

# Quo Vadis Energy System Transformation?

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This essay is not an untouchable artifact, yet an invitation to reflection, criticism and comments. Rather than a final construct, it is a composition of sections with different aspects and perspectives, related to energy system transformation and climate policy. It is possible to remove or add text paragraphs, even to consider new items contributing to the analysis.

Colleague Maarten Arentsen (University of Twente) suggested to start with describing the purpose of the essay. Rightly, given the multitude of subjects/themes and viewpoints may be a labyrinth for those not continuously involved in the matter.

My main concern is soaring climate change, intensifying continuously by the (still mounting) use of fossil fuels. Destabilization of the earth's climate and its impacts are irreversible, threatening decent human life. Urgent and drastic action is the only way to keep global climate fever below the agreed 2°C ceiling. Narrowly related is the concern about the immense inequality in income, property, living standards, life opportunities for people in the South versus the North, yet also within the borders of most countries. Environment and Development are the two challenges addressed by "Our Common Future" (Brundtland et al., 1987). For genuine Sustainable Development, political work – by citizens and by their elected representatives – is crucial. This political work can deconstruct the neoliberalist political system. So, it would eliminate big money of clans and transnational corporations determining the political course of the USA and its allies. Unfettered economic growth, that enriches the already too rich, would be replaced by real measures to reduce inequality and poverty at global and national scale.

Being a privileged academic, I collect insight and knowledge for wide dissemination and as discussion material with people sharing the concerns about environment and development. I do not offer specific, practical solutions which have to grow bottom-up. Fortunately, today novel and effective solutions abound in many fields, not the least in obtaining, storing and handling electricity – the energy current for the future carbon free energy supplies.

What then offers this essay?

- A comprehensive context for analyzing the emergence and deployment of energy and climate policies (Section 1).
- The relationships between energy use and societal development, including climate change; interlinkages between energy system and societal transformations, some being beneficial, others awkward (Sections 2 to 5).
- "*What policies can prevent climate collapse?*" (Section 6) is indebted to Elinor Ostrom's publications on managing common-pool resources. Her ideas and recommendations are applied for designing global policy to safeguard the earth's climate, a unique, global, commons. The sovereign parties are the nations of the world, yearly meeting in the "Conferences of Parties" with little result after 27 years. A workable, lean self-governance system is proposed as top of the existent and emerging diverse, multi-level, polycentric climate politics.
- Transformation means U-turns in most of the context factors (Section 1), documented in section 6.4. This is followed by suggested answers on the challenging question "Act-Now, but How?" (Section 6.5).

Quit obsolete Ideas, Interests, Institutions, Infrastructures, Energy-Technology systems. Deconstruct the neoliberal dystopia. Welcome Our Common Future by genuine Sustainable Development. Swiftly switch to locally harvesting light, wind, water and heat currents to obtain carbon free electric power: it opens the way to the third period of human civilization.

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## Acronyms

CBA	Cost-Benefit Analysis
Ce	Carbon emissions
COP	Conference of Parties (to the UNFCCC)
ETS	Emissions Trading System
Fit-for-55	4053 pages package EU documents for implementing EU's Green Deal
GHG	Greenhouse gases
HVAC	Heating, Ventilation, Air Conditioning
KPI	Key Performance Indicator
SDG	Sustainable Development Goal
SD-OCF	Sustainable Development as described in Our Common Future (1987)
SWOT	Strengths, Weaknesses, Opportunities, Threats
UNFCCC	United Nations Framework Convention on Climate Change (1992)
USD	United States Dollar
WCED	World Commission on Energy and Development, author of Our Common Future

## Foreword

The war in Ukraine has laid bare the central role of energy use in private and civic life. Energy is indispensable for every human activity. The history of humankind cannot be understood without acknowledging the role of energy and technology. Energy supplies are once again the subject of political attention, as they were in 1973. In the 1980s, the *penultimate opportunity* to secure a liveable planet was squandered.<sup>1</sup> The final opportunity to prevent irreversible climate collapse is fast disappearing. We must act now, with well-considered but immediate steps in the right direction.

Politicians issue statements about energy which lack coherence and focus. Policy muddles along with too much reliance on outdated energy and technology systems. The EU aims to achieve *secure, affordable and sustainable*<sup>2</sup> energy in abundance, but its strategy and regulations are insufficient. In addition, member states want to maintain their power to control energy, due to the immense role and impact of energy on the functioning of society.

A fossilised civilisation is focused on its 'glorious' past and conservative present. The emerging future, built on new energy systems, is not being given the space, resources and targeted policy support to develop faster and more broadly. Effective and efficient policy requires a clear vision of the feasible future, starting in the present and learning from the experiences of the past.

## Overview

This contribution about energy systems and their key components discusses which transformations are possible, necessary and desirable, and which are counterproductive. The full manuscript comprises six sections.

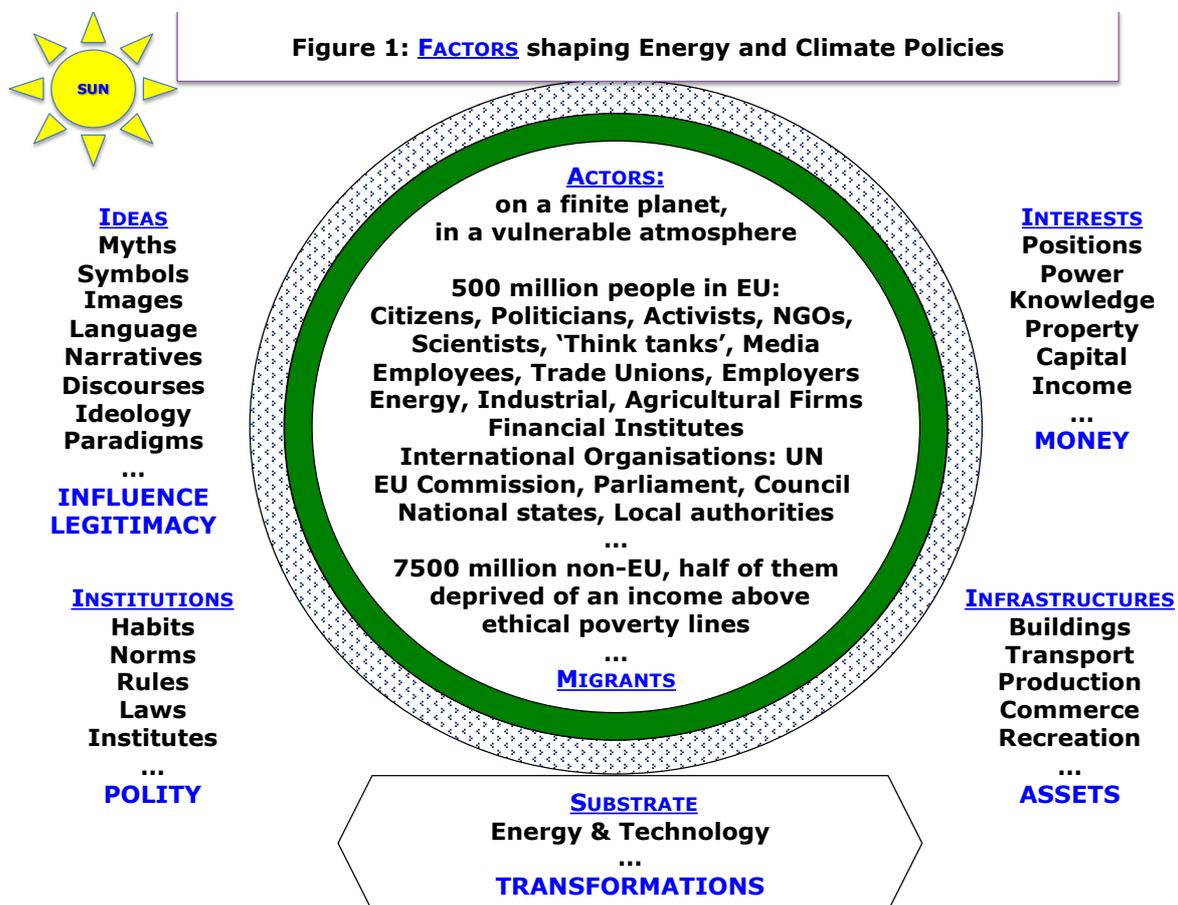
Section 1 describes the context in which energy transformations occur. The context consists of socioeconomic and technological factors, with energy and technology forming the substrate for societal activities. There is a particular focus on the 'Interests' factor with an explanation of private money and public values. Section 2 deals with energy. It focuses on the energy transformation aspect, including the difference between energy efficiency and energy conservation. After looking at the relationship between civilisation and energy use (Section 3), there follows a brief historical overview of energy use. A further explanation of electricity generation explains why the energy transformation has already begun, and why it is unstoppable. In Section 4, two energy transformations are discussed. They are contradictory in terms of the formation of a future society and the energy and technology substrate. One model requires clarity on sustainable development, the other requires clarity on how the European Green Deal is preparing for low-carbon neoliberalism. Political and social forces determine the differences in the associated substrates. In 5, we learn from a missed opportunity for energy transformation in the 1980s, mainly to prevent our final chance from being squandered now. The turmoil in the energy world today is very similar to the turmoil in the period [1973–1983].

The question 'What policies can prevent climate collapse?' is the subject of Section 6, which is divided into five subsections described at the start of Section 6.

Figures and tables help clarify connections and provide a visual illustration of key points to make them easier to understand and remember.

## 1. The context in which the energy transformation is taking place

Neoliberalism and climate change are the two central, interconnected challenges of our time. Both affect every corner of the globe, but unequally in terms of power and resources, causes and consequences. Studying and addressing these challenges requires a global vision, to find proposed solutions that can be applied globally, however not uniformly. On the contrary, the solutions are many and diverse, grown bottom-up. After being applied and tested locally, they are distributed world-wide for numerous bottom-up applications. Major challenges require a comprehensive framework for the development and placement of strategic choices. Figure 1 shows a version of the 'Ideas, Interests and Institutions' framework used by social scientists.<sup>3</sup> Actors are divided into two groups: the 500 million EU actors and the 7.5 billion non-EU actors. Because this essay is about European energy systems, the main focus is on European actors. The 7.5 billion non-EU global citizens remind us that proposals and actions without global solutions cannot solve the climate change issues. Migrants are mentioned to signal likely shifts in the ratio of 500 million to 7.5 billion inhabitants. If solutions are not offered and developed where people are, people will go looking for solutions elsewhere.



Actors pursue their goals by building, managing and engaging with Ideas, Interests, Institutions and Infrastructure interwoven with a Substrate of Energy and Technology. At the top left of Figure 1, we start with Ideas: they influence and determine people's thoughts, from which attitudes and actions follow. Ideas in the form of Myths, Narratives and Paradigms have a major influence on and legitimise the actions and positions of Actors. Manipulated Ideas and language plant false beliefs in people's minds. In the timeframe under consideration (1980 to the present), the myths, discourses and ideology of neoliberalism define the dominant paradigm. In our industrial civilisation, most people have been caught up in the dogma of unlimited economic growth. The exercise of power by big money (the super-rich and transnational corporations) is obscured in myths and narratives about 'free market' and 'democratic' regimes. The reality is other: oligopoly and

monopoly power of transnational corporations have crowded out 'free market' toward the fringe of economic activity where small-scale and mutual monitoring prevent super-profit making. How democratic are nations when big money mostly determines which candidates are elected (as is the case in the USA, called the "largest democracy" on Earth)?

Institutions that support neoliberalism are strengthened.<sup>4</sup>

Being caught up in this dogma is like buying into a pyramid scheme: a few participants win big, others win a little, while many lose. The pyramid of profits is upside down, from the small number of winners to the huge number of losers. It seems hazardous for an individual to opt out; as a result, the small interests of billions of people are subordinated to the big interests of the super-rich.

At the top right of Figure 1, under Interests, is a list of terms. The dominance of financial and economic power assigns a central role to Money, in particular 'Big Money'. Table 1 provides a further explanation of how private moneyed interests run parallel with and counter to public interests. Cost-Benefit Analysis (CBA) is a method that became widespread before and after World War-2 to evaluate initiatives with social impact based on financial ratios. As long as users of CBA keep in mind the limitations and relativity of the method, it can provide useful insights. In practice there is a lot of confusion, partly caused by the careless use of words.

**Table 1: Private money interests with and against Public interests  
(proper use of terminology is recommended)**

	<b>Private money</b> €, \$, £, ...	<b>Public values</b> monetized in €, \$, £, ...	<b>Societal</b> = <b>Private + Public</b>
<b>Debit</b>	<b>(1)</b> <b>Expenses</b>	<b>Negative externalities, e.g. pollution, disturbance, destruction, insecurity, morbidity, mortality, ...</b>	<b>(1)</b> <b>Costs</b>
<b>Credit</b>	<b>(2)</b> <b>Revenues</b>	<b>Positive externalities, e.g. amenities, learning, .. Public commons, goods &amp; services</b>	<b>(2)</b> <b>Benefits</b>
	<b>(2) - (1)</b> <b>+ = Profits</b> <b>- = Losses</b>		<b>(2) - (1)</b> <b>+ = Welfare grows</b> <b>- = Welfare shrinks</b>

Financial ratios show the balance between Debit money flows and Credit money flows. In private bubbles, these ratios relate to Expenses and Revenues that figuratively pass via private cash, of which the balance represents a Profit or Loss. Private interests (owners, entrepreneurs, corporations, etc.) are committed above all else to making profits – better-than-average profits, preferably excessive profits when they find opportunities to capture super-profits (rents)<sup>5</sup>.

The initiatives, projects, investments and so on undertaken by private interests are usually not confined solely to revenues and expenses. They frequently create side effects for those

around them, and for society at large. These side effects (in economics called 'externalities') may be negative or positive. Positive side effects may bring value to a private entrepreneur, e.g., by improving their image or helping them attract engaged staff. The burden of negative side effects (environmental pollution, disturbance, damage to health, up to disruption and destruction of life-support systems) falls on the community, and on people in the future. Public intervention is required to internalise these effects, i.e., shift the burden of the side effects to the entrepreneurs responsible. Monetary figures are needed that properly reflect public values (a pleasant living environment, vibrant biodiversity, a clean atmosphere, a mild climate, etc.). In addition to private projects, there are many public projects aimed at obtaining public goods and services (security, justice, governance, information, education, health, mobility, and so on). Some projects are also the subject of a CBA to decide which public goods are preferred and how many. In theory, the social costs are the sum of the project expenses plus the negative side effects of the project, expressed in monetary terms, while the social benefits are the sum of the project revenues plus the positive side effects of the project, also expressed in monetary terms.

Some observations regarding the CBA method: (1) In many cases, it is impossible to perform a comprehensive, reliable CBA, particularly if the time horizon is beyond 100 years, if the degree of doubt is beyond the risk standard and even beyond uncertainty to a state of ignorance, and in situations where the impacts of decisions are irreversible<sup>6</sup>; (2) the framework and terminology in Table 1 are key to proper language use. One example that is directly applicable to the energy world is the continual references in the literature and in the media to the "low costs of fossil fuels". These "low costs" do not exist, due to the numerous major negative side effects. Because these side effects have not thus far appeared on the bills of energy users, or only to a very small extent, it is only correct to talk about 'low expense' and 'low-priced' fuels. However, such low prices do not cover the full, real costs. It follows that real costs are rolled-off on others (the community), on future generations as is the case with climate change.

Table 1 provides a simple depiction of how private money interests in neoliberalism, fixated on super-profits, high revenues and low expenses (column 2), ignore the social costs of their activities. Political and social institutions are needed to create and maintain social balance based on prosperity in the fields of interest (column 4).

Institutions are the social fabric where people deal with each other in a civilised manner, and where objectives that benefit everyone (the "common good"), such as high levels of prosperity, properly distributed, can be achieved and protected. Key institutions are handed down through the generations. These include habits, obvious norms, unwritten rules about trust, respect, reciprocity, etc. Political institutions impose rules and laws, and provide legal, administrative, communication, social, economic, scientific and other institutions that enhance modern society.

Infrastructures refer to the material assets societies need to function and thrive. Drastic and urgent change has been impeded by large, long-lived structures, some in public ownership, some owned by private companies. When governments try to remove certain infrastructure from private ownership, the owners raise the issue of 'stranded investment' and demand compensation from the government. The compensation is sometimes a negotiated amount, but more often it is imposed by the courts.<sup>7</sup> The necessary transformation of energy systems will result in the demolition of large elements of infrastructure (Figures 5 and 6). As shown in section 5, the construction of too much obsolete infrastructures (thermal power plants; LNG terminals; large crude oil carriers, and similar) is a strong brake on the transformations needed for zero carbon emissions.

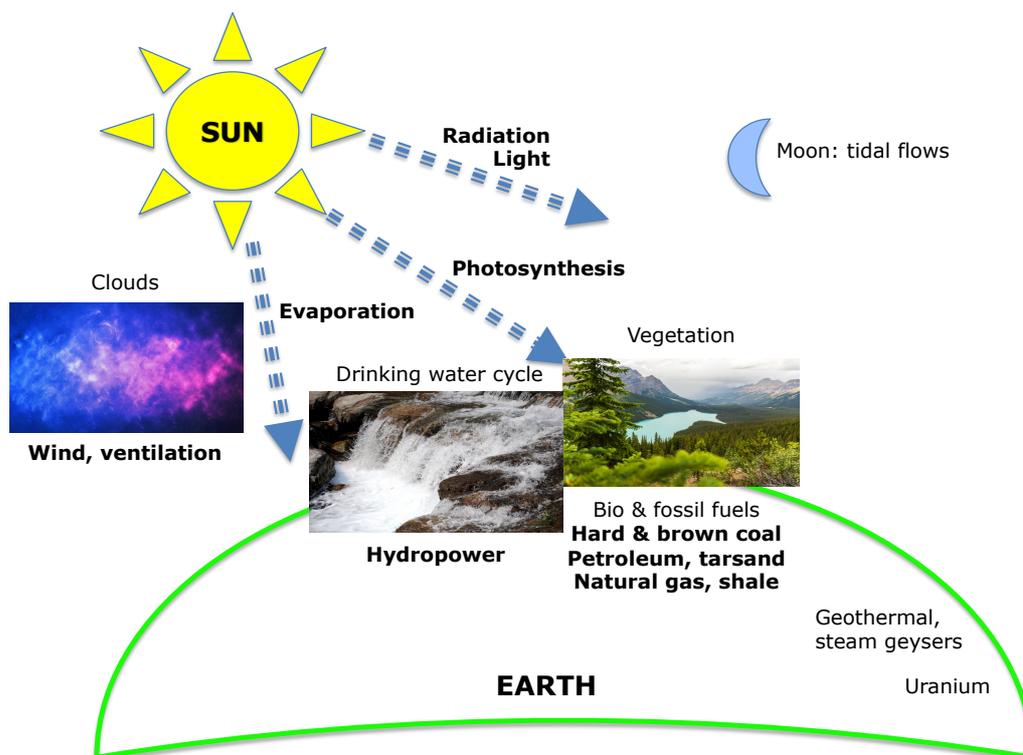
In Figure 1, Energy and Technology are given a special place, namely they provide a crucial Substrate on which the countless activities of the Actors flourish.

## 2. A little more information about energy

Figure 2 shows the key energy sources, the ones people currently use the most. The sun plays the leading role, in conjunction with the Earth. Without the sun, life on Earth would quickly wither away. Sunlight, the growing of crops, the water cycle, wind, ventilation ... the sun gives us all of that for free. Fossil fuels are reserves of stored solar energy, and were also created free of charge. 'Free energy from nature' is the starting point for understanding energy.

Besides the sun, there are several smaller energy suppliers. Tides are a kind of hydro-power, regulated by the gravitational impact of the moon. Harnessing free geothermal energy is expensive, except in places where steam escapes from the ground. Uranium mines provide the raw material for enriched isotopes required for nuclear fission, which converts mass into energy ( $E=mc^2$ ).

**Figure 2: Energy sources for life on planet Earth**



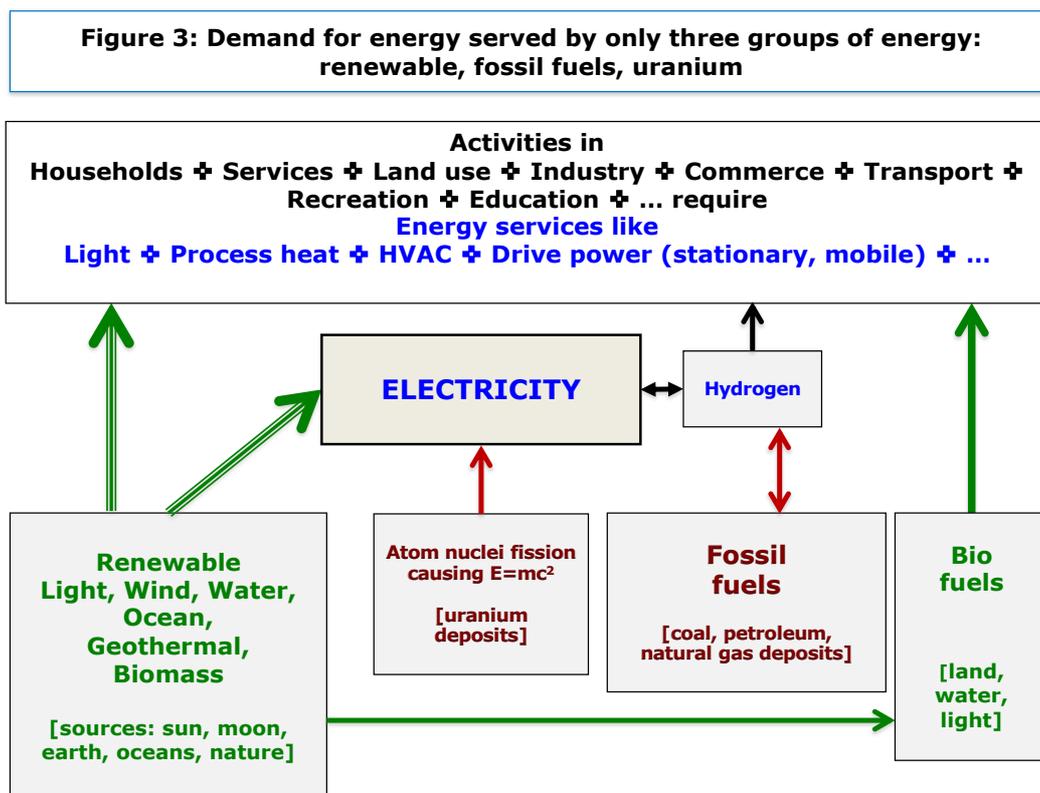
Technology is generally required in energy use chains, which have three consecutive links: capturing primary energy; processing it into secondary energy for use by apparatus in buildings, businesses, vehicles, etc.; supplying final energy to the energy use link, such as HVAC<sup>8</sup> in buildings, or driving force in factories and vehicles. The development, construction and operation of technology are not free, since they require the use of production factors.

Technology requirements are small and cheap when available energy flows are used directly (e.g., daylight, natural ventilation, harvesting fruit). But generating electricity from sunlight requires photovoltaic (PV) panels; from wind currents, wind turbines are needed; from water, customised turbines. When fossil fuels or uranium is used, many ancillary techniques are needed, such as boilers, turbines, condensers, pumps, and more (Fig. 6).

There are only three energy sources useful for human ends: (a) Direct (light, heat) and indirect (wind, water) currents from the sun; (b) fossil fuel reserves; (c) uranium. These are shown in the bottom half of Figure 3. Energy is required for human activities in

households, services, companies, etc. Activities require a range of energy services, such as light, heat, driving force.

Each activity requires 'suitable energy', in terms of type and quantity, at the place and at the time of use. The numerous and diverse activities of humans rely on extensive energy systems that are spread throughout society. Since the 18<sup>th</sup> century, these have increasingly been fed with fossil fuels, which have been mined and pumped up in abundance. However, using fossil fuels causes greenhouse gas emissions, which in turn lead to climate change. The use of fossil fuels must be rapidly reduced until they disappear from energy systems altogether. Likewise, nuclear energy will not be part of the future energy supply (Section 4). All of the brown parts of Figure 3 must be erased in the coming years, without the granting of spineless service life extensions. Continuing to invest in new capacity that is dependent on fossil fuels or uranium is reckless.



The wide variety of different types of renewable energy must find a way to supply the energy we require. In that enormous task, energy efficiency and energy conservation will be vital allies. The difference between these two concepts is important. Energy efficiency is not about changing types or quantities of activities, it's about reducing the amount of energy used by the activities. Such reduction can be achieved by technical measures. Technical efficiency measures often result in the number of activities increasing, because energy expenditure has decreased (this is known as the 'rebound effect', e.g. LED lighting results in more light points, which are often switched on more often than the lights that were replaced).

Energy conservation is about changing human activities, which is a major challenge for society. The essential questions are: what activities are necessary, desirable and possible in the light of what goals? What type and quantity of energy is justified for a specific activity? 'Setting limits' on human activities is part of the gradual building of a civilisation. Capitalism, and in particular neoliberalism, its out-of-control variant, has destroyed many

limits. For the rich, anything is possible, including the extreme and the obscene, such as superyachts and space tourism. Sustainable Development for 'Our Common Future' is the opposite to neoliberalism, and sets limits on it, such as "Consumption standards that are within the bounds of the ecologically possible and to which all can reasonably aspire"<sup>9</sup>.

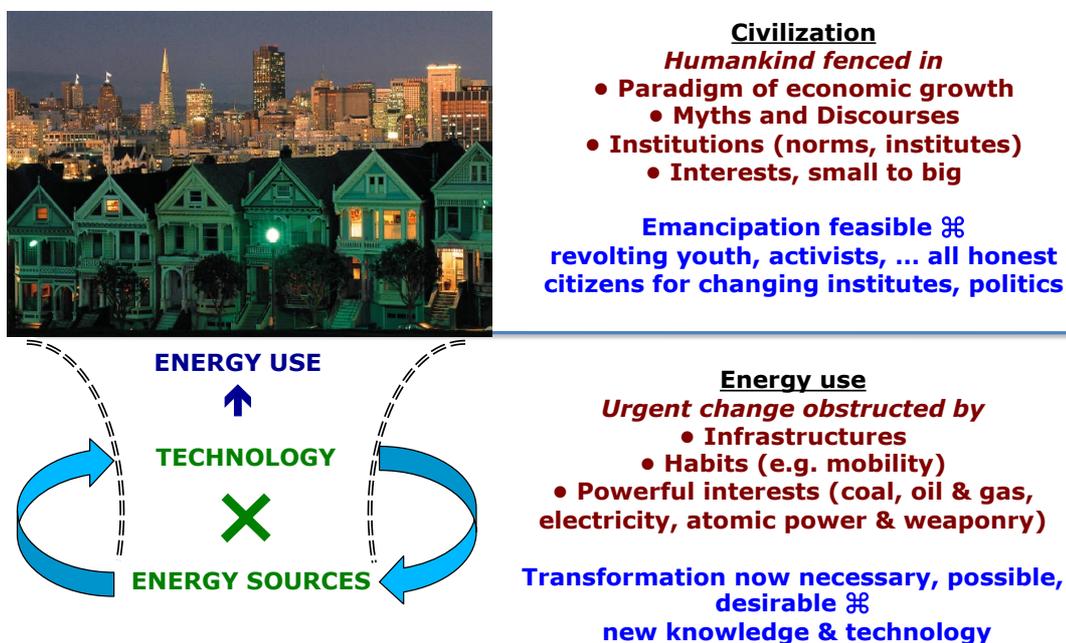
Limits ought to be placed on the idiocy of Branson, Bezos and Musk, and space tourism should be banned as a crime against future generations. This extreme example will cause a certain amount of commotion. But it is relevant to a broader theme: setting our sights on air travel. Around 11% of the world's population travels by plane. More than half of the greenhouse gas emissions from aviation can be attributed to 1% of the population (S. Gössling, Lund University), which partially overlaps with the 1% of super-rich people who own private jets. There are many arguments for drastically reducing air travel, if the "ecologically possible" rule of Sustainable Development is applied.

Applying energy conservation to many human activities goes hand in hand with the rolling out of Sustainable Development to replace the neoliberalism that pursues unlimited economic growth for those who are already far too rich (Section 6.5.2, Fig. 14).

### 3. Civilisation and Energy

The intense interaction between human civilisation and the available energy systems has been repeatedly documented.<sup>10</sup> Figure 4 presents an urban, industrial civilisation living on energy use arising from a specific energy system. Energy systems differ in terms of the sources of energy and the technology used. Technological development enables the use of specific energy sources.

**Figure 4: Civilization ⌘ Energy use**



*Homo sapiens* expanded its radius of activity and management of the environment through the domestication of animals (e.g., dogs as guardians, trackers, hunters) and through fire (roasting, baking food and pots, working metals, dying textiles, etc.). Until end of the 18<sup>th</sup>

century, renewable energy sources were used almost exclusively, with steady advances in technology (e.g., water wheels, windmills, sailing ships, carriages, hoisting equipment, blast furnaces and forges on charcoal).

In the second half of the 18<sup>th</sup> century, English scientists discovered steam power: heated water under pressure is a method to effect force. In 1824, French engineer Nicolas Léonard Sadi Carnot published the basic principles of thermodynamics, to design more and better thermal machines. Later followed scientists defining the thermodynamic laws, such as the first law on the conservation of energy (Joule), and the second law on the availability of thermal energy (Clausius).

Over the course of the 19<sup>th</sup> century, scientists such as Franklin, Volta, Coulomb, Ørsted, Ampère and Faraday explored the phenomena of electricity and magnetism. This led to the invention of the alternator that converts rotary movement (generated from steam or water power) into electrical power.

Most steam comes from burning coal and natural gas. Since the 1950s, nuclear power plants also supply steam for electricity production (in 2021, less than 10% of the global electricity supply comes from nuclear power plants<sup>11</sup>).

In the 1880s, power plants began supplying electricity to customers in major cities such as New York, London and Berlin. It was the start of an industrial success story, and it had a profound impact on the societies that electricity rapidly permeated.

Petroleum (oil) extraction also began in that period, with a range of refined products. In the 20<sup>th</sup> century, oil-based fuels fundamentally altered the structure of industrialised countries by fragmentation. The storage, transport and use of oil-based fuels is technically easy. A range of economic activities were able to become established anywhere; cars and other means of transport (ships, aircraft, tractors) connected the scattered places where people lived, worked, studied, shopped, played sports and so on.

The addiction to fossil fuels is widespread. Changes in energy use are impeded by existing infrastructure that is still expanding (e.g., airports), habits stemming from past decisions (e.g., living at distance from town and city centres encourages car use), and by powerful energy companies and institutions preferring own profits and positions above the preservation of a liveable atmosphere and mild climate.

The flipside of the exuberant use of fossil fuels is grim. It causes or amplifies practically all problematic environmental issues, such as climate change, acidification, photochemical air pollution, fragmentation of open spaces, noise pollution, water and soil pollution, and so on. The damage from this impact is beyond comprehension, but obvious in the case of the irreversible decline of the earth's atmosphere and climate.

The world must abandon fossil fuels and thermal electricity production. This is a must for escaping climate collapse. It is a phenomenal challenge in terms of change, but feasible because human ingenuity and decisiveness from certain countries, their politicians and residents, have paved the way for the technical quantum leap<sup>12</sup>. The breakthrough came around 2018; since then, electricity from sunlight and wind is the cheapest it has ever been since the start of the electric power era. Moreover, technology is improving and solar panels and wind turbines are getting cheaper ([www.irena.org](http://www.irena.org)). Figure 5 depicts the technological revolution in electricity production, being the central hub in the energy supply of the future (Fig. 3).

It is a revolution in both technology and energy sources (Fig. 5). From the second half of the 18<sup>th</sup> to the early 21<sup>st</sup> century, concentrated energy sources (fossil fuels, uranium) were extracted and processed. Laborious, expensive, polluting and risky technologies were used to convert the energy into high-pressure steam<sup>13</sup>. The 'source flabs' required to obtain high-pressure steam and the 'waste flabs' that deal with the residual products of electricity plants are financially expensive, use a great deal of energy themselves, cause considerable pollution and involve significant risks.

**Figure 5: Technological reversal in electricity generation**

18<sup>th</sup> – begin 21<sup>st</sup> century ⇔

3<sup>rd</sup> millennium

Thermal flows are costly (table 1) ⇔

Harvesting electricity

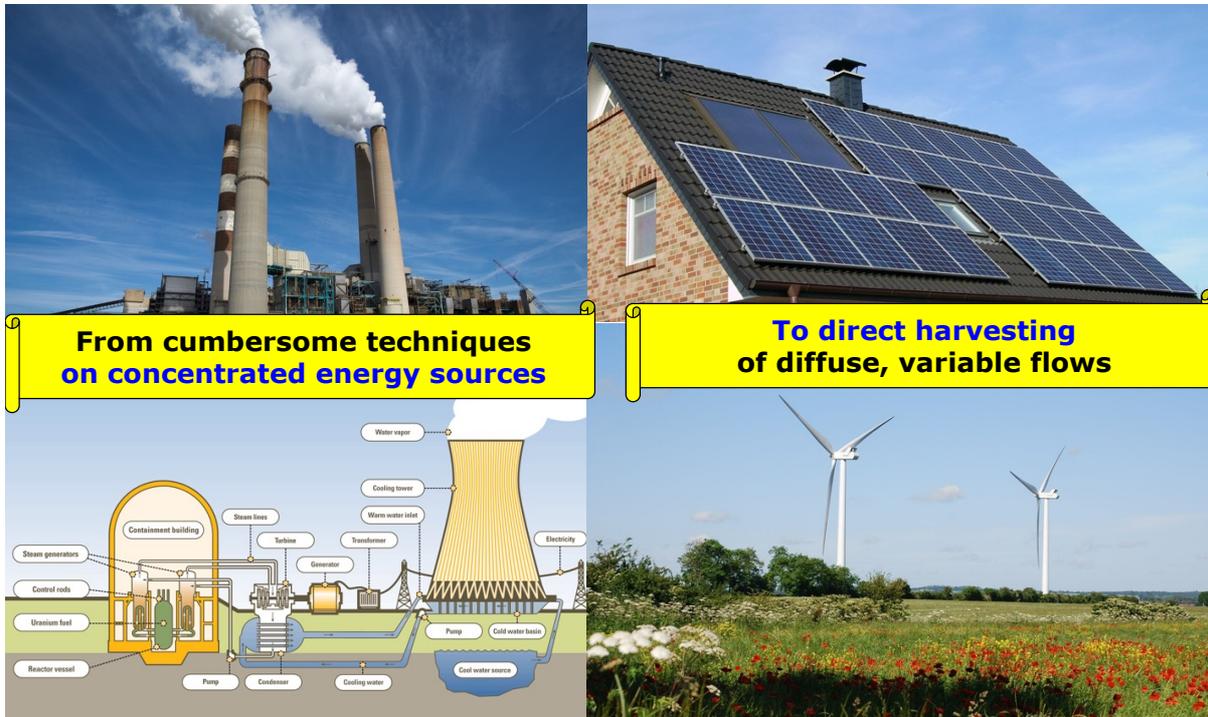
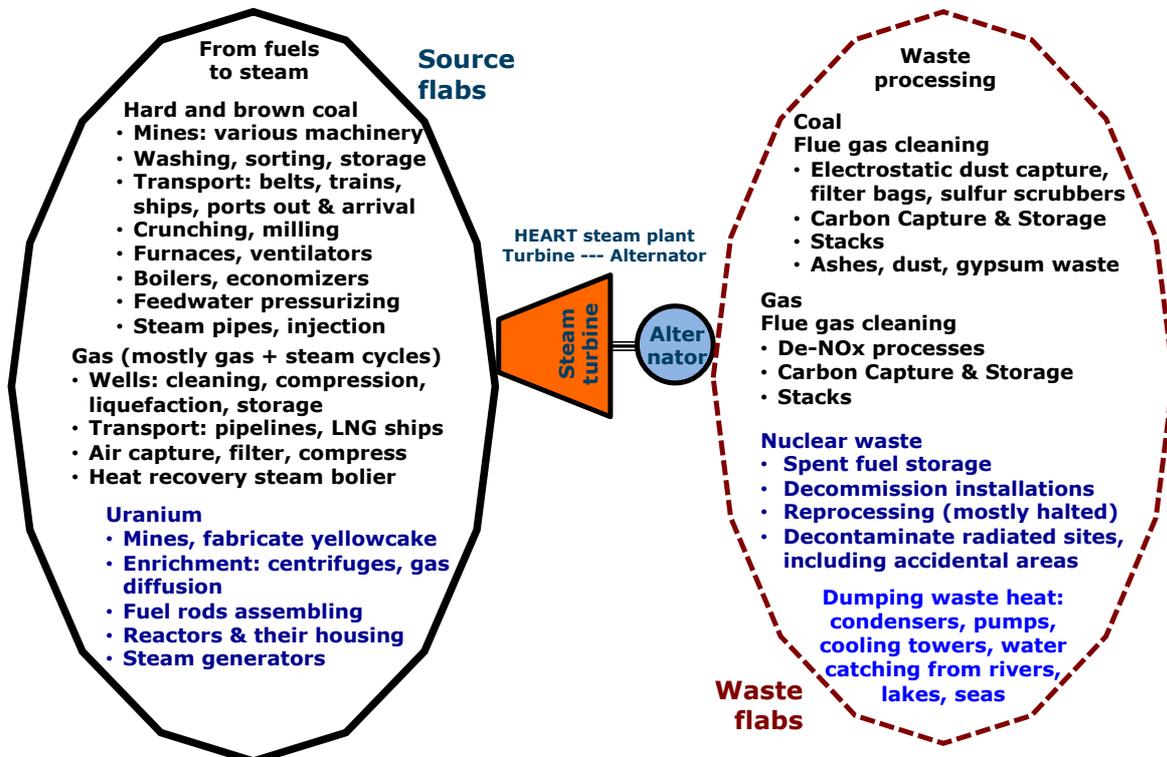


Figure 6 presents non-exhaustive lists of the many infrastructure elements required to supply high-pressure steam to the heart of a steam power plant, where the conversion to electricity takes place with the help of steam turbines and an alternator. But the problems are far from over: making and using steam causes major waste problems, and treating that waste also requires sizeable facilities. In addition, two water cycles are required: one to drive the steam from the heat source (boilers, reactors) through the steam turbine, which is turned back into water at the outlet; the other to provide cooling water to condense the steam outflow. The quantities of cooling water required are massive, particularly for large nuclear reactors. Water is a scarce resource in hot summers, which means nuclear power stations sometimes have to be fully or partially shut down due to a shortage of cooling water<sup>14</sup>.

The production of heat and electricity causes 42% of energy-related CO<sub>2</sub> emissions.<sup>15</sup> The 'source flabs' and 'waste flabs' connected to thermal electricity production cause at minimum 10% of energy-related CO<sub>2</sub> emissions.

Selecting electricity production as a priority sector for climate policy is sound policy, since it is the main source of CO<sub>2</sub> emissions. Tackling this issue boosts prosperity, because thermal electricity generation using fossil fuels and uranium is technically, financially and environmentally outdated. From society's point of view, the externalities of thermal electricity generation have been causing huge damage for a long time, meaning the cost of its kWh output is far higher than the private expenses (table 1). Since 2018, based on expenses only, steam-generated power is no longer competitive with electricity from sunlight, wind and water. Shutting down thermal electricity production is also a priority action that will put an end to a large number of outdated activities. The economically advantageous, less-material intensive way of obtaining electricity from natural currents, is the correction of a rampant, unbalanced system.

**Figure 6: Electricity generation from steam (or gas) flows implies expensive, risky, polluting techniques as source and waste flabs (non-exhaustive lists)**



#### 4. Energy system transformations

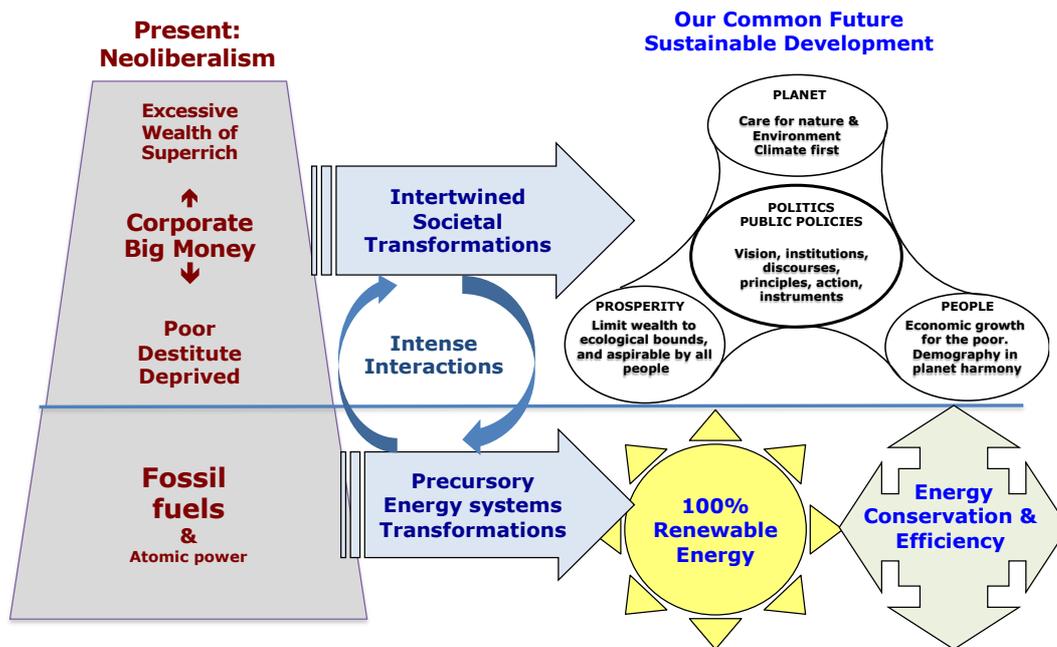
The plural in the heading indicates several transformations, each championed and defended by specific interests. I will discuss two conflicting versions. First, I will describe the transformation that is needed for a liveable future for most people on the planet (Fig. 7); I will then examine the transformation that the European Commission wishes to engineer with its 'Fit for 55' package (Fig. 9). Applicable to both is the logic that "human civilisation is rooted in a substrate of energy and technology" (Section 3, Fig. 4).

The left-hand side of Figure 7 shows the present state of affairs: the dominant paradigm and model for the exercise of power is neoliberalism. The three key features of neoliberalism are: (1) Financial power, concentrated in giant companies and super-rich clans, dominates the politics via loyal politicians, in the making of strategic socioeconomic decisions; (2) Economic growth is unrestrained, increasing the fortunes of the super-rich, with many ecological limits being exceeded; (3) Gross inequality is accepted as normal: charity is sufficient to alleviate extreme poverty. Expecting there are future possibilities of improving the own living condition keeps people in line (consider our own behaviour). Neoliberal growth is intertwined with an ever-increasing use of fossil fuels, which make up more than 80% of commercially-traded energy. Nuclear energy's lower than 10% market share in electricity production, or around 2% of the entire energy supply, confirms its technical and economic inferiority.<sup>16</sup>

The central section of Figure 7 depicts the intense interaction between precursory energy system transformations, forerunners of the intertwined societal transformations. The required new energy substrate consists of 100% renewable energy, 80% of which is in the

form of electricity generated from sunlight, wind, water and other sustainable flows. Local, small-scale production covers most needs, along with additional, limited large-scale production (e.g., in offshore wind farms). The partners of renewable energy production are energy conservation and energy efficiency (Section 2). On this substrate, Sustainable Development for Our Common Future (SD-OCF) can thrive. This is the necessary replacement for neoliberalism.

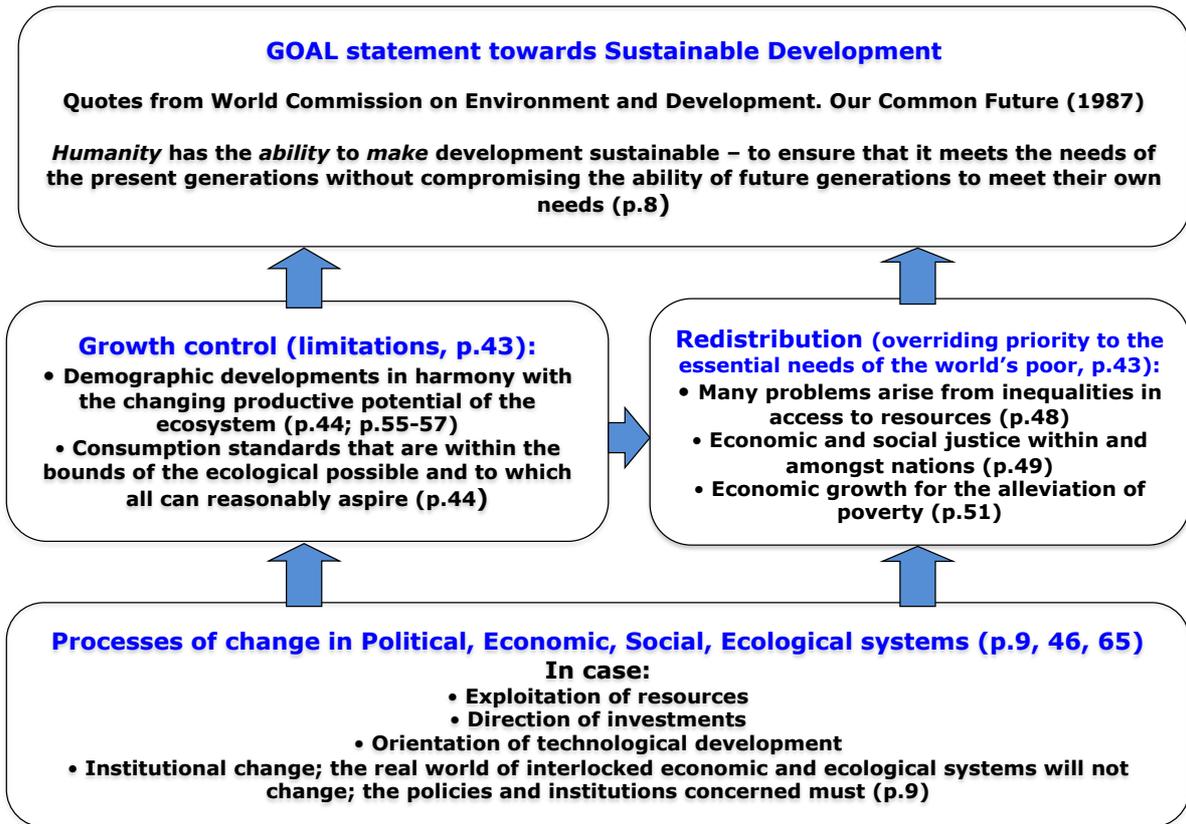
**Figure 7: Societal and Energy transformations for the public good: Sustainable Development and 100% renewable energy**



When the WCED report was released in 1987, right-wing neoliberal thinktanks<sup>17</sup> in the US had their strategy ready: to erode the essential content and replace it with a tidal wave of toothless sustainability discourse. The main goal of the neoliberal strategy was to conceal the responsibility and power of democratic politicians to achieve SD-OCF. An efficient vehicle for doing so was the '3Ps' framework: Profit, Planet and People, whereas SD-OCF implies a 4P framework: Politics, Planet, People and Prosperity, with Politics central, as shown in Figure 7. The 3P framework is like the blades of a wind turbine without an alternator: they turn, but produce nothing. Achieving Our Common Future via Sustainable Development depends on the central, driving factor of Politics.

The SD-OCF paradigm is a replacement for neoliberalism. Because few people have read the WCED report, Figure 8 provides a synopsis of its contents using quotes from the original report.<sup>18</sup> After 1987, in addition to the 3P reduction, one-liners were launched as 'definitions' of sustainable development, such as "*Development that meets the needs of the present without compromising the ability of future generations to meet their own needs*". The reader is left guessing about what these 'needs' are (see Section 2 on energy conservation and the classification of activities). In addition, such one-liners are not definitions of sustainable development, only a description of its general goal. The first quote from Figure 8 sets out the general goal, beginning with a few important words: "*Humanity has the ability to make ...*". In other words, people and democratic politics have to make something happen; sustainable development is a possibility, it will not happen automatically.

**Figure 8: Sustainable Development: GOAL statement and content SUBSTANCE**



The substance of sustainable development comprises three linked elements: control of growth, redistribution and change. Each of the quotes is worth memorising and discussing in its own right. The final sentence in Figure 8 says that policies and institutions must change in order to achieve sustainable development: Politics cannot avoid its responsibility.

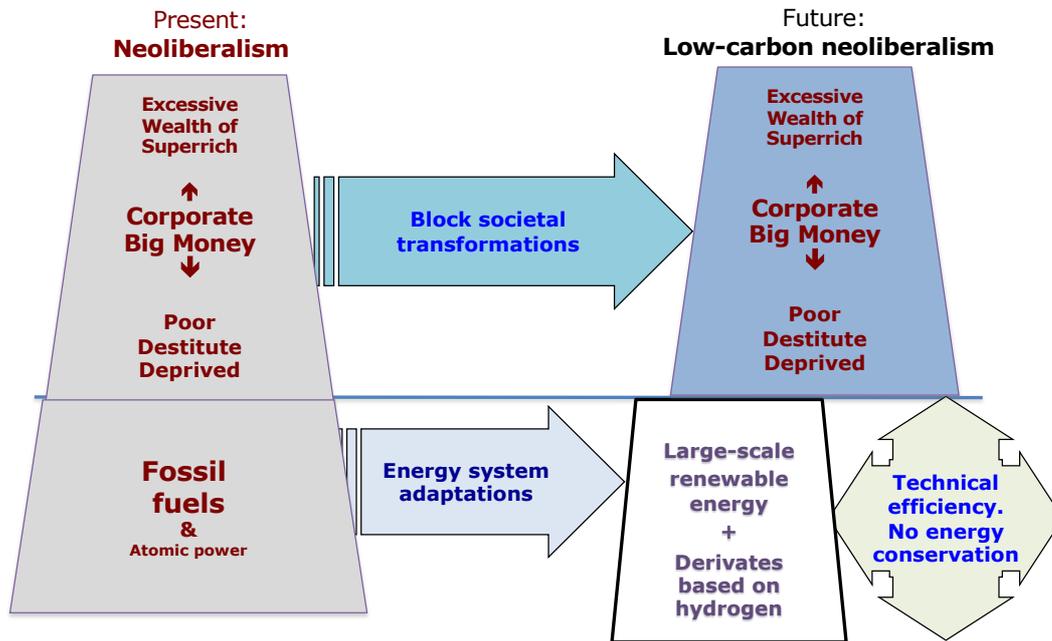
Figure 9 depicts the EU Commission's plan in its Green Deal: converting fossil-fuel-based neoliberalism into low-carbon neoliberalism. This requires adjustments to the energy system. The EU Commission wants to rely on investment from established energy corporations in large-scale renewable energy projects. It believes technical efficiency improvements will be sufficient, because energy conservation is politically too difficult and would reduce the growth figures of the Gross Domestic Product.

On 14 July 2021, the EU Commission placed 4,053 pages of documents online: the 'Fit for 55' package, a field day for consultants, lobbyists, civil servants, academics, NGOs and others.

The eurocentrism of the package lacks the universal vision for coordination within a global strategy. Continued economic growth in the EU is paramount, with blind faith in neoliberal economic recipes. The narrow approach is hidden beneath a flood of words in bold, such as "*international solidarity*", "*transformational change*", "*socially just transition*", and so on.

'Sustainable Development for Our Common Future' is neither a goal, nor a guiding principle, for the EU policy. 'Fit for 55' contains phrases such as "*a sustainable Europe in a sustainable world*", "*sustainable growth*", "*sustainable competition*", "*sustainable fuels*", etc. 'Fit for 55' supports 'low-carbon neoliberalism', in which the use of fossil fuels is reduced, with the goal of becoming 'carbon neutral' by 2050.

**Figure 9: Decarbonising, 'carbon-neutral' energy system preparing a future of low-carbon neoliberalism**



The EU Commission is bowing down to neoliberalism without a blush; 'Fit for 55'<sup>19</sup> literally puts it in writing:

(1) *"It (the package) ensures that industry can lead the transition, and gives it the certainty it needs for boosting investment and innovation. It focuses on taxing energy sources in line with our climate goals and environmental objectives. The package translates the polluter pays principle into practice"*.

To the EU Commission, polluters are households, schools, hospitals and other small-scale users of electricity and fuels.

(2) *"The European Green Deal is a growth strategy, and as outlined in the EU's updated Industrial Strategy, the Fit for 55 proposals offer significant opportunities to develop, deploy and export low-carbon technologies and green jobs". "In reviewing the environmental and energy State aid guidelines the Commission will pay particular attention to ensure that they mirror the scope and ambition of the European Green Deal"*.<sup>20</sup> For example, the European Commission does not question the growth of aviation, nor how the benefits and burdens of aviation are distributed among frequent flyers and the communities affected by airports, noise pollution and climate change.

(3) The package provides for the expansion of the existing 'emissions trading system' (ETS) and the setting up of an additional ETS for road transport and buildings. The ETS produces "revenues", paid for by users of electricity, buildings and vehicles, because "tax warehouses and fuel suppliers have only limited possibilities themselves to reduce emissions".<sup>21</sup> The new ETS system provides: "25% of expected revenues will in principle go to a new Social Climate Fund to tackle energy poverty and mobility problems for the vulnerable low and middle-income households, transport users, and micro-enterprises".

The European Commission seems afraid of vulnerable people protesting in the streets, but at the same time it is unwilling to hold the super-rich accountable. 75% of the "revenues" goes to fuel sellers and the European Commission. This amounts to the taxation of citizens without an explicit democratic decision; similar to the existing ETS system, who pays and who receives what amounts, for what reasons, is completely opaque.

The conflict around the Magna Carta (which started in the year 1215 in England) was about the power to levy taxes, which has been a crucial aspect of the democratic functioning of states ever since. Imposing taxes on a constituency is the exclusive right of the constituency's (democratically elected) representatives. The amounts levied are reported in publicly available documents, like are parliamentary documents. In verifying the national accounts of the nations, the International Monetary Fund requests detail about taxes and subsidies applied by the nations. Nations properly applying the taxation rules, are keen to protect their sovereign and exclusive authority on taxing their constituencies (for example the UK when it was a member state of the EU).

Entrusting to large energy corporations the power to tax energy use does not promote democracy.

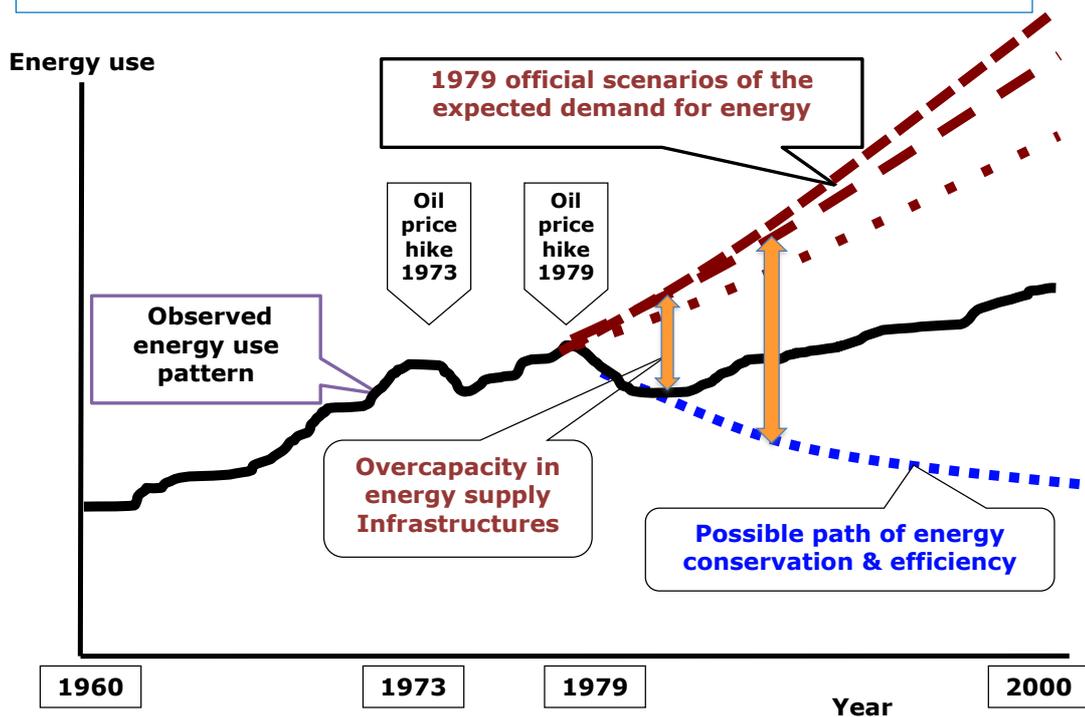
## 5 Learning from a missed opportunity for energy transformation

*'Learning from the past may prevent mistakes in the present'*. Profound transformations take place when a crisis (real or assumed) occurs. In a crisis, the actions taken depend on the ideas that are present. This means developing alternative proposals and keeping them alive and available until the moment when the politically impossible tips over into the politically unavoidable.<sup>22</sup>

In the 1970s, the leading crises were caused by sudden oil price rises in 1973 (the Yom Kippur/Ramadan War) and 1979 (Islamic Revolution in Iran). The exponential increase in oil consumption came to a halt in 1974, with a sharp drop in 1975 accompanied by an economic recession. After 1975 energy use rose again, but less quickly than before 1974. The black line in Figure 10 shows the pattern of energy use recorded for the period 1960–2000. The 1979 price shock had a huge impact on energy use. In 1973, the price shock came like lightning from a clear sky: there were no ideas, no technologies, no practices for using energy in a more efficient manner. At the time, energy waste was significant; 'saving energy' meant sealing holes and cracks in buildings and having carless Sundays. After 1973, energy was a hot topic, and 'Rational Energy Use' became a goal. Research into efficient technologies and practices was given funding, so that by 1979, ideas, new technologies and fledgling experience were available to bring about a drop in energy use. The other factor that contributed to this drop was the economic recession caused by the huge spending on imported oil. Oil-exporting countries, united in the OPEC cartel, and transnational oil companies siphoned off billions of USD in rents (super-profits without effort), mainly from European and Asian oil-importing countries (a situation for which the [2022 War in Ukraine](#) is once again paving the way).

Politicians and CEOs of large companies paid little attention to energy conservation and efficient use, turning their attention instead to increasing energy supplies, with actions such as: mining more coal in Limburg, building LNG (liquid natural gas) infrastructure in Zeebrugge, signing gas purchase agreements with Algeria and constructing additional nuclear power stations (Doel 3 and 4; Tihange 2 and 3; with plans for Doel 5 and Tihange 4). The 'Energy White Paper' (1979) published three scenarios for future energy demand in Belgium. Belief in exponential growth was still the guiding principle (Fig. 10), so the White Paper suggested the low-growth scenario was dangerously unrealistic. Supply-side capacity for the high-growth scenario has subsequently proven to be over-capacity, consisting of capital-intensive, long-lived infrastructure. This has hijacked energy policy ever since, and blocked the potential path of energy conservation and efficiency. During the 1980s, the oil price halved, and energy use climbed once more.

**Figure 10: Lost opportunities for energy conservation and efficiency**



The period 1973–1985 is a source of various insights, including:

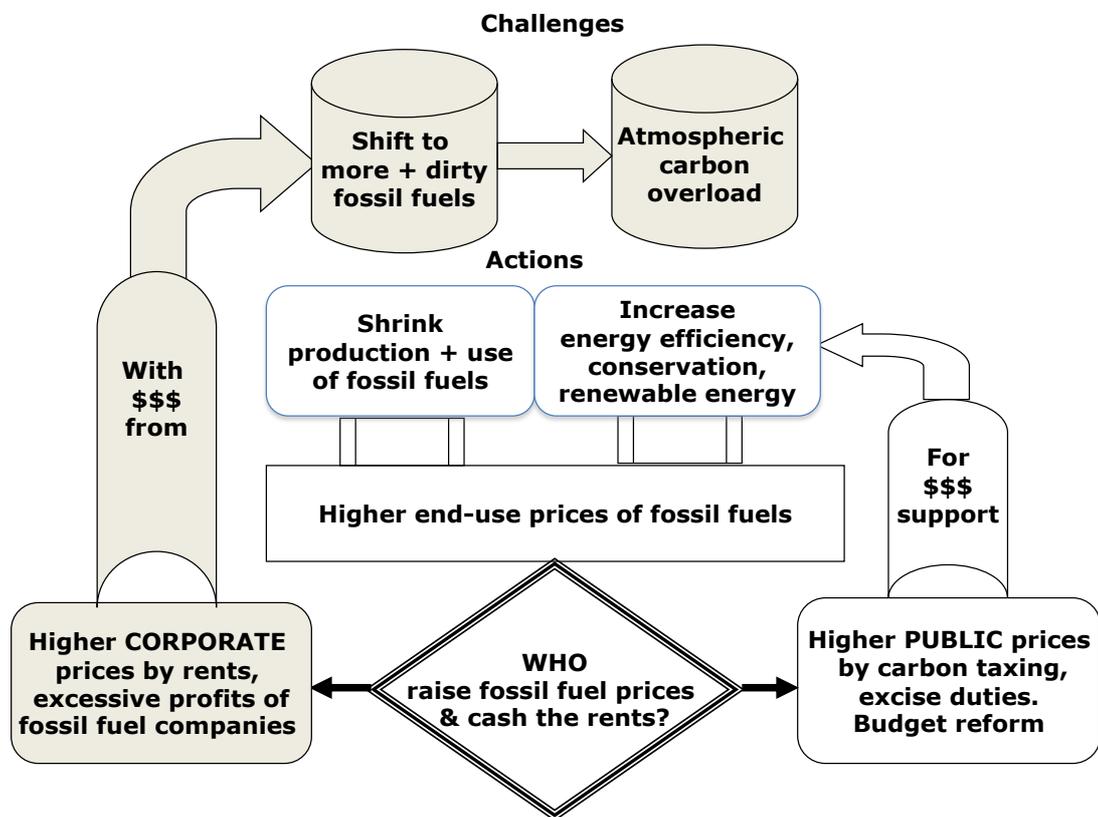
- A supply-driven energy system leads to over-capacity, which inhibits and undermines energy conservation and efficiency.
- The difference between the responses in 1973 and 1979, and the recovery after 1983, teach us that if ideas, technologies and practices for efficient and carbon-free energy use are present during a crisis phase, another path is possible, but not guaranteed. The fossil fuel and nuclear energy sectors want market share and expansion.
- Price is a key factor in determining the type and quantity of energy used by end users in a wide range of applications. For the part of the world with above-average incomes, more consumption is an important life goal.
- High energy prices encourage energy conservation and efficiency, and the development of renewable energy. When prices are low, many of these initiatives are put on the back burner or stopped altogether.
- Oil prices can rise suddenly, then fall again, then rise again. Such fluctuations confuse end users and politicians, and are a hindrance to future-focused energy policy.

Setting the oil price (which has a strong influence on the prices of other types of commercial energy) is not a neutral activity. The oil price is set either by transnational oil companies and their friendly export countries, or by governments through excise duties, carbon taxes, budget reform, etc. Figure 11 shows the contrasting options in the context of climate policy with challenges and actions. The challenges arise from the use of more (or dirtier) oil that aggravates the carbon overload in the atmosphere. The actions consist of reducing oil production and use and increasing energy conservation and efficiency and local renewable energy.

When oil companies set the prices, they receive hundreds of billions, sometimes trillions of USD in rents, royalties, super-profits, which they can use to strengthen and extend their business model. When governments set the prices through various taxes, the financial

revenue remains in the country and can be used for public purposes, such as support for low-income households, research and development, renewable energy technology, and so on. Price control by transnational corporations or by national governments supports two diametrically opposed objectives.

**Figure 11: Two ways of oilprice setting, cashing and spending rents**



Well-designed taxes respect the diversity of applications and users, and take into account the distribution aspects of taxation. For example: a government may place a heavy tax on fuel for helicopters that are used for leisure travel, but subsidise helicopters when they are performing rescue operations. A tax on household energy use with a progressive structure can ensure that prolific users pay more than small-scale users. The diverse and socially-oriented application of taxes and subsidies is a far cry from what the European Commission, neoclassical economists and neoliberal interests are proposing with the [emissions trading system](#) or a uniform carbon tax for Europe.

Money is a key driver of actions, but effectiveness, efficiency, fairness and practicality depend on the context and shape of the inducement.<sup>23</sup> There are also drivers other than just money.

## 6. What policies can prevent climate collapse?

Climate change due to global warming is the consequence of the increasing, and already far too high, concentration of greenhouse gases (GHGs) in the atmosphere. This increasing concentration is the result of annual GHG emissions, abbreviated as  $C_e$  (Carbon emissions).  $C_e$  represents the emissions of six greenhouse gases: carbon dioxide (CO<sub>2</sub>), methane (CH<sub>4</sub>), nitrous oxide (N<sub>2</sub>O) and three fluoride (F) gases. The warming effect is different for each gas; CO<sub>2</sub> is the reference, and the other five gases are assigned a CO<sub>2</sub>-equivalent (CO<sub>2</sub>eq) weight.  $C_e$  is currently around 50 gigatonnes (= billion tonnes) of CO<sub>2</sub>eq emissions per year.

### *Three periods of human civilisation*

Energy use causes 75% of the  $C_e$ , and is consequently the priority issue for climate policy focusing on the target  $C_e = 0$ .<sup>24</sup> Energy and Technology are the substrate of human civilisation (Fig. 4, 7 and 9), in which three periods can be distinguished: first, renewable energy from the emergence of *Homo sapiens* until the end of the 18<sup>th</sup> century; second, the period of fossil fuels and nuclear energy, which will end in the first half of the 21<sup>st</sup> century; from now on, the unlimited third period of energy products and services from renewable sources, mainly harvested as electricity currents with increasingly improving technology (Section 3 and figure 13).

The second period, with the increasing use of fossil fuels, was and is turbulent, as if we were holding an increasingly wild party, drawing on the abundant reserves of energy accumulated over millions of centuries by the interaction between sun and earth. The party could go on for hundreds of years more, were it not for its creation of unavoidable solid, liquid and gaseous waste. This waste already caused a trail of destruction; Planet Earth, the soils, water cycles, atmosphere and accompanying climate, cannot absorb any more waste.

Because the intoxication of this second period was widespread and addictive, kicking the habit of fossil fuel use is painful, turbulent and involves [violent episodes](#). The outcome is uncertain, as outlined in Section 4 (Fig. 7 and 9) as two possible paths. The right path leads to Sustainable Development for Our Common Future (Fig. 7): a qualitative leap towards greater humanisation by ensuring rights to a decent life for all. Perpetuating and strengthening the neoliberal social model (Fig. 9), is not a beneficial path to take: it delays the task of transformation, making the future darker instead of brighter. As happened since 1992 until today, more precious years will get lost, notwithstanding the paramount urgency to act now.

### *Ideas and Sustainable Development paradigm*

Navigating these turbulent times is a huge challenge. Push and pull forces come at us from all sides. We repeatedly hear and read the adjectives 'complex' and 'wicked'; they are more likely to lead to confusion and paralysis than understanding. However, understanding is required if we are to imagine, support, promote and build a humanising future. This is a task for all young people, who must decide which major they should choose, which diploma or certificate they should obtain, which job(s) they will later perform, in which speciality they should perfect their skills, and so on. Everyone can contribute, because of the multifaceted, diverse and all-embracing nature of the challenge and task of unlocking and carefully shaping the third period of human civilisation.

Breakthroughs begin with ideas that create new paradigms, recorded in narratives, as described in art and theatre: *"To live is to live with narratives. Without narratives, we do not exist. Not as individuals, nor as a group. Once, narratives gave us cohesion and meaning. They connected the past with the future and gave direction to the present. They held a community together. They told of its origins and its development. They gave a place to every individual and meaning to every event. In the confusion of a time of transition, we can only tell narratives about conflict and destruction. The new is tangible only in the shattering of the old."* (Wim Vandenkeybus & Ultima Vez, dS 16/2/2019).

Narratives are interwoven with myths, symbols, imagery, arguments, discourses, language, with many facets and levels where people act and interact, and the public factor (politics) plays a role. Many population groups, with different backgrounds and experiences, contribute to conceptualisation and discourse, which leads to conflicting world views and ideologies. Vested interests invest in conceptualisation that maintains their privileges, including in relation to climate policy and energy system transformations. This makes it incredibly difficult to formulate a new paradigm and build up sufficient support for it.

It is fortunate that from 1983 to 1987, the twenty-two members of the World Commission on Environment and Development (WCED) set down in writing the paradigm of Sustainable Development for Our Common Future (SD-OCF) (Section 4, Fig. 8). The WCED and its report were a response to two important post-WWII issues, development and the environment, which the prevailing conceptual frameworks and conventional politics had failed to solve. A new conceptual framework and new politics were required.

Although it is possible to comment on or update the WCED document, it is unnecessary, because its contents are sufficiently clear to be applied as a future paradigm. Young colleagues (in their twenties and thirties), to whom I have recommended reading the WCED report, are astonished at how current, balanced and apt the text remains. Colleagues such as M. Mazzucato<sup>25</sup> and J. Eeckhout,<sup>26</sup> whose reputations are growing with confirmation of prominent roles in Politics and Public Policy. Reclaiming a place for Sustainable Development as the leading future paradigm will curb neoliberalism.

The 4P concept (Fig. 7), with Politics at its centre, is an essential depiction of this process of reclamation. During lectures, participants sometimes suggest adding Peace (peace and security as preconditions for development), Precaution (which reduces the impact of risks), Prevention (avoiding problems is better than fixing them), and so on. These are useful additions, but adding things takes time and could muddy the main message. Moreover, as SD-OCF unfolds, other positive aspects will be given more space.

### *Overview of Section 6*

Section 6 is longer than planned, and contains five subsections. In 6.1, the key problem of climate change in society is characterised as relating to 'unique, global commons', with a brief explanation of what those three words mean for climate policy. Drivers of human actions (6.2) are important to work out which policies could work to avert the impending climate collapse. The scientific approach of 'commons' developed and applied by E. Ostrom can also be used in global climate policy in need of a forceful start (6.3, Fig. 12). In 6.4, the self-evident statement that 'transformation requires U-turns' is explained with examples (Table 2), and used to justify giving priority to local, small-scale renewable electricity generation projects. IRENA reports show that electricity from offshore wind can cost twice as much as electricity from onshore wind (Fig. 13); however, offshore wind is given preferential treatment to preserve the business model of large electricity companies. Subsection 6.5 searches answers to the difficult question, 'Act-Now, but How?' This subsection is divided into a further five parts. Each part ends with a box offering a list of key points.

'New voices' (6.5.1) provides five suggestions for an appropriate disposition and approach. The importance of a 'Paradigm shift' (6.5.2) also provides information about the distribution of the income and proceeds of economic growth across the global population (Fig. 14). The stakeholders in the paradigm shift from neoliberalism to sustainable development constitute a sizeable majority. The transformation of energy systems is a driving force for U-turns (6.5.3). Five pages are spent on the topic 'What matters is power' (6.5.4). The topic of power is highly challenging: it is essential to achieve transformation, but the social and political sciences offer no unanimous interpretation or recommendations. Section 5 concludes with 'Navigating turbulent crisis situations' (6.5.5), providing a few hints on how to stay on track towards the ultimate goal of sustainable development built on decentralised, renewable electricity production.

## 6.1 Climate change is the key problem

The purpose of identifying climate change as the key problem is not simply to manage the problem or to isolate it from related factors and developments. Such identification is required to attract attention and resources for priority actions.<sup>27</sup>

GHG emissions and their concentration in the atmosphere continue to climb, year after year, even though at the World Summit in Rio de Janeiro (1992) world leaders agreed “to achieve (...) stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system”, “on the basis of equity and in accordance with their common but differentiated responsibilities and respective capabilities”.<sup>28</sup> In Paris (2015) a similar promise was confirmed again, but GHG emissions continue to rise. By 2022, thirty important years had been lost due to inadequate policies at all levels: global, European, national, local.

In addition to climate change knowledge from the fields of physics, chemistry, climatology, biology, etc., a problem definition from a social perspective is required. Atmosphere and climate are ‘*unique, global commons*’. Each of these words points to a particular difficulty:

- *Commons*: Property that is not subject to private property rights. It can be freely used: the exclusion of users is impossible or, if possible, undesirable. In principle, use is free of charge. If there is no overuse or abuse, no user interferes with other users and the commons are preserved. Overuse and abuse can lead to the devaluation and even destruction of commons. To prevent this, political intervention and public policy are required.
- *Global*: At this policy level, participants are the sovereign nations of the world, which have joined together in the United Nations (UN). There is no power higher than a sovereign state, apart from powers that have been ceded to UN institutions by convention. In terms of climate policy, the UNFCCC was signed by world leaders in June 1992. The convention came into force on March 21, 1994. The framework convention is supposed to be implemented through the COP (Conference of Parties), held each year since 1995 (with the exception of 2020, due to COVID). The COP has not yet transformed the rise in global GHG emissions into a necessary, drastic and urgent decline.
- *Unique*: The Earth has only one atmosphere and one climate, and their proper functioning is an essential prerequisite for human life on Earth. Emissions of greenhouse gases and harmful, toxic gases disrupt the mild effect of the climate and the absorption capacity of the atmosphere. These disruptions may progress into the absolutely irreversible<sup>29</sup> loss of the functional services of atmosphere and climate. This situation is also termed climate catastrophe, or climate collapse. The consequences are dramatic in terms of the loss of homes and possessions, human habitats, and human lives. The most-affected population groups are those who are the least to blame for rising GHG emissions. Imminent irreversibility demands drastic and urgent emission reductions.

## 6.2 Drivers of human actions

Transformation is a far-reaching form of action, and has more advocates when the results are rewarding for them. Human actions are a key theme of most social and human sciences, such as anthropology, philosophy, political philosophy, sociology, history, law – and also economics. To discuss the approaches and results of the many fields of research here would be impossible. But limiting ourselves to a purely economic view would be too narrow and misleading. Discussing some basic ideas about drivers from non-economic researchers places the economic approach in a broader perspective.

In the final quarter of last century, philosophers focused a great deal on mimesis as a driver of human actions.<sup>30</sup> Mimesis has two opposite sides: positive is the teaching, up-bringing, education and training of young people or other newcomers to a community;

negative is mimetic envy ('what others own, I want to own too') as a source of rivalry between people. Girard revealed the core problems of social history: the mimetic nature of all human desire, the emergence of conflict and violence, and the fundamental scapegoat mechanism, with which the community suppresses internal violence by directing it at a scapegoat, representing the broader collective's vulnerabilities and transgressions, who is sent into the wilderness or nailed to a cross.

Earlier, Kant had suggested that human passions are not focused on objects; instead, they are desires in relation to other people. Kant, and later Ricoeur, referred to three passions or drivers: Matter (possessions), Power (domination) and Honour (prestige). Ricoeur considered Prestige to be based on Power, which in turn is based on Possessions; in other words, the original organisation of human communities is essentially economic. In 2014, Hardy suggested a fourth driver:<sup>31</sup> Knowledge, the passion of artists, scientists and curious individuals.

To a certain extent, the economic self-interest of people, individually and collectively in groups, clubs, communities, companies, etc. colours the other drivers. Self-interest is an ineradicable force with positive and negative aspects. I compare it with gravity in the physical world: science still does not completely understand exactly what gravity is; it is a force that operates everywhere, continuously; it creates order because it keeps things in place, and without it, chaos would reign. To achieve desired higher goals, it is necessary to transcend this force, otherwise everything would stand still. All of these aspects of gravity apply to the operation of human self-interest, of which economic self-interest is the easiest form to measure due to the existence of money (the universal equivalent used to trade goods and services).

The positive effect of human self-interest is that it provides sound, appropriate solutions to most problems in society ('*put your own house in order first*'). Persons may not always know exactly what they want, but they will have a better idea than other people. This includes finding the most suitable solutions and approach to appropriately achieve what is desired, taking into account the specific context and limited possibilities (including the available budget). Allowing people freedom of choice as 'sovereign' consumers is a reasonable starting point, although in practice the bombardment of advertising and lack of reliable information seriously damage that sovereignty.

Unbalanced self-interest has negative consequences for the community and for the person concerned, whether too much self-interest (egotism, greed) or too little (self-torment, neglect). A favourite figure in theoretical economics is Robinson Crusoe, alone on an island. In reality, people are social creatures, tiny cogs in mimetic relationships within communities and in a world filled with many people.

If people want to achieve and protect higher goals – the highest goals, such as safety, freedom and equality – to a certain extent they must put aside their own short-term, material interests and work together in communities. Successful collaboration is rewarding for all participants, but it is fragile if it is possible to escape the duties of collaboration (stealthily or otherwise) while retaining the benefits.<sup>32</sup> How people behave depends on their moral convictions, the context, the matter in question, previous experiences and social control. This last factor opens up a broad range of options in terms of political regimes, from democracy to autocracy.

In his book *Leviathan* (1651), Thomas Hobbes formulated the still-influential theory of the social contract. To live together in peace and avoid the danger of conflict between citizens, which can be fatal, citizens must submit to a ruler who does not have to justify his or her decisions on social and political matters. Referencing Hobbes, Wolin (2010, p.239) said: "*if citizens feel unsafe, and if they are driven by competitive aspirations, they will choose political stability over social engagement, protection over political participation*". He criticised American neoliberalism that promotes and maintains aspirations and a lack of security. Top-down authority can also be democratically delegated; a perfect, properly functioning democracy is a subject of great concern, with a confusing and cluttered literature.

The difference between *top-down* (where one power – which may or may not be delegated – is imposed and enforced over the community's rules of cooperation) versus *bottom-up* (where sovereign parties agree on and comply with cooperation) is important in energy and climate policy at all levels, from local to global. In stark contrast to the neoclassical economic ideal of a global uniform carbon price, social scientists (and some economists) have formulated proposals tailored to the extremely diverse world, with many policy levels and centres, organisations and institutions.<sup>33</sup> Nobel Prize winner Elinor Ostrom<sup>34</sup> was a pioneer in the study of bottom-up cooperation between sovereign parties. Her research into existing bottom-up management systems for local commons provided insight into the necessary components and factors for the successful development of such systems. She organised her insights into a scientific methodology for 'Institutional Analysis and Development'. The core of this methodology is the consideration by the sovereign actors involved of the expected costs and benefits of participation in the bottom-up approach. Because actors can opt out, the benefits must be greater than the costs, and the management must be effective, efficient, fair and completely transparent. To meet the requirements, the management rules applied must be suitable to the specific commons and context, and aligned with other administrative entities (such as the central government). Ostrom's scientific method is also extremely useful for climate policy, at various levels from global to local, where an exceptional degree of personal initiative and self-governance is required to achieve energy and societal transformations. Section 5.4 contains a diagram showing how Ostrom's recommendations are applicable to global climate policy.

### 6.3 Self-governance of sovereign nations in global climate policy

After 30 years of improvisation from mega-gatherings (UNFCCC, June 1992, and 26 COPs since 1995) to prevent dangerous climate change, the Ce continues to climb.

Taking immediate steps in the right direction – steps which grow bigger each year – is more important than unenforceable intentions with no results. Because the nations of the world are sovereign, and no binding global authority exists (yet), the methodology of self-governance developed by Ostrom is a welcome approach. Figure 12 is a diagram showing how the components of the Ostrom approach can be applied in global climate policy<sup>35</sup>.

UN member countries are sovereign: they govern themselves, and govern global public affairs jointly, in a reality with many levels of policy (local, regional, national and international) and numerous centres of decision-making that all interact with each other.

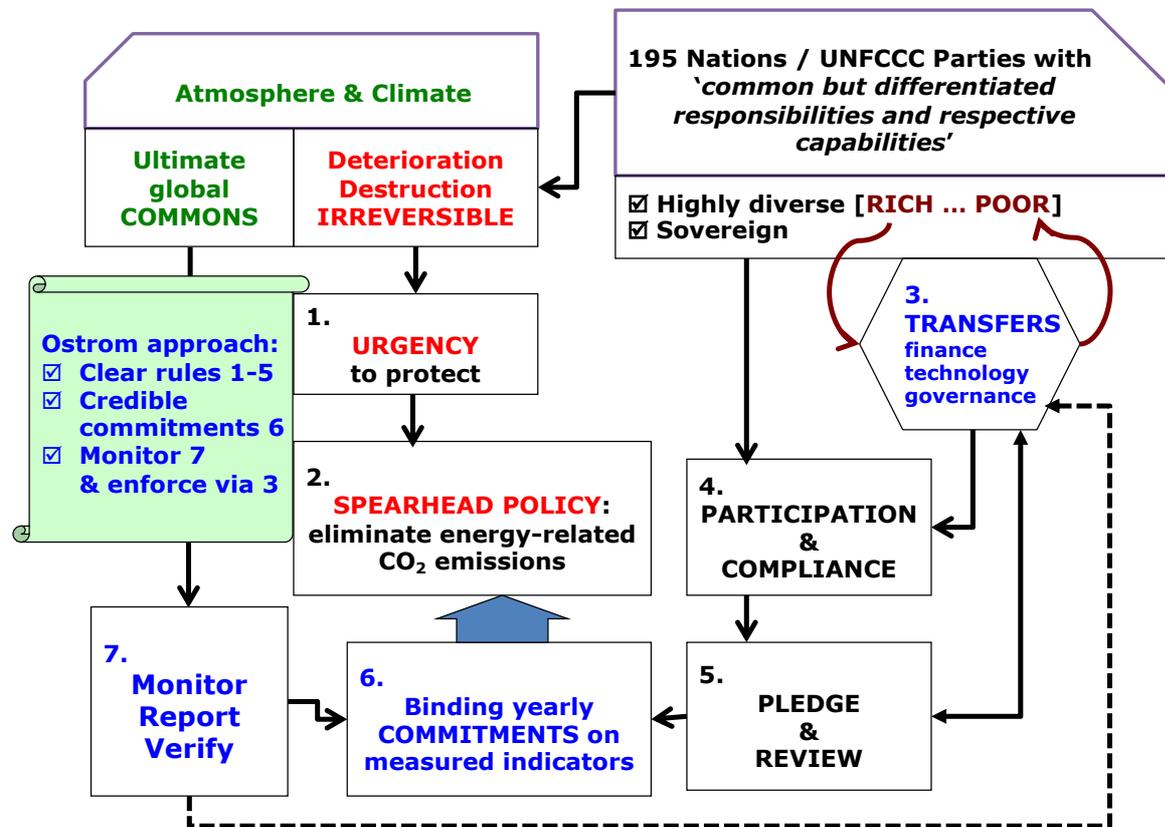
Keeping that tangle of policies in order requires a three-part approach, Ostrom (1990, p.42) calling it the three 'puzzles': 1) Setting clear, appropriate new rules, when rules are missing or when existing rules fail in building robust, stable institutions for self-governance among sovereign actors ; 2) Credible commitments and input from the sovereign nations (based on reciprocity, trust and fairness), and 3) Mutual monitoring (with enforceable measures). "Without monitoring, there can be no credible commitment; without commitment, there is no reason to propose new rules. The process unravels from both ends ..." (Ostrom 1990, p.45). Mutual monitoring is precarious in many situations, but seems less problematic among sovereign nations, when the rules and the data are clear and transparent for all participants.

The Ostrom approach can be applied to global climate policy (Fig. 12), with the COPs being given the task of organizing and managing the self-governance process at the global level. Actual policy-making for selecting, performing, controlling real actions, etc., happens at the sub-global levels of the multi-level policy and politics kaleidoscope, with its numerous polycentric decision centres.

'Atmosphere and Climate' are susceptible to deterioration and destruction that is absolutely irreversible (not '*potentially irreversible*', as stated in the 2015 Paris Agreement). Protection is urgent (Rule 1), which means priority actions are required (Rule 2). It is up to UN member countries to shape the climate treaty: they are sovereign but highly diverse, and they sit on a broad spectrum from rich to poor. The close link between climate and sustainable development requires a robust mechanism of transfers from rich to poor: financial, technological and governance-related (Rule 3). Guaranteed, transparent and performance-linked transfers play a crucial role in effective climate policy. They encourage

participation and compliance with the agreed rules, so that joint determination is gradually achieved (Rule 4). Rule 5 is the step where countries make pledges; the pledges are checked for realism and may be reviewed. Rules 4 and 5 are closely linked to transfers.

**Figure 12: Sovereign nations: selfgovernance in global climate policy [Ostrom]**



The sixth step consists of the annual (at the COP) formal communication of binding and steadily increasing commitments by and for every country. These are quantitative commitments to reduce CO<sub>2</sub> emissions from energy use. They may relate to the share of renewable energy in total energy use, the energy intensity of the Gross Domestic Product, or financial stimuli for budget reform (tax shift) to stimulate carbon-free activities and reduce carbon-intensive activities. Step 7 is the final stage of monitoring: measuring and tracking the six previous steps, producing an annual quantitative and transparent report, verifying that figures reflect the true facts. Without monitoring (Step 7), the commitments (Step 6) are not credible; without commitments, the rules (1–5) are pointless.

This application of the Ostrom approach creates a meaningful role for the COPs. It is not their only role: 30 years of wasted time has seen climate change reach an extremely precarious situation, with increasingly negative impacts, loss and damage. Huge transfers are necessary from rich countries to poor (see the 100 billion dollars per year, pledged at COP15 in Copenhagen, 2009; pledged again at COP21 in Paris, 2015; still not paid in 2022). The criteria and rules for this compensation are separate from the emissions reduction approach.

#### 6.4 Transformation requires U-turns

Section 5.1 concluded that drastic reductions in greenhouse gas emissions are urgently required. The continuously rising Ce curve needs to bend downwards, almost vertically to  $C_e = 0$ . Section 5.2 talked about the energy price crisis in the 1970s. This crisis opened a window of opportunity for alternative ideas and proposals, if any were available. However, the alternatives were in an embryonic state at the time, and insights were too limited to prevent neoliberalism. Section 5.3 discussed the drivers of actions, with a particular focus on economically motivated drivers for individuals, and for individuals in a community; in other words, for citizens in society.

How can we seize the opportunity today to take drastic, urgent action to benefit the environment and development? Deep transformations are needed, not gentle curves but U-turns in energy systems and many of the societal structures built on them. We must find a synthesis of new and existing elements, rejecting some and strengthening others. Dialectics offer a conceptual framework for U-turns. A dialectic (Hegel) explains dynamic phenomena as gradually increasing tension between thesis and antithesis that quantitatively builds until it reaches a tipping point, creating a qualitatively new state, the synthesis. Marx applied dialectics to the progression of history, which provided insights but no overall explanation or guaranteed predictions.

A qualitatively new synthesis is a radical concept, applicable to the transformations needed now to take human history from the second to the third period. The pressure to do this drastically and urgently is increasing, since the dominant neoliberalism has been negligent, and is too incompetent to see or to tackle the real-world issues to safeguard mankind.

In contrast to the penultimate opportunity during the 1973–1983 period of crisis, the energy and technology substrate today is fully ripe for a U-turn. This is reassuring, but should not paralyse us as we search for forms of governance to give effective shape to the U-turns. For example, how technology develops – whether in a centralised or decentralised way – is now a matter of capital interest, which is mainly decided at a political level. The decisions made have a significant effect on the energy substrate and the organisation of societal activities (neoliberalism versus sustainable development).

##### *Renewable electricity: the flawed transformation*

The energy transformation has two main axes: one, the use of electricity as the most common, indeed almost exclusive commercial<sup>36</sup> energy carrier to support human activities; and two, the extraction of electricity from natural flows, primarily wind and sunlight, using wind turbines and photovoltaic cells. Today, these technologies supply the cheapest kWh in history. Since the 1990s, far-sighted politicians in Denmark and Germany have achieved this technical and economic success, with the use of an appropriate financing mechanism. The momentum supplied by ongoing action by citizens, cooperatives, environmental NGOs, scientists, forward-thinking entrepreneurs, and so on, provided the necessary oxygen for the development process for these technologies. The decentralised, local, community character of this transformation is the polar opposite of the top-down climate policy of the European Commission (emissions trading) and investments by the oligopoly of giant electricity companies (construction of coal and gas-fired power plants and nuclear power plants).

However, around 2010 it dawned on the giant companies that they were headed down the wrong path, and that their business model needed to change: specifically, that they should generate all electricity from renewable sources, but on a massive scale, as well as using data and knowledge management for continued control of the 'electricity markets'. To facilitate this change of direction, in 2014 the European Commission amended the State aid rules (in response to lobbying). Since then, the renewable energy transformation has been in the hands of companies that have been the largest contributors to CO<sub>2</sub> emissions; paving the way for low-carbon neoliberalism, but closing the door to decentralised electricity generation in line with people's needs, here and in developing countries. The model for a sustainable-energy future lost an important battle in 2014.

Can the stranglehold of the neoliberal balance of power be broken? Two factors indicate that breaking this stranglehold and replacing it with an electricity supply organised in a decentralised way is both necessary and possible. Necessary, because this transformation is a global issue required to fend off climate collapse: it should address not only the 500 million Europeans, but also the 7,500 million non-Europeans. Possible, because the decentralised harvesting of wind and sunlight makes more economic sense than the unnatural concentration of this activity in huge farms.

Wind turbines and photovoltaic panels are small-scale technologies; aggregation to create high-capacity facilities means placing many small-scale units alongside each other: combining photovoltaic cells in panels, and placing panels on a roof or in a field. The scale of wind turbines has increased to 10–12 MW, and a giant 15 MW turbine is being planned. Big companies prefer to build them out at sea (off shore), although the resulting power is more expensive than power from onshore wind turbines.

**Figure 13: Global weighted average total installed costs per kW, Capacity factors, and Levelized costs of generated electricity of newly commissioned utility-scale solar PV, onshore and offshore wind, 2010-21**  
 Source: IRENA (2022). Renewable Power Generation Costs in 2021

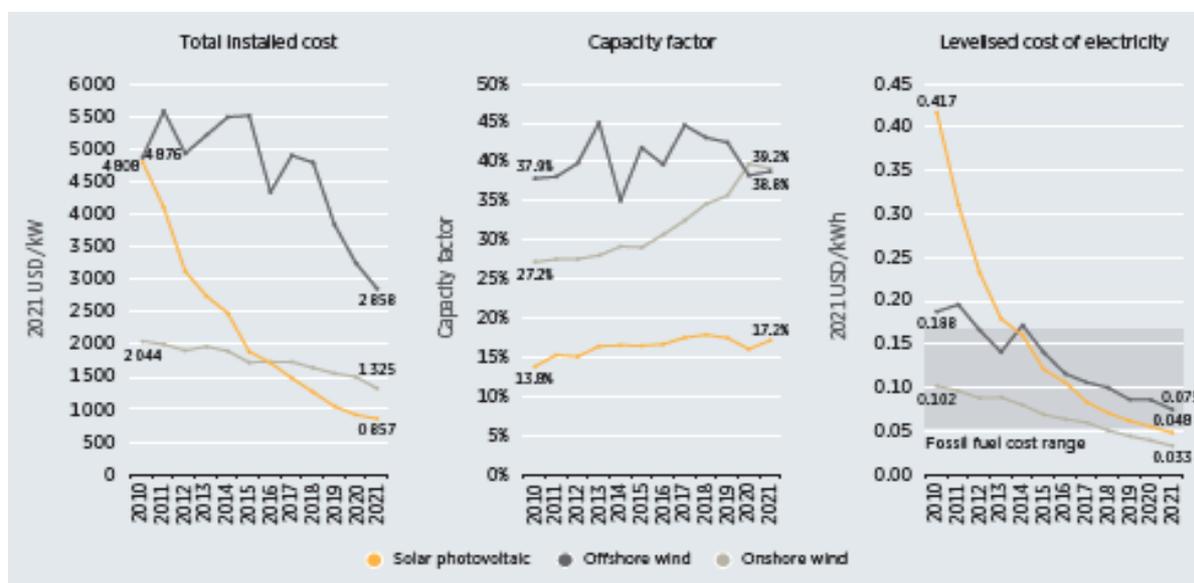


Figure 13 shows the key differences, such as: Investment cost (USD<sub>2020</sub>/kW): 1,325 for onshore, less than half of the 2,858 for offshore; Capacity factor: 39.2% for onshore, exceptionally higher than the 38.8% for offshore, with capacity factors above 40%; Cost of power (USD<sub>2020</sub>/kWh): 0.033 for onshore, less than half of the 0.075 for offshore.

Placing PV systems on buildings instead of in fields, and placing wind turbines on industrial and infrastructure on land, is the most rational choice, economically speaking. This decentralised electricity produced by a broad range of economic agents should be prioritised in electricity systems. Offshore wind should not be banned, but it should be limited to a supplementary role, not the overwhelmingly preferred option of giant companies to support their business model of large-scale units.

If wealthy industrialised nations adopt a decentralised approach and thus optimise the technical and economic aspects, this will stimulate the rollout of renewable electricity in developing countries.

But what is best for communities and the future is not what the political agenda and politics of the big administrations (World Bank, European Commission, US Energy Department, etc.) are advocating, promoting and setting down in regulations.

The [2014 power grab](#) by then European Commissioner J. Almunia is an example of how lobbying and political weakness are two sides of the same coin. What is in the EU's 'Fit for 55' pipeline is even worse.

Transformations and U-turns are not obvious, but they are vital. Mentally and linguistically, future visions are critically important, but it's a difficult exercise to balance on the edge of a knife between ingrained tunnel vision and wishful thinking.

Table 2 sets out some of the many required U-turns, from today and in the years ahead. Here and there, the brief descriptions require additional explanation. Discussion and proposals for different policies will follow in Section 5.6 'Act Now, But How?'

Table 2: U-turns, which are part of the energy and societal transformations

From the old, outdated and redundant	To the new, promising and necessary
<p><b>Perspective:</b></p> <ul style="list-style-type: none"> <li>• Focus on developed countries</li> <li>• Neoliberalism: democracy controlled by politicians subordinate to private interests; fragmented citizenship; huge inequality</li> <li>• Change is expected to occur without any actual change at the individual or community level</li> <li>• The instigators of harmful trends on Earth have been asked and authorised to come up with and manage solutions</li> </ul>	<p><b>Perspective:</b></p> <ul style="list-style-type: none"> <li>• Focus on developing countries</li> <li>• Reclaim the original Sustainable Development paradigm (WCED 1987) for Our Common Future</li> <li>• Reversal of Ideas, Interests, Institutions, Infrastructure, Energy and Technology</li> <li>• Growing awareness, strengthening citizen and community initiatives, connecting to political power and the law for change</li> </ul>
<p><b>Vision:</b></p> <ul style="list-style-type: none"> <li>• Places people above nature, uses nature for human ends: extraction, pollution and disruption, with little regard for the damage caused</li> <li>• Voluntarism and goodwill are sufficient to tackle social problems, such as poverty reduction</li> </ul>	<p><b>Vision:</b></p> <ul style="list-style-type: none"> <li>• People are part of nature and activities are in tune with natural processes, using available energy flows; care is shown for nature and the environment</li> <li>• The goodwill necessary for participation is transient. Use the temporary concentration of goodwill to build binding institutions</li> </ul>
<p><b>Language:</b></p> <ul style="list-style-type: none"> <li>• "When reducing GHG emissions, current generations bring sacrifices for future generations" means: it is the privilege of current generations to pollute the atmosphere and destroy the climate</li> <li>• "Fossil fuels (coal, oil and gas) are cheap, occasionally they cost a lot. The economy cannot function without this low-cost energy": this statement confuses prices and expenses with costs (Table 1)</li> <li>• "Incorporate wind and PV power into the (fossil-fuel and nuclear) electricity system": bizarre since fossil fuels and nuclear energy are disappearing</li> </ul>	<p><b>Language:</b></p> <ul style="list-style-type: none"> <li>• "GHG emissions are gaseous litter" turns privilege into obligation. Littering is a crime, and the perpetrator is required to immediately stop littering and clean up the mess they have produced</li> <li>• "Using fossil fuels causes extremely high costs, which are borne by the planet and future generations. Quickly putting an end to this use is the cheapest option" and certainly necessary to prevent climate collapse</li> <li>• "Wind and solar power are growing at the highest possible rate; whatever is holding them back must be removed"; this is what will create a future</li> </ul>
<p><b>Interests:</b></p> <ul style="list-style-type: none"> <li>• Dominance of the possession and accumulation of private money, controlled by super-rich corporations, clans, families and individuals</li> <li>• Economic growth advantages the wealthiest and increases inequality</li> </ul>	<p><b>Interests:</b></p> <ul style="list-style-type: none"> <li>• Private interests are part of and subordinated to public interests and policies for wealth creation for the entire community</li> <li>• All people obtain the 'ethical living minimum income'*</li> </ul>

<p><b>Institutions:</b></p> <ul style="list-style-type: none"> <li>• Economy: The global economy is under the control of transnational corporations; the oligopoly destroys local markets; the 'free market' is a smokescreen</li> <li>• Climate politics: Emissions trading gives big industry free permits and the legitimacy to charge carbon taxes, paid for by (primarily small-scale) energy users</li> <li>• Climate policy: 2030/2050 targets shift political responsibility to future politicians; plans are packed with intentions but no guarantees, and have produced little or no results</li> </ul>	<p><b>Institutions:</b></p> <ul style="list-style-type: none"> <li>• Economy: The local market is suitable for trading goods and services, provided political oversight and regulation are in the public interest</li> <li>• Climate politics: Policies prioritise decentralised renewable electricity, energy conservation and efficiency; more prosperity for more people through alternative activities</li> <li>• Climate policy: Immediate steps in the right direction, measured and reported on annually; practices have direct results (see Section 5.4)</li> </ul>
<p><b>Infrastructure:</b></p> <ul style="list-style-type: none"> <li>• Expansion of airports and sea ports, mineral extraction, industry, trade, roads, waste management, car parks, shopping malls, sports complexes, etc.</li> <li>• Large-scale, capital-intensive renewable energy plants receive financial support and priority in projects</li> </ul>	<p><b>Infrastructure:</b></p> <ul style="list-style-type: none"> <li>• Construction of infrastructure in developing countries: transport (trains, water, roads), utilities (electricity, water, waste), health care, education, etc.</li> <li>• Priority is given to electric interconnections between countries, smart local grids, storage at the neighbourhood or village level, etc.</li> </ul>
<p><b>Energy and Technology:</b></p> <ul style="list-style-type: none"> <li>• Priority is given to large-scale energy generation, conversion and supply with profits for transnational corporations</li> <li>• Ongoing fossil fuel use, with promises of carbon capture and storage</li> <li>• Maintenance of outdated concepts of electricity production and price-setting*</li> </ul>	<p><b>Energy and Technology:</b></p> <ul style="list-style-type: none"> <li>• Priority is given to the decentralised, small-scale projects of households, cooperatives, communities, etc.</li> <li>• Fossil fuels and uranium are completely eliminated due to the high costs and risks</li> <li>• New economic theory for wind and solar electricity production and correct pricing<sup>37</sup></li> </ul>
<p>*Concepts and price-setting assume that power plants supply on command with marginal costs &gt;0. Neither applies to Wind or Solar</p>	<p>*This income provides a decent living, covering housing, food, education, mobility, etc. Half of the world's population lacks such an income</p>

## 6.5 Act-Now, but How?

The title of this section contains a command and a question. Answering this question is a huge and difficult task because it requires completeness and cohesion, specificity and precision. It requires us to weigh doubt against courage, the possible against the unavoidable, the achievable against the necessary.<sup>38</sup>

The following paragraphs support the preceding sections of the manuscript. The focus now is on what to do and where to start. Answers usually take the form of commands: think about, research, break down, build up, connect, throw away and so on. Selected recommendations are summarised in boxes at the end of each subsection.

### 6.5.1 New voices

There are many publications, interviews, forums and active people spreading new voices. Such voices can either steer the forthcoming transformations in the direction of a safe, equitable world (Fig. 7), or delay or work against that transformation (Fig. 9). Positive voices put forth visions and proposals for a different relationship between people and nature, in symbiosis<sup>39</sup> and harmony, where people are subordinated to nature and its laws (Table 2: Vision). It is encouraging to see the numerous individuals, households, small communities, local councils, micro-enterprises, etc. that are finding realistic ways to develop and enjoy a different way of living (soft modes of transport; diets that place fewer

demands on nature and generate less Ce; generating their own electricity from solar or through participation in a wind turbine project). More people are choosing to enjoy the good life, out of the rat race. Academics link such decisions to an economy in which material throughput falls (de-growth). It is promising to see more and more people viewing a U-turn as both necessary and possible.

The general narrative is now well known; it is recounted over and over, everywhere and every day.<sup>40</sup> The present task is to make the visionary proposals specific and to link up ongoing, practical initiatives for greater strength and power. The right disposition,<sup>41</sup> a good combination of rationality and morality, is important, along with an understanding of the context and framing of fixed and planned events.

**Box 1: Disposition and approach**

1. The extent to which they are free from vested interests, are independent and serve the public interest, determine the usefulness and reach of research, conclusions and recommendations
2. Start with the Facts. Check that Ideas (myths, symbols, images, narratives, discourses, paradigms) are consistent with the Facts when shaping an informed opinion about people, institutions, organisations, administrations, society and so on.
3. Perform critical analysis based on in-depth knowledge of specific problems. Even if the results are shocking and sobering in terms of what is happening, critical analysis is encouraging, and it is effective in public debate where radical solutions must be defended
4. Reject partial or half-hearted solutions: getting stuck halfway through a U-turn is like the proverb, '*Gentle healers make stinking wounds.*'
5. Include and engage researchers from all disciplines (social and human sciences, physics, chemistry, life sciences, engineers, etc.); the transformations will be far-reaching and affect nearly every part of the machinery and filaments of society

### 6.5.2 Paradigm shift

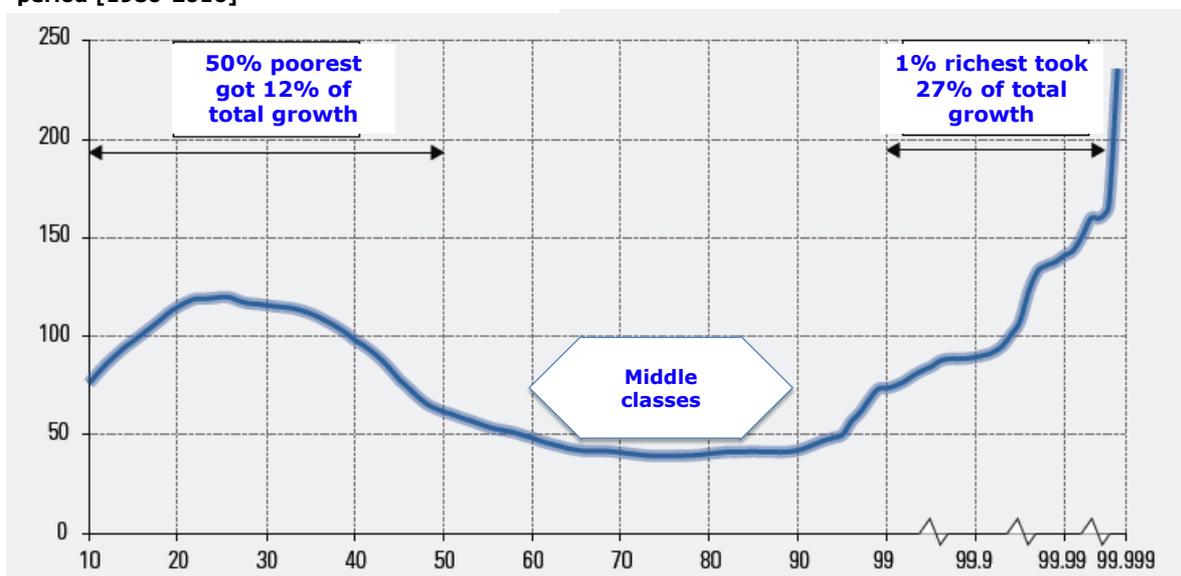
For the past half-century, neoliberalism has reigned. If its regime is not rapidly brought to an end, it will be too late to prevent climate collapse and usher in the third period of human civilisation. Neoliberalism is built on three pillars: financial power dominates political power; unlimited economic growth for the rich; inequality requires only paternalistic attention. On these three pillars, a divided, unsafe and unequal world has grown.

The 2019 UNDP Human Development Report documents the unequal distribution of the returns of economic growth between rich and poor. Ten percent of the world's population is so poor that they are not even shown in Figure 14. The bottom fifty percent obtained 12% of the growth over 36 years [1980–2016]. In that period, the richest 1% enjoyed 27% of the growth (more than double the growth experienced by the lowest 50% of incomes). For approximately 35% of the global population with moderate to high incomes, income growth was less than 50% between 1980 and 2016.

The elephant curve provides a picture of the three biggest income groups in the world: the poorest 6%, of which four-fifths do not earn a 'minimum income for an ethical existence', and one-fifth barely earn it; the middle class (30%), with moderate to high incomes; the 9% who have high incomes and the super-rich 1%. By capturing the highest growth percentages, the super-rich are growing increasingly wealthy compared to all the other people on Earth. It's not surprising that economic growth is part of the creed of neoliberalism.

**Figure 14: Elephant curve of global income inequity & shares in economic growth**  
 Source: UNDP Human Development Report 2019, chapter 3

% increase of real income of adults over the period [1980-2016]



**Decile classification of world population ranked by income of adults. The poorest decile is not shown; the richest 1% is shown in more detail highlighting the enrichment of the superrich.**

Neoliberal ideology and brag in the US brought neoliberalism to the fore in the 1980s, coupled with the new cult of the successful senior executive, trained and certified in the complex dynamics of the organisation, management and application of power.<sup>42</sup> US President Reagan [1980-1988] saw *'government as the problem'*, and adapted himself to the agendas of lobbying transnational corporations. This resulted in an unprecedented accumulation of money and market power in private hands and transnational corporations. In 2010, there were approximately 130,000 parent companies with 886,000 foreign subsidiaries. In 2014, transnational corporations produced around USD 7.9 trillion worth of added value, with approximately USD 36.4 trillion in turnover, or around 80% of international trade, while employing 75 million workers. The World Bank estimates that transnational corporations pay around USD 1 trillion in kickbacks each year to obtain lucrative contracts. The default position of transnational corporations is to defend the status quo, or at the very least to delay change for as long as possible.<sup>43</sup>

The neoliberal discourse connects the supremacy of transnational corporations with the 'free market'. However, in this economic concept, 'free' means that everyone, or in practical terms, many people, have a 'free choice' to join a market as a producer, so that competition will prevent superprofits. The monopoly/oligopoly of transnational corporations means that most markets are not free at all, allowing these corporations to achieve superprofits. Access by large numbers of companies to an oligopoly sector does not seem to be possible, since it has not been observed during the past few decades. For key activities on the global scale, the number of producers has fallen. Sometimes a member of an oligopoly appears, usually via a niche activity, such as Tesla in the electric vehicle market.

The misleading use of language that couples together 'neoliberalism' and 'free market' is seldom criticised. This denigrates the actual institution of the market, which is necessary for the proper organisation of economic trade. Anyone who rejects the market as an institution commonly suggests allocation by administrations as an alternative. Given that choice, a large majority would prefer neoliberalism. Restoring genuine, workable free

markets is a positive component of the transformation; neither is possible without a substantial and general decentralisation of key economic activities, with the supply of energy being the decisive activity.

**Box 2: Paradigm shift**

1. Place the essence of Sustainable Development for Our Common Future (World Commission on Environment and Development, 1987) at the centre of the future paradigm for renewing societies.
2. Adopt the 4P tetrahedron (figure 7) symbol to indicate the vital, active role of Politics (metaphor: a wind turbine with three blades but no generator won't work)
3. Dissect and document the harmful role of neoliberalism with respect to politics, unequal economic growth, inequitable distribution, the use of fossil fuels and nuclear energy, the arms trade and warfare, and so on.
4. Make climate change and the impending climate collapse the common thread in energy system transformations.
5. Remember that the European Commission's so-called 'emissions trading' scheme is a tool devised and controlled by transnational energy corporations, who deal in oil, gas and electricity
6. Examine EU climate policy critically and in depth, in particular 'Fit for 55' which is paving the way for low-carbon neoliberalism. Do not believe the claim that the system that has been put in place (details published on 14 July 2021) is amenable to improvement

### 6.5.3 Transformation of energy systems

The energy system transformation is completely intertwined with the paradigm shift, in relation to the role of pioneer, the key to both preventing the life-threatening climate collapse and upending numerous interests, institutions and elements of infrastructure. Along with pushing through the Sustainable Development (WCED 1987) paradigm, energy systems can be transformed by U-turns, for example:

- Energy conservation and efficiency can reduce energy use significantly, primarily by limiting and sometimes banning activities that are extremely harmful to the environment, which are usually accompanied by the intensive use of fossil fuels.
- In the future, electricity will be nearly the only commercial energy carrier.
- Practically all electricity comes from the conversion of sunlight, wind, water and geothermal flows. The technology can be used in all countries, by people without a degree; the women who currently collect wood, often for burning in poorly ventilated rooms, will become the managers of the renewable energy supply
- Decentralised application of decentralised technology: smart local grids for buildings, neighbourhoods, cities, business parks and farms; buildings that make passive or active use of environmental energy; optimal use of somatic energy from moving people; and so on.
- Centralised projects (such as offshore wind farms), preferred by big electric power companies to preserve their neoliberal business model, should be ancillary, and not crowd out decentralised, small-scale development
- Sufficient continuity in the supply of electricity is assured by demand-side management, the continent-wide exchange of power and the storage of energy directly as electricity to be converted without GHG emissions (potential energy in water reservoirs, hydrogen via electrolysis and reconversion to electricity via fuel cells, and chemical energy in batteries)
- Thermal electricity production is disappearing, because it is not competitive and is fraught with risks and environmental impact (Fig. 6). Unnecessarily maintaining or expanding thermal electricity production is pure waste and interferes with strong climate policy.

- Shutting down thermal electricity production would be a substantial start and a component of natural 'de-growth'. Energy conservation is also a guiding principle and contributing factor in 'de-growth'.

The sustainable energy revolution is liberating, but many conflicts, invasions and civil wars are likely, particularly in relation to renouncing fossil fuels and keeping them in the ground. Nuclear energy is collapsing under the weight of its own failures and catastrophes; the wasting of billions of euros and of valuable human capital, and the piling up of ever more nuclear waste and risks, should ideally be stopped immediately.

**Box 3: Energy transformation as the driving force for U-turns**

1. Energy use and system transformation is essential for Ce reduction; it is the fastest possible path to  $C_e = 0$  and the powerful key to preventing climate collapse
2. Encourage an intense connection and interaction between energy substrate transformation and the paradigm shift in society (Fig. 7)
3. Urgency is crucial: ultra-fast electrification of practically all economic activities, and ultra-fast growth of decentralised power generation. This is financially, economically, socially, environmentally and politically better than using fossil fuels and uranium for longer.
4. Avoid a half-hearted approach, because that would be expensive, risky and unpredictable
5. The radical energy revolution will be accompanied by U-turns in politics and activities: democratic functioning will replace the explicit/secret exercise of power by the super-rich, senior executives and neoliberal thinktanks; the decimation of the military sector will make room for prosperity; choosing to live well and rejecting growth fetishism and the rat race; prosperity instead of financial gain; and so on.

#### 6.5.4 What matters is power

Since the 1980s, neoliberal discourse and interests have gained influence and power, with the USA as the birthplace and headquarters of neoliberalism. In Europe, too, neoliberalism dominates current discourse and official policies. An example of the impact on the EU administration and climate policy is the [EU emissions trading system](#) and the '[Fit for 55](#)' [package](#), tailored to align with the interests of transnational corporations. The dominant role of transnational energy corporations is secret, but can be observed in the contradictions, symbols, narratives, and suspected money flows,<sup>44</sup> of the emissions trading system. Neoliberal thinktanks and interests also influence, if not determine, international climate policy. This was already clear at the World Summit in Rio (1992), where a hollowed-out version of sustainable development preserved the growth fetish of industrialised nations. Since then, international climate policy has been stuck in endless talkfests and bureaucratic labyrinths, while the  $C_e$  continues to rise every year instead of drastically and urgently falling. In addition, in Working Group III of the IPCC, which deals with mitigation (actions to reduce the  $C_e$ ), neoliberal viewpoints and neoclassical economists set the tone and allow Saudi Arabia to protect oil and gas interests.

The enormous concentrations of money, power, status and influence wielded by transnational corporations are mostly sufficient to corrupt or cripple a significant portion of the population, including the graduates and officials responsible for running the corporate and political systems. For them, realism means accepting the supremacy of neoliberalism and, if they respond to necessary change of direction, they look for tiny changes in the systems' cracks ('niches' is the fashionable word). In 2022, now that even transnational corporations can no longer ignore the seriousness of climate change, a slow shift to a climate-neutral economy is their preference, with the aim of achieving low-carbon neoliberalism (Fig. 9). Accordingly, the world is squandering the last chance to prevent climate collapse,

because profound change and radical transformation are required now ('Act Now'; Section 5.2).

Fear, paralysis, inertia and complacency are bad advisers when the water is up to our necks. In 2022, all cards are on the table in order to usher in the third period of human civilisation. Let us take them, and create a future (Fig. 8: "*Humanity has the ability to make development sustainable*", WCED). The toughest obstacle will be today's negative forces that have no answers to the major global challenges and no comprehensive and inclusive vision for the future of humanity. Continuing on the same course as the past thirty years will not prevent climate collapse.

What matters is power. A further exploration is required, with the goal of building a countervailing power.

### *The use of power, for Good and for Evil*

Power can set things in motion, bring about change. The word 'power' evokes the concept in physics: power is the intensity of energy flows (the energy supplied per unit of time). If the intensity is high and continuously maintained, it is lasting power, not merely an outburst, as is often the case with movements of revolt (a protest action, a demonstration, a strike, a revolution).

In 'Democracy Incorporated', Wolin<sup>45</sup> poses the question of how ordinary people can turn the tide of neoliberalism, and concludes that: "*without democratisation of people themselves, the democratisation of politics will be purely formal (not very effective)*", "*self-democratisation increases by virtue of one's own activities*", "*it requires the individual to participate in public life, to shape public, open policy, which in principle is accessible to all who wish to be part of it*".

However: "*Popular political interventions are, at the national level, inevitably episodic and fleeting*", "*the People will never dominate politics*".

And: "*a united populace is no longer possible, and may not even be desirable: instead of One People, it would be preferable to have democratic citizenship*", "*most likely to be cultivated in local, small-scale forms*".

Wolin adds: "*the quality of public debate must change significantly*", "*this depends on the recapture of the media from commercial hands*".

The recommendation that electricity production and supply be organised in a completely decentralised way by households, cooperatives and local councils is in line with proposals by political philosopher Wolin to engage citizens more in cooperative partnerships.

What can bring change is no vast, concentrated build-up of power in centralised headquarters, but a network of tiny pockets of power spread across the world. The characteristics of power being used for Good also include '*having access*' to people, institutions, infrastructure, solutions and prosperity; '*being invited*' to participate in activities; '*being heard*'.

Avelino<sup>46</sup> discusses power and empowerment from a range of perspectives in the context of transition and transition management. Green<sup>47</sup> advocates for a modified system analysis and the effective use of power for Good.

Today, the use of power for Evil dominates the world and the media. The images with which children, young people and adults are inundated every day via the TV, Internet, films, shows, etc. predominantly have evil, violence, crime as their main themes, without explanation. Under the neoliberalism paradigm, this is *normal*: Transnational corporations control essential political processes, such as elections in the USA (the so-called 'greatest democracy on earth'), where massive amounts of sponsorship and media money decide the winner (a situation denounced decades ago by Noam Chomsky); the vast majority of politicians subordinate the public interest to the plans and interests of transnational corporations and big money; their form of economic growth degrades the planet, irreversibly changes the climate and makes the money super-rich even richer; the poverty of billions

of people is 'normal', so that voluntary charity is sufficient; transnational corporations in the fossil fuel and weapons sectors are served by conflicts and wars that enable them to keep raking in billions of USD.

The mighty neoliberalist money centres, and their neo-conservative servants, are no choir-boys. They specialise in deception, masterminding of policy areas that affect them, lobbying, kickbacks and blackmail. [Based on experience](#), it is possible to perceive a pattern in how the exercise of power unfolds.

The general framework is: the exercise of power for Good (e.g. when a corporation makes a donation to a nature restoration project, to a cultural or social event) results in extensive adulation in the media; the exercise of power for Evil (e.g. lobbying and kickbacks to procure advantageous regulations, ineffective climate policies, State aid guidelines promoting corporations' interests) is as secret and invisible as possible; preferably, 'third parties' are used to engage in shady dealings that further the interests of the powerful entity, to prevent damage to its reputation.

The efficiency rule in exercising power is to achieve intended results with as little visible power as possible.

Power at work moves 'others', or keeps them immobile, through the application of force. The forces used to control others are tangible. For a centre of power, two groups of others are important: those who belong to or are connected with the centre of power, and those outside of it who are in actual (or potential) contact or interaction with the centre. The exercise of power with regard to the two groups differs in form, packaging and method, but always comprises four consecutive stages to force individuals to move or to render them immobile: (1) inform/persuade; (2) seduce/bribe; (3) force/coerce; (4) cast aside/eliminate.

The sequence progresses from gentle to harsh methods, from effective and efficient to risky and expensive interventions. Both sides, the centre of power and 'the controlled others', suffer greater damage if the sequence passes beyond stages 1 and 2. In terms of form and intensity, the damage is much worse for the controlled – considerably worse, if elimination means death (as is the case in many countries for social, environmental, political, legal and other activists for saving the planet).

The sequence emphasises the paramount importance of Stage 1: Ideas (Section 1, Fig. 1): my rough estimate is that a broad two-thirds majority accepts the dominant paradigm and considers the dominant centres of power legitimate. It also explains the disproportionate influence of big media on the functioning of society. Add to this Stage 2, which appeals to people's Interests (Section 1, Fig. 1), and the majority grows to more than nine-tenths. Stages 3 and 4 are thus rather exceptional, but nevertheless very important to the neoliberal centres of power in breaking a nascent countervailing power: those with different opinions who want to install the paradigm of Sustainable Development (WCED 1987) and place the organisation of the energy supply in the hands of the people. As an existential threat to neoliberalism, this movement has experienced coercion and elimination.

There are no handbooks to teach activists how to deal with and overcome coercion and elimination; it requires self-awareness, perseverance and agility (so as not to fall into cynicism), and the understanding that this transformation is the only path to a humane and decent world: the third period of human civilisation. In post-WWII political history, various peoples have defeated an immensely superior force using guerrilla strategies and tactics (although many countries and peoples have paid a heavy toll for doing so). Their struggle can teach us a great deal about fighting attempts at coercion and elimination. It is also important to explore how neoliberal centres of power organise and operate.

### *Learning from those who hold, wield and exercise power*

The exploration starts with learning from the way in which transnational corporations organise themselves to achieve their stated goals. Renowned universities (Harvard, Stanford, Chicago, ...) have upmarket business schools that supply expensive, highly desired, Master of Business Administration (MBA) degrees. Their curricula devote considerable attention to strategy and organisation – in other words, the planning and application of the exercise of power. Some lecturers define management as *'making people do things that they wouldn't do by themselves'*; they extensively address every aspect of the four steps described earlier. MBA handbooks are readily available.<sup>48</sup> They state that a successful company builds its strategy on a formulated vision which is endorsed by all employees. To the established vision is linked an adaptable mission, to achieve the primary objective of the company: making above-average profits. For companies, money is and will continue to be the ultimate goal. But their strategies and methods are also relevant to other goals.<sup>49</sup> For example, the SWOT<sup>50</sup> approach can be used to position organisations and actions in their operational context. The following SWOT analysis for the energy system transformation makes a preliminary case for a necessary exercise by a diverse, dedicated team.

#### Strengths:

- The positive vision of the paradigm to be achieved, Sustainable Development for Our Common Future (WCED 1987): Reset the chaotic world of abuse of power, disgraceful poverty versus obscene wealth, devastation of nature and the environment, and more.
- The agents for and of change and revolution are increasing in number and determination in wealthy countries (Youth4Climate, Extinction Rebellion, Hambach Forest, individuals and families leading a climate-conscious way of life, etc.): community values outweigh money accumulation.
- Actors in developing countries, where four billion people are still denied the 'ethical living minimum income', are becoming more aware of the need for action. An unstoppable migration is underway. An alliance between these fearless actors and the impoverishing parts of the global middle classes (Fig. 14) is a strong social force for change.
- A superior factor of strength: in technical, economic, financial and environmental terms, electricity from free sources such as sunlight, wind, water and geothermal energy is superior to all other sources. Small-scale applications have more advantages than large-scale applications.
- Academic criticism of neoliberalism is increasing from several corners, including from successful economists (such as M. Mazzucato, K. Raworth and J. Eeckhout).
- Neoclassical economic theory, a cornerstone of neoliberalism, is out of touch with reality. It does not acknowledge the importance of diversity; the Pareto criterion for measuring prosperity is conditional on the infinite availability of resources; its prescriptions are uniformly top-down in all corners of the globe.<sup>51</sup>

#### Weaknesses:

- For U-turns in wealthy countries, the number of activists and leaders is still small; they lack experience and training; coordination in a broad, horizontal structure needs strengthening.
- The media determine the perceptions of everyone, particularly those who do not have the resources (time, money, networks or training) to delve into the background and context of messages. Independent, critical media organisations have few resources and their impact is still small, although essential. They need more coordination and strategy to deflate the amplified messages of the neo-conservative thinktanks and media.
- Many environmental NGOs subscribe to the EU's neoliberal climate policy. They believe that the EU emissions trading system will work if higher symbolic fringe prices<sup>52</sup> appear on the boards of the exchange platforms in Leipzig and London.
- Because of their poor analysis of the 'Fit for 55' package, environmental NGOs endorse the preservation of neoliberalism, now disguised in a low-carbon hull. As

a result, the radical energy system transformation is facing so many delays that climate collapse is inevitable.

- Cognitive dissonance remains widespread among neoclassical economists, civil servants who observe energy and climate matters, international institutions, large NGOs, and so on.

#### Opportunities:

- Laborious discussion about the societal paradigm needed for the third phase of human civilisation can be skipped: Sustainable Development for Our Common Future has already been written in 1987.
- There is a formal consensus about Sustainability as a feature to be pursued. There is a growing understanding that the political dimension is essential.
- Technological developments on generating electricity from wind and sunlight have been phenomenal, and aren't over yet. These are small-scale, decentralised technologies, affordable and able to be controlled by households, cooperatives and local communities.
- The superior energy systems of the future match up extremely well with the objectives and substance of Sustainable Development (WCED 1987), unlike neoliberalism.
- Top-down power makes it difficult to understand the little visible world of the 21<sup>st</sup>-century catacombs and their expansion due to the ongoing and swelling streams of 'illegal' refugees and migrants, and infuriated disadvantaged people in wealthy countries.

#### Threats:

- In the U-turns to prevent climate collapse, the biggest losers will be the super-rich and powerful people. Their resistance, blinded by vanity, greed and lust for power, is out of touch with reality and could be devastating for the planet and human civilisation. The super-rich may strengthen alliances with neoconservative groups and fascist politicians, as happened in history (the 1936 cooperation of German big industry with the Nazis). Today, it is observable again in right-wing and Apartheid regimes.
- Media companies owned by the super-rich and transnational corporations will play a particularly pernicious role in the fight over the Ideas for the future. Some of the extreme media and social media trolls fuel neofascists, authoritarian groups and governments around the world. Their conspiracy stories, hate speak and campaigns, are based on the cracked claim that problems are caused by 'others', such as other races, refugees, emancipated women, scientists<sup>53</sup>, ...
- Defusing and phasing out established bastions of power and wealth is many times more difficult than developing new energy systems and the related Ideas, Institutions, Infrastructure and Interests.

That was the result of my SWOT exercise. It could be used as the starting point for a participatory panel, with experienced experts from many fields and researchers working in a range of disciplines. A SWOT analysis is very helpful in the initial phase of the strategy cycle, which should be gone through in iterative repetition and adjusted where necessary. The strategy cycle answers the questions: Where are we (situation analysis)? What do we want (objectives, targets)? What do we do (actions, measures)? Afterwards, it is important to check whether the goals have been achieved and adjust the actions; goals too are sometimes adjusted, depending on the results of the check.<sup>54</sup>

Key Performance Indicators (KPIs) are used to measure progress. The SDGs (Sustainable Development Goals), which were proposed as a substitute for the full content of sustainable development, are KPIs (Fig. 12 in Section 5.4 applies SDG KPIs). As D. Green (2016, p.147) also states, SDGs are too limited in terms of impact; they fall short as a substitute for constructing a strategy and paradigm; they are part of it, but not a valid substitute.

*See the bigger picture*

Transformation comes from people: individuals and small groups at first, then more and more. Every individual person is one of the eight billion people on the planet, a tiny part of a larger whole. Quite a few academic initiatives keep an eye on the bigger picture. It is exciting to see colleagues focusing on the polycentric decision-making structure at multiple levels<sup>55</sup>. Table 3 presents a schematic framework to ensure we do not lose sight of the breadth and variety of perspectives. Decisions and actions at the micro level are influenced by what exists and is happening at the meso and macro levels. Crossing the borders between the levels is needed for coordinating the respective plans and actions.

Table 3: Perspectives in terms of time, space and various institutions and functions at different levels

Level	Timeframe	Space	Institutions, functions
Macro	Historical scope. Sequentially phased 40-year horizon	Global, Continents, Alliances of nations	UN treaties and organisations; transnational corporations (oil, gas, coal, electric power). International aviation, shipping, tourism, materials and minerals. Military bases, ...
Meso	Years, moving 5-year periods	Nations, Cities, networks, sectors	Substrate and subordinated to the macro level. Frames and supports the micro level
Micro	Within the year, quarter, month	Entities: individuals, federations, companies, unions, institutions, cooperatives, etc.	Action-oriented, from resources to results. Huge engagement of actors: self-governed commons

**Box 4: The use of power for and against the energy system transformation**

1. Power is related to energy: it is present everywhere, has many forms, can be used for good and evil purposes, and can move or immobilise people
2. Neoliberal concentrations of power and use of power are the toughest obstacles to implementing a proper, necessary and urgent energy transformation
3. You can't change big money through persuasion, bribery or coercion. The only possibility then is 'elimination': head-on through politics, laws and regulations; via an ethical disposition and actions: choosing value over money, collaboration over a concentration of power, equality over greed. Such actions, amplified by more and more people, make big money irrelevant.
4. Learning from those who hold, wield and exercise power will help organise the energy transformation.
5. Keep in mind that decisions and changes stem from confusing melting pots at various levels, influenced by countless centres of power supporting a range of interests – big and small.

*6.5.5 Navigating turbulent crisis situations*

The transformation from the second to the third period of human civilisation has begun. It's a real Odyssey, requiring us to be ingenious, audacious and tenacious, with the final destination in view, even if we've been buffeted far off course<sup>56</sup>. Deception through Ideas is the most debilitating, followed by seduction for attaining personal Interests. When coercion and elimination grow, they may signal the lose of control by vested neoliberal big money and military powers. It will then be harsh times, with unpredictable actions and reactions from various sides.

There are always solutions, as Nelson Mandela stated: "*We must use time wisely and forever realize that the time is always ripe to do right*". But the transformation is tectonic and turbulent, and often requires rapid decisions and actions. This means there is little time for study and extensive consultation. It is necessary to fall back on previously acquired understanding and ready knowledge, and to seek advice from reliable experts with a broad and diverse perspective at various levels (Table 2). A list with rules of thumb is helpful; beacons in the storm to help us stay on the right course.

Box 5: Beacons help maintain course

1. Transformation requires U-turns
2. What seems impossible today, may be unavoidable tomorrow
3. Reject half-heartedness; go for the interlinked societal paradigm - energy transformations
4. Facts instead of myths, symbols, images and words
5. Facts are facts if verified from different sides
6. Identify who has what interests in specific proposals and outcomes
7. Request transparency of money flows and batches in energy and climate policy
8. Give priority to local, small-scale electricity production and significant energy conservation
9. Reject any investment in fossil and nuclear fuels and power plants<sup>57</sup>
10. Handle power in such a way that the use of power for Evil stops, and its use for Good grows
11. Build countervailing power from the bottom up

In general, people (thus we) would rather have peace of mind than be vigilant, rather be complacent than active, rather be trusting than critical. The default attitude is to defend the status quo, underestimating the risks connected to 'just carrying on' and overestimating the risks of change that consists of venturing into unknown territory. We all mostly prefer that others must change.

However, in exceptional times and circumstances, people can be incredibly vigilant, active and critical, mount an irresistible opposition, and push forward to do what is needed to save their community. Our Common Future depends on a clean Atmosphere and mild Climate: our community is the global world.

## Endnotes

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- <sup>1</sup> Verbruggen, A. (2021). Pricing Carbon Emissions: Economic Theory and Utopia. Routledge, pp.97-100, fig.7.4
- <sup>2</sup> The EU assesses its energy supply against the "secure, affordable and sustainable" criteria. Interest groups interpret the criteria differently. For example, "security" is seen as an abundant, uninterrupted supply; to the business world, "affordable" means competitive and low-priced; "sustainable" is often limited to compliance with existing environmental regulations, and is thus far removed from what "Sustainable Development" (WCED 1987) implies. In addition, the criteria are presented as a 'trilemma': more of one means less of the others. If the criteria were given their full, correct meaning, they would form a cascade: first comes Sustainable Development, followed by security once all energy is renewable and is mainly locally produced; once these two criteria have been met, energy will be affordable (directly and indirectly, the sun provides free, renewable energy; harvesting techniques will increase in performance and fall in cost).
- <sup>3</sup> Green, D. (2016). How Change Happens. Oxford University Press
- <sup>4</sup> An example from the academic world is the decline of independent research; resources (people, funding) are funnelled to topics and strategies with economic potential, which are seen as a higher priority. The standards and rules have changed.
- <sup>5</sup> Verbruggen, A. (2022). Geopolitics of Trillion US\$ Oil and Gas Rents. International Journal of Sustainable Energy Planning and Management
- <sup>6</sup> Verbruggen, A. (2013). Revocability and reversibility in societal decision-making. Ecological Economics 85: 20-27
- <sup>7</sup> The private energy sector is disproportionately protected by the 'Energy Charter Treaty'.
- <sup>8</sup> HVAC = Heating, Ventilation, Air Conditioning (which includes cooling).
- <sup>9</sup> Word Commission on Environment and Development - WCED (1987). Our Common Future. Oxford University Press, p.44
- <sup>10</sup> White, L.A. (1943). Energy and the Evolution of Culture. American Anthropology 45: 335-356
- <sup>11</sup> Schneider, M., Froggatt, A. (2022). [World Nuclear Industry Status Report](#)
- <sup>12</sup> Mainly Germany and Denmark maintained ideas and experiments developed after the oil price crises of the 1970s; around 2000 they rejected the proposal of the European Commission for an EU-wide trading system in green certificates (see ch.5 and annex D in Pricing Carbon Emissions (endnote 1))
- <sup>13</sup> Next to high-pressure steam, pressurized flue gas flows are fossil-based energy currents (in gas turbines, as also used in airplane jet engines). For clarity, the text uses the most proliferated technology as example.
- <sup>14</sup> Verbruggen, A., Wealer, B. (2021). [Nuclear Power and Sustainability](#), in Constance, C. (ed.) The Palgrave Handbook of Global Sustainability.
- <sup>15</sup> Energy use causes 76% of all greenhouse gases (source: World Resources Institute; [www.wri.org](http://www.wri.org)); other major sources include transport (14.2%); industry (12.6%); agriculture and livestock farming (5.9%); the waste sector (3.3%) and land and forest use (2.8%).
- <sup>16</sup> The World Nuclear Industry Status Report (WNISR), an annual publication. [www.worldnuclearreport.org](http://www.worldnuclearreport.org)
- <sup>17</sup> Jacques, P.J, Dunlap, R.E, Freeman, M. (2008). The organization of denial: Conservative think tanks and environmental skepticism. Environmental Politics 17 (3): 349-385
- <sup>18</sup> The Dutch translation was provided by the Belgian electricity sector. The translation of 'Our Common Future' as 'Onze Aarde Morgen' (Our Planet Tomorrow) is reason enough to only read and cite the original English text.
- <sup>19</sup> European Commission. Communication 'Fit for 55': delivering the EU's 2030 Climate Target on the way to climate neutrality. COM(2021) 550 final
- <sup>20</sup> For the record: the EU State aid review in 2014 gave preference to large-scale wind farms and photovoltaic arrays at the expense of small-scale projects. In addition, the 'Fit for 55' communication refers to offshore wind, but does not mention citizen-driven or cooperative projects. The book cited in footnote 1 describes the 2014 coup.
- <sup>21</sup> European Commission. SWD(2021) 601 final, PART 2/4, Annex 3, pp. 103-104.
- <sup>22</sup> Based on Milton Friedman "Capitalism and Freedom", cited in Green, D. (2016, p.17) How Change Happens. Oxford University Press. Note: M. Friedman is the academic father of neoliberalism, whose prescriptions were applied in Chile after the bloody coup of 11 September 1973.
- <sup>23</sup> Other connections, such as ideological, philosophical, religious and other beliefs, are more centrifugal than centripetal. Societies that coalesce around an ideology of salvation usually end badly. Elinor Ostrom received the Nobel Prize for Economics in 2009 for her research into how societies can best manage their commons; the core of her methodology was taking into account the self-interest of the participants.
- <sup>24</sup> The EU climate policy is not targeting CE = 0, only climate neutrality, or 'net zero'. This implies the compensation of CE through the capture and use of carbon in hydrogen (H<sub>2</sub>) derivatives, for example.
- <sup>25</sup> Mazzucato, M. (2018). Mission-oriented innovation policies: challenges and opportunities. Industrial and Corporate Change 27(5): 803-815
- <sup>26</sup> Eeckhout, J. (2022). *De Winst Paradox. Waarom de macht van supersterbedrijven onze economie ondermijnt* [The Profit Paradox: Why the power of superstar companies is undermining our economy]. Lannoo
- <sup>27</sup> The United Nations Development Programme (UNDP 2008 Annual Report) considers climate change to be the number one development issue, due to its devastating impact on other development projects.
- <sup>28</sup> UNFCCC (United Nations Framework Convention on Climate Change) 1992, Article 2 and Article 3.1.
- <sup>29</sup> 'Reversibility is the possibility of the preservation or recovery of the functional operation of a system'. Reversibility gradually reduces until it tips over into absolute irreversibility (a 0/1 concept). This is sometimes referred to as 'reaching tipping points'. More details can be found in Verbruggen, A. (2013). [Revocability and reversibility in societal decision-making](#). Ecological Economics 85: 20-27
- <sup>30</sup> Girard, R. (1978). Things Hidden Since the Foundation of the World. Editions Grasset & Fasquelle, Paris; Achterhuis, H. (1988). *Het rijk van de schaarste. Van Thomas Hobbes tot Michel Foucault* [The Realm of

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Scarcity: from Thomas Hobbes to Michel Foucault]. Ambo/Baarn; Van Bladel, L. (1989). *Materie, Macht & Minne. Verzamelde Opstellen* [Matter, Power and Honour: Collected Essays]. DNB Pelckmans, Kapellen.

<sup>31</sup> Hardy, J.S. (2014). *Linéaments d'une phénoménologie des passions chez Ricoeur* [Lineaments of Ricoeur's phenomenology of passions]. *Philosophiques* 41(2): 313–332.

<sup>32</sup> This behaviour is known as 'free riding' (taking the bus without paying). The 'prisoner's dilemma' describes the individual choice of whether or not to cooperate. With appropriate parameters, cooperation is the best solution.

<sup>33</sup> Thiel, A., Blomquist, W.A., Garrick, D.E. (2019). *Governing Complexity: Analyzing and Applying Polycentricity*. Cambridge Studies in Economics, Choice, and Society. Cambridge University Press.

<sup>34</sup> Ostrom, E. (1990). *Governing the Commons. The Evolution of Institutions for Collective Action*. Cambridge University Press; Ostrom, E. (2005). *Understanding Institutional Diversity*. Princeton University Press

<sup>35</sup> A more extensive treatment available in Verbruggen, A. (2015). [Self-governance in global climate policy](#).

<sup>36</sup> I use the term 'commercial energy' to preserve the distinction with 'natural energy' such as sunlight, and wind currents that ventilate and cool, and the 'somatic energy' of our bodies.

<sup>37</sup> Verbruggen, A. (2022). [Europe's dystopia in electricity pricing](#).

<sup>38</sup> "The test of a first-rate intelligence is the ability to hold two opposed ideas in the mind at the same time, and still retain the ability to function. One should, for example, be able to see that things are hopeless and yet be determined to make them otherwise" (Francis Scott Fitzgerald)

<sup>39</sup> [www.natuurinhethart.be](http://www.natuurinhethart.be)

<sup>40</sup> The metaphor of the supertanker that has to perform a U-turn is well known. Continuing that metaphor: the bridge of the tanker is crowded with opinionated people pointing in every direction; the engine room is still being controlled by 'old' interests, and as a result, the tanker continues to sail straight ahead.

<sup>41</sup> Disposition: a person's inherent qualities of mind and character. Aristotle. *Nicomachean Ethics*. Translated, introduced and annotated by Ch. Hupperts and B. Poortman. Uitgeverij DAMON

<sup>42</sup> Wolin, S. (2010) *Democracy Incorporated*. Princeton University Press, pp.222-224

<sup>43</sup> Green, D. (2016) *How change happens*. Oxford University Press, pp.152-165.

<sup>44</sup> 'Suspected' money flows, because no clear figures have been published, although the EU emissions trading system is finally imposing an energy tax on small and medium-sized electricity users

<sup>45</sup> Wolin, S. (2010) *Democracy Incorporated*. Princeton University Press, pp.289-292

<sup>46</sup> Avelino, F. (2021). Theories of power and social change. *Power contestations and their implications for research on social change and innovation*. *Journal of Political Power* 14(3), 425-448

<sup>47</sup> Green, D. (2016) *How change happens*. Oxford University Press

<sup>48</sup> Volberda, H.W., Morgan, R.E., Reinmoeller, P., Hitt, M.A., Ireland, R.D., Hoskissen, R.E. (2011). *Strategic Management: Competitiveness and Globalization (Concepts and Cases)*. Cengage Learning EMEA

<sup>49</sup> Stanford MBA alumnus and McKinsey director P. Winsemius became the Dutch Minister for the Environment in 1982; his management methodology helped the administration work systematically and effectively. Winsemius, P. (1986). *Gast in eigen huis. Beschouwingen over milieumanagement* [Guests in our own home: Reflections on environmental management]. Samson H.D. Tjeenk Willink.

<sup>50</sup> SWOT = Strengths – Weaknesses; Opportunities – Threats; these two dipoles connect an organisation with its environment and context.

<sup>51</sup> Economics in the world of business is the reverse: the focus is on diverse producers and consumers, segmented markets, abundant variation in quality and prices, ad hoc and bottom-up solutions, and so on.

<sup>52</sup> The meaning and role of fringe prices is relevant beyond EU's emission trading system. It explains also the hold-up by the electricity oligopoly companies on the purses of their electricity customers in the energy price crisis of 2022. See Verbruggen, A. (2022) [Europe's dystopia in pricing electricity](#).

<sup>53</sup> Colleague Ramana, M.V. (University of British Columbia; <https://sppga.ubc.ca/profile/m-v-ramana>) attended to this important aspect.

<sup>54</sup> Cardinal J. Cardijn, founder of the KAJ (Young Catholic Workers movement) taught the strategy cycle in training courses. The young people had to keep asking themselves: Where am I? What do I want? What do I do?

<sup>55</sup> Thiel, A., Blomquist, W.A., Garrick, D.E. (2019). *Governing Complexity. Analyzing and Applying Polycentricity*. Cambridge Studies in Economics, Choice, and Society. Cambridge University Press. The contributors build on the work of Vincent and Elinor Ostrom.

<sup>56</sup> The upheaval by the full war since the February 24, 2022 invasion of Ukraine by the Russian army, is life-threatening for humankind. It is interlinked to the hegemonic power of the US, as being described by Wolin. The [control over oil and gas is first rank](#), related to the [excessive super-profits](#) cashed and further impoverishing of billions of people. The wars may be a trigger of demasking neoliberalism and its neo-conservative power.

<sup>57</sup> A. Guterres (VN): "Climate activists are sometimes portrayed as dangerous radicals. But the truly dangerous radicals are the countries that are increasing production of fossil fuels. Investing in new fossil fuel infrastructure is moral and economic madness."