

Health impacts of an environmental disaster: a polemic

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Abstract

At this early point in the 21st century a major concern that we face is the future possible effects of people-induced global warming. The predicted effects are severe, but argued by some to be avoidable if we act now. Here we consider the dimensions of another disaster: one for which not only the causes, but also their horrific consequences, are current worldwide. The implicit question is ‘why are we more worried about future disasters than those already occurring?’ The worldmapper collection of cartograms (where a map is used like a pie-chart to present data) is used here to illustrate the extent of international inequalities in health and living conditions, discussed in relation to other aspects of human lives. Though the shape that we can see the world is in is shocking, we can also envisage a positive future. We compare these current global times to more local past times experienced during the ravaging inequalities of Victorian Britain. We use Britain simply as an example. We end by suggesting a further step the current British Prime Minister could make in his thinking. Doing this we can see the potential for environmental reconstruction, which would result (as it did before) in considerable reductions in infant mortality. Our common future is not already mapped out; it is still to be won.

Keywords: disaster, inequality, health, world, cartogram, imagination

Last year—2006—was a year of wake-up calls about an impending catastrophe. Al Gore starred in his film about this inconvenient truth [1], arguing that *now* is the time for action. In October Sir Nicholas Stern warned Britain ‘we have the time and knowledge to act but only if we act internationally, strongly and urgently’ [2]. Yet the causes and possible effects of this disaster have been taught, even in the curricula of British secondary schools, for at least the past 10 years—so why have these rallying cries only now become mainstream [3]? They become so now because we are currently at a peculiar historical point where this ‘future’ environmental catastrophe has been mainstreamed. Those who control the global media increasingly believe they and theirs are at risk and so aim to prevent the problems that this catastrophe is set to cause humans—in particular the more extreme and dangerous weather events, the displacement of people (particularly from the middle and south of the globe),

the possible increased spread of diseases (northwards is the fear). Health impacts are a major reason for the mainstreaming of concern over environmental disaster (see, for example, Kessel, 2006 [4]).

Researchers at the universities of Sheffield and Michigan spent 2006 creating a series of world maps, one for each day that year. The three authors of this paper were part of that research team. World maps are often used to help us to think globally about past, current and future catastrophes and disasters, states of health and of the environment [5–10]. Worldmapper maps also aim to do this, by reshaping territories (often countries and similar entities). These maps redistribute the area of a map according to the proportion of a variable found there, just like a pie chart [11, 12]. If a territory has half of the available global area, this means that half of the variable is found there. These visualizations of (what is usually) United Nations data quickly communicate the worldwide distribution of many relevant variables, including

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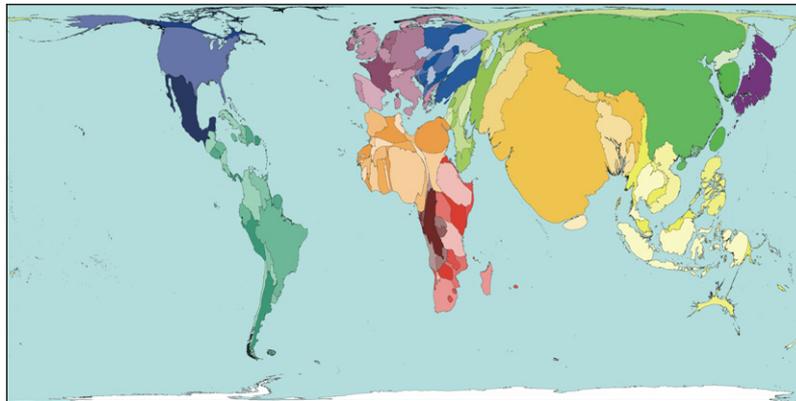


Figure 1. Total population (map 002). The size of each territory shows the relative proportion of the world’s population living there. Data source: United Nations Development Programme, 2004, Human Development Report.

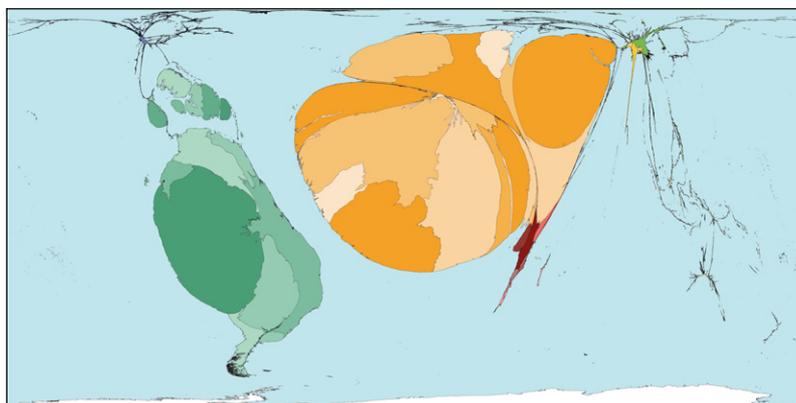


Figure 2. Yellow fever (map 236). Territory size shows the proportion of worldwide cases of yellow fever found there, 1995–2004. Data source: World Health Organization, 2004. Human Resources for Health.

diseases, forests, water, pollution, resource depletion, housing conditions, transportation, species at risk of extinction and people affected by volcanoes and earthquakes (freely available from www.worldmapper.org). Figure 1 shows the distribution of the world’s population in 2002 [13]. India (shown in mustard yellow) and China (in pea green) appear large on the map because large proportions of the world population live there. Figure 2 shows the distribution of yellow fever cases—yellow fever is found almost exclusively in South America and Northern Africa [14]. Both maps show the absolute counts, of people and yellow fever cases, respectively.

We are concerned about the future health effects of the impending catastrophe—but perhaps we should also question how close are we to already experiencing a disaster. And, what is a disaster anyway? The nature, theory and conception of disasters are much debated, and the subject of much academic deliberation [15, 16]. In simple terms, according at least to the Oxford English Dictionary [17], a disaster is something of a ‘ruinous or distressing nature; a sudden or great misfortune, mishap, or misadventure; a calamity.’ Perhaps this is something of an over-simplification of a complex concept. However, it is a definition that most people can relate to; severity, speed of onset and magnitude distinguish a disaster from something ‘bad’.

For this conception of a disaster, we consider primarily the effects on people, but which people? At a time when people are living through disasters of many forms, our media, politicians and businesses turn their attentions to the onset of a future environmental disaster. Why do they appear less concerned with current disasters? To answer that we need to consider both the magnitude of current environmental disasters and their distribution: how many are affected and where? What follows is a socio-environmental depiction of the modern world using evidence derived from the United Nations [18], World Health Organization [19] and World Bank [20], amongst others. We relate the current global picture to the stark inequality of Victorian (19th century) Britain. We believe that these images add to a growing wealth of powerful evidence that urgent international political action is needed now.

Imagine what the world might look like during a global environmental disaster (see figures 3–8). It is a strange and distressing image. Nevertheless it is recognizable and becomes increasingly familiar in following the story told by worldmapper maps. It is a world in which over a billion are forced to live in slums [21], three billion with only the basic sanitation of a communal pit latrine available [22], another two and a half billion without even that [23], two billion living in homes as overcrowded as last seen in a country like Britain

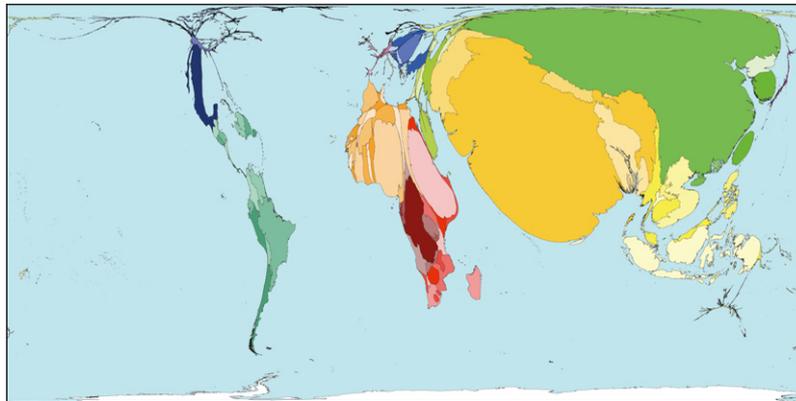


Figure 3. Poor sanitation (map 183). Territory size shows the proportion of all people without access to basic sanitation (toilets) that live there. Data source: United Nations Development Programme, 2004, Human Development Report.

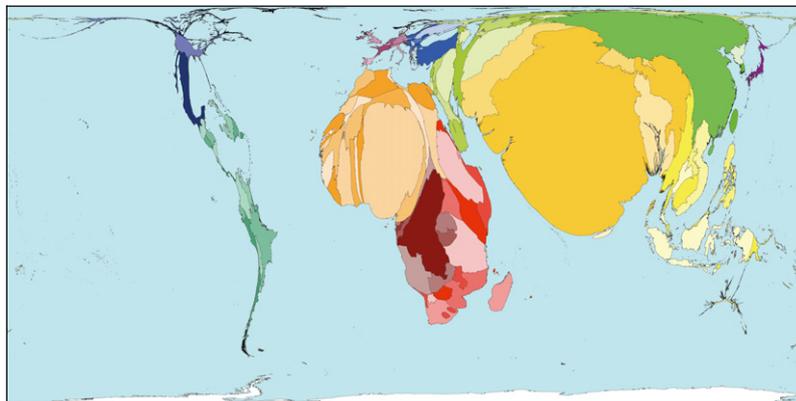


Figure 4. Stillbirths (map 259). Territory size shows the proportion of all stillbirths over 28 weeks of gestation worldwide that occurred there in 2000. Data source: World Health Organization, 2005, World Health Report.

in Victorian times [24], well over a billion with access only to dirty water—and that they have to walk for [25]; a world where half the population is crowded into poorly designed cities [26], a billion more are arriving over the course of a generation [27] and another 888 million more to move to the cities in just the next 14 years.

These eight statistics are not simply pulled from the ether. References [21–27] in the preceding paragraph are linked to some 2108 words of explanation and references as to how these estimates were made. To avoid polluting the world with more reams of technical text (albeit mainly electronic rather than on paper) from here on we only provide brief footnotes each beginning with the relevant worldmapper map number—the full technical notes can then be found by the corresponding map on the worldmapper website that this article draws on (and at www.worldmapper.org/data.html). The numbers matter and it is important that they are right—but it is even more important to begin to recognize what they imply for the future.

An environmental disaster might mean over a billion people trying to live on below subsistence levels of income [28], additionally over a billion and a half in absolute poverty [29]; over half the population of the world living each day on those goods, services and shelter that a ten dollar bill

would buy in the United States. The numbers undernourished are growing [30]; and within a generation from now we should expect those to top a billion, over half being underweight children [31]. Millions of children have to work [32] and two out of five children do not ever attend a secondary school [33]. The same proportion of babies is born without a midwife or some other person with her knowledge present [34].

In a disaster situation it is hardly surprising that over 3 million pregnancies a year result in death at birth—almost all where the disaster hit hardest [35]. A further 3 million newborn babies struggle then die in their first week of life [36]; each year there are over ten million children dying a year before their fifth birthday—also almost all where the disaster was most acute [37]. Almost 250 million children of these ages suffer from diarrhoea, mostly in these worse-off places, and that is where the disease is more often fatal [38]. These are the same places as where the slums have become concentrated, the sanitation does not exist, overcrowding is rife, and the drinking water is dirty; where billions live in poverty, go hungry and children so much more often than elsewhere, and more often than adults, are emaciated.

Certain diseases are most concentrated in impact where the environmental damage is greatest. Often these are the same

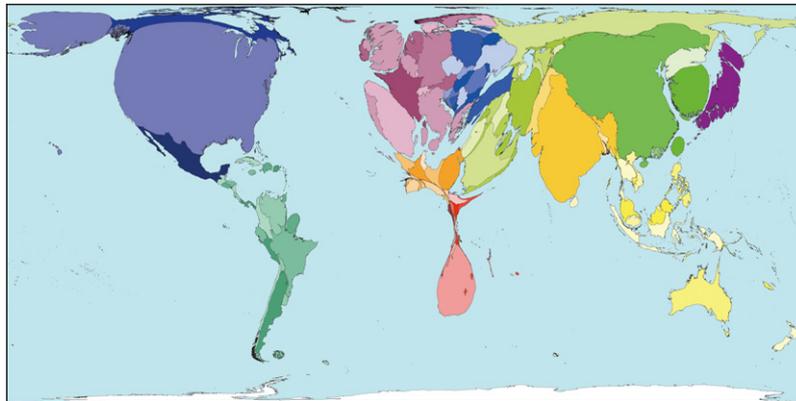


Figure 5. Nitrogen oxides (map 302). Territory size shows the proportion of all nitrogen oxide emissions that come from there. Data source: United Nations Statistics Division, 2005.

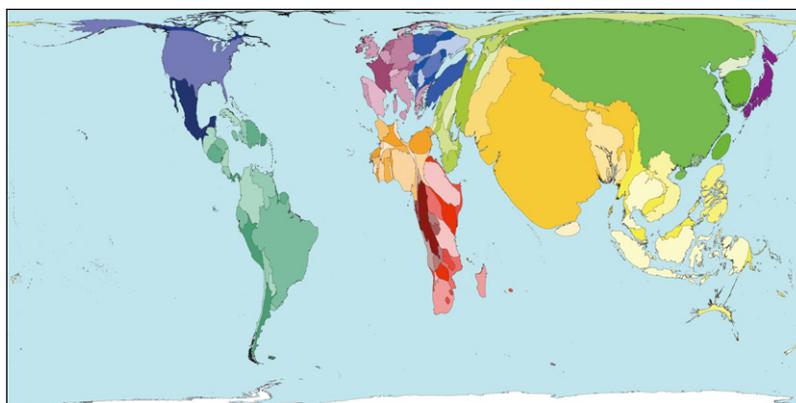


Figure 6. Road deaths (map 243). Territory size shows the proportion of all road traffic accident deaths worldwide that occurred there. Data source: World Bank, 2005, World Development Indicators.

diseases that were common in the overcrowded and unsanitary conditions of Victorian Britain. Cholera is still widespread, with over one hundred and fifty thousand cases a year [39] resulting in a few thousand deaths every year, despite its susceptibility to treatment and prevention [40]. More than 8 million cases of tuberculosis are recorded annually; there are 72 million cases of malaria [41] resulting in over one hundred thousand deaths a year [42]. Disease and the resultant premature deaths are the worst outcomes of the disaster. One hundred million very young children died unnecessarily during each of our current decades. Millions more older children and adults are dying young unnecessarily. Considering under five year olds alone, more have died from preventable causes in a dozen years than in all the wars of the 20th century—and these have been the most violent wars of all centuries.

This is the 21st century environmental disaster. It is not a disaster resulting from rising carbon emissions [43], even though they have disastrous future implications. It is not a disaster of the greenhouse gases combined [44], or methane and nitrous oxide emissions [45], and nitrogen oxides [46]; it is not the result of our pumping sulfur into the air [47], chlorofluorocarbons [48], even of our dumping nuclear [49] and other hazardous waste [50], sludge [51], and rubbish [52]. This is not an environmental disaster that is the

result of our depletion of the planet’s energy resources [53], mineral reserves [54], or forests [55]. Activities involving all these things contribute to the disaster, but hardly any of the tens and hundreds of millions of premature deaths have been as a result of pollution other than from our own sewage. Our rapid depletion of gas [56], oil [57], water [58], and other resources [59] beyond the capacity of the land where we live [60] was not the cause of the crisis. We did not run out of oil power [61], gas [62], coal [63], nuclear energy [64], although in places the firewood was exhausted long ago [65]. This environmental disaster did not result from the World Bank failing to include the costs of this damage in their accounts [66], nor from the International Monetary Fund’s unfair influence [67]—although that may well have contributed. This disaster is a result of various limits: some of these are fixed limits; many are self-imposed, often unwittingly so. It is the latter that we can alter, along with the horizons of our imaginations. Our ability to think, invent, change, express, and care is not limited.

In Victorian Britain the poor within the cities of the rich were imagined to be of another race, destined to short and destitute lives. Slightly further afield, affecting almost the entire population, famine was tolerated, even sustained, as long as it occurred overseas—even if that stretch of water in the case

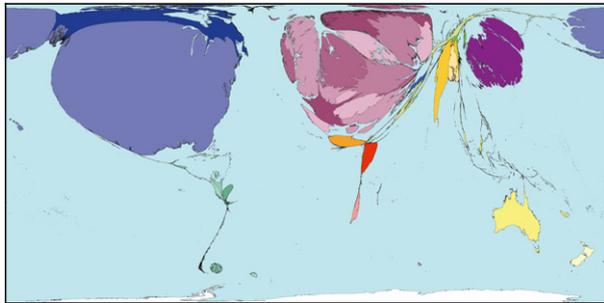


Figure 7. International food aid. Territory size shows the proportion of all contributions to international food aid programmes that come from governments there. Data source: World Food Programme, 2005, Annual Report.

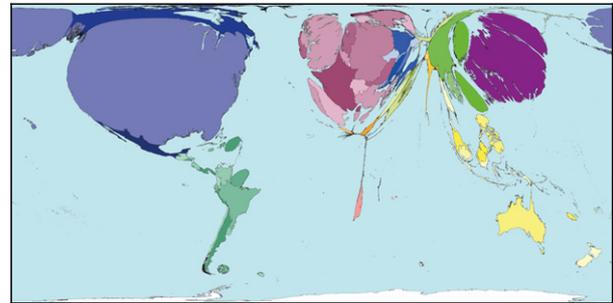


Figure 8. International fast food. Territory size shows the proportion of all McDonalds restaurants that were open in 2004 that were found there. Data source: McDonalds corporation.

of one set of Isles was as narrow as the Irish sea. Famines in much of the rest of the world were prevented by pre-colonial administrations such as those in India (until the British East India Company's intervention in the 18th century [68]) and in China (until the opium wars of the 19th century [69]), or Brazil (where 20th century famines have their antecedents in British financial interventions [69]). As Victorian times ended, infants died in British cities in the worst of hot summers at a rate that surpassed that to be found almost anywhere else in the world today. They died because of the limits of the horizons of our imaginations; because infant death then in England was not seen as a social problem—but explained as an act of god. At that time infant mortality was considered a fate that could not be prevented. And then it was. Between the time when our grandparents were born and our children's births, infant mortality rates for the well-off in Britain fell one hundred-fold. This illustrates human capacity for rapid improvement, and the ability to change something that was previously thought to be inevitable.

From Victorian times onwards the horizons of the British public's imagination have widened: to see most other people in our cities as people, to tolerate no child dying of neglect near where we live; to see famines, at least those nearby, as wholly avoidable. Our horizons have extended to not view colonization of almost all the peoples of the world as a civilizing influence. However, we Brits still accept that some children are malnourished, even on our own streets if we do not see them as the same as us (the baby of a refugee, for instance, is legally entitled to less food through welfare in Britain [70]). Concern is currently transfixed by our own self interests such that we see the car as a necessity for the tenth of people worldwide with cars [71], and ignore the million deaths a year that result [72].

We are obsessed over access to crude oil (worldwide annual US\$320 billion exports: [73]), or that one day soon we will not be able to fly as often and far as we do now (25 billion km each year and rising [74]), and are as concerned by climate change as we once were by AIDS, and before that nuclear winter, and before that world war, before that revolution—before we thought we were safe from each concern and moved on to worry about the next. The wars never ended [75]; the nuclear weapons remain [76]; over 30

million people have HIV [77] and three million a year are dying of AIDS—but largely out of sight and over the limits of our imagination now that that disease is no longer pandemic 'at home'. Now imaginations in the rich part of the world turn to scares over a return of an influenza outbreak that could kill us or 'ours' [78]; worrying about our diets [79], giving up smoking [80] and recycling [81]. What will concern us in a decade?

Meanwhile—elsewhere acute disasters are still the experience of millions a year [82]; and thousands are killed [83] by earthquakes [84], volcanoes [85], droughts [86], floods [87], storms [88], landslides [89], heat waves [90], and pestilence [91]. But for every death attributed to such a disaster, at least one hundred more (mostly infants) die relatively quickly and quietly from largely undocumented poverty, as they did in that first modern city, Manchester, at the time when Queen Victoria died.

We gave to charity then and we still do—doling out food aid [92] in almost direct proportion to our consumption of burgers [93]. But we no longer expect children in cities in the rich world to rely on charity (at least outside of the United States we do not). Our horizons are widening: we can talk around the world [94], the internet explodes [95]. Most children are now literate [96], 100 million are at university [97], and millions of people, disproportionately the young, are willing and now able to demonstrate in numbers never seen before [98] and to vote [99], strike [100], organize [101], and to understand how the world works [102] and does not work [103].

The global environmental disaster is here, now [104]. Billions are living in environmental conditions of our making that are the main detrimental impact on human health. Worldwide inequalities in health are rising and living standards are polarizing. There are places where general living standards are falling [105], and where absolute incomes are falling [106]. Most people will never fly; more do not have access to a car with every year that passes; and material production has come to be concentrated on one side of the planet [107], making us reliant on a single source of fuel for bulk transport [108] to the other side of the planet [109]. Although the product of this labour may allow near universal electricity access in China [110] it cannot result in the spreading of standards of living acquired largely as a result not of labour but of earnings

from mercantilism [111], finance [112] and royalties [113], that are less than zero-sum in world aggregate (a few benefit at the expense of the majority). Simultaneously 71% of the plant species of China are threatened with extinction [114] while the highest numbers of animal and plant species extinctions overall are found in the United States [115]: the results of past environmental disasters and those yet fully to come.

The global datasets that give us such vertiginous world views do not allow us to illustrate the detail in the *flows* of global goods and bads between territories, which result in disastrous inequities. The images shown here and on the worldmapper website are so dramatic because inequities are so vast, and their implications so serious. In considering their implications it is worth taking into account the parallels between the worse-off places in Victorian Britain and the world today. The enclosure of land in Britain, and the appropriation of common land and rights worldwide, often preceded environmental disaster in both cases despite these being very different times [116]. The counter to the enclosure of land in Britain was when the large estates were reclaimed as they were ‘donated’ to the National Trust (appropriated by an arm of government). Nationalization of common ground continues to this day in Britain as yet more land is made accessible; more children are allowed into what were once hallowed colleges, and, at the other end of the age range, a few more normal folk made members of a House of Lords. Nevertheless, as the old Lords look out over their gardens at a few more common people tramping across the access land that now covers part of their grounds they symbolize that one of the most capitalist of nations contains contemporary and positive examples of possible ways into a better future . . .

Returning to the concerns of Al Gore and Nicholas Stern, amongst others, there is an obvious answer to their fears. Most of us, the world population that is, live with relatively small impacts on the Earth [117] (this is linked to a lack of ‘entitlement’ to resources, to enclosure and appropriation of the common land, as much if not much more than to any local environmentalism). Some of us enjoy overheated homes, mini breaks from London to the Alps, New York to LA, the luxury of eating imported meat and giving each other presents of air-freighted (or industrially greenhouse-grown) flowers. Will this small group sacrifice even a small part of its undeserved and largely unneeded privileges to tackle not just the environmental disaster that looms in the future, but also the disastrous situations of the present? Those with power have started to see the disaster as an emergency and to tell another inconvenient truth.

‘. . . I have come to New York—to the city where the world convenes—to support the Secretary-General’s call and to tell the truth: the goals the world has set are not being met and we face an emergency—a development emergency—and we need emergency action if we are to meet them. . . . As the UN Secretary General said earlier this month pointedly and persuasively “millions of lives quite literally hang in the balance”. . . . The calendar says we are half way from 2000 to 2015. But the reality is that we are a million miles away from success. . . . So it is time to call it what it is: a development emergency which needs emergency action. If 30 000 children

died needlessly and avoidably every day in America or Britain we would call it an emergency. And an emergency is what it is. . . . So when the need is pressing, when it is our generation that has made historic commitments, when the time to meet them is now short, the simple questions that—to paraphrase the words of an American president—we must ask are: If not now, when? If not us, who? If not together, how?’ Gordon Brown, 2007 [118]

The implied first step has somewhat biblical undertones: treat and respect others as you wish for your friends, your family and yourself to be treated. If we can extend a genuine caring attitude to people far beyond those we know, then this is the first step towards thinking our way out of disaster. Live in fear of others for what they might take away from you, and you limit the horizons of your imagination. Another step yet to be taken by people in positions like that of the British Prime Minister (despite his ‘prudence’) is to consider what affluent people might more realistically need. See others as less deserving than you, as less intelligent, as less civilized, less human, less important and you will find it very hard at all to imagine a world in which 9 billion people will be alive when our children’s grandchildren ask why their ancestors did not recognize and prevent the disaster [119]. If we fail, the answer that may be given to the far fewer than 9 billion survivors may be that we were too limited in our collective imaginations. If we believe we should only act when our actions have direct consequences upon ourselves (or just our children), then we will fail. If we ignore the environmental disaster that kills well over a million of us every month now, we will fail. If we are only just learning that other people within our countries are human too, it may be already too late. Not too late to save us from future global warming, but too late to save us from what we have already become. For instance, if many in the United States could not already see as fully human the people forced to crowd inside the Louisiana Superdome in August 2005—their own neighbours and fellow citizens—why should we expect horizons of the imagination to widen much any time soon? The premise for the film, an inconvenient truth is a very narrow self-interest:

‘What changed in the US with Hurricane Katrina was a feeling that we have entered a period of consequences’ [120]

Not enough will have changed until we understand that we have been in a period of consequences for many decades, if not centuries, and until we recognize who we are within these times: do we care enough?

Although many millions more say they care now, than did just a few years ago, the current shape of the world may be a more accurate gauge of our real current shared concerns—and lack of real concern. This can change, as it has at least locally in Britain since Victorian times and in a multitude of other loci of past human induced environmental disaster. However, the horizons of our imagination will need to be stretched far wider than before if we are to overcome our current disaster.

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For the worldmapper maps referenced below, see www.worldmapper.org
- [21] 187 Urban Slums; 188 Slum Growth. Data are from: UN-HABITAT, 2005. There are difficulties in defining a slum because the indicators needed to measure any international definition of what a slum is are not often available. The United Nations agency responsible for producing the Millennium Development Indicator: 'Slum populations in urban areas', UN-HABITAT, therefore had to resort to proxy indicators. This text below (source: <http://www.unch.org/>) discusses this issue 'Research on estimating the number of slum dwellers started with an attempt to measure the phenomenon 'secure tenure'. Secure tenure is the concept of 'protection from involuntary removal from land or residence except through due legal process'. The lack of data based on a specific and operational definition made direct estimation impossible. Initial efforts attempted unsuccessfully to use tenure status data (owner, renter and squatter) as a proxy measure. UN-HABITAT then proposed that the attribute of secure tenure would be demonstrated in household behaviour. Households with secure tenure would tend to have more improvements than households without secure tenure and that this could be measured by a proxy index that included dwelling structure and amenities data. This was seen as a subset of the UN-HABITAT slum index initiative that was already underway. The resulting secure tenure index provides a fair assessment of the magnitude of slum dwellings. The characteristic variables include: the proportion of households with access to water (within 200 m), the proportion of permanent structures in the housing stock, the proportion of housing that is in compliance with local regulations, the proportion of households connected to a sewer, the proportion of households connected to electricity.' Even when lack of secure tenure is directly measurable, differences in legal systems and cultural attitudes may make the figures not strictly comparable. If they are available, in some territories they may not include many people which would have been counted using the proxy indicators, or the other way round. Please refer to the original data source for how the figures for particular territories were arrived at. The territories where we used regional percentages because they were missing from the original data set were Mauritius, Swaziland, Djibouti, the Holy See and Taiwan. The figures that we used gave a world total of 927 million people living in slums in urban areas in 2001. The total rise in slum populations, in all territories where there was a net increase, was 220 million more people living in slums in 2001 than there were in 1990.

- [22] 184 Basic Sanitation. Data are from: United Nations Development Programme 2004 *Human Development Report*. Basic sanitation, or improved sanitation as it is termed and defined by the United Nations Development Programme is ‘access to adequate excreta disposal facilities, such as a connection to a sewer or septic tank system, a pour-flush latrine, a simple pit latrine or a ventilated improved pit latrine. An excreta disposal system is considered adequate if it is private or shared (but not public) and if it can effectively prevent human, animal and insect contact with excreta.’ Here we are excluding people connected to a public sewer and wastewater treatment plant. The definition above was taken, in August 2006, from the source below http://hdr.undp.org/reports/global/2003/indicator/indic_48_1_1.html The United Nations Environment Programme provides a precise definition and explanation of being connected to wastewater treatment facilities; this was sourced from the meta data of the source data, under filename ‘water_pop_connected_public’. ‘Data of the percentage of national population connected by public waste water treatment plants. Non-public treatment plants, i.e. industrial waste water plants, or individual private treatment facilities such as septic tanks are not covered here. When reading these data one should keep in mind that the optimal connection rate is not necessarily 100%; it may vary among countries and depends on geographical features and on the spatial distribution of habitats’. By the year 2000 almost 3 billion people in the world had access to basic sanitation—that is pit latrines within walking distance or toilets linked to cesspits, but not mains sewerage.
- [23] 183 Poor Sanitation. Data are from: United Nations Development Programme 2004 *Human Development Report*. Poor sanitation is defined as the lack of access to ‘improved sanitation’ facilities. Improved sanitation is defined by the United Nations Development Programme as ‘access to adequate excreta disposal facilities, such as a connection to a sewer or septic tank system, a pour-flush latrine, a simple pit latrine or a ventilated improved pit latrine. An excreta disposal system is considered adequate if it is private or shared (but not public) and if it can effectively prevent human, animal and insect contact with excreta.’ If improved sanitation is not available, people will either use public toilets or latrines, or any facilities that they do have do not meet the above criteria. The definition above was taken, in August 2006, from the source below http://hdr.undp.org/reports/global/2003/indicator/indic_48_1_1.html Some 2.5 billion people do not have access to improved (or what we term basic) sanitation (good quality latrines within walking distance or sewerage). According to the original source, 39% of the world population were lacking improved sanitation. Once missing figures have been estimated for territories not included in United Nations Development Programme estimates, the proportion of people with access only to poor sanitation rises by a percentage point to stand at 40% by the year 2000. The source of the data used here is the United Nations Development Programme’s 2004 Human Development Report, table 7. This report drew on a UNICEF (United Nations Children’s Fund) report published in 2003, entitled ‘The State of the World’s Children 2004’ (New York: Oxford University Press), which was the product of a joint effort of the United Nation Children’s Fund and the World Health Organization. Estimates were made for the 33 territories that the Human Development Report does not cover, and for those territories with missing data. These estimates were based on using the regional averages for the region in which each territory with missing data was found.
- [24] 192 Overcrowded Homes. Data are from: World Bank 2005 *World Development Indicators* An overcrowded home is considered to be when people are living in houses, flats or other structures where there are more than two people for every room in their home. About 2.3 billion people in the world appear to be living in overcrowded homes. This is an arbitrary international definition, but allows comparisons to be made. See technical notes 191 (or [27] below) on the worldmapper website on households for details of how they are estimated. And please note that the caveats concerning the reliability of this data are much the same; 192 is a provisional map based on a limited amount of data from the same source as that for 191. For example, the highest rate of overcrowding is reported in India (76.8% of people) and that proportion is applied to the entire Indian region—due to missing data for other territories there. In future it is hoped that better data will become available.
- [25] 186 Poor Water. Data are from: United Nations Development Programme 2004 *Human Development Report* 327 Water Connected; 328 Water Connecting. Data are from the World Health Organization and United Nations Fund for Children 2005 Joint Monitoring Programme. Poor water means the being reliant upon of water sources such as vendors, bottled water, tanker trucks and unprotected wells and springs. Whether someone’s access to water is poor is also measured by the sustainability of access to this source. This definition was accessed from the webpage below in August 2006 <http://hdr.undp.org/statistics/data/indicators.cfm?x=21&y=1&z=1> In the year 2000, about 1.1 billion people did not have sustainable access to an improved water source. The source of these estimates are the United Nations Development Programme’s 2004 Human Development Report, table 7. This report draws on UNICEF’s (United Nations Fund for Children) 2003 report, entitled ‘The State of the World’s Children 2004’. (New York: Oxford University Press). This report was based on a joint effort by the United Nation Children’s Fund and the World Health Organization. This map that this fact was drawn from shows the distribution of households connected to water. In 2004, almost 3.4 billion households were connected; that is 54% of all households. Access to an improved water source refers to the percentage of the population with reasonable access to an adequate amount of water from an improved source, such as a household connection, public standpipe, borehole, protected well or spring, or rainwater collection. Unimproved sources include vendors, tanker trucks, and unprotected wells and springs. Reasonable access is defined as the availability of at least 20 l a person a day from a source within 1 km of the dwelling. Territorial data for access to an improved water source in 1990 and 2002 differentiated into rural and urban community access are given in the source data sheets of worldmapper 323, Water Depletion. Mapped here is access to an improved water source consisting of a household connection. The calculations assume that households connected are of average size for households in that territory. Where there are overall low levels of connectivity, and households connected tend to have fewer people in them than average households there, the figures for map data will be slightly inflated. Data sources: these data were sourced from the World Health Organization and the United Nations Fund for Children’s (UNICEF) Joint Monitoring Programme, from their data on water & sanitation worldwide. See: <http://www.wssinfo.org/en/sanquery.html> (accessed 5/10/2006). Estimates of 100% connection were inserted for Australia, New Zealand and Hong Kong, rather than assuming the regional rates. This is because regional average rates for Asia Pacific and Eastern Asia are likely to be much lower than the actual rate for

- these territories (it should be noted that 100% is also likely to be too high). Elsewhere, the regional average rate is used when data are missing. Population numbers assumed proportional to households to permit aggregation and to allow the total to be an estimate of the proportion of people thought to be connected. It should be noted that more recent data are now available from the same data source. The new report, updated in 2006, was made available at: http://www.wssinfo.org/en/40_mdg2006.html
- [26] 190 City Growth. Data are from: United Nations Development Programme 2004 *Human Development Report* Urban growth is the predicted increase in the total number of people that live in towns and cities in each territory. The timescale for this change is 2002–2015. Worldwide it is predicted that the population of urban areas will increase by 888 million over the course of these 13 years (2002–2015) in those territories where there is a net increase. The projected net decreases are not mapped and they only amount to some 10 million fewer urban dwellers in territories worldwide. However, 6.5 million fewer people are projected to be living in cities in the Russian Federation by 2015 as the population there shrinks, 2.3 million fewer will be urban dwellers in the Ukraine. The projected reductions in urban populations amount to just over a million in ten other territories; these territories are Italy, Georgia, Bulgaria, Lithuania, Latvia, Armenia, Switzerland, Estonia, Romania, and Slovenia. Data sources: on the worldmapper website see technical notes 189, Urban Areas, for the source of urban population data. The estimate of the population that will be living in each territory is given in technical notes 164, Wealth 2015
- [27] 191 Households. Data are from: World Bank 2005 *World Development Indicators*. A household is a group of people that live together. This may be measured by the index of whether they eat together, or share a bathroom (for those that have one). The map that these data is drawn from shows the number of households. There are no reliable world estimates of household structure or size. Figures for household size have been collected from 55 of the territories that are mapped. Regional averages were often used to estimate missing data. Simple estimates were made for those regions for which data were missing (these were Western Europe, Eastern Asia, Japan and North America). The result of this is to suggest that in 2002 there were 1.7 billion households in the world, which on average would consist of 3.7 people. This average varies from about 7.7 people in a household in Iraq, to around 2 in some territories with very low fertility rates and a high proportion of elderly people. Data sources: the estimates made here rely for their first approximation upon the World Bank's 2005 World Development Indicators 2005, table 3a: urban housing conditions estimates of average household size. It was noted that this is a 'work in progress (coverage and quality is being enhanced. More indicators for larger number of countries will be presented on the WDI online version)
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