Degrowth as a solution to the energy problem

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I hereby declare that the work submitted is mine and that where I have made use of another’s work, I have attributed the source(s) according to the Regulations set in the Student’s Handbook.

January 2019
Thessaloniki - Greece
Abstract

This dissertation refers to the proposal of sustainable Degrowth as an alternative solution to energy resource depletion and climate change. World’s energy demand relates closely to growth and the raise of GDP. If nothing changes climate change and energy resource depletion will be fatal for human mankind and the earth. The use of renewables is limited to electricity, unable to mitigate global warming to sustainable levels, not to mention the deadly consequences of a nuclear accident. Energy efficiency has not lead to the necessary energy use fall, neither is expected to. The degrowth proposal sets under question growth as the basis of society and calls the world to pay attention to more than this such as ethical values, wellbeing, democracy, environmental limits. Born from several philosophical horizons, movements and intellectual resources, sustainable degrowth is a multifaced project that does not refer merely to the decrease of the economy, such as similar alternative proposals (e.g. a-growth, steady state economy), but aims to change the system that lies underneath in order to achieve a “right-sizing” of the economy. However the implementation of it in the growth-based society we are into is a tough call that could take place only as a last resort in case of radical and unexpected sociopolitical changes.

Keywords: degrowth, climate change, energy resource depletion, a-growth, steady-state economy

Despoina Karagkiozi
31-01-2019
Preface

This dissertation was written as part of the MSc in Energy Law, Business, Regulation and Policy at the International Hellenic University. I would like to thank my supervisor Professor Enzo Di Giulio for the knowledge, assistance and understanding throughout the dissertation formation. His valuable comments and input lead to the successful completion of the present dissertation. Special thanks, warmth and appreciation to my beloved husband for his support and patience and my children who gave me the nerve needed to cherish my academic goal despite difficulties.
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CHAPTER 1: ENERGY TODAY

1.1. Energy Use Perspective

It is a common acknowledged fact that there is no simple answer referring to the world’s energy perspective since the decisions and the policies to be applied in the future are hard to tell today. This is why the World Energy Outlook 2018 models and presents three case scenarios according to the assumed future energy policies: the New Policies Scenario, the Current Policies Scenario and the Sustainable Development Scenario (IEA, 2018a).

The New Policies Scenario takes into account the present policies, measures and policy proposals by mid-2018, incorporating the Nationally Determined Contributions (NDCs) pledged under the Paris Agreement.

The Current Policies Scenario embodies the policies and measures that are currently enacted or adopted by mid-2018, offering a baseline picture of the energy sector without any further policy intervention. Thus it does not take into account any policy actions that may be possible in the future but does embody technological improvements. Fossil fuels are expected to be of higher demand and consequently of higher prices but not to the point to allow RES to widespread. Subsequently CO₂ emissions are expected to rise.

The Sustainable Development Scenario is based on three goals of the UN 2030 Agenda for Sustainable Development: universal access to modern energy services (SDG 7), action to tackle climate change according to the objectives of the Paris Agreement (SDG 13) and the reduction of health impacts of air pollution by posing a limitation on other energy-related pollutants (SDG 3.9). The energy demand is expected to be lower which means that there is less need for fossil fuels pushing their prices down, including oil prices (Table 1).

<table>
<thead>
<tr>
<th>Table 1: Fossil-fuel import prices by scenario (IEA, 2018c).</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Real terms ($2017)</strong></td>
</tr>
<tr>
<td>------------------------</td>
</tr>
<tr>
<td><strong>IEA crude oil</strong> ($/barrel)</td>
</tr>
<tr>
<td><strong>Natural gas</strong> ($/MMBtu)</td>
</tr>
<tr>
<td>United States</td>
</tr>
<tr>
<td>European Union</td>
</tr>
<tr>
<td>China</td>
</tr>
<tr>
<td>Japan</td>
</tr>
<tr>
<td><strong>Steam coal</strong> ($/tonne)</td>
</tr>
<tr>
<td>United States</td>
</tr>
<tr>
<td>European Union</td>
</tr>
<tr>
<td>Japan</td>
</tr>
<tr>
<td>Coastal China</td>
</tr>
</tbody>
</table>

Notes: MMBtu = million British thermal units. The IEA crude oil price is a weighted average import price among IEA member countries. Natural gas prices are weighted averages expressed on a gross calorific-value basis. The US gas price reflects the wholesale price prevailing on the domestic market. The EU and China gas prices reflect a balance of pipeline and liquefied natural gas.
gas (LNG) imports, while the Japan gas price is solely LNG imports; the LNG prices used are those at the customs border, prior to regasification. Steam coal prices are weighted averages adjusted to 6,000 kilocalories per kilogramme. The US steam coal price reflects mine-mouth prices (primarily in the Powder River Basin, Illinois Basin, Northern Appalachia and Central Appalachia markets) plus transport and handling cost. Coastal China steam coal price reflects a balance of imports and domestic sales, while the EU and Japanese steam coal price is solely for imports.

CO₂ is expected to be taxed in all OECD countries resulting in a CO₂ price convergence from 2025 reaching 140$/tonne CO₂ in most OECD countries by 2040. In addition, several non-OECD countries are expected to limit CO₂ emissions using cap-and-trade schemes. Last but not least since all regional markets have alternatives for energy, a convergence of prices is expected to take place (Table 2).

Table 2: CO₂ price in selected regions by scenario ($2017 per tonne) (IEA, 2018c).

<table>
<thead>
<tr>
<th>Region</th>
<th>Sector</th>
<th>2025</th>
<th>2040</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Current Policies Scenario</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Canada</td>
<td>Power, industry, aviation, others*</td>
<td>35</td>
<td>39</td>
</tr>
<tr>
<td>Chile</td>
<td>Power</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>China</td>
<td>Power</td>
<td>15</td>
<td>31</td>
</tr>
<tr>
<td>European Union</td>
<td>Power, industry, aviation</td>
<td>22</td>
<td>38</td>
</tr>
<tr>
<td>Korea</td>
<td>Power, industry</td>
<td>22</td>
<td>39</td>
</tr>
<tr>
<td><strong>New Policies Scenario</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Canada</td>
<td>Power, industry, aviation, others*</td>
<td>35</td>
<td>39</td>
</tr>
<tr>
<td>Chile</td>
<td>Power</td>
<td>8</td>
<td>20</td>
</tr>
<tr>
<td>China</td>
<td>Power, industry, aviation</td>
<td>17</td>
<td>36</td>
</tr>
<tr>
<td>European Union</td>
<td>Power, industry, aviation</td>
<td>25</td>
<td>43</td>
</tr>
<tr>
<td>Korea</td>
<td>Power, industry</td>
<td>25</td>
<td>44</td>
</tr>
<tr>
<td>South Africa</td>
<td>Power, industry</td>
<td>11</td>
<td>24</td>
</tr>
<tr>
<td><strong>Sustainable Development Scenario</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Advanced economies</td>
<td>Power, industry, aviation**</td>
<td>63</td>
<td>140</td>
</tr>
<tr>
<td>Selected emerging economies</td>
<td>Power, industry, aviation**</td>
<td>60</td>
<td>140</td>
</tr>
</tbody>
</table>

*In Canada’s benchmark/backstop policies, a carbon price is applied to fuel consumed in additional sectors.

**Coverage of aviation is limited to the same regions as in the New Policies Scenario.

Apart from the above scenarios the Future is Electric Scenario was developed specifically for the WEO-2018 with a focus on electrification, starting from the conditions of the New Policies Scenario and presupposing that electric technologies are affordable and widely adopted without any constraints by infrastructure, supply chains or consumer preference. It is expected that by 2040 electricity will rise at least to an extraordinary 31% of final consumption (Figure 1). However the extent of its use depends on the policy to be applied in the future and the technological improvements.
This is mainly attributed to the expected wide use of electric cars and the adoption of heat pumps in buildings and low-temperature heat in industry (IEA, 2018b). The above are illustrated in Table 3.

Table 3: Definitions and objectives of the WEO-2018 scenarios (IEA, 2018b).

<table>
<thead>
<tr>
<th>Definitions</th>
<th>Objectives</th>
</tr>
</thead>
<tbody>
<tr>
<td>Government policies that had been enacted or adopted by mid-2018 continue unchanged.</td>
<td>To provide a baseline that shows how energy markets would evolve if underlying trends in energy demand and supply are not changed.</td>
</tr>
<tr>
<td>Existing policies are maintained and recently announced commitments and plans, including those yet to be formally adopted, are implemented in a cautious manner.</td>
<td>To provide a benchmark to assess the potential achievements (and limitations) of recent developments in energy and climate policy.</td>
</tr>
<tr>
<td>An integrated scenario specifying a pathway aiming at: ensuring universal access to affordable, reliable, sustainable and modern energy services by 2030 (SDG 7); substantially reducing air pollution (SDG 3.9); and taking effective action to combat climate change (SDG 13).</td>
<td>To demonstrate a plausible path to concurrently achieve universal energy access, set a path towards meeting the objectives of the Paris Agreement on climate change and significantly reduce air pollution.</td>
</tr>
<tr>
<td>Assume that electric technologies will be widely taken up in this sector as soon as they become cost-competitive, because policy makers remove non-economic barriers.</td>
<td>To explore what would happen if specific policies and technology cost reductions were to lead to a faster pace of electricity demand growth.</td>
</tr>
</tbody>
</table>

According to Figure 2 and the New and Current Policies 2018 scenarios of IEA, the energy related CO₂ emissions are expected to rise in high correlation with the energy demand’s increase by over ¼ till 2040, whereas the Sustainable Development scenario shows a considerable decrease of CO₂ emissions till 2040 although the demand remains stable mainly by improving energy efficiency which is considered as the least costly abatement option (IEA, 2018a).
Notes: Bubble size and numbers represent total primary energy demand. Mtoe = Million tonnes of oil equivalent; Gtoe = gigatons of oil equivalent or 1000 Gtoe; Gt CO\textsubscript{2} = gigatones CO\textsubscript{2}.

Figure 2: World primary energy demand and energy-related CO\textsubscript{2} emissions by scenario (IEA, 2018a).

Figure 3 shows schematically that not even the Future is Electric 2018 scenario is sufficient to hold back the increase of CO\textsubscript{2} emissions in the future, but only the Sustainable Development Scenario manages to meet climate goals keeping CO\textsubscript{2} emissions’ rise well below 2°C, between a 1.7–1.8°C (Figure 4). Today the world is already around 1 °C warmer than in pre-industrial times. The increase of energy-related CO\textsubscript{2} emissions in the New Policies Scenario, along with emissions of other GHGs, would cause a temperature rise of around 2.7°C by 2100 (IEA, 2018a).

Figure 3: World energy-related CO\textsubscript{2} emissions by scenario (left) and change in CO\textsubscript{2} emissions by sector in 2040 relative to the New Policies Scenario (IEA, 2018a).
Notes: Figure shows energy-related CO$_2$ emissions, including CO$_2$ emissions from industrial processes. Scenarios projecting a median temperature rise in 2100 of around 1.7-1.8 °C above pre-industrial levels are those following Representative Concentration Pathway (RCP) 2.6 in the Shared Socioeconomic Pathways database. See https://tntcat.iiasa.ac.at/SspDb/.

Figure 4: CO$_2$ emissions in the Sustainable Development Scenario and other “well below 2°C (1.7-1.8°C) (IEA, 2018a).

Population and world gross domestic product (GDP) are also considered among the fundamental factors to estimate the energy use perspective, although the relationship is not linear. In WEO-2018 the rates of population growth are based on the projections of the United Nations Population Division report (UNPD, 2014). World population is expected to grow from 7.5 billion in 2017 to 9.2 billion in 2040, having a reduced growth rate as years pass by: from 1.2% per year in 2000-2017 to 1.0% in 2017-2025 and 0.9% in 2017-2040 (Table 4).

Table 4: Population assumption by region (IEA, 2018b).
The population of the developed countries already accounts for 20% of global population and is hardly growing any longer, while in developing countries the population growth rates are considerably higher.

To the same direction, world gross domestic product (GDP) is expected to grow on average by 3.4% per year from 2017 to 2040 (Table 5).

Table 5: Real GDP growth assumptions by region (IEA, 2018c).

<table>
<thead>
<tr>
<th>Region</th>
<th>Compound average annual growth rate</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2000-17</td>
</tr>
<tr>
<td>North America</td>
<td>1.9%</td>
</tr>
<tr>
<td>United States</td>
<td>1.8%</td>
</tr>
<tr>
<td>Central and South America</td>
<td>2.7%</td>
</tr>
<tr>
<td>Brazil</td>
<td>2.3%</td>
</tr>
<tr>
<td>Europe</td>
<td>1.8%</td>
</tr>
<tr>
<td>European Union</td>
<td>1.5%</td>
</tr>
<tr>
<td>Africa</td>
<td>4.4%</td>
</tr>
<tr>
<td>South Africa</td>
<td>2.8%</td>
</tr>
<tr>
<td>Middle East</td>
<td>4.1%</td>
</tr>
<tr>
<td>Eurasia</td>
<td>4.0%</td>
</tr>
<tr>
<td>Russia</td>
<td>3.4%</td>
</tr>
<tr>
<td>Asia Pacific</td>
<td>6.0%</td>
</tr>
<tr>
<td>China</td>
<td>9.1%</td>
</tr>
<tr>
<td>India</td>
<td>7.2%</td>
</tr>
<tr>
<td>Japan</td>
<td>0.8%</td>
</tr>
<tr>
<td>Southeast Asia</td>
<td>5.2%</td>
</tr>
<tr>
<td>World</td>
<td>3.6%</td>
</tr>
</tbody>
</table>

However, annual average growth is expected to fall from 3.7% during 2017-2025 to 3.3% during 2025-2040. India’s GDP is expected to grow faster than any other region’s, followed by China’s and Southeast Asia’s, with Europe and Japan coming last in the line.

Last but not least since excise taxes, value added tax rates and subsidies are also of great importance for the formation of the fuel prices and they should be taken into account. In WEM2018 however they are expected to face no change over the projection period till 2040.

1.2. World’s energy needs

The world’s energy needs are constantly getting higher as Figure 5 clearly shows, and are expected to continue this way according to the New Policies Scenario with the only exception of North America, whereas the Sustainable Development Scenario shows a slight decrease in energy demand worldwide attributed to efficiency improvements (Figure 6).
The increase in worldwide energy demand is currently concentrated in Asia, having China and India to represent over 40% of the total energy demand growth. A significant growth also takes place in Southeast Asia (8% of global energy demand growth) and Africa (6%) no matter their low per capita energy use. According to the International Energy Agency (IEA), the actual increase in global demand for electricity has been significantly higher than the projections of primary energy consumption. This is a clear indication of the increasing importance of electricity for energy supply and end-use applications. As a matter of fact the energy demand is heavily influenced by factors such as the economic activity, climatic conditions, and decisions of individual
governments and is different for each sector of economic activity (commercial, industrial, residential and transportations sector) (Shaik and Yeboah, 2018).

According to the Global Energy and CO2 Status Report (IEA, 2017a), “Global energy demand rose by 2.1% in 2017, more than twice the previous year’s rate, boosted by strong global economic growth, with oil, gas and coal meeting most of the increase in demand for energy, and renewables seeing impressive gains”. If there are no big changes to the current growth policy, energy demand is forecasted to grow in a non-linear and at a greater speed in the future. According to IEA’s 2018 New Policies Scenario, global energy demand will grow from almost 14 Mtoe in 2017 to almost 18 Mtoe in 2040. Specifically, the demand will be 28% for oil, 22% for coal, 25% for natural gas, 5% for nuclear and 20% for renewables (Figure 7).

Figure 7: Shares of fuels in world primary energy demand today and in 2040 by scenario (IEA, 2018a).

1.3. Environmental aspects

According to UNEP’s 2018 Emissions Gap Report global GHG emissions have reached historical levels (53.5 Gigatons in 2017, an increase of 0.7 compared with 2016). It notes however that at the same time most countries are reluctant to go into serious measures and unprecedented changes in order to keep world temperature increase below 1.5°C reducing the risk for people and the earth (UNEP, 2018). As a matter of fact the energy sector produces over 60% of greenhouse-gas emissions. The more recent 2018 WMO Greenhouse Gas Bulletin reports that global man-made emissions (carbon dioxide, methane and nitrous oxide) are increasing at a steady pace over the last years, with CO₂ accounting for about 82% of the total radioactive forcing increase over the last decade (WMO, 2018). The Report of IPCC in 2018 over Global Warming of 1.5°C reports that global net emissions of CO₂ would need to be reduced to half by 2030 compared to 2010 levels, and reach "net zero" by 2050, since the change in global temperature since the mid-20th century is mainly due to human activity. Otherwise there would be a need for techniques to reduce the emissions to the desired levels, something that is questionable whether is applicable or not since “the
effectiveness of such techniques are unproven at a large scale and some may carry significant risks for sustainable development” (IPCC, 2018).

Energy-related GHG emissions today are about 40 Gt, out of which 75% come from industrial processes. However the power sector is expected to drop by 76% by 2040 according to the Sustainable Development Scenario (IEA, 2018a).

Notes

Figure 8: GHG emissions from selected sectors, 2017 and in the Sustainable Development Scenario, 2040 (IEA, 2018a).

The climate change, which we already experience facing global warming, rising sea levels, and dangers of extreme weather (heavy rains, storms, floods, heat waves, droughts), has concerned the scientists at least for the last 50 years as illustrated in the Report for the club of Rome’s project on the predicament of mankind (Meadows et al., 1972). Still nowadays it remains the most serious issue that shows the way towards new policies not only cleaner and technologically more advanced but also new and alternative. 2015 in Paris the Parties to the UNFCC realised the dangers behind climate change made for the first time an ethical commitment to reduce climate-damaging emissions in order to keep the world temperature increase well below 2°C above pre-industrial levels and to pursue limiting the temperature rise even further to 1.5 degrees Celsius. The UNFCCCs that followed, with the last in Poland 2018, try to promote concrete steps towards this direction. However the USA under President Trump’s government have already announced they will withdraw from Paris Agreement. So the future seems unpredictable concerning the degree of measures that will be taken from the countries in order to achieve the goal of 2°C, although earth’s climate is changing at a great speed (Kontgis et al., 2019), bearing a significant threat to humans, animals, and the environment (Thomas et al., 2004; Wheeler and Von Braun, 2013). For example, the frequency and intensity of extreme heat is expected to rise (Luber and McGeehin, 2008), which may damage worldwide food systems (Battisti and Naylor, 2009). The characteristic phrase of ecologist Bill McKibben describes the environmental problem in relation to the energy resource
depletion clearly and vividly: “Even before we run out of oil, we’re running out of planet” (McKibben, 2007).

Scientists working in the anthropogenic climate science describe climate change as the biggest threat for public health this century (Goodman, 2013; Intergovernmental Panel on Climate Change, 2007a, 2007b, 2007c, 2007d; Watts et al., 2015; Whitmee et al., 2015). 2017 was one of the warmest years ever recorded characterized by warmer-than-average temperature on land and ocean surfaces worldwide. Since global records began in 1880, a record warmth was observed in 2017 across nearly all continents, not to mention the oceans which had their third warmest year (Climate Monitoring). Climate change made the air quality worse, the weather conditions dangerous and placed not only physical but also mental health at stake (Epstein, 2005).

1.4. Natural Resources Depletion-Hubbert’s peak

WEO-2008 and WEO-2013 presented an analyses of decline rates in oil fields based on actual production data for a quite large number of fields. The decline rates vary according to the type of field, the geographical location and the decline phase. There is also a difference in decline rates between observed decline rates and natural decline rates (the decline rate that would be observed in the absence of further investment in producing fields).

The estimated volume of reserves has doubled since estimations of 1980 mainly because of revisions made in the 1980s in OPEC countries and less because of new discoveries. Thus since 1990 there have been noted modest increases in oil reserves, although oil consumption is rising.

Middle East and the traditional players of OPEC are currently under pressure since the discovered oil fields, accounted for about 80% of the world’s oil reserves, are getting old and quite expensive whereas the United States tight oil output, Canada’s oil sands and Brazil’s deep-water production is rising at a fast pace. Not to mention the natural gas which is discovered all over the world. However by mid-2020s, non-OPEC production is expected to decrease with OPEC providing once more most of the oil supply.
At current rates of consumption conventional crude output from existing fields is estimated by IEA in WEO 2008 to fall by more than 40mb/d by 2035 facing an annual decline of 6%. So more than half of the oil demand projected for 2035 will be needed in order to offset the declining production mainly by expensive upstream oil investments. As Figure 9 clearly shows, the observed and natural declines of oil production till 2025 are much faster than the drop in the Sustainable Development Scenario, not to mention the New policies scenario, where the drop is even faster.

According to 2012 estimations of IEA oil and natural gas reserves are only half of a century away from depletion and coal more but just 1.5 times further. Investments and new technology may however longer this period, since the total remaining recoverable resources are quite more, but still a depletion deadline is estimated to occur in the future sooner or later because of fossil fuels non-renewable -fast enough-nature. As for the most critical energy source, oil, IEA estimates that over 80% of the proven reserves are already under production, reducing its volume to be used in the future (Figure 10).

Apart from IEA’s estimations, according to David Rutledge 90% of the global coal production will take place till 2070 (Rutledge, 2011). Steve Mohr’s national Hubbert Linearization estimated 2081 as the key year (Mohr, 2010). Last but not least Patzek and Croft’s multi-Hubbert cycle analysis gave 2058 (Patzek and Croft, 2010).

Notes: All bubbles are expressed as a number of years of production based on estimated production in 2013. The size of the bubble for total remaining recoverable resources of coal is illustrative and is not proportional to the others. The figure specifies the status of reserves for coal as of end-2011, and gas and oil as of end-2012.
Sources: BGR (2012); O&GJ (2012); USGS (2000, 2012a and 2012b); IEA estimates and analysis.

Figure 10: Fossil energy resources by type (IEA, 2013).

The direction of the data in the above Figure 10 towards a fossil energy resource depletion deadline reconfirms Hubbert’s peak, which is a model that approaches the production rate of a non-renewable fossil energy resource over a certain time period. Predicting beyond the mere fact of the resource depletion to the actual depletion time period, Hubbert’s curve shows the maximum production point at a period when the
demand keeps rising, predicting a sharp production fall right afterwards with probable dramatic differences in production and demand since the demand continues to increase but the production drops. Although Hubbert’s predicted model may be applied to many non-renewable energy resources, it was initially scheduled for the US oil production (Figure 11). His reasoning lies in the conclusion that when the consumption rate of an exhaustible energy resource is greater than its renewal rate this leads to a severe resources’ drop right after a production ‘s peak.

As we can see from the above figure, Hubbert proved to be right up to the 2000’s, as US production peaked indeed as predicted in 1970 facing a dramatic decline after this point. However Hubbert could not take into account the technological advancements of the 21st century, that enabled non-conventional oil to be produced and led to a nowadays second peak.

![Figure 11: U.S. Crude Oil Production Vs. Hubber Curve.](image)

However according to the peak oil theory there will be an ultimate peak in oil production when there will remain only half of the oil reserves. So it seems that there is a large number of external factors that may change Hubbert’s model, slightly or more, proving that real production rates are not as simple as a bell shaped curved.
1.5. **Renewables are not enough; The Danger of Nuclear**

A. According to REN21 Renewables 2018 Global Status Report (GSR) and BP Statistical Review of World Energy 2018 renewables grow stronger as years go by, being more affordable and enjoying more subsidies than they used to (BP Statistical Review of World Energy, 2018; REN21, 2018) (Figure 12).

![World consumption](image)

World primary energy consumption grew by 2.2% in 2017, up from 1.2% in 2016 and the highest since 2013. Growth was below average in Asia Pacific, the Middle East and S. & Cent. America but above average in other regions. All fuels except coal and hydroelectricity grew at above-average rates. Natural gas provided the largest increment to energy consumption at 83 million tonnes of oil equivalent (mtoe), followed by renewable power (69 mtoe) and oil (65 mtoe).

Figure 12: World primary energy consumption in 2017 (BP Statistical Review of World Energy, 2018).

In IEA’s Renewables 2018 renewables is expected to raise its share in global energy demand by 12.4% from 2017 to 2023. However the bigger change upwards will be seen in electricity rather than heat and transport, where the increase of renewables will be minimal, far less than the era demands (Figure 13).
Figure 13: Shares of renewables in electricity, heat and transport 2017 and 2023 (IEA, 2018c).

According to the IEA’s World Energy Outlook 2017 (“Sustainable Development Scenario”), the total share of renewables is not enough to keep global temperature rise well below 2°C and it is not expected either to be enough in the future, although its growth is beyond doubt (IEA, 2017b). This is mainly because of the low use of renewable energy in the heat and transport sector where the countries still allow global warming-related fossil fuels to prevail enjoying higher production and consumption subsidies. As a matter of fact investments in fossil fuel and nuclear energy remained high in 2017, (USD 103 billion and USD 42 billion respectively) and global coal consumption increased by 1% (REN21, 2018).

Furthermore, the situation gets even more difficult because of the stochastic nature of the output of variable renewables such as wind and solar PV, which allows only to a proportion of the installed capacity to be produced. Thus, it is uncertain if the SDG 7 will be fulfilled by 2030.

B. According to the “Health effects due to radiation from the Chernobyl accident report”, 2008, UNSCEAR, and the “Sources, effects and Risks of ionizing Radiation Report”, 2013, UNSCEAR, nuclear power’s health impacts in case of an accident are severe and deadly depending on the exposure, including deterministic and stochastic effects (immediate death, cancer of several types etc). Moreover there are high risks for the non-human biota at land and sea.

However nowadays there is an acceptance of nuclear energy in some part of the academic and scientific society which claim that nuclear energy, in contrary to fossil fuels, is capable to support the Sustainable Development Goals of the UN including climate change and global warming mitigation (IAEA, 2017). Although they can not deny the fatal nature of nuclear energy in case of an accident, they underline the fact that on one hand there is no totally harmless energy form, including renewables which function is based on fossil material, and on the other hand that, compared to pollution from fossil fuel energy, nuclear energy is more friendly and safe. According to Kharecha and Hansen, global nuclear power has prevented over one and a half million deaths related to air pollution and 64 gigatonnes of CO₂-equivalent (GtCO₂-eq) GHG
emissions that would have resulted from fossil fuel burning (Kharecha and Hansen, 2013).

Nevertheless, even if the above allegations are true and nuclear power compared to fossil fuel power is indeed safer, this does not mean according to the historical data that it is safe in general terms or safer than any other solution of energy form or alternative proposal related to the energy and the mitigation of climate change.

1.6. The root of the devil in energy economics terms and the way to cut it off

Living in a growth-based society where consumerism, capitalism and wealth is considered as the ultimate good towards a well-promising future, energy is a sine qua non factor that contributes to the direction of the economy (Alexander, 2011). When the energy gets more and more expensive, as it recently has, and the supply does not meet the demand, the economy (firms, households, nations) begins to disfunction having several problems such as forced economic degrowth, stagnation, recessions, debt default, social turbulence etc. (Tverberg, 2012). The most recent paradigmatic example is the global financial crisis of 2008, which still has not thoroughly ended. Among others Rubin and Hamilton consider that it was imposed by high oil prices, since oil is the mainly used energy source that till recently was affordable enough to support the growth of the economy (Hamilton, 2010; Rubin, 2012, 2009). According to the last one the 10 out of 11 recessions of the USA after the second world war were due to high oil prices. Figure 14 shows schematically the close relationship between oil supply and economy. According to Ayers and Warr, 2010, the relationship is not bilateral but it’s the energy growth that drives economic growth, and not the reverse (Warr and Ayres, 2010).

![World Oil Supply Growth vs World GDP Growth](image)

**Figure 14:** World Oil Supply Growth vs. Growth in World GDP, based on exponential trend lines fitted to values for selected groups of years. World GDP based on USDA Economic Research Data (Tverberg, 2012).
The above described high correlation between economic growth and energy supply combined with the growth model, the exceeding earth’s carrying capacity and the subsequent serious environmental impact caused by humans seems to be the main reasons of the energy resources depletion (Ayers and Warr, 2009; Stern and Kander, 2011; Warr and Ayres, 2010) that leads the world nowadays to a dead-end seeking for the light in the tunnel of non-sustainable -as it seems so- growth.

Scientists and academics around the globe are now placing energy at the center of macro-economic models which imply that we are into a twilight age of economic growth (Georgescu-Roegen, 1971; Murphy & Hall, 2011a, 2011b; Rubin, 2012; D. Stern & Kander, 2011; Tverberg, 2012a; Tverberg, 2012b). The era’s turbulence is easy to realize after all considering the multitude of energy proposals that aim to a sustainable future, not to mention the efforts for higher energy efficiency, alternative sources of energy and for electrification. Starting from the proposal of sustainable development, which has not anymore, the glory of the past, to green growth, smart growth, inclusive growth etc., it is impressing that all these proposals include the term “growth” in their definition. However, there have been efforts for implementation within a growth-based society in order to make it sustainable, cleaner, greener, smarter, there has not been any progress since their introduction to the scientific community. So it seems that a non-growing economy is the worst scenario for an economist, but at the same time so is for an ecologist an economy that is constantly growing. The above described dilemma of growth is what makes this puzzle so difficult to solve for governments and institutions (Jackson, 2009).

According to the above mentioned already, it seems rather impossible to apply a carbon-free policy in a society that is motivated according to the imperatives of growth, since the cleaner sources of energy (renewables, nuclear) can not keep the economy at a growth pace and what’s more phase out fossil fuels with safety. Thus, being ready to allow for or accept a growth reduction, in one way or another, is an option to seriously think about if sustainability is actually a goal to be achieved for the world’s sake in the future.

In the chapters to follow, the movement of sustainable degrowth in analyzed, being compared with a-growth and steady state economy, which are all considered as rather alternative if not radical proposals that can be implemented only out of the growth model of society that dominates the world today.
CHAPTER 2: A LITERATURE REVIEW OF DEGROWTH

2.1. Historical retrospective of Sustainable Degrowth movement and its important exponents

The term “degrowth” originates from the French word “décroissance”, which the French intellectual André Gorz, inspired by Nickolas Georgescu-Roegen, first used while criticizing over the first report of the Club of Rome in 1972 about Limits to Growth and more specifically over the compatibility of zero growth/degrowth with capitalism. Georgescu-Roegen advocated that the endless growth preached by the neoliberal economics would only cause irreversible damage because it ignored the basic principle of entropy, according to which the energy used cannot return to its former state but it is used degraded or transformed in another form. Referring to the earth’s natural resources, he advocated that eventually they will be depleted if continued to be used in the same way (Georgescu-Roegen, 1973).

Some other precursors of the idea of degrowth are to name a few, except for Georgescu-Roegen, Arendt, Illich and Schumacher (Arendt, 1958; Georgescu-Roegen, 1973; Illich, 1973; Schumacher, 1973). The exponents of degrowth come from several philosophical horizons, movements and intellectual sources (Bayon et al., 2010; Ridoux, 2006). One group comes from anthropologists who criticise the idea that the growth-based northern countries are to be imitated by the countries of the south (Cochet, 2005; Hoogendijk, 1991; Hueting, 1980a; Latouche, 2006; Ridoux, 2006). Serge Latouche is one of the leading personalities of this school of thoughts. Karl Polanyi describes this as an “irruption of the generalized market system” (Polanyi, 1944). Another group focuses on democracy as the basis for the economic and social system (Arie’s, 2007; Ellul, 1983; Fotopoulos, 1997; Gorz, 2008; Gras, 2007; Illich, 1973; Polanyi, 1944; Schneider et al., 2001) Another source of degrowth comes from the ecology (Alexander, 2009; Besson-Girard, 2005; Guattari, 1989; Mongeau, 1985; Odum and Odum, 2001; Rabhi, 1983; Schneider et al., 2001; Thoreau, 1854). The last group comes from bio-economics or else ecological economics, believing in more equity and dealing with resource depletion and waste disposal (Hueting, 1980b). The theory of degrowth started at the time of the oil crisis in the 70s and the economic recession that followed, but was then abandoned after the crisis was over. It reappeared to the global energy scenery beginning from France, and later Italy and Spain in the late 90s-early 2000s as a criticism to sustainable development. However the term of ‘degrowth’ was first used 2008 at the Paris first international conference of Schneider’s Research and Degrowth, expanding worldwide afterwards entering to important academic journals and at least 7 special issues in peer-reviewed journals (Cattaneo et al., 2012; Kallis et al., 2012; Saed, 2012; Schneider et al., 2010; Sekulova et al., 2013; Whitehead, 2013).

2.2. Defining Degrowth

Concerning the definition of “Degrowth” the First International Conference on Socially Sustainable Economic Degrowth for Ecological Sustainability and Social Equity held in
Paris in 2008 underlines in its Declaration that degrowth is a "voluntary transition towards a just, participatory, and ecologically sustainable society". Degrowth aims to "meet basic human needs and to ensure a high quality of life, while reducing the ecological impact of the global economy to a sustainable level, equitably distributed between nations" by transforming the global economic system and the governments' policies in order to eradicate absolute poverty achieving a "right-sizing" of both national and global economy. According to Schneider et al. degrowth is "an equitable downscaling of production and consumption that increases human well-being and enhances ecological conditions at the local and global level, in the short and long term", suggesting sustainability in both environmental and social terms (Schneider et al., 2010). Kallis sees degrowth as a "multi-facet political project that aspires to mobilize support for a change of direction, at the macrolevel of economic and political institutions and at the micro level of personal values and aspirations" and defines it from an ecological economics point of view as "a socially sustainable and equitable reduction (and eventually stabilization) of society's throughput" (Kallis, 2011). According to him the goal is the reduction of income and material comfort not to be experienced as welfare loss. He considers degrowth as an "umbrella keyword" that links government's policy with social movements. Degrowth puzzles the scientific community that deals with the limits of economic growth and searches for alternative paths to prosperity (Kallis, 2011; Martinez-Alier et al., 2010; Schneider et al., 2010; Spangenberg, 2010). Martinez-Alier et al., claims that degrowth challenges the society to become better through a “post-development” way that’s characterized by justice and ecological limits (Martinez-Alier et al., 2010). Thus from a political point of view degrowth is all about democracy, equality, justice, and self-determination aiming to a directly democratic society with better structures than today (Fournier, 2008; Latouche, 2010). Latouche considers that the goal of growth should be abandoned for the sake of growth itself (Latouche, 2009).

To end with, degrowth is not a negative size of growth. It does not call for doing less, but for doing things in a different way that reassures well-being and prosperity that is irrelevant from GDP. It aims to train people to think beyond money as a life’s goal and act in harmony with each other and the environment. As Latouche puts it, degrowth aims to be associated with “Better”, not “Less”. (Latouche, 2009).

### 2.3. Degrowth Proposals

Degrowth proposals focus either on institutional and policy reforms (Fournier, 2008) or to some radical ideas that are difficult to apply in today’s world as we’ve used to it. As for the first category, emphasis is given to redistribution (of work and free time, natural resources and wealth), social security and gradual relocalisation of the economy in order to reduce the size of it according to degrowth’s beliefs. Filka Sekulova proposes the reduction of the intermediaries, the decrease of the number of appliances and goods used or consumed per household and the introduction of simpler technologies along with strict regulation of advertising, work sharing and slow-mode transportation (Sekulova et al., 2013). Gorz and Victor propose a reduction of the working hours (Gorz, 1994; Victor, 2010), while Raventos insists on a basic income that ensures economic security to everyone (Raventós, 2007). Jackson believes in a
labour policy for less productivity and more employment in humane sectors such as
health or education (Jackson, 2009), to the same direction with Latouche who
proposes salary caps (Latouche, 2009). Distributive taxes may finance public
investments such as gardens, squares etc. according to Latouche (Latouche, 2009).
Relocalisation may be based on complementary local currencies according to Seyfang
(Seyfang, 2001) and on the decentralization of the Banks (Korten, 2008). Taxes to
polluting uses and resources, as well as to nuclear energy) are also proposed along
with CO₂ caps (Alcott, 2010; Kallis and Martinez-Alier, 2010). Shared mobility and
cohousing have also been proposed in the degrowth literature as a way to avoid
resource use and unnecessary material flows on the one hand and to bring people
closer on the other hand (Schneider et al., 2010).
CHAPTER 3: DIFFERENCE BETWEEN SUSTAINABLE DEVELOPMENT AND DEGROWTH

According to the Brundtland Commission definition “Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs” (WCED, 1987). Although more than 30 years have passed since the report of the WCED, politics and public attitudes have not changed enough to avoid climate change and biodiversity loss. Theodoropoulos considers that the experience of the last 20 years has shown that sustainable development cannot be ecologically viable, since it still exhausts natural resources and has not improved prosperity and quality of life (Theodoropoulos, 2013). According to Georgescu-Roegen, sustainable development has been “a lovely lullaby” that’s been putting the world to a long sleep with dreams of a bright future of wealth combined with prosperity which can not be put into practice (Georgescu-Roegen, 1993). It was first launched 1992 at the Rio Conference and dominated the energy scenery afterwards throughout the last decade of the 20th century despite, or maybe because of, its non-specific meaning. However it seems that the first enthusiasm over it has long ceased to exist. The words of Professor W. Adams from IUCN 2006 are characteristic setting under question the role of Sustainable Development nowadays: “In implying everything, sustainable development arguably ends up meaning nothing” just like it happened with previous movements such as the social development, the human development, etc.

The diagram below (Figure 15) shows schematically in quite simple terms the main differences between sustainable development and degrowth which result to the different approach and key-solutions each proposal has towards the current environmental problems. Sustainable development requires a decoupling of GDP (growth) and use of energy resources with the help of technology and efficiency improvements to the point that GDP increases while the use of resources stays stable or even decreases. Meanwhile it presupposes a standard demographic transition all over the world that leads to a stabilised world population. In contrary, according to the degrowth proposal, the use of resources, along with the world’s population, are not expected to grow but rather to decrease after a short period of booming accompanied by GDP factor in the same direction and proportional size. Degrowth rejects growth aiming to a “post-development” way that’s characterized by justice and ecological limits (Martínez-Alier et al., 2010). According to D’ Alisa et al. sustainable degrowth underlines that the environmental impact may be reduced by a democratic way of living that shrinks production and consumption (D’Alisa et al., 2015) “re-centring the society around care” in order for justice and well-being to prevail against GDP growth (D’Alisa et al., 2015).

The only part that’s the same between these two theories is the message of environmentalism that warns mankind for almost half century now as an alarm (Boulding and Boulding, 1995) that energy resources will sooner or later be depleted due to their overusage with dangerous results on the mankind and its environment. The reaction towards this warning is what differs between the two movements, each of which has a separate theory for what should be done in order to avoid the “end of
the world as we know it”, as the well-known REM song notes. Whereas the traditional concept of sustainability considers dematerialization and efficiency improvements as the best way to reduce the environmental impact and problems, degrowth focuses on the transformation of the system underneath that has caused the global warming and the source depletion (Martinez-Alier, 2009).

In general terms the proposal of degrowth differs from any proposal that supports the continuing of growth as a model for society no matter if that’s called sustainable growth, green growth, smart growth, inclusive growth etc. Rejecting the system that lies under the growth policy, degrowth followers consider all the above proposals as policies of a common endless growth path or, as Jackson puts it, "a general call to revive consumption and boost growth" that leads willy-nilly to energy resource depletion and rest environmental problems (Jackson, 2009). According to Gorz the compromise of economic development and environmental sustainability is impossible, since the problem is structural and systemic (Fournier, 2008; Gorz, 1993). It looks as if similar policies such as green-smart-inclusive growth, change the words because they cannot change things (Koukoulas, 2013). The question however is not to replace a bad economy with a good one, or bad growth with good growth, green, social, fair, accompanied by a robust set of regulations, but to put the imaginary foundations of economy into a radical challenge in order to abandon growth expansion (Latouche, 2010).
CHAPTER 4: IS DEGROWTH A WAY OUT FOR THE FUTURE?

4.1. Degrowth: Consequence of a catastrophe or Choice of being different?

Since the 2008 world crisis a GDP degrowth and a CO₂ emissions reduction has been noticed (Martinez-Alier, 2009). Many considered this recession as an opportunity for political changes in order for this inevitable degrowth to become socially sustainable and this way to defend the suggestions of the degrowth proposal. However, although the nowadays enforced economic downscaling of production and consumption may be turned into an opportunity to apply the suggestions of the degrowth proposal, sustainable degrowth is not equivalent to negative GDP growth in a growth economy, distinguish between an unplanned degrowth process of the economy in a growth regime, and sustainable degrowth, in terms of a voluntary, smooth and equitable transition to lower level of production and consumption (Schneider et al., 2010).

Economic degrowth in a growth-based economy is a not socially sustainable degrowth progress, as it brings unemployment, economic insecurity, lack of credit, inflation and finally collapse of social peace with, although it may reduce the environmental impact while it lasts (Schneider et al., 2010). However the proposal of sustainable degrowth is based on a free-willing democratic procedure that aims to move the scope of state governance beyond the mere increase of GDP to people’s wellbeing and to environmental sustainability. Thus it seems that the so called dilemma of degrowth does not exist, since the proposal of sustainable degrowth does not aim to an enforced recession but shows the way how to get out of it not only unwounded but with precious environmental and social benefits.

4.2. A Comparison of Growth, A-Growth, and Degrowth

I believe that growth and degrowth have already been analyzed in detail in the above chapters, so in this chapter I will refer to a-growth and its suggestions in order to reach the environmental goals necessary.

The proposal of a-growth suggests that we remain agnostic and “indifferent about GDP growth” (Bergh, van den, 2011), applying caps and trades on CO₂ emissions and rest environmental externalities setting the prices of goods at a right basis and continuing the important negotiations for climate change. This way the consumers will shift their choices from dirty to clean activities, a procedure that van den Bergh calls “economic restructuring”. As a reason it is provided that the relationship between pollution, GDP and wellbeing is difficult and complex to foresee and make definite statements.

Table 6 compares degrowth with growth and a-growth. The a-growth proposal is indifferent to the economy perspective (once good environmental and social policies are pursued), considering the decrease of growth as certain, at least for a while, once stringent environmental and climate policies are pursued, given the fact that growth is based mainly on dirty rather than clean activities (Jackson and Victor, 2011).

The degrowth proposal aims to the economy downscaling in order not only to meet the environmental goals but also to make the society better as a whole,
considering that there is a high correlation between growth, pollution/resource use and welfare. This fact however seems to be reconfirmed by the environmental Kuznets curves over the decoupling of GDP and environmental pressure which show that decoupling does not apply to every sector but only to relatively easy problems that mainly refer to human health (Stern, 2006). Jackson comes to the same conclusion that “the numbers do not add up” referring to the continuation of the economy growth and the solution of the environmental issue, unless a complete 100% decarbonization is succeeded (Jackson, 2009).

Table 6: Comparison of Growth – A growth – Degrowth (van den Bergh and Kallis, 2012).

<table>
<thead>
<tr>
<th>Statement supported</th>
<th>Growth</th>
<th>A-growth</th>
<th>Degrowth</th>
</tr>
</thead>
<tbody>
<tr>
<td>GDP is an accurate indicator of social welfare or happiness</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>GDP growth is necessary and sufficient for full employment</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Growth of income increases welfare</td>
<td>Yes</td>
<td>Not always</td>
<td>No</td>
</tr>
<tr>
<td>Growth does not harm, or even promotes, equity and environmental sustainability</td>
<td>Yes</td>
<td>Not always</td>
<td>No</td>
</tr>
<tr>
<td>The aim of unconditional GDP growth constrains our search for improvements in social welfare</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Further average income growth does not increase social welfare in rich countries</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Microeconomic and macroeconomic theories do not give any support to GDP growth as a welfare-increasing strategy</td>
<td>No attention</td>
<td>Yes</td>
<td>No Attention</td>
</tr>
<tr>
<td>The GDP growth paradigm can be seen as an invention of mainly empirical macroeconomists and politicians</td>
<td>No</td>
<td>Yes</td>
<td>No Attention</td>
</tr>
<tr>
<td>The past shows a high positive correlation between income and environmental pressure</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Growth is bad for the environment</td>
<td>No</td>
<td>Not always</td>
<td>Yes</td>
</tr>
<tr>
<td>Degrowth is a focused strategy to fight inequity and unsustainability</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Growth is generated mostly by relatively dirty activities using much energy and material resources and creating much pollution</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>
Stringent environmental policies can decouple income from environmental pressure, and thus allow for a continuation of the old growth pattern

| Yes | Possible but unlikely | No |

The above table shows schematically that both -radical for a growth based system-proposals of a-growth and degrowth converge to the abandonment of the pursuit of growth, while promoting similar policies beneficial for the society and the environment such as pollution caps. They differ however in that degrowth aims to the downscaling of production and consumption, since this is necessary for the acceptance of stringent environmental policies (Kallis, 2011) for environmental sustainability to be gained, whereas a-growth remains indifferent to production and consumption levels as long as beneficial environmental policies are pursued.

### 4.3. Steady State Economy and the superiority of Degrowth

The steady-state economy is another alternative proposal for the reduction of the environmental impact first developed by Daly calling it a “zero-growth” economy (Kerschner, 2010). It focuses only on material thoughtput (Daly, 1996) and economic reforms, such as cap and trade, leaving out of scope any socio-political and cultural changes (Kallis, 2011; Schneider et al., 2010). Herman Daly already since the 1970s was against the economic growth suggesting a steady state economy (Schneider et al., 2010). According to Christian Kerschner the concepts of Degrowth and Steady State economy are not in contradiction but complement each other in a way that an economic degrowth of the North leaves space for the growth of the South providing a worldwide equitable steady state economy (Daly, 1996; Kerschner, 2010; Max-Neef, 1995).

So it seems that a common characteristic of the two proposals of a-growth and of steady state is that they lack in socio-political suggestions towards a multifaced sustainable world in general, missing out to refer to the people ‘s attitude of the society apart from the environment and GDP. This is actually where the main criticism towards these two movements is placed according to François Schneider et al., 2010, whereas the sustainable degrowth proposals include apart from economic and environmental suggestions also cultural and socio-political ones, making it a more complete alternative path towards the solution of the energy and environmental problem (Schneider et al., 2010).

Apparently that the different backgrounds and education fields of the degrowth supporters have turned this movement into much more than another radical alternative proposal for the sustainability of the earth. Degrowth academics and practitioners have turned this movement into a belief on how to redefine welfare and “the joy of living”, as Georgescu-Roegen calls it. The solution of the environmental and energy problem will afterwards be solved as a mere consequence of this attitude change. According to the author of this thesis this is the main reason the proposal of degrowth is of a higher level than a-growth or steady state economy.
4.4 The feasibility of Degrowth as a possible energy solution. A personal reflection

Since degrowth aspires not only to solve the world’s energy problem together with the conservation of the planet, but also to bring peace in our hearts training people to act harmonically as a group for the common sake, one may ask himself why it is not implemented yet. It’s been already over 10 years since the degrowth project has been officially introduced from the academic society, but still there has been no progress putting its imperatives into practice. Is it just another firework of energy economics addressing merely to academics for theoretical personal reflections and endless discussions among the scientific cycles or can it really be implemented in the society of today and help us save ourselves from the disasters that’s about to take place? Obviously there is no doubt anymore even for the non-educated that the environmental impact has long exceeded the sustainable level; the rising of the sea levels and extreme weather conditions due to human imposed global warming are everyday now on the news all over the world. Technology and cleaner energy resources are apparently not enough to stop this or not safe. So why are we handicapped in a situation that leads us right to the cliff? Why can’t we just follow the advice of scientists for changing this growth lifestyle and turn to simplicity and pure joy of life?

The addressee of these questions is mainly the political system which decides over the macro policies to be implemented and the market’s economy. Afterwards comes along the individual choice, together with its weaknesses for radical social change at a micro level. Luckily or not we are living in a growth-based society where capitalism and consumerism are promoted as the ultimate source of “good” and power, having infiltrated not only to institutions but also to human relationships.

However even from the times of Aristotle material security was not the means to approach “eudaimonia” (well-being or prosperity). The human nature feels “at home” when having the potential to participate meaningfully to the life of the society, when being healthy and giving and receiving love, and finally feeling happy. (Aristotle’s Nicomachean Ethics). As a matter of fact there is an approach that the factors that lead to prosperity are no different than the ones which ensure subjective wellbeing and happiness (Dolan et al., 2008, 2006; Jackson and Papathanasopoulos, 2008; Layard, 2005) (Figure 16).
Nevertheless “the growth imperative has shaped the architecture of the modern economy” (Jackson, 2009). Castoriadis mentions that “the social imaginary of growth plays in capitalist societies the role that religion played in pre-capitalist ones” (Castoriadis, 1985). The pursuit of personal profit counted in monetary units has entered deep inside to the point that it is easier to think about the end of the world than a serious social change. The possession of material goods has become a life’s goal being connected with social and psychological meanings. Consumer goods symbolize nowadays one’s identity, friendship, family, sense of belonging to a community; last but not least they define one’s social status being under constant comparison (Baudrillard, 1970). Thus, the struggle for their possession, no matter how anxious may be, is of major importance in today’s growth society which aims to liquidity and individual pursuit of consumption in order to survive via its policies and institutions. What is even more worrying than the above described situation is that it seems there is no way out of this vicious cycle if social progress continues to depend on materialism putting prosperity under threat.

Of course a high income is very important up to the point that basic entitlements are covered, such as for example life expectancy and health. After this point however it seems that a rising income has not much to offer to such needs, but rather reduces the levels of subjective well-being and inner comfort (Jackson, 2009). See for example Figure 17, according to which as GDP per capita grows beyond $15,000 or so, life expectancy does not follow accordingly, but rather fluctuates depending on other factors.
Nonetheless as long as economic stability depends on growth, the pursuit of wealth will continue to prevail, having become part of man’s nature, which only teenagers and romantics still set under question. However if man would stop dreaming of the desired destination, he wouldn’t know which direction to follow even when the road seems endless, not to mention that eventually the road would be lost and hard to find. From a personal point of view, this is one of the main attributions degrowth has to offer to the society. That keeps the flame on in case needed. 

What is more, going into a sustainable degrowth process that brings prosperity back into the game in the critical era we live in is not a case out of the game, either via revolution or via social transformation. According to F. Schneider “crises open opportunities for alternative discourses” (Schneider et al., 2010). Mike Davis refers to the example of the U. S. economy which changed in a flash when needed in the 1970s to fight fascism: cars were shared, people used bicycles, recycled at an unprecedented level, hitchhiking became very popular. As he explains, the system changed so radically that people would not even dare to talk about their wealth publicly. To go further, climate change and energy resource depletion are indeed two of the century’s most threatening problems, which solution fulfils the preconditions for a revolutionary social change (Davis, 2007). 

All in all, no matter how radical the alternative proposal of Degrowth may still seem today to most of us, the implementation of it in the near future is not out of the question because on one hand of the criticalness of the two main threats of this century, energy resources depletion and climate change, which are due to human exploitation and pursuit of constant growth, and on the other hand because of the
man’s oppressed lust, hidden deep inside, to find back prosperity and joy of life released from the tyranny of a constantly demanding economy.

Conclusions

It is now common ground that global warming is rising at dangerous levels for life itself. Crude oil is sooner or later running out, not to mention the danger of nuclear proliferation and the insufficiency of renewables to set the situation under control. Moreover, the rise of the world’s population makes sustainability even more difficult to achieve. The growth of the economy has been closely related to the pollution to the point that it leads to a dead-end.

The proposal of degrowth may have been recently introduced to the scientific community in 2008, but the term is already known as “décroissance” since the 1970s. Degrowth is a “voluntary transition towards a just, participatory, and ecologically sustainable society” aiming to “meet basic human needs and to ensure a high quality of life, while reducing the ecological impact of the global economy to a sustainable level, equitably distributed between nations” by achieving a “right-sizing” of national and global economy in order to eradicate absolute poverty and ensure equity, democracy, and prosperity that is irrelevant from the economy growth. Sustainable degrowth differs from forced economic degrowth that takes place in case of a crisis leading to recession, stagnation, and social turbulence. Its proposals refer to the macro and micro level of the economy focusing on institutional and policy reforms (eg reduction of working hours, work sharing, ensuring of basic income to everyone, re-localization of economy with local currencies and banks, introduction of simpler technology, regulation of advertising, slow-mode transportation, distributive taxes) and on alternative way of living (shared mobility and cohousing).

Compared to other proposals degrowth has proved to be of a higher level since it has turned into much more than another alternative proposal for sustainability, but rather a belief on how to redefine welfare and prosperity that allows for an environmental impact reduction aiming to change the system of non-sustainable growth and wealth from beneath. The proposal of sustainable development, which addresses to a society based on the continuance of growth, still exhausts natural resources not improving quality of life, not to mention its non-specific meaning. A-growth proposal, although quite alternative as well, suggests to be indifferent about GDP, referring merely to environmental policies, leaving out of scope socio-political institutions and people’s way of living. Steady State Economy, an alternative project as well, focuses only on material throughput and economic reforms, not including any proposal for socio-political and cultural changes.

Last but not least, sustainable degrowth is a quite alternative multifaced project with aspirations for a better, rather idealistic, world that’s difficult to achieve. However the critical era we live in today, that’s characterized by economic crisis, energy resource depletion and climate change, does fulfil the preconditions for the implementation of a new and totally different policy such as degrowth, since the current system has obviously failed to ensure the world’s sustainability at both
environmental and socio-political levels, and most importantly to bring back to the people the feeling of inner fulfilment and prosperity.

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