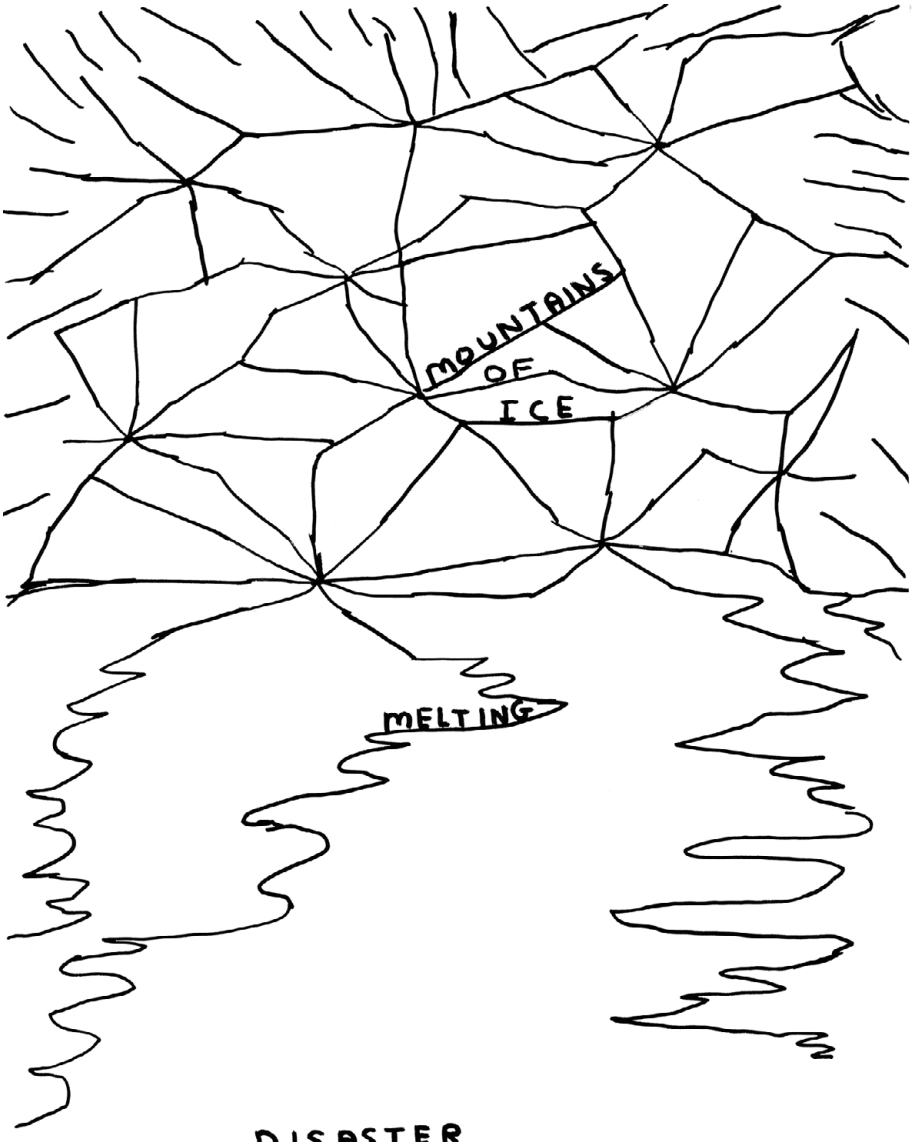

DISASTER
Looms

WE IGNORE IT

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15 The Physical Environment and the Planet

I felt my lungs inflate with the onrush of scenery – air, mountains, trees, people.
I thought, 'This is what it is to be happy'.

Sylvia Plath

Human life is a recent arrival on this planet. Homo sapiens evolved about 200,000 years ago, and for most of the time since then we humans have moved around in nature and lived off wild plants and animals. About 12,000 years ago, the first villages developed; and about 6,000 years ago, the first major towns emerged. But we remain massively dependent for our wellbeing upon nature (including the ways in which we have modified it).

In this chapter, we shall examine the following issues.

(1) How important for our wellbeing is direct experience of the natural world?
(2) How do different aspects of the man-made environment affect our wellbeing?
(3) How should we respond when climate change threatens the wellbeing of future generations?

To set the scene for the first two questions, we can begin with an ambitious study of human experience in Britain using the app called **Mappiness**.[1] People who use this app are beeped three times a day and asked to record how happy they feel, using a slider along a 'visual analogue scale'. They are also asked what they are doing and with whom.

The GPS system also records their location. This tells us three things – whether they are in an urban or rural environment, whether they are in an area covered with buildings or not (as in a park) and, finally, how scenic the area is (as judged by an independent panel viewing photographs of the area). It also tells us the prevailing weather at the moment when they reply.

The strength of the study is that each individual records many experiences, so that by including a 'fixed effect' we are tracing how different experiences affect the same person – the results being averaged across all of the people studied. All the experiences are measured as either 0 or 1, except for 'scenic quality', heat, sun and rain

[1] www.mappiness.org.uk/.

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Table 15.1 Effect of real-time experience on real-time happiness (0–10) (UK)

Activity	Points (0–10)
Sports	0.72
Fishing	0.48
Socialising	0.42
Gardening	0.40
Walking	0.39
Resting	0.11
Commuting	−0.22
Working	−0.32
Weather	
Heat (0–1)	0.40
Sun (0–1)	0.12
Rain (0–1)	−1.11
Environment	
Natural habitat	0.06
Rural (v. urban)	0.09
Scenic (0–1)	0.28

Source: Seresinhe et al. (2019) Table 1. The coefficient on scenic has been adjusted using the discussion in the text; all activity effects are measured relative to the average; controls include who you are with

which are continuous variables, where the lowest value scores 0 and the highest value scores 1. Happiness is measured 0–10.

The results for the UK are striking (see Table 15.1). First, we look at the importance of which **activity** a person is engaged in. People don't like working or commuting as much as they like exercising or socialising. We have already documented similar effects in Chapter 1.

Next come the effects of the **weather**. British people are happier when it is hotter, when the sun shines and when it is not raining. These are instantaneous measures of how people are affected by today's weather. A quite different question is how people are affected by the year-round weather (or 'climate') where they live. Research on this produces a somewhat confusing picture. For example, Daniel Kahneman astonished many people by showing that people are as happy in Minnesota, which is subject to weather extremes, as in sunny California.[2] More systematic research suggests that the climate that is best for wellbeing has an average temperature of 18 degrees centigrade (64 degrees Fahrenheit). Anything less than that reduces wellbeing and so does anything greater.[3] This means that climate change will have much worse direct effects on wellbeing in tropical countries than in those with more temperate climates.

[2] Schkade and Kahneman (1998).

[3] Maddison and Rehdanz (2011). They used World Values Survey waves between 1981 and 2008 with regional but not country fixed effects. The effect of a 1 degree centigrade deviation (from 18 degrees

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Finally, in Table 15.1, there is the impact of the local **physical environment**. People prefer being in a natural habitat, be it in the countryside or in an urban park or garden. (From other research 'blue' environments with water are as appealing as those that are 'green'). They also, on average, dislike being in towns. And finally, they value the beauty of the environment, whether it is rural or urban.

How Nature Affects Us

So let's look at the impact of the **natural environment**. There is abundant evidence that people value nature, whether it is the countryside or green spaces in towns. For some time, we have known about the effects of nature upon health, generosity, aggression and crime, and now we have similarly powerful evidence of its effects on wellbeing.

We can begin with health. A classic early study reports the results of a specific '**natural experiment**' – a difference in how people are treated, which is essentially random. In this case, after operations for gall bladder, some patients were placed in rooms that faced trees, while others were placed in rooms that faced brick walls. The patients facing trees needed fewer painkillers and recovered faster.[4] In another study in hospitals, it was found that even pictures of nature made a difference – people recovered faster when they were surrounded by pictures of landscapes than when they were surrounded by abstract art.[5] Similarly, having plants in your hospital room affected patients' recovery – in a study of 90 patients who had a haemorrhoidectomy, those in rooms with plants experienced less pain, anxiety and fatigue and they had lower blood pressure.[6]

Contact with nature also makes people behave better. In a simple **lab experiment**, 85 students were shown four slides, either of nature or of an urban landscape (2 minutes for each slide).[7] Allocation was random. The students then participated in a game in which they were given $5. They then had to choose between the following:

- Keep $5 or
- Give it to another student, who will also then receive another $5 from the organisers (and can dispose of the $5 as she likes).

Those exposed to nature were significantly more generous with their money. The same happened if, instead of seeing different slides, one group of students were in rooms with plants and the others in rooms without. These results are remarkable, and

centigrade) upon annual wellbeing was approximately 0.01 points (out of 10) for each 1 degree deviation for each month of such deviation. However, within countries, there is no strong seasonal variation in wellbeing except that up to 5% of people suffer seasonal depression in winter (Seasonal Affective Disorder, SAD). Counter-intuitively, suicide tends to be high in late spring and summer when 'other people' are more visibly enjoying themselves.

[4] Ulrich (1984). [5] Montgomery (2013). [6] Park and Mattison (2009).

[7] Weinstein et al. (2009).

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they suggest that people will also behave better in real life if there is more nature around.

And so they do. The Ida B. Wells public housing development is in a poor section of Chicago and includes 98 similar apartment blocks. But some of these blocks are surrounded by trees, while others are surrounded by asphalt, and others lie in between. In path-breaking research, the degree of green cover was analysed by helicopter and scored at between 0 and 4. The number of crimes reported by residents in each building was also recorded. It turned out that more trees were associated with less crime.[8]

Why was this? The researchers hypothesised that criminal aggression resulted from 'mental fatigue' – the inability to concentrate and the associated irritability and impulsivity. They then showed (in another housing project) that tree cover did indeed improve people's measured ability to concentrate, and it also reduced their aggression.[9] Thus, they claimed, nature improves our behaviour by calming our minds.

However, the ultimate test is how **green space** affects wellbeing, rather than behaviour. In a number of studies, researchers have traced the same individuals when they move to a new house that is nearer or further from green space. The results of these studies again show clearly how urban green space improves wellbeing.[10]

One study of Germany used the panel data from the Socio-Economic Panel (SOEP), which measures the life satisfaction (and much else) of panel members, year by year. From the respondent's address,, it is also possible to measure the amount of urban green space there is within 1 kilometre of the respondent's home. Fixed effects regression then shows that, for each extra hectare of green space within 1 kilometre, wellbeing goes up by 0.007 points (out of 10).[11]

It is interesting to see what this implies for the value of additional green space. In German cities, the average number of adults living within a kilometre of any spot is 6,000. Thus, if an extra hectare of green space is provided for one year, the gain in wellbeing is 0.007 times 6,000 which is 42 WELLBYs. As we have seen in Chapter 13, the monetary equivalent of a wellbeing-year (WELLBY) is about €100,000. So it would be worthwhile to provide an extra hectare of green space if it cost less that €4.2 million a year in terms of upkeep and the alternative rental value of the land.

There is, of course, a totally different way of valuing an urban amenity or disamenity, which has been used by economists for many decades. This is based on the theory of '**spatial equilibrium**'. This says that people of a given income and characteristics will distribute themselves between areas (or between houses) in such a way that no one could become happier by moving. In other words, at the margin people of given income and characteristics are equally happy wherever they live.

[8] Kuo and Sullivan (2001a). [9] Kuo and Sullivan (2001b).
[10] For example, in the UK, see White et al. (2013); and Alcock et al. (2014).
[11] Krekel et al. (2016). The study controlled for the quality of housing (type, rooms per person) but not for the price of houses.

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If they live in a nicer place, then they must be paying for it. Typically, they will be paying through higher house prices. Thus, we can find out the value of an amenity (like green space) by seeing how much it affects house prices. We simply estimate a **'hedonic' price equation** where we regress house prices on the amenities of the area (and, of course, the quality of the house). The coefficient on each amenity is its hedonic price.[12]

But these 'hedonic prices' only capture the full value of the green space if the assumption is true. And the assumption is that people who live near green space are (at the margin) no happier than those who live further away – because they are having to pay for whatever the green space is worth to them. But we have already seen that in Germany they are in fact happier if they live near green space. So, there is clearly an excess value of the green space on top of what people are actually paying for it.[13]

More generally, it has been shown that, contrary to the theory of spatial equilibrium, the happiness of people of given income and characteristics varies widely between US counties – and this variation is related to many aspects of the environment and local public goods.[14] People do tend to move to places that will make them happier,[15] but the result is not full spatial equilibrium and hedonic prices do not therefore reflect the true value of different amenities.

A quite separate question is why nature matters to us. In 1984, the great biologist Edward O. Wilson advanced the hypothesis of **biophilia** (love of living things). According to this hypothesis, humans evolved in close contact with nature and we therefore experience a strong attraction towards both plants and trees, as well as other mammals (especially when they are young). Others have hypothesised that there is a huge comfort to be got from a world not governed by humans but by the huge forces of nature.

But, whatever the explanation, there is ample evidence that nature is good for our wellbeing. This is an important argument for national parks. It is also an important principle for urban design. But there are many other aspects of the built environment which are also crucial for wellbeing.

[12] One British study (Gibbons, Mourato and Resende [2014]) found that a 1% point rise in the share of green space in your ward raised the value of your house by about £2,000. This extra 1% of green space would average 10 hectares (since there are about 1,000 hectares per ward). So the value of each extra hectare to one household is £200. Since the average number of households per ward is 3,000, the total social value of each hectare is £600k. And this is a stock value – the annual value will be a tenth of that or lower. This is an order of magnitude below the German estimate of annual value quoted earlier.

Another study by the ONS estimated that the green space and water in Britain raised house prices by on average £4,800, or in total by £135 billion. Since there are about 40 million hectares of urban green space, a maximum value per hectare is £34,000. (There are 8,000 wards of roughly 1,000 hectares each, 50% of which is green.) This is a substantially lower figure than the previous one. (ONS [2018]).

[13] The total willingness to pay should reflect this excess plus the hedonic price that residents are already paying. We can find the excess value from a wellbeing equation that does not include the house price on the right-hand side of the regression. If, alternatively, one estimates $W = a_1$ Green Space $+ a_2$ log (Income-House Cost Value), then a_1 includes the full value of the green space.

[14] Ahmadiani and Ferreira (2019). [15] Goetzke and Islam (2017).

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The Built Environment and Urban Design

Over half the world's population now live in urban areas (56%) and this is increasing every year.[16] Towns and cities exist mainly because people can work more productively if they work closer to each other – the benefits of '**agglomeration**'. In early stages of development, these advantages may not be fully exploited and people in cities may have higher wellbeing than other people. But, when development is more advanced, one might expect a situation closer to equilibrium – with people equally happy in cities and elsewhere. Broadly, this is what we observe (see Figure 15.1) – in less developed countries, people in cities are happier on average than other people, but in more developed countries there is no difference. There is less disequilibrium.

Civilised city life requires major collective decisions about zoning (of houses and workplaces), housing (standards and provision) and the outdoor environment. So in this section, we shall examine the zoning of houses and workplaces, the regulation and the provision of housing and the control of air pollution and noise.

Some things are obvious from what we have said already. People want spaces that provide social connections. This argues for quiet, unpolluted residential streets and attractive pedestrianised local centres where people congregate within walking distance of their homes.[17] But people also want safety from unwanted social connections. In an interesting experiment, shielding ground-floor flats from strangers walking outside them reduced mental illness by at least 25%.[18] And people also like a 'scenic' environment that includes greenery and nice-looking buildings.

But there are other issues that are not so obvious:

- How bad is commuting?
- How important is the size and quality of homes?
- What are the effects of polluted air and of noise?

Let us take these issues in turn.

Commuting time

Workplaces in a city tend to be congregated near the centre (to get the benefits of agglomeration). So if you live further out, you probably travel further to work. There is plenty of evidence that this commuting is one of the experiences people enjoy least (see Table 15.1), and it costs money. But people are willing to commute because the rental value of housing is cheaper the further you go from the centre. In standard economic theory, this lower rental value must be low enough to compensate for the increased cost and bother of commuting, so that in equilibrium the marginal person is

[16] United Nations (2018). [17] Appleyard and Lintell (1972). [18] Halpern (1995).

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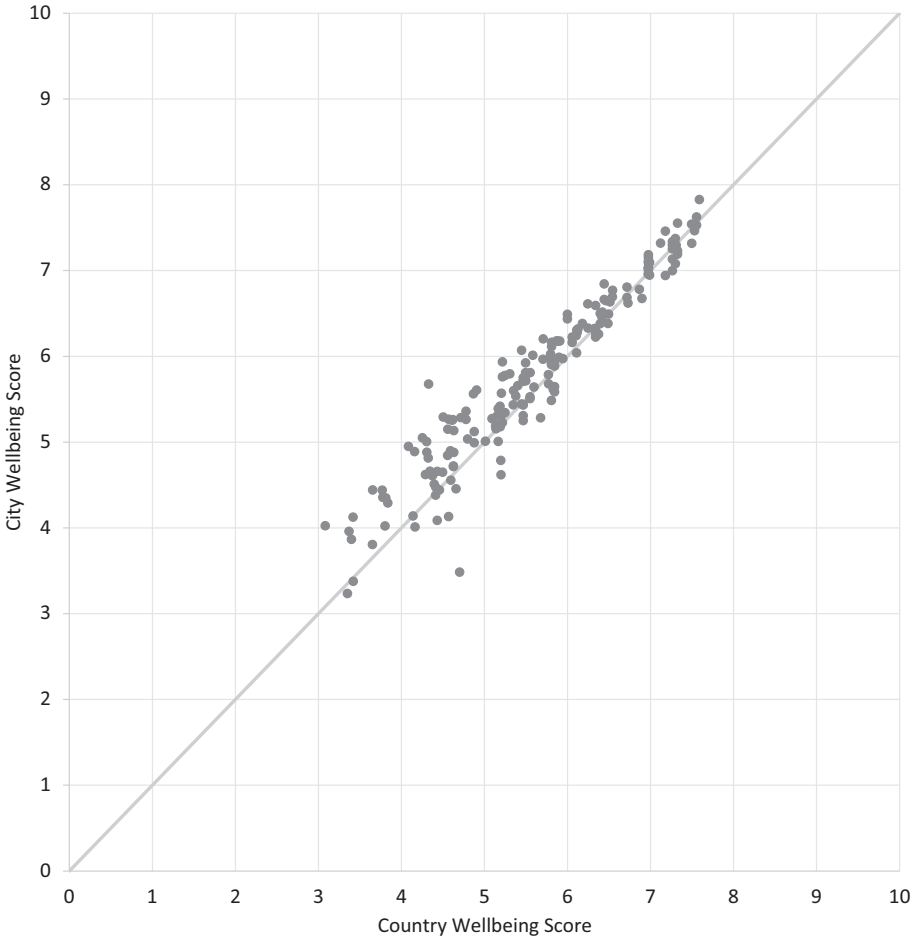

Figure 15.1 Subjective wellbeing in cities worldwide
Source: De Neve and Krekel (2020); Gallup World Poll, Gallup US Poll
Notes: The scatterplot takes into account all cities worldwide with at least 300 observations of individuals in the Gallup World Poll during the period 2014–2018, as well as the ten largest cities in the United States using data from the Gallup US Poll.

indifferent about where to live. Thus, life satisfaction should be independent of commuting time. But as Stutzer and Frey showed, in a notable paper, this is not the case in Germany – the overall situation is shown in Figure 15.2.[19] And, in a multiple regression, it was found that the average commuter (who spends 46 minutes a day

[19] Stutzer and Frey (2008). For results for England, see ONS (2014); and B. Clark et al. (2020) – both are mainly supportive.

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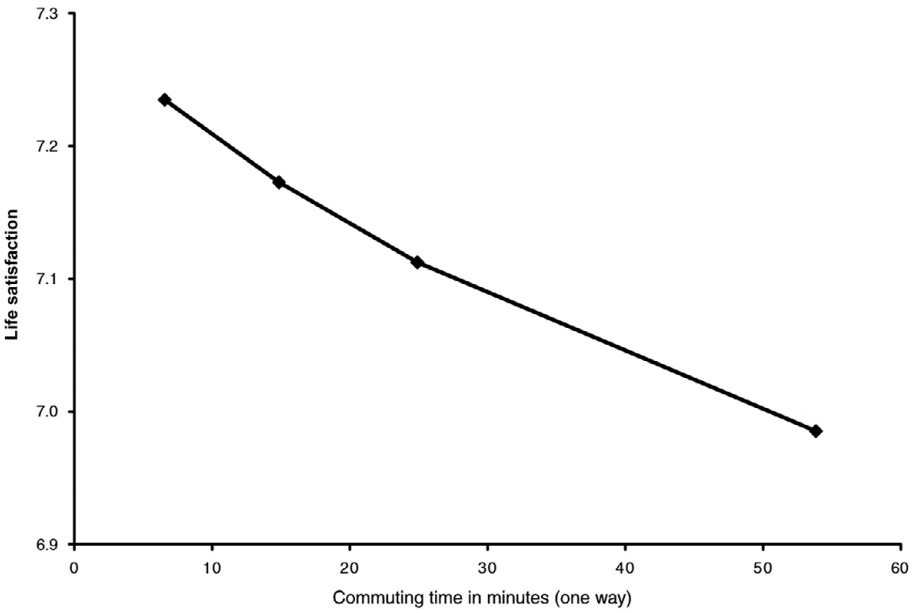

Figure 15.2 Commuting time and average life satisfaction, Germany
Source: Stutzer and Frey (2008); GSOEP 1985–2003; average life satisfaction for each quartile of commuting time

commuting) is 0.08 points (out of 10) worse off than a similar person who has no commute.[20]

This pattern cannot be explained by standard economics but wellbeing science offers a clue. The big commuters probably overestimate the benefits of the higher pay they get (compared with if they worked more locally). And they probably overestimate the benefits of the better supply of housing in the suburbs. So let us turn to the housing market.

Housing quality

In the United States, people in larger houses are more satisfied with their house. And over time houses have become bigger – since 1945 they have doubled in size. Yet, despite this, people are no more satisfied with their houses than they were in the 1980s when measurement began (see Figure 15.3).

Clearly, this is the Easterlin paradox again, but this time relating to houses rather than income. And once again the main explanation seems to be social comparisons, plus a bit of adaptation.

[20] This is from a fixed effects regression which contains education but not wages or rents. Rents should be compensating for the commute. Thus 0.09 is a minimum estimate of the true psychic cost of commuting.

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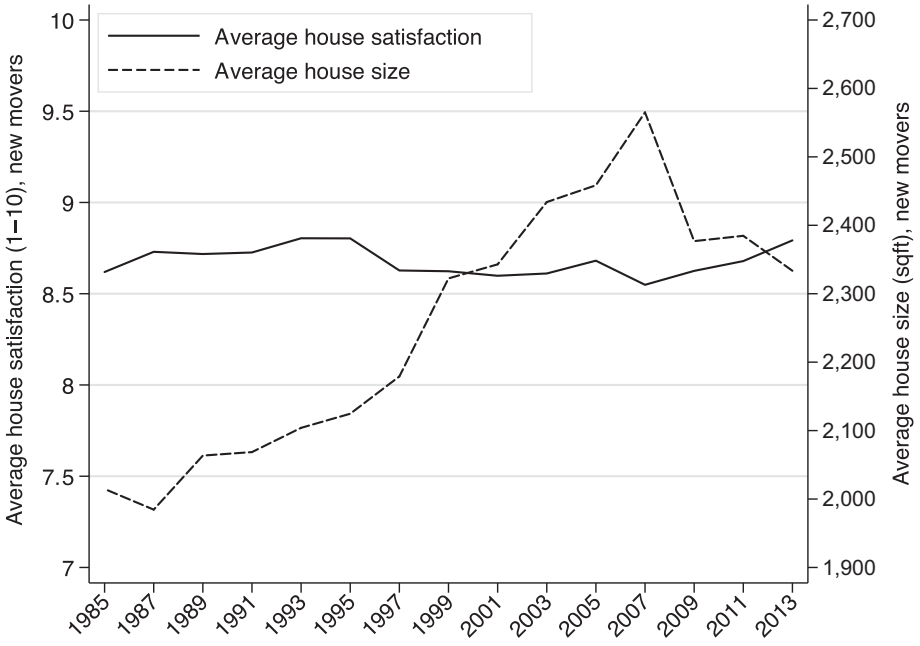

Figure 15.3 House sizes and house satisfaction, United States 1985–2013, new movers
Source: Bellet (2019) Figure 2
Notes: New movers are defined as homeowners who bought their house within the last 2 years before being surveyed (N = 22,772).

In a study of single-family houses in US suburbs, a 1% rise in the size of your house increased your satisfaction with your home by 0.08%. But at the same time, a 1% rise in the size of other houses in your area decreased your satisfaction with your home by 0.07%. And the longer you had lived in your house, the less satisfied you were.[21] Clearly Karl Marx was on to something when he wrote:

> A house may be large or small: as long as the neighbouring houses are likewise small, it satisfies all social requirements for a residence. But let there arise next to the little house a palace, and the little house shrinks to a hut.[22]

But doesn't this whole analysis underestimate the importance of housing for our wellbeing? To investigate this issue, the British government used its regular English National Housing Survey to find out how far people's life satisfaction depended on their housing, other things being equal.[23] Surprisingly, the answer was: little. When

[21] Bellet (2019) Tables 2 and 10. The comparator house size is at the 90th percentile. Panel data from the American Housing Survey (AHS).
[22] Marx (1947).
[23] Department of Housing, Communities and Local Government (2014). In the analysis, income was held constant.

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life satisfaction was regressed on the standard control variables and housing variables were then introduced, the only really important new influence came from the finance of housing. If you were in arrears on your rent or mortgage, this reduced your life satisfaction by a big 0.60 points (out of 10). But no variables within the home had any significant influence (including overcrowding, damp, disrepair and poor heating). However, people did dislike living in high-rise apartments (-0.32 points compared with terraced housing). And people in social housing were as content as outright homeowners.

A recent study of house moves in Germany also found that housing has a small or zero impact on life satisfaction.[24] But in the US, a rather different impression comes from a targeted intervention known as Moving to Opportunity. Here people in poor, run-down housing estates were randomly offered housing vouchers to enable them to live in less disadvantaged areas. Fifteen years later, those who used the vouchers were 0.4 points (out of 10) happier than the controls. But it was not clear what aspect of their new life had made them happier.[25]

Air pollution and noise

Finally, pollution. There have been many studies of the effects of **air pollution** and noise. One careful study used longitudinal data from the German Socio-Economic Panel (SOEP) together with data on sulphur dioxide levels, county by county.[26] This showed that, where the sulphur dioxide level was reduced by 1 microgram per cubic metre, wellbeing rose by 0.005–0.008 points (out of 10). This implies that the reductions in sulphur dioxide achieved in Germany from 1985 to 2003 raised average wellbeing by 0.25–0.40 points. That is a lot. To bring about the same change in wellbeing would require a doubling of income. By contrast, when the cost of pollution is estimated by looking at differential house prices, the effect is under one-tenth of that estimated by the wellbeing method.[27]

A similar difference in costs is found in relation to **airport noise**. A classic study looked at the wellbeing of people living near Amsterdam's Schiphol Airport. It estimated that the median resident affected by significant noise would need compensation for the noise equal to nearly 4% of her income.[28] But noise had no detectable influence on house prices.

[24] A. E. Clark and Díaz Serrano (2020).

[25] Kling, Ludwig and Katz (2005); Ludwig et al. (2012, 2013); Chetty, Hendren and Katz (2016). The study was not of course able to trace any external effects on the remaining residents in the poor areas nor on the existing residents in the 'better' areas.

[26] Luechinger (2009). There was the risk that, when they are happier, people choose to live in less polluted counties. So the pollution level was instrumented by the extent to which local pollution had been reduced by mandated scrubbing of power plants. See also Welsch (2006); and Dolan and Laffan (2016).

[27] A parallel wellbeing study in the United States, using a cross-section of individuals and the particulate density in their county, found that a 1 standard deviation of particulate density was equivalent to roughly a 1/3 fall in income per head. Levinson (2012).

[28] Van Praag and Baarsma (2005).

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Though these studies are far from perfect, they cast obvious doubt on the use of house prices to value environmental harms. They also remind us that pollution is an important problem outcome of uncontrolled economic growth.

Climate Change

A bigger problem still is **climate change**. If you care about wellbeing, it is natural to care about climate change. For the first principle in the wellbeing approach is that everybody matters equally, wherever they are born and whenever they are born. So the wellbeing of future generations matters as much as our own wellbeing – subject to a small discount (as we shall see later).

The climate change problem is a classic case (perhaps the biggest ever) of a **public good problem**, that is, one that affects everyone. Such problems can only be solved by collective action. In the case of climate change, the action has to be international. Every tonne of CO_2 that is emitted locally joins the body of greenhouse gasses surrounding the world and it affects every country in the world. To resolve the problem, the UN organises an annual Conference of the Parties (or CoP) meeting to reach agreement on the action that is needed.

The nature of the problem is well-known.[29] At present, the earth is warming by an extra 0.2°C each decade. And the rate of warming is not slowing down, because greenhouse gas emissions worldwide are not falling. The earth is already 1°C hotter than it was 100 years ago, and the impact on sea levels, fires, floods and hurricanes is already apparent. At higher temperatures, there would inevitably be major droughts and floods causing millions or even billions to move. The sea level would rise – threatening the security of the one billion people who live lower than 10 metres above sea level. Conflict would be inevitable, and wellbeing in many hotter and lower-lying parts of the world would fall.[30] Warming is also killing off many species of plants and animals. The reduction of biodiversity reduces the opportunities of future generations to find new ways to fight disease, increase food production and experience the wonders of nature.[31] To prevent unacceptable climate warming will require rapid action, because the CO_2 that is emitted today will stay in the atmosphere for a hundred years or more.[32] To limit the temperature rise to 1.5°C above nineteenth-century levels requires emissions to fall to net-zero by 2050.

However, there are sceptics who challenge this mainstream view. They argue that it will impose unreasonable costs on the present generation for the sake of future generations. There are two elements of this argument: the discount rate to be used and the actual scale of the costs.

[29] Stern (2015).

[30] Extra heat also increases aggression and reduces wellbeing; see Carleton and Hsiang (2016); and Krekel and MacKerron (2020).

[31] Dasgupta (2021). Some people would also give wider, non-human reasons for preserving biodiversity and the planet as it is.

[32] This assumes that no economic way is discovered for removing the CO_2 once it is out in the atmosphere.

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The discount rate

There has to be **some discounting** of the future. Distant benefits are inherently less certain than ones that come sooner. Moreover if there were no discounting, any way in which we benefitted all future generations would be infinitely valuable. But, as we argued in Chapter 2, the rate at which we discount future wellbeing should be quite low. The official British 'pure social time-preference rate' is 1.5%:[33]

$$\text{Discount rate for wellbeing} = 1.5\% \text{ a year.}$$

By contrast, when economists think about discounting, it is income they are planning to discount, not wellbeing. And when discounting income, you also have to take into account the fact that income is likely to rise in future, and (as we have seen) the impact of additional income on wellbeing declines as income rises. For example, suppose that wellbeing is a linear function of log income. Then the marginal utility of income is inversely proportional to income – it falls at the same rate as income rises. So, if real income is expected to rise at 2% a year,

$$\text{Discount rate for real income} = 1.5\% + 2\% = 3.5\%.$$

This 3.5% discount rate makes the future much less important than the present. For example, a loss of $1 in 2100 is only worth averting if it costs less than $0.06 today to do so. Thus, when economists measure the impact of climate change in units of GDP, some of them question the importance of incurring costs today to avert future losses due to climate change – simply because the losses are so distant.

However, the wellbeing approach differs from the standard economic approach, in three ways. First, the discount rate applied to those effects is much smaller – 1.5% a year. At a rate of 1.5%, a loss of 1 WELLBY in 2100 is always worth avoiding, so long as it costs less than 0.33 WELLBYs today to avoid it. Second, the wellbeing approach looks at the impact of climate change in much wider terms than GDP. It includes the wellbeing impact of conflict, the uprooting of communities and the sheer fact of loss aversion (meaning that $1 lost makes a bigger impact than $1 gained). Finally, it takes into account the fact that those who lose will mainly live in countries with low initial levels of wellbeing.

How big are the costs?

This immediately raises the issue of how big are the costs of limiting climate change to 1.5°C? Some years ago, the costs seemed dauntingly high. But today it is apparent that the costs are less. The biggest change is in the costs of clean electricity. By now, onshore wind, offshore wind and solar energy are close to competitive in terms of cost with fossil fuels. And there are now real possibilities of expanding the use of electricity (or hydrogen made from electricity) as a power source for all forms of transport and for heating buildings.

[33] HM Treasury (2020). The Stern Review (Stern et al. [2010]) argues for a lower rate.

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The key issue is the **cost of clean energy** compared with dirty energy. Once clean energy is cheaper than dirty energy, the dirty sources of energy will be abandoned and the coal, oil and gas will stay underground.[34] Reductions in the cost of clean energy have been driven partly by private investment but they have been (and remain) hugely dependent on publicly funded research and development, which in the last 100 years has been central to most technological change.[35] In addition, the behaviour of consumers has to change toward low-energy transport and low-energy housing. Thus, we have the possibility of a Green Revolution (including energy generation and energy saving) that will be largely self-funding. But it will also require some regulations that impose costs on consumers and business, some extra public expenditure on research and development and some subsidies. The total annual cost of reaching net zero by 2050 is expected to be between 1 and 2% of world GDP each year.

Who should bear the cost? As regards costs borne by present generations, the richer countries should clearly bear the greater part of the cost since their marginal utility of income is lower.[36] But it is difficult to persuade anyone to bear the cost. To see this, it is illuminating to regress the wellbeing differences between countries on their differential performance on each of the 17 UN Sustainable Development Goals (SDGs).[37] This regression shows that, for most of the goals, good performance predicts higher measured wellbeing. But for two of them it does not, and those are 'climate action' and 'responsible consumption and production'. People don't like making these sacrifices. No wonder it is a proving so difficult to secure adequate and binding international agreements in this field.

There is, however, an obvious way out – let future generations contribute, as well as us.[38] If today's government borrows to finance green expenditures, this will (probably) reduce investment of other kinds. This in turn will reduce the amount of capital available to future generations and thus reduce their national income to below what it would have been. But in return for that the future generations will be spared excessive climate change – and they will probably also be richer than us anyway due to technological progress.

So which countries are doing best in providing wellbeing to the present generation, while at the same time protecting future generations against climate change? The New Economics Foundation provides an interesting approach to this analysis, through the **Happy Planet Index**. This measures the ratio between WELLBYs experienced by the current generation and the country's ecological footprint (i.e., its impact on the future).[39]

[34] King et al. (2015).

[35] Mazzucato (2015).The key international partnership for developing cheap ways of producing clean energy is Mission Innovation – a partnership of some 20 countries who pledged to double their public expenditure on clean energy research and development. Annual expenditure at present is about $25 billion.

[36] Budolfson et al. (2021). [37] De Neve and Sachs (2020). [38] Sachs (2014).

[39] See Happy Planet Index (2016). In this index, WELLBYs are adjusted for inequality (the adjusted measure is essentially $\sum_i \log WELLBY_i$ per person born). The ecological footprint is a measure of land needed per person to sustain the current pattern of consumption and to absorb the CO_2 produced in the process.

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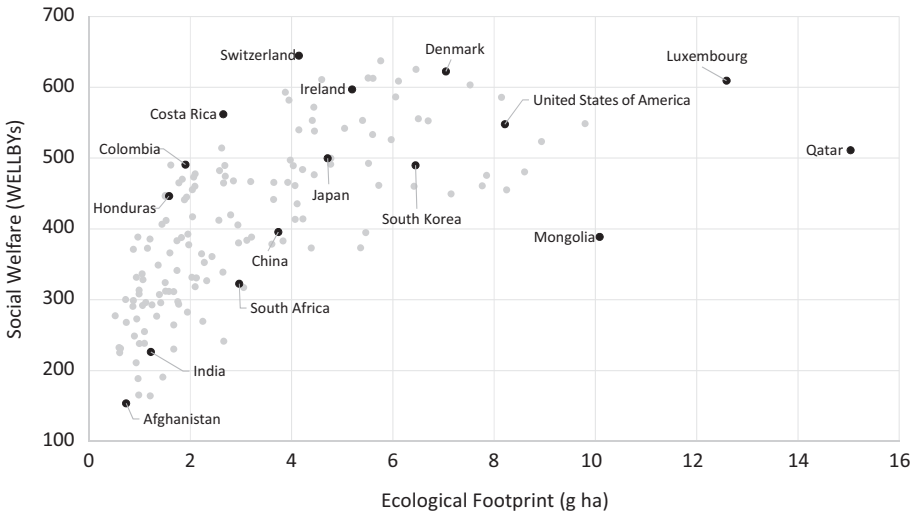

Figure 15.4 The Happy Planet Index: Happy life-years against ecological footprint
Source: Happy Planet Index (2016) Figure 3

In Figure 15.4, WELLBYs are measured on the vertical axis and the ecological footprint on the horizontal axis. So a country is doing well and scores highly on the index if it has a high value on the vertical axis relative to the horizontal axis. (The index is the ratio of one to the other). The country doing worst is Qatar and the countries doing best are Honduras, Colombia and Costa Rica.

As this analysis shows, there is a natural alliance between those who care about wellbeing and those who care about climate change. For climate change is the biggest threat to the wellbeing of future generations. At the very least, policy-makers should be able to deliver a **sustainable** future – meaning that wellbeing does not fall.

Conclusions

(1) Being exposed to nature (trees, plants, green space and water) has demonstrable effects on our physical health, our behaviour (including crime) and our wellbeing. Quantifying this can improve the design of our lifestyle and our cities.
(2) House price differences underestimate the wellbeing effect of green space and other aspects of the environment (like air pollution and noise).
(3) People with **longer** commutes experience less wellbeing.
(4) The quantity and quality of housing has a relatively small effect on wellbeing. This is partly because people compare their houses with those of their neighbours. But being in arrears on your mortgage or rent has a really negative effect.
(5) Climate change is a clear threat to the wellbeing of future generations. The wellbeing approach invites us to value the wellbeing of future generations as much as we value our own (subject only to a very small discount rate).

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(6) Climate change is a classic public good problem, since CO_2 emitted anywhere affects people living everywhere. Every country has an incentive to free ride on the costs incurred by others. Only international agreement can overcome this problem.

Questions for discussion

(1) How convincing it the valuation of urban green space in Germany that is reported in the chapter?
(2) Why do house price differences so strikingly underestimate the effects of the external environment on wellbeing?
(3) Do people overvalue the importance of housing and, if so, why?
(4) How important is the wellbeing of future generations relative to our own?
(5) How can the costs of controlling greenhouse gas emissions be shared most fairly between those countries which are already rich and poorer countries which are trying to catch up?

Further Reading

Happy Planet Index: https://neweconomics.org/2006/07/happy-planet-index.

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