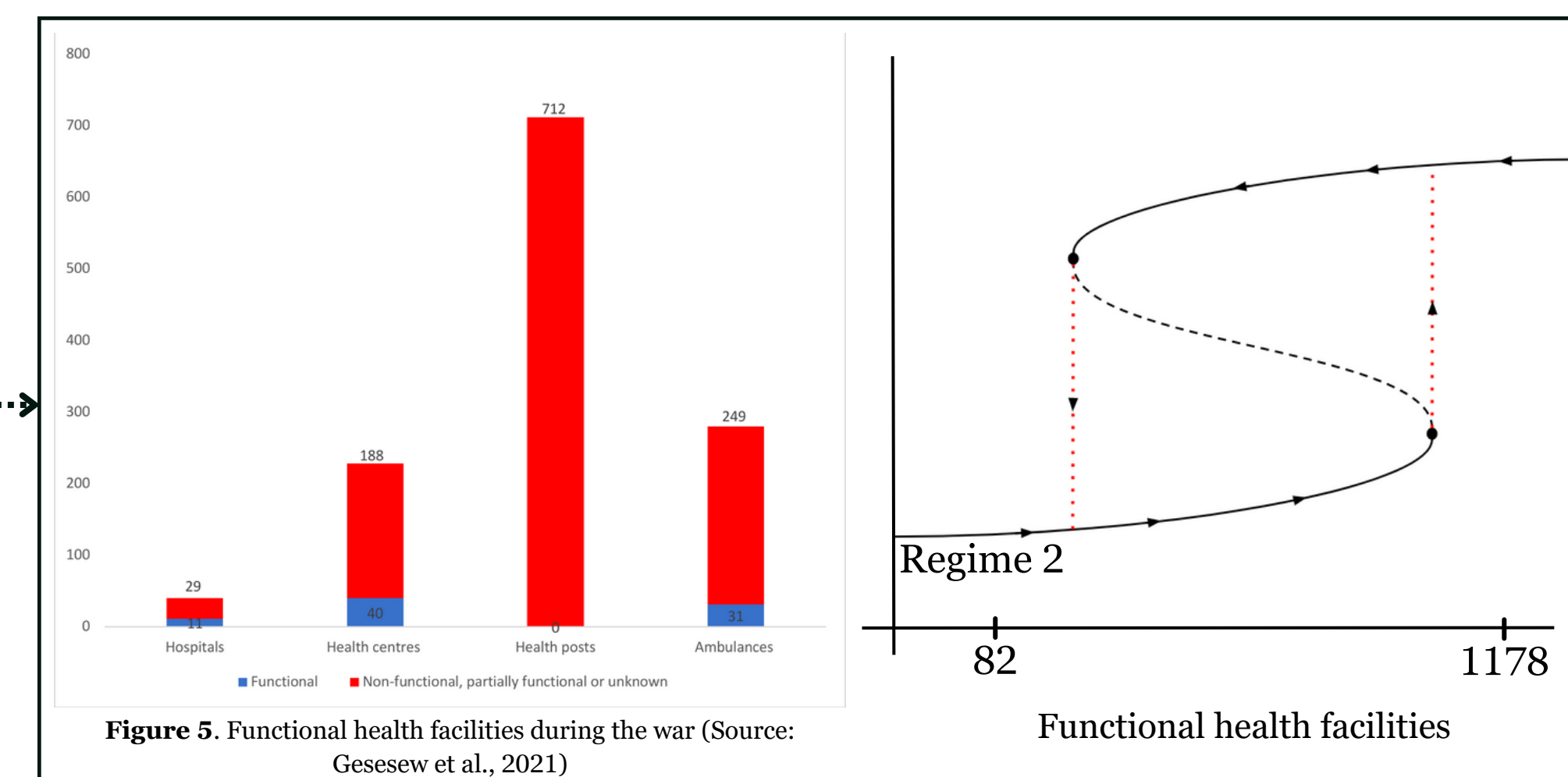


Figure 5. Functional health facilities during the war (Source: Gesesew et al., 2021)

The alternative regime is characterised by:

- High mortality rate
- High maternal mortality
- High rates of diseases such as measles, cholera, syphilis, HIV, pneumonia

Example of mesurable characteristics by Gesesew et al. (2021)

- Non-communicable diseases (NCDs)
- Chronic infectious illnesses
- Outbreak status of selected ailments
- Malnutrition

Increase in maternal mortality of ca. 300 per 100,000 live births to 840 per 100,000 live births (Legesse et al., 2023)

Getting back to the first regime:

- Hysteresis: conditions need to improve to an even better state as prior to the war for the system to reach the system state of before the war (regime 1).
- Once regime 1 is reached, resilience will be high due to the adaptation needed to reach that state.