Chapter 2
From Climate Change and Security Impacts to Sustainability Transition: Two Policy Debates and Scientific Discourses

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Abstract Since the climate conference in Copenhagen in 2009 global climate diplomacy faces a 'climate paradox' as reflected in the policy declarations by the G8 to reduce their greenhouse gases (GHG) by 80 % by 2050. Several countries failed to implement their legal GHG reduction obligations under the *United Nations Framework Convention on Climate Change* (UNFCCC) of 1992 and the Kyoto Protocol of 1997. A 'climate paradox' is a result of the dominant Hobbesian 'business-as-usual' climate and security policies. Since 2004 the physical and societal impacts of climate change were 'securitized' in the policy debates in the context of international, national and human security. Since 2007 the scientific discourse on climate change and security emerged, where in the social sciences several approaches are distinguished: (a) qualitative vs. quantitative approaches; (b) scenario analysis; (c) scientific modelling; (d) discourse analysis and (e) causal analysis. In 2009, the UN Secretary General in a report on the climate change security nexus referred to climate change as a 'threat multiplier' prevailing in the security debate and to climate change as a 'threat minimizer' pointing to proactive transformative policies towards sustainability. This chapter briefly reviews both debates arguing that the security consequences of climate change may be countered by strategies and policies aiming at sustainability transition.

Keywords Climate change and security discourse · Climate paradox · Global climate change · Hobbesian policy · Security impacts · Sustainability transition

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2.1 Introduction: Two Alternative Discourses

This chapter reviews two parallel policy debates and scientific discourses dealing with the societal impacts of climate change *reactively* by addressing them as security dangers and *proactively* as opportunities to realize a sustainable development path. This chapter argues that to overcome the paralysis of global climate diplomacy since 2009 a departure from the prevailing and reactive BAU approach is needed that resulted in a 'climate paradox'. Oswald Spring and Brauch (2009) pointed to an alternative vision of a "fourth sustainability revolution" that requires major changes in the 'worldview' of scientists, in the 'mindset' of policymakers, in the 'culture' of citizens and consumers, and in climate-conscious forms of local, national and international governance (Held et al. 2011, 2013).

The first debate addresses possible security consequences of the present global climate policy where the state parties failed to stabilize the GHG emissions from 1990 until 2000 according to the *United Nations Framework Convention on Climate Change* (UNFCCC) of 1992 and to reduce the global GHG by 5,2 % under its Kyoto Protocol of 1997 (in force since 2005) until end of 2012.

The emerging second scientific debate on a new scientific revolution aiming at sustainability (Clark et al. 2004), on sustainability transition (ST) in Central Europe (Grin et al. 2010) refers to a process of transformative science (WBGU 2011; Schneidewind and Singer-Brodowski 2013) and proactive policies aiming at a long-term and fundamental transformative change in values, behaviour, production, consumption and governance.

One major goal of the *Sustainability Transition and Sustainable Peace* (STSP) project and of its STSP handbook (Brauch et al. forthcoming) is to contextualize these multiple emerging but often unrelated streams of debate in the framework of the key purpose of the UN Charter "to maintain international peace and security" (Art. 1,1), "to develop friendly relations among nations" (Art. 1,2) and "to achieve international co-operation in solving international problems" (Art. 1,3) where ecological challenges and those of global environmental change where not yet recognized.

The social construction of these challenges did not evolve until the 1960s and 1970s when these dangers and concerns were gradually 'scientized,' 'politicized' and during this century also 'securitized' (Scheffran et al. 2012), reaching the United Nations. On 11 June 2009, the UN General Assembly (A63/281) requested "the Secretary-General to submit a comprehensive report … on the possible security implications of climate change" (UNGA 2009). In this report of 11 September 2009 the Secretary-General (UNSG 2009) referred to climate change as both a 'threat multiplier' that prevails in the national security approach and as a 'threat minimizer' aiming at sustainable development.

Secretary-General Ban-Ki Moon identified five channels through which climate change could affect security:

(a) *Vulnerability*: Climate change threatens food security and human health, and increases human exposure to extreme events.

(b) *Development*: If climate change results in slowing down or reversing the development process, this will exacerbate vulnerability and could undermine the capacity of states to maintain stability.
(c) *Coping and security*: Migration, competition over natural resources and other coping responses of households and communities faced with climate-related threats could increase the risk of domestic conflict as well as have international repercussions.
(d) *Statelessness*: There are implications for rights, security, and sovereignty of the loss of statehood because of the disappearance of territory.
(e) *International conflict*: There may be implications for international cooperation from climate change's impact on shared or undemarcated international resources (A/64/350: 1).

Climate change as a 'threat minimizer' points to proactive policies towards sustainability (Fig. 2.1) including "climate mitigation and adaptation, economic development, democratic governance and strong local and national institutions, international cooperation, preventive diplomacy and mediation". To respond to and prevent climate change-induced security threats the report suggested an international capacity "to anticipate and prepare itself to address a number of largely unprecedented challenges posed by climate change for which existing mechanisms may be inadequate", focusing on climate-induced displaced persons and migrants, to the "statelessness of citizens of submerged island nations", water-

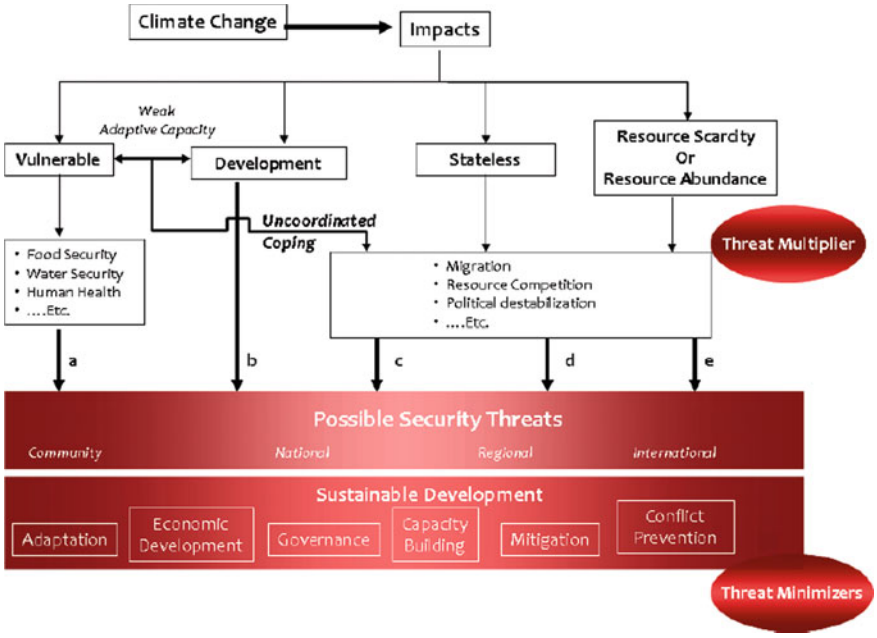

Fig. 2.1 Channels of threat multipliers and threat minimizers. *Source* UNSG (2009: 7)

scarcity and the increased competition "over newly accessible Arctic natural resources and trade routes".

This UN report points to two policy debates and scientific discourses that will be discussed in this chapter: (a) since 2002 on the 'securitization' of climate change (2.3) that resulted in scientific analyses using (i) scenario analysis, (ii) scientific modelling, (iii) discourse analysis and (iv) causal analysis (2.4). The alternative discourse (2.5) appeared in 2005 (2.6). The *sustainability transition and sustainable peace* (STSP) project addresses consequences of non-action and postponement of action in dealing with probable impacts of global environmental change and a possible 'peace dividend' of a long-term transformation of the global and national economic and energy systems towards sustainable development goals (2.7). This chapter concludes that a policy strategy aiming at sustainability transition must overcome the climate paradox (2.8).

This chapter argues that due to the rapid increase in GHG emissions since 1990 a 'climate paradox' has evolved (2.2) that may only be overcome with strategies aiming at a 'sustainability transition' towards a gradually decarbonizing world economy (2.7), where the violent consequences of business-as-usual policies may be avoided.

2.2 Assessment of GHG Emissions since 1990 and Compliance with the Kyoto Protocol: A Climate Paradox

According to UNFCCC's assessment of the national greenhouse gas inventory data for 1990–2010 "total aggregate GHG emissions excluding emissions/removals from land use, land-use change and forestry (LULUCF) for all Annex I Parties decreased by 8.9 % and total GHG emissions/removals including LULUCF decreased by 14.6 %." However, without LULUCF the GHG emissions increased for Australia by 30 %, Spain by 25.8 %, Canada by 17.4 %, and the USA by 10.4 % (UNFCCC 2012: 1).

According to preliminary estimates of the International Energy Agency during 2012 "global carbon-dioxide (CO_2) emissions from fossil-fuel combustion reached a record high of 31.6 gigatonnes (Gt) in 2011. … This represents an increase of 1.0 Gt on 2010, or 3.2 %."[1] According to the IEA's 2012 edition of its *CO_2 Emissions from Fuel Combustion—Highlights* global GHG emissions increased from 1990 to 2010 by 44.4 %, for all Annex I countries they declined by −3.7 % and for Annex I Kyoto parties by −12.4 %, but for North America they rose by 11.4 %, i.e. for Canada by 24 % and USA by 10.3 %. However, for all non-annex

[1] See IEA Press Release of 24 May 2012: "Global carbon-dioxide emissions increase by 1.0 Gt in 2011 to record high", at: http://www.iea.org/newsroomandevents/news/2012/may/name,27216,en.html.

I countries GHG emissions increased by 114.7 % (IEA 2012: 48). By 2010 the ten top CO_2 emitting countries from fuel combustion were China, USA, India, Russia, Japan, Germany, Korea, Canada, Iran and UK (IEA 2012: 9).

Globally, from 1990 to 2010, GHG emissions increased significantly and several Annex I countries failed to achieve their GHG reduction targets under the Kyoto Protocol by end of 2012, most particularly Australia (+39.5 %), New Zealand (+31.8 %), Canada (+30 %), Japan (+13.4 %) while for the economies of transition GHG emissions dropped by 33.9 % (IEA 2012: 9).

So far most developing countries objected to accept any legally binding GHG emission reduction targets, most particular China, whose emissions are projected to double between 2005 and 2030 (IEA 2007). From 1990 to 2010, major changes in GHG emissions have occurred between Annex I and Non-Annex I countries (Fig. 2.2), most particularly for China (+226.4 %; accounting for 24 % of global emissions in 2010) and India (+179.2 %; accounting for 5 % of global emissions in 2010) (IEA 2012: 50) and they are projected to double for India from 2010 to 2035 (IEA 2012: 23).

According to an analysis of the UNFCCC Secretariat (Fig. 2.3) 21 governments with obligations under the UNFCCC (Annex I Parties) reported that they would meet their targets under the KP relying only on national policies and measures (P&Ms), while 14 expected "to meet their targets under the Kyoto Protocol only by a combination of domestic action and the use of Kyoto Protocol mechanisms" (UNFCCC 2012a: 11). Figure 2.1 refers to nine Annex I parties that are also parties to the KP, which the US never ratified, and from which Canada withdrew in December 2011. There is an emerging consensus among many scientists that the

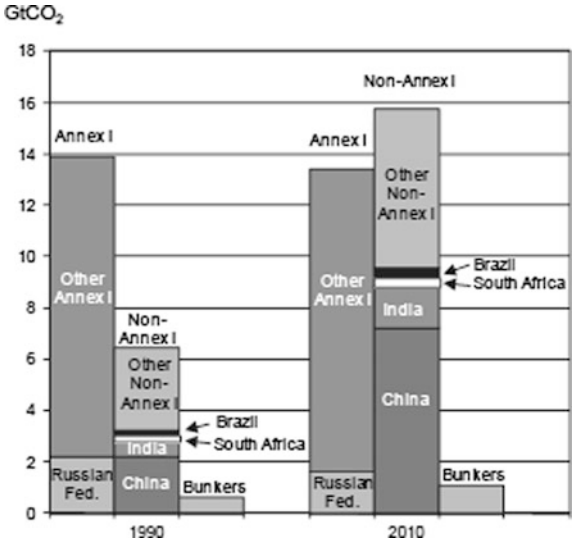

Fig. 2.2 The growing importance of GHG emissions in BRICS countries. *Source* IEA (2012: 19)

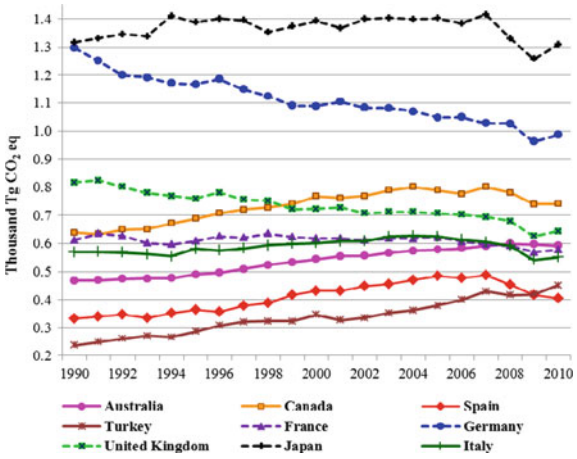

Fig. 2.3 Greenhouse gas emissions excluding land use, land-use change and forestry of Annex I Parties that do not have economies in transition that are also Parties to the Kyoto Protocol and that have the largest contribution to total aggregate emissions. *Source* UNFCCC (2012a: 16) based on: National greenhouse gas inventory submissions for 2012; at: http://unfccc.int/ghg_data/ghg_data_unfccc/items/4146.php

goal to stabilize GHG emissions at 2 °C above pre-industrial levels by 2100 has come beyond reach and that humankind may be confronted with a 4 °C (New et al. 2011) increase of global average temperature above pre-industrial levels and an increase of GHG concentrations in the atmosphere far above 450 ppm. On 26 May 2013 the GHG concentration in the atmosphere reached 400 ppm, and has thus increased by 85 ppm in 55 years.[2]

The concept of a 'Climate Paradox' (Brauch 2012) refers to a fundamental contradiction in the behaviour of developed (G8) and threshold countries (G20), as reflected in their policy declarations and their lacking implementation. The G8 confirmed the IPCC findings and supported the goal to stabilize the increase of global average temperature at 2 °C above the pre-industrial level by 2100. From 2007 to 2011, the G8 in their annual summit declarations, e.g. in May 2011 in Deauville (France), declared as the goal: "of developed countries reducing emissions of greenhouse gases in aggregate by 80 % or more by 2050, compared to 1990 or more recent years". This goal was dropped in May 2012 during the US presidency and in June 2013 during the British presidency the issue was taken from its agenda.[3] In 2013, only the EU seems to still adhere to this goal, e.g. in its

[2] See: US NOAA: "Trends in Atmospheric Carbon Dioxide"; at: http://www.esrl.noaa.gov/gmd/ccgg/trends/weekly.html; and "Weekly mean CO_2 and historical comparisons"; at: ftp://ftp.cmdl.noaa.gov/ccg/co2/trends/co2_weekly_mlo.txt.

[3] "Sign of the times: G8 Summit drops climate change from agenda"; at: http://hockeyschtick.blogspot.de/2013/06/sign-of-times-g8-summit-drops-climate.html. For an analysis see: Robert Falkner, LSE: "The burning hole at the heart of the G8 agenda. Why was climate

Energy Roadmap 2050 of 15 December 2011. But in late June 2013, German Chancellor Merkel blocked higher emission targets for cars and before her governments had challenged its own emission reduction targets of 40 % by 2020, cutting the subsidies for renewables under its Renewable Energy Act of 2000.[4] Whether the EU countries will remain a climate policy leader will depend on the "new 2030 climate and energy targets" the EU Commission will propose in autumn of 2013, upon which EU leaders will have to decide by March 2014, prior to the COPs in Warsaw (2014) and Paris (2015) when the next legally binding agreement is to be adopted to replace the KP. The *Climate Action Network* (CAN) cautioned: "Continuing 'business as usual' would mean putting the livelihood of millions of European (and other) citizens at risk."[5]

The strategies and policies of the G-20 (Figs. 2.4 and 2.5) that accounted for about 80 % of the global GHG emissions in 2007 reflect the prevailing *business-as-usual* (BAU) approach where possible security consequences become an object of *reactive* policies.[6] Both the prevailing climate policies of non-action or of postponed action and the focus on possible military responses are an expression of a realist, power-centred or *Hobbesian* outlook that has addressed the national security impacts of global environmental change and climate change, since 2007 primarily in the USA, while the EU pointed to international security consequences from a *proactive* perspective (Brauch 2009).

2.3 First Discourse: Securitization of Climate Change

Since 2002 the physical and societal impacts of climate change were securitized in policy debates and scientific discourses on international (EU, UN), national (USA) and human security (HSN, IPCC). On the climate change and security nexus policymakers differed:

– From an international security perspective many UN member states emphasized in the General Assembly (UNGA 2009) and Security Council (UNSC 2007, 2011) the need to prevent climate change becoming a 'threat multiplier' that

(Footnote 3 continued)
change marginalised at the 2013 G8 summit?"; at: http://blogs.lse.ac.uk/politicsandpolicy/archives/34244.

[4] See Climatesolutions: "Bundesregierung blockiert schärfere EU-Abgasgrenzwerte" (28 June 2013); at: http://www.climatesolutions.travel/umwelt/bundesregierung-blockiert-schaerfere-eu-abgasgrenzwerte.

[5] CAN: "EU Already at 27% below 1990 – Time for Merkel, Hollande and Cameron to Wake Up", 12 June 2013; at: http://www.climatenetwork.org/blog/eu-already-27-below-1990-%E2%80%93-time-merkel-hollande-and-cameron-wake.

[6] See University of Toronto, G8 Centre; the reference to the aggregate total GHG Emissions (for 2007 unless otherwise stated) [Mtonnes per CO2 equivalent] were compiled by Masa Kovic, "G8 and G20 Data on Climate Change", updated 26 June 2010a.

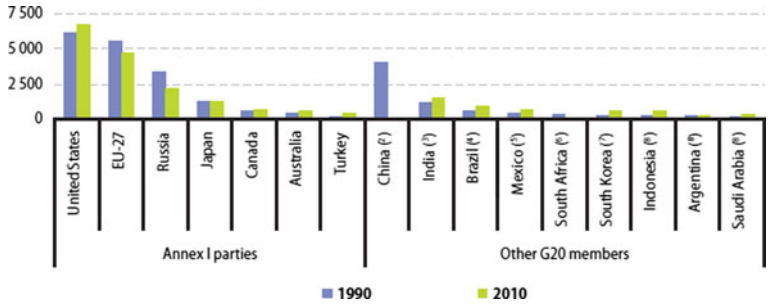

Fig. 2.4 Greenhouse gas emissions, 1990 and 2010 of Annex I and other G20 countries (million tonnes of CO2 equivalent). *Source* The most recent data and tables by Eurostat on greenhouse gas emissions from 1990 up to present may be found at: http://epp.eurostat.ec.europa.eu/portal/page/portal/statistics/search_database. See also the most recent Report from Eurostat: *Annual European Union greenhouse gas inventory 1990–2011 and inventory report 2013* that may be obtained at: http://www.eea.europa.eu/publications/european-union-greenhouse-gas-inventory-2013

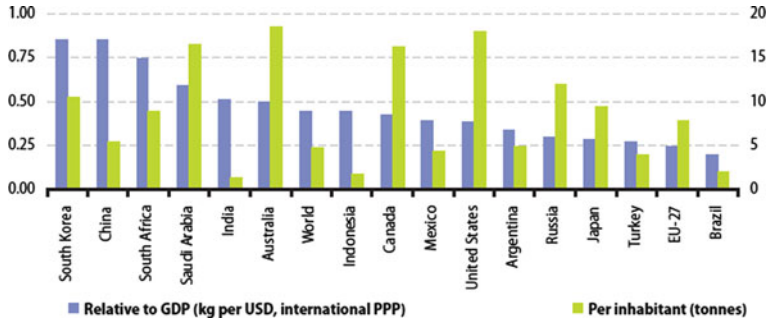

Fig. 2.5 Quantity of carbon dioxide emissions of selected countries relative to GDP and per person (2008). *Source* http://epp.eurostat.ec.europa.eu/statistics_explained/images/6/6c/Quantity_of_carbon_dioxide_emissions%2C_2008_%281%29.png

may trigger a violent escalation of existing conflicts by strengthening sustainability strategies, and thus to minimize security threats (Sect. 2.3.1).

– From the perspective of US national security, the interest of the defence and intelligence community is in how the military can continue to operate in a world where climate change impacts are increasing and how the US can maintain its position as the single military superpower and influence outcomes in the interest of its national security. Thus, the focus is primarily on conflict management but also on conflict prevention (Sect. 2.3.2).
– From the perspective of human security, the goal is to avoid climate-induced violent conflicts that would affect the livelihood of human beings, most particularly those with the highest degree of social vulnerability in the poorest countries, who lack the capacities for proactive adaptation and mitigation and whose capacity for resilience is limited (Sect. 2.3.3).

The discussion on linkages between climate change, security, and conflicts has been conceptually influenced by earlier research on environmental security. Based on environmental conflict research, the debate on security implications of climate change began in 1989 (Brown 1989; Gleick 1989; Swart 1996; Scheffran 1997; Edwards 1999; Rahman 1999). The climate-security nexus was taken up since 2000 (Gleditsch and Nordas 2009; Bohle and O'Brien 2007; Webersik 2010; Scheffran et al. 2012) by consultants (BMU 2002; Schwartz and Randall 2004; CNA 2007), governments (WBGU 2008; NIC 2008, 2012) and international organizations (EU 2008, 2008a; UNSG 2009).

2.3.1 *Climate Change and International Security: EU and UN*

The publication of the fourth IPCC Assessment Reports (IPCC 2007), debates in the United Nations Security Council [UNSC] and General Assembly [UNGA]), and the award of the Nobel Peace Prize to the IPCC in fall of 2007 gave high political visibility to climate change and its impacts. The UK took the lead on 17 April 2007 in putting this challenge on the agenda of the UNSC,[7] while Germany put this issue on the agenda during its dual presidency of the EU and of G-8 in 2007. A report for the German environment ministry (BMU 2002) addressed the linkage between climate change and conflicts (Brauch 2002). Based on a report on *Climate Change as a Security Risk* (WBGU 2008), the German government proposed an EU strategy on the security impacts of climate change.

The public policy debate on the securitization of climate change evolved in the UK beginning in 2004 when ministers and high-level policy advisers, scientists and diplomats addressed this linkage (Stern 2006, 2009). UN Security Council Res. 1625 (14 September 2005) had called for promoting sustainable development as part of a broad strategy of conflict prevention. On 14 March 2008, the Council of the European Union released a paper on "Climate change and international security" (S113/08) that specifically recommended enhancing capacities at the EU level (building up knowledge, assessing the EU's own capacities, improvement in the prevention of, and preparedness for early responses to disasters and conflicts). With regard to "cooperation with third countries" the paper calls for "revisiting and reinforcing EU cooperation and political dialogue instruments, giving more attention to the impact of climate change on security". The EU took up the political debate on the securitization of climate change in the UK and in Germany,

[7] This debate is documented at: "Press Conference by Security Council President, 4 April 2007"; at: http://www.un.org/News/briefings/docs//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: http://www.un.org/News/Press/docs/2007/sc9000.doc.htm.

and the European Council became a major 'securitizing actor' in translating the scientific messages into concrete policy proposals.

Since 2007, many other international organizations have worked on climate change. In March 2008 the World Bank addressed the "Social Dimensions of Climate Change" (Mearns and Norton 2009), and published its *World Development Report 2010*: *Development and Climate Change* (World Bank 2010). This debate on possible security implications of global climate change culminated on 20 July 2011 during the German UNSC Presidency.

While Russia, China and many representatives of the Group of 77 (G-77) opposed this discussion by the UNSC, a coalition of OECD countries, including all EU states, the USA, Canada, Japan, South Korea, Australia, New Zealand, and the Pacific Small Island States, stressed the need to address the linkage between climate change and its potential security implications from a proactive perspective (Brauch and Scheffran 2012).

A few delegations associated the climate change debate in the UNSC with the human security concept (Oswald Spring et al. 2013), while during the specific debates in the General Assembly on Human Security on 22 May 2008, on 20 and 21 May 2010, and on 14 April 2011 many countries referred to climate change as a major threat for human security.[8]

2.3.2 Climate Change and National Security

Since 2004 several defence ministries, the military establishments, and the intelligence community have addressed climate change as a new threat to national security. In 2004 a study by Schwartz and Randall (2004) for the US Department of Defense was leaked. In 2007, a report on *National Security and the Threat of Climate Change* by the US Center for Naval Analyses (CNA 2007), and in November 2007, a second report on *The Age of Consequences: The Foreign Policy and National Security Implications of Global Climate Change* (Campbell et al. 2007) by the Center for Strategic and International Studies (CSIS) and the Center for a New American Security (CNAS) triggered a policy debate on climate change and US national security (Campbell 2008; Moran 2011; NRC 2013) that was taken up by the administrations of George W. Bush and Barack Obama (Brauch 2011).

[8] These debates are documented at: Statement by the President of the Security Council on "Maintenance of Peace and Security: Impact of Climate Change", S/PRST/1011/15, 20 July 2011; at: http://daccess-dds-ny.un.org/doc/UNDOC/GEN/N11/424/28/PDF/N1142428.pdf?OpenElement; See the minutes of the all-day debate, at: http://www.securitycouncilreport.org/atf/cf/%7B65BFCF9B-6D27-4E9C-8CD3-CF6E4FF96FF9%7D/CC%20SPRST%202011%205.pdf and at: http://www.securitycouncilreport.org/atf/cf/%7B65BFCF9B-6D27-4E9C-8CD3-CF6E4FF96FF9%7D/CC%20SPV%206587.pdf and the UN summary for the press, at: http://www.securitycouncilreport.org/atf/cf/%7B65BFCF9B-6D27-4E9C-8CD3-CF6E4FF96FF9%7D/CC%20SPV%206587%20RES1.pdf (27 July 2011).

While the National Intelligence Council (NIC) of the CIA had ignored climate change in its projection of the world by 2020 (NIC 2004), it included the security impacts in its projection of the world by 2025 (National Intelligence Council 2008) and addressed it in its report on the world by 2030 (National Intelligence Council 2012). Retired Air Force General Charles Wald voiced support for bringing the national security bureaucracy into the debate over global warming and John J. Hamre, a deputy secretary of defence in the Clinton administration, said "global warming couched in security terms would make if far more difficult for politicians to ignore".[9] In 2010, the US intelligence community requested the NAS/NRC "to evaluate the evidence on possible connections between climate change and US national security concerns and to identify ways to increase the ability of the intelligence community to take climate change into account in assessing the political and social stresses with implications for US national security" (NRC 2013: 1).

The Obama Administration has addressed the climate change and security nexus in its Quadrennial Defense Review (QDR 2010), in its National Security Strategy (2010). In February 2010, the QDR stressed that the "DoD will need to adjust to the impacts of climate change on our facilities and military capabilities" noting that the "rising demand for resources, rapid urbanization of littoral regions, the *effects of climate change*, the emergence of new strains of disease, and profound cultural and demographic tensions in several regions are just some of the trends whose complex interplay may spark or exacerbate future conflicts". DoD acknowledged that "climate change will shape the operating environment, roles, and missions that we undertake". According to "assessments conducted by the intelligence community indicate that climate change could have significant geopolitical impacts around the world, contributing to poverty, environmental degradation, and the further weakening of fragile governments. Climate change will contribute to food and water scarcity, will increase the spread of disease, and may spur or exacerbate mass migration". DoD's operational readiness hinges on continued access to land, air, and sea training and test space. Managing the national security effects of climate change will require DoD to work collaboratively … with both traditional allies and new partners". In his first National Security Strategy of May 2010 (NSS 2010) President Barak H. Obama stressed a shift towards a value oriented strategy that includes "forging cooperative solutions to the threat of climate".

The *National Intelligence Council* (NIC) in its projection of the global trends for the "World by 2030" of December 2012 noted as Megatrend 4 on the growing food, water and energy nexus that "climate change will worsen the availability of these critical resources" (National Intelligence Council 2012: iv). It also listed among the potential black swains that would cause the most disruptive impact a more rapid climate change. In Africa climate change may create "new social and economic tensions that could flare into civil conflict" (NIC 2012: 3). It further

[9] Bryan Bender: "Bill ties climate to national security seeks assessments by CIA, Pentagon", in: *The Boston Globe*, 9 April 2007.

stated that climate-change-driven-migration "is likely to affect Africa and Asia far more than other continents" (National Intelligence Council 2012: 23). As the worst case outcome for climate change until 2030 the report referred to a total collapse of the climate change negotiations and as the best case cheaper and more plentiful natural gas resources (National Intelligence Council 2012: 56). It claims that the Middle East, South Asia and the Sahel zone would be most vulnerable to climate change impacts. However, from a Cornucopian perspective the report claimed that "GM Crop deployments will enable higher yields and address climate change driven food scarcities" (National Intelligence Council 2012: 91).

Responding to the request of the US intelligence community the National Research Council's (NRC) report on: *Climate and Social Stress – Implications for Security Analysis* (2013: 3) concluded that "anthropogenic climate change can reasonably be expected to increase the frequency and intensity of a variety of potentially disruptive environmental events". The NRC report concluded that "the links between climate events and security outcomes are complex, contingent, and not understood well enough to allow for prediction". The NRC Report (2013: 9–13) suggested specific measures for improving monitoring and analysis to better anticipate "national security risks related to climate events". The NRC report proposed that the intelligence community "should establish a system of periodic 'stress testing' for countries, regions, and critical global systems regarding their ability to manage potentially disruptive climate events of concern" and "countries, regions, and systems of particular security interest should be primary targets for periodic stress testing". This analytical report points to multiple research needs and restrains itself from a classical analysis of US national security threats.

Whether President Obama's strong emphasis on climate change in his second inaugural address on 20 January 2013 and whether his "climate change action plan"[10] of 25 June 2013 will result in stronger climate change policies will depend on decisions of the US Congress and especially of the Republican controlled House of Representatives. Besides policy efforts to reduce the carbon bootprint of the military by replacing hydrocarbon with renewable energy sources, it remains to be seen which role the climate change and security nexus will play and whether it will be successfully used by his administration to legitimize and implement 'extraordinary measures'.

The British Ministry of Defence (MoD) identified climate change as a key strategic trend and its Chief of Defence Staff has suggested that climate change is a threat to global security that military planners must include into their calculations. In Germany, the link between 'climate change and security' was discussed at a workshop by the German Command and Staff College (FüAk) in cooperation with the Centre for Transformation of the German Armed Forces (*Bundeswehr*) and the German Development Institute (GDI) in Hamburg in 2006 (Jopp and Kaestner

[10] See White House: "President Obama's Plan to Fight Climate Change", 26 June 2013; at: http://www.whitehouse.gov/share/climate-action-plan; "Barack Obama pledges to bypass Congress to tackle climate change", in: The Guardian, 25 June 2013; at: http://www.guardian.co.uk/world/2013/jun/25/barack-obama-climate-change-strategy (6 July 2013).

2008). In several other countries, climate change has been addressed in national security documents (Brzoska 2012), and the defence ministries of several NATO countries analysed the implications of climate change for their defence planning processes.

2.3.3 Climate Change and Human Security

Climate change also poses severe security impacts for human security and its referent objects: human beings and humankind. From this perspective, climate change was addressed by the GECHS (2005) programme in June 2005 and was the focus of the Greek Presidency of the Human Security Network (2007–2008). The conceptual debate on climate change and human security started in 2005 with a workshop on the linkage between *global environmental change and human security* (GECHS) which was the theme of an IHDP research project (1999–2009) (Barnett and Adger 2005; Barnett et al. 2008; O'Brien et al. 2010; Matthew et al. 2010; Sygna et al. 2013). Barnett and Adger (2005: 1; 2007, 2010) discussed how climate change may undermine human security, and how human insecurity may increase the risk of violent conflict as well as the role of states in human security and peace building. Schnabel (2007) addressed the linkages between climate change, human (in-) security and stability. The Millennium Ecosystem Assessment (Leemans 2009) and the Earth System Science Partnership (ESSP [Leemans et al. 2011]) and its related projects have offered a forum for the global scientific discourse (e.g. on health related issues).

During the informal debate of the UNGA on 14 April 2011 Brauch addressed "The Environmental Dimension of Human Security", and proposed a fourth human security pillar as "as freedom from hazard impacts",[11] based on previous reports (Brauch 2005, 2005a). 'Freedom from hazard impacts' calls for reducing the environmental and social vulnerability and enhancing the coping capabilities of societies confronted with environmental, geophysical, and climate-related hazards. It implies that people can mobilize their resources to address sustainable development goals. Human security as 'freedom from hazard impacts' is achieved when people who are vulnerable to environmental hazards that are often intensified by poverty, food insecurity, and improper housing in flood-prone and coastal areas are better warned of impending hazards, and are protected and empowered to prepare themselves.

Thus, by 2007 climate change was perceived by a majority of the people in many countries as a major new international, national, and human security concern. Since 2008, the impact of climate change on security in developing countries is also increasingly being addressed by the security community both for national

[11] UN, 2011: "Informal Thematic Debate on Human Security"; at: http://www.un.org/en/ga/president/65/initiatives/HumanSecurity.html; see for a detailed coverage: http://www.afes-press-books.de/html/hexagon_05_PressConf_Presentations.htm#NY2; Hans Günter Brauch: "Talking Notes", at: http://www.un.org/en/ga/president/65/initiatives/Human%20Security/DrBrauch.pdf.

security (e.g. by IDSA[12] in India) and from a human security perspective (by ISS in Pretoria).[13] Five years later, the scientific conceptualization of climate change impacts from a human security perspective has progressed. A *Climate Change and Human Security Handbook* (Redclift and Grasso 2013) is forthcoming and a chapter on "climate change and human security" in the IPCC's AR5 (2014/2015) is in preparation.[14] By 2013, the human security perspective on the climate change-security nexus has a growing impact on the scientific discourse, while the policy impact has remained negligible.

In a human security approach non-military means prevail. The development of new scientific knowledge, its technological application, and its effective political implementation matter. From a human security perspective, climate change directly impacts on water, soil, food, health, and livelihood security. Climate change will exacerbate these sectoral security problems if the communities and social groups fail to create mitigation and adaptation strategies with resilience-building through preventive learning and decisions. From a policy perspective, a holistic coping strategy requires better horizontal coordination of strategies, policies, and the measures carried out by ministries and international organizations.

2.4 Climate Change and Security in the Social Sciences

Building on the contributions of meteorologists and historians (Neville Brown 1989, 2001), in the social sciences the debate on the climate change and the security nexus has emerged both within peace research and security studies, especially by political scientists (James Lee 2009; Nils-Petter Gleditsch 2012; Brauch 2002, 2009, 2012), geographers (Karen O'Brien; Hans-Georg Bohle; Neill Adger; Jürgen Scheffran), economists (Stern 2006), sociologists (Giddens ^{2}2011) and psychologists (Welzer 2008).

During the 21st century, climate change may result in environmentally-induced forced movements of peoples, hunger- and famine-induced protests, and small-scale societal violence, and possibly also in violent conflicts within and between countries. While future climatic scenarios can be simulated and socio-economic trends can be projected, specific events (Gaddis 1992/1993), such as climate conflicts as the outcome of the decisions of future policymakers, cannot be predicted, rather a number of 'conflict constellations' can be foreseen (WBGU 2007,

[12] See: Institute for Defence Studies and Analyses (IDSA): "Workshop on Security Implications of Climate Change for India: A Report" (New Delhi, 6 April 2008).

[13] See the workshop by ISS (Pretoria) with IDRC (Canada) on: "Climate change and human security in Africa" (Pretoria, South Africa, 27–28 February 2008).

[14] The Working Group II contribution to the AR5, "*Climate Change 2013: Impacts, Adaptation, and Vulnerability*", will be released in March 2014; see at: http://www.ipcc-wg2.gov/AR5/ar5.html and at: http://www.ipcc-wg2.gov/AR5/AR5_authors.php (6 July 2013).

2008) that may possibly escalate into violence. The causal linkages and possible extreme societal outcomes have been discussed from four scientific perspectives:

1. *Determinists* claimed that climate change will lead to wars during the 21st century (Lee 2009).
2. *Empiricists* stressed that environmental stress and climate change contributed to forced migration and small-scale violence (Detraz and Betsill 2009; Brauch 2009; Scheffran 2011) and reviewed conflict constellations triggered by climate change (Bauer 2011).
3. *Sceptics* pointed to a lack of evidence on the link between climate change and wars (Gleditsch and Nordas 2009).
4. *Deniers* challenged these links (Lomborg 2009; Tetrais 2011). For example, Russia, China, and many G-77 countries considered climate change primarily as an issue of sustainable development, but not as an issue of international peace and security.

Five types of analyses may be distinguished:

(a) *Policy analyses* by consultants put this linkage on the agenda of national governments and international organizations.
(b) *Scenario analyses* prepared policymakers for potential future security threats posed by societal climate change impacts. They were often funded by defence ministries, intelligence agencies (US NIC), supranational (EU 2008) and international organizations.
(c) *Discourse analyses* examined policy statements of national and international policymakers and press reports on international, national, and human security (Detraz and Betsill 2009; Rothe 2012; Kurtz 2012)
(d) *Conceptual and model analyses* that stress the interactions between natural and human systems (Scheffran 2008, 2009, 2010, 2011).
(e) *Theoretical and empirical analyses* examine 'observed' and 'projected' interrelations of climate change effects on the state, society, the economic sector and on individuals, community groups, and humankind (Webersik 2010; Scheffran et al. 2012).

Work on the first two types was primarily carried out by consultants, on the third by sociologists, political scientists, and media specialists, while the last two require multi- and transdisciplinary cooperation among scientists.

In the USA and Canada a growing climate scepticism has contributed to a shift of public opinion and on the political level to a blockade of climate change implementation legislation. While some EU governments have taken up elements of the alternative paradigm in their policies for a gradual transition towards sustainability, most actions by governments, civil society, the business sector and the scientific communities are still adhering to the BAU paradigm. Combined with a declining perceived political urgency and a lack of political will these trends have favoured a 'climate paradox' (Brauch 2012) of nonbinding long-term policy declarations and the inability to adhere to legal commitments.

Within the BAU community there are two alternative policy positions of the Neo-Malthusians and of the Cornucopians (Gleditsch 2003). Many Neo-Malthusians accept the resource scarcity argument as a result of climate change and they are seriously considering possible security consequences of climate change for their own national security. In the USA, these security concerns are reflected in the studies by the CNA (2007), of the National Intelligence Council (2008, 2009, 2012) and they were incorporated in official defence documents (QDR 2010; NSS 2010; Brauch 2011; Brzoska 2012). A basic assumption and goal behind this argument is that the US military must adapt its infrastructure, missions and equipment to be able to operate in a world that is influenced by increasing societal impacts of GEC and GCC. In this policy debate, climate change was perceived as a 'threat multiplier'.

From a Neo-Malthusian perspective climate change is often analysed within a Hobbesian world. The adherents of this perspective argue that (i) climate change will result in resource scarcity, depletion and conflicts (Lee 2009); (ii) the military has to be able to operate under the conditions of climate change to protect 'our' national security, way of life, productive system and people; and (iii) the military has to reduce its ecological 'bootprint' and to adopt its infrastructure to rising sea-level and new extreme weather events by strengthening humanitarian missions.

In contrast, Cornucopians have argued that scientific ingenuity and technical solutions will enable society to cope with the effects of climate change without requiring either significant technical fixes or a fundamental transformation towards sustainability. The Cornucopian vision emphasized: (i) a priority of adaptation measures over fundamental mitigation strategies; (ii) a belief in technological fixes and breakthroughs; (iii) strategies for enhancing energy efficiency; and (iv) major initiatives and projects of geo-engineering.

Scientists claimed that a 'climate paradox' of long term policy declarations and, in many cases, the lack of the political will and of the financial, administrative, scientific and technical capabilities, may lead to a major catastrophe for humankind during this century. If the scientific worldview and political mindset of a BAU world prevails non-binding unilateral pledges are unlikely to be fulfilled after the legally binding commitments were ignored.

While among a majority of the G20 countries the strategic approach of a *business first* (among some OECD countries) or *development first* (among most developing or G77 countries) is still dominant, several countries have indicated in their declaratory politics and some in their policy planning the need to gradually shift to a low carbon economy.

For the second decade of research on climate change and security there is a need for:

- a *dialogue between the natural scientists* working on climate change issues and *social scientists* addressing observed or projected possible societal impacts that may affect international, national and human security perspectives and assessments;

- an intensive *discourse between different scientific schools* to overcome the tendency of communicating solely within one epistemic community and ignoring the results of the other school;
- a closer *debate between scientists* (of all disciplines and schools) and *policy-makers* to address areas for preventive policy initiatives to reduce the probability that climate change may trigger series security consequences, conflicts and in the worst case even wars.

2.5 Alternative Discourse: Proactive Policies Towards a Sustainability Transition and Sustainable Peace

Many scientists (Steffen et al. 2004; Leemans et al. 2011) and scientific bodies (IPCC 2007, 2011, 2012) argued for a fundamental shift in the development paradigm. Some called for a 'scientific revolution for sustainability' (Clark et al. 2004), for a 'social contract for sustainability' (WBGU 2011), for a 'long term transformative change' to sustainable development (Grin et al. 2010) and for a 'fourth sustainability revolution' (Oswald and Brauch 2011).

A new field of 'sustainability transitions research' is emerging and in 2009 a *Sustainable Transitions Research Network* (SRTN) was established, a book series on *Sustainability Transitions* was launched in 2010, and a *Journal on Environmental Innovation and Societal Transitions* (EIST) started publishing in 2011. New research institutes, programmes and projects were established in Europe.

The adherents of this alternative paradigm have argued for a shift towards sustainability transition with a (i) fundamental transformation of Western mass culture, life styles and 'way of life'; (ii) a long-term transformative change in worldviews towards sustainability; (iii) a transformation of the prevailing mindset in politics and the business community towards decarbonized and dematerialized productive processes and consumptive patterns; and (iv) a new social contract for sustainability (between state and civil society) with new forms of local, national, regional and global governance.

While the adherents of this alternative paradigm agree energy and resource efficiency is crucial for sustainable development, they argue that a gradual and fundamental transformative change cannot be achieved from the dominant worldview and mindset of the BAU approach. They insist avoiding this transformation process results in violence and wars, as the militarization of the industrial revolution in the 19th century and of the revolution in the energy, transportation, communication and IT systems in the 20th century have resulted in World War I and II and in many wars since 1945, the scientific discourse must also address potential linkages of a long-term transformative change on peace and security, whether it endangers or enhances the prospects for a sustainable peace.

The concepts of a 'sustainable development' and 'sustainable peace', as well as 'security' and especially 'human security' are highly contested in scientific and policy debates.

- According to the classic definition by Wolfers (1962) "Security, in an objective sense, measures the absence of threats to acquired values, in a subjective sense, the absence of fear that such values will be attacked". Social constructivist approaches in international relations conceive of security as a social and political interaction where social values and norms, collective identities and cultural traditions are essential. From this perspective, security is always intersubjective or "security is what actors make of it" (Wendt 1992).
- 'Human security' points to different policy agendas of violence, underdevelopment, environment and hazards and to good governance, rule of law and political, social, economic and cultural rights (UNDP 1994; Annan 2005). Human security calls for both 'protection' and 'empowerment', especially of the poor and most environmentally and socially vulnerable people (CHS 2003).
- The Brundtland Report (1987) introduced 'sustainable development' as a new global development path that was adopted at the United Nations Conference on the Environment and Development (UNCED) in Rio de Janeiro (1992) and promoted as a key policy goal of the Millennium Report (2000), and at the World Summit on Sustainable Development (WSSD) in Johannesburg (2002) and at the second Earth summit in Rio+20 (2012).
- 'Sustainable peace' is a normative concept in the social sciences and politics that implies a policy vision for the 21st century combining a 'security policy for the Anthropocene' with proposals for a 'science for global sustainability', economic strategies of 'sustainable development', where proactive action and cooperative policy implementation is crucial for a new peace strategy in the Anthropocene based on a gradual decarbonization of the global economy to cope with global environmental change impacts.

The call for a 'sustainable development' and a 'sustainable peace' suggests a fundamental change in the conceptual thinking in international relations during the Anthropocene. The proposed 'political geoecology' links the rapidly emerging *Earth Systems Science* (ESS) with global earth governance by integrating the political and security dimensions into the natural sciences and by sensitizing the social sciences and the humanities to the earth sciences (Brauch et al. 2011b).

Transformation is needed to achieve the goals adopted by the G-8 (2007–2011) to reduce GHG emissions globally for OECD countries by 80 %, and by the G-20 to implement the financial commitments for developing countries by 2020 and to move towards a green economy. Scientific worldviews must move towards sustainability, including changing values and an enhanced environmental consciousness, different ways of life and lifestyles and overcoming the gap between attitudes and behaviour. This requires also changes in the mass culture and waste economy based on a growing energy and resource consumption.

A transformation of the prevailing mindset in politics, business and society must overcome the dominant BAU paradigm and move towards a progressing decarbonization of the economy by enhancing energy efficiency (Weizsäcker et al. 1997, 2009) and a substitution of fossil energy sources with renewables. The German Advisory Council on Global Change (WBGU 2011) argued that this "new great

transformation" requires a new "social contract for sustainability" between state, society and the business sector with new forms of transformation governance.

During the second industrial revolution besides a close interaction between state, economy and society (Weber 1921, 1972, 1968, 1978) knowledge mattered and between 1700–1900 a 'knowledge revolution' (Jochum 2010) emerged with: (a) a 'horizontal' expansion and imperial penetration of the Americas, Africa and Asia, (b) a 'vertical' expansion in the aftermath of the enlightenment, and (c) a 'retrospective' one (history). Major changes in the organization of knowledge were the emergence of academies, universities and research institutions for training technical experts for innovation and management along with the emergence of modern library systems and knowledge dissemination through the media (journals). During the third technical revolution based on non-renewable energy, new transportation and communication systems and with the IT revolution (computers, internet) the access and spread of knowledge will become essential.

These new forms of knowledge-creation and dissemination require a 'pragmatist' interaction (Habermas 1968) between the political and the knowledge system to avoid 'decisionist' (scientists as legitimizers of policy decisions) and 'technocratic' (policymakers implement scientific or administrative choices) pitfalls. Those scientists who called for a second scientific revolution suggested a fundamental change in the scientific worldview (Kuhn 1962) towards sustainability.

Thus, the newly emerging research on 'sustainability transitions' addresses the societal, economic and political processes, changes and transformations needed to achieve the long-term transformative goal in specific knowledge sectors (energy, transportation, agriculture, food, health). From the perspective of international relations, as well as security and peace studies, this raises new research areas to draw lessons from the impacts of the three previous long-term and global transformations on the environment but also on peace and security, or how new forms of a militarization of societies and of revolutions in warfare can be avoided and the goal of a 'sustainable peace' may be enhanced.

The multiple innovations that emerged from the two industrial revolutions were all applied by the military making warfare more violent, widespread by increasing the number of victims. Thus, the discussion on a fourth sustainability revolution (FSR) or on a sustainability transition (ST) must also address potential conflictual consequences of the suggested transition and possible peace dividends by reducing the competition over access and control of hydrocarbon energy sources.

2.6 Emergence of the Alternative Discourse

In *Our Common Journey: A Transition Toward Sustainability* in 1999 the US National Research Council noted that in the 21st century "many human needs will not be met, life-support systems will be dangerously degraded, and the number of hungry and poor will increase" (NRC 1999: 101). The NRC also argued that "a successful transition toward sustainability is possible over the next two

generations" but that this would require "significant advances in basic knowledge, in the social capacity and technological capabilities to utilize it, and in the political will to turn this knowledge to action" (NRC 1999: 160).

The new research field of 'sustainability transition' combines "complex systems analysis, a socio-technological and a governance perspective". It has evolved since the 1990s when "innovation and technology scholars … started to address environmental innovation and sustainability transitions more explicitly" (van den Bergh et al. 2011) to which research on *technological innovation systems* (TIS) and the *multi-level perspective* (MLP) have contributed (Coenen and Truffer 2012: 4–5). The WBGU Report on a *Social Contract for Sustainability* called for a new paradigm of a 'Science for Global Sustainability'. The 'sustainability transition' proponents combine sustainable development with a long-term transformative change. *Global Environmental Change* (GEC) and *Global Climate Change* (GCC) were triggered by the first industrial revolution, while the second industrial revolution led to a fundamental change in communication and transportation systems and an evolution of new information technologies that made modern processes of globalization possible.

The 'sustainability transition' proponents address both the causes and impacts of GEC and GCC by facing and coping with both and avoiding the projected societal consequences of dangerous or catastrophic climate change and of possible 'tipping points' in the climate system (Lenton et al. 2008). Hence 'sustainability transition' may become a 'threat minimizer' towards sustainable development.

'Sustainable development' and 'sustainability transition' refer to a much wider research agenda than the relatively narrow focus on environmental and technological innovation. The process of 'transition' refers to multiple long-term evolutionary and revolutionary transformative changes. These two debates may be summarized as follows:

1. We are in the midst of a global transition in earth history triggered by the first and second industrial revolution that resulted in an anthropogenic transformation of the earth system. Therefore, Crutzen (2002, 2011) pointed to the transition from the 'Holocene' to the 'Anthropocene' due to the increase in human interventions into the earth system with a rapid increase in GHG emissions.
2. The impacts of the transformations of these processes have resulted in complex global environmental change, in climate change and biodiversity loss, what affected most environmental services.
3. The societal impacts of the physical effects of climate change and of biodiversity loss may result in major international, national, and human security dangers and concerns. These have been discussed at national and international levels since 2000 from the perspective of different scientific world views, schools of thought, and political mindsets.
4. Since 2005 an alternative discourse on 'sustainability transitions' or on 'transitions to sustainable development' has begun to evolve. It addresses new directions in the 'study of long-term transformative change' that also needs to focus on resilient societies.

2.7 Goal of the STSP Project

The *Sustainability Transition and Sustainable Peace Project* (STSP) was launched after completing the project on *Reconceptualization of Security* (Brauch 2008; Brauch et al. 2008, 2009, 2011a). STSP addresses key scientific and political challenges of the 21st century, including the relative failure of international efforts to address, face and cope with impacts of global environmental and climate change that resulted in a 'climate paradox', where industrialized countries were unable or unwilling to comply with their legally binding and declaratory global commitments since 1992. This failure is reflected in

- the inability of the international community represented by the world of states to agree on a legally binding follow-up regime to the Kyoto Protocol by the end if 2012;
- the relative failure of the Conference of Parties (COP 15–18) to the UNFCCC;
- the failure of most G8 countries to initiate measures to implement their announced goal (2007–2011) to reduce their GHG emissions by 80 % by 2050 that decided on 18–19 May 2012 at their summit in the USA not to repeat their previous commitments;
- the failure of the G20 meeting in Mexico on 18–19 June 2012 to adopt an agreement on financing climate change activities in developing countries;
- the failure of the United Nations Conference on Sustainable Development (Rio+20) in Rio de Janeiro on 20–22 June 2012 to adopt any new and legally binding decisions besides the declaratory statement: "Outcome of the Conference: The future we want".

This diagnosis has resulted in two different approaches on international security and environmental policy (Oswald Spring and Brauch 2011):

- a *business-as usual policy* that hopes market forces, economic initiatives and military power will be able to cope with the consequences of global environmental change;
- a *fourth sustainability revolution* that looks towards a long-term transition towards sustainability.

'Sustainable peace' is a normative concept that has been used in publications by the development and the peace research community that goes beyond Galtung's (2013) negative (absence of war) and positive (social justice) peace aiming at 'peace with nature' (*ahimsa*) combining the goal of peace with that of sustainable development, thus linking two highly contested concepts (Chap. 1 above). In a policy framework, sustainable peace calls for proactive strategies, policies and measures to prevent and avoid possible security impacts of global environmental and climate change and to diffuse future resource conflicts over the access and control of oil and gas after 'peak oil' has occurred.

The STSP project combines international relations with *environment, security, development and peace* (ESDP) studies to examine the impacts of both alternative policy approaches for international peace and security.

2.8 Conclusions

The climate performance of the G20 countries since 1990 has been unsatisfactory. Only Russia and most EU-27 countries have fully met their GHG reduction obligations under the KP, while among the Annex-B countries (under the Kyoto Protocol) Australia, Canada and the USA have been the laggards. The USA never ratified it, Canada withdrew in 2011 while Australia and Japan still adhere to these obligations. The G8 have repeatedly declared to reduce their GHG emissions by 80 % without agreeing on the base year (1990 or 2005). While the EU (2011) has started with its Energy Roadmap 2050 a policy process that aims at this goal, no similar commitments exist for Russia, Japan, Canada and the US. Some Non-Annex B G20 countries have made reduction pledges for 2020 under the Cancun Agreement, while no BASIC country pledged to stabilize its GHG emissions. The major change from 1990 to 2020 will occur between the Annex-1 and Non-Annex 1 countries: while the share of the global GHG emissions of Annex-1 countries will decline from above 50 % to slightly more than 1/3 that of Non-Annex 1 countries is projected to rise from below 50 % to nearly 2/3. This trend is also reflected in the global population projections for the G-20 until 2030, 2050 and 2100.

Changes in the global GHG emissions cannot be achieved by relying on a BAU approach in science, government, the business community and in society. Adhering to such an approach may increase the prospects that a dangerous or catastrophic climate change may trigger multiple security consequences.

A major change in GHG emissions requires strategies, policies and measures that aim at a 'sustainability transition' towards a low-carbon or green economy. Sustainability transition requires a major reduction of hydrocarbon energy sources (coal, oil, gas) and a significant increase of renewables linked with significant energy efficiency improvements in the energy (electricity, transportation, heating/cooling), production (industry, agriculture) and consumption sectors. Such a 'sustainability transition' includes these dimensions:

- *scientific dimension* (a new scientific revolution towards sustainability that requires a fundamental shift in the dominant scientific worldview);
- *societal and cultural dimension* (changes in values, attitudes, culture, world-views, mindsets, and behaviour);
- *economic dimension* (energy sector, production and consumption patterns) aiming at a progressively de-carbonized and dematerialized world, national and local economy;

– *political dimension* (changes in governance processes at the local, national and international level and of national and international policy goals to be oriented at a sustainable peace).

Such a fourfold process of a 'sustainability transition' is the major challenge for humankind during the 21st century in the Anthropocene. A 'fourth sustainability revolution' covering these four dimensions of a process of sustainability transition may avoid the prospects of major resource conflicts (on hydrocarbons after peak oil) and climate-induced conflicts and war; and the needed cooperation may increase the prospects for a 'sustainable peace'. Many of these questions will be addressed in the *Sustainability Transition and Sustainable Peace Handbook* (Brauch et al. forthcoming).

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