

Erlijn van Genuchten

A Guide to a Healthier Planet 2

Scientific Insights and Actionable Steps
to Help Resolve Climate,
Pollution and Biodiversity Issues

 Springer

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For nature

Foreword

I am part of a generation that was growing up in an era of growth, optimism, and the rush to consume. A generation that only later in life realized that there is no “Planet B”... As a child, I experienced actual scarcity of food, clothing, and experiences. For example, my first trip abroad happened when I was 13, and not only was I excited to get on a big plane, but I felt like I wanted to do it over and over again. This was in the 1990s.

Decades later, I see things differently. I have experienced environmental degradation and what it means for health, for example living in a beautiful house with a beautiful view but with air full of smoke from hay being burned on the fields. I have worked on it, through my years at the United Nations Development Programme (UNDP) and now as Deputy Executive Secretary at the United Nations Economic Commission for Europe (UNECE), where we try to promote norms and standards for air quality, help countries prevent industrial pollution, and build cleaner vehicles. And, finally, I have heard about it from my children: much more sensitive and aware—a very different generation from mine.

So, reading *A Guide to a Healthier Planet*—Volume 2, I found that it is doing an incredibly important job: it communicates about complex issues in a way that is understandable, that resonates, and that enables action. And it does so on a solid scientific base. Why is this important?

First, because policy choices are too often informed by oversimplified notions about human and planetary health. These oversimplified notions, coming from the (social) media, may overshadow the importance of properly researched but hard-to-comprehend policy briefs prepared by professionals. Instead, a policymaker would do well by reading this Guide—putting things in a scientific perspective but without requiring rigorous study.

Second, because we need to be able to illustrate the complexity of the interdependencies underpinning the triple planetary crisis. The effects of nitrogen pollution on allergies, the effects of the changing climate on mountain ecosystems and ecosystems of pollinators, the unique role of whales in the global ecological balance all are important (and not at all obvious!) examples of such interdependencies. They point to a need for more subtle and more systemic solutions.

Third, because we need to be able to talk about solutions in this clear way too. Importantly, this Guide offers solutions at several levels:

- (a) Personal action and responsibility (*yes, switching to rail travel makes a big difference!*)
- (b) Industry innovation and new business models (*be it self-healing concrete or non-fossil-fuel based kerosene or artificial intelligence-powered waste sorting*)
- (c) Future of policy and regulation (*which needs to reflect the links between climate and health; pollution and biodiversity; etc., and hence needs to be much less siloed*)

Dr. van Genuchten masterfully delivers on all three fronts. Her book would be a useful and inspiring read for a minister, an international activist, a CEO, or you and I, just to name a few. The videos in-built into the text provide for a useful mix of media, and the well-structured narrative helps navigate the reading, but also makes the book an actual guide.

So, with this Guide at our disposal, let's work together to keep our planet safe and beautiful—for ourselves, our children, and generations yet to come.

United Nations Economic Commission for Europe.¹

Geneva, Switzerland

Dmitry Mariyasin

¹The views described here are Dmitry Mariyasin's own and do not necessarily represent the opinion or endorsement of the UNECE.

Introduction

First, I would like to thank you! Thank you for taking the time to learn more about one of the most pressing topics in today’s world: the health of our planet! It is an incredibly important topic because our beautiful planet Earth is what provides us with the resources to live. Without these resources, all other issues we deal with in daily life are irrelevant. This is supported by Maslow’s hierarchy of needs (see Fig. 1), showing the different needs in life, with physiological needs at the base of the pyramid. The pyramid expresses that the lower needs must be satisfied before higher needs become relevant.

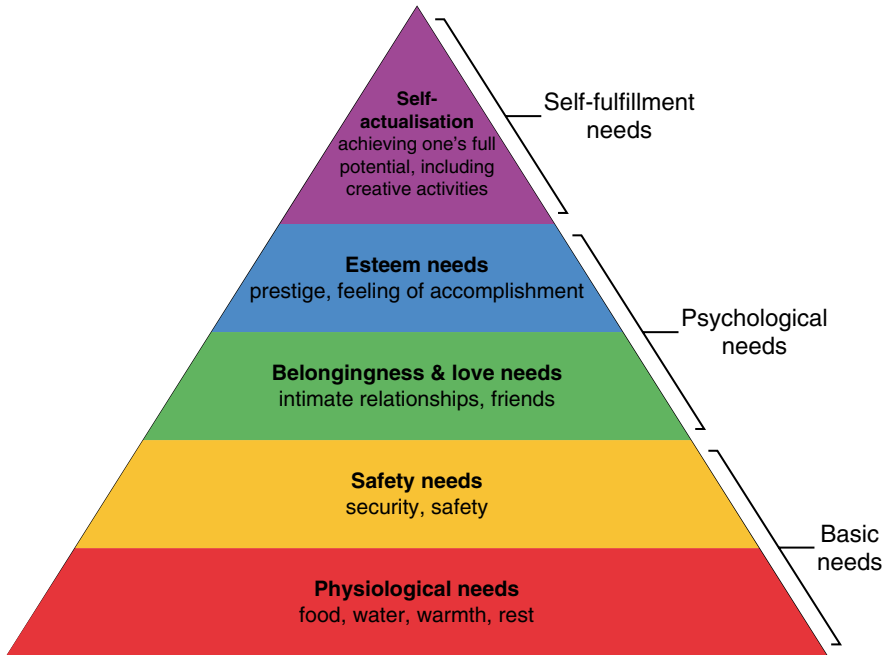


Fig. 1 Maslow’s hierarchy of needs

And even though not everyone is aware of it or already experiencing it, some of these physiological needs are at risk. This is because we are currently facing a triple planetary crisis. Triple means that we have to deal with three environmental crises at the same time: climate change, environmental pollution, and biodiversity loss:

1. Climate change refers to changes in temperature and weather patterns caused by rising levels of greenhouse gases such as carbon dioxide (CO₂) and methane in the atmosphere.
2. Environmental pollution refers to physical, chemical, and biological contaminants that harm the earth or atmosphere to such an extent that normal processes are disrupted. An example of a physical contaminant is noise, a chemical contaminant is sunscreen, and a biological contaminant is a virus.
3. Biodiversity loss refers to different plant and animal species going extinct.

A broad range of issues and the far-reaching consequences caused by the triple planetary crisis have been discussed in Volume 1 of *A Guide to a Healthier Planet*. For example, Volume 1 explains how climate change impacts our wine, how heavy metal pollution can contribute to Parkinson's disease, and how soil biodiversity impacts the health of our planet. Also, it for example explains how we can mitigate climate change by reducing methane emissions, how we can remove pollutants from water and soil, and how biodiversity can be protected by more sustainable agriculture.

While it is good news that solutions exist for each of the consequences discussed in Volume 1, it is important to realize that many more issues are caused by these environmental crises. And that many more solutions are available. Many of these solutions can be put into practice by us as individuals in daily life. And even when these actions may seem small, they are extremely important. In the video in Fig. 2, I explain why every single action counts.

To further increase our understanding of the broad range of issues and solutions, Volume 2 of *A Guide to a Healthier Planet* covers further issues and solutions related to climate change, pollution, and biodiversity loss. The structure of the book is the same, with each part focusing on one of the three crises. Again, each part consists of four chapters addressing examples of current and future issues and two chapters addressing examples of how we can resolve these issues and take action towards a healthier planet.

In the climate change part (see Table 1), we first look at how we can tell that cyclone intensity is impacted by climate change (Chap. 1). After that, we look at

Fig. 2



Table 1 Overview of Part I

Consequences	Chapter 1: Impact of Climate Change on Cyclone Intensity
	Chapter 2: Impact of Climate Change on Mountains
	Chapter 3: Impact of Climate Change on Animals
	Chapter 4: Impact of Climate Change on Pregnant Women and Birth Defects
Solutions	Chapter 5: Controlling CO ₂ Levels in the Building Sector
	Chapter 6: Controlling CO ₂ Levels in the Aviation Sector

Table 2 Overview of Part II

Consequences	Chapter 7: Impact of Different Types of Pollution on Pollinators
	Chapter 8: Impact of Sunscreen Pollution on Marine Environments
	Chapter 9: Impact of Nitrogen Pollution on Pollen Allergies
	Chapter 10: Impact of Plastic Pollution on Spreading Viruses
Solutions	Chapter 11: Removing Plastic Waste from the Environment
	Chapter 12: Removing Waste from Landfills

Table 3 Overview of Part III

Consequences	Chapter 13: Impact of Amazon Deforestation on Biodiversity
	Chapter 14: Impact of Exotic Animal on Ecosystems
	Chapter 15: Impact of Global Warming on Ocean Biodiversity
	Chapter 16: Impact of Whales on Our World
Solutions	Chapter 17: Protecting Natural Ecosystems
	Chapter 18: Sustainable Fishing

consequences that we are already clearly noticing in daily life: how climate change affects mountains (Chap. 2) and animals (Chap. 3). Then we look at consequences that may not be so obvious: how pregnant women and unborn babies are affected by climate change (Chap. 4). In the last two chapters of this part, we look at solutions: at how CO₂ emissions can be reduced in the building (Chap. 5) and aviation sectors (Chap. 6).

In the pollution part (see Table 2), we first look at how different types of pollution affect pollinators (Chap. 7) and how sunscreen pollution affects marine environments (Chap. 8). After that, we look at how pollution also directly impacts us: how nitrogen affects pollen allergies (Chap. 9) and plastic pollution can spread viruses (Chap. 10). In the last two chapters of this part, we look at solutions: how plastic pollution can be removed from the environment (Chap. 11) and how waste from landfills can be removed (Chap. 12).

In the biodiversity part (see Table 3), we first look at the consequences of cutting down trees in the Amazon rainforest on plants and animals (Chap. 13) and how exotic animals harm ecosystems (Chap. 14). After that, we look at the consequences



Fig. 3 Sustainable living is not only easier when understanding the importance and psychology behind it but also rewarding

of global warming on ocean biodiversity (Chap. 15) and how whales have a huge impact on our world (Chap. 16). In the last two chapters of this part, we look at solutions: how natural ecosystems can be protected (Chap. 17) and how the fishing industry can be made more sustainable (Chap. 18).

Finally, in the conclusion is discussed why today’s ‘grow now, clean up later’ mentality has devastating consequences and why adopting an environmental protection mentality is important. Interestingly, understanding the importance of sustainable living and the psychology behind it not only makes it easier but also more rewarding to contribute to a healthier planet (see Fig. 3)!

As in Volume 1, each chapter is based on one or more recent scientific publications and makes scientific insights from these publications available in easy-to-understand language. In addition, in each chapter, ideas are added about what you and I can do in daily life to make a positive difference. This allows each and every one of us to take the first or next step straight away.

Figure Credits

Fig. 1 “Maslow’s Hierarchy of Needs” by Androidmarsexpress and updated by Belbury is licensed under CC BY-SA 4.0 DEED

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Fig. 3 PeopleImages.com—Yuri A on Shutterstock

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Part I

Climate Change

With the climate crisis progressing, the disastrous consequences are becoming more obvious in daily life and are present in the news more frequently. For example, extreme weather events such as storms and floods made many headlines in 2023, as ten countries on different continents experienced severe flooding in less than two weeks.

As further extreme weather events and resulting catastrophes are likely to occur in the near future, they are also a call for immediate action toward mitigating climate change. To trigger climate action, several climate change meetings, such as the United Nations' Climate Conference series COP, have led to agreements that define climate goals. One of these agreements is the Paris Climate Agreement, which aims at limiting global warming to less than 2 °C (3.6 °F), ideally 1.5 °C (2.7 °F). Also, the European Union has committed itself to achieving net-zero greenhouse gas emissions



Fig. 1 Net-zero means that as much greenhouse gas emissions are extracted from (*left part of the scale*) as sent into (*right part of the scale*) the atmosphere



Fig. 2 As climate policies are not bringing about required action to mitigate climate change, actions taken by individuals like you and I are critical

by 2050. A net-zero emission goal means that they strive to balance out the amount of greenhouse gases sent into and extracted from the atmosphere (see Fig. 1).

While the awareness and concern about climate change are spreading, a large difference exists between commitments and actions taken. This is called the knowledge-action gap. In fact, this knowledge-action gap has not been improved by climate policies at a national level across the EU since the Paris Agreement was adopted in 2015. In some European Union member states, this knowledge-action gap is even widening!

So, while the call to take action is an old one, it is more relevant than ever. And as governments are not enabling the required speed of change, we as individuals need to take our future into our own hands (see Fig. 2).

Credit

This Chapter Is Based On:

Nayna Schwerdtle, P., et al. & Jungmann, M. (2023). Interlinkages between climate change impacts, public attitudes, and climate action—Exploring trends before and after the Paris Agreement in the EU. *Sustainability*, 15(9), 7542.

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Chapter 1

How Climate Change Impacts Cyclone Intensity



Abstract In recent years, more and more countries across the globe experienced severe flooding due to cyclones, typhoons, or hurricanes. While such storms naturally impacted the world throughout history, their increased intensity is caused by climate change. This trend can be shown using different methods. These methods involve indices, historical datasets, observations, and numerical modeling. To be able to draw high-quality conclusions about this trend, enough high-quality data needs to be available. Also, statistical tests must be performed to ensure that changes are not caused by chance. The resulting insights help us understand the effects of climate change on future cyclones and their consequences.

Keywords Science · Science communication · Climate change · Climate change consequences · Global warming · Tropical cyclone · Typhoon · Hurricane · Extreme weather events · Intensity change

In 2023, ten countries on different continents experienced severe flooding in less than 2 weeks. Some of these floods were caused by storm Daniel, which severely affected several countries including Greece and Libya (see Fig. 1.1). Other floods were caused by multiple typhoons in Asia, also affecting several countries including Taiwan, China, and Hong Kong. And also North and South America were affected. The consequences involved streets that turned into deadly rivers, villages being submerged, collapsed dams, flooded metro stations, and homes without power. Just to name a few.

The storms causing these devastating effects were very strong, destructive storms with winds rotating inward (see Fig. 1.2). Wind speeds are 119 km/h (74 mph) or more, with the highest speeds and heaviest rainfall near the center, or eye, of the typhoon. Depending on where they form, these storms are called typhoons, cyclones, or hurricanes: typhoons form over the Northwest Pacific, cyclones over the South Pacific and Indian Ocean, and hurricanes over the North Atlantic, central North

Credit: This chapter is based on two scientific articles by Liguang Wu and Nick Marriner and their colleagues. (Full citations are available at the end of the chapter)