1 Adaptation and the Paris Agreement

1.1 THE GLOBAL CONTEXT

Around 1950 humanity began a phase of explosive growth in manufacture, trade, consumption, technology and the transformation of natural ecosystems and traditional societies. The speed of change ensured that weaknesses inherited from the past continued to deform our societies, including the exclusion and oppression of many people on grounds such as 'race', gender, caste, class and faith. Ignorance and greed also ensured that economic change had many negative side effects, notably the destruction of ecosystems and ecological services that sustain society, and the pollution of the air, food and water that sustain health.

Carbon dioxide (CO_2) from burning organic carbon in wood and coal was one pollutant that would soon come to have a particular significance. For by 1950 the biosphere – the global system comprising all life – had already absorbed almost as much extra CO_2 as it could without changing the composition of the air and the heat balance of the biosphere. As emission rates grew further the atmospheric concentration of CO_2 quickly rose to a level not seen for at least 800,000 years (Snyder, 2016; Our World in Data, 2020a). It has continued to rise ever since, with our annual carbon emissions soaring from a few billion tonnes in the 1960s to 40 or 50 billion tonnes in the 2010s (Ballantyne et al., 2012; Our World in Data, 2020b).

Because CO_2 is a greenhouse gas (GHG), this at once began the process of trapping abnormal amounts of solar radiation within the biosphere. Land use change and industry then added more and different GHGs, some of them far more potent than CO_2, including methane (CH_4), nitrous oxide (N_2O), sulphur hexafluoride (SF_6) and

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compounds based on bonds between atoms of carbon and fluorine (such as the chlorofluorocarbons or CFCs). All have different heat-trapping (and other) effects, persist in the atmosphere for different lengths of time and react differently with other chemicals and under varied physical conditions in the biosphere.

The various sources (emission origins), sinks (absorption processes) and net rate of growth in GHG concentrations in the atmosphere are monitored and reported in detail for CO_2 (Le Quéré et al., 2015, 2018; Friedlingstein et al., 2019, 2020) and CH_4 (Saunois et al., 2016, 2020). These studies show not only an increasing understanding of the complex heat-trapping effect of GHGs over time but also a series of discoveries that call into question each level of understanding almost as soon as it is reached. These uncertainties have arisen, for example, from methane sources in melting permafrost, decaying peat and warming sea beds (Chapter 2), and from nitrous oxide released by the breakdown of fertilisers in farmland. These are capable of amplifying climate change and its impacts beyond the scope of previous models.

While GHG emissions were escalating, we were also changing ecosystems and extinguishing species. This was degrading the capacity of the biosphere to absorb GHGs and buffer their effects. The net result of all these processes came to be seen as an approaching crisis of global heating, mass extinction and ecological breakdown. Our first response was a false dawn in the early 1970s, when the United Nations Environment Programme (UNEP) was founded, followed by a pause when the political world was polarised by the Cold War. There was a more complete effort in the early 1990s, built around the United Nations Conference on Environment and Development in Rio de Janeiro, where two key environmental treaties were agreed: the Convention on Biological Diversity (CBD), which sought to head off mass extinction and ecological collapse, and the United Nations Framework Convention on Climate Change (UNFCCC).

The latter sketched out a path by which we would bring net GHG emissions under control (a process known as 'mitigation'), in

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order to head off the climatic effects of global heating ('climate change') and cope with their consequences ('adaptation'). The story since has been one of long pauses, scientific progress, political controversy, denial, distraction and occasional flurries of constructive thought and useful activity, notably in 2007 and 2015. In the process it came to be realised that the drivers of global heating and climate change are so foundational to our ways of life that mitigating them adequately would be very hard and expensive.

With public support, political will, leadership and cultural change this might not be impossible, but the difficulty of achieving adequate mitigation meant that adaptation came to be seen as an equal priority. This is partly an admission of defeat but mainly a pragmatic survival response. Besides which, many adaptation actions can contribute to mitigation and vice versa, as well as helping to reduce biodiversity loss and ecosystem breakdown. Thus, we have realised that all these problems are connected and can only be solved through systemic action based on holistic thinking.

1.2 THE CLIMATE CONVENTION

The UNFCCC entered into force in 1994 and provides the main framework for global discussions on mitigation, adaptation and 'means of implementation' aspects of the climate response (Kamphof, 2018a). Decisions are taken each year at a Conference of the Parties (CoP), the first of which, CoP 1/1995, was held in Berlin.[1] Some of these were game-changing: CoP 13/2007 in Bali, for example, coincided with and contributed to a sea change in governments' perceptions of climate change as a major economic threat, and hence their engagement with mitigation; while CoP 21/2015 in Paris yielded an agreement that set out new paths for mitigation and adaptation

[1] Other recent CoPs took place in Cancún (16/2010), Durban (17/2011), Doha (18/2012), Warsaw (19/2013), Lima (20/2014), Paris (21/2015), Marrakech (22/2016), Bonn (23/2017), Katowice (24/2018) and Madrid (25/2019). The next CoP (26) is planned for Glasgow in late 2021, having been rescheduled from 2020 due to the Covid-19 pandemic – see later in this chapter and Chapter 2.

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efforts to follow, based on new ways for nations to cooperate (see Section 1.5). Decisions of special significance for adaptation had also previously been made at CoP 11/2005 in Nairobi, where the Nairobi Work Programme was agreed, and at CoP 16/2010 in Cancún. The latter authorised an Adaptation Committee at the UNFCCC Secretariat, and also issued the Cancún Adaptation Framework, which called for equal priority between mitigation and adaptation, while focusing adaptation on water, health, farms, food security, coastal zones and ecological and other systems.

Pre-dating, informing and later paralleling the UNFCCC process, the Intergovernmental Panel on Climate Change (IPCC) was set up in 1988 by UNEP and the World Meteorological Organisation. Its role is to analyse scientific findings on climate change and to inform the United Nations (UN) system about them, which it has done through a series of assessment reports (IPCC, 1992, 1995, 2001, 2007, 2014) and reviews on particular topics (most recently: IPCC, 2018, 2019a, 2019b). The sixth IPCC Assessment Report is due in 2022, and is expected to spell out: the certainty of human agency in driving climate change; the true dimensions and urgency of the emerging climate threat; and the transformative scale of global, economy-wide interventions needed to mount an adequate climate response. Many hopes are therefore pinned on the success of the CoPs in 2021–2023.

National and international laws have a common origin in top-down rule by governments, where leaders and apex forums make decisions that bind citizens and institutions to certain norms of behaviour. International law continued this tradition, and the CBD, which originated at the Rio Conference alongside the UNFCCC in 1992, reflects this top-down approach as a binding treaty imposed by all governments on all governments and the citizens and institutions over which they have jurisdiction. The UNFCCC could not be formulated in the same way, however, since even at the time (it became worse later) there was too much debate on the causes of climate change and what to do about it to agree upon anything more definite

than a 'framework convention', with the details to be worked out later. These details would be provided by the CoPs, which were expected to produce leadership statements, technical guidance documents and specific binding protocols, which they did, for example, in the Kyoto Protocol at CoP 3/1997 (and its amendment at CoP 18/2012 in Doha) on reducing and reporting GHG emissions.

Meanwhile, three things happened. First, the climate response became embroiled in intense and extended debate, based partly on scientific uncertainties but mainly on the political exploitation of those uncertainties by groups with an interest in preventing binding GHG emission reductions (Chapter 2). Second, the subject of climate change became much more complex: 'mitigation' grew to embrace many different GHGs and their diverse and changing sources and sinks in all economic sectors in all countries; and 'adaptation' grew to cover an extraordinary range of factors as it was realised that vulnerability extended to every aspect of everyone's economic system and society, and they would all need to be strengthened in different ways against changing threats. Third, it became clear that this dynamic complexity, in the absence of an all-knowing 'hegemon with the power to impose a single set of rules' (Overdevest and Zeitlin, 2011: 2), meant that the top-down approach to organising the climate response would not work (Overdevest and Zeitlin, 2014). Opinion among European Commission (EC) and European Union (EU) member state stakeholders seemed to reach this conclusion after a humiliating failure of EU climate diplomacy at CoP 15/2009 in Copenhagen, and thereafter 'the EU moved away from its ambition of legally binding instruments towards more soft yet universal agreements' (Kamphof, 2018a: 3).

1.3 EXPERIMENTALIST GOVERNANCE

These three factors opened the way for a new approach based on 'experimentalist' governance, a form that is typically established by agreement among central, global or apex actors and local, national or subsidiary ones. It has three defining characteristics: (1) there are

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overarching but provisional goals and ways to assess progress; (2) there is broad discretion for subsidiary actors to pursue the goals in their own way, provided that they report regularly and transparently so that they can all learn from each other (e.g. through peer dialogue and periodic reviews); and (3) there are opportunities to revise the goals and ways of assessing progress, and the decision-making procedures themselves, in response to the results of the review process (Sabel and Zeitlin, 2012; Zeitlin and Sabel, 2013). Thus, it involves free actors in a common enterprise where progress is made iteratively, through repeated cycles of design, effort and learning, followed by redesign, renewed effort and new learning until the goal is reached or changed.

This kind of governance system emerged in large cultural domains where centralised rule was hard to sustain, yet all actors recognised their common interests and the need to cooperate in protecting those interests. This combination often occurs in large political entities, but not necessarily so. The ancient Roman Empire, for example, maintained centralised rule over a large area by means of professional legions, good roads, loyal colonies and intimidated client states (Luttwak, 1976), and its immediate successor, the Byzantine Empire, retained centralised control using its military and religious prestige (Rocker, 1937). For clearer cases of *experimentalist* governance, we would have to look to vast cultural domains with weak central control, including the 1,000-year Holy Roman Empire of the German people (Wilson, 2016) and the EU (Sabel and Zeitlin, 2012).

Historically the aims of subsidiary actors were mainly collective security and efficient trade, but more recent experimentalist regimes have been used in the domains of food, the nuclear power generation industry and air-traffic safety (Sabel and Zeitlin, 2011). The EU is a particularly rich source of experimentation in this model, owing to its Holy Roman Empire heritage via the Federal Republic of Germany, as a hands-off oversight and standard-setting body, and the creative tension between and among the EU institutions and member states. By 2000 it had already developed an experimentalist approach to internal problem-solving, an example being the Water

Framework Directive (WFD, Sabel and Zeitlin, 2012). In this process, tensions between the top-down regulatory and bottom-up experimentalist preferences of the various member states occurred in the 1990s, until the decisive shift in favour of experimentalism occurred by 2000 (Box 1.1).

BOX 1.1 Experimentalist governance and the EU Water Framework Directive

Years of negotiation among EU Member States produced a series of directives, including the Urban Waste Water Treatment Directive (1991) and the Nitrates Directive (1991). These aimed to tackle the problem of eutrophication, the accumulation of nitrate and phosphorus compounds from sewage and fertiliser pollution, which causes excessive algal growth that can suffocate aquatic life. They also targeted health issues such as microbial pollution in bathing water, and nitrates in drinking water. . . . Realising that the world is complex, that local conditions vary, that member states all have different legal systems, priorities and capabilities, and that a 'one-size-fits-all' approach might not be the best way forward, the EU then developed its Water Framework Directive or WFD (2000). This requires integrated river basin management, and aims to ensure clean rivers, lakes, ground water and coastal beaches throughout its member states. It is a unique 'gold standard' in the management of water resources. It sets standards for river basin planning, and for the ecological quality and chemical purity of surface and ground waters. For river basins, the aims are general protection of aquatic ecology, and specific protection of unique and valuable habitats, drinking water resources, and bathing water, and all these objectives must be integrated for each river basin.

The central requirement of the WFD is that the environment must be protected to a high level, in its entirety. For ecological quality, water bodies are supposed to show no more than a slight departure from the biological community which would be expected with minimal human impact – the equivalent, say, of a Canadian lake

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BOX 1.1 **(cont.)**

exposed only to summer campers and duck-hunters. . . . As the member states tried to put the WFD into effect, they quickly developed a Common Implementation Strategy. In this, each country developed its own ideas of what good practice actually meant and how to measure progress, then applied them while studying the results, and compared notes so that they could all learn from each other. Every now and then the European Commission would study progress and lessons learned, and make proposals for everyone to think about. This kind of networked, exploratory peer learning, now called 'experimentalist governance' by academics, has proved to be an immensely powerful approach to managing systems that are too complex and dynamic for top-down rule-making to work very well.

Caldecott (2020): 163–165

1.4 EXPERIMENTALISM, SUSTAINABILITY AND SYSTEMS THINKING

The Sustainable Development Goals

Once the EU had abandoned a top-down approach around 2010 it began to exert a stronger influence on the UN, by supporting the UNEP and more generally being in favour of experimentalist solutions to major problems of environment and development. This approach contributed to the agreement in 2015 of the UN 2030 Agenda for Sustainable Development (UN, 2015) and the Sustainable Development Goals or SDGs (Kamphof, 2018a, 2018b; Table 1.1). The SDGs are overarching goals in an experimentalist sense, with autonomous actors and iterative learning processes, but each is related to the outputs of different complex systems. For example, SDG 6 (on water) depends upon the management of water resources, and those resources are themselves outputs of complex systems involving catchments, aquifers, farms, dams, pipes, treatment

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Table 1.1 *The SDGs for 2015–2030*

SDG	Summary description
1	*No poverty*: End poverty in all its forms everywhere, through inclusive economic growth and equality.
2	*Zero hunger*: End hunger, achieve food security and improved nutrition, and promote sustainable agriculture.
3	*Good health and well-being*: Ensure healthy lives and promote well-being for all at all ages, as essential to sustainable development.
4	*Quality education*: Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all, as the foundation for improving people's lives sustainably.
5	*Gender equality*: Promote gender equality and empowerment of all women and girls as a necessary foundation for a peaceful, prosperous and sustainable world.
6	*Clean water and sanitation*: Ensure availability and sustainable management of water and sanitation for all.
7	*Affordable and clean energy*: Ensure access to affordable, reliable, sustainable and modern energy for all, as this is central to nearly every major challenge and opportunity.
8	*Decent work and economic growth*: Promote sustained, inclusive and sustainable economic growth with full and productive employment and decent work for all.
9	*Industry, innovation and infrastructure*: Build resilient infrastructure, promote inclusive and sustainable industrialisation and foster innovation.
10	*Reduced inequalities*: Reduce inequality within and among countries, through policies that are universal in principle and pay attention to the needs of disadvantaged and marginalised populations.
11	*Sustainable cities and communities*: Make cities inclusive, safe, resilient and sustainable, with opportunities for all and access to basic services, energy, housing, transportation and more.
12	*Responsible consumption and production*: Ensure sustainable consumption and production in all sectors.
13	*Climate action*: Take urgent action to combat climate change and its impacts, as global challenges that affect everyone, everywhere.

Table 1.1 (*cont.*)

SDG	Summary description
14	*Life below water*: Carefully manage the oceans, seas and marine resources for sustainable development.
15	*Life on land*: Sustainably manage forests, combat desertification, halt and reverse land degradation, halt biodiversity loss.
16	*Peace, justice and strong institutions*: Ensure access to justice for all, and build effective and accountable institutions at all levels.
17	*Partnerships*: Revitalise the global partnership for sustainable development.

Sources: UNDESA (2018); UN (2020).

facilities, etc. Moreover, every such system and every output depends upon or affects one or more of the others. For example, SDG 3 (on health) depends on the outcomes of the systems behind SDG 1 (on poverty), SDG 2 (on hunger), SDG 4 (on education) and others.

Systems Thinking

Because of their interlinkages, to make sense of the SDGs and to plan for or monitor their achievement requires systems thinking (e.g. Bateson, 1972; Meadows, 2008). This makes sense of complex phenomena using ideas such as *interconnectedness* (everything is connected to everything else), *synthesis* (understanding the whole and its parts at the same time), *emergence* (new phenomena arise from interactions among other phenomena), *feedback loops* (outputs of phenomena are inputs to other phenomena and affect their behaviour), *causality* (one thing leads to another) and *systems mapping* (tracing all the connections and effects among the parts of the system). For these reasons, experimentalism, sustainability and systems thinking are deeply connected (e.g. Sanneh, 2018), and together they provide the pervasive approach of this book. But to return to the immediate story, 2015 was also the year of CoP 21/2015 in Paris, and by then the EU had had several years after Copenhagen to encourage

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experimentalist thinking as an alternative to making a fresh attempt to agree to a top-down treaty.

1.5 THE PARIS AGREEMENT

Experimentalist Features

The Paris Agreement's role is to enhance implementation of its parent convention (UNFCCC, 2016a). Thus it shares with the UNFCCC most of its purposes (such as capacity building and reducing GHG emissions), methods (such as transparency and rules of procedure), principles (such as equity and common but differentiated responsibilities) and mechanisms, including its financial and technology mechanisms, its Secretariat, its CoPs[2] and its technical subsidiary bodies. In experimentalist terms, it has overarching goals for mitigation and adaptation (which it repeatedly states are to be given equal priority), and both a reliance on and freedom for its parties to choose, explain and report transparently on their own paths towards those goals, thus supporting both a continuous peer-learning process and periodic reviews. The latter are described as 'global stocktakes', the first of which is to be at the CoP in 2023 (Article 14), with others at five-year intervals unless the scheduling is changed.[3] As the supreme decision-making forums of the convention, the CoPs have the power to redefine goals, methods and anything else in the light of experience and lessons learned.

Global Mitigation Goal

In Article 2 the parties accept the 'temperature goal' of holding 'the increase in the global average temperature to well below 2°C above

[2] The UNFCCC CoPs since 2015 have had an overlapping role in governing the Paris Agreement through 'CMAs' (from *'Conference* of the Parties Serving as the *Meeting* of the Parties to the Paris *Agreement*').

[3] CoP 26 has been delayed by the Covid-19 pandemic from 2020 to 2021, and it is unclear whether or how this will affect the timing of the first global stocktake.

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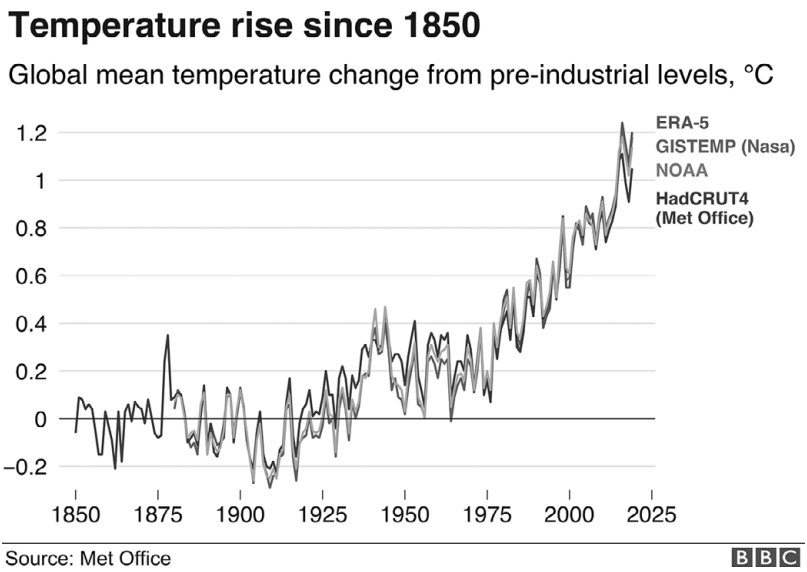

FIGURE 1.1 **The heating biosphere**
Notes: Data processed by the Met Office. Graphic from BBC News at www.bbc.co.uk/news. Reproduced with the permission of BBC News and the Met Office. (A black and white version of this figure will appear in some formats. For the colour version, please refer to the plate section.)

pre-industrial levels and pursuing efforts to limit the temperature increase to 1.5°C above pre-industrial levels'. This seems straightforward, since rising temperatures can be measured and depicted (Figure 1.1), and 'everyone knows' both that they can be felt and that they are the central issue in 'global warming'. But it is not so simple, because (1) measuring global average temperature in real time requires the continuous collection and analysis of enormous numbers of temperature records over the whole planetary surface and (2) its action significance is based on projected heating effects from GHGs in the air (as tonnes of carbon dioxide equivalent, tCO_2e), but the relationship between the two, although roughly linear, contains significant uncertainties (Matthews et al., 2009). Moreover, non-linear emissions can occur from drastic and unexpected ecological change, making projections based on linear models unrealistically reassuring, and GHGs

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exert their heating effects over long periods so there are time lags that confuse the links between actions and responses.

Only supercomputers and satellites make this indirect approach possible, and it would have been much simpler to have adopted instead the overall goal of reducing to zero, and then reversing, the rate of increase of the concentration of GHGs in the atmosphere. This is much easier to measure, and in the case of CO_2 it has been measured continuously since 1958 (Keeling, 1986; GML, 2020a, 2020b). It is also more directly relevant to the defining purpose of mitigation, which Article 4 makes clear is to reduce net GHG emissions and accumulations in the air. But the temperature goal does not obscure the key task, which is for all parties to reduce their net GHG emissions as much and as quickly as possible.

Global Adaptation Goal

In Article 7 the parties adopt 'the global goal on adaptation of enhancing adaptive capacity, strengthening resilience and reducing vulnerability to climate change'. The adaptation goal is therefore expressed in process terms. This is amplified in Article 2, where it is stated that the agreement aims to strengthen the global climate response by 'increasing the ability to adapt to the adverse impacts of climate change and foster climate resilience'. The key ideas are to increase resilience and reduce vulnerability, and build capacity to do both. Meanwhile the articles add the requirements that whatever is done to adapt should contribute to sustainable, low-carbon development (both articles), while not threatening food production (Article 2), and being seen in the context of the temperature goal (Article 7).

These articles together describe a domain in which adaptation makes societies stronger and better able to resist climate impacts, while also improving well-being sustainably without undermining other goals. Other articles add nuance to these ideas: Article 11 refers to the need for capacity building 'at the national, subnational and local levels'; Article 7 reaffirms the multilevel nature of adaptation challenges and efforts, and calls for 'a country-driven, gender-

responsive, participatory and fully transparent approach, taking into consideration vulnerable groups, communities and ecosystems', guided by science and 'traditional knowledge, knowledge of indigenous peoples and local knowledge systems' and promoted through knowledge sharing; and Article 12 stresses the priorities of education and public participation in whatever is done. Box 1.2 gives a summary of the UNFCCC Secretariat's recent thinking on what adaptation is.

BOX 1.2 What is adaptation?

Adaptation refers to adjustments in ecological, social, or economic systems in response to actual or expected climatic stimuli and their effects or impacts. It refers to changes in processes, practices, and structures to moderate potential damages or to benefit from opportunities associated with climate change. In simple terms, countries and communities need to develop adaptation solution[s] and implement action[s] to respond to the impacts of climate change that are already happening, as well as prepare for future impacts.

Adaptation solutions take many shapes and forms, depending on the unique context of a community, business, organization, country or region. There is no 'one-size-fits-all-solution' – adaptation can range from building flood defences, setting up early warning systems for cyclones and switching to drought-resistant crops, to redesigning communication systems, business operations and government policies. Many nations and communities are already taking steps to build resilient societies and economies, but considerably greater action and ambition will be needed to cost-effectively manage the risks, both now and in the future.

Successful adaptation not only depends on governments but also on the active and sustained engagement of stakeholders including national, regional, multilateral and international organizations, the public and private sectors, civil society and other relevant stakeholders, as well as effective management of knowledge. Adaptation to the impacts of climate change may be undertaken across various regions, and sectors, and at various levels.

BOX 1.2 **(cont.)**

Parties to the UNFCCC and its Paris Agreement recognize that adaptation is a global challenge faced by all with local, subnational, national, regional and international dimensions. It is a key component of the long-term global response to climate change to protect people, livelihoods and ecosystems. Parties acknowledge that adaptation action should follow a country-driven, gender-responsive, participatory and fully transparent approach, considering vulnerable groups, communities and ecosystems, and should be based on and guided by the best available science and, as appropriate, traditional knowledge, knowledge of indigenous peoples and local knowledge systems, with a view to integrating adaptation into relevant socioeconomic and environmental policies and actions.

Source: UNFCCC (2020a).

Adaptation Reporting and Learning

Parties to the UNFCCC agreed at CoP 19/2013 in Warsaw that each would submit a report to the Secretariat, to be known as its Intended Nationally Determined Contribution (INDC), on its circumstances and willingness to contribute to the global climate response. The call was reiterated at CoP 20/2014 in Lima, along with further non-binding guidance on the expected content of each INDC and special provisions for least developed countries (LDCs) and small island developing states (SIDS; Holdaway et al., 2015). Most did so, and the INDCs were synthesised to provide a reference level of ambition and commitment for use in negotiations when CoP 21/2015 convened in Paris (UNFCCC, 2015), with the synthesis being updated immediately afterwards (UNFCCC, 2016b). Parties to the Paris Agreement then agreed in Article 4 to submit the same kind of report, now known as a Nationally Determined Contribution (NDC), as soon as possible after formally joining the agreement and every five years thereafter (UNFCCC, 2020b; WRI, 2020). Since most

of the first generation of NDCs were dated 2016, the majority of updates are expected in 2021.

In Article 7 the parties further agreed that they would 'submit and update periodically an adaptation communication', which could be part of or separate from the other reports that the UNFCCC requires of its parties, including Biennial Update Reports, National Communications, the NDCs themselves, and also the National Adaptation Plans (NAPs) envisioned under Article 7 of the Paris Agreement. The intention of allowing this overlapping reporting was to avoid 'creating any additional burden for developing country Parties'. The result is that there are a number of routes through which parties can convey descriptions of their circumstances, vulnerabilities and actions, and articulate their adaptation needs and priorities. To these can be added the 'adaptation scorecard' reports that EU member states have prepared, which are not part of the UNFCCC/Paris Agreement arrangements, but which relate to the EU-wide NDC (Chapter 11).

The adaptation communications are the collective mechanism by which the parties inform each other and the entire global community of interest, through the Secretariat, of their intentions regarding, and progress towards, the adaptation goal in its 'local, subnational, national, regional and international dimensions' (Article 7). Apart from being a source of insights, experience and lessons learned for use and sharing by the Adaptation Committee of the Secretariat, the adaptation communications are raw materials for the global stocktake process. In Article 14 the parties agree to assess collective progress 'in a comprehensive and facilitative manner, considering mitigation, adaptation and the means of implementation and support, and in the light of equity and the best available science'. In Article 7 the parties agree that the stocktake will use the adaptation communications to review 'the adequacy and effectiveness of adaptation and support provided for adaptation' and 'the overall progress made in achieving the global goal on adaptation', with a view to enhancing 'the implementation of adaptation action'. Informed by the stocktake, the

relevant CoP will then make decisions as appropriate to amend goals, strategies and anything else where changes are needed.

The Talanoa Dialogue

One of the decisions of CoP 21/2015 in Paris was to encourage dialogue among countries, through which they could share insights and experiences as they prepared to implement the Paris Agreement (UNFCCC, 2020c). An official process of this kind was launched at CoP 23/2017 under the presidency of Fiji, and named the 'Talanoa Dialogue' from a Pacific (Fijian-Tongan-Samoan) word meaning 'talk' or 'discussion' (Robinson and Robinson, 2005), or less prosaically, 'storytelling without concealment' (Moorhead, 2019). It was a one-year process designed to promote understanding and mutual aid among countries in thinking and talking through the implications of their Paris Agreement commitments, and, it was hoped, would be reflected in more ambitious mitigation goals being announced at CoP 24/2018 in Katowice. The resulting *Talanoa Call for Action* was short on specifics, but the *talanoa* approach offers a way to promote adaptive thinking, where sharing ideas and knowledge is critical to progress (Chapter 13).

Rethinking the CoPs

Before reaching the global stocktake, new issues have arisen over how CoPs work in practice. These started as large meetings and grew larger over time: the mean number of participants was 5,040 in CoPs 1–10, 8,875 in CoPs 11–14, 16,482 in CoPs 15–22 and 22,733 in CoPs 23–25. In recent CoPs, nearly two-thirds of the participants were from states (parties and observers), more than a quarter were from observer organisations (mainly non-governmental organisations (NGOs)), and the rest were from the media (UNFCCC, 2020d). These numbers reflect intense and growing public interest in climate change, and also the fact that countries and organisations feel they have something to gain or lose from the outcomes.

The Covid-19 pandemic has called the model into question, given the potential of a physical meeting to result in the infection and potential disablement or death among specialist officials, journalists and activists. The main argument in favour of retaining a physical format is that deals are done and influence exerted through persuasion and consensus-building among people interacting directly, often in informal settings on the conference fringes. Also, the annual conference means that at least once a year there is significant media coverage of climate change issues. These effects would be hard to reproduce through remote digital/virtual conferencing, but the urgent need for decisions on climate change has driven discussion of alternatives (Calliari et al., 2020; Mori, 2020). In the present context, CoP 26 is due to make decisions on Article 6 of the Paris Agreement, and hence to agree a specific mechanism and operating guidelines for the supervision and coordination of international carbon emission offsetting and trading. This is an important and divisive topic, and there are many others.

There is also concern that the structure of the CoPs raises issues of representation, inclusiveness and influence in relation to gender and ethnicity, including limited opportunities for indigenous peoples' delegates to bring about change (e.g. Suseeya and Zanotti, 2019). The whole issue is complex, however, since only the CoP can legally make binding decisions (and must therefore meet in order to decide not to meet), and attending a physical meeting is a poor way to obtain the insights and influences of all the world's peoples and interest groups. A solution may lie in something like an upward cascade of virtual citizens' assemblies and other national consultations to provide guidance to each country as it prepares and then submits its proposals for specific actions and decisions to the UNFCCC Secretariat. The latter would collate and circulate these proposals, in advance of a parties-only meeting to decide what to do through consensus or voting. A scaled-down and careful physical CoP in 2021 may be the most likely scenario for now, with a more limited, regulated and therefore controversial NGO and media presence, while other arrangements are gradually devised.

1.6 DESIGN OF THE BOOK

There are many ways to consider and describe the problem of growing instability of the world's climate, and many points of view upon which to base potential solutions. It is often described as a 'wicked' problem (Chapter 9) because it has no common meaning for everyone, and almost every aspect of it is worrying and debatable. This book targets a topic at one extreme of this uncertainty – adaptation – and tries to make it make sense in terms of the behaviour of complex systems. The aim is to consider climate systems and the ecological and social systems with which they interact, and to develop some simple ideas for how best to adapt to chaotic system change.

Evidence and case studies are therefore deployed to explain how and why to strengthen ecological and social systems as a key way to promote adaptation at the local and landscape levels of all countries. This responds to the adaptation goal noted in Section 1.5, since it assumes that systems must be made stronger in various ways, including resilience, to reduce their vulnerability to near-random climate stresses, while the capacity of stakeholders to build such strength is increased, and the ability of the systems to meet human needs sustainably is preserved or enhanced.

The approach is inherently bottom up, so would benefit from the experimentalist dimension of knowledge sharing and networking, among adapting communities and also with governments that have an essential role in enabling and supporting local stakeholders in their efforts to adapt. This alliance between local and central stakeholders is complementary to other government roles in orchestrating sustainable national development in cooperation with other governments that are also faced by climate change. The key point is that local people face microclimatic chaos, rather than macroclimatic change, and this can only be adapted to through local actions that strengthen local systems.

If this is done effectively, then each country will grow stronger at its 'grassroots', and a large part of the climate problem for each

country will be made less severe. The problem itself cannot be solved without major progress on mitigation, but adaptation can buy time and limit casualties and costs while this is achieved. The design and performance of recent aid projects are considered in light of this approach, in the hope of guiding future adaptation investments to perform better in future and in practice. Along the way it is also hoped to establish that much of what many good aid projects do already is in fact helpful to adaptation, and that the need is for *more of the same but better, plus systems thinking*.

Chapter 2 describes the scale and urgency of the emergency that we are facing, and some ways to think about what we are trying to do about it and why. It ends with a brief review of some changes that offer grounds for hope that peoples, governments and major institutions are reacting more realistically to the overall challenge than they have ever done, but also that this is just a beginning relative to the likely climate system breakdown in mid-century. A sea change in our collective attitude is needed, but this may already be underway. In this hope, Chapter 3 offers the conceptual tools that are needed to support a new and localised approach to adaptation, introducing systems and systems thinking, chaos and its relevance to climate, and the nature of ecological and social systems. Chapter 4 explores the sources of strength and weakness in these systems, and how this knowledge can be applied to help them cope with chaotic stresses.

Chapters 5–7 then relate how these principles were applied – if not deliberately then at least in practice – to aid investments in Nepal, Bolivia and Zanzibar, and with what effect. These chapters therefore also explain how to identify and plan for the telltale signs of good design and high performance in real-life projects that directly or indirectly affect the strength of systems in the face of climate chaos. They are followed in Chapter 8 by a brief discussion of some principles for adaptation in cities. The book then returns to the global perspective, with Chapter 9 on evolving ideas, priorities and choices of researchers, aid professionals and governments since the Paris Agreement, followed by a review in Chapter 10 of changing patterns in adaptation

action and adaptive thinking, as revealed by an analysis of the adaptation communications submitted in 2015–2020. Chapter 11 then details the adaptation challenges and responses in Europe, small islands, Africa and the Americas, before Chapter 12 explores the question of how to design and evaluate adaptation investments in light of all this.

As new approaches to adaptation are tried out and understood, points of consensus start to be visible. This is a complex and dynamic process, however, as there has been more innovation, and more progress, on the climate response in the last five years than in the previous five decades. But the direction of travel is in line with everything that had previously been discovered about the importance of ecosystem-based and community-based sustainability. For example, it has long been known that community-based ecosystem management involving secure tenure, forums, environmental education and intercommunity networking tend to enable sustainable and equitable outcomes, and that similar arrangements work similarly well in African, Asian and American forest, savannah, wetland and coastal marine ecosystems (observations and references in Caldecott, 1988, 1996, 2005, 2015, 2017a, 2020; Caldecott et al., 2013; Lutz and Caldecott, 1996). Moreover, that this is so regardless of the kind of renewable resource concerned, from ecotourism and bioprospecting revenues to fish, wild meat, rattan cane and timber harvests.

This knowledge leads towards the conclusion that climate chaos must be addressed primarily at the local and landscape levels, where its impacts are most severe yet can also be resisted by strong ecological and social systems. Hence it is possible to sketch out a framework for designing and evaluating aid investments to make them more effective in promoting such an approach. The aim is for these findings to contribute to discussion in the years leading up to the first global stocktake required by the Paris Agreement, and beyond.

Chapter 13 concludes the book by considering some of the distinctive issues involved in thinking about mitigation and

adaptation, and their implications for our understanding of the emergency that faces us. It emphasises that our collective responses do, and must, go much deeper than anything we have yet attempted as a global system of peoples, cities, countries and ecosystems. To keep focused we will need hope, for which there is at least some good reason, and also a sense of purpose based on a commitment to take the kinds of collective action for which humans are best equipped, with the aim of building 'Peace with Nature'. The final section offers specific messages for the UNFCCC Secretariat, national and local governments, aid institutions, students, researchers and teachers, and for the citizens of localities and landscapes everywhere.