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Zürcher Hochschule der Künste
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Global Warming – Action, not Apathy

Getting to a Personal Action Plan and Starting a Grassroots Movement, through Design – The HEAT Method

MAS Strategic Design
ZHdK 2019-20

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10 March 2020

Fig. 1. Amazon rainforest fire, "The Sun", 25 August 2019 [1]

Abstract

Never before have we known so much about how human behaviour impacts the environment. The resulting global warming leads to resource shortages and loss of habitat supporting human life. Yet we seem to do little. Despair, denial and disengagement significantly inhibit action taking at all levels. This thesis focuses on empowering positive engagement, starting with individuals and households in Switzerland.

A strategic design approach, involving research into the psychological and cognitive mechanisms behind denial led to the HEAT Method (in short: **H**ope, **E**valuate, **A**ct, **T**ell), which focuses on emotional and motivational aspects and designs a positive future vision, a set of concrete actions and a corresponding narrative. Sharing the narrative openly is used to start a grassroots movement. The ideas underlying HEAT originate from experiences in the author's family. Approaches for scaling up to society at large are also investigated. The result is a way of keeping motivated and engaged.

Fig. 2. Arctic Ablaze: The European Space Agency's Copernicus Sentinel-2 satellite took this image on 27 July 2019 of wildfires burning released methane near the Mackenzie River in Canada's Northwest Territories, (picture: Pierre Markuse [2])

Affirmation of Originality

I hereby affirm that I have independently prepared the present work without outside help. All passages that I have taken literally or by analogy from public or non-public sources, I have identified as such.

Zurich, 10 March 2020

David Christie

Thanks

HEAT Method prototype testers

- Regula Cincera
- Katarzina Flood
- Beat Jost
- Palle Petersen
- Tom Röttig

Reviewers

- Candace Brooks
- Áedán Christie
- Seán Christie
- Eva Cincera
- Sumeet Degun
- Urs Hunziker

Local actors in society at large

- Dr. Jürg Artho, Director of the Social Research Center, Psychological Institute of Zurich University
- Nicola Forster, Co-President of the Green Liberal Party GLP, Canton of Zurich
- Selin Jost, Corporate Sustainability and Responsible Investing, Bank Julius Baer & Co. AG
- Andrew Katumba, Member of the Cantonal Council, Socialist Party SP, Canton of Zurich
- Prof. Dr. Christoph Küffer, Professor for Urban Ecology, Landscape Architecture, HSR Rapperswil and Member of the Institute of Integrative Biology, Environmental Systems Science, ETH Zurich
- Tilla Künzli, Urban Agriculture Basel
- Kathrin Schlup, Head of Transformational Programs and Member of General Management, WWF Switzerland
- Christina Schnellmann, Basel
- Nicola Siegrist, Co-President of the Young Socialists JUSO, City of Zurich

ZHdK (www.zhdk.ch/en/)

- My MAS Strategic Design colleagues, too numerous to mention
- Nina Bruderer (who looked after us throughout the MAS Strategic Design)
- Stefano Vannotti (overall MAS Strategic Design course leader and MAS mentor)

…and of course, my family!

Fig. 3. "Thousands Flee to Shore as Australia Fires Turn Skies Blood Red", New York Times, 31 December 2019 [3]

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Prologue

I have been interested in environmental protection for many years, but the topic of global warming finally grabbed my personal attention when Al Gore's film "An Inconvenient Truth" came out in 2006 [4], shortly followed by the IPCC Fourth Assessment Report in 2007. It was clear to me as a trained scientist that humanity was on a crash course to destroy its own human habitat.

In 2010, I took an online course given by the United Nations Environment Programme in conjunction with the finance industry (UNEP Finance Initiative "Climate Change: Risks and Opportunities for the Finance Sector"). Basically, it was a course that explained the drivers behind global warming and suggested ways the finance industry could contribute positively. Some of the "ESG[1]" products are indeed finally coming to fruition, but the topic is only now starting to emerge nearly ten years later. It remains something that the finance industry feels it must talk about but not really take all that seriously. Until the customers start to demand solutions that address global warming, nothing much will change.

A word about names and frames

I have tried to avoid the term "climate change" in this document, preferring to use the more meaningful term "global warming". "Climate change" is a way of framing the "global warming" crisis so that it sounds harmless and not caused by human activity. This framing, formulated by a communications consultant Frank Luntz [5], was put about by the US Republican Party in 2003. Luntz recently changed sides and started to call for action when asked to speak to the US Special Committee on the Climate Crisis [6]. See also §3.2

My original idea was to establish a currency used to tax emissions as near as possible to their source in units tied to actual emission levels, limiting the amount of that currency in circulation to ensure that it has a significant market value, and then distributing a fixed amount to individuals and to companies so that high emitters would have to buy their emission units from low emitters so compensating them for their restraint. A negative interest rate would ensure that the currency units were not hoarded, and a border adjustment tax would be used to handle imports into and exports out of the zone where these rules apply. Back then this was regarded as unrealistic. There are people thinking along these lines today.

Ten years on, I began to realize that I was guilty of thinking, along with many others, that global warming could be addressed as a problem just needing a "technical" solution, but things are far more complex. Social, cognitive and emotive factors play a very important role, as do the lobbies that represent groups that are creating the problem. The global warming emergency is a "wicked problem", where:

- Intellectual arguments alone are not enough, particularly where one's worldview/lifestyle is called into question
- Relying on individual choice as solution is an abdication of responsibility by politicians
- Pollution of the global "commons" is the problem, but it is only now becoming tangible and visible
- The pollution is being carried out by a few global companies, but with the collusion of political actors *and us all*
- Our current prosperity is based on technologies that cumulatively pollute and destroy our habitat, and have been doing so since the first coal was burned
- On the whole, carbon credits are a fancy system of Indulgencies as formerly known in the Roman Catholic Church, where we buy a good conscience, absolution of our sins, and hope to "go to heaven" despite our behaviour
- The results of global warming cause strong emotional reactions. Suppression of these reactions leads to denial, apathy and resignation.

Instead of a "technical" approach, an "adaptive" one is needed. This document prototypes a *design method* to help motivated individuals and households in prosperous Switzerland create their own personal action plan to fight the trap of resignation, and then start a grassroots movement by sharing a narrative with friends and colleagues. Taking action at a practical level also impacts the personal and political spheres, so presents opportunities to scale up to the level of society at large.

This is just one part of the puzzle of how to tackle the wicked dilemma of global warming: we know what the problem is, but we seem not to take any action to solve it.

[1] Products where Environmental, Social, and Governance (ESG) criteria apply, resulting in "green" bonds, special insurance products, etc. [119]

1 Introduction

Global warming is the central theme of this Master of Advanced Studies (MAS) project. Never before have we had so much information about how human behaviour is impacting the environment, with long-term consequences that could result in large scale loss of habitat supporting human life, on the only planet we have. Yet we seem to do nothing. This MAS focuses on this dilemma.

Global warming is too large a problem, too long term, perhaps too diffuse. The language we use about it is muddied. Politicians are engaged in misinformation or even outright denial, see for example [7]. None of this empowers individuals to have hope and engage in positive change. Psychological and cognitive aspects conspire to weaken our response, resulting in apathy and resignation from exactly those individuals and groups who should be most motivated to react.

We are more than aware of the impact of our behaviour on the environment and the negative side-effects of polluting the atmosphere with greenhouse gases. There are also people who are sceptical or even deny that global warming is taking place. Even for individuals who are aware and want to change, it is difficult to see the effect of taking action. Approaches are also needed that can motivate individuals who are not so informed or even sceptical. Furthermore, people have to have *hope* that something will come of their individual actions, and the *courage* to talk about what they themselves are actually doing about global warming! Despair, denial and disengagement are a real risk.

Because global warming is a "wicked problem" requiring social innovation, a design approach was consciously chosen. Ezio Manzini describes using design to tackle social innovation in his book "Design, When Everybody Designs" [8]:
"When confronted with new problems, human beings tend to use their innate creativity and design capacity to invent and realize something new: they innovate. It has always been like that, but today these everyday innovations are spreading, appearing in unprecedented forms and making themselves felt with greater force."

In the last years, the author's own family has tried to change its behaviour: mostly successfully despite the apparent lack of progress on the larger scale. These "Living Lab" interventions and the related frustration triggered the choice of theme for this MAS and led to the proposed HEAT Method[2].

LL Living Lab Themes

The Living Lab themes are covered in boxes styled like this throughout the document:

- Mobility and travel, see §LL.1
- Local and seasonal food, see §LL.2
- Consumption and waste reduction, see §LL.3
- Heat and power – energy consumption in the household, see §LL.4

Since changing the collective behaviour of individuals and households can have significant larger-scale impact on society and influence political discourse, it is essential that individuals stay engaged. How to achieve this and proposing ways to scale up to society at large are investigated.

This paper addresses individuals and households in Switzerland, which is an interesting location because of its direct democracy and the global reach of the Swiss economy. Interviews with local actors at in society at large are used to gain insights into scaling the approach up and ensuring engagement on a wider scale.

The rest of the document is structured as follows:

- Chapter 2, Global Warming, covers the scientific background and focuses in on Switzerland
- Chapter 3, Psychological, Cognitive and Transformational Aspects, addresses motivation and engagement
- Chapter 4, Shaping the Strategic Design Challenge, covers the overall design process followed and the way that the HEAT Method was developed
- Chapter 5, The HEAT Method, contains a description of the method itself
- Chapter 6, The HEAT Method Revisited, covers the HEAT Method iterations and scaling up to society at large
- Chapter 7, Summary, covers the overall results of the research project and proposes possible actions.

The appendices give details of the prototyping sessions, citations and bibliography references.

[2] HEAT is an acronym for the four main steps in the method, in short: **H**ope, **E**valuate, **A**ct, **T**ell: see §5

2 Global Warming

Global warming is caused by the rising level of greenhouse gases in the atmosphere. The science behind this is well understood. Because the level of these gases in the atmosphere is cumulative and only slowly returns to equilibrium naturally, all additional CO_2 (and other greenhouse gases) directly results in increased heating effects. Human activity based on fossil fuels is releasing additional carbon which was stored in the ground over millions of years.

The resulting effect on the ecosphere is highly complex, since individual subsystems react in different, complicated and interconnected ways. Some of the resulting changes also result in feedback loops which reinforce the warming effect. These tipping points can result in catastrophic changes which are potentially irreversible. And, because the level of greenhouse gases in the atmosphere reaches global equilibrium very quickly, every local emission affects the whole world globally in short order.

This chapter covers the science of global warming in quite some detail, as it is essential to have a broad understanding of which aspects of human activity contribute to the problem. The latter part puts Switzerland's role into perspective. The following topics are covered:

- A Summary of the Background Science
- What Can Humanity Do?
- "Business As Usual" is Unsustainable
- What Can Individuals and Households Do?
- What Can *Swiss* Individuals and Households Do?
- Take Tips from Nature.

2.1 A Summary of the Background Science

The concept of greenhouse gases[3] and their effect on the climate has been known for a considerable time, nearly 200 years: Joseph Fourier first proposed the effect in 1824 [9]. Over seventy years later in 1896, Svante Arrhenius was first to put forward a theory giving a *quantitative* prediction of global warming by certain gases and water vapour in the atmosphere, in a ground-breaking paper entitled "On the Influence of Carbonic Acid in the Air upon the Temperature of the Ground" [10][4].

Essentially, certain gases and water vapour absorb energy from the sun very effectively in a particular long wavelength part of the spectrum, the infrared. Humans do not see infrared waves but experience them as **heat**[5]. The atmosphere does not absorb in the visible part of the spectrum (which we call **light**[5]), which is why we are not able to sense the effect directly ourselves. Arrhenius showed that the amount of CO_2 directly affects the overall atmospheric temperature because of the heating caused by selective absorption of the sun's energy. The temperature change is approximately proportional to the total amount of greenhouse gases in the atmosphere.

It is very important to understand the difference between the **weather** – wind, precipitation, etc. – which we experience daily, and the **climate**, which is a *statistical* summary of all weather experienced in a certain area over a *long* period of time[6]. The energy absorbed by the atmosphere affects the overall balance of energy flows between the atmosphere, land masses and water in the Earth's climate system. This energy budget affects the weather, and is shown symbolically in the following graphic.

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[3] The term "greenhouse gas" was invented by analogy with the heating effect within a greenhouse, where the heat from the sun gets trapped locally somewhat like in the atmosphere. The physical processes are actually completely different, but the name has stuck! See [124] for a summary of the various sources of the term "greenhouse effect"

[4] Throughout, Arrhenius refers to carbon dioxide (CO_2) as "carbonic acid" following the convention at the time

[5] The colours are those used on the NASA chart, Fig. 4: **yellow** for light and **orange** and **purple** for direct and indirect heat

[6] Climate scientists use standardised thirty-year periods for climate analysis: the current period is the thirty years from 1991 to 2020

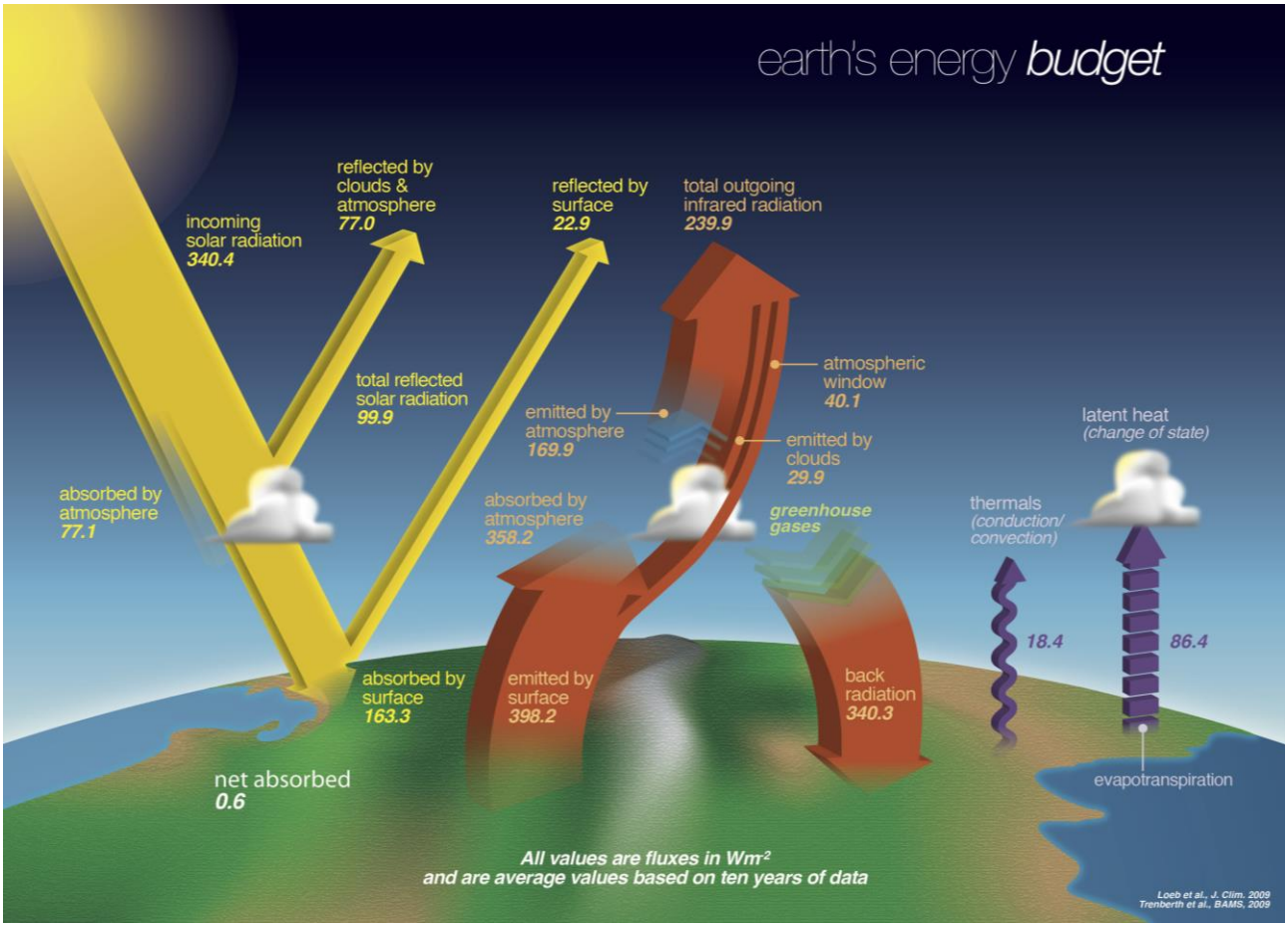


Fig. 4. NASA (last updated 9 August 2019): Energy flows in the atmosphere, from [11]

Since the time of Arrhenius, the science of the greenhouse effect has become well understood. The key atmospheric components that play a role are as follows (in decreasing order of importance, [12]):

- Water vapour (H_2O) – very strong effect, but extremely short-lived (around 9 days)
- Carbon dioxide (CO_2) – stays in the atmosphere for up to 100 years, with some remaining even longer
- Methane (CH_4) – stronger effect than CO_2 but with a much shorter lifetime in the atmosphere of 12 years
- Nitrous oxide (N_2O) – even stronger effect and with a lifetime of 120 years
- Ozone (O_3) – low concentrations at ground level where it breaks down into normal oxygen (O_2), with most atmospheric ozone in the higher stratosphere (the "ozone layer" that protects us from ultra-violet radiation)
- Chlorofluorocarbons (CFCs) and Hydrofluorocarbons (HCFCs and HFCs) – originating in refrigeration systems, in very low concentrations in the atmosphere, but well-known because of their destructive effect on the ozone layer.

Without greenhouse gases in the atmosphere, the average temperature of the Earth's surface would be around -18°C rather than the current 15°C, so the greenhouse effect is also essential for human life. Because the greenhouse effect of the different gases differs and their lifetimes in the atmosphere vary, it is customary to talk about CO_2-equivalents (referred to by the symbol CO_{2e}), which weight the various greenhouse gases to make them comparable with the same amount of CO_2. "CO_2" is used to mean the wider CO_2-equivalent term in the rest of this document for simplicity. The lifetime of the greenhouse gases in the atmosphere is important since there is a *cumulative* effect caused by *past* emissions. Thus, greenhouse gases that were emitted tens of years (or even a century) ago are *still* significantly affecting the climate.

Other aspects of the atmosphere also affect the overall energy balance:

- **Clouds** – water droplets or ice crystals suspended in the atmosphere: clouds reflect back a significant part of the incoming energy and so shade the Earth from getting even hotter

- **Aerosols** – small particles and atomic nuclei which cause clouds to form
- **Albedo** – the level of reflection of incoming solar radiation by the Earth's surface: how reflective the surface is – ice, being white, is an important reflector, so that the loss of major ice sheets can drive up the heating of the Earth, since less of the sun's energy is reflected back into space.

The key relevance of CO_2 and CH_4, the carbon cycle and fossil fuels

Atmospheric carbon dioxide and methane are perhaps the most important factors in global warming. They are the main gases released into the atmosphere as a result of human activity. Until the human race started to burn fossil fuels, the majority of CO_2 and CH_4 were released by processes which were in balance within the Earth's overall ecosystem.

For example, a growing tree captures CO_2 naturally from the atmosphere through photosynthesis, using the sun's energy to convert the CO_2 into sugar, derived from the carbon, oxygen and water. A complex process transfers part of the carbon via the roots of the plant into the soil. In this way, the carbon is sequestered (stored) by the living plant and the soil. When animals (including humans) eat plants, they transform the carbon in the plants into glucose that provides energy to the animal. When animals eat other animals, a similar process takes place and the carbon moves along. When we and the animals exhale, we return part of the carbon back to the atmosphere as CO_2. Also, when a tree is burned, a broadly equivalent amount of CO_2 is re-released. Similar closed cycles apply to CH_4 and other greenhouse gases. Before the burning of fossil fuels, this natural carbon cycle was in balance.

Burning fossil fuels (coal, oil and natural gas), on the other hand, re-releases significant quantities of CO_2 that have been sequestered underground over very long periods. Essentially, CO_2 removed from the atmosphere hundreds of millions of years ago is being re-released in an abnormally short period, so the whole ecosystem is no longer in balance. A similar problem is caused by methane being released from permafrost that is melting because of higher ambient temperatures.

The current concentration of CO_2 in the atmosphere has been measured continuously at the Observatory at Mauna Loa, Hawaii since 1958. The curve (Fig. 5) only goes upwards – natural annual variations cause the wiggle in the line. Similar data for CH_4 is available back to 1984, and for NO_2 back to 2001. All the curves only increase year on year.

The global average temperature is directly related to the levels of these gases in the atmosphere. If we were to stop burning all fossil fuels tomorrow, the greenhouse gases would remain in the atmosphere for a significant period, meaning that the warming effect will not just go away.

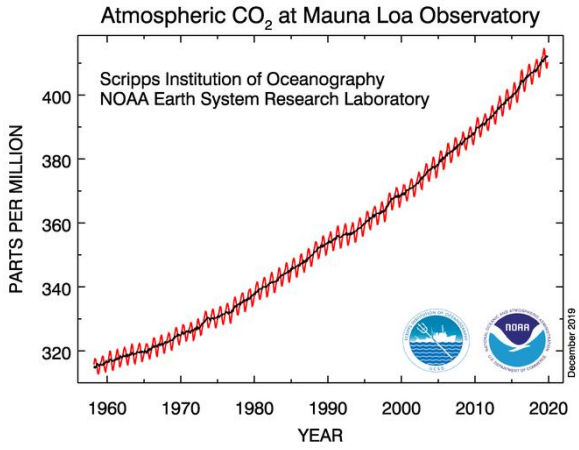


Fig. 5. Atmospheric CO2 as measured at the Mauna Loa Observatory [13]

Sinks – removal of CO_2 from the atmosphere by trees and the sea

Apart from vegetation, and in particular trees (as mentioned above), which remove CO_2 from the atmosphere, the oceans are also a key sink of CO_2. The oceans naturally absorb CO_2 by a complex process involving exchange between the atmosphere and the upper layers of the ocean, and between the upper and lower levels. There are also large, planetary scale circulations of ocean water that are very important for weather system stability.

As CO_2 is absorbed, the seawater becomes more acidic. As temperatures and the acidity increase, the less CO_2 can be absorbed, thus making the oceans less effective as we emit more CO_2. The more acidic the oceans are, the less hospitable they are for life. In particular, coral reef ecosystems are seriously at risk. Coral reefs are not only themselves a CO_2 sink, but also a home for fish and seafood, and a protection for coastal regions in stormy weather.

Is global warming happening and is it caused by human activity?

The Intergovernmental Panel on Climate Change (IPCC) is a UN organisation of scientists and governmental representatives which reports on the state of climate science and advises policy makers. The main way that they do this is to issue regular Assessment Reports which represent the current consensus about the science. The most recent of these, the Fifth Assessment Report, was issued in 2014 [14]. There is evidence that almost the whole climate science scientific community (98%) is in agreement with the IPCC results [15].

In the chart (Fig. 6) the global average concentrations of CO_2 in the atmosphere over the past 800,000 years are shown. For most of that period there were regular fluctuations in CO_2 concentrations that coincide with the onset of ice ages (low CO_2) and "interglacials" (high CO_2). These are caused by the "Milankovitch cycles" which result from changes in the Earth's orbit around the sun.

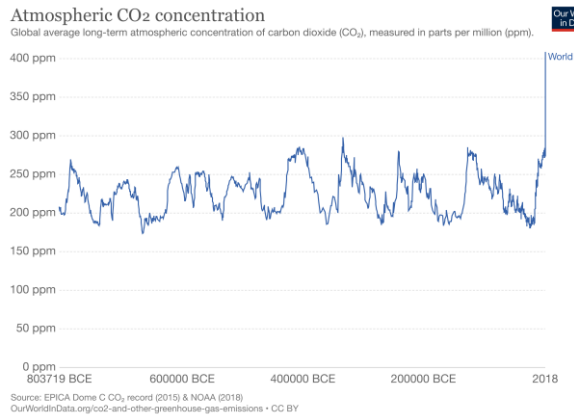


Fig. 6. Atmospheric CO_2 concentration over a long time period, from "Our World in Data" [16]

The IPCC already talked of a goal of "no more than 2°C above pre-industrial levels (1850)" in early Assessment Reports. The value "2" was a political judgement at the time that this particular level of temperature increase would not trigger catastrophic or irreversible changes – it meets the need for a simple target for political purposes. From this value, it is possible to work out approximately what level of atmospheric CO_2 is tolerable.

The 2015 United Nations Climate Change Conference of the Parties was held in Paris, France, from 30 November to 12 December 2015[7]. In particular, it established a framework for binding decision-making by governments and agreed on a more ambitious target: *to stay well below 2°C.* Article 2 of the Paris Agreement states: *"Holding the increase in the global average temperature to well below 2°C above pre-industrial levels and pursuing efforts to limit the temperature increase to 1.5°C."* [17]: a key argument used was that low-lying ocean island states are already severely threatened at a global warming level of 1.5°C because of sea-level increases resulting from rising ambient temperatures.

The IPCC issued a Special Report in 2018 [18] on request of the parties to the Paris Agreement. The Special Report uses strong language (for scientists), concluding:

"This Special Report confirms that climate change is already affecting people, ecosystems and livelihoods all around the world. It shows that limiting warming to 1.5°C is possible within the laws of chemistry and physics but would require unprecedented transitions in all aspects of society. It finds that there are clear benefits to keeping warming to 1.5°C rather than 2°C or higher. Every bit of warming matters." [18, pp. Foreword, v, 18, 18]

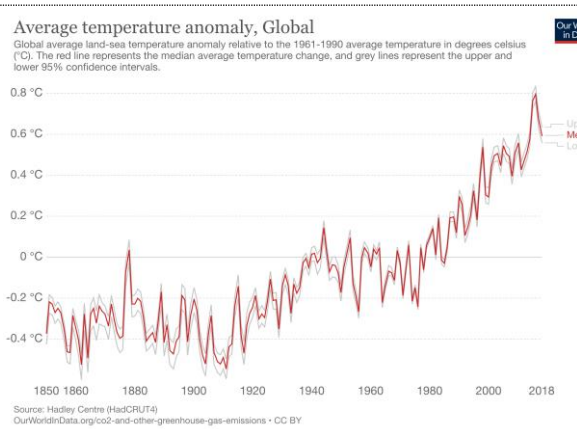


Fig. 7. Average temperature anomaly, Global, from Our World in Data) [16]

Fig. 7 shows that by 2018 we have already reached global warming of around 1.0°C since pre-industrial levels (1850), so the remaining scope for action gets smaller every year.

The answer to the question ***"is global warming happening and is it caused by human activity"*** is: **unequivocally, yes.**

[7] The 21st yearly session of the Conference of the Parties (COP 21) to the 1992 United Nations Framework Convention on Climate Change

Environmental tipping points in global warming

There are various irreversible changes that ever-increasing temperatures bring with them, which have been detailed by the IPCC and others (Fig. 8). Some examples are:

- Extreme weather events (such as floods, droughts, storms, and heatwaves)
- The loss of the arctic ice masses, with a related rise in sea level (and the related drop in albedo), putting a large part of humanity living very near sea level at risk
- The death of coral reefs (Fig. 9)
- The loss of land ice, such as the glaciers in Switzerland, with a related loss of ground water (and drop in albedo)
- The melting of permafrost, making the land instable for buildings and releasing large quantities of methane
- Temperatures that make human life no longer possible in certain regions (we are already close to this in parts of India) and increase the risk of premature death in others
- Desertification and depletion of freshwater reserves, and increased risk of wildfires (witness the fires in Australia, the Amazon and California in 2019, among others), putting much more CO_2 into the atmosphere
- Breakdown of the food supply for animals and humans, and severe loss of biodiversity.

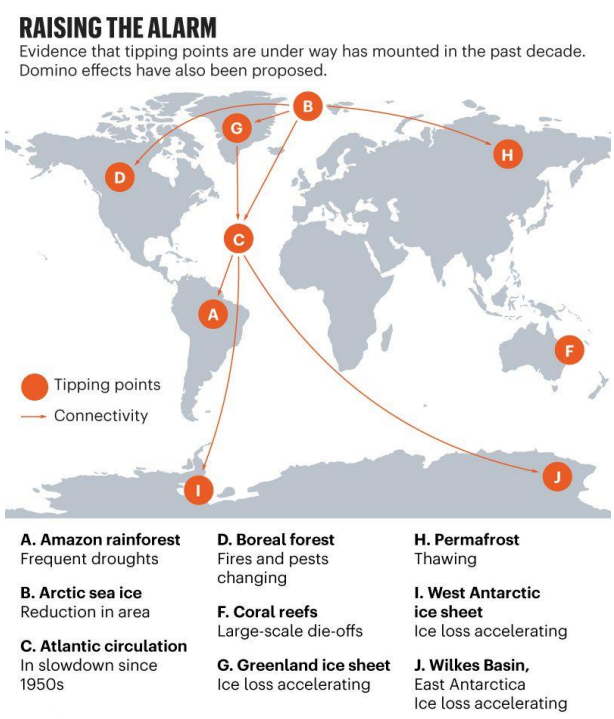


Fig. 8. Climate tipping points, © "Nature" [19]

These changes are devastating in themselves but will also cause adaptation costs, mass migration and potentially armed conflict. For a depressing summary, see "The Uninhabitable Earth" [21], which begins:

"It is worse, much worse, than you think. … The earth has experienced five mass extinctions before the one we are currently living through, … The most notorious was 250 million years ago; it began when carbon dioxide warmed the planet by five degrees Celsius, …, and ended with all but a sliver of life on Earth dead. We are currently adding carbon to the atmosphere at a considerably faster rate; … And there is already, right now, fully a third more carbon in the atmosphere than at any point in the last 800,000 years … There were no humans then. The oceans were more than a hundred feet higher." [21, p. 3 ff.]

Fig. 9. Bleached coral on Heron Island, Great Barrier Reef (credit: The Ocean Agency / XL Catlin Seaview Survey) [20]

2.2 What Can Humanity Do?

To explain the overall situation, let us make the cumulative nature of the greenhouse effect clearer by using the analogy of a bathtub as shown in Fig. 10.

In pre-industrial times, the rate at which CO_2 (the water) was flowing into the bathtub (the atmosphere) was balanced by the rate of natural removal of CO_2 from the atmosphere (the drain hole, with a fairly fixed capacity). The level in the bathtub stays more or less level. The global temperature remains stable as a result.

Now that we are burning fossil fuels, the picture changes dramatically. Since the rate at which we add CO_2 is considerably higher than the natural rate at which it is being removed, the level rises without stopping, and with it the global temperature. We can imagine lines on the side of the bathtub marking where "1.5°C" and "2°C" are reached. Currently, the level is at around "1°C". Some of the tipping points will already be reached at "1.5°C".

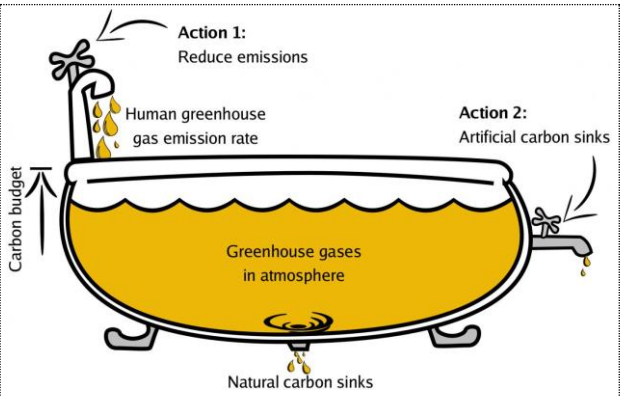


Fig. 10. Simplest climate model yet – a bathtub [22]

If we stop the emissions by turning off the tap fully, which is unrealistic (Action 1 in the figure), the level will slowly go down, but essentially only as fast as natural processes can remove the CO_2 from the atmosphere. In reality, though, we cannot cut the emissions that drastically, since the world economic system still depends on burning fossil fuels.

Another possibility is to build up carbon sinks to remove CO_2 faster. One option is to plant *many* trees (this is like enlarging the drain hole in the bathtub). However, the trees need to stay around for many decades to have an effect. There are also groups working on artificial carbon sinks (Action 2 in the figure), but these are still not yet at industrial scale. Some of them involve storing the CO_2 deep in the oceans or in rock formations, with considerable risks of re-emission. Other techniques being explored involve using energy to rebind the CO_2 in new chemical compounds. Geo-engineering projects, such as attempting to change the reflectivity of clouds by seeding them with chemicals, also raise considerable ethical issues because they impact all of humanity and are extremely difficult to test in advance.

What is the urgency?

As we know from scientific projections already made public by the IPCC, high increased temperatures will have *catastrophic* effects for humanity. Our habitat is at risk through higher temperatures, drought and desertification, fresh water supply problems, extreme weather events, rising sea-levels, risks of wildfire, etc. Our food supply is at risk, because food chains are stressed or even being destroyed. If temperatures rise too high, the Earth cannot sustain as many humans, even leading to armed conflict.

The longer we wait, the fuller the bathtub gets! We all need to act with urgency. Hence the oft repeated deadlines. The UN's Sustainable Development Goals (SDGs) [24] are worthless if we destroy our habitat first! This was also recognised by the IPCC in the 2018 Special Report [18], which explicitly referred to the SDGs.

An interesting way of showing the tension between environmental limits and SDGs is given by Kate Raworth in her Doughnut Model (Fig. 11) and book [25]. The **green** zone represents the safe place for humanity, the **red** areas the challenges, of which global warming is just one.

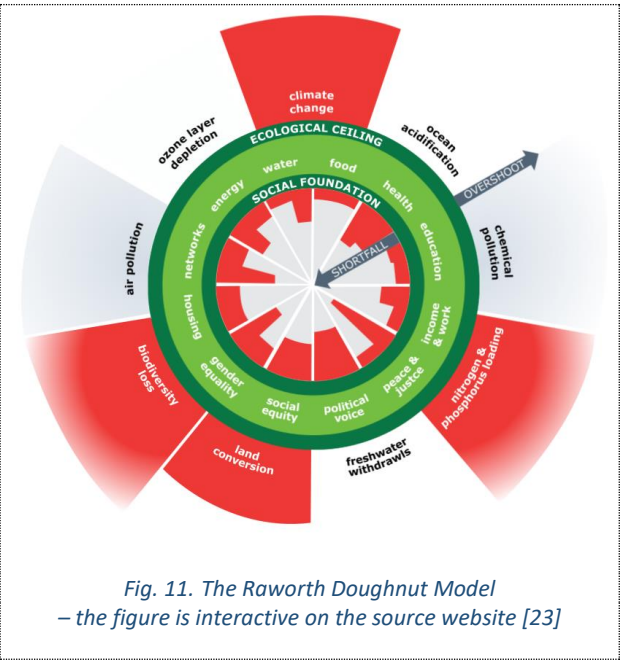


Fig. 11. The Raworth Doughnut Model
– the figure is interactive on the source website [23]

What the Doughnut Model brings home is that humanity has to stop treating the Earth as an unlimited supply of resources and unlimited dustbin. Our consumption-led, growth-obsessed economic system *urgently* needs to become more sustainable. This includes supply chains and the whole product lifecycle from raw material to disposal. Perversely, regulations such as product guarantee periods even encourage built-in obsolescence.

Also, exploiting the vulnerable by destroying their habitat must stop: for example, the pollution of ground water in North America through fracking.

The environment is a **common good** – today, the "tragedy of the commons" [26] is taking place globally.

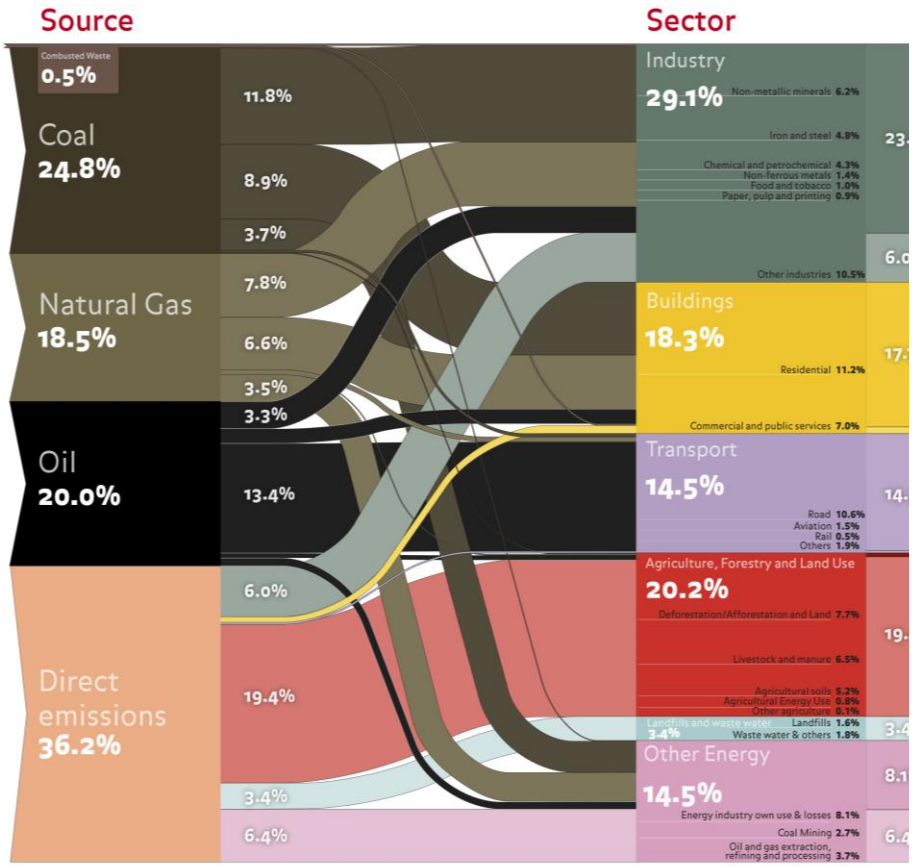


Fig. 12. World GHG Emissions Flow Chart [27], base data from 2012 (figure cropped) – left-hand side of figure

Where can we have the most impact?

To assess where we can have the most impact, it is necessary to look into which sectors emit the most greenhouse gases. Fig. 12 and Fig. 13, one figure split across two pages, give an overview. Although the data is not so recent, the picture has not changed dramatically in the last few years. Global emissions split into two major categories:

- **fossil fuel related emissions** (the top part of the figure [coal, natural gas and oil], making up around two thirds)
- **direct emissions** (the bottom part of the figure, making up around one third of the total).

Fossil fuel related emissions. Not all fossil fuel is directly burned, but a part goes into producing chemicals and plastics. Also, coal burning is very important for concrete production. The carbon nevertheless finds its way into the atmosphere in the end. Since global warming is caused by the carbon originating from fossil stores, the only real way to remove the additive effect on the carbon budget is to replace the source of carbon with renewable sources such as freshly grown plants.

Such renewable sources of both fuels and chemicals are available, but it is of course very difficult to judge from the end product if the embedded carbon is "carbon neutral" or not. This needs a high degree of trust between the consumer and producer, which means that the producer has to be available locally and trusted by the consumer.

There is also the issue of how clean a given fuel is. Generally, the more complex the molecular structure of the fuel being burnt, more by-products are produced that can pollute the environment.

But just as important are the pollutants released into the environment during extraction, transportation and disposal. Fossil fuels have a very poor record in this regard, since they pollute along their entire lifecycle and supply chain [28].

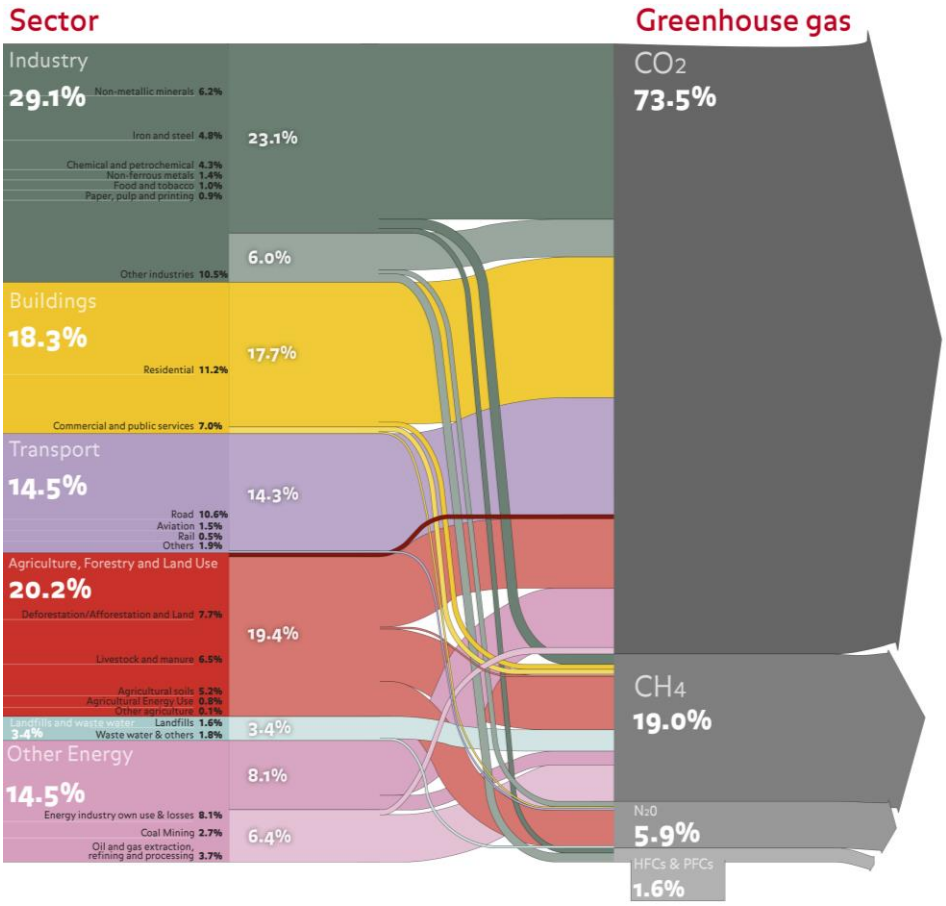


Fig. 13. World GHG Emissions Flow Chart [27] – right-hand side of figure

The so-called "renewable" energy sources are far cleaner concerning general pollution. Because they directly use the sun's energy, they only contribute CO_2 emissions when their installations are built and disposed of.

Electric cars are also cleaner (there are no emissions during driving), *so long as the fuel source for the electricity is also clean*.

Direct emissions. Somewhat over half the direct emissions of CO_2 and CH_4 come from livestock and agricultural land use (Fig. 22), deforestation and other land use changes.

Particularly problematic is the use of deforestation to free up more land for agriculture, for example for growing crops to feed cows for beef production. Not only are the trees burned down, thereby releasing substantial amounts of CO_2, but also the carbon storage capacity of agricultural land is considerably lower than with forests because there are fewer, more shallow roots. Tilling of the soil also releases CO_2. This aspect has recently been documented in detail by the IPCC [29].

The other half of direct emissions comes from landfills and waste water, and from industry. Industrial and energy production emit CO_2 as a by-product or through wasteful processes. An important example in this regard is concrete production, which makes up around 5-10% of total emissions[8], where there is no convenient substitute currently available [30], except the use of renewable materials such as wood.

To summarise, the areas where we can have the most immediate impact on reducing CO_2 emissions are as follows:

- Reduction in the direct use of coal, natural gas and oil in industrial processes, particularly for ore extraction
- Significant reduction in the amount of oil used in transport and aviation
- Improvement in the energy level used in buildings, particularly through burning fossil fuels for heating *and cooling.* Significant levels of energy are used by air conditioning to keep humans cool
- Reduction in (industrialised) agricultural and livestock processes that avoidably emit greenhouse gases and that are not in balance with nature
- Stopping of deforestation, combined with reforestation.

[8] The CO_2 attributed differs between sources, because the energy needed to make concrete and the chemical process both result in CO_2 emissions which are not consistently reported

Fig. 14. Google's Data Centre in Hamina, Finland, sited near the Bay of Finland for cooling purposes. The race for renewable energy is already on between the big tech companies [31] (photo: Google, cropped)

We also need to become aware of other carbon emissions that we are not directly conscious of. The IT industry, with its data centres running networking and virtual clouds, is no longer an insignificant energy consumer (Fig. 13 shows one of these large data centres). According to an article from Yale Environment 360 [31]:

"The gigantic data centres that power the internet consume vast amounts of electricity and emit as much CO_2 as the airline industry" … "Google estimates that a typical search using its services requires as much energy as illuminating a 60 W light bulb for 17 s and typically is responsible for emitting 0.2 g of CO_2" … "Around a third of internet traffic in North America is already dedicated to streaming Netflix services alone"

We as a human race must get back into balance with nature and change our way of life to go with the grain of nature, before it really is too late. And above all, we must start to treat the release of greenhouse gases from the burning of fossil fuels and as a result of our industrialised agricultural processes as **pollution** with costs that must be carried by the consumers of the end-products. The World Wildlife Fund released a new report "Climate, Nature and our 1.5°C Future" early in 2020, explaining how urgent it is for humanity *"… to place our natural world at the heart of this conversation and fight for this future together"* [32].

A few large corporations are responsible: a recent report links 100 active fossil fuel producers to 71% of industrial greenhouse gas emissions since 1988 [33]. There is evidence [34] that the public has deliberately been misled.

2.3 "Business As Usual" is Unsustainable

Despite what various politicians would like us to believe, carrying on as we are (called the "Business as usual" (BAU) scenario to make it sound harmless) is simply not sustainable:

- Capitalism cannot be based on wholesale exploitation of the environment, out of balance with nature
- Permanent economic growth as underlying assumption is unrealistic, given the clear reaching of natural limits
- Using loss of economic prosperity as reason for no change is untenable (disregarding the fact that doing nothing may anyhow destroy our habitat so that prosperity is not tenable)
- Using "business cases" to frame the debate as a cost problem deflects discussion away from the root causes
- The apparent successes at meeting major challenges for humanity are based on an unsustainable underlying model and can be lost again just as fast
- Quoting solutions (such as carbon storage or artificial trees) which are not yet credible at scale should not be used as a pretence that we have the answer so that no lifestyle change is required (this is a form of denial).

Underlying the current BAU is denial of humanity's deep-seated dependence on an *intact* nature. Sadly: "it is easier to think of the end of the world as we know it than to think of the end of capitalism." [35, p. 264]

2.4 What Can Individuals and Households Do?

First of all, not despair!

The worst thing we can do about climate change is to do nothing. Global warming is a "wicked problem" because it requires us to change and adapt as part of the solution. This is why there is no simple solution. We have to act on many levels at once.

For many years, scientists and politicians have argued that we need systemic changes to reduce the overall carbon footprint. This is undoubtedly true, but is also a truism. Likewise, the repeated "individual responsibility" argument that if only the individuals knew all the facts (they do), they would change their behaviour (they do not). In fact, this focus on "individual responsibility" is a political tactic to deflect attention away from the need for changes to policy, such as properly taxing carbon emissions.

We have learned to be a "throw away" society – this lifestyle cannot continue and may not be allowed to set an example for the very populous and growing new middle classes in Asia and Africa if we want to reach the 2°C goal at all. We are addicted to a way of living that has been sold to us as consumers.

Collectively, we have power. We always have had. We can make choices…

- …if and how we travel, and how much time we allow for travel *(see Living Lab LL.1)*
- …what and how we eat and drink *(see Living Lab LL.2)*
- …how and what we consume *(see Living Lab LL.3)*
- …how we heat and cool our buildings and what type of energy sources we use *(see Living Lab LL.4)*
- …which media messages we believe
- …who represents us politically
- …actually, to vote
- …to become politically active (Fig. 15)
- …to tell others why we made these choices and start our own grassroots global warming movement.

In today's economy, we collectively send signals to government and corporations through our individual choices. If we boycott polluting industries and stop flying just for leisure, policy changes will follow. The process will take place faster if we speak out, explain why, and call out the polluters. We need to take action and tell others!

And: we also need to start getting used to how to live in a post fossil economy. The sooner we experience that it is possible to live within the limits of our environment the faster we will get global warming under control.

Fig. 15. "Wir haben keinen Planeten B" – "we don't have another planet": Greenpeace activist present at the submission of 112 296 signatures for the Gletscher-Initiative, Bern, 27 November 2019 (picture, Peter Klaunzer [36])

2.5 What Can *Swiss* Individuals and Households Do?

Consumption and Waste in Switzerland

In Switzerland, we have been brought up to regard consumption as a duty, because it drives the economy! The accompanying built-in obsolescence, and general level of waste have been sold to us as unavoidable collateral damage. The Swiss are proud of their recycling, and ignore the fact that they are also world leaders concerning the amount of waste produced[9].

Every time we throw something away, the raw resources and energy that went into making it are mostly lost. Furthermore, the natural world is polluted by each product cycle, including by CO_2 emissions. Recycling is not so virtuous: it is better to use products for as long as possible so as to amortise the raw resources and energy used to make them, so long as the use of the products itself does not cause significant pollution. Even better is to avoid wanting new products in the first place! Instead of recycling, we Swiss should consider the many other Sustainability R options (see Fig. 16).

Fig. 16. Sustainability Rs [37]

Exporting Swiss Emissions

According to a Report of the Swiss Federal Council [38, p. 9], the per capita impact on the environment *within* Switzerland has declined by 19% in the last 20 years. However, this has been at the cost of rising environment impact abroad. In other words, we have been exporting our environmental impact to other countries. *The statistics are not flattering at all*: the Swiss emitted around 14 t CO_2 per capita worldwide in 2015, significantly over the European average and over 23 times the globally sustainable footprint of 0.6 t CO_2 per capita [38, p. 23].

The argument that Switzerland is too small to have an impact ignores not only the full footprint of Swiss consumption but also the relevance of the Swiss finance sector both through its investments in carbon intensive industries, *and through the investments of its customers*. Exactly because of the large global CO_2 footprint of Switzerland when imports are counted, our consumer choices are also very relevant. Although our current prosperity is carbon-based, this is a choice that we make.

Swiss local climate scenarios

The effects of global warming are not uniformly distributed across the world (for example, Switzerland has had a higher average temperature rise, see Fig. 17), not only because of the way land and water are distributed, but also because economically intense human activity is concentrated in the northern hemisphere. In order to be able to adapt, it is essential to understand what local climate changes to expect. For Switzerland, the following main climatic changes are anticipated [39]:

- Drier summers
- More extreme precipitation
- More hot days
- Snow-scarce winters.

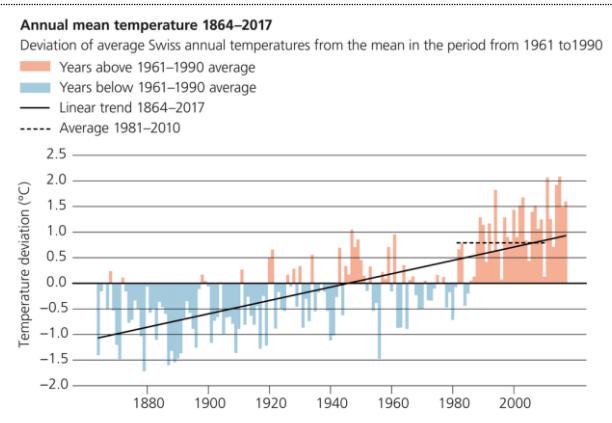


Fig. 17. Swiss annual mean temperatures are already 2°C above pre-industrial levels, over the global average [39, p. 18]

[9] According to [38, p. 166], the Swiss generated 715 kg of waste per capita in 2016 (up by 18.6% since 1990), beaten only by the United States and Denmark when compared with other OECD countries. In the same period, recycling has increased, with 52% of municipal solid waste being recycled

2.6 Take Tips from Nature

Finally, it is important to take stock of what we can learn from nature. Here is a selection of quotes from a short article by Jonathan Foley that reminds us that we can always learn from nature [40]:

" Despite what many people claim, politics and economics are arbitrary systems of belief that people in power have invented over the years. And regardless of what we have been brought up to believe, the planet does not actually obey the rules of politics and economics. It never has.

***Earth is powered by renewable energy.** The sun provides nearly all of the energy used to power life on Earth, as well as fuelling all of our weather, ocean currents, and water cycling.*

***Nature has almost zero waste.** Earth is essentially a "materially closed" system.*

***Earth's ecosystems build strength and resilience from diversity.** Evolution has created a remarkable diversity of life, which is extremely resilient in the face of change. Nearly every flow of energy and matter, and practically every ecological niche, functional trait, and space is being used by something.*

The natural world has also taught me that we should be far less arrogant about the power of our science and technology. We still have so much to learn. It is humbling, but we have to admit that nature does things that we cannot yet do ourselves. Even the simplest pond scum is able to run entirely on renewable energy, with nearly infinite recycling, with extraordinary diversity and resilience. In short, nature is one hell of an engineer. "

Fig. 18. "There are estimates that one billion animals have now been killed in the (Australian) bushfires" (picture of a lone joey that was rescued from the fires and treated for burns, Ryan Pollock, January 2020) [41]

LL.1 Mobility and Travel

In 2016, our trusty family car finally reached the end of the road: the latest repair was considerably more expensive than the remaining value of the vehicle! We had been living in Zurich since the end of 2008 and if we were honest, we didn't really use the car much at all. In fact, the battery often ran down, particularly in winter. Although we had talked about using car sharing for a while, we resisted with the argument that the car was at least not polluting the atmosphere while it was standing around on our parking lot. It is common knowledge that old used cars are often exported abroad where they are driven into the ground. Since we moved to Zurich, we got used to a high degree of mobility using public transport, by bicycle or on foot. The car was really only used for family journeys where having a car was convenient or considerably faster.

Fig. 19. "Io scelgo la bicicletta" – "I choose to ride my bike", Milan, 29 Sept. 2019 (picture by author)

H – Start with Hope

When the car finally broke down and we knew it would not be repaired, we had to come to terms as a family with not having a car at all. After checking that the car would indeed be destroyed and not just exported, we let go of the vehicle that had accompanied our family since the boys were small!

Our positive future state vision was as follows. Luckily, the necessary infrastructure is largely already available in Switzerland. Elsewhere in Europe, cars are often still unavoidable, but attitudes to public transport are changing (see the picture):

- Use public transport for most journeys, or go by bicycle or on foot, even if this takes a bit longer. All (family) travel by public transport is paid without question
- Use Mobility car sharing (www.mobility.ch) whenever a car or van is (really) needed. Examples are collecting or delivering heavy goods, or travelling to inaccessible places or at difficult times
- Use a hire car for longer trips where a car is unavoidable. Else, go by train and take a *local* hire car for part of the trip, if (really) necessary
- Avoid flying, even if the journey by train takes longer. No intercontinental flights for leisure reasons. Take advantage of high-speed train networks in Europe. Use the travel time to do other things or visit other places. Where such air travel is *absolutely unavoidable*, compensate *100%* of the CO_2 (as estimated by [42]) using a *full* carbon capture and removal service, which provides more realistic price signals (Climeworks currently costs around CHF 1 per kg CO_2 [43])

E – Evaluate your Approach

- **Desirable:** Public transport is readily available. Mobility vehicles have the advantage that they are pretty new and increasingly electric or hybrid. Getting a car from Mobility is fast and easy with many vehicle stations in our immediate neighbourhood
- **Viable:** From a cost point of view in Zurich, it turns out that the combination of public transport and vehicle hiring/Mobility is highly competitive with keeping a rarely driven car on the road
- **Feasible:** There are no barriers to moving directly to the vision, except for emotional attachment to our old car!

A – Actually Act

Once the family car was got rid of, it was neither hard nor expensive to initiate the necessary actions.

T – Tell Your Story

The Christie family uses walking, cycling or public transport for all its travel, except where the journey time is considerably longer or impossible by public transport. We get a vehicle from Mobility or use a hire car only where we need to. We are members of the Mobility cooperative and hence get better rates. We avoid flying, also in Europe. We'd rather travel a bit slower and enjoy the places *en route* too! Recent family holidays were European city to city itineraries, with primary travel by rail. And, luckily, all of us live near to our workplaces and can use "home office".

When one of our cats needed to go to the vet in the middle of the night, we simply got a car from Mobility. Most of our journeys to London where we have relations were by rail (TGV and Eurostar), except where we gave in to the ever-present pressure to travel fast and cheap. Ironically, the only intercontinental flights taken in the last five years were part of the MAS Strategic Design. Going to teach a course in Madrid in February 2020, I went by train even though this needed a full day each way. On a positive note, I visited in Barcelona on the way back!

Key learnings:

- Travel planning and the travel itself often need longer, but this is not necessarily a bad thing!
- Train travel in Europe still costs more than flying, but products like Interrail are starting to compete. It is nevertheless important to reduce differences in travel time by improving the high-speed train network further and reintroducing a competitive night train service
- High speed rail is faster than driving for many European journeys under 1000 km, and faster than short haul flights city centre to city centre
- Booking train travel in Europe is unfortunately still complicated, but it does improve year by year
- We are very privileged in Switzerland concerning public transport. My current employer offers me a public transport travelcard for the whole of the Canton of Zurich at half the price of a normal commuter travelcard
- We have learnt that "slow mobility" can open up other travel possibilities
- Neither of my adult sons owns a car or wants to. The younger one has learned to drive and uses Mobility
- Use of "home office" to avoid some work-related travel is increasing. So are the possibilities to use video and audio conferencing.

3 Psychological, Cognitive and Transformational Aspects

How to combat denial and misinformation by developing effective motivational interventions is key to dealing with behaviour concerning global warming. The dilemma of feeling powerless and even apathetic although knowing that there is a crisis must also be tackled on a psychological and cognitive level. See [44].

One's personal worldview has such a powerful cognitive effect that an individual is fully able to dismiss the broad scientific consensus about global warming as untrue and to ignore or explain away its most egregious local effects. In addition, in-groups can reinforce shared worldviews so that entire communities can become inaccessible to rational, scientific facts.

There is evidence that systematic misrepresentation of global warming over more than a decade by right-wing groups and corporations in the US, motivated to maintain the current consumption-led capitalist *status quo*, has led to the current partisan divide on global warming [45, p. 35]. But the non-partisan objectivity of science should be a central pillar of our Enlightenment heritage.

This chapter covers all these topics, as follows:

- Emotions, Denial and Motivation
- The Importance of Language and Framing
- Worldviews, In-groups, Values Modes and Narratives
- The Relevance of Cognitive Bias
- The Political Dimension and Social Tipping Points
- Technical Problems vs. Adaptive Challenges
- The Three Spheres of Transformation
- Making Change Happen – Actions, not just Words.

3.1 Emotions, Denial and Motivation

Emotions are central to human decision-making for several reasons and colour the way we think about the world and react to it [46, p. 84 ff.]. Our emotional response is unconscious or semi-conscious, and emotion-based decision-making needs far less energy than rational decision-making, so the latter is often skipped (see Kahnemann, [47]). Obvious threats to life or one's body are often handled intuitively. And threats to self-image and identity are given more importance than threats that can only be understood intellectually.

A subconsciously created narrative is used to justify unconscious reactions to situations that emerge. The rational thinking system is used to fill out the narrative and explain away any inconvenient truths, and arguments are found that negate any facts. This continues until it is no longer possible to ignore reality – humans are masters at waiting for a crisis to happen before taking action. Cognitive dissonance is accepted, although painful, in order to avoid confronting the emotional feelings.

Various matters need to be considered when trying to deal with the emotionality of global warming, as follows. This problem has even led to the emergence of a new subdivision of psychology, termed Climate Psychology [35]:

- We feel uncomfortable and have strong emotions, see [35, p. 153 ff.]
  - Grief and sadness, about the potential loss of natural habitat etc. A new term "climate grief" (or as pompous sounding Latin, *solastalgia*) has emerged [48]
  - Guilt and shame, about the lack of personal or social action or about the known negative effects of personal behaviour, for instance *flygskam* [49]
  - Anger, about the others who are profiting (although this may already be an avoidance tactic)
  - Fear, panic and anxiety, of a change in *status quo*, loss of one's own lifestyle and even habitat, and *in extremis* fear of actually accepting reality or of personally not surviving
  - Being overwhelmed and frustrated, as global warming is a very big problem and affecting it seems impossible
  - Despair, with existential dread often leading to apathy and even solution-solving paralysis.

- The object of these emotions is subjective and diffuse, see [35, p. 129 ff.]
  - The problem of global warming is overwhelmingly large
  - Deeply held feelings are not admitted openly
  - To many people, the resulting negative changes seem to be far away in place or time for them personally (despite news that the effects are already there and life-threatening for some parts of humanity)
  - CO_2 pollution cannot be perceived directly by individuals and the distinction between fossil-based and renewable CO_2 seems arbitrary or even "intellectual"
  - Deep understanding of the science cannot be assumed among the general population
  - Deep-seated beliefs of the individual and of his in-group(s) play a very important role as a filter
  - Our attitudes to nature and the relationship between humanity and nature are very important in conjunction with global warming. The mind-body split introduced by Descartes and the Cartesian idea that humanity and nature are distinct stop us from understanding the essential role of humanity in causing global warming, see [35, p. 177 ff.] and [44, p. 174 ff.].
- Narcissistic, authoritarian leadership is problematic
  - A pre-disposition to "simple solutions" is counter-productive
  - The solutions are framed to suit the personal interests of the leader and do not address the problem itself
  - A reliance on identity-based, emotional messages framed as beliefs makes rational debate extremely difficult.

Fig. 20. Picture from "Why you should stop calling climate deniers stupid", 17 November 2018 [50]

Human beings have many strategies for dealing with strong emotions, and personal strategies are often internalised when very young and thus become unconscious. Particularly where the subject of the emotion is hard to pin down, a key strategy is avoidance. A number of avoidance tactics can be identified, see [35, p. 217 ff.]:

- **Negation:** knowingly doing the opposite, believing in a personal entitlement to carry on as before, that other things are more important, etc.
- **Disempowerment:** feeling entitled to carry on as before
- **Denial:** disregarding or ignoring the science, it can't be as bad as people say, moulding the information to suit one's own/in-group's views
- **Disavowal:** disclaiming knowledge of responsibility for the problem causing the emotion (ignoring until personally impacted or until the crisis arrives) or even actively expressing that the opposite is occurring
- **Projection:** why are others not doing anything? why should one do anything? – it will have no effect anyhow
- **Fantasy:** the magic of technology will solve all problems before time runs out.

In order to become engaged and take effective action, both the emotions and the avoidance strategies have to be acknowledged and transformed into positively framed actions. This involves a technique termed "containment" by psychologists where subconscious emotional reactions (affects) are made conscious in order to allow reflection [35, p. 13]. Intuitively, we use these techniques when we invite people going through emotional stress to "talk about it". Activating positive emotional frames, such as hope, empathy and gratitude can help handle negative feelings. In addition, putting oneself in the place of children (the next generation) activates a powerful empathetic frame in the case of global warming.

It is necessary to be aware of barriers to behavioural change which are often totally subconscious, such as ingrained habits. Changing behaviour is complex and involves establishing new behavioural intentions, which in turn may be driven by attitudes, norms or perceived controls [46, p. 18 ff.].

Finally, awareness is needed that there are people and organisations deliberately and actively denying the scientific consensus, reframing science as a debate of opinions rather than of objective facts. To understand what is going on, it is necessary to grasp the difference between scepticism and denial:

- **Sceptic:** considers the evidence *and then* comes to a conclusion – the heart of the scientific method
- **Denier:** comes to a conclusion *and then* denies the evidence – perversion of the scientific method.

The science denier typically uses a mix of the following approaches: fake experts, logical fallacies, impossible expectations, cherry picking of arguments and conspiracy theories. This is explained well in [51]. It is hard to distinguish between misinformation (genuinely held but false beliefs) and disinformation (intentional deception), so it is better to attack the denial techniques themselves rather than the motives. This also avoids activating the frame of argument. For an example of egregious denial, see [52] and compare its messages with IPCC material such as [14] and evidence about scientific consensus [15] (see §2.1).

3.2 The Importance of Language and Framing

We need to be careful with language! The language used to frame discussion is very important, because the frame activates particular belief systems in a largely subconscious way. It is enough to refer to a frame to activate it, even when refuting it! The relevance of framing for the political process is described very clearly in George Lakoff's book "The All New Don't Think of an Elephant!" [53]. Here are some examples of loaded terminology to avoid:

- The terms "green", "nature", and "environment" have been hijacked and overloaded with identity politics
- The planet will out-survive humanity, so let's stop saving the planet and start saving humanity. It is better to talk about loss of the habitat supporting humans and reduction of pollution, rather than using "destroying the planet"
- The speed of climate change is slow, but there are environmental tipping points and event horizons which require faster action – an example is the imminent loss of glaciers, arctic ice and coral reefs
- The use of more dramatic language that matches the severity of the problem is needed: use "climate crisis" or "climate emergency", for instance
- The language of "the free market", such as talking about "consumers", just reinforces the narrative of carrying on as before ("BAU", see §2.3). Likewise, avoid vague future commitments as goals, since these can be used to preclude taking real action now (externalising/socialising of future losses)
- As in this document, use the term **"global warming"** rather than "climate change"!

To quote George Lakoff [53, p. xi]:

" We think with our brains. We have no choice. It may seem that certain politicians think with other parts of their anatomy. But they think with their brains.

Why does this matter for politics? Because all thought is physical. Thought is carried out by neural circuits in the brain. We can only understand what our brains allow us to understand.

The deepest of those neural structures are relatively fixed. … And we are mostly unconscious of their activity and impact. "

3.3 Worldviews, In-groups, Values Modes and Narratives

We as humans deal with the uncertainty and randomness of the real world by using narratives (making up stories) to explain why things are the way they are, and how our actions fit in to this picture.

Our narratives are deeply embedded in our semi-conscious worldview, which in turn is reinforced by our interactions with our in-groups (something well-known in the marketing world, [55]). Not much of this process is conscious, partly because rational thinking needs so much more energy (see §3.1). This is why story-telling is so important in psychology. Telling personal stories reveals deeper frames and worldviews [35, p. 88 ff.].

We need to be able to express a positive future state so that we can deal with the underlying emotions. And, in order to formulate a *personal* positive future state, we need to align the desired future state with the individual's underlying worldview. Otherwise, the semi-conscious narrative processes will find a way to reject it.

The Values Modes model developed by the UK company Cultural Dynamics Strategy and Marketing [54] provides a way to get a handle on this and is based on a large body of data classifying deep values of individuals collected over many years (see Fig. 21).

Based on a simple questionnaire, an individual can be classified into one of three major groups which represent *personas* [56] – settlers, prospectors, or pioneers.

The major categories are as follows [56, p. 209]:

- ***Settler:*** security driven – does not want to let go of current position, conservative, concerned not to lose traditions
- ***Prospector:*** outer directed – want to be part of success stories, needs ambassadors/influencers, organise solutions
- ***Pioneer:*** inner directed – prepared to try new things and be radical, values oriented, reaction to threat is to undertake something themselves.

These personas turn out to be important when scaling interventions up to society at large (see §6.2).

3.4 The Relevance of Cognitive Bias

Not only do we humans make up our own narratives, but we tend to prefer stories which reinforce our own opinions or the opinions of our in-groups. This is called *confirmation bias* and is one of many biases which can interfere with creating a positive future state.

Cognitive biases help us to handle difficulties we have with the complexity of reality:

- The need to act fast
- There is simply too much information
- There is not enough meaning
- What should we remember?

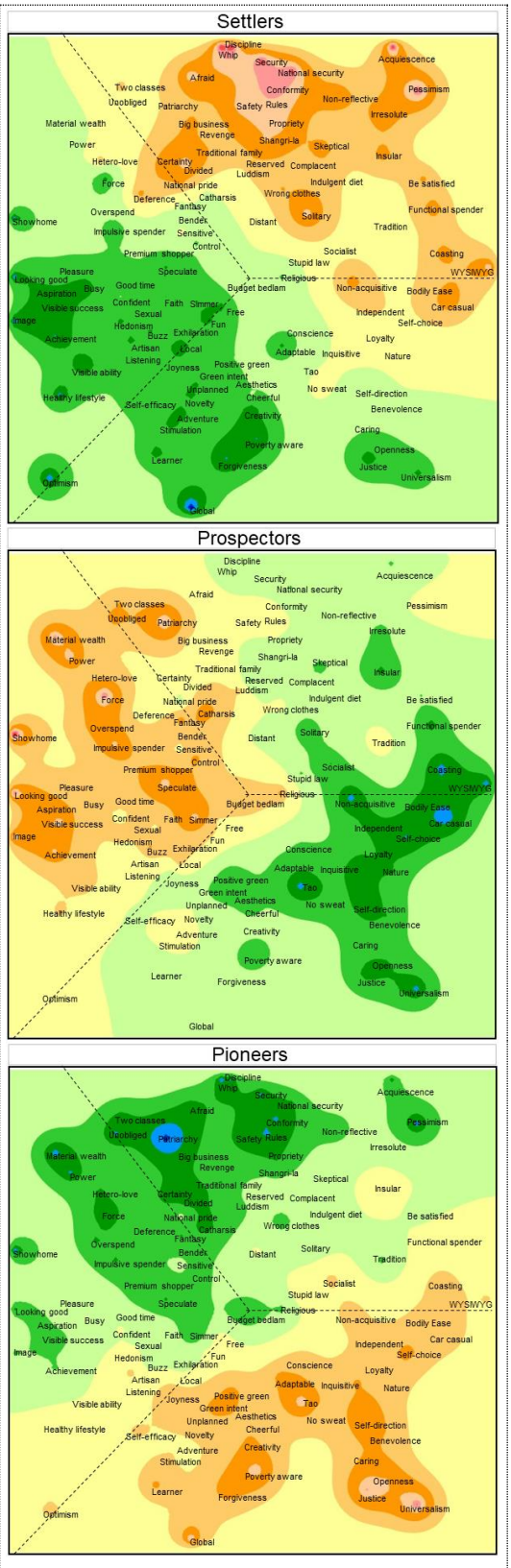
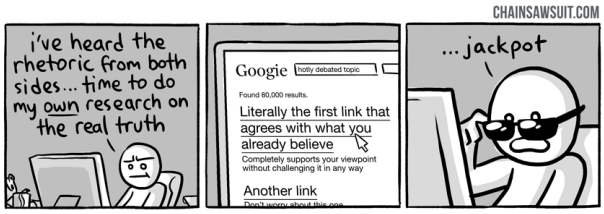


*Fig. 21. Values Modes plots for the three main categories. **Orange** represents more agreement with a given attribute, **green** higher disagreement (cropped, [54])*

There are so many cognitive biases, that it is useful to use a structured summary. See [58] and the Cognitive Bias Codex poster that resulted from it [59].

"Factfulness" by Hans Rosling [60] also covers this tendency to jump to conclusions without reflection. The book lists no fewer than ten "instincts" which get in the way of understanding what is really going on.



[57]

In particular, in the West we have a completely undifferentiated conception of humanity that suggests an enormous gap between "rich" (us) and "poor" (them). This couldn't be further from the truth! Although a billion humans are truly poor, the remaining six billion have adequate food and medical care, full schooling to middle school and life expectancy over sixty years [60, p. 53 ff.]. This false split into "developed" and "developing" countries is a reason why there is so little progress at a global level. In fact, only a very small part of humanity is so affluent that it can afford to pollute our human habitat to the point of destruction. We in Switzerland belong to this affluent polluting class!

Fig. 22. Industrial agriculture is also part of the global warming problem (picture, Johny Goerend/Unsplash, CC BY-SA) [61]

3.5 The Political Dimension and Social Tipping Points

In the West, our underlying philosophy is deeply rooted in ideas from the Age of the Enlightenment [44, p. 144 ff.]. These basic ideas colour how human society relates to nature and result in unconscious obstacles in dealing with the environment:

- Use of rationality and the scientific method to objectify nature
- Extraction of knowledge from nature and its exploitation for the benefit of humankind (under capitalism: for individual profit)
- An underlying, but hidden assumption that humans are independent of nature, which of course is not true, since we and our habitat are part of nature
- A tendency to treat nature as unlimited and available for free
- A belief among non-scientists that there is absolute scientific truth (the scientific method is inherently sceptical: there is no absolute scientific truth, only a current theoretical consensus)
- A belief that humans are somehow superior to nature, originated by various religions.

This belief framework is problematic, since it places "the environment" outside humankind and positions science and technology as a technocratic solution to all our problems. After all, we have been surprisingly successful at manipulating our environment down the years. As already mentioned in §2.2, this totally negates the fact that humanity deeply depends on nature for its basic habitat.

Our tendency to wait for the crisis to happen before acting is a deep part of human nature. We prefer to ignore inconvenient or unsettling knowledge rather than confront it. The fact that global warming proceeds comparatively slowly amplifies this effect.

Society also moves rather slowly. Our collective beliefs are a summary of our individual interactions and our interchanges through media. But seemingly small triggers can nevertheless cause rapid change, as described by Malcolm Gladwell in his bestseller "The Tipping Point: How Little Things Can Make a Big Difference" [62]. The triggers can be events such as continued unseasonably hot weather or apparently sudden changes of opinion, where a particular idea travels like wildfire through society via the media and peer groups.

2019 was marked by several such tipping point events (here is a personal selection). It will remain to be seen whether the effect lasts:

- The "Greta effect": Greta Thunberg, a Swedish 16-year-old climate activist, skips school to protest outside the Swedish parliament, gives an address at the UN Climate Action Summit and starts a worldwide youth protest movement [64], [65]
- Indian heatwaves with temperatures up to 50°C for three weeks [66] – see Fig. 23
- The Amazon has been burning for a considerable time [67], yet the fire in Notre-Dame (Paris) got more attention in media dominated by the West [68]
- California has serious wildfires for the third year in a row exacerbated by climatic changes [69]
- The Arctic is melting! *"In Alaska, a heat record toppled July 4, with temperatures reaching as high as 32.2° Celsius … Average June temperatures in parts of Siberia were almost 10 degrees higher than the average temperatures from 1981 to 2010."* [2]
- The Arctic is burning! Melting permafrost unleashes methane that burns in natural peat fires – a positive feedback loop and environmental tipping point that was not expected so soon [70], [71]

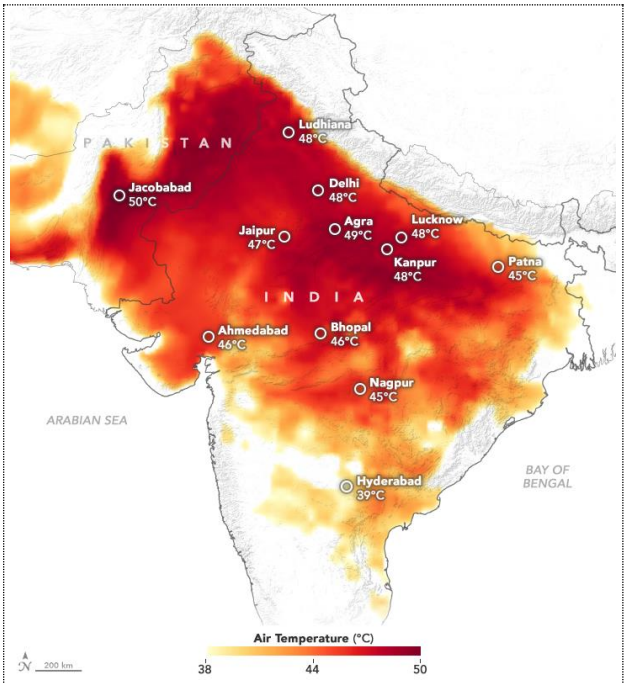


Fig. 23. In early June 2019, an intense heatwave scorched northern India. Some regions experienced temperatures over 45°C for most of three weeks. On 10 June (date of picture), Delhi had its hottest day on record for June, at 48°C [63]

- Disappearing glaciers were mourned in Iceland [72] and Switzerland [73]
- Jakarta has its worst floods for over a decade, made worse by global warming [74]
- Venice floods: climate change, or political failure, or both? [75]
- Australia has the hottest decade in history and is suffering devastating fires [76], [3], [77] that are just not going away [78]
- Swiss elections: green landslide [79].

When we look back, it could be that 2019 will be remembered as the year when global warming became mainstream and when many people actually started to take global warming seriously. Unfortunately, this does not mean that they will take any action.

3.6 Technical Problems vs. Adaptive Challenges

Global warming is an *adaptive challenge*. As opposed to a *technical problem*, an adaptive challenge cannot be fixed quickly and typically needs the person or persons challenged to *adapt* to the new situation as part of addressing it.

Believing that we can solve all problems in a technical way blinds us to the need to take care of the emotional costs and the adaptation needed by those involved. This a reason is why explaining the need to react to global warming does not cause action (see Fig. 24). The terminology and the underlying theory were first introduced in a pioneering article in the Harvard Business Review [81].

The single biggest failure of leadership is to treat adaptive challenges like technical problems.

TECHNICAL PROBLEMS	ADAPTIVE CHALLENGES
1. Easy to identify	1. Difficult to identify (easy to deny)
2. Often lend themselves to quick and easy (cut-and-dried) solutions	2. Require changes in values, beliefs, roles, relationships, & approaches to work
3. Often can be solved by an authority or expert	3. People with the problem do the work of solving it
4. Require change in just one or a few places; often contained within organizational boundaries	4. Require change in numerous places; usually cross organizational boundaries
5. People are generally receptive to technical solutions	5. People often resist even acknowledging adaptive challenges.
6. Solutions can often be implemented quickly—even by edict	6. "Solutions" require experiments and new discoveries; they can take a long time to implement and cannot be implemented by edict

Fig. 24. Technical Problems versus Adaptive Challenges [80]

To quote from the article:

"Followers want comfort, stability and solutions from their leaders. But that's babysitting. Real leaders ask hard questions and knock people out of their comfort zones. Then they manage the resulting stress"

3.7 The Three Spheres of Transformation

When looking at how to react to global warming with action, the necessary transformation is complex and needs changes on many levels, from the personal up to the whole of society. A useful and simple framework, focussing on three interacting spheres of transformation, was proposed recently by Karen O'Brien and Linda Sygna [82], based on earlier work by Monica Sharma [83].

The framework (see Fig. 25) was proposed in order to give structure to discussions about transformations required to address global warming and sustainability. The three spheres of transformation conceptually overlap and are as follows:

- **Practical:** personal behaviour changes, social and technical responses and innovations, and institutional and managerial reforms
- **Political:** social *and ecological* systems and structures that frame the practical transformations
- **Personal:** individual and collective beliefs, values and worldviews that shape the political transformations.

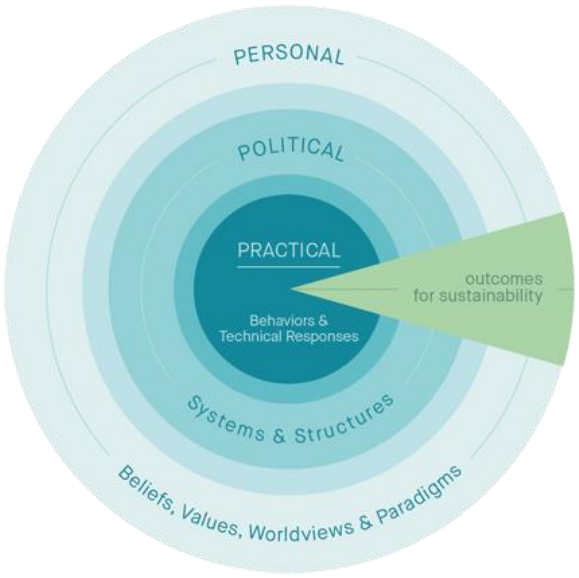


Fig. 25. The three spheres of transformation [82]

The framework reminds us that results in the "practical" sphere, where focus is often placed on measurable indicators, may even be counter-productive if the "political" sphere is not taken into account. The line between "business as usual" and necessary transformations can easily become fuzzy. If the "political" sphere is not considered, "practical" changes may even be counter-productive. An example given in the article is the replacement of fossil fuel cars by electric vehicles: just replacing the energy source does not address necessary changes to the mobility system itself.

Likewise, transformations in the "political" sphere are shaped and inhibited by personal beliefs, values and worldviews in the "personal" sphere. This is why framing and misinformation are so important in political discourse, but also why small changes of personal opinions can lead to tipping points. The green wedge symbolises the need for change in all three spheres *and* on the interfaces between them, cutting across multiple disciplines. The widest part of the wedge is on the outside in the "personal" sphere, reflecting its key relevance for successful transformations.

3.8 Making Change Happen – Actions, not just Words

As this chapter has explored, an argument based on scientific facts is not a sufficient basis to cause change in an individual on an emotional or cognitive level. We humans need to face up to the strong emotions that global warming evokes and find a personal narrative that enables action.

As the picture on page 16 suggests (Fig. 20), there are still people who are in denial or exhibiting other avoidance tactics. Convenient "simple answers" obligingly provided by global warming deniers can mean that these individuals also *feel empowered to do nothing!*

The only easy way out of this dilemma is to empower those individuals to take the first step, not by attacking beliefs and thus reinforcing a frame that suppresses action [53], but by explaining what can actually be done [50]. The following quadrant diagram (Fig. 26) shows this schematically.

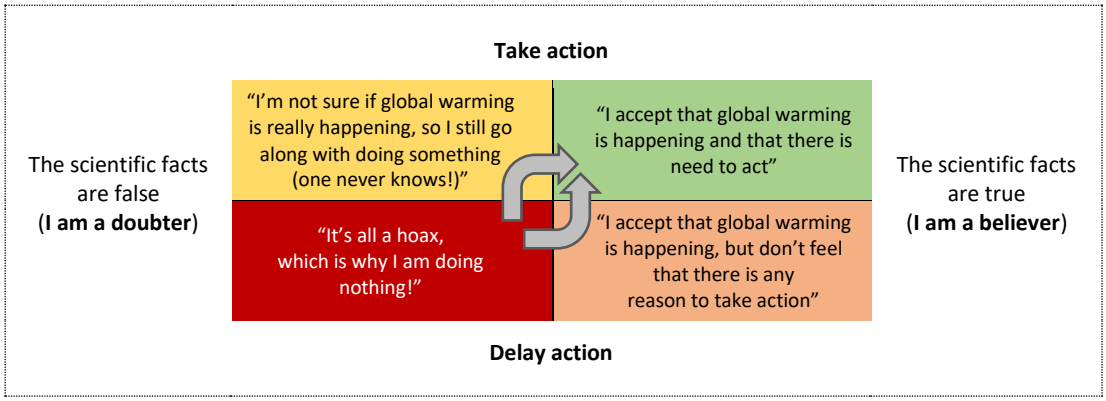


Fig. 26. Belief-Action Quadrant Diagram (from the author)

It may be hard to persuade the people in the lower-left **red** quadrant to move to the top-right **green** quadrant in one go, but it might be feasible to bring them to the **orange** or **yellow** quadrants, both representing an improvement over sheer denial and inaction. Of these, the **yellow** quadrant is preferable, since action is at least not being inhibited. The goal is to reach the **green** quadrant.

Design is a suitable approach for tackling our reaction to global warming, because it puts the user and his experience in the centre of problem-solving. Design Thinking deliberately uses iterative processes to find user-oriented solutions to complex problems. For instance, see [84, p. 16]. How the strategic design challenge was approached in this case is explored further in Chapter 4.

Elisabeth Kübler-Ross is well-known for introducing a model with five stages of grief which she experienced with the terminally ill [86]. These emotional stages and associated change curve are also applicable to the strong emotions that global warming evokes and the related change process.

In summary, the five phases as they might apply in global warming cases are (with textual interpretations from [85]):

- **Shock** and **denial:** "This can't be happening"
- **Anger:** "No! I can't accept this!"
- **Bargaining:** "… give me more time. A few more years?"
- **Depression:** "What's the point of trying?"
- **Acceptance:** "It's going to be OK.", "I can't fight it, I may as well prepare for it."

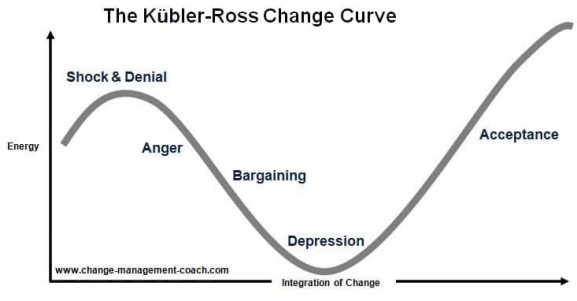


Fig. 27. The Kübler-Ross Stages and Change Curve [85]

The phases clearly align with the avoidance tactics outlined in §3.1. The Change Curve diagram (Fig. 27) shows the accompanying level of emotional energy schematically, with the emotional "low" of depression followed by the "high" of actually coming to terms with the change. The emotional stages do not all necessarily take place.

To reach the **Acceptance** stage, Kübler-Ross believed that **hope** and not just optimism is the key, and that this hope is the belief that there will be a positive end. This need for a positive future vision was also mentioned by Abbot Urban of Einsiedeln in his talk on 15 November 2019 in the MAS Strategic Design Lecture Series[10], in his case provided by his religious and spiritual beliefs.

Hope can be characterised as follows:

- Hope takes courage, whereas optimism does not
- Hope involves *engagement and action*, whereas optimism does not
- Hope needs a *positive future vision*
- Hope requires the belief that one can make a difference.

Fig. 28. A firefighter and a koala watch as fire burns in the Lobethal vineyard in the Adelaide Hills (photo: Eden Hills Fire Service) [87]

[10] www.zhdk.ch/veranstaltung/40909

LL.2 Local and Seasonal Food

For many years, we have tried as a family to eat "sensibly" concerning environmental matters. In general, this means trying to have a diet of local, seasonal and organic food, avoiding significant CO_2 emissions. Less meat, and in particular less red meat is a key part of the equation. It is harder for us to reduce the level of dairy products and egg in our diet, so ruling out aspects of vegan cuisine.

Fig. 29. The Christie family's rooftop urban garden, 13 Sept. 2019 (picture by the author's wife)

H – Start with Hope

Our positive future state vision was as follows:

- Eat local and seasonal: buy in the local market if possible, or from local farmers
- Avoid food that has to be flown! Avoid food needing long distance transport, except if local production of the same item would involve significant energy use
- Grow our own when it makes sense (urban farming) – as we own our house with another family, this is easier than if we were renting and the building also lends itself to this usage
- Cook our own meals rather than warming up industrially prepared meals
- Meat: "nose to tail" and "grass fed" if at all possible, Swiss produce. Prefer vegetarian over meat. Have fewer meals involving meat.

E – Evaluate your Approach

- **Desirable:** The goal of eating more vegetarian food results interestingly in far more exciting menus at home! It is possible to cook tasty food that is fully vegetarian, as many Indians demonstrate. Growing our own produce at home is very motivating, and unlike with supermarket produce, it is tastier and there is far less waste
- **Viable:** Food is not a very significant part of our household budget, which means that spending a little more on local and organic produce is not a problem. Eating less meat also saves money. Growing your own food requires some outlay on infrastructure but this is more than compensated by the delight of seeing things grow
- **Feasible:** Growing your own, and buying locally is not problematic in Zurich. We needed to install better irrigation facilities in our house, in order to make urban gardening easier.

A – Actually Act

As a result of our "grow your own" urban gardening strategy, we have installed additional irrigation on the roof terrace and all balconies of our house. The roof houses a number of berry plants and figs, and has a large raised bed for smaller produce and flowers. We have an extensive herb garden on one of the balconies, and a small glasshouse which doubles as winter quarters for our perennials on another. We often buy our fresh vegetables and salad in the local market. We get seedlings for urban gardening not only from the market but also from the Pöschwies prison, where my wife visits inmates.

We have become members of an organic, dairy produce cooperative in Dietikon (Basi-Milch, basimil.ch/), which delivers 4 l of milk and yogurt, and 400 g of cheese to us to a depot ten minutes' walk from our house every week. The supply concept has small production runs, low waste and short transport distances.

We get meat from two independent Swiss "nose to tail" suppliers and keep it frozen so that we can consume it over a longer period and avoid industrially produced meat. We have started to try out newer products such as "vegetarian burgers".

We have decided to establish a wild bee swarm in our back yard in 2020 (wildbieneundpartner.ch/patenschaft/).

T – Tell Your Story

The Christie family has tried to eat locally, seasonally and organic for many years, growing its own urban gardening produce at home on the roof terrace and house balconies, which has the side-effect of making the terrace and balconies nice places to be, even in hot weather! We try to support local farmers and markets and are part of a local dairy cooperative. Food waste avoidance by reheating/reusing left-overs is part of the puzzle. Reducing our overall meat consumption is a goal, but we still enjoy meat from time to time! We don't go hungry or have boring food!

Key learnings:

- Urban gardening requires attention to the plants and regular watering, even when away!
- When buying in the supermarket, it is particularly difficult to judge which items on the shelves are the most environmentally friendly
- Trying to keep to the same overall approach when eating out in restaurants can be very challenging! Generally, we reserve eating out for special occasions and try to choose local non-chain restaurants carefully.

4 Shaping the Strategic Design Challenge

This chapter covers the overall *strategic design* process followed and ends with the way that the HEAT Method itself was designed:

- Strategic Design as Research Approach
- Double Diamond – Discover and Define
- Double Diamond – Develop and Deliver
- Designing the HEAT Method Itself.

4.1 Strategic Design as Research Approach

As befits an MAS in Strategic Design in the Design Department of the Zurich University of the Arts, a design process was used as research approach for investigating how to solve a strategic problem. Research through Design [88, p. 146 ff.] is an *abductive* reasoning technique and uses iterative interventions as a way to explore the problem space and generate new knowledge. See also [89, p. 132 ff.].

Nigel Cross covers the theoretical basis of the *abductive* design approach, in comparison to *inductive* and *deductive* reasoning as typically applied in scientific research, in his book "Design Thinking" [90, p. 28]: *"… the full system comprises mind, action and world … The designer's natural way of working encompasses that larger system through interacting with temporary models of the solution being designed for."*

Abductive reasoning starts from observations and searches for their simplest and most likely explanation. Unlike with deductive reasoning, the conclusion reached is plausible, but not confirmed. For "wicked problems" like global warming, where the interventions also change the system under observation, this is acceptable *and even necessary*.

Design is of its very essence an iterative process. To quote Tim Brown: *"Design thinking is inherently a prototyping process. Once you spot a promising idea, you build it. In a sense, we build to think."* [91]

This MAS involved two distinct phases:

- The process of determining the research question itself
- The shaping of the HEAT Method, itself a design method for tackling the research question, through intervention and prototyping.

The overall design process followed is the Double Diamond, well known in design circles [92] – see Fig. 30.

The initial **challenge** formulation was a pretty vague "cover a topic in the area of global warming", and the initial **outcome** was equally vague "something with meaningful impact for people".

The first iteration loop involved circling in on the actual "how might we" question which needs to be clear by the time that the intersection of the two diamonds is reached! This part of the overall process is covered in §4.2.

The second iteration loop was the research process itself, which started from the "how might we" question and developed the HEAT Method. This part of the overall process is outlined in §4.3 and the design of the HEAT Method itself in §4.4.

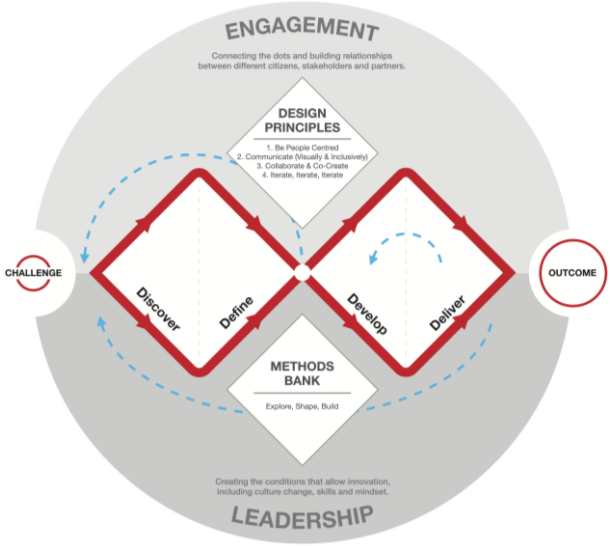


Fig. 30. Design Council's evolved Double Diamond
© Design Council 2019

4.2 Double Diamond – Discover and Define

This MAS addresses global warming. As should be clear from Chapter 2, this is a very large and "wicked" problem space, and in order to meet the time constraints of the MAS, it was essential to limit the scope of the research question. This proved quite challenging and it took several iterations to get to a question that was both self-contained enough to be covered in the few months available, but nevertheless wide-ranging enough to be considered strategic.

The original idea was to tackle the problem of narratives that inhibit global warming action. However, the initial approach for developing and testing the narratives themselves would have involved far too much time and resources. Nevertheless, the kernel of the research question was there from the start: tackling avoidance of action by prosperous Swiss individuals and households who can afford to mitigate and adapt.

After the first colloquium, the question scope was reduced to looking for "nudges" that would help individuals and households to keep engaged with global warming. However, the frustration inherent in the dilemma of little or no progress on global warming issues, despite increasing clarity of the challenges facing us, means that trying to develop "nudges" was not sufficiently strategic, especially as the initial focus was to be on people who were already susceptible to taking action.

The next idea was to limit the scope to a particular topic, looking for ways for individuals and households to reduce meat consumption. However, the limitation to meat consumption alone was too limiting and did not reflect the various efforts taken in the family sufficiently. Furthermore, the limited topic of meat consumption was not a theme specifically followed in the Living Lab.

Finally, reflection on what was driving frustration with global warming led to tackling the central dilemma of why humanity individually takes so little action, despite everything that is known. What brought matters to a head was that the author's family travelled to London *by plane* for the last weekend in May 2019, despite having less environmentally challenging options available. The train was chosen instead of the plane for London trips before – so why not this time? Answer: convenience, cheapness, availability. *What hypocrites!*

Crystalizing out the "How Might We" Question

While on the trip to Hong Kong and Shenzhen as part of CAS Design Cultures, having read Marcel Hänggi's book *"Null Öl. Null Gas. Null Kohle."* [93], the author became politically active in global warming by signing up for the association behind the Gletscher-Initiative (Fig. 31), through frustration with the lack of political progress.

One task was to help develop positive future scenarios which could be used for selling the goals of the initiative to the general public after it collects the necessary signatures and moves into the political process. This process was very fruitful and underlined the power of positive future pictures to build motivation.

In fact, it was the writing of such a positive future scenario concerning housing which led to the idea of engaging an Energy Coach organised by the City of Zurich to help the family plan the next steps to reducing the carbon footprint for our house (see §LL.4).

Because the family is already active with urban gardening (see §LL.2) it was clear that a "green façade" (combining photovoltaic with plants) would be part of that future vision.

The **"how might we" research question** (strategic design challenge) is now finally clear:

Fig. 31. Gletscher-Initiative banners on the author's house, 12 May 2019 (picture: author)

How might we empower individuals and households in Switzerland to remain engaged and take sustainable action concerning global warming? And how might we, as a result, also have a significant positive impact on society?

4.3 Double Diamond – Develop and Deliver

But, of course, the outcome of the research question was far from clear: this needed further design iterations! Because the challenge was now far more concrete, it was clear that a prototyping approach was needed [94, p. 87ff].

First of all, it was necessary to learn far more about the psychological and cognitive processes that inhibit action. A summary of this learning process is covered in Chapter 3, which included reading many media articles from a wide range of sources about global warming, particularly in conjunction with motivational issues such as denial or resignation.

Living Lab – Iteration 1

In the Living Lab, various interventions impacting global warming have been experimented with in the last few years. These interventions have been successful in keeping the family motivated concerning global warming, despite the rather depressing lack of progress in society at large.

In the Living Lab, trying to keep engaged and doing our part, the family had intuitively always developed a positive future vision, taken action, even if the first steps were very small, and told others what they were doing. This is the kernel of the HEAT Method.

Chosen themes from the Living Lab experiences are presented throughout this document in green boxes structured along the lines of the HEAT Method.

- Mobility and Travel, see §LL.1 on page 14
- Local, seasonal food, see §LL.2 on page 24
- Reducing waste and avoiding packaging, see §LL.3 on page 30
- Heat and power – energy consumption in the household, see §LL.4 on page 38

In other words, this is **Iteration 1** of the method, before it had a name.

The HEAT Method – Iteration 2

At some point, an article by Raz Godelnik [95] gave inspiration. It suggested the use of a design method to tackle apathy. The article led to research of adaptive challenges (§3.6) and the spheres of transformation (§3.7), and led to the realisation that the search for a technical solution to a technical problem was insufficient, since global warming is an adaptive challenge! Also, far more emphasis on the emotional and psychological aspects was required.

The need for a positive future state based on hope came partly from the Living Lab reflections and partly from personal experience in change programmes (§3.8). The basic ideas from the article, extended and reframed, led to the **HEAT** Method (in short: **H**ope, **E**valuate, **A**ct, **T**ell, see §5): **Iteration 2**.

Why is a design method an interesting approach for tackling this particular strategic design challenge? The American psychologist and sociologist Herbert Simon originally defined "design" as follows in a seminal book called "*Sciences of the artificial"* in 1970, which is now in its Third Edition [96, p. 111]:

"Everyone designs who devises courses of action aimed at changing existing situations into preferred ones."

By this definition, the HEAT Method is a *design method* with the goal of "changing existing situations" (global warming crisis) "into preferred ones" (a future state where the worst side-effects of the climate crisis have been avoided). Initially, the method was deliberately scoped for use by individuals and households in Switzerland.

The intention was to empower the development of a *personal* positive future state vision, constructive "courses of action" and an accompanying narrative, focused on self-responsibility.

The choice of the acronym "HEAT" is of course deliberate!

Iteration 2 was prototyped with five testers. Reflections and notes from the workshop sessions are given in Appendix A.

The updated version of the HEAT Method after feedback from the initial testers is documented in Chapter 5.

The HEAT Method Revisited – Further Iterations

Iteration 3 is documented in Chapter 5, and incorporates feedback from the prototype testers.

Further potential iterations are covered in Chapter 6.

Fig. 32. Large waves in Plobannalec-Lesconil, France, as Storm Ciara (Sabine) was hitting western and northern Europe [97] (photo: Fred Tanneau/Agence France-Presse, Getty Images) – such storms seem to have become the "new normal" in Europe in 2020

4.4 Designing the HEAT Method Itself

The approach to designing the HEAT Method was as follows. Many design methods were incorporated – they are referenced throughout this section.

A core central idea is the development of a personal, positive future state vision:

- Firstly, in order to make the future state concrete enough, it must not be too far in the future. A timescale of **ten years** was originally suggested to the prototype testers – they all found this a good proposal. In the updated description, the timescale is now fixed
- Secondly, the topic area needs to be limited, since the whole of global warming is too large a topic. Some possibilities were proposed – they were sufficient that all test participants managed to find a topic area rapidly
- Thirdly, there is a need to tailor the future state to suit the worldview of the participant. For this, the Cultural Dynamics and Marketing questionnaire was used (see §3.3). None of the testers had an issue with this, and the resulting picture of the participants was very useful without causing any offense.

  Essentially, each participant was linked with a particular *persona*, and a simple framing of the vision was made, dependent on that persona. This also makes the method robust when faced with typical deniers. Personas are a common approach to tackling diffuse user groups in design [98, p. 95], [88, p. 132 ff.].

From the author's research, confronting deep personal emotions triggered by global warming is central. Rather than explicitly carrying out any psychological analysis directly, the participants were encouraged to talk about their emotions openly, which served to frame and anchor the vision discussion. This containment technique (see §3.1) activates a deeper level of discussion. This functioned successfully with all testers without feeling contrived.

Central to the HEAT Method is the development of concrete actionable steps. These are generated by deliberately starting with the future state and working backwards to the present, also called "*back*casting". See [99] for a detailed description. The main reason for choosing this particular approach is to avoid being trapped by the difficulty of making the first step, which often occurs with "*fore*casting". This is also referred to as the Blue Ocean method [100, p. 172]. In the case of global warming, emotional issues also get in the way of starting from the present. Because the future state is relatively open and chosen by the persons themselves, there is also more freedom to be creative.

The HEAT Method has four steps as follows, starting in **Step H** by establishing a *personal* positive future state using an adapted storyboard [98, p. 97], leading to actionable ideas using brainstorming [98, p. 117]:

- **H**: establish *personal* positive future state and actionable ideas – this takes around half the time allocated
- **E**: evaluate the ideas, using IDEO impact assessment [101], clustering [88, p. 26 ff.] and context mapping [98, p. 41]
- **A**: document the actions and **commit to act,** using a structured "HEAT map" [102, p. 46 ff.], [88, p. 24 ff.]
- **T**: create a personal narrative and **commit to tell others** – see [94, p. 129 ff.] for the importance of storytelling.

The last step is key to grassroots movements. Its relevance in strategic design is covered by Ezio Manzini [8, p. 44 ff.].

The last step also involves the writing of a "letter from the future" (a variant of the Love Letter method [88, p. 114 ff.]), where the developed narrative is documented and sent back to the workshop participant some time later. Writing during the workshop anchors the content and future repetition underlines it.

Following on from the workshop some optional homework is given. Reflection on the actions and narrative developed aims to reinforce the transfer effect. All the testers confirmed that the result of the workshop was still present in their minds weeks later and that they had not only actually carried out at least one of the actions, but also discussed their personal narrative with others. One participant pointed out that the realisation that others were also interested in the topic or even active was very empowering.

A workshop setting was chosen, with the author moderating [88, p. 102 ff.]. This was a conscious choice enabling reactions to be assessed directly and detailed questions to be answered where the method description was insufficiently clear. It turned out not to be necessary to steer the discussion explicitly, but timekeeping is important! In the feedback round, the testers felt that it was necessary to have a dialogue setting, but that an external moderator is not essential. A family group could apply the HEAT Method without needing someone from outside to steer the process. If the group consists of more than seven or so people, a moderator is probably essential, though.

Chapter 5 contains a "standalone" description of the HEAT Method revised after the first prototyping round.

LL.3 Consumption and Waste Reduction

As a family, we have been conscious of our consumption and production of waste for years. We have not always been consistent concerning modern gadgets such as smartphones. The seduction of the new and trendy was difficult for all of us to escape, particularly in the last couple of decades with all their technological developments.

Fig. 33. The Christie family home refill centre, 29 Sept. 2019 (picture by author)

H – Start with Hope

Our positive future state vision was as follows:

- Use re-usable containers for fruit and vegetables, grains, pasta, eggs etc. Avoid one-use items such as paper or plastic cups, and carrier bags
- Buy in large quantities and fill smaller dispensers in our house, to reduce overall packaging waste
- Buy items loose and not wrapped otherwise, make use of the farmer's market
- Reheat leftovers and compost organic waste
- Do not follow the dictates of "fashion" when buying clothes: have enough clothes made of good quality materials and choose a timeless style
- When buying larger goods such as furniture, buy solidly built items that will last and are made from good quality materials
- Do not always upgrade to the next, best version of a given gadget just because it has more features: the CO_2 emissions and raw resources from production to disposal are not recovered. Recycling cannot reclaim all important materials such as rare earths, as the products are not designed to be disassembled
- Choose natural materials that have a low environmental impact in their production, and which are locally produced: look for "cradle to cradle" and other circular economy goods.

E – Evaluate your Approach

- **Desirable:** Although it sounds easy to buy without unnecessary packaging, this requires quite a lot of planning so that the necessary reusable containers are actually with you when you shop! Furthermore, today's global supply chain introduces a lot of surplus waste in the form of packaging needed to keep the goods intact during their journeys. Buying locally does not necessarily get rid of that packaging
- **Viable:** Economically, it is indeed feasible to reduce unnecessary waste at the household level. The waste in the industrial processes and transport systems is harder to tackle. Perhaps, over time, refilling will become more commonplace (again) and so less wasteful
- **Feasible:** On the surface, it seems to be becoming easier and easier to buy goods with less waste and packaging, but this is not at all mainstream yet. The supply chain needs considerable upheaval to reduce waste along the entire lifecycle of a given product.

A – Actually Act

For several years, we have been buying various washing products in large quantities and filling dispensers within our own household. This has been a success story in that we have avoided a lot of packaging as a result. In the case of washing up liquid and soap, we are also using considerably less product as a result. We also buy our cat food in large quantities.

We started to use re-usable containers several years ago, but are not always so successful having them with us when actually shopping.

Apart from reheating left-overs, we also make good use of a "Hungry Bin" composter for organic waste in our cellar (it uses live worms and does not smell!). This has the side effect of helping us keep the humus in the earth around our house healthy.

We use a second rubbish collection service in addition to the regular town rubbish collection that takes all our non-organic and non-food waste and recycles it properly: this makes possible the recycling of batteries, plastics and other items that would otherwise just be incinerated.

T – Tell Your Story

The Christie family is committed to reducing its consumption and waste footprint in various ways. We avoid unnecessary packaging and buy local products where possible. We do not follow all fashion trends and prefer to buy long-lived, classical products that are made from renewable resources and that can be disposed of easily or better still recycled. We use various strategies to avoid food waste such as reheating of left-overs and composting.

Key learnings:

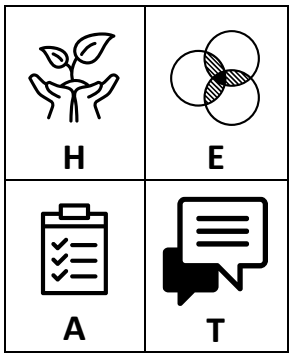
- We are all addicted to convenience: avoiding all this packaging and waste is *extremely* hard to do
- Buying in large quantities needs planning and the financial means and space to buy and store in large amounts
- Our overall consumption and amount of waste has actually gone down
- We have not been very successful at avoiding unnecessary upgrading of technical products
- When buying, it is extremely difficult to judge whether a given product is environmentally friendly – we probably need more mechanisms such as the EU's energy efficiency labelling [103].

5 The HEAT Method

The HEAT Method[11] was developed to help interested Swiss individuals and households develop a personal action plan and start their own "grassroots" movement. It is a structured method used in a workshop setting which aims to develop a personal positive future state vision in a particular topic area, actionable steps that can be taken now, and a personal narrative that can be shared with others.

The HEAT Method has four major steps:

- **H** – Start with **H**ope (see §5.2)
- **E** – **E**valuate your Approach (see §5.3)
- **A** – **A**ctually **A**ct (see §5.4)
- **T** – **T**ell Your Story (see §5.5).



The HEAT Method looks for *personal* and motivating solutions. Humans are social beings: the more of us who can imagine a positive future with global warming, have taken some concrete steps within our own possibilities, and can talk about this within our peer group, the less easy it is for denial and apathy to set in, and for misinformation to take the upper hand.

The HEAT Method is designed to tackle our mostly negative psychological reactions to the strong emotions caused by global warming. It is these reactions that trigger our unconscious denial and apathy reactions. A first step in dealing with these emotions and our denial reflexes is to admit that they are there. This is not enough, however. To take action we need to see a feasible journey to a positive future that we can *personally* identify with. This needs the courage to have hope that the future can be positive. Only then, can we decide on actual steps to take and fight our cognitive biases.

The HEAT Method goes on to plan the taking of the first steps, however small, so that actual action is being taken. The HEAT Method rounds off with the creation of a personal story or narrative which joins the actions up with the future vision. This *personal* "elevator speech" is framed so that it answers the question **"…and what are *you* doing about global warming?"**.

A personal commitment should be made to carry out the first actions and to tell others what you have decided to do. A "letter from the future" is written at the end of the workshop that is opened several weeks after the original HEAT workshop, in order to reinforce a sustainable transfer to daily life.

Preparation for the workshop is covered in §5.1 and should not take more than 30 minutes or so. The workshop itself needs 90 to 120 minutes and good timekeeping. Allow around half the time for the **H** step. Materials required:

- a flipchart, but a whiteboard or large pieces of paper will do
- Post-its® of various colours, but a notepad for listing actions and results will do
- suitable pens, some blank paper and an envelope.

The HEAT workshop should be carried out as a dialogue, where one person acts as moderator and takes care that the method steps are followed properly.

It is possible to carry out the workshop with a group of people, allowing time for discussions and break-out groups so that the group can build up its confidence. Then, a moderator is essential, and more time needs to be planned because group consensus needs more discussion. In group setting, an additional presentation block giving input about global warming can be planned before the HEAT workshop proper. More than ten people in one workshop is not advisable.

A follow up (see §5.6) should be planned several weeks after the HEAT workshop itself.

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[11] The intention is that Chapter 5 should be able to stand alone, so that it can be used for running a workshop. For that reason, all web links are given in full, and the second person is used, referring to the subject of the HEAT workshop. All links in this chapter were accessed on 11 January 2020. The icons come from the Noun Project and were developed by icon4u, Meaghan Hendricks, Beth Bolton and Susanna Nova

5.1 Preparation

Before the HEAT workshop, various preparation steps need to be carried out to set the scene:

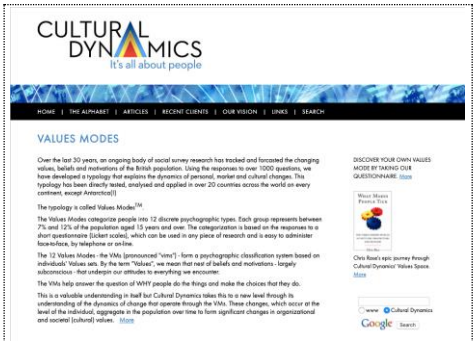


Fig. 34. The Cultural Dynamics Values Modes Questionnaire

- Self-assessment I: Cultural Dynamics profile

  Cultural Dynamics and Marketing is a company involved in strategy and marketing and has been assessing what drives people for many years. They provide a short self-assessment test – The Cultural Dynamics Values Modes Questionnaire (www.cultdyn.co.uk/Process/indexAdagioGeneral.php). There are twenty simple questions that take no more than five minutes to answer. Please take this test and have the results available before the HEAT workshop. The results will be discussed in the workshop.

- Self-assessment II: WWF personal carbon footprint

  There are many carbon footprint calculators. It is not so important which one is used, but it helps to have recently considered key personal factors before the workshop. The Swiss WWF footprint calculator can be found here: www.wwf.ch/de/nachhaltig-leben/footprintrechner. Again, it does not take more than five minutes to calculate your footprint.

- Global warming *is* happening: some (optional) background reading

  Human-caused global warming *is* happening. The scientific consensus is near to unanimous that humans are causing global warming[12]. The cumulative amount of CO_2 that humanity has emitted is directly affecting the average climate temperature. The amount of CO_2 in the atmosphere has risen to the unprecedented level of 415 ppm, exceeding the maximum of the last 600,000 years which was around 300 ppm. The overall rise in temperature has been around 0.9°C since 1850, and even more in Switzerland. For more information see climate.nasa.gov/evidence/. See also www.climatecentral.org/news/see-earths-temperature-spiral-toward-2c-20332.

  Changes to the climate not only increase local temperatures but also affect our global habitat and disturb natural food chains, weather patterns, wildlife and vegetation. The 2015 United Nations Climate Change Conference in Paris (unfccc.int/process-and-meetings/the-paris-agreement/the-paris-agreement) agreed to set an upper limit to the average temperature increase of 2.0°C (with the key preference of keeping "substantially below 1.5°C") so as to mitigate side-effects and tipping points such as more violent weather, the desertification of parts of the world and sea-level change. The natural world is also stressed by these factors and there is strong evidence that a mass extinction of species is under way (a report by the UN, published in May 2019, shows that Earth's biodiversity is suffering a catastrophic decline unprecedented in human history: see www.dw.com/en/why-biodiversity-loss-hurts-humans-as-much-as-climate-change/a-48579014). The human food chain is also directly impacted.

- Reflect on key personal emotions caused by global warming

  Before the HEAT workshop, reflect on personal emotions caused by global warming and its potential to destroy the human habitat. Consider not only yourself, but also your family and children (should you have any). These emotions can include **fear** of unpredictable future changes, **anger** about corporations and individuals profiting from the pollution, and **grief** at the loss of flora, fauna and natural habitats.

  Come prepared to talk about the deep emotions that you personally feel as part of this reflection.

- Select your personal global warming topic area in advance of the workshop

  In order to make the discussion concrete, please choose one key topic area impacted by global warming (some examples: mobility and travel, local and seasonal food, consumption and waste reduction, heat and power).

[12] See agupubs.onlinelibrary.wiley.com/doi/10.1002/2013EF000226 , "Earth's Future", Volume 2, Issue 5 [123, pp. 295-298]

5.2 **H** – Start with **H**ope

In 2019, we were all very impressed by Greta Thunberg when she deplored global warming inaction with her no-nonsense, candid and blunt "the emperor wears no clothes" style. However, her image of our burning home lacks a key ingredient: *hope*.

Hope needs courage. It needs the courage to believe that we *can* get the worst excesses of the climate crisis under control, we *can* find new and innovative ways of living without fossil fuels, we *can* imagine how not to destroy the habitat of humanity (and the flora and fauna that accompany us), we *can* instrumentalise human ingenuity for good.

Amidst all the bad news that we are knowingly and collectively destabilising our environment, degrading whole ecosystems, destroying natural habitats of both humans and animals and all the rest, we need hope so that we do not give in to despair and darkness and let cynical politicians and lobbyists manipulate us with fear.

- **Step H1:** Create your vision of a *personal,* positive future state

  The first step in the HEAT Method deliberately builds hope into the solution by starting from a positive future vision and imagining a journey from today towards that vision. Unless you prefer otherwise for a particular reason, use a time horizon of **ten years**[13]. If you do not have a topic area, pick one from the preparation list now. *You* are empowered to design *your* future!

  At this point take your Cultural Dynamics result. There are three main result categories which can be used to frame your future vision. If you are a…

  - ***Settler:*** aim for a future vision that is as far as possible comfortably like today, enables us to keep our traditions intact, ensures that no unnecessary risks are taken, but…
  - ***Prospector:*** aim for a future vision that reflects your idea of how people in your peer group are likely to be living, allows people still to have fun and be successful, gives us what we need to live, but…
  - ***Pioneer:*** aim for a future vision that takes best account of how the future will turn out, including significant technological and ecological changes, allows for self-choice, keeps nature intact, is ethically acceptable, and…

  …takes account of realities that we know are being forced on us by global warming. In a group workshop the vision should be developed in Cultural Dynamics category sub-teams.

  Taking your chosen topic area and time horizon, sketch out how a positive future *could be* on a flipchart or large piece of paper. Use pictures or sketches where possible. The vision is a *personal* idea of the future. It must be placed in your future (you are ten years older!) and incorporate likely changes within the timeframe (such as a significant increase in the cost or even a banning of fossil fuels), but need not attempt to be extremely precise. The key thing is having a concrete mental model of a positive personal vision. See Fig. 40 for an example.

- **Step H2:** Working *backwards* from the future vision, imagine a *feasible* path from today to the future state (Fig. 35). Make a flipchart of the details of the path from present to future, and note waypoints as they come to mind (Fig. 36).

  Why work backwards and use "*back*casting"? The main reason is to ensure that today's difficulties with taking action do not inhibit a positive route to the future. Let the future vision lead the way back to the present. Think about social or technological changes that might need to happen along that journey that help to reach the personal future state.

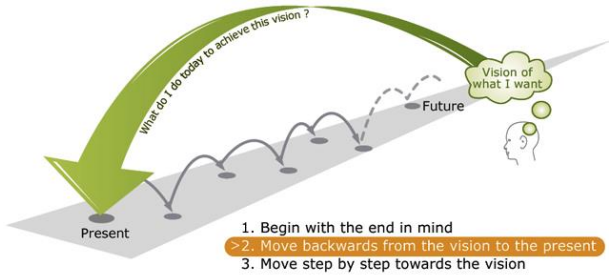


Fig. 35. © 2011, The Natural Step Canada (www.naturalstep.ca/backcasting)

[13] In order to meet the Paris goal of 2.0°C ("preferably well below 1.5°C"), there is not much time left. The recent IPCC Special Report published in 2018 ("Global Warming of 1.5°C", see www.ipcc.ch/sr15/) made this very clear. This is why a time horizon of ten years (2030) was chosen.

- **Step H3:** List as many actions as possible that could be taken today (or soon) to start the envisaged journey

  Taking Post-its®[14], brainstorm as many concrete actions as possible that could be taken to start the journey towards the future vision.

  Do not assess the feasibility of the actions at this point.

  Try to have a wide range of actions: not just immediate practical actions, but also actions that other people *that you can influence* could definitely carry out.

  Also consider actions that involve changing your personal worldview *over time.*

  For inspiration in a group workshop, consider sources such as Project Drawdown [104] – www.drawdown.org/.

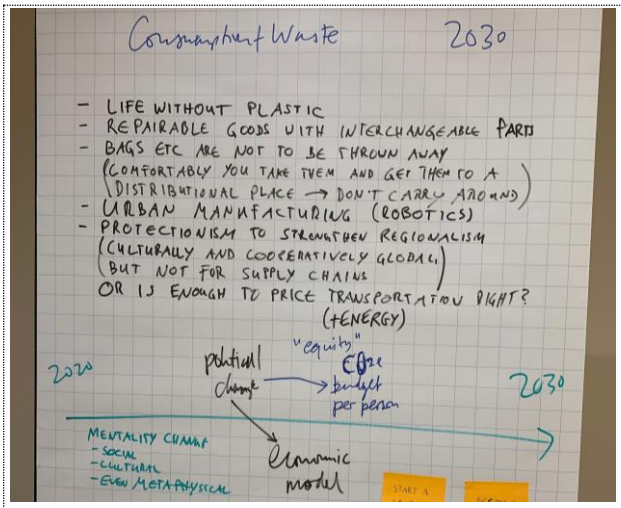
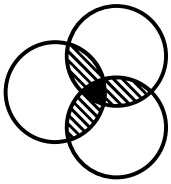


Fig. 36. HEAT workshop, 11 Dec. 2019 (picture: author, cropped)

5.3 **E** – **E**valuate your Approach



Only at this point do we evaluate the actions that were generated before. An honest assessment of the possible actions anchors them to reality and simultaneously empowers by establishing a personal relationship with the action.

The actions are evaluated in the following three steps:

- **Step E1:** Assess the impact of your brainstormed actions

  How do designers typically evaluate their solutions? One well-known way is given by IDEO in their "Field Guide to Human-Centered Design" [101] – Fig. 37.

  To be successful and sustainable, impactful solutions need to be:

  – **Desirable:** delightful enough that the actions will get carried out

  – **Viable:** economically possible, within personal financial reach

  – **Feasible:** technologically possible and meaningful (can achieve the necessary impact).

  Take the actions generated in **Step H3** and assess them under the IDEO categories. Try to land in the "sweet point" in the middle of the IDEO chart and adjust the action text if necessary. If one of the three dimensions can only be met later along the journey (for example, a given technology is not yet fully available), then mark those actions as potential for the future.

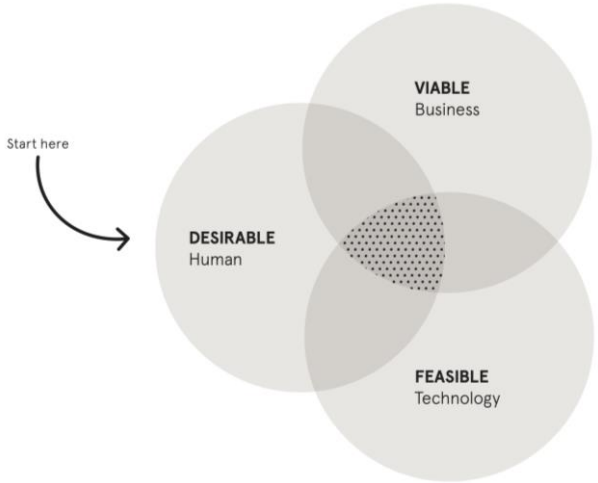


Fig. 37. IDEO: Create Real Impact [101, p. 14]

[14] When brainstorming with Post-its®, avoid writing too much on each one, and use little sketches. It is better to end up with lots of Post-its®!

- **Step E2:** Cluster your actions by transformation type

  Transformations can be classified into three overlapping spheres as proposed by Karen O'Brien and Linda Sygna[15]. The three spheres (Fig. 38) are as follows:

  - **Practical:** personal behaviour changes, social and technical responses and innovations, and institutional and managerial reforms
  - **Political:** social *and ecological* systems and structures that frame the practical transformations
  - **Personal:** individual and collective beliefs, values and worldviews that shape the political transformations.

  The overlaps between the spheres indicate that the different types of transformation influence each other.

  The green wedge symbolises the need for change in all three spheres *and* on the interfaces.

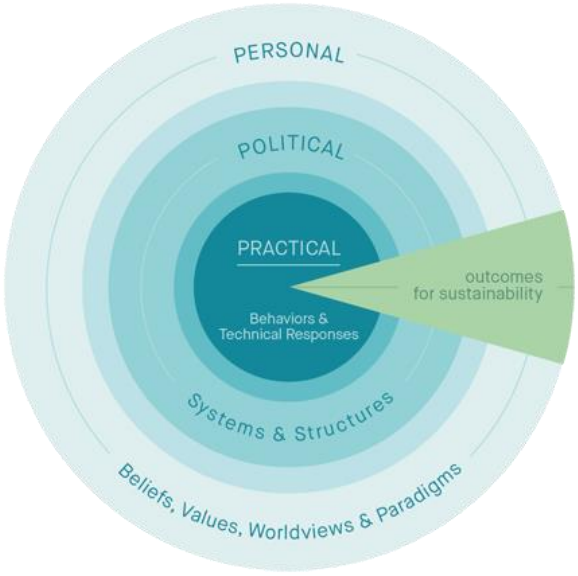


Fig. 38. Three spheres of transformation [82]

- **Step E3:** Make your personal HEAT map

  Stick the adjusted Post-its® onto a two-dimensional matrix on a fresh flipchart or large piece of paper[16], with the following axes:

  - **Horizontal:** from now (left) towards the future (right)
  - **Vertical:** the three spheres of transformation (personal – political – practical), with overlapping allowed!

  This represents a map that should enable navigation towards the *personal* future vision (see Fig. 39 and Fig. 44 for examples).

  If there is time in the workshop, then the timetable can be broken down into year blocks, and potential future actions can be recorded for follow up later.

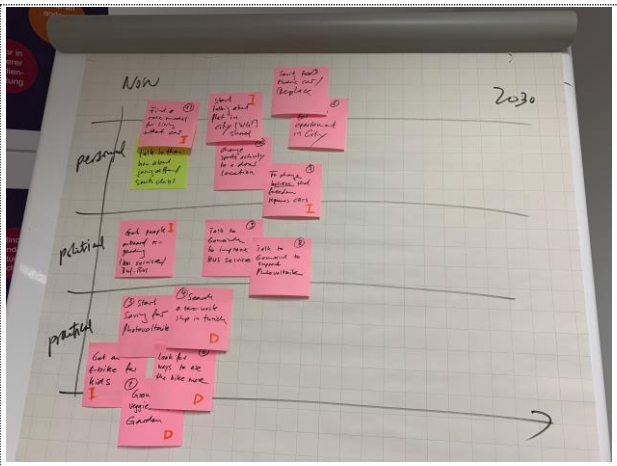


Fig. 39. A prototype HEAT map, being produced during a HEAT workshop on 5 Dec. 2019 (picture: author)

At this point, the following has been achieved:

- A concrete personal future vision has been sketched out
- A set of impactful actions has been generated, some of which can be carried out immediately
- The actions are clustered along the key change dimensions represented by the spheres of transformation.

The last two steps in the HEAT Method concern committing to actions (**A**) and telling your story (**T**).

[15] Responding to Climate Change: The Three Spheres of Transformation, *from* Proceedings of Transformation in a Changing Climate, 2013

[16] In a group setting, a wall can be used for clustering, so that all participants remain involved

5.4 **A** – **A**ctually **A**ct

The **A** step in the HEAT Method concerns itself with committing to the initial actions on the plan.

The actions will not be carried out during the workshop. But it should be possible to select actions which can be started as soon as possible, or at least where a first step can be taken to *initiate* the action. Reflect on the fact that almost nothing stops us from taking action and that we do have power to make change happen.

Mark up the actions as follows:

- With a "**D**": those that can be **d**one immediately
- With an "**I**": those which can be **i**nitiated immediately
- With a "**P**": those where you can **p**rovoke change, for example ask your pension fund how sustainable its investments are.

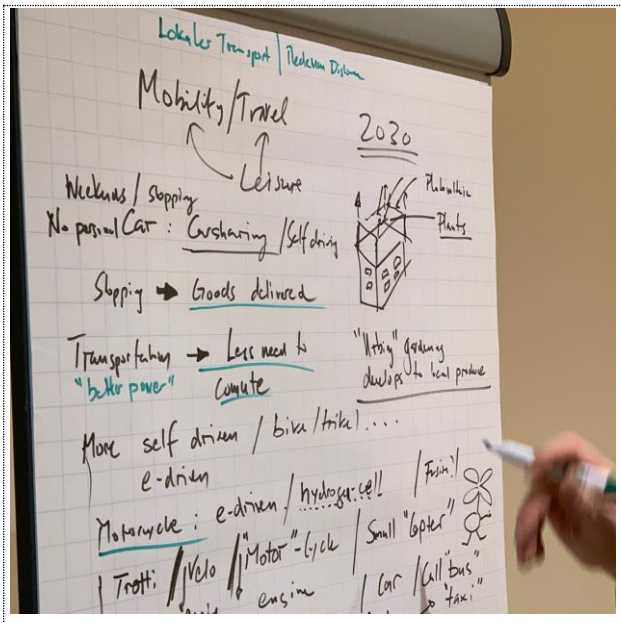


Fig. 40. Working on a personal positive future state, HEAT workshop, 6 Dec. 2019 (picture: author)

It is alright if not all actions are marked up. The aim is to find some concrete steps that can indeed be taken, and which lead to the envisaged future vision. Take a blank sheet of paper and write a list of all the actions, starting with the "**D**" actions, followed by the "**I**" and "**P**" actions and then the rest. Leave enough space in the list for notes about each one.

5.5 **T** – **T**ell Your Story

The **T** step in the HEAT Method frames your future vision and initial concrete steps into a compelling story of your approach

It is your *personal* "elevator speech" (Fig. 41), answering the question **"…and what are *you* doing about global warming?"**.

Take a blank sheet of paper and write your story. Check that it is clear, relevant and exciting.

Start your own grassroots movement! Plan to tell others this story and what you have done in the coming weeks. Take care not to judge others. Concentrate on explaining *your* personal vision and plan.

Your story should enable you to move from a feeling of hope to a feeling of empowerment. At least some first steps can be taken, even if the solution is not complete. Being able to tell your story is a way to keep denial and apathy at bay. It is also a way to build your own confidence and start to handle criticism. Read through your story and try to memorize it. Then put it into an envelope. This is your "letter from the future".

Take photos of the flipcharts with the positive future state, notes made of the transition to the future state from **Step H2**, and the HEAT map (or take the flipcharts with you).

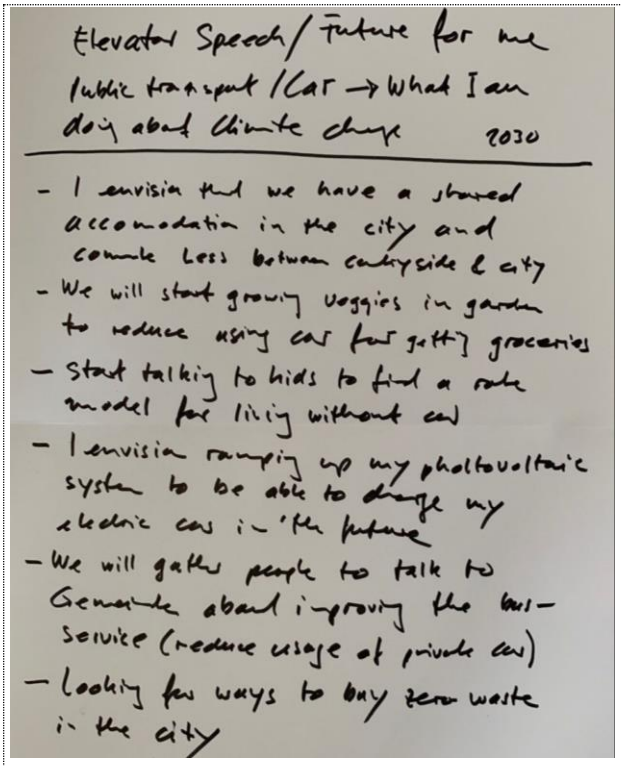


Fig. 41. Elevator speech, HEAT workshop, 5 Dec. 2019 (picture: author)

5.6 Follow Up

As soon as possible after the HEAT workshop, take the list of actions and look through them. For each action that you plan to put into action ("**D**", "**I**" and "**P**" actions)[17]:

- Reflect on the *personal* emotional effect of carrying it out, and write this down
- Reflect on cognitive biases[18] which could interfere with successful implementation, and write this down
- Reflect on how to make the solution sustainable, and write this down.

Several weeks after the HEAT workshop, open your "letter from the future"[17], and take the action list you prepared. Check which steps were actually taken, which difficulties arose, whether the personal positive future state needs adjustment, and what emotional reactions occurred.

Think about who you told your story to, and how they reacted!

Consider following up on a regular basis and repeating the HEAT workshop from time to time. This is a particularly strong way to reinforce action in groups and can be combined with breaking down the HEAT map into current and future time periods.

Fig. 42. Xiamen, China: Cycling infrastructure is being built in cities throughout the world, in the hope of reducing society's dependency on polluting vehicles (photo: Ma Weiwei) [105]

[17] In a group workshop, this reflection step could be carried out during the workshop and the letters could be sent by the workshop organiser to the participants later

[18] See the Cognitive Bias Codex by Benson and Manoogian – www.visualcapitalist.com/wp-content/uploads/2017/09/cognitive-bias.jpg (also available in print format here: www.designhacks.co/products/cognitive-bias-codex-poster)

LL.4 Heat and Power – Energy Consumption in the Household

We are privileged to co-own the house we live in with another family. This means that we could tackle projects concerning the energy efficiency and environmental impact of our heating and power systems without having to consult a landlord. In 2006 we insulated the roof and cellar, and in 2008 all the windows were replaced. After the recent very hot summers, we increasingly need to consider how to cool our house too. In 2019, we took advantage of an Energy Coach offered by the City of Zurich to look into the energetic state of the building and develop a future vision.

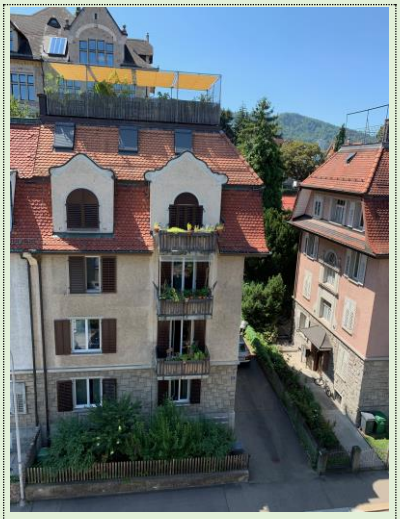


Fig. 43. The author's house in Zurich, 29 Sept. 2019 (picture by author)

H – Start with Hope

The positive future state vision we developed is as follows:

- We intend to move away from fossil fuels as fast as feasible, but must consider the amortisation of our heating systems which are quite new
- We are further insulating our house and atelier building whenever we can afford the investment
- We need to consider creative ways of keeping the building cool in summer, such as by using plants to shade the sun facing side
- We are adopting low energy solutions for lighting as soon as they become available – however, we do not replace the light fittings unnecessarily but wait until LED bulbs become available in the necessary form factor. Light fittings which do not allow the bulb to be replaced do not belong in our house, because of the waste of resources (throwing away the whole lamp when the bulb stops working is crazy).

E – Evaluate your Approach

- **Desirable:** We plan a "green façade" on the south facing back of the house, which will enable us to use photovoltaic and plants to provide shade in the summer and additional energy. This combines in a delightful way with our existing urban gardening projects! At the same time, we will insulate the south facing wall of the house
- **Viable:** Economically, we are taking account of the investment horizons for the major investments around the house, which are measured in decades. The cost of installing photovoltaic cells has dropped considerably in the last few years. In order to amortize the investment in relatively new gas heating systems in our house, we have switched from natural gas (fossil fuel) to "bio gas" produced from composting by the City of Zurich, which is a renewable alternative
- **Feasible:** Moving to geothermal energy is possible and relatively investment friendly, but we will wait until the heating systems are somewhat older. If the state offers investment incentives, we will consider to make the move earlier.

A – Actually Act

Concerning heating and energetic measures, we were already active since we took over the house in 2004. Under the roof it can become very hot in summer, especially with the increasingly long tropical night periods that we are now experiencing in Zurich. So far, we have managed to find a low energy solution (ceiling ventilator) and have been able to avoid air conditioning.

The Energy Coach was the first step in establishing our new vision. He confirmed our overall approach to insulation and heating. It was he who suggested that we consider first moving to "bio gas" and photovoltaic. The latter is preparation for a geothermal heat pump later. Potentially, the political environment will change with increased ambient temperatures making subsidies and other incentives possible.

Planning for the "green façade" and installation of photovoltaic on the roof terrace will already start in 2020. Together with our co-owners, we decided on 2 January 2020 to move to 100% bio gas (renewal fuel) for our house heating.

T – Tell Your Story

The Christie family and the other co-owners of our house are doing all we can to improve our house from both an energetic and global warming point of view. The biggest current issues are heating with gas (fossil fuel) and increasingly cooling in summer. Our next step will be to start work on a "green façade" on the south facing side of the house with a combination of photovoltaic panels and plants to provide shade and locally produced energy. Longer-term we intend to move to a heat pump heating and cooling system using geothermal energy, within the constraints of our investment possibilities.

When these ideas are discussed with other people, they often react by saying that they cannot do anything because they are renting. This is not fully true. In smaller properties, it is possible to talk directly with the owners. Often, they are willing to consider changes so long as the financing of a change can be assured – tenants can club together or potentially agree a longer-term contract which shares the costs and profits of improving the heating and cooling of a building. In larger properties, the buildings are typically owned by pension funds or banks. Increasingly, these organisations have declared aims to be or become environmentally sustainable. In fact, this even makes financial sense now that sustainable energy sources are becoming financially competitive. Merely asking the building owners what they are doing about sustainability can sometimes cause action.

Finally, there are increasingly possibilities to get support from the state when the building stock is improved, given the moral pressure on our governments to show what they are "doing about global warming". There is no reason why a tenant should not enquire about such possibilities and then propose them to their building owners.

6 The HEAT Method Revisited

6.1 Reflections after Initial Prototyping Sessions (Iteration 2)

Immediately after the prototype HEAT workshops, notes were made about what could be improved in further iterations. A summary of those notes and various remarks from the testers are given in Appendix A.

Here are some partly translated and paraphrased quotes triggered by the question about the deep emotions felt by the testers, as recorded during the HEAT workshops during December 2019:

"It is 5 after 12, not 5 to 12" … "Afraid about the future, what future for the kids?" … "We cannot solve the problem ourselves, and cannot reach a global decision either" (Beat Jost)

"My footprint is four times the planet, shocking!" … "You're kind of hopeless" … "Shitty for our kids" … "The world as we know it has already gone" … "We are helpless" … "Gadgets don't make us happy" (Tom Röttig)

"Fear – what can our children and their children expect?" … "Things have become really 'tight' for plants and animals" … "We are poisoning the Earth" … "Grief – I feel paralysed" (Regula Cincera)

"Sad – we only have one planet, it seems too late" … "Angry – people burn CDs and other garbage in Poland, just to be warm cheaply and the pollution police are not called by the neighbours" … "Fear – what about the next generation?" (Katarzina Flood)

"Frustration, helplessness, regret – no personal fear, feeling of having no power to act" … "People have to change their opinions, but actually we have to change how society is, stop the greed and self-centredness" … "Climate change is a collective task, but society is fragmenting" (Palle Petersen)

Several weeks after the prototype HEAT workshops, a joint feedback session was held. The testers were positive about the method overall. The things that needed adjusting were not structural and were more concerned with use of the short time budget in the workshop.

All reported that they had discussed their results with their families and had started to take *some* actions. The individual stories were well-anchored by all. Likewise, all remembered the discussions of emotions and which particular emotions.

One participant mentioned that she had been surprised that some other work colleagues also thought the same way as her: she would not have realised this without being motivated to talk openly about her action plan.

Another participant mentioned how hard it is to be active if the local community where one lives is full of "global warming deniers".

In the Iteration 2 feedback workshop, ways in which the HEAT Method could be developed further were also discussed. Improvements have been worked into the method itself. Otherwise, given more time:

- The pictures supporting the HEAT workshop could be prepared as handouts or cards
- Instead of covering only the three main Cultural Dynamics personas, all twelve sub-personas could be prepared for the vision development part of the workshop (**Step H1**).

Fig. 44. A prototype HEAT map produced during a HEAT workshop on 8 Dec. 2019 (photo: author)

6.2 Society at Large – Scaling Grassroots Movements Up

Having successfully carried out the HEAT Method intervention with a group of volunteers, the problem of scaling the approach up to the level of society needed addressing. The scope was restricted to German-speaking Switzerland for time reasons. Rather than organizing further workshops, interviewing [98, p. 47] was used as design method. The author met a range of people involved with the global warming topic in society at large, to assess what needed to be considered, as follows:

- local politicians and activists
- a local representative of an environmental group (WWF)
- a member of the sustainability affairs department in a global bank
- environmentally prominent representatives of the local academic community (ETH and Zurich University).

The red boxes at the end of each sub-section outline how the HEAT Method might be adapted as a result.

Politicians and Activists

Fig. 45. The global warming theme of drowning masterfully presented by young people [106] (picture, 24 May 2019)

Among the politicians, there was consensus that 2019 marked a tipping point in (Swiss) society concerning global warming and "green" topics in general, agreeing with this thesis (see §3.5). The "Friday Climate Strike" movement, inspired by Greta Thunberg, is not just a flash in the pan but is still active a year on. At least here in Europe, the realisation that global warming is actually happening is now starting to cause political change. Andrew Katumba[19] felt that the clarity and intensity of Greta Thunberg's message was the key to its impact. Our lifestyle and consumption need to change. We have been too busy consuming to care about the climate. Like many of us, Andrew Katumba also privately took part in the Zurich climate demonstrations, and felt that the success of the movement so far was helped by its not having been hijacked by party politics.

On the whole, global warming is not a partisan issue in Europe. The obvious connection between environmental protection and conservatism is mostly still intact. However, during the Swiss parliamentary elections in 2019, the

[19] Interview held on 28 January 2020

Swiss People's Party (SVP) found denouncing global warming activism and needing to conserve the environment (as the political party of Swiss farmers) an impossible balancing act. The resulting party position was the typical global warming denier cherry-picked mix of arguments: "Climate Change is happening", but not because of us Swiss who have such a tiny carbon footprint [107] (see §2.5 for a discussion of the Swiss global warming reality).

Nicola Forster[20] felt that telling one's story as widely as possible is of key importance. Political movements are sustained through shared narratives. A difficulty is to reach critical mass. Mechanisms like social media can play a role here, particularly among younger people. Newer technologies are also starting to impact how people invest (platforms like Yova [108] – *"How can I invest sustainably and transparently? The old financial system couldn't answer this question — that's why we founded Yova."*) and younger people are starting to impact the investments of their (rich) parents ("ESG – Do it for the kids" [109] – *"…when I spoke to the relationship managers, each one said how these clients are seeing pressure coming from their children"*). Young people also impact their politician parents. According to Nicola Forster, one reason for the activity of Ruedi Noser[21] in climate matters was pressure from his five children to "do something about climate change".

The fact that young people had finally found a reason to protest after a surprisingly long period of conformity should not be underestimated. Furthermore, this *global* movement of the young *is* affecting *local* politics. What happens next is critical. Nicola Siegrist, one of the organisers of the Swiss Climate Strike[22] (Fig. 46), pointed out how important it is to build local grassroots communities for action, so that the difficult transition from protest movement to political partner can be mastered.

There is the inevitable risk that groups take advantage of the natural naivety of young people in order to radicalise the movement. Climate change sceptics are also taking the opportunity to point out the hypocrisy of young people protesting and then flying to far-away destinations on family holidays (*organised by their parents!*). Likewise, the need to find a common language will be a challenge for the nascent climate movement.

The activists interviewed[23] saw similar issues from the grassroots. In particular, they stressed the need to build widely based communities that give people a place to meet like-minded people and organise. These are not necessarily party-political groupings and *must* not judge others. Local groups can have direct effect, for example by organising local urban gardening groups. Such groups can provide positive identification and support and truly cause change. They can also cause *political* pressure without being political parties, through the clarity of their narratives and through making engagement fun!

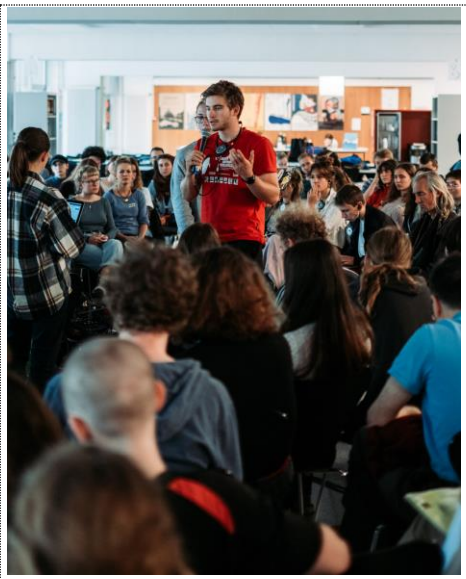


Fig. 46. 5th Swiss National Climate Strike Meeting, Bern, 1-3 November 2019 [106]

Politics

***The HEAT Method** could play a useful role in helping local communities to formulate their actions. This would require the method to be expanded into a ready-made workshop format. Also, the sharing of the resulting narratives via social media can help empower others to take their first steps – for instance, getting a "I'm a HEATer now" sticker or award in a game or other competitive element.*

[20] Interview held on 11 February 2020

[21] Zurich Representative in the Council of States, Member of the Liberal Democratic Party FDP

[22] Nicola Siegrist, is an active member in the organization of Climate Strike Switzerland and discussed these concerns with me on 11 February 2020

[23] The discussion took place in Basel on 13 February 2020 with Christina Schnellmann and Tilla Künzli

Environmental Groups

As a local representative of an environmental NGO, Katrin Schlup of WWF[24] explained that the way that the WWF tackles individuals is very different from its treatment of corporations and governments, where the engagement is primarily political, through lobbying and involvement in international NGO organisations.

Fig. 47. Swiss WWF Footprint Calculator [110]

In the case of individuals, the traditional WWF approach has been to provide information about the threats to the environment, assuming that increased knowledge would result in changes in behaviour. *This approach has not worked.* These days, role models are far more important. People are highly influenced by their peers and by persons they look up to. It is of key importance not to value judge: in the experience of WWF, moral judgement is always counter-productive.

Nowadays, WWF concentrates on the empowerment of individuals who actually want to take action. ***Pioneers*** are important in this regard (see the Cultural Dynamics model, §3.3) and can cause tipping points to happen. Typically, most people wait until they see a new idea taking off (***prospectors***). The people who take no action are not actively tracked by the WWF (***settlers***).

It is better to use the limited resources of the WWF on those who will make change happen! ***Pioneers*** take the first steps, such as mounting photovoltaic panels (PV) on their houses. After a while, there are several houses in the neighbourhood with PV: then ordinary people (***prospectors***) start to install them until this is the norm. It needs the pioneers to trigger the tipping point.

Another insight from Katrin Schlup was the positive effect of speaking with others about concerns. Asking your pension fund how it invests sustainably does in fact have an effect. If enough people ask for such information the customer advisors (who are still human beings, for now) will put pressure on their companies to offer such things.

NGO

The HEAT Method *can be employed to help pioneers take action and talk about it. If used in the WWF context it would need to be repackaged as a self-help method, perhaps with app support. A mark-up was added to* ***Step A*** *to cover talking to others to provoke change (see §5.4).*

Sustainability Affairs in a Global Wealth Management Bank

Bank bashing has become very popular in recent years. However, in private wealth management, the investment decisions are primarily driven by the customers, guided by their relationship managers, and not by the bank itself. The sustainability of a bank's own operations is, however, also part of its image. Environmental concerns increasingly form part of a bank's marketing too.

Selin Jost[25] of Corporate Sustainability and Responsible Investing at Bank Julius Baer & Co. AG, which is a global wealth management bank based in Zurich, was interviewed to get to the bottom of this.

The intention was to find out whether the HEAT Method could be reshaped into an investment advice tool. The idea would be to use the general approach of the HEAT Method but restructure it to help a bank customer formulate a global warming friendly investment strategy. This is a way to make significant impact by leveraging the considerable investment volume of the "(ultra-)high net worth individual" ([U]HNWI) customers of the bank. Selin Jost indicated that there would indeed be interest in such an idea: it would, however, be necessary to select the customers carefully so that they would be open to such a discussion. The Cultural Dynamics categories are interesting for this purpose.

[24] Interview held on 10 February 2020

[25] Interview held on 19 February 2020

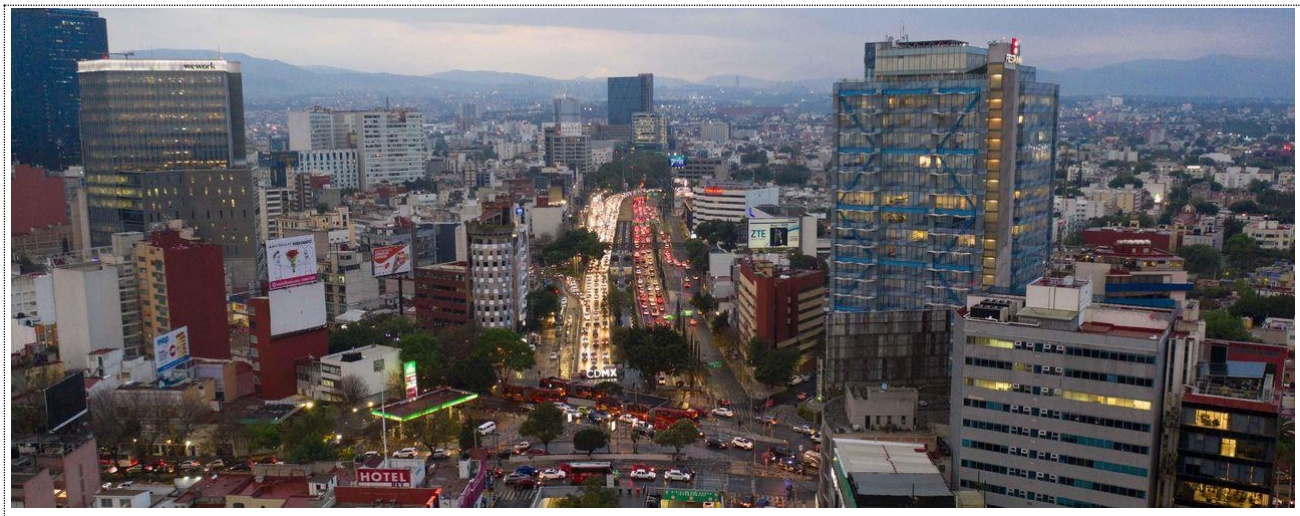


Fig. 48. "Mexico City's rivers reborn" – an ecological project on Bank Julius Baer's website [111]

Banking Industry

In Julius Baer, a potential route to these (U)HNWI customers is via their offspring, who are anyhow already being cultivated by the bank for succession reasons. *The related programme organises regular community sessions for this next generation of investors and could potentially host a* ***HEAT Investment workshop*****!**

Relationship managers (RMs) are of key importance. It is essential to select the ***pioneers*** among the RMs and train them accordingly. ***The HEAT Method*** *can not only be used to train RMs but could also help them to gain an insight into a customer's deeper motives and thus improve customer binding.*

Given the current desire of the bank's new management to be active in environmentally sustainable finance (Fig. 48), such ideas can only but help. Nudging rich individuals to make good decisions helps too!

Insights from Academia – Climate Scientist

Prof. Dr. Christoph Küffer[26] is Professor for Urban Ecology at HSR Rapperswil and a Member of the Institute of Integrative Biology, Environmental Systems Science in ETH Zurich. He is well-known for his blog about not flying any more, despite being involved in international environmental research projects concerning climate change. He successfully uses his position as a research scientist to promote his personal narrative as a pioneer [112]. He also campaigns for improved online conferencing facilities in the universities, so that all that flying can be reduced.

The role of climate science in tackling global warming was discussed. Prof. Dr. Küffer felt that the science community had been hijacked by the political community and marginalised into having to provide ever more precise models ("facts"), rather than looking for strategies for mitigating and adapting to the changes that are undoubtedly taking place. This is part of a long-term process in society that first deconstructed the church and then placed science on a similar pedestal to provide "facts". In the meanwhile, the political community has reframed the climate debate as a matter of opinion, so that "business as usual" (BAU) can continue to make the "elites" incredibly rich (see §2.3).

As a result, Prof. Dr. Küffer feels that humanity has probably lost two decades in the fight against global warming. He cautions against the use of neo-liberal language like "consumer" as this keeps the discussion in the wrong BAU frame (see §3.2). He also agreed that global warming is an adaptive challenge (see §3.6).

Science

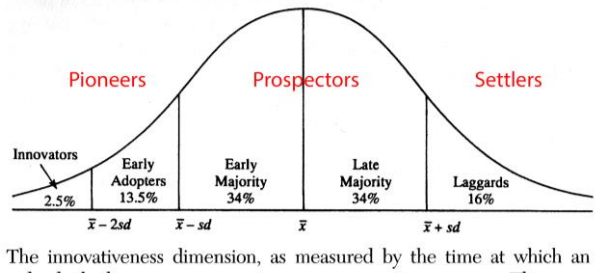
Prof. Dr. Küffer felt that the ***HEAT Method*** *could be useful for helping scientists who are also pioneers to take action.* As for society, political changes are needed to get humanity back on track. Political grassroots movements are also needed to counteract some forty years of neo-liberal dogma.

[26] Interview held on 13 February 2020

Insights from Academia – Psychologist

The second academic interview partner was Dr. Jürg Artho[27], who directs the Social Research Centre of the Psychological Institute of Zurich University. A revealing discussion about the psychology behind the HEAT Method turned out to give the *design personas* (§3.3) a central role!

Jürg Artho saw distinct parallels between the three main Cultural Dynamics categories and the various classes of adopter of novel ideas. The theoretical mechanisms were first developed by Everett Rogers in his book "Diffusion of Innovations", now in its Fifth Edition [113]. Rogers used a Normal Distribution curve to categorise the adopters of a given innovation (Fig. 49). Innovation adoption requires innovators and early adopters to kickstart the uptake before the majority reacts. This also applies to lifestyle changes needed to counter global warming.



The innovativeness dimension, as measured by the time at which an individual adopts an innovation or innovations, is continuous. The innovativeness variable is partitioned into five adopter categories by laying off standard deviations (sd) from the average time of adoption ($\bar{x}$).

*Fig. 49. Relationship between types of adopters classified by innovativeness, annotated with the Cultural Dynamics categories in **red** by the author [113, pp. 281, Figure 7-3]*

The Cultural Dynamics personas can be overlaid onto these categories (annotated in **red** in Fig. 49):

- ***pioneers:*** Innovators, Early Adopters and part of the Early Majority
- ***prospectors:*** the central Early and Late Majorities
- ***settlers:*** the rest of the Late Majority and the Laggards.

The different personas have differing motivations for changing their behaviour. A key theory that explains this is the "Theory of Planned Behaviour" of Icek Ajzen [114]. Summarized, the theory explains that our behaviour is driven by our intentions which in turn originate in our beliefs (see Fig. 50):

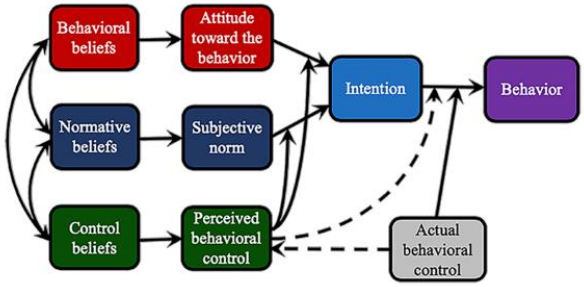


Fig. 50. The Theory of Planned Behavior, © Icek Ajzen [114, p. 117 ff.]

- **Behavioural beliefs:** consequences of our behaviour
- **Normative beliefs:** expectations of others
- **Control beliefs:** factors that control our behaviour.

Shalom H. Schwartz extended this model in his paper "Normative Influences on Altruism" [115], adding personal and moral norms as a further driver. The link to ecological behaviour was made by Marcel Hunecke in his book "Ökologische Verantwortung, Lebensstile und Umweltverhalten" [116]. The resulting main behavioural influences on the personas are as follows. All are affected by control beliefs:

- ***pioneers*:** personal and moral norms – "it is the right thing to do"
- ***prospectors*:** behavioural beliefs – "what is in it for me"
- ***settlers*:** normative beliefs – "what do others expect".

Psychology

***The HEAT Method** is successful with **pioneers**[28] because of its moral imperative, but it is exactly this which would cause it to have less success with the other categories. In order to resonate with **prospectors**, the chosen narratives need to be phrased so that they see how they can benefit socially or economically. **Settlers** will follow the majority!*

*Combining this with the theory of Diffusion of Innovations, the main HEAT Method focus should be on **pioneers** and the narratives developed should be carefully formulated to appeal to **prospectors**, so as to drive rapid adoption.*

[27] Interview held on 13 February 2020

[28] All the HEAT Method testers self-assessed as ***pioneers***

6.3 Further Iterations – Potential Next Steps

Potential further iterations of the HEAT Method that could be explored are follows:

- The HEAT Method could be repackaged as an online tool which could be used to build a community of "HEATers", which would need the background material from this MAS thesis to be repackaged and perhaps extended with a gaming component to appeal to younger people
- The HEAT Method could be used as a support for workshops in emerging local activist communities. Since these individuals are generally ***pioneers*** (§3.3), the method will resonate with them. Material for running such workshops can be based on the material in this thesis, but would need supporting artefacts to be produced professionally. Narratives generated in these workshops should be reformulated to appeal to a wider ***prospector*** community and then shared as discussed in §6.2
- The HEAT Method could be redesigned as a tool for selecting sustainable financial investments (which represent the "actions" for a given investor, where the investors themselves formulate their strategy, or "narrative", using an adjusted HEAT Method).

Fig. 51. A woman at a June 1, 2017, demonstration in New York protesting President Trump's decision to pull out of the Paris climate accords [117]. (photo: Jewel Samad/AFP/Getty Images)

7 Summary

7.1 Overall Results – Interpretation, Implications, Actions

Addressing global warming, even within the limited scope of individuals and households in Switzerland, involved coming to terms with an adaptive challenge. Not only that: psychological and cognitive factors play a very important role in the search for ways to make impact. Our individual worldviews affect our behaviour subconsciously.

The HEAT Method intervention that resulted is an effective way for ***pioneers*** (§3.3) to develop a personal action plan and narrative. This narrative in turn can be used to start a personal grassroots movement, or indeed to support the various groups which are now emerging as a result of various tipping points that came to a head in 2019, on both the environmental and social fronts. By careful framing, it should be possible to impact society in a wider sense too, by appealing to the ***prospectors*** among us. The ***settlers*** will come around in due course too.

The HEAT Method can also be reframed into further impactful instruments as evidenced by the various interviews carried out.

7.2 Research through Design

Research through Design was a new approach for the author personally. It involves an *abductive* approach, rather than the *deductive* and *inductive* approaches that had been a personal problem-solving strategy in the past (the author studied Physics and has worked as a software engineer all his life).

Research through Design is led by the problem space, and reacts to potential solutions which emerge using iteration. Interventions are prototyped and developed. This proves a very useful way of tackling adaptive challenges, since the persons affected by the problem are placed in clear focus, together with their emotions and social context. These aspects also have an important role to play in the solution of adaptive challenges and in dealing with denial and apathy in the face of global warming.

The HEAT Method is a *design method* in its own right, of course, and applies design techniques to the solution of the meta problem of generating a personal global warming action plan and narrative for an individual or group.

7.3 Self-Reflection

I look back on my experiences from the entire *MAS Strategic Design* study programme very positively and my main takeaways are as follows:

- Using Design Thinking techniques and a team-based approach, it is indeed possible to find innovative solutions to complex real-world problems, as explored in *CAS Design Thinking* and *CAS Design Cultures*
  - Putting users and their needs clearly in focus results in more appropriate solutions and can accommodate their cultural biases better
  - The use of iteration plays an important role: ideas can be freely discarded when better ways are found
  - Because of this, creativity is enhanced, since multiple ideas are allowed to compete
  - The approach, however, requires an appropriate culture and culturally aware mind set in the team
- Technology is opening up novel approaches which enable powerful solutions to be developed without long engineering cycles as in the past, as experienced in *CAS Design Technologies*. This revolution depends, however, to a significant degree on global technology supply chains involving China. The study trip to Shenzhen in *CAS Design Cultures* opened my eyes to both the positive and negative aspects of this modern development
- I feel that I have reached a high degree of competence in a *designerly* way of working as a result of the course.

The MAS itself forced me to come to terms with my own personal tendency to solve problems in a technical way. *I am not the only person with this problem!* The investigation of psychological and cognitive aspects, in combination with the realisation that global warming is an adaptive challenge, meant that I tackled the strategic design challenge in a completely novel way.

Epilogue

The news of apocalyptic bushfires in Australia around New Year 2020 led to an (abridged) email exchange with an old acquaintance living in Queensland near the border to New South Wales (NSW):

On 13 Jan 2020, at 00:48, David wrote:

Hi Graham – Just thinking of you and Christine as we read about the devastating bushfires over here – David

On 13 Jan 2020, at 06:10, Graham wrote:

Hi David

Thanks for thinking of us. We're perfectly safe at the moment. We had a scare in September when our town was surrounded by fire and a part of that came within 8 km of our house (that's just half an hour away in a stiff breeze!) but since then the fires have moved down the coast and nothing has come closer than 25 km. We've had bad smoke at times but, to be honest, the dust from the never-ending drought has been much worse. The fires continue to be worrying, though, because it is extremely dry here. We've had little rain for about 2 years now and the slightest spark would send everything up in flames and we have very little water left to fight fires with. In NSW (we're just on the border) people have had to stand by and watch their homes burn because there was no water to fight the fires with. Our local town is now surviving entirely on water brought in by tanker from another town about 60 km away and people are rationed to 80L/person/day. It's costing about $1m a month and the State has only guaranteed supply at this rate for six more months.

The destruction (about 2,000 homes razed), loss of life (28 dead so far), the deforestation (6 million hectares burnt) and the loss of wildlife (around a billion animals dead including tens of thousands of koalas and several species thought to have gone extinct) is appalling – and the summer has barely begun. This will go on through February and March and maybe even into April.

May your glaciers melt slowly

Graham

For me personally, the journey of understanding and reacting to global warming began some fourteen years ago. Here in Switzerland, we are privileged not to have felt the effects of global warming too strongly. We have, however, experienced seriously hot summer periods in the last few years and precipitation patterns have changed markedly. Nothing like Australia, though.

Life goes on here. **Life must go on!** In Switzerland, we are all preoccupied with day-by-day survival, but not in an existential sense. “Business as usual”, or perhaps “*busy-ness* as usual” numbs us. We recycle, eat less meat, use public transport and buy CO_2 compensation, but the sheer enormity of the problem does not reach us emotionally. And nature and the climate as I knew them as a child have gone for ever.

But I have tried not to give in to the darkness. I remain positive that humanity can find solutions, *is* finding solutions, once we take the crisis seriously. Searching for solutions starts with all of us, requires action and demands that we talk about our emotional reactions. Society is the sum of all of us. Our political system is slow, but does react to changes in public opinion. It remains to be seen if we can collectively react before resource shortages and habitat loss lead to armed conflict. Let us hope so.

The HEAT Method starts with hope and ends with action and telling. Taking action as consumers or even rebels, telling your story to others and listening to their stories, is how grassroots activity begins and can lead to tipping points in opinion, especially as the effects of global warming become more visible and unavoidable. I have learned that global warming is an adaptive challenge where soft-factors dominate. Having the courage to speak out and become politically active, like Greta Thunberg, may be all I can do. As a member of the rich West, I must take responsibility for what is happening, and for its impact on the vulnerable. Not all of humanity is privileged like me to have the luxury of reflecting on such things, without just having to survive.

Hope is not lost if we start to act now!

Appendix A. Summary of HEAT Method Prototyping Sessions

Prototyping of the HEAT Method (Iteration 2) was carried out with five individuals from 5 to 11 December 2019.

Here is a summary of reflections directly after finishing the five HEAT workshops:

- Preparation
  - The session needed to be called a "workshop" and not an "interview"
  - Nobody minded doing the self-assessment – all found it interesting – make a card per persona and write better text for preparing the future picture
  - Everybody went along with the ten-year horizon, so it can be fixed at ten
  - Everyone found a topic area, but it wasted time to discuss this in the session. Perhaps there is a way to get the participant to select his area in advance?
- Step H – Start with Hope
  - "Backcasting" worked with all participants, but help was needed to realise what must change on the way
  - Post-its® worked, but at least one participant was not used to writing/drawing quickly to produce many and tried to capture a whole set of thoughts on one Post-it® rather than breaking the thoughts out
- Step E – Evaluate your Approach
  - Cover the three spheres and IDEO sweet spot in more detail in the description
  - The matrix approach worked fine but is of course only the beginning of the timescale
- Step A – Actually Act
  - Marking up the "Do" and "Initiate" ideas physically was a good plan. One way to initiate change is to *provoke* others to take action by asking questions (for example, asking your local council what it is doing)
  - The reflection steps are a good idea, but there was no time to do this in the personal workshop: this might still be good in a group workshop though, perhaps used on the list written down
- Step T – Tell Your Story
  - Nobody minded writing their elevator speech
- Follow up
  - There should be some homework immediately after the workshop to cover the reflection aspects
  - The format need not always be a "workshop"
- Overall
  - 90' was a bit tight: tended to spend too long talking about the preparation, half the time is used up with "H"
  - The wording could be more "fun" in terms of description etc. – needs pictures to frame/explain each part
  - There was not too much theory
  - One participant thought that the stress on personal action was empowering and indeed useful, given the poor level of progress at the political level
  - It is best to carry out the workshop in mother tongue – some people were distracted by having to use English
  - If groups are involved, it will take longer, but can be very interesting as a result! One participant thought that at least a half day might be needed for a group, to allow time for discussions and break-out groups

Paraphrased remarks from participants about the method during the sessions themselves and in the feedback session:

- *"it went well, tough to get results in such a short time, but we did!"* (Beat Jost)
- *"good method, concrete vision and got steps that can really be done" … "we got into the topic very rapidly, which impressed me"* (Regula Cincera)
- *"enjoyed the method, liked the individual steps" … "it was exciting"* (Katarzina Flood)
- *"it made things concrete"* (Tom Röttig)

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Fig. 52. “…Für eusi zuekunft” – “…for our future”: demo in Zurich, 27 September 2019 (picture © Climate Strike Switzerland [118])