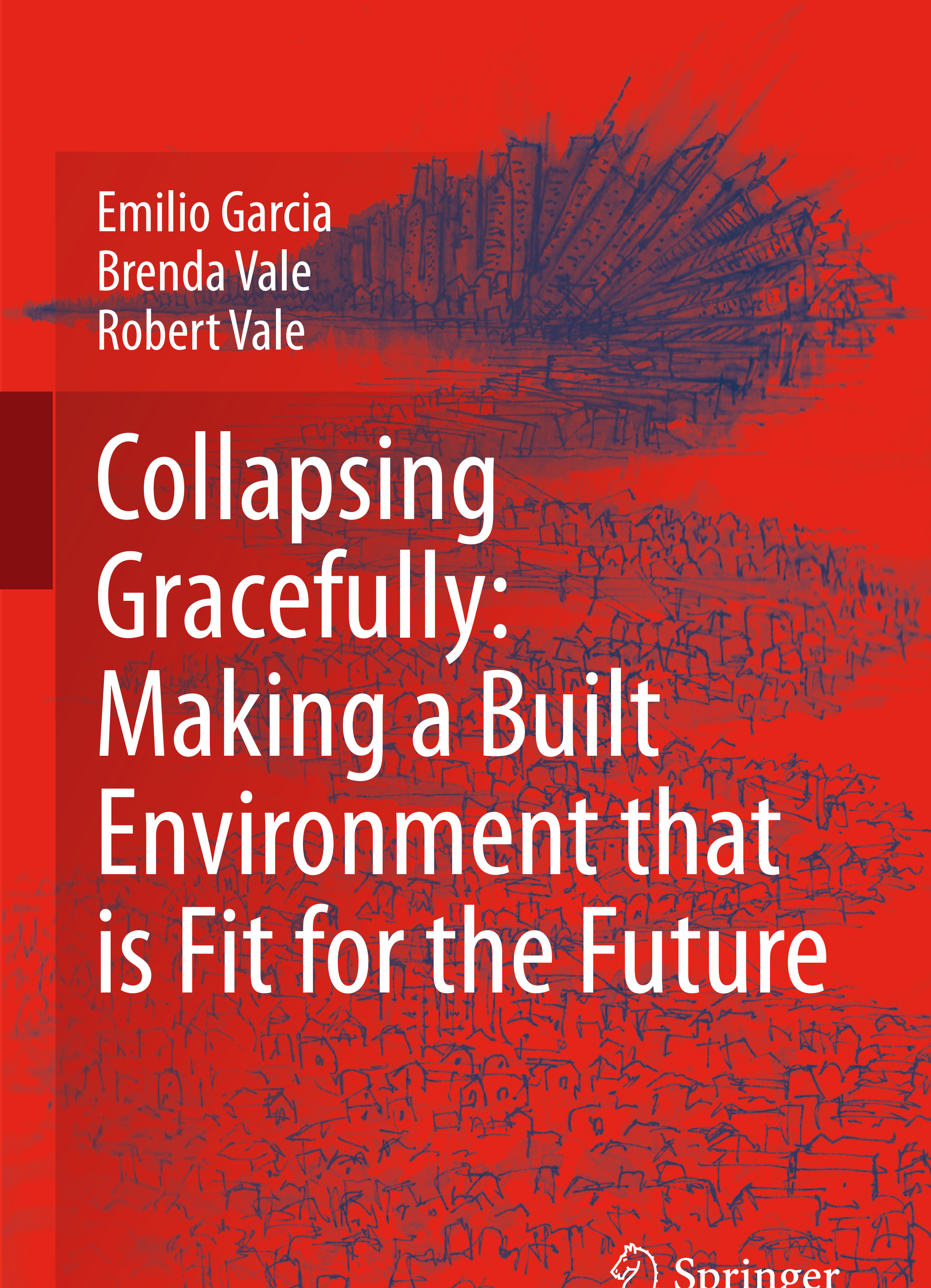

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Collapsing Gracefully: Making a Built Environment that is Fit for the Future

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Preface

This book examines what has caused the societal collapse in the past and applies this to the present, in the face of the latest impacts of climate change at the poles, the need to reduce 70% of our carbon emissions in 11 years, and the growing disproportional environmental impact between a rich minority and the rest of the world. It is also the first time in history that the human habitat is clearly identified with urban landscapes and the concentration of people in cities. This increases the dependence of cities on rural areas to obtain a continuous supply of food and ecosystems services. Moreover, it exposes millions of people living in coastal cities to the threat of sea-level rise. Regardless of these facts, cities keep on developing and growing, investing more energy and resources in their built environments without accounting for the social and environmental costs of doing this. For these reasons, this book focuses on the built environment. With this focus, the aim is to consider what needs to happen to the built environment now to avoid sudden, enforced change in the future. This is not a book about the end of the world, hopeless apocalyptic scenarios, or the struggles of ancient societies to persist. This is a book about understanding critical changes in the context of social and environmental crises and how this could be instrumental in taking future decisions about our habitat.

The book is about applying what has been learned about the societal collapse in the past to the present. Reading it, the aim is to make all involved in making decisions about the built environment—politicians, economists, engineers, planners, designers, educators—think differently about it in order to cope with a very uncertain future, given how long the built environment lasts.

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Introduction

The United Nations Refugee Agency website (UNHCR, 2020) details stories of people from Syria whose lives were turned upside down by the war. Many fled as refugees. For these people life, as they had known it, no longer existed. A way of life had collapsed and new lives had to be formed from the remnants. In contrast, for many people, and especially those living in wealthier societies, life seems stable and far from any possible collapse. For many people, life has never been better. We have a secure water supply, we have shelter, and through modern herbicides, pesticides and fertilisers we have much more control over the production of food than many previous human generations. We also have the benefits of modern medicine. We are a very mobile society, no longer living within the limits of how far we can walk in a day. Now that same day can see you moving from one continent to another. At the touch of a switch, we can light up the night, something undreamed of for many people a century ago. A modern developed society is dependent on electricity as predicted in an article from 1928: "It should not be regarded merely as a new form of light and heat; electricity provides a complete revolution in method" (Dale, 1928). Electricity underpins all modern communication systems. Electricity supply can fail and for most people power cuts are the nearest they come to experiencing the collapse of something they have come to rely on, albeit the collapse is only temporary.

All these benefits of modern society have come about through the exploitation of technological developments. The exploitation has occurred because the resources are there to provide and power the necessary hardware. At the same time, as discussed below, there have always been those who question if this supply of resources is inexhaustible and if it is possible, given human population growth, to provide the

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level of development seen in wealthy countries to all the people in the world, those in the less wealthy countries and also to the poorer members of the wealthy societies.

Many of the issues involved in the collapse of societies in the past (see Chap. 3), such as environmental problems, pollution, lack of resources, inequality and lethal pandemics, are relevant to wealthy modern societies. Modern citizens feel themselves far from the possibility of collapse, so, no doubt, did the citizens of the mighty Roman Empire. The purpose of this book is to look at aspects of collapse, both in general terms but also particularly how they might relate to the built environment. This first chapter introduces the environmental issues facing modern humanity. Initially, however, it may be useful to think about types of collapse.

Types of Collapse

Arnold Bennett describes a scene early on in his 1908 novel, *The Old Wives' Tale* (Bennett, 1908), in which the 15-year-old daughter Sophia tries on her mother's new crinoline skirt and subsequently falls over in a mass of silk and hoops somewhat buoyed up by the voluminous garment. This could be construed as a picture of collapsing gracefully and she is soon put back on her feet by her sister.

Sophia's graceful collapse can be compared with the death of her father John Baines in the same book a few pages further on and 2 years later. John Baines had suffered a stroke many years back and was confined to bed. Left unattended, he collapsed by slipping out of bed and asphyxiated on the floor (Bennett, 1908: Book 1, Chap. IV, Part III). He was found with his "tongue protruded between the black, swollen, mucous lips". Unlike Sophia in the crinoline, for John, there was no soft landing when he fell out of bed. This suggests that the collapse can be relatively graceful or exactly the opposite.

What this description does not define is the meaning of collapse. Both characters in *The Old Wives' Tale* suffer a collapse but Sophia recovers from it while John does not. Although we can describe what happens to both of them as a collapse, in one case the collapse is catastrophic and fatal and in the other the collapse is only mildly inconvenient and even somewhat comical, so clearly collapse can have several meanings.

Collapse can also happen in different contexts. Without entering into a deeper discussion about the definition here (see Chap. 3 for the detailed definition), collapse happens in specific contexts, situations and environments that are part of the process of collapse. Falling in a mass of silk as a young lady is very different from falling out of a bed after a stroke when you are older. The context and the environment where collapse happens could play a role in making it more or less graceful.

The assumption of this book is that the built environment, as the cultural landscape and habitat of a society where the process of collapse occurs, plays a role that deserves to be studied to avoid an ungraceful landing. Therefore, this book sets out to examine what collapse means for the built environment, not just for the societies that create it and inhabit it. Past societies that have disappeared, such as the Romans and the

Incas, have left behind built environments that themselves may have been part of the reasons behind such societal collapses. The question we wish to explore here is what type of built environment do we need to create now so that we can avoid collapse or, at the very least, collapse gracefully, given that the built environment tends to last a long time. We have to remember that much of the built environment that we use today was built by previous generations. We manage to live quite happily in what our ancestors built, even though they did not have the benefits of computers, mobile phones, space travel or fast food.

The Faith in Economic Growth

There are reasons why nearly a quarter of the way through the twenty-first century humanity should be worrying about collapse. In 1970, a group called the Club of Rome asked researchers at MIT to use the newly available power of computer modelling to model the future of humanity.

> The Club of Rome is an organisation of individuals who share a common concern for the future of humanity and strive to make a difference. Our members are notable scientists, economists, businessmen and businesswomen, high level civil servants and former heads of state from around the world (Club of Rome, 2018).

This work resulted in a book published in 1972 called *The Limits to Growth* (Meadows et al., 1972). The model compared the interaction between resources, food per capita, industrial output per capita, population and pollution for several different scenarios and concluded that whatever assumptions are made about these five factors "The basic behavior mode of the world system is exponential growth of population and capital, followed by collapse" (Meadows et al., 1972:142). Accepting that any model is a simplification of a complicated situation, this study showed the dangers of allowing exponential growth in a finite system, concluding that "Every day of continued exponential growth brings the world system closer to the ultimate limits to that growth. A decision to do nothing is a decision to increase the risk of collapse" (Meadows et al., 1972:183).

This work was, not unexpectedly, heavily criticised, not least by economists who of course cannot possibly consider the idea of "limits to growth" as that would run counter to their fundamental faith that growth without end is not only possible but necessary and desirable. The critics claimed that the MIT study had failed to factor in the effect of changes to and innovations in technology and the ability to substitute "…man-made factors of production (capital) for natural resources…" (Stiglitz, 1974). Schumacher (1973:99–102), who was against the modern economic ideals, was also a critic. He criticised the MIT group by proposing that the calculations done were redundant since the conclusions could be derived from the assumption that infinite material growth is not possible in a finite world. Moreover, he highlighted that it is hard to estimate the resource availability in the world and even more difficult to understand the impact that the "inventiveness of industry" can have on future availability and exploitation of resources (Fig. 1.1).

Notwithstanding the criticisms, *The Limits to Growth* did suggest that humanity might need to investigate its behaviour in order to be sure that current patterns of living would not lead to the collapse it predicted.

The seemingly irrational commitment of economists to endless growth in a finite world may indeed be the reason why as a society we do not seem to take seriously the idea that a collapse might be possible or even likely, in spite of evidence to the contrary. For example, in 2008 Graham Turner, a senior research scientist at the Australian government research organisation CSIRO, wondered to what extent the modelling carried out in 1970 for *The Limits to Growth* had been accurate, so he compared what had really happened in the 30 years since 1970 with the predictions of the *Limits to Growth* modelling. He found that since 1970 reality had very closely followed the path suggested by the modelling of a "business-as-usual" scenario in *The Limits to Growth* leading him to the rather shocking conclusion that "global collapse" was likely "before the middle of this century", i.e. before 2050 (Turner, 2008:37). Clearly, Turner's idea of a collapse is not the same as falling down in a crinoline. We will discuss the possible meanings of collapse and in particular what we mean by it in this book, in more detail, but at this point, it is enough to say that

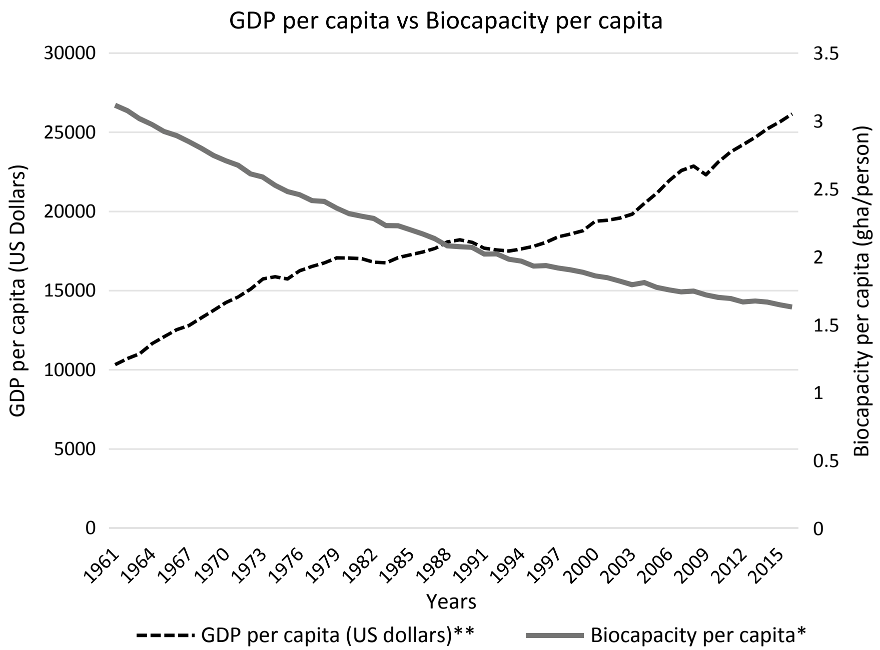

Fig. 1.1 Global GDP growth (per capita) and depletion of biocapacity (per capita). *Data sources* *Global Footprint Network (2019), ** WID.world (2019a)

we will be thinking more about Turner's idea of "global collapse" than the gentle collapse from falling over in a crinoline, buoyed up by its hoops and skirts.

If global collapse is due around 2050 as stated by Graham Turner and by *The Limits to Growth* before him, that is not very far off in time. As we write this, 2050 is about as far ahead of us as 1990 is behind us. As it happens, 1990 is the reference date for the Kyoto Protocol, the global agreement for reducing the greenhouse gas (GHG) emissions that are causing climate change.

> During the first commitment period, 37 industrialized countries and the European Community committed to reduce GHG emissions to an average of five percent against 1990 levels. During the second commitment period, Parties committed to reduce GHG emissions by at least 18 percent below 1990 levels in the eight-year period from 2013 to 2020 (UNFCCC, 2018a).

So maybe it would be a good idea to see how we have done in the 30 years from 1990 to now in order to get an idea of how well we might do in the 30 years from now until 2050 in order to try to avert collapse or at least to try to collapse gracefully.

One way to get a handle on this might be to see how things have changed since 1990 in terms of the five factors considered by *The Limits to Growth* modelling, which were pollution, population, food per capita, industrial output per capita and resources. Starting with one form of pollution, in 1750 global carbon (not CO_2) emissions were 3 million tonnes. This figure rose to 6,074 million tonnes in 1990, and in 2014, emissions were 9,855 million tonnes (Boden et al., 2017). German researchers have concluded that although the Kyoto Protocol, which applies only to its signatories, not to the whole world, may have led to reduced emissions in some of its signatory countries, this has been achieved by the signatories exporting carbon-intensive production to non-signatory countries. Overall, the Kyoto Protocol has had either no effect or may even have increased global emissions (Aichele & Felbermayr, 2011). Not all nations signed up to the Kyoto Protocol and even though some did it does not seem to have made any difference since global carbon emissions have increased by over 60% between 1990, the reference year for the Kyoto Protocol, and 2014, the last year for which there are accurate figures. Until the COVID-19 pandemic in 2020 closed down many activities, emissions had not fallen since 2014 (Mooney & Dennis, 2019).

If carbon emissions are harmful to the climate as suggested by global agreements such as the Kyoto Protocol (UNFCCC, 2018b) and the more recent Paris Climate Agreement (United Nations, 2015), so far human society has failed to acknowledge this harm because we have not done anything to reduce the emissions.

One reason for the increase in emissions might be because of population growth, even if emissions per person stayed the same, more people will mean more emissions. The world population in 1990 was 5,327,231,061 and in 2014 it was 7,295,290,765 (Worldometers, 2020). This is an increase in the population of 37%. If we had managed to keep to the same level of emissions per person, we could have expected a similar rise in emissions as the rise in population, but between 1990 and 2014 emissions rose by 60%. Emissions have risen by quite a lot more than population growth which suggests a problem ahead (Fig. 1.2). Using the 2014 population, the

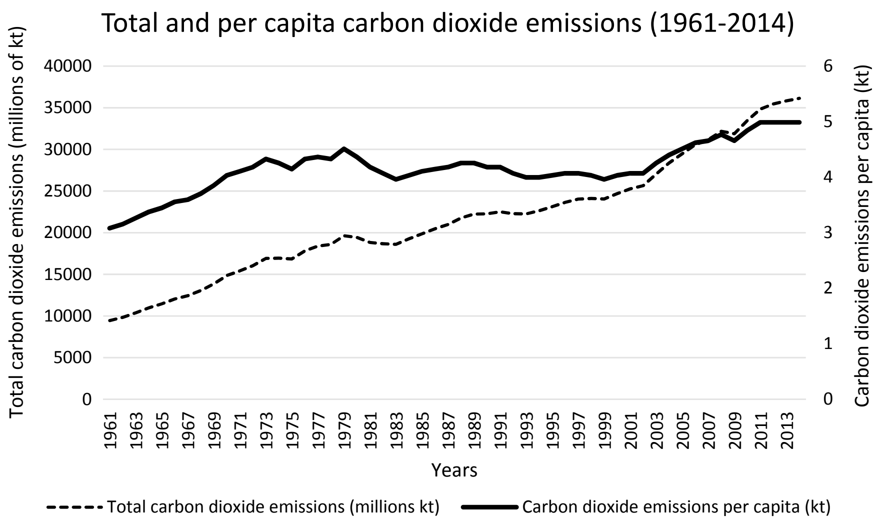

Fig. 1.2 Global carbon dioxide emissions. *Data source* Boden et al. (2017)

carbon emissions per person have risen from 1.1 tonnes in 1990 to 1.3 tonnes in 2014. Carbon dioxide is invisible, making emissions quite hard to visualise, but given that dry wood is about 50% carbon (Ecometrica, 2011) each person on earth is now responsible for throwing away the carbon equivalent of two and a half tonnes of firewood every year. This global average figure represents more energy than some households use in a year (Chicca et al., 2018:201).

Turning to a more visible form of pollution, a recent report from the UK's Government Office for Science states "Around 70 per cent of all the litter in the oceans is made of plastic". The report goes on to make the shocking statement "Globally, production of plastics exceeds 300 million tonnes per annum and it is likely that a similar quantity of plastics will be produced in the next eight years as was produced in the whole of the twentieth century" (Thompson, 2017:4). It is more than likely that quite a lot of this very durable plastic will end up in the sea. In spite of the durability of plastic, we tend to use it for ephemeral purposes—more than half of the plastic used in North America and Western Europe is used for packaging (Gourmelon, 2015)—and then we throw it away, the problem being that there really is no "away" to throw it into.

In terms of the *Limits to Growth* factor of food per capita, the value (comparable in dollar terms) of agricultural production in 1990 was US$1,431 billion, and in 2016 the figure was US$2,629 billion (FAO, 2017:88). This is an increase of 84%. On the very crude assumption that the value of production represents the amount of food produced, more food is being produced than the increase in population, meaning there could be less malnutrition. This hypothesis is supported by the figures, as the World Bank shows that whereas in 2000 14.8% of the world's population was undernourished, by 2015 the percentage had fallen to 10.7% (The World Bank

Group, 2018a), so no collapse there. On the other hand, the increased value of food production also represents higher value products, such as more meat and dairy. The United Nations Food and Agriculture Organisation predicts an increasing proportion of the world's protein input coming from meat in all countries including those which are already classed as "developed" (OECD/FAO, 2015:34).

The problem with this is that meat uses a lot of grain for its production, with grain for feeding livestock expected to be the main part of cereal use by 2024 (OECD/FAO, 2015:30). Feeding grain to livestock uses a lot more land to provide a given amount of calories or protein than feeding grain to people. It is not just the quantity of food but the type of food that has an impact. A vegetarian diet with dairy products and eggs uses less land area than one based on meat (Pimental & Pimental, 2003). The move to more meat (and dairy) may be a problem in another way since according to a recent study, humans already represent 36% of the weight of all mammals on the Earth and their farm animals are an additional 60%. Only 4% of the total biomass of mammals on Earth is wild animals, including everything from elephants and tigers to rats and mice (Bar-On et al., 2018). As the number of people and the number of farm animals continue to grow, the number of wild animals will decline further until it will no longer be a question of the elephant in the room because there will be no elephants.

Finally, and unsurprisingly, as Barry Commoner stated in the first of his four principles of ecology "everything is connected to everything else" (Commoner, 1971), modern "efficient" agriculture and food production are enormous users of energy. As far back as 2003, the production of food in the United States used not only half the country's total land area, leaving less space for the buffalo to roam, but also 80% of the fresh water and a surprising 17% of the total fossil fuel energy (Pimental & Pimental, 2003). What is often not mentioned is that this means that "when the oil runs out" there will be no food. Global proved oil reserves are currently enough to meet 50.2 years of consumption at the 2017 rate, or less if demand increases (BP, 2018:13). This may not be a problem as the Deputy Director of the United Nations FAO says that there are only 60 more harvests left to the world because of soil degradation (Arsenault, 2014).

It might not matter if the oil to grow crops runs out because there might not be any soil left to grow them in. Collapse, what collapse?

The Faith in Technological Development

The next factor used by *The Limits to Growth* to predict collapse was industrial output per capita. We saw earlier when considering pollution that "a similar quantity of plastics will be produced in the next eight years as was produced in the whole of the twentieth century" but of course one person's pollution is another person's production. Producing all that waste plastic has made a profit for someone, so must that make it an acceptable thing to do (Fig. 1.3)?

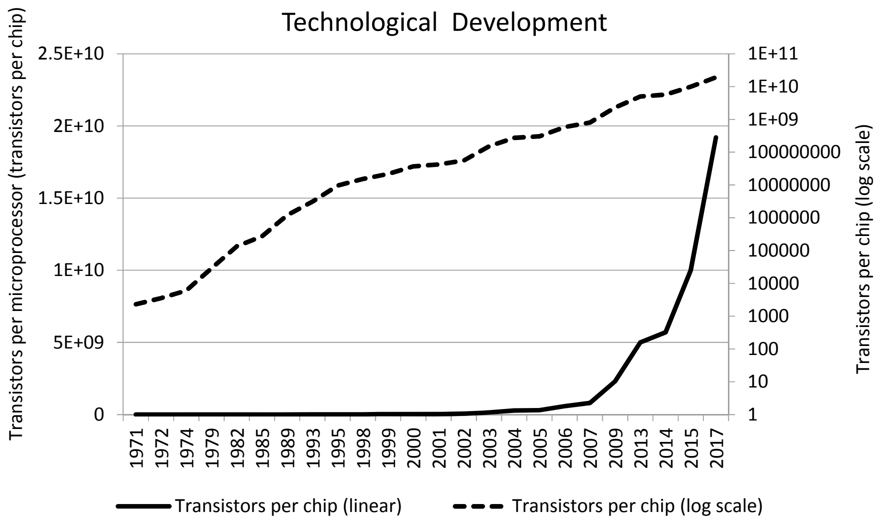

Fig. 1.3 Global technological development in transistors per chip. *Data source* Rupp (2018)

Waste from the materials produced by industry is high on several levels. Hawken et al. (1999:81) pointed out over 20 years ago in their book *Natural Capitalism* that "only one percent of the total North American materials flow ends up in, and is still being used within, products six months after their sale". This one percent is not just because things are being thrown away but also because it often takes a lot of discarded material to make the desired material. For example, the manufacture of a single gold wedding ring results in the creation of about 18 tonnes of mining waste (Farrell et al., 2004:3). As Schumacher noted (1973:97), "The most striking thing about modern industry is that it requires so much and accomplishes so little".

The OECD (2018) defines industrial production as "…the output of industrial establishments and covers sectors such as mining, manufacturing, electricity, gas and steam and air-conditioning". Since 1994 (the farthest date in the past for which figures are given) it has increased by 92% (based on data from The World Bank Group, 2018b) compared with the population which has risen by less than half this amount in the same time. The clear meaning of the figures is that there are not just more people on the Earth, there are more people with more stuff. This might work in a "circular economy" where the resources in a discarded product are used to make a new one, but the world does not work like that. Having more stuff means making more waste. Municipal solid waste, the technical term for what the garbage man collects, has risen in the United States from 2.7 lb (1.2 kg) per person per day in 1960 to 4.4 lb (2.0 kg) per person per day in 2013. In 1990, the date we are using here for comparisons, it was over 4.6 lb (2.1 kg) (EPA, 2016), so at least the figure has come down slightly but there has been a big increase from the apparently less wasteful era of the 1960s.

It is not just in the USA that waste is increasing, it is a global phenomenon. A report published by the World Bank puts it very clearly “MSW generation levels are expected to double by 2025. The higher the income level and rate of urbanization, the greater the amount of solid waste produced” (Hoornweg & Bhada-Tata, 2012:8). In Chap. 2, a building dedicated to the incineration of waste in Oslo is discussed to illustrate how this problem is being approached by a “superstar architect”.

Technological developments also produce waste. The rise in ownership of electronic goods has also led to a rise in electronic goods that are no longer wanted or E-waste. In 2016, some 44.7 million metric tonnes (Mt) of E-waste were produced, and this is predicted to rise to 46 Mt in 2016 and 52.2 Mt in 2021, which means E-waste is growing at a yearly rate of 3–4% (Baldé et al., 2017:38). In 2019 the iron, copper and gold in this waste together with other lesser components had a value of around US$ 57 billion but only 17.4% was recycled (Forti et al., 2020:14–15). We may think we are buying smartphones but we are not smart enough to recover the valuable materials in them when we throw them away.

It seems the situation is that the Earth has more people emitting more carbon dioxide and producing more waste than ever before. But we have more food and more stuff, so perhaps there is no problem. Assuming that the carbon dioxide does not change the climate to the point where much of the planet becomes uninhabitable and assuming that the waste does not choke us, the problem may lie in resources, the last of the *Limits to Growth* categories to be considered here. Do we have enough of the materials we need to allow us to carry on growing? A report published in 2001 (Tilton, 2001) suggests that there is little likelihood of mineral resources “running out” in spite of their being finite, because as a resource becomes harder to get either its price increases, which makes it cost-effective to extract it from sources that are more expensive to exploit, or ways are found to substitute it with something else. It can be argued that humanity is unlikely to run out of materials soon.

Turning to one particular category of resources, it seems somewhat perverse that humanity has chosen to build a society with a growing population powered by increasing consumption of the finite or non-renewable sources of energy, petroleum, natural gas, coal and uranium. But perhaps this finite nature is more conceptual than real, are the non-renewable fuels really finite in practice? A German source is helpful in this respect.

> In relation to the conditions in 2007, conventional crude oil will be available worldwide for 42 years, natural gas for 61 years, black coal for 129 years and lignite for 286 years. In relation to the reserves in 2005, uranium has a reserve-to-production ratio of 70 years. However, this represents a snapshot and assumes that the consumption, based on the existing reserves, is continued at the current level in the future. What it does not take into account is that advancements in energy-saving technology and substitution successes reduce the consumption while the discovery of new deposits, as a result of improved exploration technologies, can increase the reserves (Kraftwerk Forschung, undated).

From that point of view, there seems to be something to worry about, if oil will be used up in 42 years from 2007, assuming consumption “at the current level”, that means by no later than 2049, with increased consumption between 2007 and now suggesting the date might come rather sooner. Something else will have to replace it

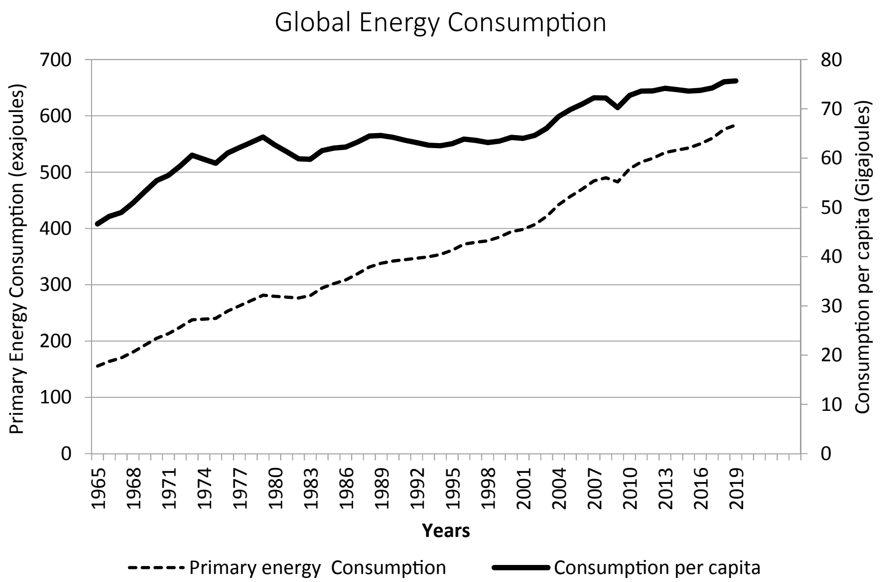

Fig. 1.4 Global energy consumption. *Data source* BP (2020)

and that will mean that the use of other fuels will increase and their life will be accordingly shorter. However, as the human population grows so also does the demand for energy (Fig. 1.4). This demand is also increased as economic development raises the standard of living.

The recent introduction of new techniques has increased the availability of non-renewable energy sources. The use of hydraulic fracturing has increased oil production in the USA from 5.5 million barrels per day in 2000 to 9 million in 2015 and half of oil production is now obtained using this technique (EIA, 2016). Another unconventional source of non-renewable energy is the vast deposits of oil bound up in the sand, which is a considerable part of some nations' oil reserves. "Of the 170 billion barrels of Canadian oil that can be recovered economically with today's technology, 164 billion barrels are located in the oil sands" (CAPP, 2018). This all sounds good, resources are being found to add to those that are already known, extending the life of finite reserves. However, a factor that needs to be taken into account is not only the financial cost but the energy cost, known as the energy return over (energy) invested or EROI (see further discussion in Chap. 5). If it takes 100 kWh of energy input to produce 100 kWh of oil from an unconventional source, that source is not a net producer of energy. It appears, now that the "easy" oil, gas and coal have been found, that not only is the EROI of all non-renewable energy sources declining over time, meaning that more energy has to be put in to get a unit of energy out, but the EROI of oil sands is considerably lower than that for conventional oil. Unfortunately, the EROIs of the various renewable sources of energy such as solar and wind are also not very favourable. It will require a huge input of non-renewable energy to build the

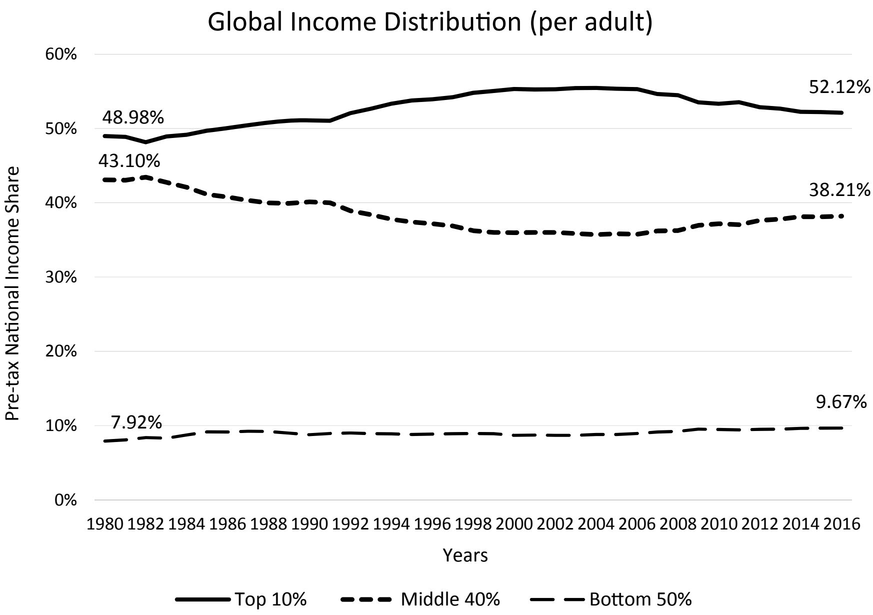

Fig. 1.5 Income inequality. The chart shows that in 2016 10% of the world population accounted for 52% of global income while the bottom 50% lived with less than 10% of global income and the middle 40% represented 38% of the income share. *Data source* WID.world (2019b)

equipment that would allow the world to operate on renewable energy (Hall et al., 2014), but at least the energy sources once built would be carbon-free. If unconventional fossil fuel resources are exploited, like Canada's oil sands, then the emissions produced by obtaining them have to be added to the emissions produced by burning them, a double burden.

To the issues of growth in energy demand, and rising levels of waste and GHG production needs to be added the rise in inequality (Fig. 1.5). It seems that as development occurs living standards rise, and demand for energy and higher cost foods such as meat and dairy also rise—but only for some. Development does not make every member of a society equally rich.

The distribution of global income between 1980 and 2016 (Fig. 1.5) shows that "inequality decreased between the bottom and middle of the income distribution and increased between the middle and the top" (Piketty, 2020:25). Since Fig. 1.5 illustrates a "distribution" of income, it means that if someone gets a big slice of the pie the rest will get smaller slices. This fact shows that the global economic growth (see Fig. 1.1) has not benefited all groups equally but has contributed to accentuating the gaps between the rich, the poor and the middle class, with few rich people getting half of the pie and half of the world sharing a thin slice. High income inequality is also linked with contrasting lifestyles and consumption levels. The top 1% of the world population produces more than nine times the global average emission per capita, which accounts for more than the bottom half of the world population emissions combined (Piketty, 2020:666). If inequality keeps on growing, it might lead to greater emissions for one population sector and scarcity of resources in the other. Since inequality can contribute to climate change issues and cannot be solved by economic and technological growth, it should be considered a big threat to our civilisation.

A Plan B: Collapsing Gracefully

It seems possible that there may be enough reserves of non-renewable energy to allow society to continue to grow, at least until the fuels became too expensive to extract, in either money or energy terms. However, it may not be wise to use these carbon-based fuels. If all the world's known fossil fuels were burned, a recent estimate is that the global mean temperature would increase by between 6.4 and 9.5 °C, but in the Arctic, the increase would be between 14.7 and 19.5 °C, so all the ice would melt. In addition, there would probably be more than four times the present rainfall (Tokarska et al., 2016). This might not be very beneficial for the continuation of human society. Chapter 5 deals with the challenges that flooding and sea-level rise pose to the urban habitat of societies.

To look at this question of changing the climate and the effects it might have, such as sea-level rise, the UN's Intergovernmental Panel on Climate Change (IPCC) was set up in 1988 by the United Nations Environment Programme (UNEP) and the World Meteorological Organization (WMO) with a membership of 195 separate nations. Its purpose is to provide government policymakers with regular scientific assessments of all aspects of climate change. The aim of these assessments is to provide scientific information to governments so that they can develop policies related to climate change.

> The IPCC assesses the thousands of scientific papers published each year to tell policymakers what we know and don't know about the risks related to climate change. The IPCC identifies where there is agreement in the scientific community, where there are differences of opinion, and where further research is needed. It does not conduct its own research (IPCC, 2018a:3–4).

Thirty years ago, when the IPCC was founded, there were just over 350 parts per million (ppm) of carbon dioxide in the atmosphere (NOAA, 2018), while NASA quotes a figure of 409 ppm for August 2018 (NASA, 2018). These figures are from the continuous records taken at Mauna Loa in Hawaii since 1958. When these records began the CO_2 level was 315 ppm, so it rose by 35 ppm in the first 30 years and by nearly 60 ppm in the next 30 years following the foundation of the IPCC, so it appears that so far since its inception the IPCC has been able to do little to reduce the likelihood of climate change.

At the time of writing this, in October 2018, the IPCC had just issued a report with the lengthy title of *Global Warming of 1.5 °C, an IPCC special report on the impacts of global warming of 1.5 °C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global* *response to the threat of climate change, sustainable development, and efforts to eradicate poverty*. The press release accompanying the report stated “Limiting global warming to 1.5 °C would require rapid, far reaching and unprecedented changes in all aspects of society…With clear benefits to people and natural ecosystems, limiting global warming to 1.5 °C compared to 2 °C could go hand in hand with ensuring a more sustainable and equitable society” (IPCC, 2018.a). An accompanying document states “Actions that can reduce emissions include, for example, phasing out coal in the energy sector, increasing the amount of energy produced from renewable sources, electrifying transport, and reducing the ‘carbon footprint’ of the food we consume” (IPCC, 2018b:8). Because the IPCC’s work is based on inputs from a large group of independent scientists from all over the world, their reports have to represent something on which all the participants can agree, so the inbuilt tendency will be for these reports to be quite conservative.

Responses from the world’s elected politicians to the IPCC report were almost instantaneous. As for phasing out coal, the Australian Deputy Prime Minister, Michael McCormack, immediately asserted that Australia would carry on using coal for electricity generation rather than moving to renewable energy (Karp, 2018), while the UK’s Minister of State for Energy and Clean Growth, Claire Perry, who was responsible for “carbon budgets”, “international climate change” and “climate science” (GOV.UK, 2018) said a week later that it was not the government’s job to advise people to eat a diet that would reduce emissions (Harrabin, 2018).

From the evidence, collapse seems quite likely on more than one front (food, energy, climate…) and democracy has provided society with leaders whose only idea seems to be to lead us over the cliff. As a result, maybe we should follow the idea of the seventeenth-century French mathematician and philosopher Blaise Pascal. In his celebrated “wager” he proposed that since it was not possible to prove or disprove the existence of God the safer bet would be to assume that there was a God and live your life accordingly. When you died, if there was no God you would not have lost out as you would have had a good life. On the other hand, if you lived a vice-ridden and godless life and then found on death that there was indeed a God, you would be condemned to eternal damnation (Pascal, 1932).

Following Pascal’s wager, if we are going to collapse, might it not be a good idea to have a “plan B” for collapsing gracefully, just in case the politicians, and the voters, have got it wrong? Perhaps the next step is for those dealing with the design of the built environment to consider what a Plan B built environment might be like. The aim of this book is to examine this and come up with suggestions for what needs to happen now to collapse gracefully in the future. Chapter 2 begins this investigation by looking at current built environment initiatives to deal with the problems outlined in this chapter.