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CHAPTER

THE IMPACT OF DE-GROWTH (LA DÉCROISSANCE) ON THE DISCOURSE OF SUSTAINABILITY

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INTRODUCTION

'De-growth' (la décroissance) emerged as a discourse amongst academics, primarily in France, in the early 2000s. Its proponents rejected the hypothesis that sustainability can go hand in hand with growth. It was not a new discourse as some academics in the 1990s had begun to question the accepted view of sustainable development, for example it had been described as a '(programmed) mythology (Perrot, Rist & Sabelli 1992: 125), and 'one of the most damaging (of) concepts' (Georgescu-Roegen 1991: 53). However in the early 2000s the proponents of the de-growth view drew together a wider group of people from various academic disciplines and backgrounds. Whilst there was some commonality amongst their views, the emerging discourse was not unified. For instance, Flipo identified five trends within the debate which had quite strong contradictions between them (Flipo, 2009: 27).

The first trend, known as ‘culturalists’, comes from anthropology. It is at the crossroads of the criticism against alienation and against the excesses of mass consumerism. This approach has been developed by authors such as Latouche and Perrot. Following an earlier tradition (Ellul 1954, Illitch 1971, Gorz 1973) the second trend developed by Cheynet and Latouche denounces the myth of technological progress. By using concepts such as ‘the ecological footprint’ and ‘the rebound effect’ the third trend focuses on the environmental damages caused by economic activity (Cochet 2009). The fourth trend has a philosophical dimension as it questions the meaning of life. Authors such as Ridoux, Aries and Rabhi oppose the (excess) permanent overproduction and waste of goods to what they call the (‘…scarcity of links between people…’) (Ridoux 2006: 25). Finally, the fifth trend insists on the consequences of the material limitations of the world (Georgescu-Roegen 1979, Daly 1977).

These authors held a negative view the concept of sustainable development. Instead they concentrated their attention on what many consider to be a major flaw in the concept i.e. that ‘…with sustainable development we are selling growth as if it were protection of the environment…’ (Perrot 2009: 2). In the highly critical discourse of the growth objectors the three ‘pillars’ of sustainable development (see Figure Intro.1 THE THREE ‘PILLARS’ OF SUSTAINABLE DEVELOPMENT) are not merely seen as difficult to balance but are in fact viewed as incompatible. In the body of literature which has been developed by the supporters of de-growth, sustainable development is regarded at best as a ‘…cosmetic operation…’ (Cheynet 2008: 78); it is also considered a discourse which fails ‘…to stop the destruction of the global econom…’ (Perrot 2009: 3), and at worst as an ‘…admission of failure…’ (Ridoux 2006: 31), an ‘…evil chimera…’ (Blamont 2004: 18), a ‘…cannibal and devastating program…’ (Perrot 2009: 2), or an ‘oxymoron’ or ‘paradox’, i.e. a juxtaposition of two contradictory words (Latouche 2003: 24).

THEORETICAL FOUNDATIONS OF DE-GROWTH

In this section, the theoretical foundations of the de-growth discourse are summarised. De-growth is not a unified body of arguments, but rather a discourse which has grown since the early 2000s based on a translation into French of the scientific work of the Romanian born economist Nicholas Georgescu-Roegen. This discourse, despite its diversity, shares a common denominator which is a strong opposition to growth, or more precisely '…the index of growth, excessive growth and unlimited productivity improvement…' (Perrot 2009: 1).

The apparent conflict between sustainable development and de-growth can be analysed with tools which derive from discourse theory as expounded by Laclau and Mouffe (1985). According to this approach, society is always based on an order which is contingent on specific power relations between actors and their concepts. This order also known as 'hegemonic' excludes other possible orders. An order is defined as '…an arrangement or conformity of parts in a structure which transcends and explains its elements. Everything is so necessary in it that modifications of the whole and of the details reciprocally condition one another…' (Laclau and Mouffe 1985: 106). However, there are always excluded alternatives which can re-emerge and conflict with the dominant hegemonic concepts (social antagonism). The opposition between sustainable development (dominant idea) and de-growth (alternative idea) can be seen as a case study of antagonism. The opposition between both concepts is based on an older critical tradition built on three main theoretical axes: a critique of wage-earning, a critique of 'technological society' and a critique of 'economic paradigm'.

All de-growth advocates agree on two points. Firstly that growth is destroying more jobs than it is creating and secondly that wage-earning (which made up 82.5% of the workforce in OECD countries in 2008), is an instrument of domination and alienation of workers. This leads them to argue for the end of a society based on productivity gains in order to achieve a better situation for workers.

De-growth proponents complain that growth has a negative impact on employment. Gorz, a figure of radical environmentalism during the 1970s, first supported this hypothesis. In the same vein as Marx, Gorz believed that growth is synonymous with the pursuit of higher productivity gains and stimulates the development of techniques so that '…the more labour productivity increases, the less we need workers to upgrade a given volume of capital…' (Gorz 2007: 52). In other words, societies are able to create more wealth by consistently using fewer workers. Under these conditions, it becomes impossible to restore full employment using a quantitative economic growth model. As Ariès concluded '…Changes in technology seem to eliminate workers in all areas…'. Ariès provided a partial list of impacts on the labour force from technological innovation including '…the destruction of professional identities, development of instability (*via* the proliferation of atypical contracts), over qualification for the jobs people do and the relative decline of wages, and mass unemployment…' (Ariès 2007: 100). These degradations are only the harbingers of the 'end' or 'abolition' of labour within labour societies as: '…we are all potential unemployed workers…' (Ariès 2007: 107).

Secondly, wage-earning is seen as an instrument of worker's alienation leading to excess, '…The tragedy of wage-earning is a long story of deprivation…'. The worker is robbed '…of its instruments of production, the fruits of his labour, its professional identity, its job culture,

its language, its solidarity, its communities ...' and finally the wage-earning system is imposed only to keep the worker tied down (Ariès 2007: 99). According to Gorz, the gradual spread of wage-earning under capitalism brings workers to perform tasks for which they control neither the organization nor the goal. Their capacity for autonomous action is reduced by forces beyond their control, ultimately reducing their choice to two simple options that of purchase or being entertained (Gorz 2008: 134).

On this basis, giving back to people their capacity for autonomous action should be the priority. This position leads de-growth proponents to reject all left-wing political parties, and even trade unions because they seem to be unable to value the workers out of the wage-earning system. In contrast, de-growth supporters argue that division of labour and continuous improvement in labour productivity should be abandoned in order to save the workers. Any measure which reduces 'the sphere of necessity' (i.e. labour) and promotes the expansion of the 'sphere of autonomy' (free time) is going in the right direction. Thus, de-growth proponents support the reduction of working time and the establishment of a guaranteed minimum income. However these measures are not sufficient to release workers from their constraints as '…the fundamental issue is not the exact number of hours that should be worked, but the definition of labour as a "value" in our society…' (Latouche 2007: 18). But this new value can be found only outside of the current division of labour. This break then leads to a society based on negative growth.

All de-growth proponents argue against the 'technological society' (Ellul 1954). Ellul denounced the growing importance of technology in our society and his work significantly influenced the discourse of growth objectors. His arguments may be summarized in three points.

First, Ellul distinguishes technology from the machine. The first is a method for a result, an array of means to reach an end. The second is a device used to perform certain tasks. It appears that the areas in which technology may be applied far exceed those of the machine. According to Ellul, science itself '…is an instrument of technology…' (Ellul 1954: 224).

Secondly, Ellul makes a distinction between 'technical operation' and 'technical phenomenon' and argues that '…the current technical phenomenon has nothing in common with the technologies of earlier societies…' (Ellul 1988: 267). A technical operation is any work (complex or simple) done by a given method in order to achieve a result (to cut a flint, to tan skin, to fly a plane, to drive a machine.) Each society has always determined the technical operations according to its needs, but also in terms of its values. Throughout history there have been technologies which were given up voluntarily. However the modern era is characterized, according to Ellul by an 'awareness' of the benefits that can be drawn from more efficient technologies and systematic research of the 'highest efficiency' (Ellul 1988: 211). The 'technical phenomenon' is then achieved when the technology is raised to the rank of supreme value by the collective will, over all the other human values.

Thirdly, the technical phenomenon progressively acquires new features such as "autonomy, unity, universality, totalization, self-growth, automation, causal progression and lack of purpose" (Ellul 1988: 56). Therefore, there is a constant development of technologies gradually killing any other option. Technologies gradually engulf all spheres of life and ultimately reproduce themselves devoid of any other purpose than efficiency increase. The ultimate consequence of this 'self-referential autonomy' of the technical phenomenon is the

formation of a ‘technical system’, that is to say linking all the technologies in a network which is autonomous and independent.

> ‘The system itself is composed of sub-systems: the railway, mail, telephone, air travel, systems of production and distribution of electric power, industrial processes and automated production. These subsystems are organized, adapted and changed gradually’. The technical system becomes ‘the element wrapping the development of our society’ (Ellul 1954: 126)

Computers, by their ability to create links between all technologies are considered as the tools allowing the completion of the system. A total society dominated by the technical order is created in which

> ‘…we have nothing to lose and nothing to gain, our deepest impulses, our most secret heartbeat, our deepest passions are known, published, analysed and used. It meets my needs, provides me with exactly what I expected and the most supreme luxury of this civilization is to give me the possibility of sterile revolt and a consenting smile …’ (Ellul 1954: 388).

Finally, Ellul condemns the advent of a ‘…seductive discourse on technologies…’ which could be considered as a ‘technological bluff’ (Ellul, 1988).

However, while there is a certain fatalism, according to Ellul, for whom the completion of the technical system is inevitable, de-growth argues that it is possible to divert the course of the technological system because ‘…the mega machine is not a monster in space, it is securely

rooted in our imagination…' and '…Decolonizing the imagination is an urgent task…' (Latouche 2004: 32).

De-growth supporters do not see the world in the same way. They do not believe the same things and, in short, they do not share the same 'paradigm' as economists that sustainability should be measured in economic terms instead of physical terms. Instead the discourse of de-growth focuses on support for the reduction of unnecessary consumption, retaining that which is really needed.

Georgescu-Roegen built a new paradigm for economics based on thermo-dynamics, not mechanics. To do so, he was first obliged to deconstruct one of the most persistent myths amongst economists, i.e. that '…resources should be measured in economic terms instead of physical terms…' (Georgescu-Roegen 1979: 101). He justified his opposition to this myth by using two laws of thermo-dynamics. The first is a 'law of conservation' which guarantees that in any isolated system (such as the Earth for instance) the amount of matter and energy remains constant. Under this law, nothing is lost, nothing is created and everything is transformed. The first law allows all processes (including economic ones) '…to take place in one direction or the other, so that the whole system can return to its original state, without a trace of what happened…' (Georgescu-Roegen 1979: 95). The second law, known as 'law of entropy', introduced a new distinction between usable energy and unusable energy. Any process (including economic transformation), made possible by the first law, irreversibly transforms usable energy and matter (so-called low entropy) into unusable energy and matter (so-called high entropy). The entropy of the system, when it is isolated (as the Earth is), then increases continuously and irrevocably to a maximum which corresponds to a situation where all the usable energy and matter has completely disappeared.

Followers of Georgescu-Roegen may appear as deep ecologists or 'green radicals' (Dryzek 2005: 15) in that they reject economic growth precisely due to the physical limits of the Earth. De-growth proponents (even with their internal divisions and differences) do fit partly into the radical green position defined by Dryzek but they have some social reflections (on the workforce, wages, place of labor) that the green radicals have not.

IMPLICATIONS OF THE DISCOURSE OF DE-GROWTH

De-growth proponents do not offer an alternative to the concept of sustainable development. They concentrate in their discourse on presenting a series of practical solutions which lead to sustainability.

De-growth supporters argue for what is called 'voluntary simplicity', because they believe an affluent society would not bring happiness. On the contrary they argue that given the adverse impacts on the environment, an affluent society would lead to disaster. The approach of 'voluntary simplicity' focuses on reducing unnecessary consumption, while maintaining essential needs. The political discourse of de-growth represents an invitation to rethink consumption patterns. This desire to reduce consumption is part of a particular perspective, '…it is to fight against poverty, a struggle against material wealth in order to reach a reduction of inequalities and the surrender of destructive lifestyles of the environment…' (Cheynet 2008: 105)

To be effective, voluntary simplicity must be accompanied by a process of self-production and relocation activities. De-growth supporters encourage self-production of services for

home use. Production from a cultivated garden is also a significant source of freedom, allowing people to be free of the consumer society. Self-production allows exchanges between people. This strategy is also particularly useful, because it has the potential to overcome consumer excesses (and in particular those engendered by advertising).

The movement of de-growth is in line with movements denouncing the evils of advertising as exemplified in the publication 'La Décroissance' (*The Degrowth*), published by the 'Casseurs de Pub' Association (*Advertising destroyers*). Created in 1999, the 'Casseurs de Pub' is a French 'association culturelle' or non-profit association, constituted under the terms of French legislation enacted in 1901, whose objectives are to promote artistic and graphic design based on the critique of consumer society and also to promote alternatives. The association promotes events such as the 'Back unbranded', the 'Buy nothing day', and the 'TV turnoff Week'.

Advertising is not only criticized for invading the public arena and everyday life, but is the subject of particular criticism due to the fact that it influences the behaviour of citizens. This strategy can also be used to redress eating habits such as eating less meat and eating more vegetables. This redressing of eating habits is justified (according to the de-growth discourse) by the fact that one calorie issued from plants requires less energy expenditure than one produced from animals. In other words, it is much less expensive in terms of energy to produce meat than vegetables. Simplicity is strengthened by a voluntary relocation of activities close to where people live, which leads to a depopulation of major urban centres.

LIMITS AND IMPACT OF DE-GROWTH

A number of limitations may be identified in the de-growth discourse which significantly undermines its potential impact. One of the most important of the criticisms is 'how to should it be done?' This question remains largely unanswered and vague with regard to the radical change expected for the whole system of social organization.

Even if it is not a question of stopping all forms of consumption, the objective of redefining behaviour in this area seems very difficult to achieve. The problem is particularly serious in Northern countries where a majority of people are unwilling to change their lifestyle. '…The idea that saving the world must necessarily lead to a serious belt-tightening in the North would generate little support among those who are shamelessly wasting energy and raw materials…' (Duval 2004: 4).

A SIMPLISTIC VIEW OF DE-GROWTH REGIMES

The frantic search for growth that characterizes capitalism, is considered by de-growth supporters o as the source of all problems. Amongst these problems are growing inequalities between countries and within each of them, impoverishment of the middle class where they exist, disruption of social links, indifference to the problems of others (near and far), hyper-competitiveness including '…acceleration of the pace of work, outsourcing, higher flexibility on the labour market, unemployment, insecurity, etc…' (Ridoux 2006: 32). To overcome these problems, the only obvious way for de-growth proponents would be de-growing society. The proposed change is that of a transition from a single starting point (growth within capitalism) to a single known point of arrival (de-growing society out of capitalism). However, the reasoning of de-growth as outlined above raises at least two major criticisms.

On the one hand, the theory rests on a narrow concept of growth and on the other hand the identified problems are not only related to growth.

First, 'disproportionate' growth based on productivity at all costs is widely included in a more general model of liberal capitalism. A model characterized by the primacy of the market, the on-going search for flexibility, openness to foreign trade and systematic preference for private property. However, this model of capitalism is not the only one in the world and co-exists with other models. It is thus possible to juxta-pose 'Anglo-Saxon capitalism' to 'Rhineland capitalism' (Albert 1991). Amable distinguishes 'free market' from 'European', 'social democratic', 'Asian' and 'Mediterranean' capitalisms (Amable 2005). The objective of these typologies is to show that each variant of capitalism is characterized by a particular combination of criteria (for example the level of competition, employment rules, role of the financial sector, importance of social protection and education system). 'The' growth is 'plural'. That means that there are several possible growth regimes based on specific models of capitalism. Growth may be moderate or excessive, more or less redistributive, protective or destructive of employment, generating more or less negative environmental externalities. Everything ultimately depends on the institutional combination in which it is embedded. The economy is '…an institutionalized process…' (Polanyi 1957: 244), that is to say, it is always embedded (or subsumed) in economic and non-economic institutions.

Secondly, if growth can indeed have benefits, the problems described by de-growth are not caused by growth. They are the result of a multitude of causes, amongst which are rising inequalities which may have come from a wage system unfavourable to certain population groups (women, youth, non-graduates, the disabled). Impoverishment and disruption of social relations may result from a weakening of the redistributive system. The accelerated depletion

of natural resources may come from the opportunistic behaviour of agents. In general, the problems described by de-growth are more attributable to policy choices than to growth itself. It is finally recognized by some of them that '…the condition of solidarity is not a decrease of wealth but clearly a choice of society…' (Cheynet 2006: 26). It is ultimately the choice of society that determines the degree of solidarity of the latter, to curb their drain on natural resources. After all, de-growth supporters are not opposed to growth but to a particular social organization that gives primacy to the market over the State, to profit and to private property. From this point of view, their approach is valuable because it tries to promote a different world. But it is not the only discourse in which similar criticisms are raised. Others include anti-globalization protesters, ecologists, and of institutionalists.

A NAIVE VIEW OF SYSTEMIC TRANSITIONS

One of the main weaknesses of de-growth is the lack of a transition scenario. On the 'how should it be done' question, there are few answers and they remain vague with regard to the crucial issue of changing the whole system of social organization. Three ways can be identified in the de-growth discourse as reform of the economy towards ecological and social goals (green taxes, economic participation fees, etc.), implementation of an eco-socialism (where the State is paying for the disastrous social effects of the de-growth of production), emergence and the expansion of local initiatives (cooperatives, communities or groups in urban areas coexisting with the traditional market economy). These three tracks outlined by de-growth neglect the fundamental aspects of the phenomena of transition.

The experiences of systemic change through history may provide interesting elements for reflection. They generally show that transition is far from a linear process. Real socialism

practiced in the twentieth century, described as a 'transition' from capitalism to communism, never knew a radical break with the (formal and informal) institutions and social organizations from the past. For example the market never disappeared in socialist countries. The Russian author Kastelinboigen even proposed a typology of eight categories of market in the case of the Union of Soviet Socialist Republics – USSR. The use of currency and currency transactions, despite various attempts to curtail them (particularly in the sphere of production), never disappeared. More pronounced business cycles were observed (when they were supposed to disappear because of the central planning of production). Finally, shortages became widespread where abundance was expected (Katsenelinboigen 1978: 55).

When socialism collapsed in Eastern Europe in the early 1990s, it brought large-scale systemic change. The liberal reformers of the time thought it would be just a question of destroying the old system (planning institutions) so that the new ones (i.e. the market economy) would emerge. There followed a flurry of reforms based on the liberalization of the economy, the stabilization of macroeconomic variables and the privatization of public companies. In the 2010s, the results are informative. Public monopolies have become private, but with little evidence of improved performance and output (Andreff 2007: 179). Some companies have become ungovernable, because of their shared ownership in a variety of small shareholders, a phenomenon described by Magnin as 'Entangled property' (Magnin 1999: 354). Recession has lasted much longer than expected in many areas, with significant social costs (unemployment, poverty, insecurity for employees, loss of most public services, and deterioration of the health care system). The Homo-economicus (i.e. the rational economic agent who continuously maximizes his profit or utility under the constraint of resources) never appeared, so a new concept had to be made, that of the Homo-sovieticus

(referring to economic agents preferring to buy more expensive goods of inferior quality from known suppliers).

What lessons may be learnt from these historical forms of change? Every phenomenon of systemic change (desired or suffered) is always a mutation of institutions (formal and informal) as much determined by the actors who have the power to set new rules (path-shaping), as by the legacy of the past (path-dependency) and deadlock situations (lock-in).

MISINTERPRETATION OF THE LAW OF ENTROPY

The law of entropy is used in the de-growth discourse to invalidate any argument in support of sustainable development. Georgescu-Roegen argued that '…no economic system can survive without a continuous supply of energy and matter…' (Georgescu-Roegen 2008: 182). So, the end of the world is inevitable, but there remains uncertainty when this state of total dissipation of the energy and matter will come. Georgescu-Roegen himself admits that this is only '…in the long-term or at the immense scale of the "world machine" that the dissipation of matter reaches sensitive proportions…' (Georgescu-Roegen 2008: 177). This raises the question of whether it could be argued that '…if the identified failure should occur in 20,000 years, would it really be useful to generations who have to think and determine their action today, to know that our concept of growth should be amended in several millennia…' (Godard 2005: 20).

Of course, the term 'sustainable development' is probably a misnomer, because nothing can be sustained on Earth. This is also true for the term 'decreasing society' since an endless decrease is also impossible. However '…The crucial error consists in not seeing that not only

growth, but also zero-growth, nay, even a declining state (…) cannot exist forever in a finite environent…'(Georgescu-Roegen 1979: 126).

IMPACT ON THE DISCOURSE OF SUSTAINABLE DEVELOPMENT

Precisely because of its radicalism and inherent limits, de-growth has almost no impact on policy makers at all levels within the European Union. On the other hand, it has an impact on the evolution of the concept of sustainability in European societies in a number of ways.

In contrast to the discourse of sustainable development, the discourse of de-growth argues that not all mechanisms to achieve growth are appropriate. For supporters of sustainable development an approach of 'selective decrease of production' is necessary. According to this approach, it is urgent to organize a decline in the most damaging (in social and environmental terms) productions for example intensive agriculture, advertising, and industrial processes including chemical production, the packaging industry and the automotive industry. However, and this distinguishes proponents of sustainability from proponents of de-growth, the selective decrease of production does not include production that meet social needs and production in the poorest countries (Association pour la taxation des transactions financières et pour l'action citoyenne – ATTAC, 2004). There is also a link between increase of Gross Domestic Product (GDP) per capita and improvements in the quality of life such as health, education, lower inequality, social cohesion, stronger democracy, less violence and criminality, lower ecological pressure. But this link is valid only below a given limit of GDP per capita (estimated at about $ 18,000). Beyond this threshold, the link disappears and 'additional increments of wealth do not generate better quality of life' (Prieto and Slim, 2010: 53).

The discourse of de-growth brings critical focus to traditional economic indicators. In 2009, for example, 22 economists (including 5 Nobel Award winners) attempted to broaden the concept of wealth by including activities not currently counted in GDP such as leisure, free time and nursing (Stiglitz, Sen and Fitoussi 2009). According to Stiglitz et al, activities can be considered as forms of capital, if they have a '…positive impact on real well-being as well as on its perception…' in areas such as – human capital, physical capital, natural capital, social capital. (Stiglitz et al 2009: 213) All these new forms of capital are then aggregated in a single new composite indicator for measuring well-being.

Almost unanimously praised, the work of these 22 economists has not escaped criticism in part inspired by de-growth supporters. It has particularly been criticized for not having broken free of the theoretical framework of orthodox economics. In other words, the recommendations of the 22 economists, especially on the new factors of wealth to be taken into account, do not escape market logic. As indicated by Stiglitz et al, the approach is based on '…the perfection of markets which is absent in reality…' (Stiglitz et al 2009: 46). But beyond the criticism of the methodology of the 22 economists, most controversially they miss out on the capitalist framework itself! Throughout the Stiglitz et al research '…there is one missing topic: that of capitalism…' (Harribey 2010: 14). What is inacceptable is its lack of objectivity in relation to the capitalist system itself. In particular, the approach of reducing everything to capital is questionable. Moreover, the assumption of substitutability between different forms of capital leads to a weak version of sustainability, '…Thus, high levels of consumption of natural resources could be sustainable if technological progress is fast enough…' (Stiglitz et al 2009: 128). If instead the capitalist framework is considered as obsolete, it would be necessary '…to include the construction of new indicators in a project exceeding the logic of profit and capital accumulation…', starting with limitations to the

market activity and development of non-market and non-monetary spaces. (Harribey 2010: 15)

Finally, the adoption of a paradigm based on thermo-dynamics would simply be revolutionary for economic thought as a whole. From the bio-economic perspective opened up by Georgescu-Roegen, all economic concepts, all theories, all measuring instruments of wealth, the very notions of efficiency, productivity and efficiency must be reviewed. How should this be done?

First, if the economic process was thought in thermo-dynamic terms, it would immediately cease to be perceived as a closed process and would be understood in its multiple interactions with the environment. In a bio-economic approach, the entire economic process is a vast machine to transform energy and matter of low entropy (useful) to high entropy (useless) and all in a substantial mismanagement.

Secondly, the traditional concepts of economists would break down when contemplated in bio-economic terms. Technical progress, for instance, could no longer be understood only as a better organization of production, leading to an increase in productivity factors (that is to say an increase in production for a constant amount of factors of production). From a bio-economic perspective, a technical progress appears primarily as a wider range of available resources to be used (of low entropy). A further distinction is introduced here between accessible low entropy and inaccessible low entropy. Technical progress only makes reachable what was previously unattainable, but it does not relieve the economic process of the law of entropy. The concept of recycling would also be reviewed. Recycling is currently seen as a method of reprocessing in order to reintroduce waste (as a resource) in the

production cycle (e.g. new bottles made from old ones, recycled paper from used paper). But recycling could never be total, because it can never capture all produced waste. Moreover, '…in the context of entropy every human action or any process in nature, can only lead to a deficit for the total system…' (Georgescu-Roegen 1979: 99). In other words, even if recycling is useful and commendable, it could not escape from the law of entropy. However it is noteworthy that recycling takes itself a lot of energy and matter of accessible low entropy in order to transform waste into new goods. Georgescu-Roegen argues that the law of entropy '…does not (at least in principle) exclude a complete reordering of partial material structure, provided there is enough free energy available…'. For instance, it is possible to melt an ice cube and then reconstruct it in a freezer. However, the complete large-scale reconstruction of all physical structures (for instance, to reassemble all the molecules of a coin) would require such an amount of accessible energy and such a long time that '…in practice such operations are impossible…' (Georgescu-Roegen 1979: 105).

These examples (technical progress, recycling), merely illustrate the real breakthrough the bio-economy represents for economics. Actually, it is not de-growth discourse but the bio-economy which is the real 'eye-opener' for economists. Bio-economy is an innovative research agenda for economists as it leaves them only two options – to adopt or reject it! It is possible to question why, after so many years the bio-economy has not already supplanted traditional economics? Is its explanatory power lower than that of economics? Is the corroboration of its predictions harder to be achieved than in economics? Lakatos recalls that the history of science is littered with cases of contention between rival research programmes and that it often takes time before posterity releases the heuristic interest of a possible abandonment of a particular vision of the world (Lakatos 1986).

CONCLUSION

It appears from this study that de-growth brings a new radical criticism to the forms of social and productive organization of contemporary societies. This new discourse highlights the dead-end capitalism has reached in its permanent search of higher productivity, in its belief in technology and traditional economics, its belief in consumerism, leading to the acceleration of the depletion of natural resources. It leads its proponents to fully re-examine current certainties, e.g. the concept of happiness, and finally poses questions about the meaning of life. Using the bio-economy, the de-growth discourse purports to advance the general understanding of the phenomena that surround people's daily lives and the economic system in particular.

However, despite its attraction for many, de-growth remains an ignored strand of the discourse of sustainability, considered as a reactionary movement by political and economic decision makers. Several reasons may explain this fact. First, an infinitely decreasing society does not make more sense than an infinitely growing society, except if all forms of life end. Secondly, the radical discourse of de-growth is based on a kind of idealization of their solutions which becomes, somehow, comparable to the ideal of perfect markets defended by orthodox economists. Thirdly, a decreasing society does not escape the impact of the law of entropy and only delays (indefinitely) the occurrence of final chaos. Finally, many citizens, with only partial knowledge of the concepts of de-growth, are required to consume less which, without resulting in significant savings of low entropy, is likely to put their health (or lives) in danger as they are left to live of law-quality food. In conclusion, since '…the law of entropy is the only one which is not predictable' …it gives humanity '…a certain margin of freedom…' for choosing the society it wants to develop (Georgescu-Roegen 1979: 98). In this

sense, de-growth is only one viable option among a range of alternatives (green growth, dematerialization of the economy, economy based on services, industrial ecology, zero growth, selective decrease), knowing that all are imperfect because of the law of entropy.

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