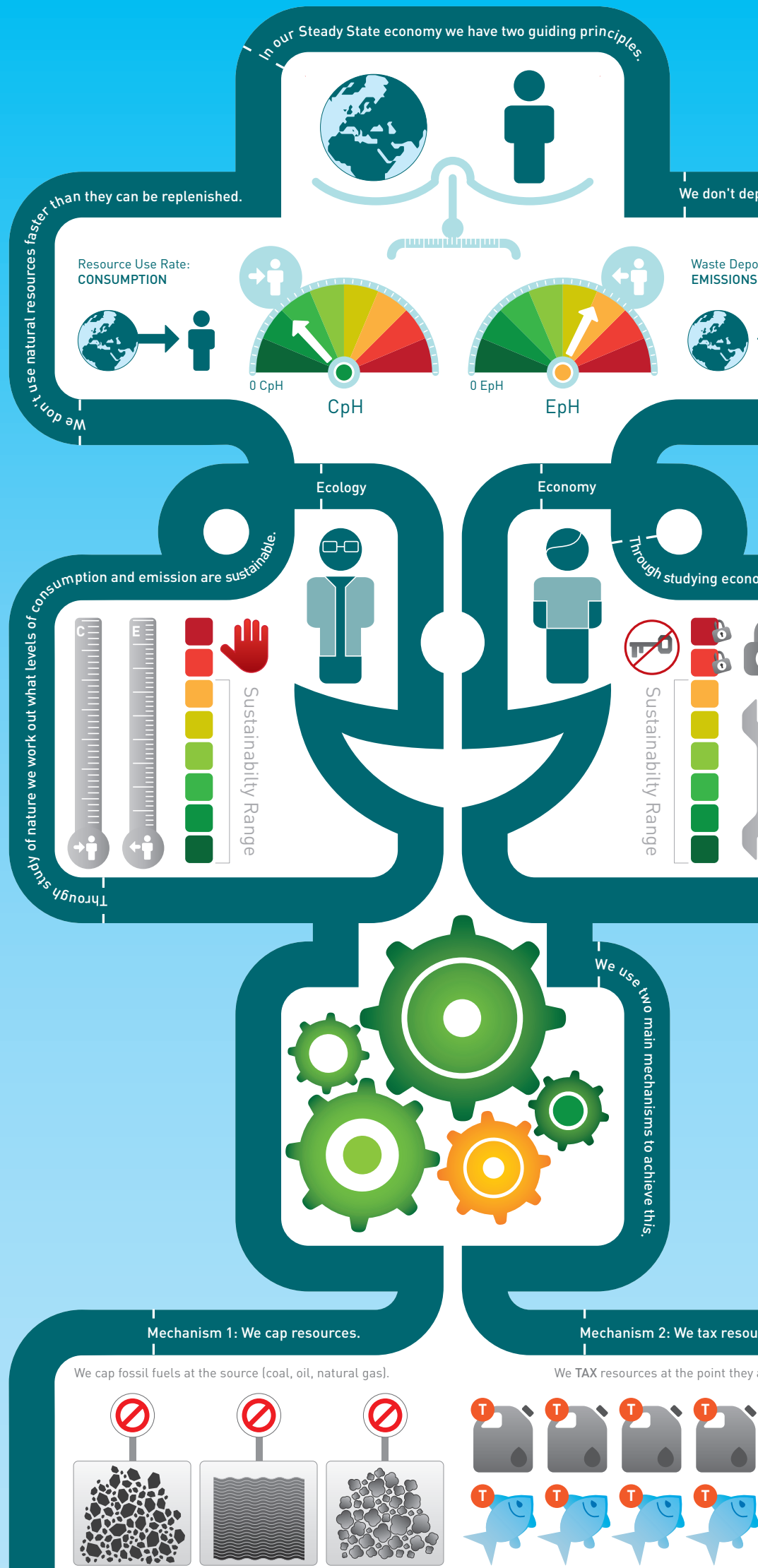


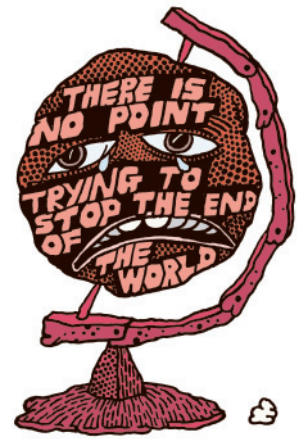


EcoMag

EcoLabs No.1 - Summer 2009

Future Scenarios





EcoLabs
EcoMags N°.1
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Text - with thanks to:

Mark Lynas
David Holmgren
Herman Daly

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Artwork in this book was made for the **Climate Roadshow** and funded by Awards for All and Artist's Project Earth.



www.eco-labs.org

EcoLabs is a network of designers and visual artists addressing systemic environmental and social problems. We aim to nurture whole systems thinking and help create an alternative cultural vision that will drive transformational change to meet the goals of a fully sustainable society. We create material, projects and programmes that work to integrate design and art with science, education and other disciplines.

Our social, economic and ecological systems will become increasingly stressed until we develop a deeper more integrated understanding of the fundamental importance of ecological systems. Ecological literacy implies a change in perspective from a world which is perceived as a machine - to a world which is seen as composed of complex systems. An ecologically informed paradigm will involve deep perceptual shifts towards a more complex, moral, integrated and global perspective. EcoLabs works to address the cause of the environmental crisis, which we see as a lack of ecological understanding.

EcoMag is a magazine about art, design & sustainability. Each issue will focus on a theme while investigating issues lying at the root of the ecological crisis. The theme of the first issue is 'Future Scenarios'. All the ideas presented in this magazine can be explored further in the original writings of the authors which in all causes is prolific. References and bibliographies are posted on the EcoLabs website (www.eco-labs.org). We are indebted to the authors: Mark Lynas, David Holmgren and Herman Daly and grateful for having been granted permission to borrow freely and/or republish work. The only change to the original work is in Herman Daly's 'cap and trade' mechanism, which we do not recommend due to inherent problems with trading systems as a means of protecting ecosystems and preserving resources. There is insufficient room in this issue to explore this important issue in depth but there are links to related articles expanding on this topic on the website and we promise to follow it up in **EcoMag No.2** - which will focus on 'Economics'.

EcoLabs aims to make artwork available for free to grassroots environmental groups. Some of the work in this book is licenced according to the EcoLabs system:

- © Constituted not for profit groups with a turn over under £50k may use our work for free.
- © NGOs, charities, schools and agencies with a turn over £50k must pay a modest fee.
- © All commercial use of our images (larger than a 2 by 3 inches) must pay a fee.

In all cases please send a request for images to: artwork@eco-labs.org.

Future Scenarios

- Section 1 Six Degrees
- Section 2 ABCD Scenarios
- Section 3 Steady State

Three bodies of work show various futures as predicted through three different lenses: science, permaculture and economics. *Six Degrees* illustrates Mark Lynas' book of the same title based on evidence compiled from hundreds of peer-reviewed scientific papers on projected changes with each degree of climate warming. *ABCD Scenarios* describes four potential future scenarios based on permaculture founder David Holmgren's work on the impact of energy transitions and multiple converging crises. *Steady State* is a graphic representation of eco-economist Herman Daly's work on a sustainable economic system.

Of course the real future will not be neatly defined by any one of these future scenarios, but will be a complex mixture of many driving forces. What all scenarios demonstrate is that humanity is now at a critical junction. The planet is experiencing a climate crisis. The generations of people alive now will either commit the most colossal moral failure in history, or will start a massive enterprise in transition. The gravity, scope, and depth of the problem demand the greatest collective effort and cooperation. None of us can succeed in addressing the root causes of the problem alone; but collectively, we have a window of an opportunity to act. *

**Tipping points in the climate system mean that if we continue to increase carbon in the atmosphere we will move beyond points where the climate will be able to maintain stability or recover. **

Six Degrees

Six artists respond to Mark Lynas' *Six Degrees*, the book compiled from hundreds of peer-reviewed scientific papers describing the projected changes with each degree of climate warming.

TEXT BY: MARK LYNAS

ARTWORK BY: Kate Evans

1°

...Whilst I and many people feel that natural life and biodiversity have an intrinsic value, separate from their use to humans, all human society is at root dependent on natural ecosystems. This might come as news to the average city dweller tucking into a ready meal in front of ITV, but it does not make it less true. From fish to fuel wood, nature's bounty feeds us, houses us, warms us and clothes us. Soils wouldn't support agriculture were it not for the organic matter broken down by bacteria. Crops would not set seed unless pollinated by bees. The air would not be breathable were it not for photosynthesis by trees and plankton. Water would not be drinkable were it not for the cleansing action of forests and wetlands...



6°C 

5°C 

4°C 

3°C 

2°C 

1°C 



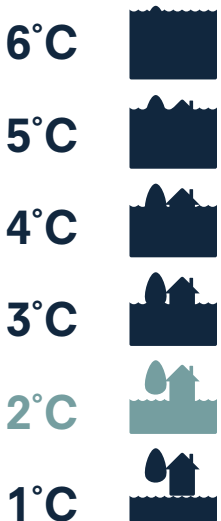
Consider the thought that living species, which have evolved on this planet over millions of years, could be destroyed for ever in the space of one human generation.

2°

ARTWORK BY: Airside

Thermal expansion of oceans and melting ice will lead to a substantial rise in sea level, forcing evacuation of homes in coastal communities.

A three-degree rise in global temperature - something that could happen as early as 2050 - effectively reverses the carbon cycle. Instead of absorbing CO₂ vegetation and soil starts releasing it in massive quantities, as soil bacteria work faster to break down organic matter in a hotter environment, and plant growth goes into reverse. ... in other words the Hadley Centre's team had discovered that carbon cycle possible feedbacks could tip the planet into a runaway global warming spiral by the middle of this century...



TIPPING

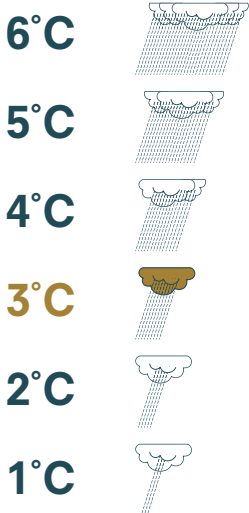


POINT

3°

ARTWORK BY: Rod Hunt

For an analogue for the three degree world, we have to go back... before the Earth entered its regular cycle of ice ages and interglacial. We have to go back a full 3 million years, to a period of time called the Pliocene. Continental glaciers were almost entirely absent - contributing to a sea level 25 metres higher than today's. ...if emissions go on rising as they currently are, global temperatures could shoot past three degrees as early as 2050.



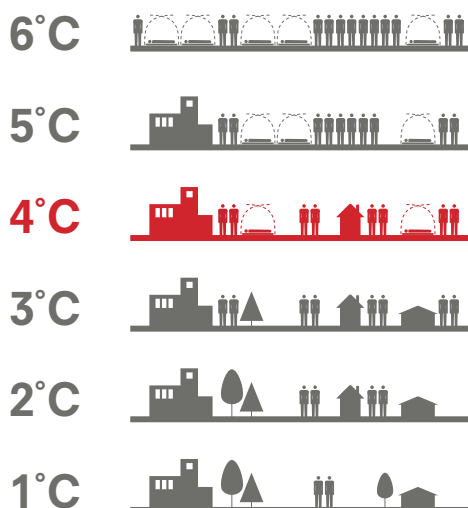


Climate models indicate an increase in the frequency and duration of extreme events. Extreme weather events will cause heavy loss of life and extensive damage.

4°

ARTWORK BY: [Jamie Slimmon](#)

Population will be flocking north, to overcrowded refuges in the Baltic, Scandinavia and the British Isles... but with habitable areas becoming more and more crowded, conflict may come sooner rather than later even in temperate, civilised Europe.



Himalayan Mountains

Evaporation

Deglaciation

Evaporation

Evaporation

Land temperatures soar

Water Emergency

Evaporation

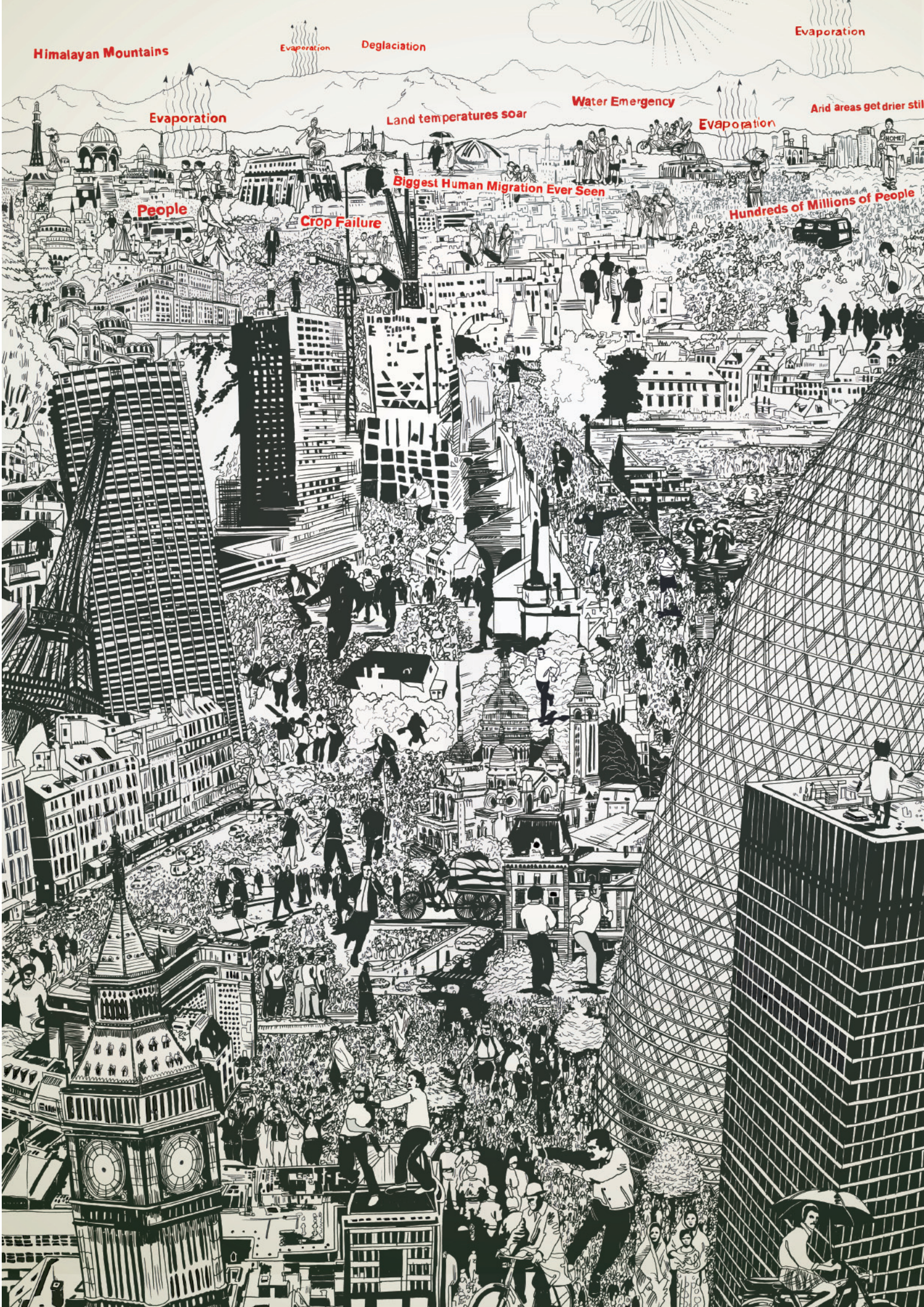
And areas get drier still

Biggest Human Migration Ever Seen

People

Crop Failure

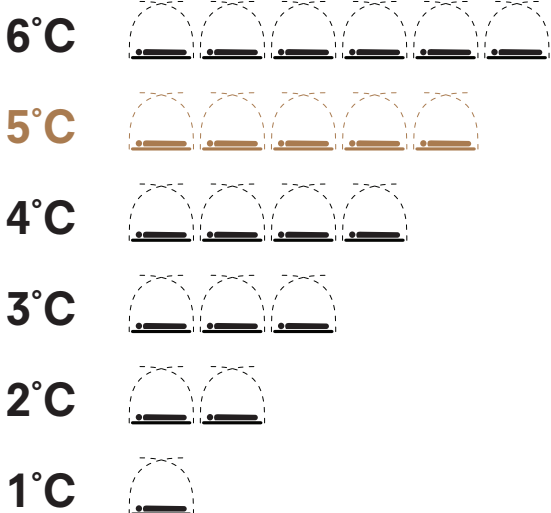
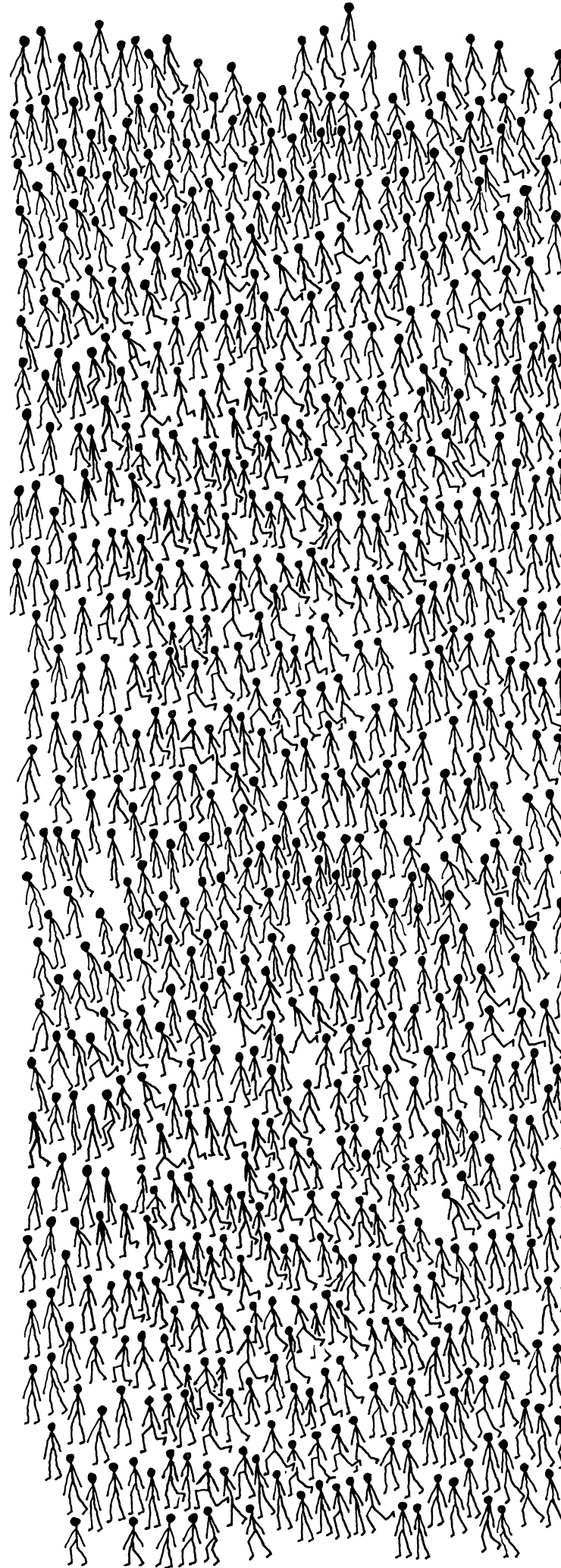
Hundreds of Millions of People

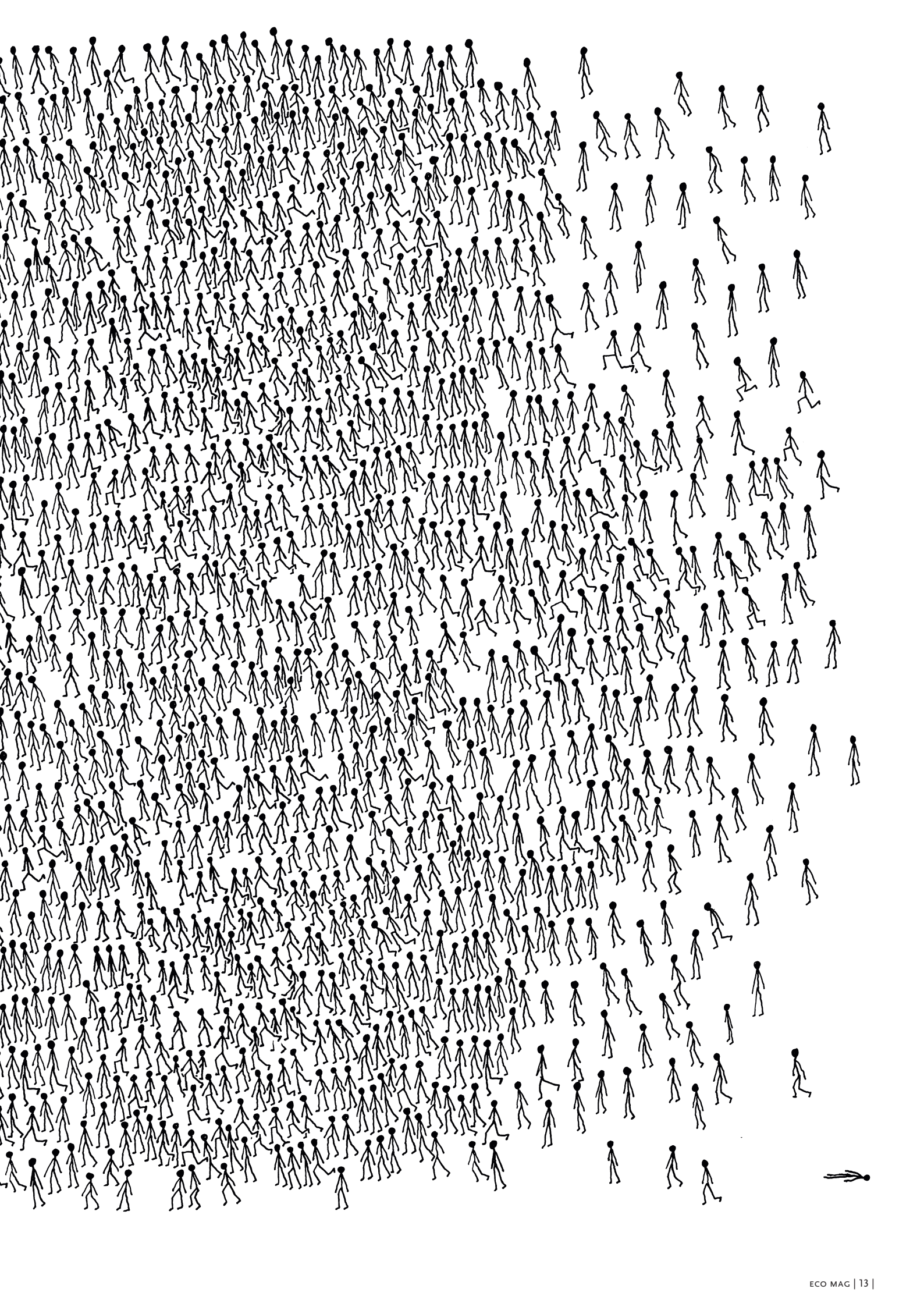


5°

ARTWORK BY: Jody Barton

With five degrees of global warming, an entirely new planet is coming into being - one largely unrecognisable from the Earth we know today...Humans are herded into shrinking zones of habitability by the twin crises of drought and flood.

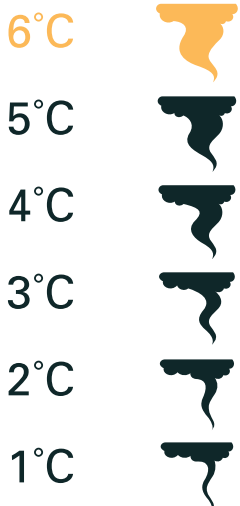




6°

ARTWORK BY: Leona Clarke

Hotter oceans bring hurricanes, far outdoing anything we see today. These superhurricanes (hypercanes) will have enough energy to carry them to the North Pole and back, perhaps even allowing them to repeatedly circumnavigate the globe.





So far as we yet know, this is the only planet in the entire universe which has summoned forth life in all its brilliance and variety. To knowingly cut this flowering short is undoubtedly a crime, one more unspeakable even than the cruellest genocide or the most destructive war. If each person is uniquely valuable, each species is surely more so. I can see no excuses for collaborating in such a crime. As the post-war Nuremberg trials established, ignorance is no defence; nor is merely following orders. To me the moral path lies not in passively accepting our destructive role, but in actively resisting such a horrendous fate...Nothing in the future is set in stone; we still have the power - though it diminishes every day - to alter the ending of this terrible drama. It need not yet end in tragedy.

ABCD Scenarios

ABCD Scenarios describes potential future scenarios based on permaculture founder David Holmgren's work on the impact of energy transitions and converging crises.

INTRODUCTION BY ECOLABS

ARTICLE TEXT BY DAVID HOLMGREN

WWW.FUTURESCENARIOS.ORG

ARTWORK BY: Andrew Merritt

We are facing a convergence of crises: social, economic and ecological - they are all related and need to be considered in tandem. Pioneering thinkers realized the systemic nature of our problems back in the 1970s and PERMACULTURE was created as a design system for sustainable land use and living. Permaculture is now the theoretical basis of the TRANSITION MOVEMENT - a fast growing network of communities working towards mobilizing to address climate change and PEAK OIL simultaneously.

Peak oil refers to the time when we hit a peak in global fuel reserves. It is important because we are completely dependent on fossil fuels and once the peak happens fossil fuels will become increasingly more expensive. If we do not anticipate this problem, energy shocks will result as supplies will no longer be able to cope with demand. Obviously, the economic impact could be severe, and potentially disastrous if we fail to plan ahead.

Both permaculture and the transition movements are based on around the key concept of 'ENERGY DESCENT'. Energy descent refers to a post-peak oil phase, when humankind goes from the ascending use of energy that has occurred since the industrial revolution to a descending use of energy. A transition town/city is a space engaged in the collaborative design of a local 'ENERGY DESCENT ACTION PLAN' (EDAP). An EDAP is a plan for weaning a community off fossil fuels, building alternatives infrastructure and resilience into a regional space. While climate change means we should lower our use of fossil fuels, peak oil means we will have to do so. Peak oil is a major challenge that will make dealing with climate change especially complex.

Peak oil is increasingly recognized by independent researchers and also widely acknowledged within the energy industry. The International Energy Agency (IEA) recently dramatically changed its position in regards to peak oil. In its 2008 *World Energy Outlook* report the IEA's own figures for projected rate of decline in world energy supply almost doubled from the previous year - from 3.7% a year (2007) to a 6.7% a year (2008). In 2008 several major companies including Arup, Yahoo and Virgin created the *UK Industry Taskforce on Peak Oil and Energy*

Security (ITPOES) which released a report calling on the UK government to plan for peak oil. Overstressed governments have been slow to acknowledge the problem, and plans to deal with climate change have ignored the threat of peak oil.

Both permaculture and the transition movement claim that there is no alternative energy source that can provide energy as cheaply and in such abundance as fossil fuels have in the past. Even controversial technologies such as nuclear power will not provide enough energy to maintain current growing demand. 'NET ENERGY' refers to amount of energy obtained in comparison to the energy required to get it. Fossil fuels are very energy dense - while all other energy sources are significantly less energy rich, and so as supplies diminish net energy is reduced. A growing number of researchers supports the permaculture position: energy descent is an inevitable result of the end of the fossil fuel era because there is no technology primed to fill the energy gap as cheaply and efficiently as fossil fuels.

The *ABCD Scenarios* project examines possible futures which result from varying societal responses to the current situation as well as various rates of energy descent (steep or gradual). The following four scenarios are republished with kind permission from David Holmgren's website: www.futurescenarios.org. The scenarios sketch four futures:

A: BUSINESS AS USUAL,

B: GREEN TECHNOLOGICAL REVOLUTION,

C: BOTTOM UP REBUILD,

D: ECONOMIC, SOCIAL AND ECOLOGICAL COLLAPSE.

Examining possible futures is considered to be a good way of informing decision making. Solutions to systemic problems are largely cultural and ethical - requiring shifts in behaviour rather than just new technology. Whether we allow our industrial systems to cross invisible limits, disabling the capacity of ecological systems to maintain stability - is a decision we are in the process of making. As long as our cultural and political institutions are unwilling to address problems systemically, all crises will continue to multiply. We create our future today, and if we don't change direction - we are likely to end up where we are headed.

*David Holmgren founded the permaculture concept in the 1970s with Bill Mollison. Permaculture creates is a design philosophy for human settlements and productive ecosystems that work with nature, with the aim of reducing society's reliance on industrial systems. Holmgren is the author of many books including *Permaculture: Principles and Pathways Beyond Sustainability* (2002) and most recently *Future Scenarios* (2009).*



A.

BROWN TECH: TOP DOWN CONSTRICTION

Slow energy decline rates, severe climate change symptoms

The Brown Tech world is one in which the production of oil declines after a peak 2005-2010 at about 2% per annum and the subsequent peak and decline of natural gas is also relatively gentle, but the severity of global warming symptoms is at the extreme end of current mainstream scientific predictions. In this scenario strong, even aggressive, national policies and actions prevail to address both the threats and the opportunities from energy peak and climatic change. The political system could be described as Corporatist or Fascist (which Mussolini described as a merger of state and corporate power).

The tendency in existing systems for massive centralised investment by corporations and governments, gives priority to getting more energy out of lower grade non-renewable resources (eg. tar sands, coal and uranium) and biofuels from industrial agriculture and forestry. "Breakthrough" technologies provide the constant promise of a better future but much of the investment in energy harvesting accelerates global warming, at least in the short term.

At the same time the cost of defending or replacing urban infrastructure threatened by storms and future sea level rise consumes more resources, while droughts and chaotic seasonal changes reduce food production from broadacre and small scale agriculture.

Flows of energy from more expensive sources such as tar sands, deep ocean oil, gas to liquids and coal to liquids slow the decline in fuels from crude oil. This transition requires a huge mobilisation of the technical and managerial capacity held mostly by global corporations, along with the financial, legal and military security that only sovereign governments can provide. This resource nationalism by government breaks down free trade and the faith in international markets that underpins the global economy.

By 2007, we had already seen the shift from a buyers to a sellers market for energy cascading through all commodities markets and reshaping geopolitical

relations. The profits from both non-renewable resources and large scale industrial agriculture rise on the back of high commodity prices, reversing many of the economic patterns and trends of recent decades. The wealth of farmers and miners as well as corporations and nations in control of these resources increases even as depletion reduces the flows of resources and climate change causes chaos in farming and land management.

The demand for biofuels in affluent countries reduces world food stocks and raises prices to levels that result in famine and chaos in many poor countries unable to sustain subsidies for staple food. In other countries, food riots by the poor force government to pay for escalating subsidies. The wealth left over for education, health etc. collapses. Wars to secure fuel and food increase and refocus public attention on external threats. In richer countries, consumer led economic growth falters or is actively shut down by government policies to focus limited resources on food, fuel and climate security. Some type of global economic depression unfolds from the combined effects of high energy and food prices, super-power contest, resource nationalism and the fragility of the financial system.

Rapid onset of climate change also tends to support centralised nationalist systems for several reasons. First the consequences of chaotic weather, food supply problems, radical land use change and abandonment of marginal land, leads to demands for strong government action to protect people from high food and fuel costs, natural disasters, the consequences of strong action by other nations, and mass migration by displaced people. Rates of urbanisation increase as climate change impacts and withdrawal of government supported services in more remote rural regions accelerates.

A decline of the middle class (already evident in many western countries) accelerates leading to discontent and suppression by government including

internment camps either for migrants or homeless people. Strong approaches to population control, even forced sterilization are introduced in some countries.

A series of short but intense international conflicts confirm major shifts in global power balances while accelerating resource depletion. Control of non-renewable fossil fuel and mineral resources remains critical, while the (relative) importance of distributed renewable wealth from agriculture and forestry continues to decline as the climate deteriorates. With food supply under threat, fossil fuels and other resources are redirected from personal mobility and consumption to intensive factory farming in greenhouses and other controlled environments, mostly clustered around urban centres and managed by agribusiness corporations.

Desalination and other high energy ways to maintain water supply systems are built at huge cost and further increase demand for energy. The threat of sea level rises leads to large scale urban redevelopment driven by strong government policies. Some very bold initiatives for energy efficient medium density urban development and public transport infrastructure are funded. A key characteristic of this scenario is the sense of divide between the reducing numbers of "haves" dependent on a job in the "system" and the relatively lawless, loose but perhaps communitarian "have nots" with their highly flexible and nomadic subcultures living from the wastes of the "system" and the wilds of nature. Security of the "haves" is a constant issue with gated communities, and apartheid style townships and barrios for the "have nots". While economic depression and reduction in consumption slow greenhouse gas emissions, the rapid expansion of strategic investment by government in new energy and urban infrastructure more than replaces the reduced private consumption, leading to a positive feedback loop that accelerates global warming.



While the elites continue to be driven by a commitment to super rationalist beliefs, a sense of hollowness and lack of purpose characterises the shrinking middle class, while fundamentalist religions and cults play a stronger role in the lives of the working and unemployed classes partly through genuine reactions to the failures of modern humanism and partly manipulated by the elites to deflect anger and disenchantment. The *Brown Tech* scenario could be dominant

and even more or less socially stable for many decades until ongoing climatic breakdown and reduced net energy return drive a shift to the *Lifeboats* scenario.

“*Top down constriction*” summarises the essence of this scenario in that national power constricts consumption and focuses resources to maintain the nation state, in the face of deteriorating climate and reduced energy and food supply.

The problems with the UK's fisheries are systemic.

B.

GREEN TECH: DISTRIBUTED POWERDOWN

Slow energy decline rates, mild climate change symptoms

The *Green Tech* scenario is the most benign, in that adverse climate changes are at the low end of projections. Oil and gas production declines slowly as in the *Brown Tech* future, so the sense of chaos and crisis is more muted without major economic collapse or conflict. This allows resources to flow to a greater diversity of responses at the global, national, city, community and personal level. In some already densely populated poor countries, conditions worsen.

However, higher commodity prices allows some poorer producer economies to escape their debt cycle while programs to empower women result in rapid reduction in the birth rate. The gradual reduction in capacity of countries to impose power globally (due to rising energy costs) increases national security. There is a redirection of resources away from defense and resource capture to resource conservation and innovation. The consolidation of the global communication systems maintains global outlooks and understandings if not global economics.

As in the *Brown Tech* scenario, electrification is a key element in the energy transition but the renewable energy sources of wind, biomass, solar, hydro, tidal, wave etc. grow rapidly developing a more diverse and distributed mix. The relatively benign climate allows a resurgence of rural and regional economies on the back of sustained and growing prices for all natural commodities including feedstocks for biofuels.

The principles behind organic agriculture and ecological management and resource allocation become the norm in many farming systems, helping to stabilise agriculture challenged by increasing cost of energy inputs and (albeit mild) climate change.

The accelerating conflict between biofuels and food is stabilised if not resolved by government subsidies to support food supply from agriculture, with biofuels coming mainly from forestry wastes. In many regions with prime agricultural land and small populations, wealthy farmers and

agribusiness corporations are the main beneficiaries employing both high technology and cheap labour from migrant workers. In some regions, with poorer and steeper land and more diversified land ownership, smaller scale polyculture systems designed using permaculture principles spread wealth more evenly through local communities.

Continuous contraction affects large sections of the economy but the energy, resource and agriculture sectors along with recycling and retrofit industries experience rapid growth based on high commodity prices that are sustained despite economic recession in the main consuming economies. In some affluent countries, reform of monetary systems lowers the scale of financial collapses and refocuses capital on productive and socially useful innovation and investment.

Information technology continues to yield gains in energy and resource management; from real time pricing and self-healing electrical grids, to internet based ride sharing systems and telecommuting. Conservation yields the greatest gains with major public policies to change personal and organisational behaviour. In other countries, especially the USA, the apparent opportunities for continued economic growth, combine with political policies to support a low carbon economy, leading to a renewable energy investment bubble followed by a severe recession.

State and city governments responsible for providing services are able to lead much of the restructuring to more compact cities and towns with increasing public transport infrastructure. Growth in large cities (especially in coastal lowlands) is reversed by public policies ahead of the worst effects of energy cost and global warming, while regional cities, towns and villages see modest growth on a compact urban model that preserves prime agricultural land and develops mixed use neighbourhoods with more local work and radically less commuting.

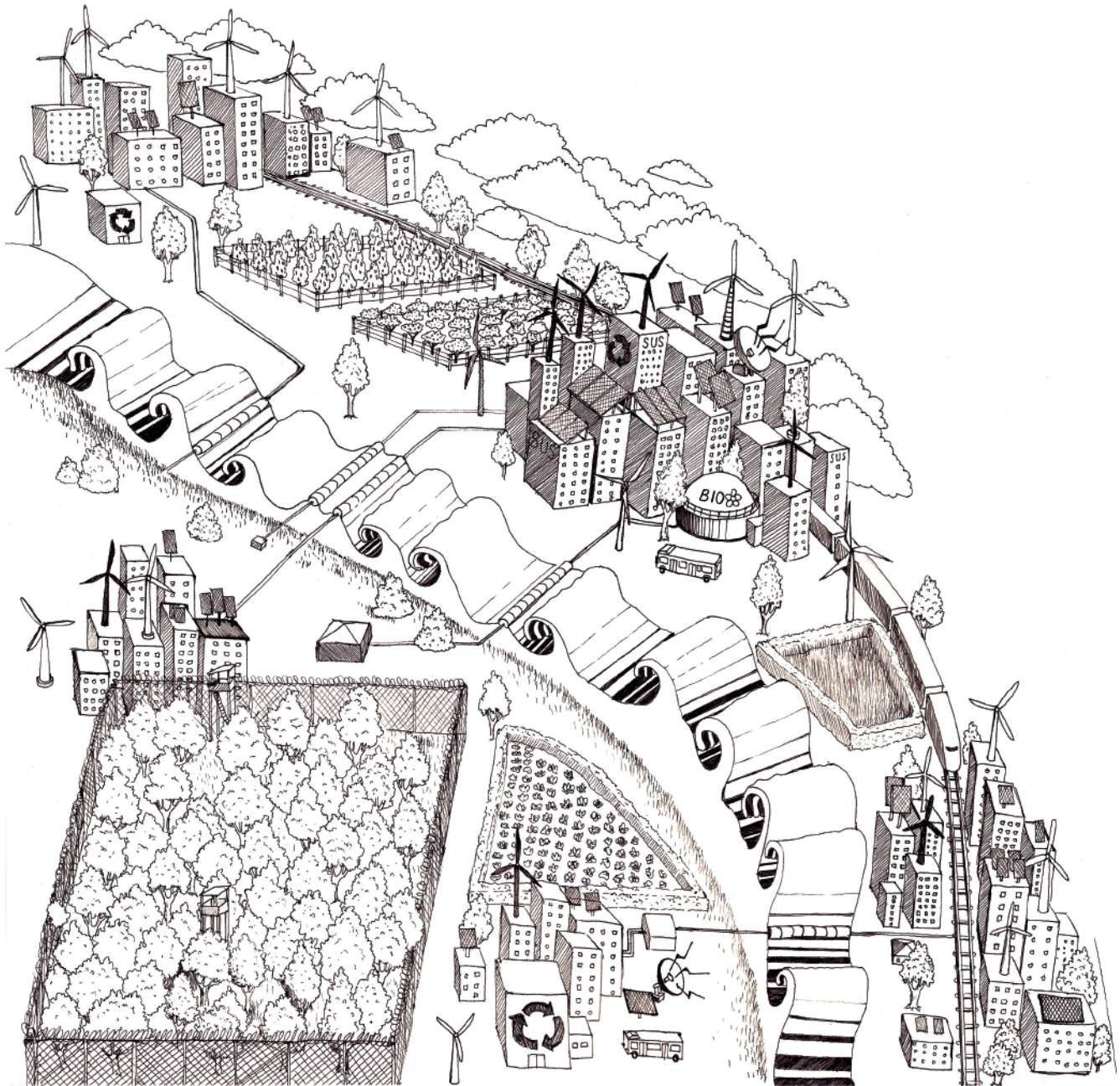
The placing together of many of the more optimistic aspects of energy

descent may seem artificial, but there are reasons to believe that the *Green Tech* scenario will tend towards a more egalitarian structure with the relative shift of power from control of oil wells and mines to control of the productivity of nature via traditional land uses such as agriculture and forestry and more novel renewable technologies.

The inherently distributed nature of these resources will lead to more distributed economic and political power at the level of cities, their hinterlands and organisations focused at this scale. For example, successful large scale farmers who have reduced their dependence of energy intensive inputs through permaculture strategies and organic methods may find new profits in more localized markets with prices sustained by policies that encourage regional self reliance. Any profits beyond farming are likely to be invested into local energy systems that generate more employment and further reduce economic dependence on central governments and large corporations. It is possible that these same processes could lead to highly inequitable, even feudal systems. However the universal focus on more sustainable production and reduced consumption that is not forced by remote and arbitrary central power, has the tendency to foster more egalitarian responses than in the *Brown Tech* scenario.

The substantial reductions in greenhouse gas emissions that result from this scenario keep climate change impacts to a minimum, thus stabilising and reinforcing the scenario's basic characteristics for at least several decades.

The success in radically reducing consumption of resources while sustaining modest growth in some local economies combined with stabilization of the climate, encourages a new "sustainability" elite to consider further changes to consolidate these achievements in the face of ongoing net energy decline. The worse excesses of consumer capitalism are controlled by restriction and reforms of advertising and other dysfunctional forces.



Civic culture strengthens where further transition towards a non-materialistic society combines with the maturation of feminism and environmentalism, and a resurgence in indigenous and traditional cultural values. These trends stabilise the accelerating loss of faith in secular humanism allowing the evolution of more spiritual “cultures of place”. Over time an evolution toward the *Earth Steward* scenario seems an obvious and natural response to the inexorable decline of non-renewable resources. “Distributed Powerdown” summarises this scenario by emphasising both the distributed nature of resources and power, and the planned contraction involved.

At their extremes the *Green Tech* and *Brown Tech* scenarios also describe many of the elements that could be

expected in a ‘*Techno Stability Long Term*’ scenario where new energy sources manage to replace fossil fuels without the stresses that lead to system wide contraction. The current levels of ecological, economic and socio-political stress are the indirect indicators that we are entering the energy descent scenarios rather than simply a transition from energetic growth to stability. Relative insulation from those stresses and the persistence of faith in the monetary accounting “house of cards” by the upper middle class (if not the global elites) continues the confusion. The lack of understanding of net energy accounting and disagreement amongst the experts on appropriate methods, combined with political pressures from the unfolding crisis lead to energetic descent being mistaken for “business as usual”.

The fishing industry damages ocean ecosystems.

This damage is hidden under the sea away from people.

The government, elected by people, set rules for industry.

But these rules allow the damage to our sea to go on.



EARTH STEWARD: BOTTOM UP REBUILD

Rapid energy decline rates, mild climate change symptoms

In this scenario the decline in oil production after a peak in total liquids production before 2010 is at the extreme end of authoritative predictions (about 10%) and is followed by an even faster decline in gas production plus a simultaneous peak in coal production. The shock to the world's fragile financial systems is overwhelming, resulting in severe economic depression and perhaps some further short, sharp resource wars.

This economic collapse and these political stresses, more than the actual shortage of resources, prevents the development of more expensive and large scale non-renewable resources that characterise the *Brown Tech* scenario or the renewable resources and infrastructure of the *Green Tech*. International and national communications networks break down.

Electricity grids become non-functional as cost and availability of fuels and spare parts reduce production and lack of paying businesses and customers reduces revenues. International tensions remain but capacity of stronger countries to use military force is constrained by unreliable energy and parts supplies and the strong evidence that war uses more resources than it captures. Global warming is slowed dramatically and reversed by the collapse of the global consumer economy and absence of large scale investment in new energy infrastructure.

There is a radical reduction in mass mobility of both people and goods. The food supply chain is severely affected both on farms and through the distribution system. Energy intensive large scale farming supplying central marketing chains is the worst affected leading to abandonment of even highly productive land. Shortages lead to rationing, black markets, and riots for food and energy.

Increases in crime, malnutrition and disease lead to a rising death rate accelerated in some countries by epidemics and pandemics that have a major impact on social and economic

capacity. The collapse in the tax base available to national and state governments reduces their power and even city level restructuring of infrastructure is difficult, but local government retains some degree of effective services, decision making and possibly democracy.

Collapse of larger businesses and the difficulties in maintaining urban infrastructure leads to a hollowing out of the cities. Loss of jobs and houses leads to migration of people out of cities to smaller towns, villages and farms with more robust local economies able to take advantage of the influx of labour. Impacts and demands on local soil, water and forest resources increases, to severe levels in many poor countries as people move out of the cities to harvest fuel, wildlife and restart food production. In long affluent countries, the underuse of local biological resources in the late 20th century provides some buffer against these impacts.

Large numbers of homeless ex-urbanites form a new underclass lacking even the skills of poverty. They provide basic labour in exchange for food and accommodation on farms needing the labour. Surviving structures of power may adapt to impose a more feudal structure based on concentrated control of productive farms and forests and built assets in large farming estates.

Organic and small farmers, close to markets and able to make use of labour and animal power, thrive (to the extent security allows) in a context of relatively benign and slow climate change. An explosion of home businesses based on building and equipment retrofit, maintenance and salvage starts to build a diversified economy. Further afield biofuels from crop waste allow farmers to continue to use machinery while wood and charcoal gasification based on regrowth forest resources near settlements and towns provide an increasing proportion of limited transport fuel. This small business growth in turn provides a new tax base for some form of effective local government. In some places new bioregional governments

institute land reform and debt cancellation following collapse of financial institutions and central banks, allowing people to stay on their properties.

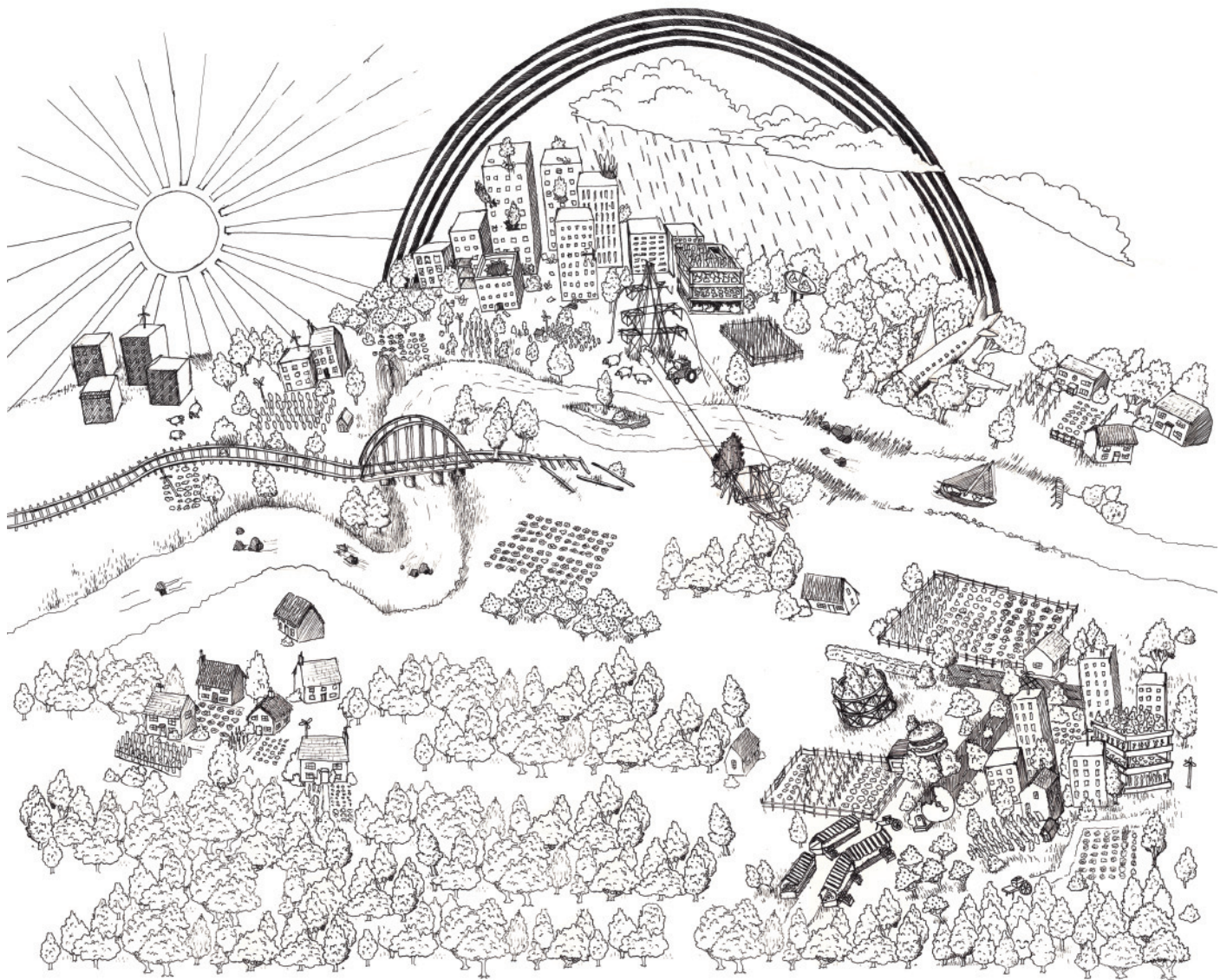
Suburban landscapes around smaller cities and regional towns with greater social capital are transformed with a booming and relatively egalitarian society sustained by bio-intensive/permaculture farming and retrofitting and reuse supported by resources from both the immediate rural hinterland and inner urban salvage.

This ruralisation of suburban landscape to produce food on all available open space, private and public provides most of the fresh fruit and vegetables, dairy and small livestock products. Local currencies, food, car and fuel co-ops, community supported agriculture all grow rapidly. Informal and household economies provide an increasing proportion of basic needs as corporate and government systems fail to deliver.

Around the larger cities especially in countries where social capital and community capacity is severely eroded, most of these new developments are in gated communities providing the basic needs and security of their residents with trade outside the community being more difficult or dangerous. Outside the gated communities salvage, fuel harvesting and animal husbandry are the main economic activities with trade controlled by gangs and local warlords.

While the impacts on people and local environments of this scenario are severe, in previously affluent countries at least, there is also a cultural and spiritual revolution as people are released from the rat race of addictive behaviours and begin to experience the gift of resurgent community and the simple abundance of nature to provide for basic needs.

The biggest difference from the *Green Tech* and *Brown Tech* scenarios is that the rebuilding and stabilisation is no longer based on dreams of sustainability or restoring the old system. Instead people accept that each generation will



have to face the challenges of further ongoing simplification and localisation of society as the fossil resource base continues to decline. This simplification in the material domain is seen as the opportunity for growth in the spiritual domain. There is a resurgence in leadership by women and a celebration of the feminine in nature and people. “*Bottom Up Rebuild*” summarises this scenario by emphasising the new growth from biological and community foundations. In some ways this scenario might be considered as the archetypal one of the Energy Descent future and the one in which permaculture principles and strategies are most powerfully applied.

The solutions to these problems with our ocean are also systemic.

D.

LIFEBOATS: CIVILIZATION TRIAGE

Rapid energy decline rates, severe climate change symptoms

In this scenario, supplies of high quality fossil fuels decline rapidly, the economy fails, and human contributions to global warming collapse but lag effects and positive feedbacks in the climate system continue to drive an acceleration of global warming. As of 2007, an increasing number of scientists believe it may already be too late to avoid catastrophic climate change. In the *Lifeboat* scenario the adverse symptoms of the *Brown Tech* and *Earth Steward* scenarios combine to force a progressive collapse in most forms of economic and social organisation. Local wars, including use of nuclear weapons accelerate collapse in some areas but the failure of national systems of power prevent global warfare. Successive waves of famine and disease breakdown social and economic capacity on a larger scale than the Black Death in medieval Europe leading to a halving of global population in a few decades.

New forms of oasis agriculture that are low input versions of the *Brown Tech* intensive systems evolve that stabilise food production as chaotic seasons make traditional field agriculture and horticulture almost impossible. Forest and rangeland hunting and harvesting become the predominant use of resources over large regions supporting nomadic bands. Warrior and gang cults provide meaning in a world of grief and violence, leading to the development of new religions and even languages that attempt to make sense of people's lives.

Urban areas are largely abandoned and dangerous but remain valuable as quarries for salvaging materials (especially metals). Suburban landscapes become ruralised into defensive hamlets making use of salvaged materials, urban storm water and surplus building space for mixed household economies.

The impacts are very patchy with worse effects in high density previously affluent and urbanised countries. In the most remote regions, remnants of hunter-gatherer and pioneer farmer cultures are better able to weather the changes. The relative abundance and

ongoing availability of high quality metals and other materials make a critical technological distinction from that of ancient traditional hunter gatherer cultures.

Mountain regions, especially with surviving glacier fed rivers allow hydroelectric systems to be maintained and rebuilt on a smaller scale. Nutrient rich glacier fed rivers also sustain intensive irrigated agriculture. In some localities, especially in favourable regions with accessible energy and agricultural resources, communities analogous to the monasteries of the early medieval period provide basic knowledge and skills to their surrounding communities and are thus protected by the locals from the ravages of local warlords and pirates. These communities, mostly in rural and suburban areas, and based on pre-collapse efforts of intentional communities or rich benefactors, pursue the task of saving and condensing knowledge and cultural values for the long dark ages ahead.

"Civilisation triage" refers to the processes by which remaining social capacity (beyond meeting immediate basic needs) are focused on conserving technology and culture that could be useful to a future society, once energy descent is stabilised after a precipitous but limited collapse process. This is not the dominant process of the scenario but the most significant in terms of future cultural capacity. The Christian monasteries that saved many of the elements of Greco-Roman culture and later provided the foundations for the Renaissance of Western civilisation is one historical example that could serve as a model for understanding how this process might work.

At its extreme, this scenario describes many of the elements of a *Long Term Collapse* in which there is a complete breakdown in the lineage of industrial civilisation such that future simple societies retain nothing from what we created through industrial civilisation. Drawing a distinction between this scenario and total collapse may seem pedantic but the reasons are important.

In the *Long Term Collapse* scenario, any future civilisation that could emerge only learns from the lessons of ours via archeology and perhaps long attenuated mythic stories. In the *Lifeboat* scenario the retention of cultural knowledge of the past combined with a moderately habitable environment allow new civilisations to emerge that build on at least some of the knowledge and lessons from ours.

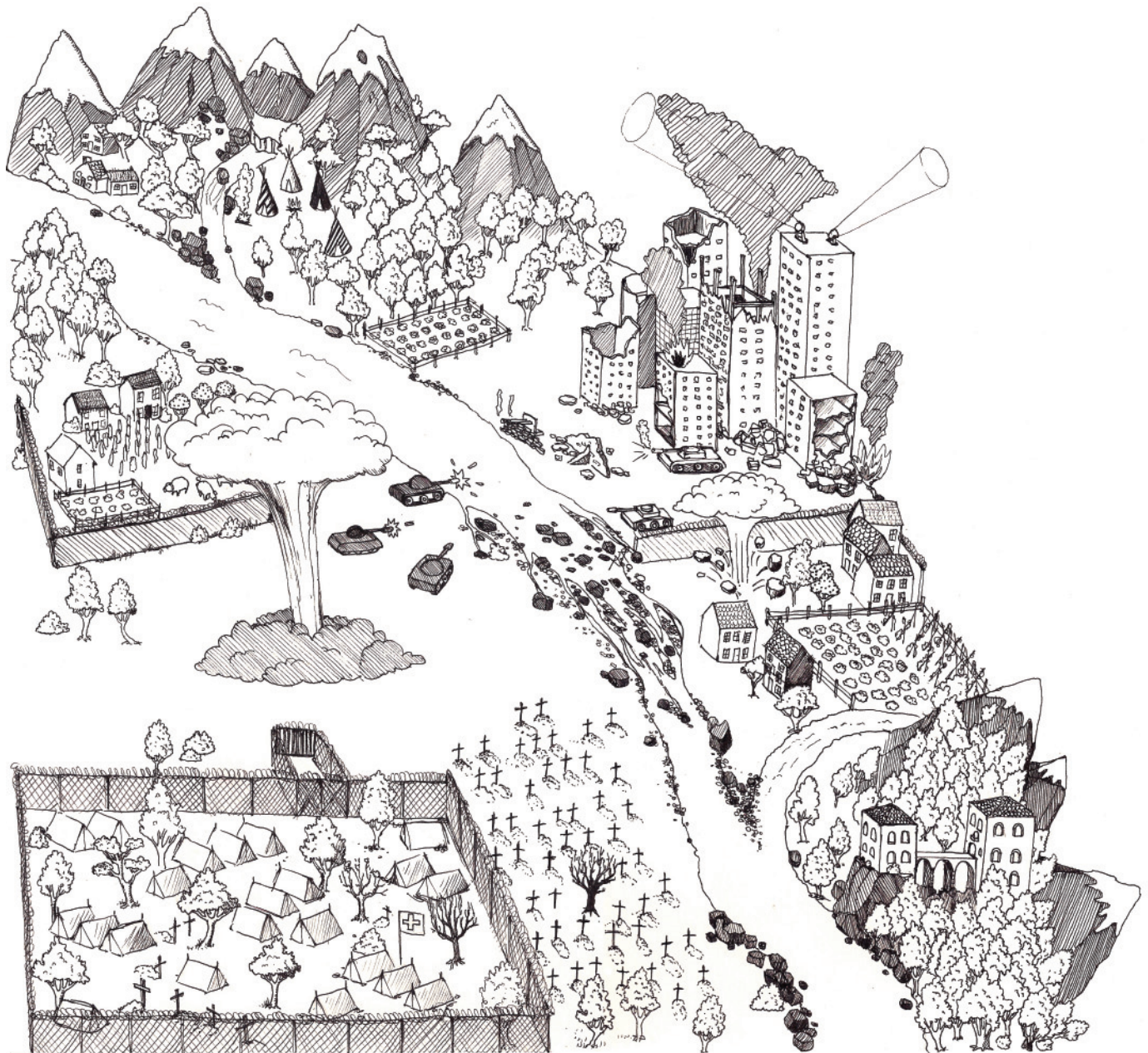
Three factors may prevent the continuous free fall to a very low global population of hunter gatherers surviving on the fringes of the Arctic of a hotter planet:

- 1) The first is the wild card created by the mixing of the world's biota, most notably the large numbers of tree and other species that exhibit what foresters call "exotic vigour". This allows new recombinant ecosystems to stabilize many environments that climate scientists are now saying will become uninhabitable in extreme climate change. The release of critical minerals, most notably phosphorus over the last 200 years into the biosphere may allow these new ecosystems to ultimately achieve biological productivity exceeding that possible from pre-existing systems.

- 2) Secondly the flooding of large areas of coastal lowlands complete with complex reef structures from flooded cities and infrastructure may also create the conditions for highly productive shallow waters and estuaries. These types of ecosystem are some of the most biologically productive ecosystems on the planet.

- 3) Thirdly, the precipitous drop in human numbers and their initial tendency to remain relatively aggregated to make use of the huge resources from industrial salvage materials (and for security) should see very large regions able to recover without harvesting and other impacts from people.

If the knowledge of ecological processes and their creative manipulation using minimal resources are retained and developed in the *Lifeboat* communities, then survival and resurgence of a more than minimalist culture may allow global



human population to be sustained at perhaps half, rather than one tenth, of current levels. More importantly it may be possible to embed the wisdom of the lessons learnt so that unconstrained human growth does not repeat such an intense cycle. Clearly these last thoughts are highly speculative but build from the same lineage of permaculture thinking developed over the last thirty years that informs the rest of the scenarios.

An alternative fishery, where ocean life can begin to replenish itself, is visualized at www.eyeoverfishing.org



**EYE
OVER
FISHING**

Steady State

Sustaining society over the long term requires existing within the carrying capacity of the ecosystem. *THE STEADY STATE ECONOMY - A TOTEM OF REAL HAPPINESS* is a graphic representation of eco-economist Herman Daly's model of a sustainable economic system.

ARTWORK BY: Angela Morelli

Infinite economic growth cannot be sustained on a planet with finite resources. Geophysical constraints limit economic growth as it is currently conceived. Our economic model is unsustainable and being unsustainable means that it will eventually collapse; and while financial collapse is painful, ecological collapse is terminal.

The alternative to environmental devastation and economic collapse is for humanity to learn to live within the ecological limits of biosphere. Under current conditions, this requirement is practically impossible. A more integrated economic model is urgently needed. Growth must be redefined from a quantitative to a qualitative state. Herman Daly describes a model 'STEADY STATE' economy. Survival over the long term now depends on our ability to quickly learn the basic ecological principles that characterize a sustainable economic system.

TWO MAJOR GUIDING PRINCIPLES

In this economic model there are two major guiding principles:

I

WE DON'T USE NATURAL RESOURCES FASTER THAN THEY CAN BE REPLENISHED BY THE PLANET.

II

WE DON'T DEPOSIT WASTES FASTER THAN THEY CAN BE ABSORBED.

In this society, people who study nature work out what levels of consumption and emissions are sustainable – and then we work out how to make sure we do not breach these limits.

Economic growth is presently entirely dependent on fossil fuels, and yet given current scientific consensus on the danger of carbon emissions, we need to move to a situation where we cap extraction of gas, oil and tar. For other natural resources we must tax resources at point of extraction from the earth, i.e. fish as they are scooped from the sea, minerals as they are mined from the earth and trees as they are taken from the forest. This will raise the price of these resources and encourage people to use them more sparingly. All that superfluous packaging will disappear (with wide spread other changes). Better design will be essential.

FOUR MAIN SUB-MECHANISMS

1) FAIR LIMITS TO INEQUALITY

While these measures will increase the price of commodities in such a fashion that will hit the poor hard, other strategies will be created to alleviate inequity. The vast and increasing disparity between rich and poor that exists in 2009 will need

to be addressed to allow us to share the planet peacefully. A *Steady State* world will set limits on income inequality. While it is difficult to decide what the permitted range of incomes should be, Herman Daly describes the importance of developing a system 'that rewards real difference and contributions rather than just multiplying privilege'. Plato thought that a factor of 4 (4:1 ratio between highest and lowest incomes) was ideal for wealth differential. Universities, the civil services and the military have always seemed to manage on a factor of 10 to 20. But the US corporate sector works on a factor of 500 or more. This vast disparity in wealth corrupts democratic systems and destroys the capacity of the system to function sustainably by creating the conditions for abuse of power.

2) ECO-EFFECTIVENESS

A *Steady State* system strives for eco-effectiveness rather than mere efficiency. Within this system the danger of being efficient at doing the wrong things is recognized. *Cradle to Cradle* author Michael Braungart explains: 'an unefficient neo-Nazi is much better than an efficient one'. In 2009 we are increasingly efficient at destroying natural resources and our climate system. Efficiency without ecological competence is lethal.

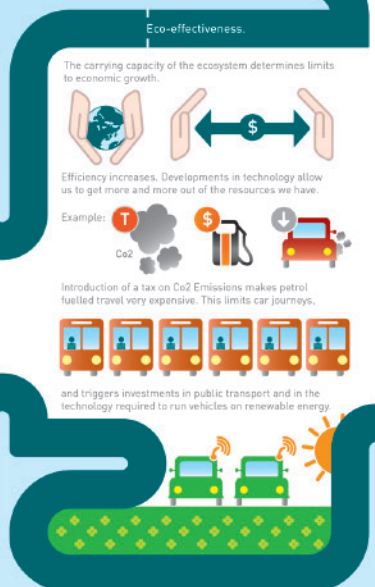
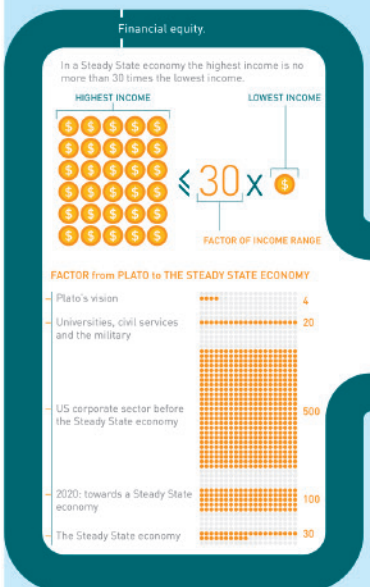
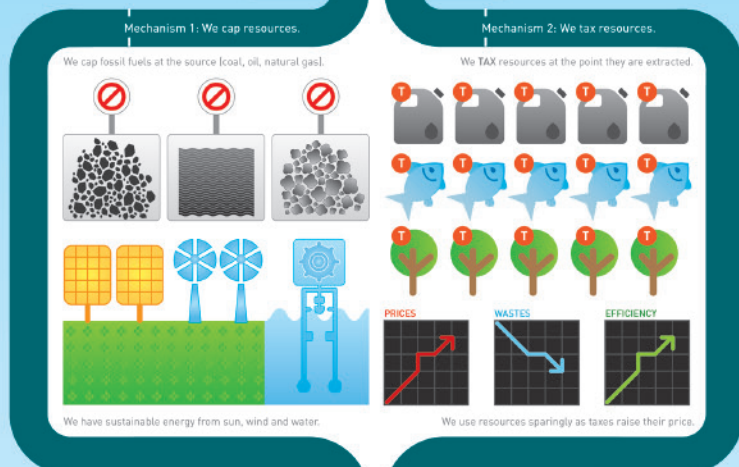
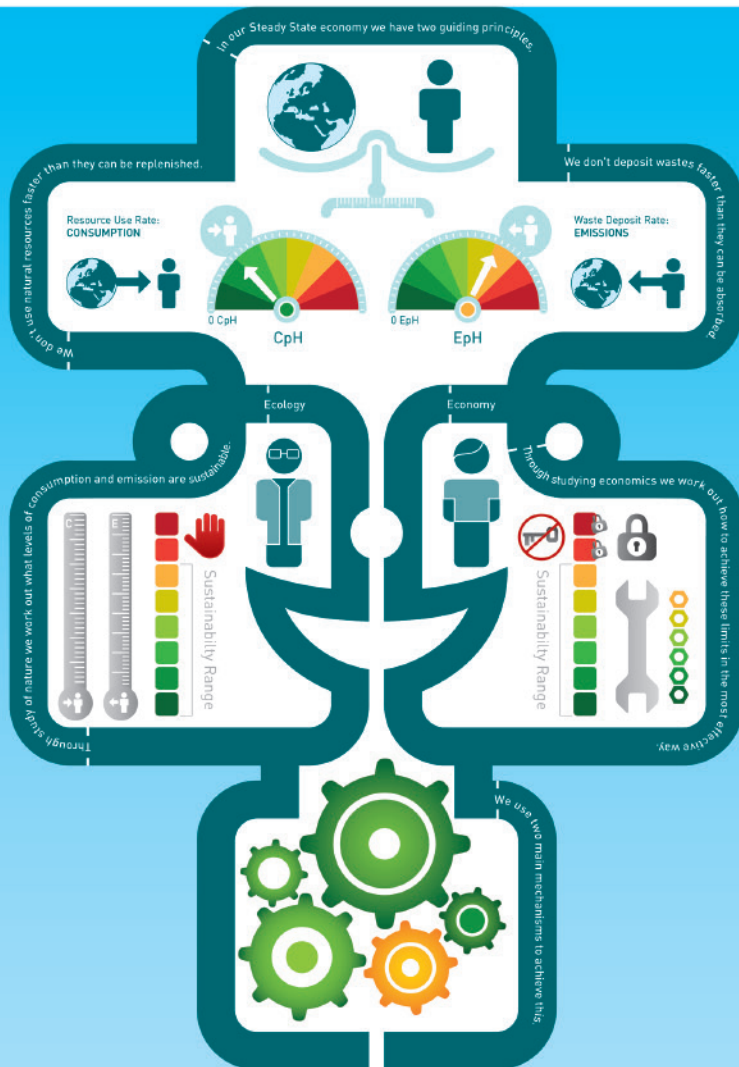
3) LOWER IMPACT LIVES:

In a *Steady State* world, products will be designed and built to last. Disposable goods will no longer be considered to be acceptable. Maintenance and repair will be important sources of employment - as will be science, technology and design. The all-important concept is the maintenance of the economic system within the 'carrying capacity' of the ecological system. Without the imperative of economic growth, there will be simply less work that needs to be done. People will work less and the whole pace of life will be more relaxed. Incomes will be lower, there will be less 'stuff' - but we will have more time. In addition, we will understand that no-one has the right to use more than their fair share of the earth's resources.

4) RE-DESIGNED FINANCIAL SYSTEMS

In a *Steady State* world, the financial system of late capitalism, based entirely on speculative value, will be accepted as fundamentally unstable and unsustainable. The enormous pyramid of debt that props up our economy in 2009 will make addressing climate change and other environmental and social problems virtually impossible until we address the more fundamental problems with the current unsustainable financial system. In a *Steady State* system we will have evolved a more comprehensive understanding of the relationship between economics and the environment.

*Herman Daly is an eco-economist who has been questioning the growth model of neo-classical economics for four decades. Daly's position is recognized by natural scientists as necessary to address global economy's destructive impact on global environmental systems. The graphic is adapted from the article 'Life in a Land without Growth' in *The New Scientist* (15 October 2008), based on a conversation with Herman Daly.*



BACKING AWAY FROM THE TIPPING POINT

Ten Crucial Steps to Attain an Ecologically Viable Economic Future

1. Cap limits to biophysical scale according to source or sink constraint, whichever is more stringent. Auction captures scarcity rents for equitable redistribution.

2. Ecological tax reform – Shift tax base from value added (labor and capital) and on to “that to which value is added,” namely the entropic throughput of resources extracted from nature (depletion), through the economy, and back to nature (pollution). Internalizes external costs as well as raises revenue more equitably. Prices the scarce but previously unpriced contribution of nature.

3. Limit the range of inequality in income distribution – A minimum income and a maximum income. Without aggregate growth, poverty reduction requires redistribution. Complete equality is unfair; unlimited inequality is unfair. Seek fair limits to inequality.

4. Free up the length of the working day, week and year – Allow greater option for leisure or personal work. Full-time external employment for all is hard to provide without growth.

5. Re-regulate international commerce – Move away from free trade, free capital mobility and globalization; adopt compensating tariffs to protect efficient national policies of cost internalization from standards-lowering competition from other countries.

6. Downgrade the IMF-WB-WTO to something like Keynes' plan for a multilateral payments clearing union, charging penalty rates on surplus as well as deficit balances – seek balance on current account, avoid large capital transfers and foreign debts.

7. Move to 100 percent reserve requirements instead of fractional-reserve banking. Put control of money supply and seigniorage in hands of the government rather than private banks.

8. Enclose the remaining commons of rival natural capital in public trusts, and price it, while freeing from private enclosure and prices the non-rival commonwealth of knowledge and information. Stop treating the scarce as if it were non-scarce, and the non-scarce as if it were scarce.

9. Stabilize population – Work toward a balance in which births plus in-migrants equals deaths plus out-migrants.

10. Reform national accounts – Separate GDP into a cost account and a benefits account. Compare them at the margin, stop growing when marginal costs equal marginal benefits. Never add the two accounts.

This text is reprinted with permission from a paper Herman Daly wrote for the UK Sustainable Development Commission in 2008.

The full text can be found at WWW.THEOILDRUM.COM.

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