# Chapter 2
# Peace Ecology in the Anthropocene for Africa


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**Abstract** The term 'Anthropocene' was promulgated by Paul J. Crutzen in 2000. Anthropogenic threats to human survival posed by the atom bomb and global climate change began in the new geological epoch of the Anthropocene. They require a joint approach within the framework of *holistic peace ecology* and a transformative strategy towards an *ecological peace policy*. Since 1945 Sub-Saharan Africa has experienced many violent conflicts and human-induced disasters. Due to population growth, the demand for water, agricultural land and food supplies will increase, while there may be an even greater shortage of food supplies and jobs by 2100. These climate-related environmental scarcities may result in new forms of violent climate conflicts. Tipping points in the climate system may trigger geopolitical conflicts. This chapter summarises the key ecological challenges which Africa has faced since 1945, reviews the conflicts Africa has experienced, and assesses their implications for peace research and environmental studies in Africa and the limited work on the connections between the two fields of research. This text discusses the relevance of a peace ecology approach and the need for an ecological peace policy for Africa and reflects on the need to rethink and integrate research and action in Africa in the Anthropocene.

**Keywords** Anthropocene · Demographic projection · Climate change · Climate models · Ecological peace policy · Environmental peacemaking · Human development report · Peace ecology · Political geo-ecology · Global environmental change · Post-conflict peacebuilding · Tipping points

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J. C. K. Kiyala and G. T. Harris (eds.), *Civil Society and Peacebuilding in Sub-Saharan Africa in the Anthropocene*, The Anthropocene: Politik—Economics—Society—Science 34,
https://doi.org/10.1007/978-3-030-95179-5_2

## 2.1 The Anthropocene: A Turning Point, Context, Challenge and Opportunity

The Anthropocene is a new concept that gained ground on 23 February 2000 when the Nobel Prize laureate in chemistry (Crutzen 2002; Benner et al. 2022), used it during a meeting of the *International Geosphere Biosphere Programme* (IGBP) in Mexico, when he claimed that due to human interventions in nature and the Earth System humankind had entered a new geological epoch in the Earth's history: the 'Anthropocene'.[1] This concept triggered an intense debate in the natural and social sciences, humanities and law that in just 20 years resulted in more than 10 000 scientific publications, including over 5 000 peer-reviewed journal articles (Brauch 2022, 2023).[2] Three specific aspects of the Anthropocene have previously been identified (Brauch 2021b):

- It is a *turning point* in the Earth's, human and political history that, according to a majority proposal of the *Anthropocene Working Group* (AWG), began between the first test of an atom bomb in Alamogordo (USA) on 16 July 1945 and the Great Acceleration (McNeill/Engelke 2014) of both the Earth System's and socio-economic trends since 1950. To date, this is the only time that fundamental changes in the Earth's history (from the Holocene to the Anthropocene) have coincided with major changes in the international order as well as in political and human history.
- The *context* of both the Earth's history and human history has fundamentally changed since the end of World War II:
  - American dominance in the political, economic (WB, IMF, GATT) and security realm (military alliances [e.g. NATO] instead of the UN Charter's [1945] collective security system)[3];

[1] This text addresses two themes the author has been working on for some time and thus builds on several previous texts that were authored and co-authored on 'peace ecology' and the 'Anthropocene' (Brauch 2012, 2014, 2016, 2016a; Brauch et al. 2011, 2015; Brauch/Oswald Spring 2011, 2015; Brauch et al. (2016); Crutzen/Brauch 2016; Oswald Spring et al. 2009, 2014a). This chapter builds on Brauch (2021), the copyright of which the author retained. Additional new texts on these themes by this author are in preparation and will be published in the years to come.

[2] I appreciate the constructive comments on a first draft of 25 April 2021 received from Dr Hans Happes (Germany), former headmaster of a grammar school (Nikolaus-Kistner-Gymnasium), who has been working in Sumbawanga (Tanzania) since his retirement; the co-editors of this book, Dr Kiyala Jean Chrysostome (Democratic Republic of Congo) and Prof. Dr Geoff Thomas Harris (Australia), both of the Durban Institute of Technology, Durban, South Africa; Prof. Dr Jürgen Scheffran, Geography Department, Hamburg University and Head of CLISEC; Prof. Em. Dr Michael Brzoska, Hamburg University, former Director of the Institute for Peace Research and Security Policy, Hamburg University (ISFH); Prof. Em. Nils Petter Gleditsch, Peace Research Institute Oslo (PRIO), Norway; Prof. Em. Dr Peter Wallensteen, Uppsala University, Sweden.

[3] See Keal (1983), Kissinger (2014), Ikenberry (1999, 2011), Mazarr et al. (2016), Parmar (2018).

  - The bipolar structure of a divided world during the Cold War that has also affected Africa, which became a battleground for several proxy conflicts and wars[4];
  - For Africa the past 76 years have coincided with the process of decolonisation from colonial rule and the acquisition of political independence, while many colonial dependencies and conflicts have remained in the postcolonial order.[5]

- Multiple complex environmental and socio-economic and political *challenges*:

  - The 'Great Acceleration' was first observed in studies on socio-economic and Earth trends by the IGBP led by Will Steffen. These were first published in 2004 and updated in 2010. They detected a take-off since 1950 that has intensified since the end of the Cold War in 1990.
  - Anthropogenic global environmental and climate change has been discussed by natural scientists since the 1970s; it became a global political issue in 1988 and was discussed as a new security issue in the early 21st century.

But also – as I add here – the Anthropocene has brought new *opportunities* to launch countermeasures to adapt to and mitigate the physical effects of climate change and its socio-economic outcomes. These are increasingly taken into account in strategies to transition to sustainability through the decarbonisation of the economy and society in order to achieve a climate-neutral world between 2050 (European Commission 2019; European Union 2019), 2060 (Chen et al. 2020) and 2100 and to reduce $CO_2$ emissions by half by 2030, as US President Biden announced on Earth Day 2021 (Stone 2021), or by 65% by 2030, 88% by 2040 and 100% by 2045, as the German government announced in May 2021.[6]

The Anthropocene has been proposed as a new geological epoch for humankind in which two fundamentally different anthropogenic threats to the *survival* of humankind have emerged:

- *Atomic weapons* and the other weapons of mass destruction have been legitimated by the military, political and economic threats posed by rival superpowers (or neighbours in South Asia); these have been analysed as an object of peace and security studies.[7]

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[4] See: Bourantonis/Wiener (1995), Volgy/Imwalle (1995), Westad (2007) Jackson/O'Malley (2018), Conca (2015); "List of proxy wars", at: https://en.wikipedia.org/wiki/List_of_proxy_wars; "Proxy Wars in Africa", at: https://www.academia.edu/Documents/in/Proxy_Wars_in_Africa; (Manyok 2008): "War of Proxy, Legacies of the Cold War on the Third World Countries: The Case of Congo and Angola", at: https://www.researchgate.net/publication/292368497_War_of_Proxy_Legacies of_the_Cold_War_on_the_Third_World_Countries_The_Case_of_Congo_and_Angola (11 June 2021).

[5] Freund (1984), Birmingham (1995), Clapham (2020).

[6] See: Die Bundesregierung (2021): "Climate Change Act 2021: Intergenerational contract for the climate"; at: https://www.bundesregierung.de/breg-de/themen/klimaschutz/climate-change-act-2021-1913970 (8 June 2021).

[7] For an annual overview of global military expenditure, see: "SIPRI Military Expenditure Database", at: https://www.sipri.org/databases/milex. This database "contains consistent time series on the military spending of countries for the period 1949–2020".

- The threats posed by *anthropogenic global environmental changes* are the result of our way of life, economic strategies, production processes and consumption preferences. They cannot be addressed by Hobbesian logic or realist geopolitics[8] but only by a fundamental transformation based on global cooperation in which the only useful role of the military infrastructure is to help face, contain and cope with the consequences of human-triggered natural hazards and disasters. These issues have been primarily addressed by environmental studies and ecological considerations aimed at sustainable development that takes its planetary consequences (UNDP 2020) into account.

These challenges have been addressed in the social sciences by two distinct research programmes between which only very limited scientific cooperation, exchanges, controversies and interdisciplinary projects have occurred. Peace and security issues have been addressed from the two different perspectives and theoretical approaches of *security studies* – following a Hobbesian or realist logic – and *peace studies* inspired by idealistic values and often by Kantian policy goals of a world based on cooperation and peaceful social change.

In environmental and ecological studies the acquisition of knowledge about anthropogenic global environmental change was obtained through discussions and research in the natural sciences. Social science studies later joined in once these topics had become political issues that were handled in environmental regimes (on climate change, biodiversity, ozone, water and soil). To address these two approaches to global environmental change, Brauch et al. (2011) proposed a 'political geo-ecology for the Anthropocene'.

Anthropogenic threats to human survival posed by the atom bomb and by global environmental and climate change began in 1945 in the new geological epoch of the Anthropocene. They require both a joint analytical approach in the framework of *holistic peace ecology* and the integrated transformative strategy of an *ecological peace policy* that is capable of addressing the causes, interdependent processes and outcomes in both policy fields in the remaining decades of the 21st century.

This chapter addresses, primarily from a conceptual approach, the two interrelated concepts of peace ecology (Sect. 2.2) and ecological peace policy (Sect. 2.3) and reflects on the proposals developed by the UNDP in its Human Development Report 2015 on *Fighting Climate Change* (UNDP 2007–2008) and its 2020 publication on *Human Development and the Anthropocene* (Sect. 2.4).

In an empirical part this chapter summarises the key ecological challenges Africa has faced in the Anthropocene in the colonial and post-colonial context (Sect. 2.5), reviews the conflict types Africa has experienced since 1945 (Sect. 2.6), and tries to assess the implications of both for peace research and environmental studies in Africa and the limited work so far undertaken on the interconnections between the two research fields (Sect. 2.7).

[8] Thomas Hobbes (1588–1679) was a British political philosopher who, in International Relations, is considered a pioneer of modern realist thinking, which is influenced by the role of military and economic power.

In the concluding part this text discusses the relevance of a peace ecology approach in Africa (Sect. 2.8) and the need for an ecological peace policy for Africa south of the Sahara (Sect. 2.9), and the author reflects on the need to rethink and integrate research and action in Africa in the Anthropocene (Sect. 2.10).

With its conceptual, empirical and reflective parts and holistic perspective, this chapter aims at *consilience*, which the American biologist Wilson (1988) noted as a growing interlocking of causal explanations across disciplines, in which the "interfaces between disciplines become as important as the disciplines themselves" and "touch the borders of the social sciences and humanities". The key issue addressed in the peace ecology approach is the complex linkage between anthropogenic changes in the climate system and their societal outcome as multiple forms of conflicts that sometimes lead to violence or societal instability, and how the latter can be managed, prevented, or avoided. To this end, reactive or proactive political strategies, policies, and measures may deal with the cause by reducing *greenhouse gas* (GHG) emissions, and can address the impacts by political adaptation and mitigation measures to avoid escalation into violent conflicts.

In the Anthropocene a complex dual causal relationship exists between human beings, the Earth System and the social system. During the Anthropocene, humankind has for the first time directly intervened in the Earth System through the burning of fossil fuels, resulting in an anthropogenic increase in greenhouse gases, most particularly *carbon dioxide* ($CO_2$), in the atmosphere. Thus, we as human beings have for the first time directly interfered in the Earth System, triggering geophysical effects that directly affect social systems and livelihoods.

## 2.2 Peace Ecology in the Anthropocene Since 1945

The peace ecology concept was proposed by Kyrou (2007) inspired by Ken Conca (1994, 2002). It was developed further by Oswald Spring et al. (2014) and from a peace activist perspective by Amster (2014). Brauch (2021) framed peace ecology within the Anthropocene, arguing that since 1945 the separate approaches to studying peace and security issues on the one hand and, later, economic and ecological themes in the Anthropocene on the other hand should be replaced with a holistic peace ecology perspective as a scientific approach that integrates peace research and environmental studies.[9]

The link between peace and environmental issues has been addressed by only a few social scientists, among them the economist and peace activist Kenneth Boulding (1966, 1978) and his wife, the sociologist and peace educator Elise Boulding (1988, 1989, 1992, 2000). Elise Boulding linked peace to ecology as a result of practical

[9] This text addresses two themes the author has been working on for some time and thus builds on several previous texts that were authored and co-authored on 'peace ecology' and the 'Anthropocene' (Brauch 2014, 2016, 2017; Brauch et al. 2011, 2015, 2016; Brauch/Oswald Spring 2011, 2015, 2017; Crutzen/Brauch 2016; Oswald Spring et al. 2009, 2014, 2014a). Additional new texts by this author are in preparation and will be published in the years to come.

daily experience. She argued that there is no true peace without ecological links, such as respect for nature and human ecology (Morrison 2005; Boulding 2017, 2017a, 2017b, 2017c).

Since the 1990s, environmental security research has shifted from environmental scarcity, degradation and conflict to the dangers posed by global environmental and climate change (Sygna et al. 2013). With the direct impacts of humans upon ecosystems in the Anthropocene (Crutzen 2002, 2011) and the progressive securitisation of issues of global environmental change (GEC) since 2003, these anthropogenic changes are increasingly threatening human lives and livelihoods. Worldwide, the destruction of key ecosystem services, the pollution of air, water and soil, land use change and extreme weather events are creating new 'anthropogenic challenges' for humankind, although these do not pose a threat of violent conflict or war.

Peace ecology in the Anthropocene was conceptualised by Oswald Spring et al. (2014a: 18–19) within the framework of *six conceptual pillars of peace, security, equity, sustainability, culture and gender*, in which *negative peace* (non-war) is defined by the linkages between peace and security, while the concept of *positive peace* is defined by peace with social justice and global equity; for interactions between peace, gender and environment the concept of *cultural peace* was proposed, and for the relationships between peace, equity and gender the concept of *engendered peace* was suggested (Oswald Spring 2020: 19; Fig. 2.1).

These *five pillars of peace ecology* point to different conceptual features of peace. The classic relationship between 'international peace and security' in the UN Charter refers only to narrow *negative peace* without war or violent conflict. Its aim is the prevention, containment and resolution of conflicts and violence and the absence of 'direct violence' in wars and repression. In order to achieve peace with equity – known as *positive peace* – the absence of 'structural violence' (Galtung 1969) is necessary. This is accomplished by overcoming social inequality, discrimination, marginalisation and poverty where there is no access to adequate food, water, health or educational opportunities.

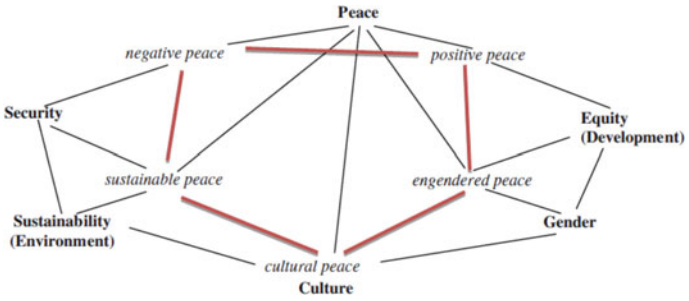


**Fig. 2.1** Six conceptual pillars of peace, security, equity, sustainability, culture and gender; five pillars of peace ecology and their linkage concepts of negative, positive, sustainable, cultural and engendered peace. *Source* Oswald Spring et al. (2014: 19)

'Peace ecology' is defined as a holistic, multi- and interdisciplinary scientific perspective and approach that addresses both the peace and security focus of the UN Charter (1945) and the new development and environment studies that have gradually evolved during the decolonisation process since the 1950s, the emerging environment policies at national level since the 1960s and, in the UN context, since the Stockholm Conference (1972), the setting up of the *UN's Environment Programme* (UNEP), and the Rio Earth Summit (1992). The decision-makers who prepared and wrote the UN Charter in spring 1945 "showed no sign of thinking about the natural world. The charter makes no mention of the Earth, ecosystems, pollution, natural resources, or sustainability … and the theme was missing from the debate on the new organisation's purpose, structure, and rules" (Conca 2015: 33). The first secret nuclear test on 16 July 1945 in Alamogordo was the starting point of the nuclear era, while its radioactive isotopes where interpreted 70 years later by the *Anthropocene Working Group* (AWG) as evidence for the start of the Anthropocene as a new geological epoch that can be identified in sediments in the atmospheric testing sites of nuclear weapons powers (US, USSR, UK, France, China, India, Pakistan etc.).

The peace ecology approach combines the scientific, technological, peace, and security dimensions with environmental perspectives and methods by looking not only at these distinct features but also at the complex interactions and feedbacks of anthropogenic processes in the climate system that were triggered by humanity and may put the very survival of humankind at risk as a result of the mass use of nuclear weapons (in a nuclear war) or the exponential increase in the burning of hydrocarbon energy sources by individual human beings as part of their production and consumption processes and lifestyles (causing anthropogenic climate change). These two anthropogenic threats to the survival of humankind as a result of a nuclear war and/or climate change require combined but different instruments, strategies and policy outcomes.

Crutzen (2016) was a pioneer of investigations into the 'ozone layer depletion' caused by the human use of chlorofluorocarbons (CFCs) and halons in aerosol spray cans and refrigerants. He also conducted research into the potential effects of a 'nuclear winter' (Crutzen 1980; Badash 2009) which could result from the mass use of nuclear weapons with disastrous consequences for the environment and food security, and he suggested using the 'Anthropocene concept' as a new framework for a transformative science.

Human beings, as policy-makers (diplomats, international civil servants in the UN system), citizens and activists (in peace movements by creating societal awareness and putting political pressure on governments) can only avoid a nuclear winter through nuclear arms control and disarmament, while individual human beings can alter their behaviour to minimise the dangers of global environmental and climate change.

Containing and overcoming the ozone hole has become a unique success story of ozone diplomacy (Benedick 1998; The Vienna Convention for the Protection of the Ozone Layer, 1985; Montreal Protocol on Substances that Deplete the Ozone Layer 1989, and so far six amendments, most recently the Kigali Amendment in 2016) that

became possible because of the development of substitutes for chlorofluorocarbons (CFCs) and halons, strong political will, and efficient leadership and diplomacy.

The peace ecology approach deals with the manifold links between peace, security and the environment, whereby humankind and the environment, as the two interdependent parts of Planet Earth, face the consequences of destruction, extraction and pollution (Oswald Spring 2008). The concept of sustainable peace also includes the processes of recovering from environmental destruction and reducing the human footprint in ecosystems through less carbon-intensive processes and, in the long term, possibly carbon-free and dematerialised production, so that future generations still have the opportunity to decide on their own resource and development strategies.

Policies aimed at 'sustainability transition' (Brauch et al. 2016; Brauch 2021b) are thus part of a positive strategy that addresses possible new causes of instability, crises, conflicts and, in the worst case, even war. These causes may be either the scarcity of fossil energy sources or the possible security consequences of anthropogenic global environmental and climate change, either of which may be triggered by linear trends as well as chaotic 'tipping points' (Lenton et al. 2008, 2019).

The relationship between peace, the environment and gender may result in the *cultural peace* that facilitates the creation of peace in the minds and actions of humankind. It socialises people so that religious and social discrimination can be overcome by establishing human rights granted equally to all people. This enables them to develop the ability to negotiate solutions to present and future conflicts peacefully and to share political, economic, social and cultural powers. The rights also respect different ecosystems by taking into account their vulnerability to human actions.

It is appropriate that the temporal context for this peace ecology research programme is the Anthropocene (Crutzen/Stoermer 2000; Crutzen 2002), since this new epoch in the Earth's and human history began when a turning point in the geological time of the Earth's history coincided with the long-term structural turning points in human history after the end of World War II, with the emerging nuclear era, the order of the Cold War (1947–1989), and the post-Cold War disorder (1990-present).

The environmental dimensions of this change could not be socially constructed until the late 1980s, when the exponential increase in greenhouse gases, particularly $CO_2$, since the Great Acceleration in the 1950s made the issues relating to global environmental change and climate change all too apparent. Whereas the $CO_2$ concentration in the atmosphere increased from 279 ppm in 1750 to 310 ppm in 1950 – i.e. by 31 ppm in 200 years – between 1950 and 1990 it leapt up by 44 ppm in just 40 years (from 310 ppm to 354 ppm), and in the 30 years between 1990 and May 2020 it increased by a further 62 ppm (from 354 ppm to 416 ppm – 137 ppm higher than the level in 1750).

Thus, with the exponential increase of *greenhouse gases* (GHG) in the atmosphere, scientific knowledge of the physical impacts of global climate change has increased since the 1980s, initially in the natural sciences. Several new research and training programmes and research institutes have been set up in the newly emerging areas of *Earth Systems Science* (ESS) and *Earth Systems Analysis* (ESA) (Steffen et al. 2020),

and new degree courses in geo-ecology[10] are being offered in the sphere of physical geography. After the build-up of new scientific capabilities, the scientific knowledge of GEC has expanded rapidly. Its peer-reviewed research output was assessed by the Intergovernmental Panel on Climate Change in its first five assessment reports (IPCC 1990, 1996, 2001, 2007, 2013, 2014) (process of *scientisation*).[11] Among policy-makers in governments and parliaments political awareness of anthropogenic climate change emerged in 1988, and after only four years resulted in the first two framework agreements on climate change and biological diversity at the Rio Earth Summit (process of *politicisation*). In 1988 analysis of the security implications of climate change gradually began. In spring 2003 the national public debate and studies in think tanks in several OECD countries (UK, US, Germany) took off (process of *securitisation*), and after 2007 related research in the social sciences also began (Brauch 2002, 2009; Brauch/Scheffran 2012; Scheffran et al. 2012; Brzoska 2020; Brzoska/Scheffran 2020).

Le Billon/Duffy (2019) pointed to several impediments to building bridges between political ecology and peace and conflict studies:

> Conflict is at the core of many political ecology studies. Yet there has been limited engagement between political ecology and the field of peace and conflict studies. This lack of connection reflects in part the broader disciplinary context of these two fields. Whereas political ecology research mostly comes from disciplines that eschewed environmental determinism, such as human geography, much of peace and conflict studies is associated with political science using positivist approaches to determine the causal effects of environmental factors on conflicts. Yet greater connections are possible, notably in light of political ecology's renewed engagement with 'materialism', and peace and conflict studies' increasingly nuanced mixed-methods research on environment-related conflicts. Furthermore, political ecology's emphasis on uneven power relations and pursuit of environmental justice resonates with the structural violence approaches and social justice agenda of peace and conflict studies (Le Billon/Duffy 2019).

Both authors have remained within the mainstream debates on human geography, political science and international relations, and have so far not addressed the proposed concepts of 'political geoecology' (Brauch et al. 2011, 2015) and peace ecology (Brauch 2016a, 2021), nor have they contextualised their analysis in the Anthropocene.[12]

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[10] The concept of 'geoecology' was introduced by Huggett (1995). In 2021, many geography departments, primarily in Central and Eastern Europe, are offering Bachelors and Masters degree courses in geoecology.

[11] The Sixth Assessment Report of the IPCC is scheduled to be released between October 2021 (WG 1) and October 2022 (WG II, WG III, Synthesis Report) and may be accessed here: https://www.ipcc.ch/assessment-report/ar6/ (8 June 2021).

[12] 'Geoecology' is a concept formulated by Huggett (1995) within physical geography. The proposal of 'political geoecology' is to combine approaches in physical and human geography or between the natural and the social sciences, while 'peace ecology' is an approach that proposes integrating ecological approaches with research programmes in the social sciences and peace studies.

In my opinion, the peace ecology approach should:

- overcome the overspecialisation in both the social and natural sciences;
- offer *holistic* approaches that address interlinkages between themes addressed by peace research and environmental studies;
- be contextualised in the Anthropocene Epoch of the Earth's history and address scientific and political linkages since the end of World War II and the Great Acceleration;
- be interdisciplinary; and
- methodologically, in the Anthropocene a peace ecology approach should be developed further from interdisciplinary and transdisciplinary approaches into a *transformative research programme.*

Between 2000, when Crutzen uttered the term 'Anthropocene', and 2020 a debate on linkage concepts between political science, international relations and peace research and environmental studies remained underdeveloped within the social sciences. The much-needed integration of knowledge derived from climate and Earth Systems Science and analysis in the natural sciences with analysis in the social sciences has remained rare despite the many pleas for interdisciplinary research.

Anthropogenically-induced global warming has triggered four major physical effects: (a) a global increase in the average temperature, (b) variations in precipitation, (c) low-onset sea-level rise, and (d) an increase in the probability and intensity of extreme weather events, which, to date, have been reviewed in five published assessment reports (IPCC 1990, 1995, 2001, 2007, 2013, 2014) in the forthcoming sixth assessment report (IPCC 2021, 2022, 2022a, 2022b), and in several special reports (IPCC 1997, 2011, 2012, 2018, 2019, 2019a, 2019b, 2020). The physical effects of anthropogenic climate change have had multiple societal impacts which may cause severe domestic or international crises, conflicts, and, in the very worst case, even violent wars (Brauch 2002, 2009).

The peace ecology approach or programme in the Anthropocene must combine and integrate the results of peace research in the social sciences with the research in Earth Systems science and analysis which has primarily been conducted from the perspective of natural sciences. The peace ecology approach must therefore cross the narrow disciplinary and research programme boundaries and move from multidisciplinary perspectives to interdisciplinary assessments. A peace ecology research programme that aims to contribute to an ecological peace policy should be transformative by including the transformation of the status quo into the research design.

So far, this debate is just emerging among a few social scientists in North America and Europe and has not yet been intensively discussed by the peace research and ecological research communities. Between 2012 and 2018 this debate partly took place in IPRA's Ecology and Peace Commission and is documented in five volumes.[13]

[13] See: Oswald Spring/Brauch/Tidball 2014; Brauch/Oswald Spring/Bennett/Serrano Oswald 2016; Oswald Spring/Brauch/Serrano Oswald/Bennett 2016; Brauch/Oswald Spring/Collins/Serrano Oswald 2018; Oswald Spring/Brauch 2021.

In countries of the Global South (in Africa, Asia and Latin America) this debate has hardly taken place, although in these regions environmental challenges, hazards and disasters have often caused internal, regional and intercontinental distress migration,[14] crises and violent conflicts, though rarely wars. In Africa there has been an increasing interest in peace research among African scholars, but their institutional funding, library resources and research equipment are extremely limited despite the urgency of the security and environmental challenges posed.

So far, eight Nobel Peace Prizes have been awarded to Africans south of the Sahara – three to four South Africans (Albert Lutuli, President of the ANC in 1960; Desmond Tutu in 1984; Nelson Mandela and F.W. de Klerk in 1993), one to former UN Secretary General Kofi Annan (Ghana 2001), two to three women (environmentalist Wangarĩ Maathai, Kenya, 2004; Ellen Johnson Sirleaf and Laymah Gbowee both from Liberia in 2011), one to Denis Mukwege (a gynaecologist and Pentecostal pastor from the Democratic Republic of the Congo in 2018), and one to Abij Ahmed, the Prime Minister of Ethiopia in 2019, who has been involved since November 2020 in a civil war with Tigray's People's Liberation Front.

All but Wangarĩ Maathai (2004) and Denis Mukwege (2018) were involved in classical issues of peace and security fighting against apartheid and for a peaceful transition in South Africa. Ellen Johnson Sirleaf (2011), as the first female President of Liberia (2006–2018), and Laymah Gbowee, who was leading a women's nonviolent peace movement, *Women of Liberia Mass Action for Peace*, both helped to bring an end to the Second Liberian Civil War in 2003. Wangarĩ Muta Maathai (1940–2011) was a Kenyan social, environmental, and political activist and the first African woman to win the Nobel Peace Prize in 2004. In 1977 she founded the *Green Belt Movement*, an environmental non-governmental organization focused on the planting of trees, environmental conservation, and women's rights. Their combined causes have addressed what activist peace ecology and ecological peace policy from below are about: struggling for political and human rights and gender equality.

## 2.3 Ecological Peace Policy in the Anthropocene

Peace ecology and ecological peace policy are two sides of the same coin. So far, the concept of 'ecological peace policy' does not exist in either peace research or environmental studies. However, several related concepts have been used in the literature, such as:

- "environment and peace" (IUCN)[15];

[14] See: Fachkommission Fluchtursachen (2021: 181–215): at: fk-fluchtursachen@bmz.bund.de.

[15] The Commission on Environment, Economic and Social Policy of the *International Union for Conservation of Nature* (IUCN) addresses "the integration of natural resource management in conflict prevention, mitigation, resolution, and recovery to build resilience in communities affected by conflict" that are "cross-cutting and relevant in all areas of conservation, sustainable development and security". This IUCN's commission works on these five areas: 1. social conflicts and peace,

- "environmental peacebuilding" (Ecopeace Middle East[16] and BioScience[17]);
- "Building Sustainable Peace: Understanding the Linkages between Social, Political, and Ecological Processes in Post-War Countries" (Krampe 2016)[18];
- "Building Peace Through Environmental Conservation" (Notaras at UNU 2010)[19];
- "Environment of Peace" (SIPRI)[20];
- "Ecological Threats to Peace" (USIP);[21]
- "Making Peace with Nature" (UNEP Report);[22]

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2. security and peace, 3. ecological conflicts and peace, 4. peacebuilding, and 5. conflict resolution. See at: https://www.iucn.org/commissions/commission-environmental-economic-and-social-policy/our-work/environment-and-peace (11 April 2021).

[16] For an overview with many sources, see: https://en.wikipedia.org/wiki/Environmental_peacebuilding (11 April 2021). See also the websites on environmental peacebuilding, at: https://www.epmooc.org/ (11 April 2021).

[17] For a summary of the emerging debate by Lesley Evans Ogden on "Environmental peacebuilding", see: *BioScience,* 68,3 (March 2018): 157–163.

[18] See Florian Krampe, summary of PhD thesis at Uppsala University, at: http://uu.diva-portal.org/smash/record.jsf?pid=diva2%3A945418&dswid=-1351 (11 April 2021).

[19] See Mark Notaras (UNU), at: https://ourworld.unu.edu/en/building-peace-through-environmental-conservation (11 April 2021).

[20] In SIPRI's research programme "climate change and environmental degradation are already impacting peace and security in diverse ways. At the same time, the change needed to transition to lower-carbon, greener economies is fraught with risks, but also offers many opportunities to contribute to more peaceful, sustainable societies. Environment of Peace will synthesize the best available evidence on environmental change and its societal impacts. It will present new insights on the risks, challenges and promising solutions. And it will illuminate pathways for policy and action. The initiative will release a major report in 2022, marking 50 years since the landmark United Nations Conference on the Human Environment (the Stockholm Conference). See at: https://www.sipri.org/research/peace-and-development/environment-peace (11 April 2021).

[21] On 22 September 2020 the US Institute of Peace presented: "The new Ecological Threat Register (ETR), produced by the Institute for Economics and Peace, [that] synthesizes and visualizes data on environmental indicators to estimate which countries, regions, and areas are most vulnerable to environment-induced conflict. In particular, the ETR underscores that 141 countries are vulnerable to ecological threats, and that approximately 1.2 billion people could be displaced globally by ecological disasters in the next 30 years. On September 22, USIP and the Institute for Economics and Peace examined the inaugural Ecological Threat Register, as experts explored the nexus between conflict and climate change and considered strategies for boosting resilience to climate-induced insecurity." See at: https://www.usip.org/events/ecological-threats-peace (11 April 2021).

[22] See: "Making Peace with Nature", at: https://www.dw.com/en/making-peace-with-nature/a-56615328 (11 April 2021). This UNEP (2019) report *Global Environmental Outlook 2019 – Healthy Planet – Healthy People* (Cambridge: Cambridge University Press) says "A new UN blueprint offers an integrated 'peace plan' to tackle three interlinked environmental emergencies – the climate crisis, biodiversity loss and pollution – that cannot be solved in isolation." See UNEP's GEO-6 (Nairobi 2019) report https://www.unep.org/resources/global-environment-outlook-6, which suggests a holistic approach:

*Fifth, environmental policy is necessary but inadequate by itself to address systemic ecological problems, solutions to which require a more holistic approach.* Current (inter)national policies are not on track to address the key environmental challenges effectively and equitably, in line with the aspirations of the SDGs. Environmental considerations need to be integrated into all policy areas,

- "War and peace in an age of ecological conflicts" (Latour 2014).[23]

The tasks of an 'ecological peace policy' are to project the probable ecological consequences of the physical effects of global environmental change; to launch early preventive actions to avoid environmental crises, conflicts or wars; and to solve these environmental consequences peacefully without any outbreaks of violence. The theme of an ecological peace policy has already been addressed by the Brundtland Commission (1987) in *Our Common Future*, which linked both themes from a policy perspective by discussing the linkage between "Peace, Security, Development, and the Environment" with regard to "environmental stress as a source of conflict", "conflict as a cause of unsustainable development", and "steps towards security and sustainable development". This political agenda-setting addressed the following four linkage problems:

1. Among the dangers facing the environment, the possibility of nuclear war, or military conflict of a lesser scale involving weapons of mass destruction, is undoubtedly the gravest. Certain aspects of the issues of peace and security bear directly upon the concept of sustainable development.
2. Environmental stress is both a cause and an effect of political tension and military conflict Nations have often fought to assert or resist control over raw materials, energy supplies, land, river basins, sea passages, and other key environmental resources. Such conflicts are likely to increase as these resources become scarcer and competition for them increases.
3. The environmental consequences of armed conflict would be most devastating in the case of thermonuclear war. But there are damaging effects too from conventional, biological, and chemical weapons, as well as from the disruption of economic production and social organisation in the wake of warfare and mass migration of refugees. But even where war is prevented, and where conflict is contained, a state of 'peace' might well entail the diversion into armament production of vast resources that could, at least in part, be used to promote sustainable forms of development.
4. A number of factors affect the connection between environmental stress, poverty, and security, such as inadequate development policies, adverse trends in the international economy, inequities in multi-racial and multi-ethnic societies, and pressures of population growth. These linkages among environment, development, and conflict are complex and, in many cases, poorly understood. But a

such that the potential and actual implications for natural resources and the environment are robustly included in policies for economic growth, technological development and urban design, so that there is effective long-term decoupling between economic growth, resource use and environmental degradation. Climate mitigation needs to be accompanied by policy for the equitable adaptation to committed climate change. Policies will only be effective if they are well designed, involving clear goals and flexible mixes of policy, including monitoring, instruments aimed at achieving them […] and when access to judicial remedies are available […]. Such a holistic approach need not require additional economic costs.

[23] Latour (2014); for an English translation, see: https://www.cairn.info/revue-revue-juridique-de-l-environnement-2014-1-page-51.htm (11 April 2021).

> comprehensive approach to international and national security must transcend the traditional emphasis on military power and armed competition. The real sources of insecurity also encompass unsustainable development, and its effects can become intertwined with traditional forms of conflict in a manner that can extend and deepen the latter (Brundtland Commission 1987).

The concept of an 'ecological peace policy' is a normative concept that still needs to be systematically developed. It must address the causes and consequences of anthropogenic global change as well as policy responses at local, national and international level. This proposed 'ecological peace policy' is not limited at *international level* to global and regional foreign, development and environment policy. It starts at the individual level with the values, attitudes and behaviour of individual citizens, e.g. with their food and consumptive behaviour, their preferred transportation system and their individual and family ecological footprint. It thus becomes an issue of education by parents and in school from kindergarten, elementary and senior school level to professional training, teaching and research at institutions of higher education.

Many ecological decisions are made by families, the local village, town or city councils, state governments, and national or federal governments. In ecological peace policy the threats that are often used to legitimate political decisions have shifted fundamentally from 'the other' (neighbour, other ethnic or religious group, country or military alliance). We ourselves have become the major cause or threat with our behaviour and consumptive decisions. Here the motto 'think globally but act locally' matters. Thus a major issue area starts with education from the kindergarten to the high school in teaching the local practice of achieving sustainable development goals.

At state and national political level an ecological peace policy does not just address the classical environmental policy areas of pollution of the soil, water and air, which also directly affects the quality of our food and our health. Major areas of analysis, debate and innovation are economic, energy, transportation, agriculture and health policies. Implementing the *Sustainable Development Goals* (SDGs) and strategies for *sustainable transition* affects all levels of policy-making and is of relevance for all societal, economic, political and scientific actors.

At international level an ecological peace policy requires the holistic approach suggested by the UNEP in its GEO-6 Report in 2019, which necessitates an integrated approach between foreign (diplomacy), security and defence policies and environment and development concerns. The European Commission's goal to achieve a European Green Deal and climate neutrality by 2050 affects multiple policy fields at the level of the European Union and its 27 member states.

With regard to ecological peace policy, two phases of human and world history can be identified which offer current researchers a reasonably long-term perspective of the Anthropocene:

(a) the *past* eighty years of world history since the start of World War II in 1939 and the Japanese attack on Pearl Harbor (1941) up to the year 2020; and
(b) the *next* eighty years of world history from the present to the end of the twenty-first century (2021–2100).

In 2022, we are midway between these two phases. We can analyse and interpret the first eight decades of the Anthropocene and project trends for the next eight decades – i.e. until 2050 and 2100, which is the horizon of most climate models assessed by the IPCC. The outcome for the planet – and humankind – depends on the political strategies and programmes that are launched now or later or not at all.

It is impossible to be sure how countries which have previously failed to implement their obligations under climate change agreements will behave in the future. However, deductions can be made about societal and political outcomes by using climate models which correlate projections of future population levels with the production and consumption levels associated with different lifestyles.

An ecological peace policy should aim to provide a preventive strategy so that (1) the projected physical effects of anthropogenic climate change can be contained, resolved and structurally prevented through multilateral diplomacy and cooperation, and (2) domestic and international violent crises, conflicts and wars can be avoided. Jointly and proactively addressing resource scarcity, resource pollution and stress (on water, soil, air) will make it possible to enhance the health and security of the affected people.

## 2.4 Rethinking Human Development in the Anthropocene

Since 1990 the *United Nations Development Programme* (UNDP) has released an annual *Human Development Report* (HDR) that addresses the following themes which are conceptually relevant for the proposed peace ecology approach:

- *New Dimensions of Human Security* (UNDP 1994);
- *International Cooperation at a Crossroads: Aid, Trade and Security in an Unequal World* (UNDP 2005);
- *Beyond Scarcity: Power, Poverty and the Global Water Crisis* (UNDP 2006);
- *Fighting Climate Change: Human Solidarity* in a Divided World (UNDP 2007/2008);
- *Sustaining Human Progress: Reducing Vulnerabilities and Building Resilience* (UNDP 2014);
- *The Next Frontier: Human Development and the Anthropocene* (UNDP 2020);

Of these six HDRs the Report on *Human Security* (UNDP 1994) had a significant influence on triggering a debate in peace research and in parts of the liberal security studies community (Brauch et al. 2009). From an ecological perspective, four reports are of relevance: (a) *Power, Poverty and the Global Water Crisis* (UNDP 2006); (b) *Fighting Climate Change: Human Solidarity in a Divided World* (UNDP 2007/2008); (c) *Sustaining Human Progress: Reducing Vulnerabilities and Building Resilience* (UNDP 2014); *and* (d) *The Next Frontier: Human Development and the Anthropocene* (UNDP 2020). For the purpose of this chapter only the most recent report on Human Development and the Anthropocene will be reviewed, specifically with regard to Africa. UNDP's Administrator, Achim Steiner, argued in his foreword:

> The pressures we exert on the planet have become so great that scientists are considering whether the Earth has entered an entirely new geological epoch: the Anthropocene, or the age of humans. It means that we are the first people to live in an age defined by human choice, in which the dominant risk to our survival is ourselves. Advancing human development while erasing such planetary pressures is the next frontier for human development, and its exploration lies at the heart of this 30th anniversary edition of UNDP's Human Development Report. To survive and thrive in this new age, we must redesign a path to progress that respects the intertwined fate of people and planet and recognizes that the carbon and material footprint of the people who have more is choking the opportunities of the people who have less (UNDP 2020, p. iii).

Looking ahead, Achim Steiner outlined alternative routes of action:

> If people have the power to create an entirely new geological epoch, then people also have the power to choose to change. We are not the last generation of the Anthropocene; we are the first to recognize it. We are the explorers, the innovators who get to decide what this – the first generation of the Anthropocene – will be remembered for. Will we be remembered by the fossils we leave behind…? Or will we leave a much more valuable imprint: balance between people and planet, a future that is fair and just? *The Next Frontier: Human Development and the Anthropocene* sets out this choice, offering a thought-provoking, necessary alternative to paralysis in the face of rising poverty and inequalities alongside alarming planetary change. With its new, experimental planetary pressures and adjusted Human Development Index, we hope to open a new conversation on the path ahead for each country – a path yet unexplored (UNDP 2020, p. iii).

The HDR 2020 addresses three themes in order to expand human development "easing planetary pressures" by (i) "renewing human development for the Anthropocene"; (ii) discussing "mechanism of change to catalyse action"; and (c) "exploring new metrics" with a special focus on human development in Africa (UNDP 2020).

In part I – on renewing human development for the Anthropocene – Chap. 1 discusses human development in the context of the Anthropocene, while Chap. 2 deals with "unprecedented planetary and social imbalances and their interactions", and Chap. 3 argues that "working together in the pursuit of equity, innovation and planet stewardship can steer actions towards the transformational changes required to advance human development in the Anthropocene" (UNDP 2020: 17). Chapter 1 concludes that

> the Anthropocene brings new evidence and concepts to inform public debate about the changes – normative, economic, technological, behavioural – needed to ease the unprecedented pressures we are putting on the planet. There can be no doubt that only people can effect these changes, but the Anthropocene and its planetary imbalances are superimposed on social imbalances and tensions (UNDP 2020, p. 43).

Chapter 2 argues that human activity has driven dangerous planetary change with an exponential increase since the Great Acceleration began around 1950. The report argues that the Anthropocene "implies enormous uncertainty for people and societies" (UNDP 2020, p. 56), where the risks are greater and different and where an unprecedented planetary change may trigger "unprecedented shocks on human development". Among the drivers climate change has weakened economic progress, increased inequality and hunger and the impacts of natural hazards (UNDP 2020, pp. 60–61) that have increasingly resulted in displacements to a minor part by

geophysical hazards (e.g. earthquakes) and to a major part by floods that have affected the continents of the Global South differently (Fig. 2.2), primarily due to floods.

According to Fig. 2.3, temperatures are projected to rise "outside the range of survivability – more over the next 50 years than in the past 6,000 years", especially in Africa, South America, South and South East Asia, China and in northern Australia, which may increase the inequity of the poor and powerless. In Chap. 3, the HDR 2020 asks how human beings may be empowered "for equity, innovation and stewardship of nature" (UNDP 2020, p. 70). The chapter concludes that sustainable development "will require more than adaptations and gradual changes. It will require transformations that break current locked-in systems of unsustainability" (UNDP 2020, p. 98).

Chapter 3 concludes that:

> We need to aim for transformative changes in how societies relate to the biosphere, focus on distributive approaches, and ensure extraction and emission rates align with the rates at which resources are produced and waste and emissions can be absorbed by the environment. Outcomes, such as biodiversity conservation and climate stabilization, can be measured as single variables, but the goals of sustainable human development must be rooted in integrated, transdisciplinary understandings of the connections of societies in the biosphere. Development pathways and goals will vary over time and space, as they are met or redefined. This requires adaptive management, the ability to better understand, learn and act accordingly in an endless, iterative process. … Sustainable human development is … a dynamic and continued process, and ample research, human will and political power – as well as urgency – exist to actively engage in that process (UNDP 2020, p. 98).

Part II of the HDR 2020:

> explores mechanisms of change that can mobilize action by individuals, communities, governments, civil society and businesses. …. Three specific mechanisms of change are considered. *First*, social norms, which frame socially permissible – or forbidden – behaviours. … *Second*, incentives for change [that] determine in part what consumers choose to buy, what

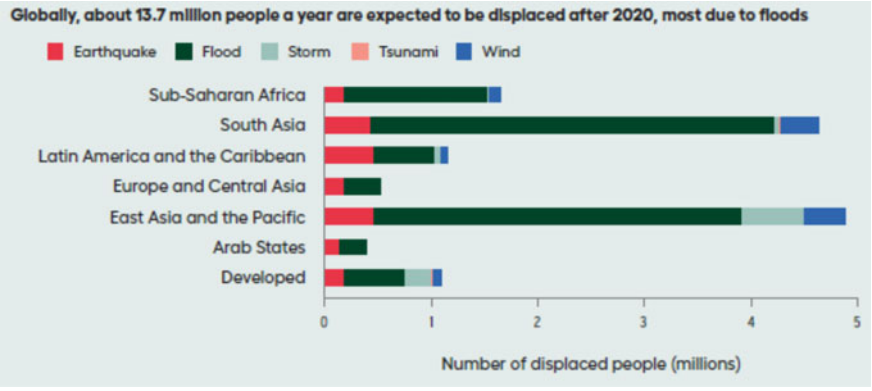


**Fig. 2.2** Major hazards and displacements by world regions. *Source* UNDP (2020: 61) based on IDMC (2002a, 2020b). The figure is copyrighted under the Creative Commons Attribution 3.0 IGO license. Permission granted

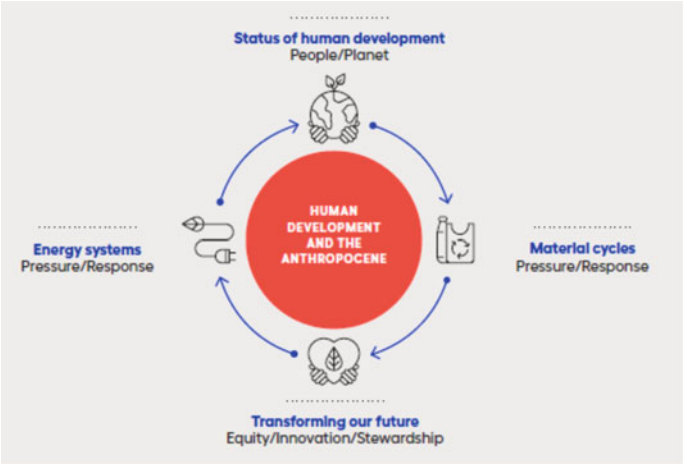


**Fig. 2.3** Human development and the Anthropocene. *Source* UNDP (2020, p. 228). The figure is copyrighted under the Creative Commons Attribution 3.0 IGO license. Permission granted

> firms produce and trade, where investors put their money and how governments cooperate. Incentives and social norms interact with one another, but incentives are also crucial in their own right: Even if people do not change their minds, they may still respond to incentives based on what they can afford and where they see opportunities to meet their aspirations. … It also explores how these incentives could evolve in ways that would ease planetary pressures and move societies towards the transformative changes required for human development in the Anthropocene. It considers three domains shaped by considerations related to incentives: finance, prices and international collective action. Third, just as social norms and incentives can be harnessed for transformational change, so can a new generation of nature-based solutions. They can protect, sustainably manage and restore ecosystems, simultaneously promoting wellbeing and mitigating biosphere integrity loss. They embrace equity, innovation and stewardship of nature (UNDP 2020, p. 129).

Part III of the HDR 2020 reviews implications "for measuring human development":

> Chapter 7 sets out a framework for advancing the agenda of human development metrics in the Anthropocene. It starts by reaffirming the continuing relevance of the Human Development Index (HDI), as long as it is interpreted to measure what it was meant to – a partial set of key capabilities. … The chapter then explores metrics of human development that are informed by the analysis in this Report. It concludes with a proposal for a new experimental index that accounts for both human development achievements and planetary pressures (UNDP 2020, p. 222).

Chapter 7 of the UNDP report also proposes a new dashboard to provide data on human development and the Anthropocene, including material cycles, energy systems and transforming the future (Fig. 2.3). The report suggests a modified Human Development Index that is adjusted to planetary pressures (UNDP 2020, p. 236).

No African country is featured among the 66 states with very high human development. Four North African countries, South Africa and Gabon are in the group

with high human development, and 11 countries are in the medium group of human development, while 31 countries are in the low development group. The material footprint[24] of Sub-Saharan African countries is 2.5 tonnes per capita and thus far below the global average of 12.3, or about a tenth of the average footprint of people in the OECD countries.

In 2019, the *Human Development Index* (HDI) value of Sub-Saharan Africa was 0.547 – slightly above the average of the least developed countries (0.538) but significantly below the global average of 0.737 and the OECD countries' average of 0.900. The value of the *planetary-pressures adjusted HDI* (PHDI)[25] for Sub-Saharan Africa was 0.539 in 2019 – slightly above 0.533 for the least developed countries but below the global average of 0.683 and significantly below the average of the OECD countries (0.766).

## 2.5 Demographic and Ecological Challenges Facing Africa in the Anthropocene

Estimations concerning the extent of the ecological challenges facing Africa by end of the 21st century are based on projections of population growth between 2019 and 2100 – indicating the likely demand for water, soil, food, and housing – and on the economic models (growth rates) and climate models which predict the impact these changes will have on temperature increase, precipitation changes, sea-level rise and the increase in the number and intensity of extreme weather events.

These projected challenges point to potential hotspots where both population growth rates and the impacts of global environmental change precipitate major changes. Sub-Saharan Africa is the region with the highest projected population increase – from 1,011 billion in 2019 to 1,400 billion in 2030, 2,118 in 2050 and 3,775 billion in 2100 – while the population in Europe and North America is projected to remain relatively stable, at between 1,114 billion in 2019 and 1,120 in 2100.

The ranking of the world's ten most populous countries, based on these official UN figures in 1990 and 2019 and on the medium-variant projections for 2050 and 2100, takes into account the following changes in these 110 years:

[24] 'Material footprint' refers to the amount of raw materials extracted from Planet Earth to meet human needs. See: https://unstats.un.org/sdgs/report/2017/goal-12/.

[25] The UNDP HDR (2020: 244) defined the *planetary-pressures adjusted HDI* (PHDI) as a: "Planetary pressures-adjusted HDI (PHDI): HDI value adjusted by the level of carbon dioxide emissions and material footprint per capita to account for excessive human pressures on the planet. It should be seen as an incentive for transformation. See technical note at: http://hdr.undp.org/sites/default/files/phdi_tn.pdf for details on how the PHDI is calculated."

In 1990, with 95 million people, Nigeria was the 10th most populous country. In 2019, Nigeria had become the 7th most populous nation, with its population more than doubling to 201 million. Ethiopia had become the 12th most populous country, with 112 million people, and the Democratic Republic of the Congo was the 16th most populous nation, with 67 million people.

By 2050, Nigeria is projected to reach 401 million people, with the third-largest population; Ethiopia will be number 8 with 205 million people; the Democratic Republic of the Congo will be number 9 with 194 million people; Egypt number 11 with 160 million; and the United Republic of Tanzania number 15 with a population of 129 million (Table 2.1).

By 2100 Nigeria's population is projected to reach 733 million, placing it at number 3 after India and China; the Democratic Republic of the Congo will be number 6 with 362 million people; Ethiopia is projected to be number 8 with 294 million people; the United Republic of Tanzania will be number 9 with 286 million; and Egypt will be number 10 with 225 million people. Thus, by the end of this century half of the 10 most populous countries will be in Africa (Fig. 2.4).

The projections of global environmental change and climate change in Sub-Saharan Africa by 2050 and 2100 based on various climate models will pose major challenges for any ecological peace policy in the decades ahead, and are currently

**Table 2.1** Population of the world, SDG regions and selected groups of countries in 2019, 2030, 2050 and 2100, according to the medium-variant projection. *Source* UNPD (2019: 6). The figure is copyrighted under the Creative Commons Attribution 3.0 IGO license. Permission granted at: http://hdr.undp.org/en/content/

| Region | Population (millions) | | | |
|---|---|---|---|---|
| | 2019 | 2030 | 2050 | 2100 |
| World | 7713 | 8 548 | 9735 | 10 875 |
| Sub-Saharan Africa | 1 066 | 1 400 | 2 113 | 3 775 |
| Northern Africa and Western Asia | 517 | 609 | 754 | 924 |
| Central and Southern Asia | 1 991 | 2227 | 2 496 | 2 334 |
| Eastern and South-Eastern Asia | 2 335 | 2 427 | 2411 | 1 967 |
| Latin America and the Caribbean | 648 | 706 | 762 | 630 |
| Australia/New Zealand | 30 | 33 | 33 | 49 |
| Oceania* | 12 | 15 | 19 | 26 |
| Europe and Northern America | 1 114 | 1 132 | 1 136 | 1 120 |
| Least developed countries | 1 033 | 1 314 | 1 877 | 3 047 |
| Land-locked Developing Countries | 521 | 659 | 926 | 1 406 |
| Small Island Developing States | 71 | 73 | 37 | 33 |

*Data source* United Nations, Department of Economic and Social Affaire, Population Division (2019). World Population Prospects 2019. *excluding Australia and New Zealand

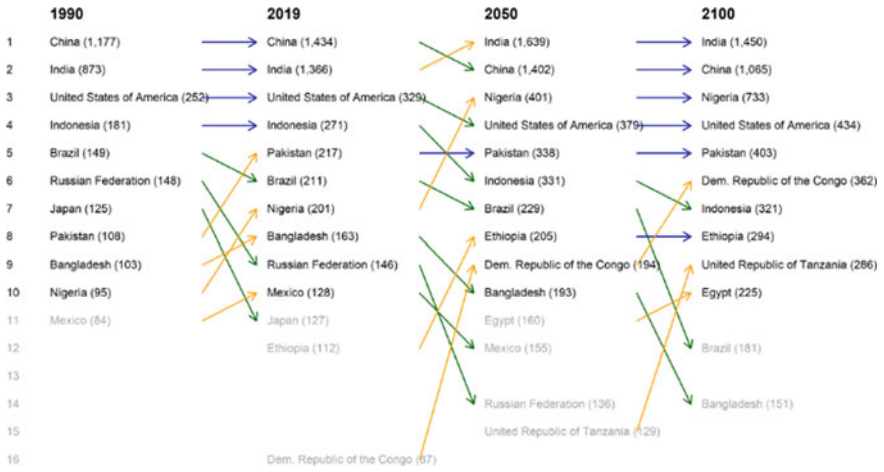


**Fig. 2.4** Rankings of the world's 10 most populous countries in 1990 and 2019, and the medium-variant projections for 2050 and 2100. *Source* UNPD (2019): 14. The figure is copyrighted under the Creative Commons Attribution 3.0 IGO license. Permission granted

based on the fifth assessment report (AR5) of Working Group II of the IPCC (Niang/Ruppel/Abdrabo 2014). The most recent data are due to be published in the IPCC's Sixth Assessment Report (IPCC AR6 2021, 2022, 2022a, 2022b).

The task of Working Group II of the IPCC is to review and assess the following problems:

- Co-benefits, risks and co-costs of mitigation and adaptation, including interactions and trade-offs, technological and financial challenges and options.
- Ethics and equity: climate change, sustainable development, gender, poverty eradication, livelihoods, and food security.
- Perception of risks and benefits of climate change, adaptation and mitigation options, and societal responses, including psychological and sociological aspects.
- Climate engineering, greenhouse gas removal, and associated feedbacks and impacts.
- Regional and sectorial climate information.
- Epistemology and different forms of climate-related knowledge and data, including indigenous and practice-based knowledge.

**Box 2.1** IPCC's Fifth Assessment Report (2014), WG II, Executive Summary for Africa. *Source* IPCC (2014: 1202–1204). The IPCC's (2022) Sixth Assessment Report will contain the most recent information on Africa in Chap. 9, and will available to download from: https://www.ipcc.ch/report/sixth-assessment-report-working-group-ii/ (Geneva: IPCC, 28 February 2022).

| IPCC, AR 4, WG II, chapter on Africa (IPCC 2005: 433–467. *Source* https://www.ipcc.ch/report/ar4/wg2/ | IPCC, AR 5, WG II, chapter on Africa (IPCC 2014: 1,202–1,204). *Source* https://www.ipcc.ch/site/assets/uploads/2018/02/WGIIAR5-Chap22_FINAL.pdf | IPCC, AR 6, WG II, chapter on Africa (IPCC 2022: i.p.). *Source* https://www.ipcc.ch/site/assets/uploads/2018/02/WGIIAR5-Chap22_FINAL.pdf |
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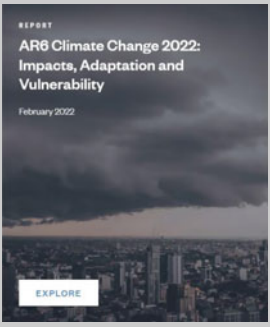
|  |  |  |
| IPCC: *Climate Change 2007 – Impacts, Adaptation and Vulnerability: Contribution of Working Group II to the Fourth Assessment Report of the IPCC* (Geneva: IPCC; Cambridge: Cambridge University Press). | IPCC: *Climate Change 2014 – Impacts, Adaptation and Vulnerability: Contribution of Working Group II to the Fifth Assessment Report of the IPCC* (Geneva: IPCC; Cambridge: Cambridge University Press). | IPCC: *Climate Change 2022 – Impacts, Adaptation and Vulnerability: Contribution of Working Group II to the Fifth Assessment Report of the IPCC* (Geneva: IPCC; Cambridge: Cambridge University Press). |

Excerpts of the Executive Summary on Africa, IPCC, WG 2, Chapter 22 (2014: 1,202–1,204):

> The mean annual temperature rise over Africa, relative to the late 20th century mean annual temperature, is likely to exceed 2°C in the Special Report on Emissions Scenarios (SRES) A1B and A2 scenarios by the end of this century (medium confidence). …
>
> A reduction in precipitation is likely over Northern Africa and the southwestern parts of South Africa by the end of the 21st century under the SRES A1B and A2 scenarios (medium to high confidence). …
>
> African ecosystems are already being affected by climate change, and future impacts are expected to be substantial (high confidence). …

> Climate change will amplify existing stress on water availability in Africa (high confidence). Water resources are subjected to high hydro-climatic variability over space and time, and are a key constraint on the continent's continued economic development. …
>
> Climate change will interact with non-climate drivers and stressors to exacerbate vulnerability of agricultural systems, particularly in semi-arid areas (high confidence). …
>
> Progress has been achieved on managing risks to food production from current climate variability and near-term climate change but these will not be sufficient to address long-term impacts of climate change (high confidence). …
>
> Climate change may increase the burden of a range of climate-relevant health outcomes (medium confidence). Climate change is a multiplier of existing health vulnerabilities (high confidence), including insufficient access to safe water and improved sanitation, food insecurity, and limited access to health care and education.

Executive Summary, Africa, IPCC, WG 2, Chapter 22 (2014: 1,202–1,204) on adaption policies:

> In all regions of the continent, national governments are initiating governance systems for adaptation and responding to climate change, but evolving institutional frameworks cannot yet effectively coordinate the range of adaptation initiatives being implemented (high confidence). … Disaster risk reduction, social protection, technological and infrastructural adaptation, ecosystem-based approaches, and livelihood diversification are reducing vulnerability, but largely in isolated initiatives. … Despite implementation limitations, Africa's adaptation experiences nonetheless highlight valuable lessons for enhancing and scaling up the adaptation response, including principles for good practice and integrated approaches to adaptation (high confidence). … Ecosystem-based approaches and pro-poor integrated adaptation-mitigation initiatives hold promise for a more sustainable and system-oriented approach to adaptation, as does promoting equity goals, key for future resilience, through emphasizing gender aspects and highly vulnerable groups such as children. …
>
> Given multiple uncertainties in the African context, successful adaptation will depend on building resilience. … Growing understanding of the multiple interlinked constraints on increasing adaptive capacity is beginning to indicate potential limits to adaptation in Africa (medium confidence). Climate change combined with other external changes (environmental, social, political, technological) may overwhelm the ability of people to cope and adapt, especially if the root causes of poverty and vulnerability are not addressed. Evidence is growing for the effectiveness of flexible and diverse development systems that are designed to reduce vulnerability, spread risk, and build adaptive capacity. These points indicate the benefits of new development trajectories that place climate resilience, ecosystem stability, equity, and justice at the center of development efforts. … There is increased evidence of the significant financial resources, technological support, and investment in institutional and capacity development needed to address climate risk, build adaptive capacity, and implement robust adaptation strategies (high confidence).

Executive Summary, WG 2, Chapter 22: Africa (IPCC 2014: 1,204), on climate change and conflict:

> Strengthening institutional capacities and governance mechanisms to enhance the ability of national governments and scientific institutions in Africa to absorb and

> effectively manage large amounts of funds allocated for adaptation will help to ensure the effectiveness of adaptation initiatives (medium confidence). Climate change and climate variability have the potential to exacerbate or multiply existing threats to human security including food, health, and economic insecurity, all being of particular concern for Africa (medium confidence). … Many of these threats are known drivers of conflict (high confidence).
>
> Causality between climate change and violent conflict is difficult to establish owing to the presence of these and other interconnected causes, including country-specific socio-political, economic, and cultural factors. For example, the degradation of natural resources as a result of both overexploitation and climate change will contribute to increased conflicts over the distribution of these resources. … Many of the interacting social, demographic, and economic drivers of observed urbanization and migration in Africa are sensitive to climate change impacts. … Of nine climate-related key regional risks identified for Africa, eight pose medium or higher risk even with highly adapted systems, while only one key risk assessed can be potentially reduced with high adaptation to below a medium risk level, for the end of the 21st century under 2 °C global mean temperature increase above preindustrial levels (medium confidence). Key regional risks relating to shifts in biome distribution, loss of coral reefs, reduced crop productivity, adverse effects on livestock, vector- and water-borne diseases, undernutrition, and migration are assessed as either medium or high for the present under current adaptation, reflecting Africa's existing adaptation deficit. … The assessment of significant residual impacts in a 2°C world at the end of the 21st century suggests that, even under high levels of adaptation, there could be very high levels of risk for Africa. At a global mean temperature increase of 4°C, risks for Africa's food security (see key risks on livestock and crop production) are assessed as very high, with limited potential for risk reduction through adaptation.

Neither the population projections of the UN's Populations Division (UNPD 2019, 2021) nor the climate change assessments of the IPCC's WG II (2014, 2022) are reliable predictions, but they refer to important trends that have to be taken into account in any framework for an ecological peace policy for Africa during the second phase of the Anthropocene (2021–2100).

From a peace research perspective, empirical research on conflicts in Sub-Saharan Africa is of vital importance, especially since independence (1950s–1990s). The WBGU's analysis in its 2008 report on *Security Risk Climate Change* and the IPCC's fifth assessments (2014) in the chapter on human security and violent conflicts may offer the best available scientific information based on the assumptions and results of existing knowledge. However, such data may be overturned by new trends emerging from exponential developments triggered by tipping points in the chaotic climate system.

In addition to its sixth Report on the *Global Environmental Outlook*, the UN's Environmental Programme (UNEP 2016) published a series of regional assessments for the global regions. Its *Regional Assessment for Africa* is of specific relevance to this chapter. According to UNEP (2016a), based on Africa's Agenda 2063:

> Africa aims to establish a prosperous region characterized by sustainable inclusive growth, peace and good governance. The region's growth path shall be led by increased agricultural productivity, industrialization, investment in infrastructure development and renewable energy, conservation of biodiversity, sustainable and fair and equitable use of its genetic resources, clean air and water, and better adaptive capacity to climate change.

The UNEP report also noted that

> Africa faces a great challenge of sustaining rapid economic growth as its population is expected to double to approximately 2.5 billion by 2050, while safeguarding the life-support system provided by its rich natural capital, which underpins the realization of its long-term vision. It is therefore imperative that such growth must consider the region's relatively weak environmental governance and a paucity of accurate and up-to-date environmental and socio-economic data for evidence-based decision-making.

In its key findings the UNEP's regional report emphasised:

> The GEO-6 Regional Assessment for Africa affirms the importance of both Agenda 2063 and Agenda 2030 as defined by the Sustainable Development Goals (SDGs). Both contain common elements for a development trajectory that will provide Africa with a healthy living environment while ensuring good health and quality of life for her people. The two are also critical to preserving and valuing Africa's natural capital for the benefit of its citizens and their livelihoods. In order to realize these visions, Africa's public institutions are called upon to build flexible and adaptive governance structures.

The report focused on all the major environmental problems: (1) indoor air pollution, (2) outdoor pollution, (3) renewable forms of energy, (4) access to potable water, (5) groundwater management, (6) Africa's fisheries, (7) land resources, (8) urbanisation, (9) food production, (10) land tenure, (11) biodiversity. The report recommended

> that Member States actively include a system of factoring biodiversity and ecosystem services into national accounting systems. Africa should also ensure that the African Union strategy on illegal trade in wildlife is translated into action, fully implemented and regularly monitored. Africa faces both enormous challenges in relation to environmental management, and equally huge opportunities for 'doing things better'. The goal to build an integrated, prosperous and peaceful region that is resilient to future shocks can only be reached with the understanding that clean and healthy air, water, land and biodiversity are necessary to support this transformation. All efforts must thus be taken to ensure the protection and integrity of these resources that are critical life-support systems for sustained human wellbeing. Whilst the inherent uncertainty and diversity in potential futures makes it tenuous for a set of prescriptive policies to be established, policy decisions should aim to minimize environmental and developmental trade-offs, and maximize Africa's ability to safeguard its natural capital effectively. Emphasis should be placed on improving protection of the environment, addressing critical data gaps, and developing the human and technical capacities required for a sustainable future. The assessment concludes that low-carbon, climate-resilient choices in infrastructure, energy and food production coupled with effective and sustainable natural resource governance are key to protecting the continent's ecological assets that underpin a healthy society.

Projections of Africa's rapid population rise during the second phase of the Anthropocene (2020–2100) indicate different global and regional trends in the working age populations during both phases of the Anthropocene (1950–2100). While for the rest of the World (without Africa) the working age population has been rising since 1950, reached its height in 2010, has declined since and is projected to continue declining until 2100, it is estimated that in Africa the highest number of employed people will be reached in 2060.[26]

## 2.6 Conflicts Threatening Africa in the Anthropocene

At least three peace research centres or institutes and the largest institute in strategic studies (IISS) offer regular reviews and assessments of conflicts globally and in Africa:

- *The Uppsala Conflict Data Program* (UCDP) maintained by the Department of Peace and Conflict Research at Uppsala University "offers a number of datasets on organised violence and peacemaking"[27];
- The *Stockholm International Peace Research Institute* (SIPRI) publishes annual reviews and assessments of "global developments in armed conflicts, peace processes and peace operations" in its SIPRI yearbook (Davis 2020);
- The Conflict Barometer of the *Heidelberg Institute for International Conflict Research* (HIIC, 2020) publishes an annual review and assessment of "disputes, non-violent crises, violent crises, limited wars and wars".
- The *International Institute for Strategic Studies* (IISS 2020, 2020a) annually issues (a) *The Armed Conflict Survey* containing a "worldwide review of political, military and humanitarian trends in current conflicts" and (b) a *Strategic Survey* containing "assessments of geopolitics".

In Fig. 2.5 the Uppsala Conflict Data Program provides a regional survey of armed conflicts during the first (past) phase of the Anthropocene (1946–2019), while Fig. 2.6 shows battle-related death by regions over a shorter timespan of three recent decades (1989–2019). There are few systematic long-term analyses of possible causal relationships between environmental and climate-related violent events in Africa.

In his analysis in the *SIPRI Yearbook 2020* of the armed conflicts in Africa during 2019, Ian Davis briefly mentioned that "while Africa is responsible for only 4 per cent of global carbon dioxide emissions, it is particularly vulnerable to the double burden of climate-related factors and political fragility" (Davis 2020, p. 178). He referred to the *African Peace and Security Architecture Roadmap 2016–2020*, which highlighted "climate change as one of the cross-cutting issues affecting peace and security" (African Union Commission 2015).

[26] For information on changes in the working age of the population, 1950–2100, see: UNPD (2019): 20.

[27] See at: https://ucdp.uu.se/downloads/charts/ (15 April 2021).

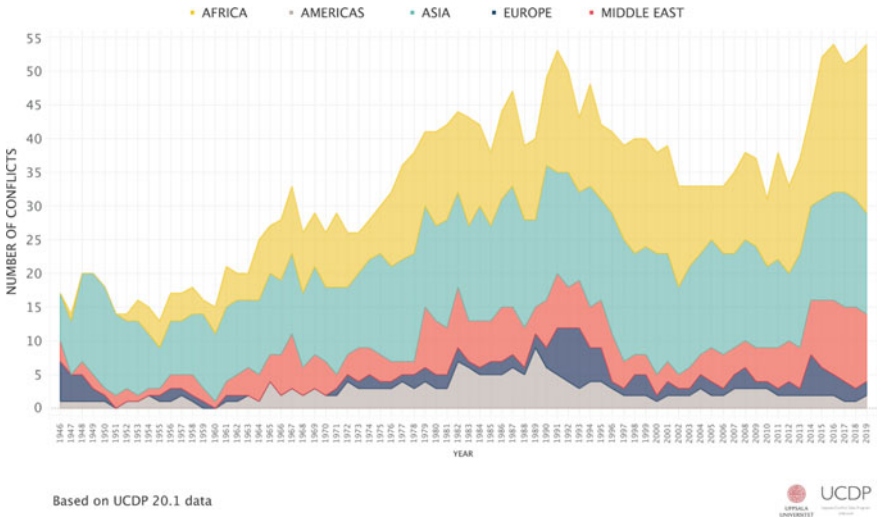



**Fig. 2.5** Armed conflict by region (1946–2019). *Source* Based on UCDP, 20.1 data are available free of charge; at: https://www.pcr.uu.se/research/ucdp/charts-graphs-and-maps/

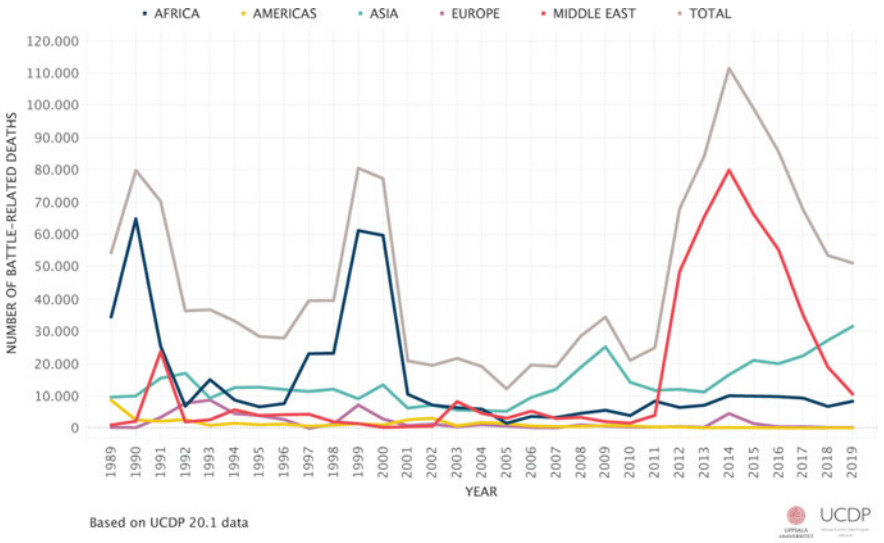



**Fig. 2.6** Battle-related death by region (1989–2019). *Source* Based on UCDP data are availabe free of charge; at: https://www.pcr.uu.se/research/ucdp/charts-graphs-and-maps/

Since 1992 the *Conflict Barometer* has offered detailed country-specific conflict data on the changes in conflict densities, the frequencies of conflict intensities and conflict type (HIIK 2020: 66–111). The IISS's *Armed Conflict Survey* was also country-specific, but did not refer to climate change or the environment in the subject index. Its *Strategic Survey 2020* did not include environmental factors among the 'Drivers of Strategic Change' and in Chap. 10 on sub-Saharan Africa focused on the regional debt crisis and South Africa's difficult choices.

So far, only a few publications have systematically addressed the impact of environmental and climate issues on displacements, migrations, crises and conflicts. In 2007, a report by the German Advisory Council on Climate Change (WBGU) on *Climate Change as a Security Risk* (WBGU 2008) discussed four possible conflict constellations relating to (a) climate-induced degradation of freshwater resources, (b) climate-induced decline in food production, (c) climate-induced increase in storm and flood disasters, and (d) environmentally-induced migration. It further analysed 10 regions as hotspots of climate change, among them two in Africa: (i) the Mediterranean (Southern Europe and North Africa) and (ii) Sub-Saharan Africa (Fig. 2.7).

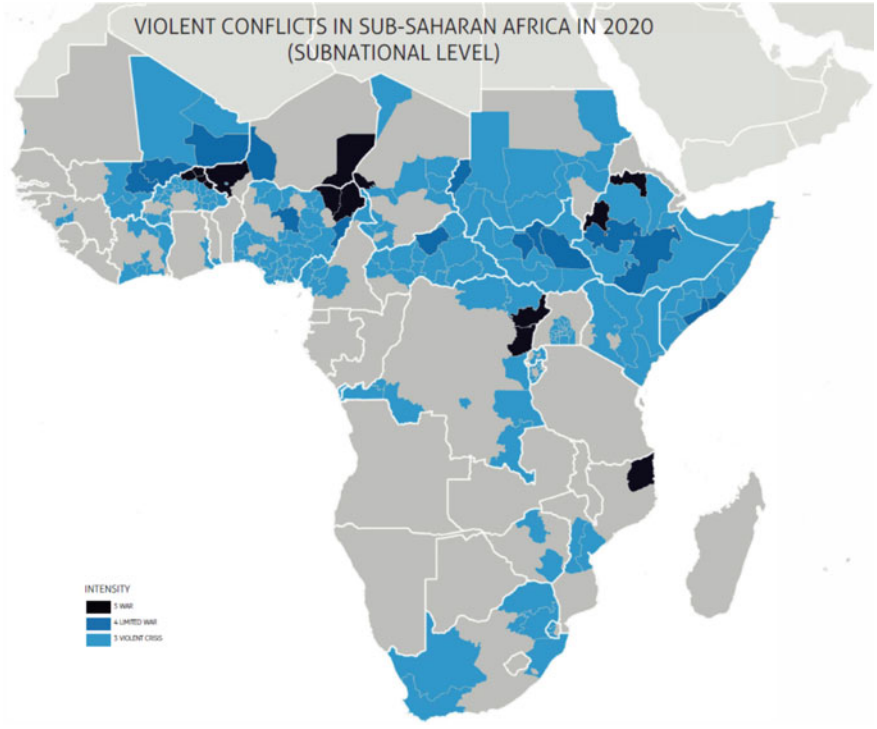



**Fig. 2.7** Violent sub-national conflicts in Sub-Saharan Africa in 2020. *Source* HIIC (2021): 70. Reprinted with permission

The WBGU Report proposed nine initiatives "for the mitigation of destabilization and conflict risks associated with climate change" within three sections: (a) Fostering a cooperative setting for a multipolar world, (b) Climate policy as security policy I: Preventing conflict by avoiding dangerous climate change, and (c) Climate policy as security policy II: Preventing conflict by implementing adaptation strategies.

Although the WBGU report was picked up by the European Council in March 2008 (EU, 2008), in a report by the UN Secretary General in September 2009 at the request of the General Assembly, and in several discussions in the UN Security Council since 2007 during the presidency of the UK and Germany and during a co-chaired presidency of France and Germany, the systematic and long-term knowledge that exists so far on Africa, which has experienced the most regional conflicts, has remained very limited.[28]

These issues have primarily been addressed by the policy briefs of consultants and by only a few systematic assessments, among them a chapter of the IPCC's 5AR (2014) on human security, climate change and conflicts. While the global environmental and climate change linkages with national, international and human security have been put on the international agenda, systematic studies and concrete actions on adaptation, mitigation and resilience-building specifically on and in Africa have been scarce.

## 2.7 Impact on Peace Research and Ecology in Africa

In his report on *Climate change and its possible security implications* of 11 September 2009, the Secretary-General of the United Nations reviewed the linkages between climate change and security, and interpreted climate change as a 'threat multiplier'. Sustainable development includes the provision of 'coping tools' whereby climate change adaptation, mitigation and conflict prevention (Fig. 2.9) become 'threat minimizers'. This figure illustrates what 'peace ecology', as a combined scientific approach in the social sciences, and an 'ecological peace policy' are supposed to be about.

[28] See: Joint paper by the Commission and the Secretary-General/High Representative concerning "Climate change and international security" presented to the European Council, Brussels, 3 March 2008; at: https://www.consilium.europa.eu/uedocs/cms_data/docs/pressdata/en/reports/99387.pdf; Press Conference by Security Council President, 4 April 2007; at: https://www.un.org/press/en/2007/070404_Parry.doc.htm; UN Security Council, SC/9000, 5663rd meeting, 17 April 2007: "Security Council holds first-ever debate on impact of climate change on peace, security, hearing 50 speakers"; at: https://www.un.org/press/en/2007/sc9000.doc.htm; UN, 2007: "Security Council Holds First-Ever Debate on Impact of Climate Change on Peace, Security, Hearing over 50 Speakers, UN Security Council, 5663rd Meeting, 17 April 2007"; at: https://www.un.org/press/en/2007/sc9000.doc.htm; UN (2009): "Climate change and its possible security implications". Resolution adopted by the General Assembly, A/RES/63/281 (New York: United Nations General Assembly, 11 June); UN (2009a), (2010), (2011): "Informal Thematic Debate on Human Security"; at: http://www.un.org/en/ga/president/65/initiatives/HumanSecurity.html

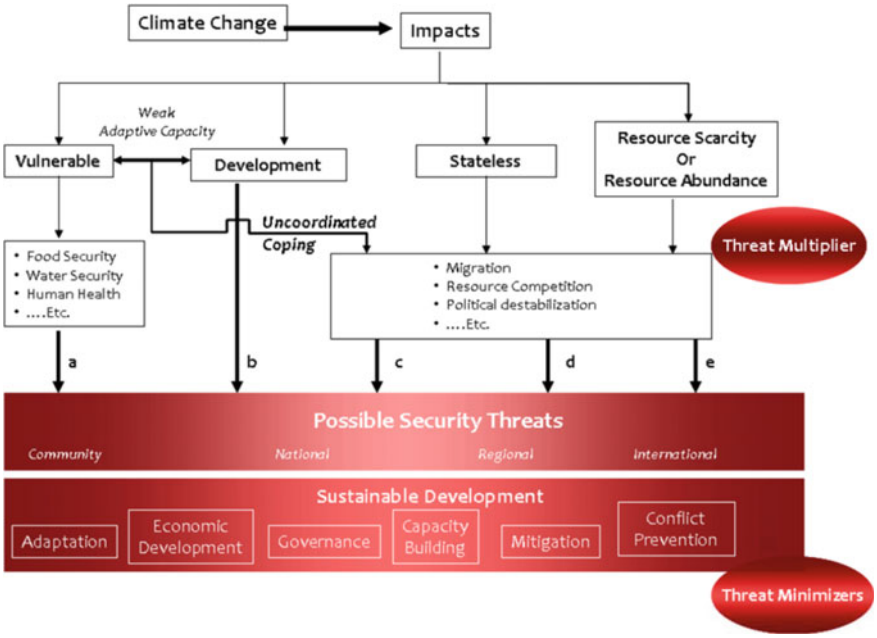



**Fig. 2.8** Threat multipliers and threat minimizers: the five channels. *Source* UN SG (2009): 6

Most research on environmental challenges in Africa and on displacement, migration and violent conflicts is still taking place in isolation without any conceptual or empirical integration. A few articles have reviewed the state of research on "Climate as risk factor for conflict", arguing (Fig. 2.8):

> Research findings on the relationship between climate and conflict are diverse and contested. Here we assess the current understanding of the relationship between climate and conflict, based on the structured judgments of experts from diverse disciplines. These experts agree that climate has affected organized armed conflict within countries. However, other drivers, such as low socio-economic development and low capabilities of the state, are judged to be substantially more influential, and the mechanisms of climate–conflict linkages remain a key uncertainty. Intensifying climate change is estimated to increase future risks of conflict (Mach/Kraan/Adger et al. 2019, pp. 193-197).

These authors argue that "the lack of clarity on current knowledge limits informed management of the risks of conflict to states and human security, and of the risks of continuing greenhouse gas emissions." The experts and authors ranked four drivers as influential conflict risks; (1): low socio-economic development, (2) low capabilities of the state, (3) intergroup inequality, and (4) recent history of violent conflict. They conclude that there

> is agreement that climate variability and change shape the risk of organized armed conflict within countries. In conflicts to date, however, the role of climate is judged to be small compared to other drivers of conflict, and the mechanisms by which climate affects conflict

> are uncertain. As risks grow under future climate change, many more potential climate–conflict linkages become relevant and extend beyond historical experiences.

The usefulness of this approach is emphasised by these authors:

> For those scholars and policy-makers who are focused on climate, a synoptic understanding of the climate–conflict relationship is important, even if the role of climate is relatively minor compared to other drivers of conflict. Given that conflict has pervasive detrimental human, economic and environmental consequences, climate–conflict linkages – even if small – would markedly influence the social costs of carbon and decisions to limit future climate change.
>
> For those scholars and policy-makers focused on conflict, the assessment has pointed to the different ways in which climate may interact with the major drivers of conflict risk. Effectively managing such interactions will require mainstream and holistic, rather than myopic, considerations of the role of the climate across diverse settings and attention to uncertainties that will persist.
>
> And finally, appreciation of the future role of climate change and its security effects can help to prioritize societal responses, which could include enhanced global aid and cooperation.[29]

Nina von Uexkull/Halvard Buhaug (2021) have summarised the security implications of climate change after 10 years of scientific progress:

> The study of security implications of climate change has developed rapidly … into an important and thriving research field that traverses epistemological and disciplinary boundaries. Here, we take stock of scientific progress by benchmarking the latest decade of empirical research against seven core research priorities collectively emphasized in 35 recent literature reviews. ... Overall, we find that the research community has made important strides in specifying and evaluating plausible indirect causal pathways between climatic conditions and a wide set of conflict-related outcomes and the scope conditions that shape this relationship.

Both articles rely on a review of the primarily quantitative literature, ignoring qualitative debate and conceptual discussion on the linkage between peace research and ecology in the Anthropocene, and they make no specific reference to Africa. They are consequently of little relevance when formulating policies to address the linkages between environmental and climatic challenges that Africa has faced during the Anthropocene between 1945 and 2020 and since independence.[30]

The policy-orientated and empirical literature on this dual policy linkage between climate and conflict pertaining to Africa and by African authors is still very limited. Scheffran et al. (2019)offer a comprehensive overview of the state of knowledge on 'Climate and Conflict in Africa', referring to climate as a "risk multiplier" in "fragile regions and hotspots" in Africa:

> where poverty, violence, injustice, and social insecurity are prevalent. The linkages have been most extensively studied for the African continent, which is affected by both climate change and violent conflict. Together with other drivers, climate change can undermine human security and livelihoods of vulnerable communities in Africa through different pathways. These

[29] See the figure: Scope of the expert assessment – Climate as a risk factor for armed conflict. Source Mach et al. (2019: 193–197).

[30] Collective thematic scope of special issue contributions. *Source* von Uexkull und Buhaug (2021), 58,1: 3–17.

> include variability in temperature and precipitation; weather extremes and natural disasters, such as floods and droughts; resource problems through water scarcity, land degradation, and food insecurity; forced migration and farmer-herder conflict; and infrastructure for transport, water, and energy supply. Through these channels, climate change may contribute to humanitarian crises and conflict, subject to local conditions for the different regions of Africa. While a number of statistical studies find no significant link between reduced precipitation and violent conflict in Africa, several studies do detect such a link, mostly in interaction with other issues. The effects of climate change on resource conflicts are often indirect, complex, and linked to political, economic, and social conflict factors, including social inequalities, low economic development, and ineffective institutions.

Regions dependent on rain-fed agriculture are more sensitive to civil conflict following droughts. Scheffran et al. (2019) argue that

> [r]ising food prices can contribute to food insecurity and violence. Water scarcity and competition in river basins are partly associated with low-level conflicts, depending on socio-economic variables and management practices. Another conflict factor in sub-Saharan Africa is shifting migration routes of herders who need grazing land to avoid livestock losses, while farmers depend on land for growing their harvest. Empirical findings reach no consensus on how climate vulnerability and violence interact with environmental migration, which also could be seen as an adaptation measure strengthening community resilience. Countries with a low human development index (HDI) are particularly vulnerable to the double exposure to natural disasters and armed conflict. Road and water infrastructures influence the social and political consequences of climate stress. The high vulnerabilities and low adaptive capacities of many African countries may increase the probability of violent conflicts related to climate change impacts.

This text, published in the *Oxford Research Encyclopaedia of Climate Science* (2019), offers a comprehensive overview of the empirical, theoretical and conceptual literature on and in Africa, and includes a broad bibliography focusing on (i) the climate-conflict nexus, (ii) climate change vulnerability, human security and violent conflict in Africa, (iii) factors of security risks and conflict potentials in Africa, (iv) North Africa, (v) East Africa, (vi) West Africa, vii) Central Africa, (viii) Southern Africa, (ix) reflections on the climate-conflict nexus, (x) emphasis on the specific conditions and outcomes in African sub-regions:

> No scientific consensus has emerged on whether and how climate change triggers or contributes to violent conflict in Africa. This is because different factors matter in different regions of Africa and the overall link between climate change and violent conflict in Africa is likely to be indirect, complex, and related to multiple political, economic, and social factors. Several studies indicate that climate-induced natural disasters can destabilize societies with weak economies, mixed political regimes, and pre-existing conflicts. Other studies find resource conflicts arising from unequal distribution of aid, changing power relationships, and opportunities for warlords. Droughts tend to affect civil conflict in regions dependent on rain-fed agriculture. Qualitative regional case studies and conceptual frameworks can help to capture the complex linkages between climate change, vulnerability, and violent conflict. Conflict escalation cannot be explained by a single factor such as climate change. However, in 'hotspots', multiple drivers, actors, and actions can interact in complex vicious circles that undermine state authority and overstretch problem-solving capabilities. The interaction between vulnerability to climate change and conflict is subject to regionally specific conditions across Africa.

Scheffran et al. (2019)summarise the different drivers for North, East, West, Central and South Africa.

> In North Africa, water allocation (particularly in the Nile River Basin), food, land use, and agriculture are most likely related to violent conflicts. Rising food prices may have contributed to cascading events that destabilized the region in the wake of the Arab Spring. In East Africa, environmental change combines with social and political issues, such as marginalization and exclusion, food problems, population pressure, refugee movements, and political instability, likely contributing to conflicts between pastoralists and other groups, which remain controversial with regard to their significance. West Africa experiences vulnerability to climate change and land use together with violent conflict, for example, between farmers and herders. Less systematic research on the linkages between climate change and conflict is available for Central Africa and South Africa, which are both shaped by adverse environmental impacts, migration, and major conflicts related to natural resource exploitation and scarcity. A political ecology perspective not only challenges simplistic linkages of farmer-herder conflicts with resource scarcity, and environmental and climate change, but also considers political power relations, complex actor networks, and social processes as well as citizenship and land use rights. (…) The conflict situation affects the conditions for resource management. New integrative strategies assess how different lifestyles are affected by ecosystem services provided by natural resources to local people. Vulnerabilities and adaptation measures to altered climate conditions are considerably different for farming or pastoralist livelihood strategies (…), encompassing local knowledge and the capacity building of institutions and governance structures that can support rural communities affected by climate change (…). All geographical levels (local, regional, and federal) and all types of society (government, private sector, and civil society) are to be included.

Scheffran et al. (2019)also distinguish between different outcomes:

> Cooperative solutions for sustainable peace and environmental peace may emerge when communities see environmental change as a common security issue that needs to be jointly addressed by collaboration to use and share resources in a sustainable and efficient way (…). In crises, cooperation often prevails over conflict, and the number of international water agreements and cooperation have been increasing (…). Policies and institutions can reduce conflicts linked to climate change, using a range of policy levers from mitigation and adaptation to development. Measures to reduce agro-pastoral conflicts include the joint management of common pool resources, the protection of resources from degradation against harsh climate conditions, and soil and water conservation techniques, as well as land fertilization by cattle manure. With regard to the societal boundary conditions, the revision of land tenure and pastoral legislation, notably on access to resources, the strengthening of local structures for conflict settlement and prevention with participation of traditional leaders, representatives of the local administration, and civil society organizations, as well as sensitization and information sharing, could be useful strategies to reduce conflict risk (Cabot 2017).

In Africa, scientific and political discussions on the links between climate change and conflicts have been taking place for about a decade within both security studies and peace research. In May 2012, the Institute for Security Studies in Pretoria, Addis Ababa, Dakar and Nairobi published a paper by Roban Adano Wario and Faruma Daudi (2012) from Kenya which aimed

> to review and assess the existing evidence on the security threat of climate change, with particular reference to Africa. The paper addresses the question to what extent climate change poses a threat to security and conflict in Africa. It further seeks to identify manifestations of climate change, the sectors and regions most likely to suffer from the adverse impacts of climate change, and the associated incidence of conflict.

In November 2011 Pius Yanda; Salomé Bronkhorst (2011) published a *Policy and Practice Brief* on "Climate change and conflict: Conflict-sensitive climate change adaptation in Africa" for the *African Centre for the Constructive Resolution of Disputes* (ACCORD) in Durban, based on a

> two-day expert seminar to identify issues and recommendations for ensuring that adaptation to climate change is conflict-sensitive. Practitioners and scientists presented new research on the linkages between climate change and conflict in Africa, and analysed various tools, policies and approaches to ensure that conflicts arising from climate change are addressed and climate change adaptation measures are conflict-sensitive. (…) The first section reports on the scientific evidence for the linkages between climate change and conflict. The second section discusses what it means to have conflict-sensitive climate change adaptation – hereafter referred as 'conflict-sensitive adaptation' – drawing on the research and discussion outcomes from the seminar. The third section outlines key considerations for conflict-sensitive adaptation. The final section includes recommendations for continental, regional and national bodies on conflict-sensitive adaptation (Bob/Bronkhorst 2014).

Since this conference in preparation for COP 17 of the UNFCCC in Durban, policy reports (von Soest 2020), scientific articles[31] and several books[32] have been published on the linkages between a specific environmental theme (climate change) and possible policy outcome (conflict) or impact (security and peace). However, none of these publications were framed in the context of peace ecology or an ecological peace policy in the Anthropocene.

## 2.8 Towards Peace Ecology for Africa in the Anthropocene

The themes of global environmental and climate change as a cause, and displacements, migration, crises and violent conflicts, including as a worst case civil and international wars, as possible outcomes and multiple impacts of policies aiming at peace and security are concerns which peace ecology and an ecological peace policy need to address in Africa in the social sciences and in practice during the Anthropocene epoch.

Brauch (2021) recommends analysis, reflection and action on the following problem areas between peace and security issues on the one hand, and environment and sustainable development problems on the other, in which various relationships and linkages have been addressed in social science literature since the 1980s:

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[31] Scheffran (2020: 19-48); Balbo, Rothe, Scheffran (2020: 287–296); van Baalen, Mobjörk (2018: 547–575); von Uexkull, Pettersson (2018: 953–968); Kamta, Schilling, Scheffran (2021: 27); Kogoui Kamta, Schilling/Scheffran (2020: 6830); Kamta et al. (2020: 95–104); Marie, Yirga, Haile, et al. (2021); Schilling, Hertig, Tramblay, Scheffran (2020: 15); Shaaban, Scheffran, Böhner, Elsobki (2019: 4); Noagah Bukhari, Sow, Scheffran (2019: 161-185); Schilling, Locham, Scheffran (2018: 571-600); Solomon, Birhane Gordon, et al. (2018: 284–290); Evadzi, Scheffran, Zorita, Hünicke (2018: 183-197).

[32] Swain, Bali, Swain Anders, Krampe (2011); Cabot (2017).

- the early conceptual debate on the linkages between peace and the environment[33];
- studies on the impacts of weapons and wars on the environment[34];
- the conceptual debate on environmental and ecological security (Brauch 2021, pp. 115–118);
- the impact of environmental degradation and stress on environmental conflict (Brauch 2021, pp. 118–122);
- environmental peace-making and the role of the environment in post-conflict peace-building (Brauch 2021, pp. 122–125);
- the emerging discourse and policy debate on climate change and conflicts (Brauch 2021, pp. 125–132);
- the early approaches to peace ecology and their shortcomings (Brauch 2020, pp. 132–141).

However, these multiple research projects and studies have not yet resulted in a joint comprehensive peace ecology research programme within the framework of the Anthropocene epoch in Earth and human history. Since the 1990s, environmental security research has shifted from environmental scarcity, degradation and conflict to the dangers posed by global environmental and climate change (Sygna et al. 2013). With the direct impacts of humans upon ecosystems in the Anthropocene (Crutzen 2002, 2011) and with the progressive securitisation of GEC issues since 2003, these anthropogenic changes are increasingly threatening human lives and livelihoods. Worldwide, the destruction of key ecosystem services, the pollution of air, water and soil, land use change and extreme events are creating new 'anthropogenic challenges' for humankind, although these do not pose a threat of violent conflict or war.

Peace ecology in the Anthropocene was conceptualised by Oswald Spring et al. (2014, pp. 18–19) within the framework of peace, security, equity, sustainability, culture and gender (Fig. 2.1). In order to develop a research framework and programme that can conceptually and methodologically encompass the many research projects that have emerged in the social sciences since the end of the Cold War, these authors suggest a wider peace ecology concept than that proposed by Kyrou (2007)/Amster (2014).

It is appropriate that the temporal context for this peace ecology research programme is the Anthropocene (Crutzen/Stoermer 2000; Crutzen 2002), since this epoch of Earth and human history began when a turning point in the geological time of the Earth's history coincided with the long-term structural turning points in human history after the end of World War II, the emerging nuclear era, the Cold War (1947–1989) and the post-Cold War disorder (1990-present).

The environmental dimensions of this change could not be socially constructed until the late 1980s, when the exponential increase in greenhouse gases, particularly $CO_2$, since the *Great Acceleration* in the 1950s made the issues relating to global environmental change and climate change all too apparent. With the exponential

[33] Brauch (2021): 111–114, Boulding/Kenneth (1978, 1989), Boulding/Elise (1988, 1992, 2000), Oswald Spring (2008a).

[34] Brauch (2021): 114–115; Westing (1976, 2003, 2013, 2013a).

increase of *greenhouse gases* (GHG) in the atmosphere since 1950, scientific knowledge of the physical impacts of global climate change has increased since the 1980s, initially in the natural sciences. Several new research and training programmes and research institutes have been set up in the newly emerging areas of *Earth Systems Science* (ESS) and *Earth System Analysis* (ESA). After the build-up of new scientific capabilities, knowledge of GEC has expanded rapidly.

In *Anthropocene Geopolitics* Dalby (2020, pp. 169–187, 184) briefly discusses the previously proposed interdisciplinary research programme of 'political geoecology in the Anthropocene' (Brauch et al. 2011), which brings natural science perspectives into primarily social-science-orientated research.

In my opinion, a peace ecology approach should:

- overcome the overspecialisation in both the social and the natural sciences;
- offer *holistic* approaches that address interlinkages between themes addressed by peace research and environmental studies;
- be contextualised in the Anthropocene epoch of the Earth's history and address scientific and political linkages since the end of World War II and the Great Acceleration:
- be interdisciplinary; and in the Anthropocene it should be further developed from interdisciplinary and transdisciplinary approaches into a *transformative research programme.*

Each discipline has its specific epistemology, premises and methods of generating new knowledge.[35] As the problems and issues that need to be examined scientifically become more complex, *multidisciplinarity* offers a first step towards analysing complex problems from different disciplinary perspectives. These multidisciplinary studies rely on the methodologies of their respective disciplines.

Given the complexity of the Anthropocene, global environmental change and resource scarcity, several research centres and think tanks have proposed *transdisciplinarity* as a new scientific approach to overcome the narrow disciplinary boundaries of specialised subfields and epistemic schools of knowledge creation. In short, *transdisciplinarity* refers to a research strategy that establishes a common research objective that crosses disciplinary boundaries.

Schneidewind, Singer-Brodowski/Augenstein (2016) proposed moving from a 'transdisciplinary' approach to 'transformative science', while Swilling (2016) suggested 'anticipatory science'. The concept of 'transformative research' or 'science' has been used since the 2000s for a new approach that cuts across the dominant *scientific paradigms.* The US National Science Board (2007) adopted the following working definition of 'transformative research':

> [it] *involves ideas, discoveries, or tools that radically change our understanding of an important existing scientific or engineering concept or educational practice or lead to the creation of a new paradigm or field of science, engineering, or education. Such research challenges current understanding or provides pathways to new frontiers.*

[35] This section relies on Oswald Spring et al. (2016: Chapter 43).

Building on this approach, in *World in Transition – A Social Contract for Sustainability*, the WBGU (2011, pp. 21–23, 321–356) referred to "four transformative pillars of the knowledge society": transformation research and transformation education, as well as transformative research and transformative education. It asserted (WBGU 2011, p. 21) that transformation research "specifically addresses the future challenge of transformation realisation" by exploring "transitory processes in order to come to conclusions on the factors and causal relations of transformation processes" and should "draw conclusions for the transformation to sustainability based on an understanding of the decisive dynamics of such processes, their conditions and interdependencies." Transformative research supports transformation processes with specific innovations in the relevant sectors and should encompass, for example, "new business models such as the shared use of resource-intensive infrastructures, and research for technological innovations like efficiency technologies" by aiming at a "wider transformative impact". Schneidewind/Singer-Brodowski (2013) and Göpel (2017)have developed this transformative approach further for climate policy and research on sustainability transition.

In its report on the *Transformative Cornerstones of Social Science Research for Global Change*, the *International Social Science Council* (ISSC 2012: 21–22) identified six cornerstones: (1) historical and contextual complexities; (2) consequences; (3) conditions and visions for change; (4) interpretation and subjective sense-making; (5) responsibilities; and (6) governance and decision-making. The report concluded that

> the transformative cornerstones framework speaks to the full spectrum of social science disciplines, interests and approaches – theoretical and empirical, basic and applied, quantitative and qualitative. By not fashioning a global change research agenda around a substantive focus on concrete topics – water, food, energy, migration, development, and the like – the cornerstones are not only inclusive of many social science voices but, perhaps most importantly, show that climate change and broader processes of global environmental change are organic to the social sciences, integral to social science preoccupations, domains par excellence of social science disciplines. … The transformative cornerstones of social science function not only as a framework for understanding what the social sciences can and must contribute to global change research. They function as a charter for the social sciences, a common understanding of what it is that the social sciences can and must do to take the lead in developing a new integrated, transformative science of global change.

Various initiatives by the US *National Science Board* (2007), the ISCC (2012), and the *Sustainability Transition Research Network* (STRN 2016) have called for a new scientific paradigm for research into both global environmental change and sustainability transitions. The policy dimension should be included in the research design by moving from knowledge creation to action, policy initiatives, development and implementation.

These efforts are still highly dependent on the top-down efforts of governments and multinational enterprises. A transformative research programme implies moving "from knowledge to action" by addressing the challenges for peace and sustainable development arising from the impacts of global environmental and climate change in the Anthropocene as a result of anthropogenic interventions in multiple Earth

Systems processes. Peace ecology – as introduced above – is action research, in which the transformative action is already reflected in the research design.

## 2.9 Ecological Peace Policy for Africa in the Anthropocene

The two suggested concepts of peace ecology and ecological peace policy in the Anthropocene are closely related. Peace ecology applies to integrated scientific analyses of peace, security, development and environmental issues since the end of World War II, when the Anthropocene began, triggered by the development, test and employment of nuclear weapons (1945) and their atmospheric testing (until 1963) and by the Great Acceleration (since 1950) that resulted in an exponential increase in *greenhouse gases* (GHG), especially *carbon dioxide* ($CO_2$).

Peace ecology differs from other more narrow concepts of environmental cooperation, environmental peacemaking, peacebuilding and post-conflict peacebuilding (Ide 2017, 2018, 2018a, 2019, 2019a, 2020; Ide/Detges 2018; Ide et al. 2021). The proposed peace ecology approach in the Anthropocene offers a specific contextualisation and a broader thematic focus on peace, security and ecological linkages than the more narrow specialised concepts in the context of environmental diplomacy.

For industrialised countries, ecological peace policy comprises a normative approach to politics that reflects ecological concerns, challenges posed by global environmental and climate change, sustainable development issues and sustainability transition designed to yield a social, business and overall policy capable of achieving the *Sustainable Development Goals* (SDGs)[36] and the UN's Agenda 2030 for Sustainable Development[37] through a process of decarbonisation.

As Africa is a continent that has already been seriously affected by the physical and societal effects of climate change, it is crucial to include environmental assessments and ecological concerns in the framework of domestic and external policy fields designed to achieve the African Union's Agenda 2063, the Framework Document and First Ten-Year Implementation Plan of which was adopted in June 2015 in South Africa.[38]

Africa is now also living in the Anthropocene. Although so far and probably for many years to come its GHG emissions are relatively low, the environmental impact of the global economic model and behaviour has already been significant, and in 2019 Africa had a 23% share of global fatalities from natural disasters, following

[36] SDGs; at: https://sdgs.un.org/goals (15 June 2021).

[37] UN's Agenda 2030 for Sustainable Development; at: https://sdgs.un.org/2030agenda.

[38] See: "01 Background Note: Agenda 2063: The Africa We Want"; at: https://au.int/sites/default/files/documents/33126-doc-01_background_note.pdf .

**Table 2.2** African Region Profile for Natural Disasters from 1980 to 2008. Source: https://www.preventionweb.net/ (18 April 2021)

| Affected People | | | | Killed People | | | |
|---|---|---|---|---|---|---|---|
| Country | Disaster | Date | Total affected | Country | Disaster | Date | Killed |
| Kenya | Drought | 1999 | 23,000,000 | Ethiopia | Drought | 1983 | 300,000 |
| South Africa | Drought | 2004 | 15,000,000 | Sudan | Drought | 1983 | 150,000 |
| Ethiopia | Drought | 2003 | 12,600,000 | Mozambique | Drought | 1981 | 100,000 |
| Ghana | Drought | 1983 | 12,500,000 | Ethiopia | Epidemic | 1988 | 7,385 |
| Sudan | Drought | 1991 | 8,600,000 | Nigeria | Epidemic | 1991 | 7,289 |
| Sudan | Drought | 1983 | 8,400,000 | Nigeria | Epidemic | 1996 | 4,346 |
| Ethiopia | Drought | 1983 | 7,750,000 | Burkina Faso | Epidemic | 1996 | 4,071 |
| Ethiopia | Drought | 1987 | 7,000,000 | Niger | Epidemic | 1995 | 3,022 |
| Malawi | Drought | 1992 | 7,000,000 | Sudan | Epidemic | 1988 | 2,770 |
| Ethiopia | Drought | 1989 | 6,500,000 | Algeria | Earthquake* | 1980 | 2,633 |

Asia (45%) and Europe (23.4%), with a higher percentage than the Americas (8%) and Oceania (0.6%).[39]

Based on older EMDAT data,[40] the Prevention Web[41] offered this summary of the disaster statistics for Africa (1980-2008), according to which between 1980 and 2008 most people in Africa were affected by drought and most people were killed as a result of droughts and epidemics primarily in the highly vulnerable Sahel zone (Table 2.2).

According to the World Bank's indicators, $CO_2$ emissions in Africa increased from 126,045.1 kt of $CO_2$ in 1960 to 438,422.2 kt in 1990 and 853,107.1 kt in 2016.[42] By 2020 the $CO_2$ emissions of 47 Sub-Saharan African countries represented about 1 billion people and constituted about 3–4 per cent of the global emissions. Based on a report on the *State of the Climate in Africa in 2019* (WMO, 2020), Africa was severely affected by increased temperatures, the unpredictability of precipitation, and extreme weather events, resulting in severe droughts and food shortages.

The tasks of an ecological peace policy are to project the probable ecological consequences of the physical effects of global environmental change; to launch early preventive actions to avoid environmental crises, conflicts or wars; and to solve these environmental consequences peacefully without any outbreaks of violence (Brauch 2002).

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[39] See: Share of fatalities from natural disasters by continent 2019. *Source:* M. Szmigiera, *Statistica* (30 March 2021), at: http://www.statista.com/statistics/273890/countries-with-the-most-fatalities-from-natural-disasters/ (18 April 2021).

[40] See EMDAT, at: https://www.emdat.be/ (20 April 2021).

[41] See: PreventionWeb; at: https://www.preventionweb.net/english/ (20 April 2021).

[42] See: "$CO_2$ emissions (kt) – Sub-Saharan Africa". *Source*: Carbon Dioxide Information Analysis Center, Environmental Sciences Division, Oak Ridge National Laboratory, Tennessee, United States; at: https://data.worldbank.org/indicator/EN.ATM.CO2E.KT?locations=ZG (14 June 2020).

It is impossible to be sure how countries which have previously failed to implement their obligations under climate change agreements will behave in the future. However, deductions can be made about societal and political outcomes by using climate models which correlate projections of future population with the production and consumption levels associated with different lifestyles.

An ecological peace policy should aim to provide a preventive strategy so that (1) the projected physical effects of anthropogenic climate change can be contained, resolved and structurally prevented through multilateral diplomacy and cooperation, and (2) domestic and international violent crises, conflicts and wars can be avoided. Jointly and proactively addressing resource scarcity, resource pollution and stress (of water, soil, air) will make it possible to enhance the health and security of the affected people.

## 2.10 Outlook: Rethinking and Integrating Research and Action in the Anthropocene

Whether these conceptual and theoretical considerations for a new research framework (peace ecology) and an integrated policy approach (an ecological peace policy) matter for Sub-Saharan African countries is for African researchers and policy-makers and their advisers to decide.

Although several environmental linkages between peace and security issues have increasingly been addressed in the social sciences – political science, international relations, strategic studies and peace research – and a peace ecology approach has slowly emerged since 2007 (Kyrou 2007; Oswald et al. 2014; Amster 2014), an integrated comprehensive ecological peace policy has so far not been developed and discussed.

Although between 2000, when Crutzen uttered the term 'Anthropocene', and 2022 nearly a thousand books and several thousand scholarly articles were published (Brauch 2021a), a debate on linkage concepts between political science, international relations, peace research and environmental studies has remained underdeveloped within the social sciences, and the much-needed integration of knowledge derived from climate and Earth Systems Science and Earth Systems Analysis in the natural sciences with analysis in the social sciences has remained rare, despite many pleas for interdisciplinary research.

In the Anthropocene there is a complex dual causal relationship between human beings, the Earth System and the social system. During the Anthropocene, for the first time humankind has directly intervened in the Earth System through the burning of fossil fuels, resulting in an anthropogenic increase in greenhouse gases, most particularly *carbon dioxide* ($CO_2$), in the atmosphere. This global warming has triggered four major physical effects: (a) an increase in global average temperature, (b) variations in precipitation, (c) low-onset sea-level rise, and (d) an increase in the probability and intensity of extreme weather events. These phenomena have been assessed so

far by five assessment reports of the IPCC and several special reports. The physical effects of anthropogenic climate change have had multiple societal impacts that may cause severe domestic or international crises, conflicts, and, in the very worst case, even violent wars (Brauch 2009).

A peace ecology approach or programme in the Anthropocene for Africa must combine and integrate the results of peace research in the social sciences with the research in Earth Systems Science (ESS) and Earth Systems Analysis (ESA) which has primarily been conducted in the natural sciences. A peace ecology approach must thus cross the narrow disciplinary and research programme boundaries and move from multidisciplinary perspectives to interdisciplinary assessments. A peace ecology research programme that aims to contribute to an ecological peace policy should be transformative by including the transformation of the status quo in the research design.

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