



IUL School of Social Sciences

Department of Political Economy

The Degrowth of Consumption as an Economic Strategy:
Is Sustainable Development a fading adage?

Dissertation submitted as partial requirement for the conferral of
Master in Development Studies

by

João Carlos Correia Palminhas

Supervisor:
Catarina Roseta Palma, Associate Professor,
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THE DEGROWTH OF CONSUMPTION AS AN ECONOMIC STRATEGY

This dissertation could not have been completed without the great support of my family and friends.

I wish to offer them my most heartfelt thanks!

Also to my university supervisor, she was helpful in helping me crank out this paper. Indeed, it was a long and laborious journey but done with honest work.

I apologize in advance for any faults, surely due to my inexperience.

“Nowadays people know the price of everything and the value of nothing”.

Oscar Wilde

RESUMO

O moderno conceito de “desenvolvimento sustentável” emergiu com o relatório Bruntland em 1987, e baseou-se num reconhecimento crescente quanto à existência de graves problemas ambientais. Decisores em todo o mundo começaram a aceitar as interconexões entre o ambiente, a economia e o bem-estar social. Contudo, cerca de 30 anos depois, o mundo já está a ultrapassar a capacidade do planeta Terra e a sua resiliência. As políticas vigentes para um desenvolvimento sustentável parecem ter sido insuficientes para cessar este caminho insustentável.

Alguns têm questionado certos mitos de desenvolvimento e alertado para os perigos do atual paradigma económico dominante, nomeadamente o fracasso, a iniquidade e insustentabilidade dos modelos de desenvolvimento económico contemporâneos. A promessa era de reconciliar o crescimento económico com o ambiente, mais isso não respondeu ao princípio económico fundamental que reside no facto de um crescimento perpétuo ser impossível devido à existência de limites biofísicos. Dado o seu peso, os padrões de consumo estão no centro do problema.

Depois de analisar o atual paradigma económico e de providenciar percepções sobre o bem-estabelecido conceito de desenvolvimento sustentável, bem como das suas derivações, consumo e produção sustentáveis, a presente dissertação irá focar-se no decrescimento sustentável do consumo como estratégia económica. O movimento *Degrowth* está a emergir como uma alternativa, rejeitando o fetiche por crescimento económico e defendendo uma governação do desenvolvimento de acordo com os princípios da ‘sustentabilidade forte’.

Dilema do Crescimento, Padrões de Consumo, Decrescimento, Economia Ecológica, Pós-desenvolvimento: **Palavras-chave**

O44; Q56: **Classificações do JEL**

ABSTRACT

The modern concept of 'sustainable development' emerged from the 1987 Bruntland Report, and was based on a growing recognition of serious environmental problems. Decision-makers worldwide began to accept the interconnections between the environment, the economy, and social well-being. However, about 30 years later the world is already overshooting the earth's capacity and resilience. Mainstream policies of sustainable development seem to have done little to stop the unsustainable path.

Some have questioned a few development myths and have highlighted the dangers of the current global economic paradigm, namely the failure, inequity, and unsustainability of contemporary economic development models. The promise was to reconcile economic growth with the environment, but this did not answer the core economic principle of an impossible everlasting growth due to biophysical limits. Given their weight, consumption patterns are in the centre of the problem.

After analysing the current economic paradigm and providing insights regarding the well-established sustainable development concept as well as its offshoot, sustainable consumption and production, this dissertation focuses on the sustainable degrowth of consumption as an economic strategy. The degrowth movement emerges as an alternative, rejecting the growth fetish and advocating a strong sustainable consumption governance.

Growth dilemma, Consumption patterns, Degrowth, Ecological Economics,
Post-development: **Key words**

O44; Q56: **JEL Classifications**

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LIST OF ACRONYMS

10YFP	10-Year Framework of Programmes (UN)
ACE	Agent-based Computational Macroeconomic Models
AD	Aggregate Demand
AIDS	Acquired Immune Deficiency Syndrome
AS	Aggregate Supply
CO	Carbon Monoxide
CO ₂	Carbon Dioxide
CSD	Commission on Sustainable Development (UN)
DG	Degrowth (as a literature subfield of Ecological Economics)
DMC	Domestic Material Consumption
DMI	Domestic Material Input
DPSIR	Driving Force Pressure State Impact Response
DSGE	Dynamic Stochastic General Equilibrium Models
EC	European Commission
ECB	European Central Bank
EEA	European Environmental Agency
EKC	Environmental Kuznets Curve
Fed	Federal Reserve System of the United States of America
GDP pc	Gross Domestic Product per capita
GSA	General Services Administration (USA)
Gt	Billion tons
HDI	Human Development Index
HSBC	Hong Kong and Shanghai Banking Corporation (Banking Corporation)
IISD	International Institute for Sustainable Development
IMF	International Monetary Fund
IPAT	Impact of Population, Affluence, and Technology (identity)
IRP	International Resource Panel (UNEP)
IS/LM	Investment Saving / Liquidity preference Money supply (Hicks-Hansen model)
IS/LM/BP	Investment Saving / Liquidity preference Money supply/ Balance of Payments (Mundell-Fleming Model)
ISEE	International Society for Ecological Economics
JEL	Journal of Economic Literature
JPOI	Johannesburg Plan of Implementation
LRAS	Long Run Aggregate Supply
MDG	Millennium Development Goals
MEA	Millennium Ecosystem Assessment
MF	Material Footprint
MFA	Material Flow Accounting
NE	New Economics (as a literature subfield of Ecological Economics)
NNS	New Neoclassical Synthesis
OECD	Organisation for Economic Co-operation and Development

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OWG	Intergovernmental Open Working Group (UNEP)
PSR	Pressure State Response
RoIS	Return on Investment in Sustainability
SAP	Structural Adjustment Programs
SCP	Sustainable Consumption and Production
SD	Sustainable Development
SDG	Sustainable Development Goals
sSC	Strong Sustainable Consumption
SSE	Steady-State Economics (as a literature subfield of Ecological Economics)
UN	United Nations
UN DESA	United Nations Department of Economic and Social Affairs
UNCED	United Nations Conference on Environment & Development (Rio de Janeiro, 1992)
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
VAR	Vector Auto Regressions
WB	World Bank
WCED	World Commission on Environment and Development
WFP	World Food Programme
wSC	Weak Sustainable Consumption
WSSD	World Summit on Sustainable Development (Johannesburg, 2002)
WWII	Second World War

INTRODUCTION

The term 'development' emerges with the end of the Second World War (WWII), still strongly connected to the view of economic growth and the notion of 'modernity.' However, over the past decades there has been a renewal of approaches to development. Some have questioned a few myths and have highlighted the dangers and consequences of the current global economic paradigm, namely the failure, inequity, and unsustainability of the contemporary economic development models.

Societies in developed countries are in an advanced stage of capitalist industrial development. They are often referred to as 'consumer societies' and are characterized by mass-market consumption patterns of goods and services. Consumer societies are closely bounded to the 'type of economy' –market economies, to the 'type of system' – the capitalist system, as well as to the 'type of goals' pursued by the majority of nations– the development paradigm.

This paradigm implies that the basis for development is economic growth, which stands for the demand for mass consumption. Yet, high consumption levels have implications in terms of potential economic, social, and environmental unsustainability. In this sense, in recent decades some criticisms have been raised concerning the development paradigm and, in particular, regarding consumerism and productivism.

Meanwhile, sustainable development has become part of the agenda in major world summits, and national policies for greater environmental protection and efficient use of natural resources have been developed. On the other hand, science and technology have made significant contributions.

However, the approach has been mainly 'end of line' and the unsustainable trajectory has not changed. In the context of increasing global environmental challenges, the discourse of 'sustainable development' (almost 30 years after the Brundtland Report, UNCED, 1987) was unable to produce comprehensive policies and a radical change of patterns, required at individual and collective levels.

Thus, the advent of an economic paradigm shift that results in a deeper structural level of change may be necessary for a decisive move towards a truly sustainable development. Notwithstanding, a process like this is not currently foreseen as globalized societies are deeply locked in neoliberal ideals.

The goal of this dissertation is to analyse the importance of consumption in current economic growth models in the so-called 'developed countries' and its implications for (un) sustainability, understood in a wide sense. At the same time, it will investigate whether a permanent and steady reduction of consumption may be an alternative path towards truly sustainable development as proposed by the recent degrowth literature.

Starting from the identified problem – the unsustainability of the current development paradigm worldwide, namely the mass consumption patterns, this dissertation will focus on the object of study– the importance of consumption. It will have as background a conceptual framework that falls into the study field of the development paradigms, and pursuant to the scientific research on (sustainable) Degrowth. In particular, some contributions in the literature reinforce the desirability and feasibility of a

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transition, through the contraction of economies, towards a steady state, within planetary biophysical limits, and maintaining a certain social welfare.

Thus, three hypotheses are analysed in this work. First, if the current hegemonic development paradigm is unsustainable; second, if a change /decrease in the consumption and production patterns can enable a truly sustainable development; and third, if Ecological Economics can formulate the conditions and propositions necessary to successfully make the changes advocated by the degrowth movement. After all, the adage of Sustainable Development may be fading; hence, its replacement by Sustainable Degrowth is crucial, as an emissary of the post-development criticisms.

Moreover, the title of the dissertation immediately points out that the subject is related to the economic system. This may be described as a system of production and provision of goods and services, allocation of resources, institutional arrangements, and consumers that comprise the economic structure. Though a system by definition is a set of interdependent parts, we can analyse its elements and its relationships¹. For the purpose of this dissertation, every economic system shall solve an ultimate problem: what/how/for that shall goods and services be produced and in what quantities?

The allocation problem triggers basic questions that must be answered in order for an economy to run satisfactorily. For instance, the scarcity problem, the depletion of natural resources and the environmental problems, and even social and economic issues, require answers that vary between different economic systems. At the same time, different objectives may be seen as desirable, such as efficiency, growth, equality, well-being, or even degrowth!

For many economists, today the hegemonic form of economic organization is based on capitalism market-oriented mixed economies (Carbaugh, 2013), in mass consumption societies. In capitalism economic systems production is accomplished to maximize private profit, investment decisions and the use of resources are determined throughout competing practices, and production occurs within a capital accumulation process. The means of production are owned primarily by private initiative and an important part of the production and investment decisions are determined in capital markets.

Although some variants may appear, capitalist systems range from laissez-faire, with low government regulation and state property, to highly regulated and social market systems, with governments aiming to achieve collective goals such as social justice, more equitable distribution of wealth, and to correct market failures. Nevertheless, it is generally accepted that modern economies are market-oriented, since decisions concerning investment, production, and distribution are mostly based on supply and demand, thus strengthening the development of global markets.

But since market economies do not exist in pure form, most existing economies do include some degree of economic planning or state-directed activity, and are therefore classified as mixed economies. In fact, there are many variations of capitalism with different relationships to markets.

¹ Every system is delineated by boundaries, influenced by its environment, described by its structure and purpose, and expressed in its functioning.

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There has been a long history of dialectic disputes between people who view government interventions as harmful (free market), and others that address the dangers of market self-regulation (state interventionism). Yet many national and/or international authorities (like the International Monetary Fund - IMF and the World Bank - WB) are inclined to 'support' interventionism of governments at the same time as they advocate the free functioning of markets.

Since the 1980s, the term globalization has been increasingly used. It is widely accepted that globalization is a process that moulds economic activities while being affected by them, with consequences for socio-cultural-institutional resources and the environment. In 2000, the IMF pointed out four key aspects²: trade, capital movements, movement of people and spread of knowledge. This way, economic 'globalization' is a historical process that refers to the increasing integration of economies, particularly through trade and financial flows, increasing economic interdependence between nations. The desirability of such a process has been defended by global organizations since WWII.

Although there have been advances and retreats such as in trade negotiations, during the 20th century the world became increasingly integrated in financial terms, as nations liberalized capital accounts and deregulated financial sectors. With the increase of capital flows, however, volatility increased. "Although international financial integration allows for the efficient allocation of savings and investment thereby promoting growth, international financial liberalization can also increase the risk of crises for countries." (Alfaro, et al., 2004) In particular, a series of crises occurred recently, which had contagious effects on countries, like the 2007-08 Global Financial Crisis and following Eurozone Debt Crisis.

Meanwhile, some criticize global governance institutions and policies such as the Structural Adjustment Programs (SAPs) consisting of loans provided by the IMF and WB. As conditionality, clauses are attached to loans, typical stabilization and long-term adjustment policies bring about effects such as austerity, privatizations, and loss of national sovereignty.

Globalization can be viewed either as a positive or negative phenomenon. To supporters of economic growth and expansion, this process is desirable and necessary to well-being because it enables global goals like democracy. Opponents see this process as the origin of social inequities, gaps between countries, loss of cultural diversity and environmental unsustainability.

Degrowth can be seen as a political, social and economic movement, based in Ecological Economics, and sustained by certain ideals, namely anti-consumerism/ globalization/ capitalism. It can also be understood as an essential economic strategy overcoming the limits-to-growth dilemma and the failures of the neoclassical model. For degrowth proponents, overconsumption is the root of environmental issues, social inequities, and economic collapse.

Meanwhile, in recent years, the words 'crisis' and 'recession' sounded wildly in the media, while the term 'Sustainable Development' was eclipsed by the storm of financial flows. Meanwhile, Sustainable Degrowth seems to have gained an ultimate boost...

² (International Monetary Fund, 2000)

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Chapter I. FOUNDATIONS OF CURRENT ECONOMIC MODELS

SECTION I.1. NEOCLASSIC MODEL AND THE ECONOMIC PROCESS

Economic processes have evolved over time along with the progression of societies. The hypothesis that the current development paradigm is unsustainable should be explored by analysing its fundamentals and its underlying historical path. Indeed, a sound tracking record of economic expansion supported in development traditions that lead to today's consumption and production patterns. The way the economic paradigm operates is important to reveal the causes of unsustainability.

I.1.1. Dissecting the Model – a historical perspective

Classical Economics, developed during the Industrial Revolution (from about 1760 until 1840), is considered the first modern school of economic thought. Several classical economists argued that free markets regulate themselves, leading the economy to a natural equilibrium. This was notably summarized by the 'Invisible Hand' of Adam Smith. It was also assumed that prices were flexible in goods and wages, aggregated production would generate enough income to buy all the output, and flexible interest rates would ensure equivalence between savings and investment.

While the definition of Classical Economics can be debated, it is generally recognised that it has developed into the Neoclassical Economics, a term first used in 1900 by Thorstein Veblen in his work 'Preconceptions of Economic Science'. Today it is used to refer to the mainstream economics, covering a significant number of other schools. Nonetheless, it generally excludes unorthodox approaches³.

Concomitantly, the term is used for economic approaches that pay attention to the formation of prices, income, and output in markets through the supply and demand process, frequently within the framework of rational choice theory, where income-constrained individuals seek to maximize their utility, and where cost-constrained firms pursue the maximization of their profits.

In Classical Economics, the value (or price) of a product depends on the costs of production. However, some neoclassical economists gradually outlined the 'perceived value' for a consumer, requiring differences in utility⁴ - the Utilitarian Theory. In other words, economists started to consider utility in consumer's willingness to pay instead of focusing only on production costs.

Another important trait was the introduction of Marginalism. It explained the difference between the values of goods by reference to their marginal utility, that is, gain (or loss) from a small increase (decrease) in consumption. The first unit of consumption yields more utility than the second⁵. At the same time, the idea of marginal product was introduced in the explanation of costs. (Backhouse, 2008).

³ According to (Lee, 2008), these refer to Heterodox Economics - all schools outside the 'mainstream economics'.

⁴ The two most influential contributors are Jeremy Bentham and John Stuart Mill.

⁵ While the neoclassic tradition has abandoned the utility concept, they embrace the concept of marginal rates of substitution. And so marginalism becomes a part of the mainstream economic theory,

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Alfred Marshall went further by explaining prices through the intersection of supply and demand curves and additionally considering different market periods. For this, he noticed that supply became a more important determinant in the long-run (Dwivedi, 2002).

Around 1933, Joan Robinson with her textbook 'The Economics of Imperfect Competition' and Edward H. Chamberlin with his textbook 'The Theory of Monopolistic Competition' introduced models of imperfect competition. Others, such as Léon Walras and Vilfredo Pareto, moved forward towards general equilibrium theories. At the same time, the level of mathematical sophistication and modelling increased. One example was the work of Paul Samuelson 'Foundations of Economic Analysis' (1947).

These developments were followed by improvements in econometrics and the development of explicitly macroeconomic models. Thus, with econometrics increase the ability to measure the economy and with macroeconomics to study the whole economy. Macroeconomics influence undermined classical economic theories such as Say's Law, and assumptions like the necessity for a hard-money standard. In turn, there were materialized by the search for the occurrence in markets of the equilibrium conditions of Pareto optimality and self-sustainability.

The attempts to combine Neo-classical microeconomics and Keynesian macroeconomics lead to the Neoclassical Synthesis, which became the dominant paradigm since the 1950s. Meanwhile, for some authors such as (Mankiw, 2008, p. 1) "during the 1990s, the debate between new classical and new Keynesian economists led to the emergence of a new synthesis among macroeconomists about the best way to explain short-run economic fluctuations and the role of monetary and fiscal policies."

The same opinion is shared by (Woodford, 2009). The New Neoclassical Synthesis (NNS) incorporates important elements of earlier traditions of macroeconomic thought⁶, as noted in the following section.

For (Landmann, 2014, p. 3) "we can distinguish three broad stages in the long journey of macroeconomics since the Great Depression", as stated in 'Annex A – From the Keynesian Revolution to the New Neoclassical Synthesis'.

1.1.2. Main Elements of the NNS

Woodford (2009) describes the NNS through five elements.

- First, the intertemporal general equilibrium foundations, enabling short run and long run impacts of changes to be examined in a single framework so that microeconomic and macroeconomic concerns are no longer separated.
- Second, the desirability of basing quantitative policy analysis on econometrically validated structural models. Thus, the modern synthesis recognizes the importance of using observed data, but economists now focus on models built out of theory instead of looking at generic correlations, a type of insight originally given by macroeconomics. Since the 1980s, atheoretical methods become more

⁶ For (Goodfriend & King, 1997) the main elements in the NNS are intertemporal optimization, rational expectations, imperfect/monopolistic competition, costly price adjustment (menu costs) and dynamic price setting, and an important role for monetary policy.

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important. Yet, they are useful to establish facts under priori assumptions, but not a substitute for structural modelling.

- Third, it is now widely agreed to model expectations as endogenous, and, in particular, that it is crucial to take into account the way in which expectations should be different in the case that alternative policies were to be adopted. This way, the new synthesis addresses the Lucas critique (1976) and uses rational expectations⁷. However, based on sticky prices and other rigidities, the synthesis does not embrace the complete neutrality of money of earlier new classical economists.
- Fourth, the NNS accepts that varying types of shocks can cause economic output fluctuations, not only exogenous 'technological shocks', as argued in the 1980s by real business cycle theory. Before, the Monetarist stated that monetary variables cause fluctuations and the Keynesian defended that supply is stable while demand fluctuates. Combining both, in the NNS output gaps exist as a difference between actual output and efficient output, recognizing that potential output does not grow continuously, but can move upward or downward in response to shocks⁸.
- Fifth, monetary policy is now widely agreed to be effective, especially as a means of inflation control, but in a narrowed way comparably with the traditional Monetarist school. This way, central banks can control inflation within reasonable limits. However, variations in real activity (and other factors of supply costs) are still perceived as important causes for the level of prices and the Phillips curve is still used in the current empirical DSGE models. Yet, the Phillips curve is an incomplete model of inflation and the behaviour of firms and households can only determine relative prices. Thus, it must be the government policy that provides stability to an economy, the so-called 'nominal anchor'.

Although important differences in methodological orientation remain among macroeconomists, at the core of the NNS is the view that the economy is a dynamic general equilibrium system that deviates from an efficient allocation of resources in the short-run because of sticky prices and perhaps a variety of other market imperfections. In various ways, the NNS forms the intellectual foundation for the analysis of monetary policy at the central banks worldwide, thus influencing the actual development paradigm.

1.1.3. Limitations and Key Criticisms

The disruption of the economic paradigm should be analysed in light of recent years. The 2008 Financial Crisis and the economics problems that followed may have shaken up macroeconomics. For Landmann (2014, p. 1) "the paradigm of the NNS, which seemed to provide a robust framework of analysis for short-run macro not long ago, fails to capture key elements of the recent crisis". While the consensus was broken, a widespread transition to a single new paradigm is not in sight.

⁷ It is common in positive interpretations of macroeconomic data and in normative analyses of possible economic policies to assume rational expectations in line with the methodology of the New Classical literature of the 1970s.

⁸ Modern empirical Dynamic Stochastic General Equilibrium (DSGE) models, like that of Smets and Wouters, include a variety of types of disturbances to technology, preferences, and government policies (including fiscal shocks), and part of the variability in aggregate time series is attributed to each of these types of shocks.

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The period of more than two decades of low inflation and moderate output fluctuations was named 'Great Moderation' by the Ben Bernanke, the ex-governor of the Federal Reserve System (Fed)⁹. However, this serenity faced an abrupt end with the 2008 crisis. As often before, this macroeconomic shock came as a surprise and the NNS came under attack with economics sorting out what went wrong.

For (Landmann, 2014), turbulence in macroeconomics always occurred in critical historical events which the dominant theory couldn't accommodate, such as: the Keynesian Revolution in 1930s because mainstream thought was unable to deal with the Great Depression; in the 1970s when the Neoclassical Synthesis had difficulties accommodating stagflation; now with the Financial Crisis when the NNS frayed under financial markets vagaries.

It is argued further, "the key elements in the causation of the Financial Crisis were totally absent from the paradigm of the New Neoclassical Synthesis. The canonical macro model and financial economics simply had no point of contact" (Friedman, 2013, *apud* Landmann, 2014, pp. 10).

Another criticism that was pointed out was that macroeconomics deviates from realism due to its microfoundations: "some of the standard assumptions of the new-synthesis model owe their popularity more to their theoretical elegance and analytical convenience than to their accuracy in describing actual behaviour" (Caballero, 2010, *apud* Landmann, 2014, pp. 12).

Some criticism concerns the detour performed by macroeconomics in the NNS since it abandoned the analysis of coordination failures in large systems of interconnected decentralized markets, an early topic of interest (Leijonhufvud, 1981, *apud* Landmann, 2014).

For (Davis, 2006, p. 54) "there is a spectrum of possible interpretations regarding the nature and direction of development of current economics", such as in 2003's debates opposing James Peach and David Colander. The first sustains that core neoclassical ideas are in the basis of mainstream economics¹⁰. While the second stands that, core neoclassical traits do not apply nowadays¹¹.

Davis is inclined to Colander's view by agreeing that resource allocation is no longer central because of the new growth theory, game theory, and information economics. Also because recent behavioural economics recognize Pareto efficiency as benchmark, but they are focused on explaining outcomes that are not efficient. Hence, "these influential mainstream approaches relax or abandon the assumption that markets are competitive in order to explain a wider range of phenomena" (Davis, 2006, p. 57).

Despite of this debate, the purpose has always been the upscaling of the economy has the ultimate solver of all problems. Yet, the mainstream thought after the crisis is turning less consistent, struggling to escape the straightjacket of the NNS, but certainly with more ideas and a richer agenda. Maybe it is time for heterodox economics such as Ecological Economics to step out (as debated in 0).

⁹ At the 2004 Eastern Economic Association: www.federalreserve.gov/Boarddocs/Speeches/2004/20040220/

¹⁰ E.g., equilibrium methods in the tradition of Newton, constrained optimization, and individualist methodology.

¹¹ E.g., focus on resource allocation; variation on utilitarianism; focus on marginal trade-offs; assumption of far-sighted rationality; methodological individualism; and method of general equilibrium.

SECTION I.2. ECONOMIC GROWTH

I.2.1. Introduction

Economic growth can be defined as the increase in the market value of the goods and services produced by an economy. But why have measures of growth become so important, instead of alternative welfare or happiness indicators? For (Aghion & Howitt, 2009, p. 1) “perhaps the most compelling reason is that economic growth is what mainly determines the material well-being of billions of people.”

Normally growth is measured in real terms or inflation-adjusted to eliminate the distortion effect of a mere augmentation of prices. It is common to use synthetic indicators such as the Gross Domestic Product (GDP). This subject will be explored later. Nevertheless, it is important to highlight that the measures of economic growth are normally based on the System of National Accounts.

While some concepts are well known to the public, others are not. For instance, intensive growth refers to a more efficient use of inputs, whereas extensive growth happens when an economy uses more inputs such as human, physical, or natural capital.

Another prior important distinction concerns the difference between economic growth (or theory), as an area in economics that is concerned about how nations can advance their economies, from development economics that deals with the development process including many other features, such as social wellbeing and environmental performance. It is also common to distinguish between short-run economic changes, referenced as business cycles, from long-run trends due to structural causes. Economic growth is mostly concerned with the latter.

Though productivity has been the most important source of growth (along with demographics and transitions in the sectors of activity), there are many drivers that influence growth. The major interest in studying them lies on explaining cross-country differences, as well as in the performance over time.

Some authors like (Bassanini & Scarpetta, 2002, p. 10) claim that:

The accumulation of physical as well as human capital to be the main drivers of economic growth. In addition, R&D activity, a sound macroeconomic environment, trade openness, and well-developed financial markets contribute to raise living standard in OECD countries. Some of the same factors that operate “directly” on growth also influence it indirectly via the mobilisation of resources for fixed investment.

Regarding the causes, and for analytic purposes, they can be separated into demand-side factors (short run) and supply-side factors (long run). Demand-Side determines growth of Aggregate Demand (AD):

- Interest Rates - lower rates make borrowing cheaper and boost investment and consumption.
- Confidence Levels - consumer and business confidence boosts economic growth.
- Asset Prices - such as rising house prices create a positive wealth effect.
- Real Wages - if inflation is lower than nominal wage, real income rise, enabling consumption.
- Exchange Rates - if devalues, exports become more competitive and imports more expensive. This would help to increase demand for domestic goods and services.
- Banking Sector - 2008 credit crunch showed how influential it could be in investment and growth.

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Supply-Side Factors determine growth of Aggregate Supply (AS), being LRAS the Long Run Aggregate Supply (e.g. the productive capacity). In the long run, economic growth can be determined by:

- Levels of infrastructure. Investment in roads, transport, and communication can help firms reduce costs and expand production.
- Human Capital. Human capital is the productivity of workers. This will be determined by levels of education, training, and motivation.
- Development of Technology. In the long-run development of new technology is a key factor in enabling improved productivity and higher economic growth.

Sometimes, other factors are mentioned like Commodity Prices, Political Instability, Weather, and Natural Disasters. In a very simplistic way, we can say that if the AD increases and the LRAS doesn't change, we may face an inflationary process.

1.2.2. Modelling the Economy

An economic model is a recreation of reality, made to produce testable hypotheses about economic behaviour, a way to understand economic phenomena. Because there are no objective measures of economic outcomes, each model is subjective in design since one may take different approaches. (Ouliaris, 2011, p. 46) considers two broad classes of models, the theoretical, and the empirical:

Theoretical models seek to derive verifiable implications about economic behaviour under the assumption that agents maximize specific objectives subject to constraints that are well defined in the model (for example, an agent's budget). They provide qualitative answers to specific questions—such as the implications of asymmetric information (when one side to a transaction knows more than the other) or how best to handle market failures.

In contrast, empirical models aim to verify the qualitative predictions of theoretical models and convert these predictions to precise, numerical outcomes. For example, a theoretical model of an agent's consumption behaviour would generally suggest a positive relationship between expenditure and income.

Generally, economic models contain a set of mathematical equations describing a certain theory of economic behaviour or how an economy works. They can be quite simple or rather have complex formulations. Meanwhile, when we want to examine economy-wide phenomena such as GDP, consumption, inflation and unemployment, we are in the field of macroeconomics.

A macroeconomic model is designed to examine the dynamics of aggregate quantities, although this can be done in different ways, depending on the purpose. For instance, models are useful to illustrate theoretical principles, to test theories, to build scenarios for policies, or even for forecasting.

For (Kocherlakota, 2009), the modern macro model revolution began in the 1980s in response to Robert Lucas' critique. In the original models, there was little role for government stabilization¹². Newer models can be summarized by five key features:

¹² In 1976, Robert Lucas published a paper criticising empirical forecasting models. Lucas argued that economists ought to build models based on economic fundamentals (such as preferences, technology, and budget constraints).

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- a. Budget constraints for households, technologies for firms, and resource constraints for the economy.
- b. They specify household preferences and firm objectives.
- c. They assume forward-looking behaviour for firms and households.
- d. They include the shocks that firms and households face.
- e. They are models of the entire macroeconomy.

It is important to distinguish between **four main types of macroeconomic models**:

- Simple theoretical models – they can be simple textbook descriptions of the macro economy involving a few number of equations and diagrams. For example, the AD-AS model, the IS/LM model, the IS/LM/BP model of Keynesian macroeconomics, and the Solow model of neoclassical growth theory. But without more structure it is difficult to use them for quantitative applications such as forecasting, testing, or policy evaluation.
- Empirical forecasting models – they are quantitative models built to describe observed data dynamics. They appeared after the WWII, as governments began to produce accounting data. The choice of variables and parameters is partially supported by theory but mostly determined through empirical grounds.
- Dynamic stochastic general equilibrium models (DSGE) – these models are based on economic fundamentals, i.e., have microfoundations as described above. The models can be used in different periods, while assuming a type of self-consistency equilibrium: each agent make an optimal choice given the prices and decisions of others and, at the same time, prices must be consistent with agents' supplies and demands.
- Agent-based computational macroeconomic models (ACE) – like DSGE, these models also assume a set of agents in the economy (agent-based modelling) and specify the interactions they can have. However, instead of defining the preferences they often specify their strategies. Given the defined strategies, interactions can be simulated in a computer and then aggregate macroeconomic relationships that arise from those individual actions can be studied.

Within the theoretical models, several growth paradigms can be identified. (Aghion & Howitt, 2009) highlight - the Neoclassical Growth Model, the AK Model, the Product-Variety Model, and the Schumpeterian Model. These will be described below.

The Neoclassical Growth Model

The success of this model is due to its simplicity: the growth process is described by only two equations. The current flow of output goods as a function of current stocks of capital (K) and labour (L). Where 'A' is a productivity parameter and ' $\alpha < 1$ ' so that production involves decreasing returns to capital.

$$Y = AK^\alpha L^{1-\alpha} \quad (1)$$

Equation 1.1 - The Neoclassical Growth Model – aggregate production

Second, the capital accumulation depends on investment (equal to savings) and capital depreciation. Where 'sY' denotes aggregate savings, 'and δK ' denotes aggregate depreciation of capital.

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$$\dot{K} = sY - \delta K \quad (2)$$

Equation 1.2 - The Neoclassical Growth Model – motion law

Labour and capital are used at constant rates, without the fluctuations in unemployment and capital utilization commonly seen in business cycles. An increase in output can only occur by the increase of one of the following possibilities (total factor productivity): capital stock, population, or improvements.

One aspect that makes it a benchmark is, paradoxically, that in the long run growth does not depend on economic conditions; in particular, economic policy cannot affect a country's long run growth rate. "Specifically, per capita GDP Y/L cannot grow in the long run unless we assume that productivity A also grows over time, which Solow (1956) refers to as 'technical progress'". (Aghion & Howitt, 2009, p. 13).

The problem is that technical progress is not explained. One needs a theoretical framework in which productivity growth is endogenous, accounting for long-term technological progress and productivity growth, without which decreasing returns to capital and labour would eventually choke off all growth (would converge to a steady state). The answer came in the 1980s with endogenous growth theory.

The AK Model

AK models do not explicitly distinguish capital accumulation and technological progress, merging physical and human capital. Simply there is no reason to think that, with the accumulation of different sorts of capital, decreasing returns will drag marginal product to zero. Part of that accumulation is indeed the technological progress needed to balance the decreasing returns. High growth rates demand large savings partially channelled to finance technological progress.

"Formally, the AK is the neoclassical model without diminishing returns¹³. It starts with an aggregate production function that is linear homogeneous in the stock of capital" (Aghion & Howitt, 2009, p. 13):

$$Y = AK \quad (3)$$

Equation 1.3 - The AK Model – aggregate production

In addition, the same equation for capital accumulation:

$$\dot{K} = sY - \delta K \quad (4)$$

Equation 1.4 – The AK Model - capital accumulation

Then economy's growth rate is simply (5). Which is merely increasing in the saving rate 's'.

$$g = \frac{\dot{K}}{K} = sA - \delta \quad (5)$$

Equation 1.5 - The AK Model – growth rate

The AK ignores, for instance, the difference between innovation and accumulation, between advanced economies that already accumulated capital from economies that are beginning, and the developments that can occur in the rest of the world (except if these change the conditions for capital accumulation).

¹³ The AK production function is a special case of a Cobb–Douglas function with constant returns to scale ($\alpha=1$).

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The Product-Variety Model

This model corresponds to a second wave of endogenous growth theory. It includes innovation-based growth models, such as the product-variety model of Romer (1990), in which innovation brings about productivity growth through new products. It starts from a Dixit and Stiglitz (1977) production function:

$$Y_t = \sum_0^{N_t} K_{it}^\alpha di \quad (6)$$

Equation 1.6 - The Product-Variety Model – aggregate production

Where N_t represents different varieties of intermediate products, each produced using K_{it} units of capital. If K_t is divided by N_t , the production function can be rewritten in

$$Y_t = N_t^{1-\alpha} K_t^\alpha \quad (7)$$

Equation 1.7 - The Product-Variety Model – aggregate production rewritten

“The degree of product variety N_t is the economy’s aggregate productivity parameter, and its growth rate is the economy’s long-run growth rate of per capita output. More product variety raises the economy’s production potential because it allows a given capital stock to be spread over a larger number of uses, each of which exhibits diminishing returns.” (Aghion & Howitt, 2009, p. 15)

New varieties (i.e. innovations) themselves result from R&D investments by researchers– entrepreneurs motivated by perpetual monopoly rents if they successfully innovate. The problem is that lasting monopoly rents has no adherence to reality. Moreover, there is just one kind of innovation producing the same kind of new products. No attention is given to the possibility of exits (by reducing the variety variable N_t , i.e., that determines aggregate productivity) and turnover.

The Schumpeterian Model

This branch of innovation-based theory, initiated by Segerstrom, Anant, and Dinopoulos in 1990, and developed by Aghion and Howitt (1992, 1998) grew out of modern industrial organization theory and is so called because it focuses on quality-improving innovations. Hence involves the force that Schumpeter called creative destruction. It begins with a production function specified at the industry level:

$$Y_{it} = A_{it}^{1-\alpha} K_{it}^\alpha, \quad 0 < \alpha < 1 \quad (8)$$

Equation 1.8 - The Schumpeterian Model – aggregate production

Where ‘ A_{it} ’ is a productivity parameter attached to the most recent technology used in industry ‘ i ’ a time ‘ t ’. Where ‘ K_{it} ’ represents the flow of a unique intermediate product (produced and sold exclusively by the most recent innovator) used in this sector, each unit of which is produced one-for-one by final output or, in the most complete version of the model, by capital. Then, aggregate output is just the sum of the industry-specific outputs Y_{it} .

The first implication is that faster growth generally implies a higher rate of firm turnover. In the meantime, “although it focuses on individual industries and explicitly analyses industrial competition, the assumption that all industries are ex-ante identical gives it a simple aggregate structure. In particular, it is easily shown that aggregate output depends on the aggregate capital stock K_t according to the Cobb-Douglas aggregate per-worker production function:” (Aghion & Howitt, 2009, p. 16)

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$$Y = A_t^{1-\alpha} K_t^\alpha \quad (9)$$

Equation 1.9 - The Schumpeterian Model – aggregate production rewritten

Where the labour-augmenting productivity factor A_t is just the unweighted sum of the sector-specific A_i 's.

As in neoclassical theory, the economy's long-run growth rate is given by the growth rate of A_t , which here depends endogenously on the economy-wide rate of innovation. This theory provides a framework in which the growth effects of various policies are highly context-dependent.

Dynamic stochastic general equilibrium models

DSGE models are currently used to complement more traditional empirical forecasting models. One good example is the European Central Bank (ECB) Smets-Wouters Model¹⁴ (ECB - Eurosystem, 2003). Its methodology attempts to explain aggregate economic phenomena and the effects of monetary and fiscal policy using macroeconomic models, derived from microeconomic principles. Thus, these models may be less exposed to the Lucas critique on the failure of models based on aggregate historical data.

'Dynamic' because they allow studying different periods of time and 'stochastic' because they admit "random" shocks, such as macroeconomic-policy, the price of commodities, and technological changes. They combine microeconomic modelling with empirical calibration fitting macroeconomic time-series¹⁵.

Using Bayesian estimation and validation techniques, it is shown that the estimated model is able to compete with more standard, unrestricted time series models, such as vector auto regressions (VARs), in out-of-sample forecasting. (Smets & Wouters, 2002, p. 5)

Still, these models are not exempt of criticism, because DSGE models were unable to predict the Financial Crisis of 2008. Accordingly, (Kocherlakota, 2009, p. 1) points out three particular weaknesses:

First, few, if any, models treat financial, pricing, and labour market frictions jointly. Second, even in macro models that contain financial market frictions, the treatment of banks and other financial institutions is quite crude. Finally, and most troubling, macro models are driven by patently unrealistic shocks. These deficiencies were largely—and probably rightly—ignored during the 'Great Moderation' period of 1982–2007, when there were only two small recessions in the United States.

1.2.3. Forecasting and Measuring the Economy

Every model should produce precise implications about the economic phenomena. For evaluating them, one should test their key implications and assess their capacity to correct reproduce stylized facts. I.e., the best model should be the one that has fewer forecast errors (unpredictable mean errors and zero on average). Yet, despite of the complex forecast apparatus, macroeconomic modelling and forecasting received many criticisms due to their inability to predict the 2008 Financial Crisis.

For (Wieland & Wolters, 2012, p. 1), "policymakers take a more pragmatic view, namely that there is no alternative to the use of simplified models, but that the development of complementary tools to improve

¹⁴ For further reading, see ECB Working Paper No. 171: www.ecb.europa.eu/pub/pdf/scpwps/ecbwp171.pdf

¹⁵ For further information, see Christoffel, Kai, Günter Coenen, and Anders Warne (2010), *Forecasting with DSGE Models*, Working Paper Series n.º 1185, ECB. Available at: www.ecb.europa.eu/pub/pdf/scpwps/ecbwp1185.pdf

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the robustness of policy decisions is required". An idea supported by Jean-Claude Trichet¹⁶: "the key lesson I would draw from our experience is the danger of relying on a single tool, methodology, or paradigm". Besides, these authors propose a comparative approach to macroeconomic policy analysis¹⁷. They settled a database that allows comparisons and implications of specific policies¹⁸.

Another important issue is how the economy is measured. This kind of task demands a large amount of data collection, such as the systematic keeping of national accounts that began after the Great Depression. To measure goods and services it is necessary to assign them a monetary value. This is normally the market value (the price when bought or sold), meaning that use value is not determined. Three accounting methods are used: product (or output), expenditure, and income accounts.

The most common one is expenditure accounting, which focuses on finding the total amount of money spent in an economy. The well-known formula is given by the following equation, Where: C = household consumption, I = gross private domestic investment, G = government consumption and gross investment, X = gross exports, M = gross imports.

$$GDP = C + I + G + (X - M) \quad (10)$$

Equation 1.10 – Gross Domestic Product (GDP) Function

There are well-known difficulties of measuring national expenditure. Some are concrete, such as illegal operations, unreported income, and informal markets (non-monetized sector). The other type of difficulties is conceptual. E.g., the inclusion of unpaid services such as household chores, identification of factor incomes or even of intermediate goods (by definition national income only includes final goods).

The long list of criticism by economists and researchers from other social sciences has been growing. Some concentrate on the limitations of GDP statistics in itself, such as: differences in the distribution of income, differences in hours worked, international price differences, difficulty of assessing true values, hidden economies, and currency conversion. (Limitations of GDP statistics, 2014).

The most preminent criticism arises from the insufficiency of GDP as a measure of welfare, quality of life, and social standards, as well accounting for the quality of environment and depletion on natural resources. Thus, in the last decades another classifying measures are been proposed. Notwithstanding, some political initiatives have been steered, such as the strong political statement at the 'Beyond GDP' conference, organised by the European Commission (EC) in 2007¹⁹. The development of alternative measures for policy-making is gaining momentum (European Commission, 2014).

(Bleys, 2012) reviews the different classification schemes available in the literature and introduces alternative as scheme build upon the notions of economic welfare, well-being and sustainability. In Annex B – Measures of Well-being, Economic Welfare, and Sustainability: a brief comparison.

¹⁶ ECB Conference, 18 November 2010: www.ecb.europa.eu/press/key/date/2010/html/sp101118.en.html

¹⁷ For more information, the authors presented a new paper 'A New Comparative Approach to Macroeconomic Modelling and Policy Analysis', available at: www.voxeu.org/sites/default/files/file/Wielandetal_120123.pdf

¹⁸ The macroeconomic model database is available to download from www.macromodelbase.com.

¹⁹ EC' indicatives can be tracked at: http://ec.europa.eu/environment/beyond_gdp/index_en.html

I.2.4. Economic Policy

What is prosperity? Though the answer may not be simple, continuous economic growth is seen as a way to deliver it. At the same time, and as we have seen, GDP is the main measure of growth. This is the main reason why GDP has been the most important measure for economic policy all over the world. In this sense, 'growth accounting' has been used to consider how humans satisfy their needs. To this extent, the determinants of growth have been scrutinized and the desirability of economic growth.

Since the industrial revolution, economic growth has been undoubtedly the key element to change countries and to bring benefits to millions, taking them away from poverty. However, "It turns out that beyond a certain level, increasing affluence does not do much to make people happier" (Common & Stiglitz, 2009, p. 167). And, then again, there are the environmental problems and resource depletion.

Development economists, national governments, and international agencies have advocated very different development paradigms. In the 1960/70s the paradigm was that governments should have a key role in development, adopting policies aiming to reduce imports and planning the accumulation and allocation of capital. Later, in the 1980/90s, the paradigm shifted: 'the Washington Consensus suggested that markets should be given the leading role in development: trade should be liberalized, industries deregulated, and public enterprises privatized'. (Hodler & Dreher, 2012, p. 63)

(Hodler & Dreher, 2012, p. 64) argue furthermore that:

Appropriate policies differ across developing countries as a starting point, and show that countries that would perform poorly anyway because of their poor economic and institutional pre-conditions tend to follow development paradigms more closely. This argument suggests that development paradigms have a tendency to fail because they attract countries that would fail anyway.

One starting point is the analysis and comparison of countries around the world. The United Nations Development Programme (UNDP) is a specialized agency to deal with countries' development. Reports show that the difference in terms of GDP per capita between countries is getting larger (UNDP, 2014), though in 1500 AD differences were tenuous. This is due to different rates of growth in the last few hundred years.

Most neoclassical economists share Keynes' belief in the desirability of growth and therefore in growth as the principal objective of government policy. With growth, all other desirable objectives will become easier to reach.

Another important remark is that the only way to alleviate poverty and therefore to improve the conditions of a big part of the poor is through growth. The only other possibility would be by redistributing wealth, taking away from the better-off. This entails three problems (Common & Stiglitz, 2009):

- The better-off tend not to like it and history has proven that redistribution is a source of conflict;
- The portion by which the better-off are collectively better is insufficient to solve the problem;
- A redistribution policy is a disincentive to behaviours such as saving and investing.

The recent evolution of China is shown as an example of success for the notion that a growth policy is better than a redistributive one. The substantial rates of growth helped to lift millions from poverty.

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Nevertheless, there are cases where the power of compound growth was not so spectacular and even cases where it did not work.

Focusing on current policymaking. One of the most important features of 2008 financial crisis was the consensus on putting economic growth back on track. 'From the International Monetary Fund (IMF) to the United Nations Environment Programme (UNEP), from political parties across the political spectrum (...), the call was for mechanisms that would 'kick-start' consumer spending and get the economy growing again' (Jackson, 2009, p. 103).

The justification is clear enough. If expenditure slows down, firms shut down and unemployment grows, and even the State is affected because expenses tend to increase, for instance, with social protection, while tax revenues are reduced with less economic activity. (Jackson, 2009) points out that there were four mainstream options on the table for rebooting the economy, but all of them had risks:

- 'Do nothing' and wait for the economy to self-readjust. But it was political unacceptable and the recovery could last a long time;
- Stimulate demand through monetary expansion. But due to the global financial crisis, to the high levels of private and public debt and to banking sector fragilities it could be explosive;
- Putting more money in people's pockets by cutting taxes and raising benefits. But governments couldn't control where the extra money goes. E.g., people may spent it on imported goods. Even is a part of it goes to savings, it is contradictory, because the goal of increasing consumption can be harmed (a situation named by Keynes as the paradox of thrift). And how to finance it?
- A classic Keynesian public spending programme analogous to the 1930s New Deal and also with similar problems. The New Deal involved massive investment in public sector works but the current version would be directed to specific sectors and economic activities.

This last option was partially the chosen one. This was called the 'Green New Deal', around which a consensus was reached during the dawn of the 2008 crisis. The belief was that an economic recovery demands investment. While a transition to low-carbon economies requires investment, key political agents advocate putting the two objectives together²⁰. I.e., an investment and stimulus package which outlines a series of policy proposals to fight global warming and the financial crisis.

However, even this entails the condition that the economy returns to continuing consumption growth. It relies on an unsustainable condition. Moreover, several voices raised against this type of interventions that may increase public spending and unbalance state accounts. Thus, something else is need.

In reality, the advanced economies invested a small part of the stimulus spending commitments to green elements. According to the HSBC Global Research published on 25th February 2009²¹, around 15.6% on average of the total package of economic stimulus plans went to the Green Fund.

²⁰ More on this issue: www.greennewdealgroup.org/

²¹ More information available on: <http://www.hsbcnet.com/hsbc/research>

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Green stimulus has many advantages. Due to the slow progress towards a sustainable society, strong investment is crucial to change the socio-technical regime and the landscape. We still live in a carbon lock-in economy and economies have become locked into fossil fuel-based technological systems through path-dependent processes driven by technological and institutional increasing returns to scale.

In the logic of Keynesianism, investment would stimulate the growth of consumption, employment, credit flow, consumer spending, companies investing and innovating, and productivity would increase, boosting the circular flow of the economy. Yet:

There is still no consistent vision of an economy founded on continual consumption growth that delivers absolute decoupling. And the systemic drivers of growth push us relentlessly towards ever more unsustainable resource throughput. A different way of ensuring stability and maintaining employment is essential. A different kind of economic structure is needed for an ecologically constrained world. It is to this possibility that we now turn (Jackson, 2009, p. 118).

1.2.5. The Growth Dilemma

As stated before, prosperity goes beyond growth but it is not clear whether prosperity without growth is possible. In other hand, is economic growth a necessary condition for an enduring prosperity in countries? (Jackson, 2009) explores this question through three common propositions:

The 1st is that material opulence is a necessary condition for flourishing. The 2nd is that economic growth is closely correlated with certain basic entitlements – for instance, health or education, perhaps – that are essential to prosperity. The 3rd is that growth is functional in maintaining economic and social stability.

If one of the above propositions were true, the prospects for achieving a degrowth strategy would turn into a dilemma, for growth would appear to be essential for prosperity, yet continued growth looks ecologically and socially unsustainable.

On the first proposition, (Jackson, 2009) notes that the appetite for material consumption has not diminished in advanced economies, going further than 'the point of usefulness', while in poorer nations there is a need to raise income to satisfy basic needs.

The reason for that may lay in our tendency to infuse material things with social and psychological meanings. In a way that consumer goods provide a symbolic language to social interactions and, as so, the sense of prosperity depend on them²².

An important aspect comes from the relative value that we give to material things. This means that well-being is largely 'washed-out' through relative effects, i.e., how we compared ourselves to those around us. 'Income provides access to the 'positional' or status goods that are so important in establishing our social standing' (Jackson, 2009, p. 52).

The second proposition was tested through cross-country correlations between income and certain key components of human prosperity using UNDP data. Even if a causal link between income and prosperity can neither be proved nor disproved, it is a useful starting point to understand how important GDP might be for human flourishing. The relationship between GDP per capita and life expectancy shows

²² This has been corroborated by consumer research and anthropology studies.

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diminishing returns as countries get richer. And some middle-low income countries have even greater life expectancy than some rich countries. Similar results occur in infant mortality, participation in education and other indicators. The author noted that 'as incomes grow beyond about \$15,000 per capita the returns to growth diminish substantially'. Even more, some countries experience reductions in GDP pc while improving human indicators.

The third proposition is perhaps the most difficult to argue. For (Jackson, 2009, p. 61) 'It is clear from the evidence here that collapsing economies do present a risk of humanitarian loss. Economic stability or, at least, some form of social resilience, is important for prosperity.' Nevertheless, some countries faced severe economic hardship and yet maintained or enhanced national health indicators – notably Japan, Cuba, and Argentina.

One possible explanation may be the social structure of a society. The economic collapse of the ex-Soviet states brought very deep changes and the decrease of social indicators while the government was unable to provide public services like health and social care. However, in Cuba, the government continued to provide those services and some indicators kept improving while the economy collapsed.

The risk of humanitarian collapse due to economic instability is, nonetheless, enough to place a question mark over the possibility of a voluntary stop to economic growth. The question remains whether growth is necessary to keep the economy stable.

To investigate this we need to explore how economies work. In capitalist economics, a high emphasis is put on efficiency (how inputs are used) and innovation. New improvements in technology mean that more output can be obtained of inputs. At the same time, efficiency stimulates demand by driving costs down and contributes to a cycle of expansion. If enough growth offsets the increase in labour productivity, the system remains stable, while giving positive feedback mechanisms to further growth.

If an economy slows down this leads to unemployment, loss of consumer confidence, increase in public spending with social protection - falling into a spiral of recession.

A partial conclusion may be that growth is functional for stability in a growth-based economy. A capitalist market-oriented mixed economy may not have an easy path to a degrowth strategy nor to achieve a steady state position. According to (Jackson, 2009) the natural dynamics of the capitalist model push it towards expansion or collapse.

- Growth is unsustainable – at least in its current form. Burgeoning resource consumption and rising environmental costs are compounding profound disparities in social well-being.
- 'De-growth' is unstable – at least under present conditions. Declining consumer demand leads to rising unemployment, falling competitiveness, and a spiral of recession.

In the next chapter, we will further explore the implications of the current economic paradigm, aiming at economic growth, in light of the mainstream sustainable development conception, in particular the sustainability issues and the implications of overconsumption. In addition, it will be discussed some propositions for a sustainable path and how can a reduction or change in consumption be feasible, supportable, and equitable.

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Chapter II. DELEVERAGING CONSUMPTION

SECTION II.1. DEVELOPMENT AND UNSUSTAINABLE PATHS

II.1.1. Sustainable Development: an Holistic and Systemic View

The term “Sustainable Development’ has maintained prominence in debates about environmental and resources policy and, in more general terms, in development policy. Nonetheless, ‘the term itself has suffered from overuse alternatively as a panacea for all modern ills or as a meaningless catch-all theme to which all policy challenges (no matter of what complexion) are somehow inextricably linked. Nor is there consensus about what sustainable development is...’ (Atkinson, et al., 2007, p. xiii).

A large number of events contributed to establish this principle in the international policy scene. Among others, in 1987 the worldwide known Brundtland Report²³, the 1992 Rio’s Earth Summit and the 2002 Johannesburg’s World Summit. Even earlier, according to the International Institute for Sustainable Development (IISD), Rachel Carson’s book ‘Silent Spring’, published in 1962, was a turning point in our understanding of the interconnections among the environment, the economy, and social well-being²⁴.

The Brundtland Report stated sustainable development as a way to address many different aims: economic development, preserving the environment and the well-being of present and future generations. Although the debate has widened since then and the term could be defined in multiple ways, frequently the Report’s definition is quoted because it coined a meaning for the term:

Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs. It contains within it two key concepts: the concept of needs, in particular the essential needs of the world’s poor, to which overriding priority should be given; the idea of limitations imposed by the state of technology and social organization on the environment’s ability to meet present and future needs.

In conceptual terms, Sustainable Development can be divided into four general dimensions: social, economic, and environmental (addressing the key principles of sustainability – the Triple Bottom Line²⁵), and institutional (addressing the key institutional policy and related capacity issues). All definitions require a vision of the world as a system (connecting time and space). The concept is rooted in

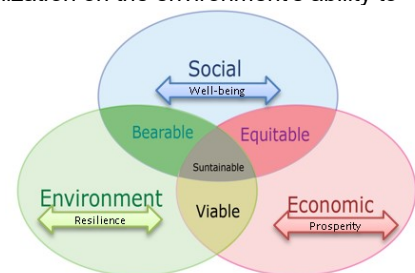


Figure II.1 – Key elements of sustainability

²³ The ‘World Commission on Environment and Development’ (WCED), dissolved in 1987 after releasing ‘Our Common Future’ (Brundtland Report). Available at: www.un-documents.net/our-common-future.pdf

²⁴ Since 1997, the IISD has been publishing the key milestones in the journey towards sustainable development – SD Timeline, 2012 ed. available at https://www.iisd.org/sites/default/files/pdf/2012/sd_timeline_2012.pdf

²⁵ An accounting framework with 3 parts: social, environmental, and financial, also called the 3 Ps: people, planet and profit, or the “three pillars of sustainability”. The term was coined by John Elkington in 1994.

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systemic thinking and the complex issues should be approached holistically. In fact, one key aspect is the unity of environment and development.

Furthermore, it insists that the environment goes beyond the physical world to include social and political landscapes and settings. It is not just about how poor countries can cope with their situation, but what the whole world can do to improve our common situation. Another key aspect is intergenerational equity. Yet the Report assumed that a market-led economic growth could be reformed and even expanded...

Other views have been developed since then. (Waite, 2013, p. 26) quotes different understandings of sustainable development. The first dates from 1938, while the last is the Rio+20 Conference, in 2012:

We recognize that poverty eradication, changing unsustainable and promoting sustainable patterns of consumption and production and protecting and managing the natural resource base of economic and social development are the overarching objectives of and essential requirements for sustainable development.

More recently, the Circles of Sustainability approach distinguished four domains of economic, ecological, political, and cultural sustainability. The United Nations Agenda 21 specifies culture as the fourth domain of sustainable development.

It is difficult to find evidence of equilibrium even among the three traditional pillars in countries' initiatives. When endeavouring for more development, countries often focus on the economic growth pillar. Often they bet on resource extraction as the main internal driver, yet evidence shows that high GDP rates due to resource extraction may have few benefits for the society as a whole. An even worth, as shown by (Sachs & Warner, 1995), economies with abundant natural resources may tend to grow less.

It is worth mentioning the first edition of the book 'Limits to Growth' in 1972. It reported that global ecological constraints related to resource use and emissions would have important impacts in the 21st century. Although its scenarios have shown to be overly pessimistic, global ecological constraints were not absurd. Physical growth restrictions are already an important aspect on the global policy arena.

Historically environmental problems were considered local, not global. Yet ecological overshoot is reality worldwide and possibilities of collapse are becoming more vivid²⁶. The challenge is to engage a truly transition to sustainability and not relying on palliative measures. Sustainable degrowth is still far behind in the public discourse – thought to be a remote, hypothetical, and academic concept.

II.1.2. The Role of Consumption in the Growth Paradigm

While countries put their development efforts mostly on growth, also consumption plays a central role. But before analysing its role, we should first state some definitions and determine what we are talking about. As many macroeconomic variables, it is an aggregate of many different things.

Defining Consumption

We can define consumption simply as the value of goods and service bought by people in a certain geographic area. Consumption is normally the largest component of GDP. For decades, many scrutinise

²⁶ More on this matter, see Planetary boundaries: www.stockholmresilience.org/21/about.html

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economic performance largely in terms of consumption levels and dynamics. Though growth based on investment and exports is often defended, in fact, policies target consumption as an end.

Within consumption, it is possible to classify purchased objects as durable (e.g. cars), non-durable (e.g. food), and services (e.g. tourism). Another frequently used classification is to divide consumption in terms of the needs it satisfies (e.g. health, housing, etc.). The latter is important since people may use different decision-making rules depending on their social group and level of income.

Often consumption as the use of goods and services is distinguished from 'consumption expenditures' (buying acts). This makes even more sense for durable goods, of which richer populations tend to have a bigger cumulative bundle. This means that, besides meeting basic needs, they may enjoy higher levels of satisfaction. Reciprocally, if non-durable goods are not used, generally they turn into waste.

It is worth highlighting that the scope and rules for accounting consumption²⁷ have significant impact. For instance, although old and new objects provide satisfaction, only newly produced goods enter into the definition and report to a certain year. In macroeconomic terms, consumption corresponds to the sum of the consumption of all households, excluding business investment and public expenditures.

One can also find determinants of consumption. The most important is the current income level (labour, capital, remittances, and coming from the cumulative bundle). Another important cause is cumulative savings and, conversely, debt. Expectations on the future also play an important role. Finally, other factors can determine the size, shape, and dynamics of consumption. To simplify, we can call them "routines" that can be related to income, savings and expectations, as well as social and demographic characteristics. Examples are lifestyles, propensity to save, past investments (e.g. stock-exchange boom), consumer credit facilities, employment expectations, fiscal conditions, and many more.

Not only is consumption the largest GDP component, it also has a positive feedback loop²⁸, since an increase of consumption raises GDP by the same amount *ceteris paribus*, and because current income is the most important determinant of consumption, it triggers a further rise.

Nonetheless, things are not so simple. Otherwise, if people did not save, the economy would be an unstoppable engine running at full employment. Income can be employed in consumption or savings, raising investment and thus future production possibilities. In addition, agents can spend on national products or on imports. Even national products may incorporate, in their production chain, imported parts. Thus, an increase in consumption will have direct or indirect effects on the level of imports and, therefore, on the trade balance and on the current account balance.

Finally, consumption may affect other variables, among which government tax revenues, investment decisions, price levels, and currency exchange rates.

Historically, consumption has grown over the last 50 years, although at different rates between periods and with some exceptions during recessions. Consumption is a pro-cyclical variable meaning that any

²⁷ See the recent methodologic modifications that occurred in the European System of Accounts (ESA 2010).

²⁸ Known as the "Keynesian multiplier". Read more: www.investopedia.com/ask/answers/09/keynesian-multiplier

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large fall in consumption would decrease GDP. Yet it shows a smoother dynamics than GDP. This point is important since it sustains and stabilizes the trend. In terms of categories, usually durable consumption overshoots GDP fluctuations (strongly pro-cyclical and may peak before GDP) while non-durables often undershoot cycles (weakly pro-cyclical). Conversely, services growth at a steady pace.

Although the pace of consumption growth appears unsustainable, its characteristics have been changing. It is possible that, due to policies (e.g. green fiscal reform), public awareness and new sociotechnical regimes, more sustainable lifestyles can be induced. Will this be enough?

Consumption Patterns in the long-term

The 20th century brought an unprecedented growth in world population and in the economy. Global population quadrupled to 6.4 billion and GDP increased more than 20-fold (Maddison, 2001, *apud* Krausmann, et al., 2009, pp. 2696). Conversely, this global socio-economic system expansion led to changes in relations between nature and society, and the transformation of natural systems. (Krausmann, et al., 2009, p. 2696) argue that “one of the main drivers of human induced environmental change has been the growing social or industrial metabolism”.

They define ‘industrial metabolism’ as the inflows of materials and energy into socio-economic systems and corresponding outflows of wastes and emissions. Changes in the structure and size of social metabolism are directly and indirectly linked to a wide range of environmental pressures. Then they assess the global use of materials in the period 1900-2005 based on the principles of Material Flow Accounting (MFA), since it entails significant stages of global industrialisation and economic growth.

To carry out this task, they gathered published statistical data and estimations for material flows not covered by international statistical sources, compiling a quantitative estimate of annual extraction of biomass, fossil energy carriers, metal ores, industrial minerals, and construction minerals. Nonetheless, they acknowledge it lacks a comprehensive account of global materials extraction.

Analysing the changes in the size and composition of material flows in relation to the global economy, population growth and energy consumption, (Krausmann, et al., 2009, p. 2696) shows that “so far there is no evidence that growth of global materials use is slowing down or might eventually decline and our results indicate that an increase in material productivity is a general feature of economic development”.

Global materials use increased 8-fold (currently about 60 billion tons (Gt) per year), particularly after WWII, since a rapid physical growth was driven by both population and economic growth. Although the pace of materials use was slower than the economy, it was fast than population²⁹. Regarding its composition (see Annex C – Changes in the composition of global material extraction), mineral materials have become dominant over biomass.

Future scenarios are not promising. Although many can argue that GDP may never grow as in the past for the developed countries, there are new industrialized countries, and the world's least developed countries are only now beginning the transition towards an industrial social metabolism.

²⁹ Material intensity (amount required per GDP unit) declined while materials use per capita doubled from 4.6 to 10.3 t/cap/yr

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The carbon-intensive character of modern consumption may well make it impossible to mitigate the overshoot without altering the dimension and composition of consumption patterns. However, raising consumer spending remains central to economic policy prescriptions. Thus, consumption holds a paradoxical role, a remedy to economic problems yet at the heart of environmental degradation.

To be fair, climate change has become nuclear in the political agenda and attempts to harmonize growth and the environment are frequent. Thus, the notion is often held that we can green economic recovery through investment in energy and infrastructure, hoping to maintain the status quo of our lifestyle.

Unfortunately, as stated by (Jackson, 2009), achieving growth without increasing carbon output has no historical precedent and, thus far, decoupling growth from carbon has failed to materialise³⁰. Any improvement in carbon efficiency has been entirely overshadowed by the effects of further growth. (UNEP, 2014) demonstrates its use has accelerated, causing severe environmental damage and depletion of natural resources.

Traditional Economic Perspective

As stated before, current economic paradigms are built on neoclassical economics ideas and in theories of consumption. Current problems are reaching a level, especially in the environmental domain, that may undermine the very goal of economic development – well-being – through the destruction of the biophysical system on which human beings depend.

For (Mont, 2007, p. 14) “the outcome is not surprising, since the neoclassical economics evolved in situation when environmental problems were not yet known or as acute as there are nowadays”. Besides, he states that eco-efficiency approaches to reduce impact of the systems of production and consumption have not been able to cope with increasing consumption levels.

Traditional microeconomic consumption theory tries to model how rational consumers allocate their budget for maximizing their utility. Since tastes and preferences do not change fast, choices will hinge on income and prices. “This understanding leads to proliferation of financial mechanisms not only in economic sphere, but also in environmental economics and in environmental policy (Van den Bergh and Ferrer-i-Carbonell, 2000, *apud* Mont, 2007, pp. 16).

Income and prices are seen as the main limiting factors, and consumer's choice revealed by the optimal condition where utility/prices rates are equal. Generally, technological improvements may enable an increase in income because they provide higher productivity, lower production costs, and prices. Because consumers are insatiable and choices directly linked to their budget, they want to increase their income, which can be obtained by raising productivity. This may turn into over-supply resulting in drop of prices and rebound effects, which can promote more consumption and environmental impacts.

Another interesting feature in the traditional perspective is that consumers maximize utility in a world of perfect information and market competition, deciding how to allocate available resources by considering

³⁰ (IEA, 2015) has recently shown some stabilization in some OECD countries, while in the rest it has grown exponentially. Please see Annex D – Global energy-related CO₂ emissions by sector and region.

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their present and future income, as well as interest rates, but without considering other issues such as social, ethical and environmental.

Therefore, neoclassical economics has “a normative bias: it is argued that it does not focus on explaining real life economies, but instead on describing an ‘utopia’, in which Pareto optimality is achieved (...) it largely ignores the problems of scale both in time and space assuming infinite substitution possibilities among resources and unlimited technological change.” (Mont, 2007, p. 17)

Although it is important to study the economy at individual level, it may fall short if the focus is broader and long-term issues. At this level of analysis, it may be difficult to discuss and find answers regarding the desirability and stability of the economic system as a whole in a world of finite resources.

The assumption of consumer preferences as being exogenous has also been criticised for preventing a full understanding of behaviour and decision making in the long run. Observed preferences are subject to multiple factors, such as education, advertising, and social groups. “The definition of how to optimally satisfy evolving preferences and the bundle of material and non-material satisfiers should be changing accordingly (Costanza et al. 1998, *apud* Mont, 2007, pp. 17).

In addition, the assumption of perfect knowledge and information has little real adherence. If one takes into account the concept of bounded rationality³¹, consumers may not be efficient in choices and the neoclassical economics view falls short. Additionally, when it comes to firms, another criticism can be added, since maximizing profits is done irrespective of people.

Finally, one major criticism focuses on rejecting the idea that increasing levels of consumption raise the levels of life satisfaction. Studies have been carried that show that, after a certain point, more income does not always increase happiness and well-being. Hence, consistent with the ‘Easterlin Paradox’³², a key concept in Happiness Economics. Besides, we can see how central this theme is since the 2015 Nobel Prize was awarded to Angus Deaton for his analysis of consumption, poverty, and welfare³³.

(Mont, 2007) recognizes that neoclassical economics incorporate policies to reduce market failures through more information and by adjusting prices to internalise environmental and social costs. Yet the argument that ‘one should maintain consumer sovereignty’ is counteracted by the fact that consumers are not fully informed, have bounded rationality and that they don’t act as independent actors since they are locked-in by technology and existing infrastructures, as well as by products provided in the markets.

Nonetheless, if we admit to ignore some exogenous factors, such as culture, for simplification purposes, neoclassical economic theory has been very useful for modelling the effects of technological and labour productivity, and for environmental policy interventions using economic instruments, like carbon taxes.

³¹ The term coined by Herbert A. Simon. In *Models of Man* (1957), pointing out that most people is only partly rational and is irrational in the remaining part of their actions.

³² Easterlin, Richard A. (1974), *Does Economic Growth Improve the Human Lot? Some Empirical Evidence*, New York, Academic Press. Available at: <http://graphics8.nytimes.com/images/2008/04/16/business/Easterlin1974.pdf>

³³ See: www.nobelprize.org/nobel_prizes/economic-sciences/laureates/2015/popular-economicsciences2015.pdf

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The raising of new approaches

Natural resource economics deals with the supply, demand, and allocation of the Earth's natural resources, mostly within the neoclassical framework. Environmental economics, in contrast, emerged mostly from the analysis of market failures. (Perman, et al., 2011). The figure on the right illustrates how Neoclassical Economics sees the economy - as an abstract entity separate from the natural world. When the economy and environment interact, it is an externality that can be corrected with market-based tools, such as pricing environmental goods.

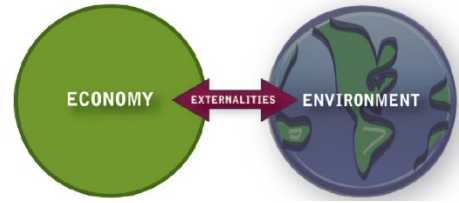


Figure II.2 - Neoclassical Economics - economy as an abstract entity separate from the environment.

Source: (GSA, 2009)

In the 1980s, some economists and natural scientists concluded that it was necessary to study environmental problems in an interdisciplinary way. In 1989, the International Society for Ecological Economics (ISEE) was created. The chosen name may be because most natural scientists were ecologists but also economics and ecology were seen as the two disciplines most directly concerned with what was seen as the central problem – sustainability (Perman, et al., 2011). The figure illustrates how Ecological Economics sees the economy – as subset of the ecological environment, where low-entropy raw materials flow over the economy and exit as high-entropy waste.

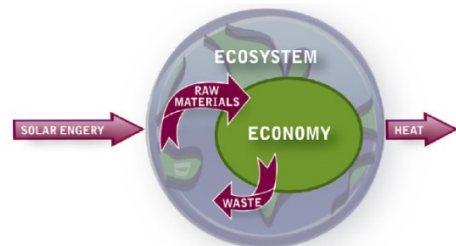


Figure II.2 - Ecological Economics - economy as a subset of the larger ecological environment.

Source: (GSA, 2009)

Ecological economists argue that a more holistic discipline integrating natural-scientific and economic paradigms is needed. Furthermore, the sustainability problem requires a major change in social values and a scientific reorientation. Ecological economists also tend to be more sceptical of the ability of technical progress to handle resource scarcity and to foster sustainability.

However, there are is common ground between economists. Few believe that markets can regulate the relationship between the environment and the economy. Contrariwise, market-type incentives do have a role to play. The discussion lies on what governments need to do and on the effectiveness of different kinds of policy instruments. To pursue the goal of finding the best policies, one needs to discuss the interdependences of economic and environmental systems and problems related to sustainability.

II.1.3. Unsustainable Paths and Limits to Growth

The Main Themes: Efficiency, Optimality, and Sustainability

According to (Perman, et al., 2011) there are three main themes when dealing with the economic analysis of natural resources and the environment: efficiency, optimality, and sustainability.

Efficiency can be explained in terms of missed opportunities. Normally economists focus more on allocative inefficiencies and less on technical or physical ones. Even when resources are used in a

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technically efficient way, some benefits may be squandered if the resource allocation does not take into account the opportunity costs of different uses.

Optimality is a normative goal for a specific group, such as a society, for which an overall objective is defined. A given use of resources is socially optimal if it maximizes the chosen objective, weighting any relevant constraints. In addition, optimality is related to efficiency because the former is a necessary (but not sufficient) condition for the latter. This is quite simple to picture because if a society wastes resources it cannot maximize its objective, no matter which one. At the same time, because we can have different allocations of efficient resource-uses, not all of them are socially optimal.

The last central theme is sustainability. As noted in next section, this might include many aspects. To understand it in a simple way, we may say that it involves taking into consideration posterity, which is not necessarily the case in traditional optimality concepts.

The Fundamental Issues in the Economic Approach

(Perman, et al., 2011) sketch out four key features of the current economic approach to resource and environmental issues: (1) Property rights, efficiency and government intervention; (2) The role, and the limits, of valuation, in achieving efficiency; (3) The time dimension of economic decisions; and (4) Substitutability and irreversibility.

Regarding point 1), the central question relates to allocative efficiency. Markets and prices play a central role in analysing this question and well-defined property rights are one of the necessary conditions. For mainstream economics, given the necessary conditions, markets will bring efficiency to allocation. But “because property rights do not exist, or are not clearly defined, for many environmental resources, markets fail to allocate those resources efficiently” (Perman, et al., 2011, p. 10)

Even when discussion focuses on the type of interventions governments shall implement, many environmental problems cross national borders, and there is no global government to deal with them.

When dealing with point 2), environmental economists focus their attention again on the absence of market prices that is common to many externalities, due to the absence of well-defined property rights.

But the fact that some resources have no price doesn't mean that they don't have a value, which must be estimated. Yet, the techniques to value non-market goods and services may be difficult, not to mention controversial. For many, providing monetary valuations for crucial environmental resources (or services), and to base decisions on them, is simply wrong.

Point 3) deals with the time dimension of decisions. One should make the distinction between 'flow' and 'stock' resources. The problem of stock resources is that today's use may have implications on tomorrow's availability. Moreover, a further division in the case of stock resources is between 'renewable' and 'non-renewable'. The former can grow over time, while for non-renewable resources “there is no positive constant rate of use that can be sustained indefinitely” (Perman, et al., 2011, p. 11).

Generally, the economy sees stock resources as assets that yield flows of environmental services over time. When dealing with the dynamic (intertemporal) dimension, one must regard the productivity of the

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accumulated capital in terms of saving and investment, comparing the productivity of natural resources to that of other assets in the economy.

Finally, regarding point 4 - Substitutability and irreversibility, these are central issues for environmental policies. If a stock resource is depleted irreversibly and there are no close substitutes, then the depletion rate has strong implications for sustainability. Concerning substitutability, two main dimensions arise: the extent of the replacement between natural resources and that of an environmental resource by other inputs, like human-made capital.

Some environmental resources are important, not only because they provide productive uses but also because they provide amenity services, recreation, and aesthetic enjoyment. For example, a national park can be conserved as it is (reversible decision), or used for mining (irreversible decision). Many would argue that there are no close substitutes for the environmental services it provides.

The Sustainability Problem and Limits to Growth

When discussing the interdependence of the economic and environmental systems, many concerns about sustainability arise. Economic activities occur within earth's natural environment. Annex E - Economy–Environment Interdependence Scheme illustrates bidirectional relationships between them. The outer line represents the thermodynamically closed system that is the environment, which can only exchange energy with its outside.

Thus way the four basic functions that the environment performs are: 1) amenity services base, 2) resource base, 3) waste sink, 4) life-support services.

A special remark should be made regarding the substitution possibilities for the environmental services (dashed lines in the Annex). For example, recycling reduces the need for using the waste sink and, at the same time, reduces the need for resources, while for some amenity services, such as recreational activities, alternatives can be found. The most difficult substitution is for life-support services.

A second way to understand the sustainability problem is to define the proximate drivers of the economy's impact. According to (Perman, et al., 2011, p. 28):

The environmental impact of economic activity can be looked at in terms of extractions from or insertions into the environment. In either case, for any particular instance the immediate determinants of the total level of impact are the size of the human population and the per capita impact. The per capita impact depends on how much each individual consumes, and on the technology of production.

This notion can be expressed in worldwide known IPAT identity that can be formulated as below. Where: 'I' is the impact, measured as mass or volume; 'P' is the population size; 'A' is per capita affluence, measured in currency; units; 'T' is the technology, as the amount of the resource, used or waste generated per unit production:

$$I \equiv P \times A \times T \quad (11)$$

Equation I.11 – The IPAT Identity Function – main variables

Using GDP for national income, we would have the below equation. When cancelling 'population' and 'GDP' we would have: Impact equalling resource use.

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$$I \equiv Population \times \frac{GDP}{Population} \times \frac{Resource\ use}{GDP} \quad (12)$$

Equation 1.12 - The IPAT Identity Function – using GDP

Although too simplistic, this equation has the merit of showing the total impact on the environment through three multiplicative components: population, affluence, and technology. It can be applied to specific items such as global carbon dioxide emissions to see what happens if one variable, such as population, changes. Models can be built to incorporate behavioural relationships between the various components and with other economic variables such as supply and demand functions.

Thirdly, to understand the sustainability problem it is important to take into account the current state of human development. The United Nations Developments Programme publishes data and several documents such as the *Human Development Reports* (UNDP, 2014).

According to income-based measures of poverty, 1.2 billion people live with \$1.25 or less a day. However, according to the UNDP Multidimensional Poverty Index, almost 1.5 billion people in 91 developing countries are living in poverty with overlapping deprivations in health, education, and living standards. And although poverty is declining overall, almost 800 million people are at risk of falling back into poverty if setbacks occur. Many people face either structural or life cycle vulnerabilities. (UNDP, 2014)

The central question is whether things are or will be getting better. Despite the unprecedented growth of the 20th century and the changes in equilibrium between nature and society, 1.3 billion live in extreme poverty and nearly ½ of the world population live on less than \$2.50 a day. Hunger still kills more people every year than AIDS, malaria & tuberculosis combined³⁴.

Additionally, in the 2015 Revision of the World Population Prospects³⁵, a projection shows that between 2050-60 the total world population may be over 10 billion (7 billion in 2014). At the same time, emerging economies like China aspire to the living standards of the Western world, as does the non-industrialized world in general. It is the combination of population increase in the developing world and unsustainable consumption levels in the developed world that poses a stark challenge to sustainability.

SECTION II.2. SUSTAINABLE CONSUMPTION AND PRODUCTION

II.2.1. Concepts of Sustainability

In the previous section, we have seen the concept of sustainable development, which embodies the theme of sustainability. In fact, sustainability has become central with the appearance of environmental, social, and economic issues. However, it is important to theorise it.

There are different ways of conceptualizing 'sustainability'. In general terms, the most common categories of approaches are the economic, ecological and of social processes and institutions. For

³⁴ According to the WFP – World Food Programme available at <https://www.wfp.org/hunger/stats>

³⁵ The 2015 Revision of World Population Prospects is the twenty-fourth round of official UN population estimates and projections. Available at <http://esa.un.org/unpd/wpp/DataQuery/>

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economists, the obvious way is to identify interests as consumption levels, and consider comparisons of different time paths for these. But there are other ways.

As regard by (Perman, et al., 2011, p. 83), “there is no universally agreed definition of the concept of sustainability”, to illustrate the difficulties in finding a single general definition. It is distinguished between ‘sustainable’ development, ‘sustained’ development and ‘survivable’ development.

As we have seen in Chapter I, Section I.1 Dissecting the Model – a historical perspective, in neoclassical theory, the usual assumption in intertemporal economic analysis is that utility can be considered a function of consumption. Therefore, the most broadly used concept of sustainability in economic analysis is ‘non-declining consumption’. But this criteria is not problem-free and often fell short to choose the best option. Yet, other criteria can be added such as survivability.

The origin of the concern for sustainability comes from ethical worries with future generations and with an evaluation of the facts. This implies that such worries need to be included into present decision-making. At the same time, even limiting attention to consumption, a huge variety of expressions can be found that entail several constraints on current planning. Additionally, not all the alternative consumption paths are feasible. For example, it is not admissible that non-renewal resources can be used indefinitely.

In order to have a wider idea of the different approaches (economist, ecologist, and social processes and institutions) the authors (Perman, et al., 2011) summarize six concepts of sustainability:

1. A sustainable state is one in which utility (or consumption) is non-declining through time.
2. A sustainable state is one in which resources are managed to maintain production opportunities for the future.
3. A sustainable state is one in which the natural capital stock is non-declining through time.
4. A sustainable state is one in which resources are managed to maintain a sustainable yield of resource services.
5. A sustainable state is one that satisfies minimum conditions for ecosystem resilience through time.
6. Sustainable development as consensus-building and institutional development.

As noticed, the first, second and the third concepts are economic in nature; the fourth and fifth are originated with ecologists; and the sixth is essentially a governance problem. These concepts should not be seen as mutually exclusive. Besides, these six concepts entail other theories and notions. Yet none of these concepts details the period for its operation.

Good examples of the economists’ approaches are: the debate over substitution possibilities between different types of capital (natural, physical, human and intellectual); the Hartwick Rule for maintaining constant consumption with a particular savings/investment rate while satisfying the conditions for intertemporal efficiency; and the notions of weak and strong sustainability, where the former implies substitutability and the latter sees certain capital types as irreplaceable.

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For ecologists' approaches, in contrast, two other concepts can be highlighted: the notion of sustainable yields so that harvest of renewable resources stays under the natural growth; and the idea of ecological resilience with sustainability being assessed in terms of prevailing ecosystem structure and properties. A related idea is that of the steady-state economy, introduced by Herman Daly in the early 1970s.

Finally, the institutional approach focuses on processes rather than on outcomes or constraints as the two previous. It involves building consensus and developing institutions. It comes more from political scientists and sociologists. Many of its concepts are close to the essence of the Brundtland Report.

In short, normally economists theorize sustainability as constant or non-declining consumption, while maintaining productive potential through time. In turn, ecologists are more prone to focus on preserving the properties of the biosphere like resilience, and somewhat less on human welfare. Nonetheless, in what concerns the general objectives, both approaches should be seen as complementary.

As expected, economists are more likely to accept substitution possibilities of human-made for natural capital, more faithful on technology and tend to be in favour of keeping total capital intact. Also, they rely on price incentives as policy instruments while ecologists are more willing to advocate a cautious approach to policy objectives. As noticed by (Perman, et al., 2011, p. 103) "ecologists tend, that is, to be 'strong sustainabilists' whereas economists tend to be 'weak sustainabilists'".

II.2.2. Sustainability Measures, Policy and Decoupling

Sustainability is the endurance of systems and processes. The organizing principle for sustainability, i.e. the central reference point that allows everything else to derive, is the sustainable development.

Despite the popularity of the term 'sustainability', the possibility that humanity will achieve a truly sustainable development remains highly questionable. Still nowadays, the world faces environmental degradation, climate change, overconsumption, socioeconomic inequalities, while pursuing a perpetual economic growth in a thermodynamically closed system that is the environment.

Sustainability comprises a theoretical and analytic framework that draws on and connects with many different disciplines. It can be studied and managed over many scales (levels or frames of reference) of time and space and in many contexts of our environmental, social, and economic organization. Thus practical measures to reach global sustainability have been hindered by the complexity of systems and processes and, in general, the size of the planet and limited information on all its ecosystems.

Due to the complexity and multi-dimensionality of the concept (involving the environmental, social, and economic domains, both individually and in combinations), the metrics are countless and constantly evolving sustainability standards and systems, indexes and accounting, indicators and benchmarks, among others.

For instance, for measuring the performance or quality of the sustainability governance of a country one can find the 'Green National Product', the 'Environmental Sustainability Index', or the 'Ecological

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Footprint' published by the ecological organization Global Footprint Network³⁶. For organizations, we can find ISOs, the Triple Bottom Line accounting or corporate sustainability reports.

In the article 'SURF Framework for a Sustainable Economy' (Waite, 2013) presents a practical framework for approaching sustainable development and the green economy. The author argues that two extremes can be found. On the one hand, theoretical literature has very macroscopic ideas for sustainable development and sustainability (such as the definitions that were presented before). On the other hand, there is a large body of specific tools, such as life cycle analysis, that can enable sustainable development decision-making.

Regarding the specific tools, the author includes a non-exhaustive but extensive list of tools, guidelines, frameworks, and indices in the sustainable development area. They are reproduced in Annex F - Tools, Guidelines, Frameworks, and Indices for Sustainable Development Decision-Making.

Once we have defined the concept of Sustainability and the organization principle for it - Sustainable Development, it is important to picture some policy approaches towards the problematic. Although sustainable development calls out for and integrated intervention, it is useful to locate policies and measures in the three traditional domains addressing the key principles of sustainability.

In the article 'An overview of sustainability assessment methodologies' (Singh, et al., 2009) overview the sustainability indicators and composite indexes that are gaining increasingly recognized importance as a powerful tool for policymaking and public communication.

One important development in this area is the Pressure State Response (PSR) framework of the OECD, which is based on the concept of cause and effect.

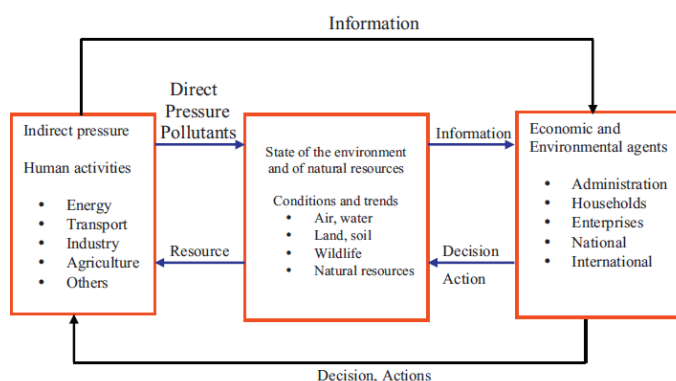


Figure II.3 - The pressure-state-response (PSR) framework

This framework defines the impact of human activities which exert 'pressures' on the environment and results in change in the quality and the quantity of environment conditions (the 'state'). Accordingly, society responds to these changes through environmental, economic, and sector policies (the 'societal response') for its adaptation. Response of society acts as a feedback to "pressure" segment through human activities.

³⁶ Global Footprint Network and data can be found at: www.footprintnetwork.org

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Beside the PSR framework, it is worth mentioning the Driving Force Pressure State Impact Response (DPSIR) model, an extension of the former. It has been adopted by the European Environmental Agency (EEA) and the European Statistical Office in 1997". The figure shows those five aspects and their connections.

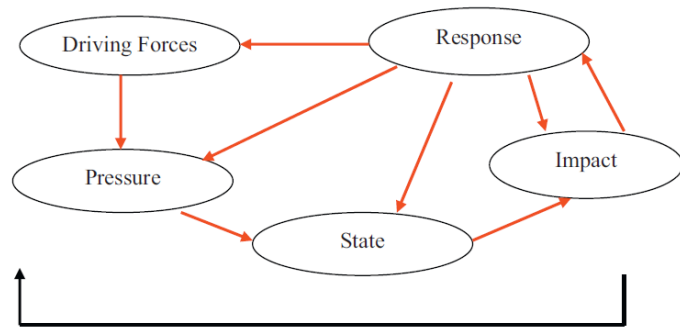


Figure II.4 - The DPSIR framework

After Agenda 21, the UN Commission on Sustainable Development (CSD) came out with a list of about 140 indicators, which cover various dimensions of sustainability.

Regarding the environmental dimensions, there are two major ways of reducing negative human impact and enhancing ecosystem services. The first is direct approach the environmental management, and the second is an indirect approach, probably more effective, relying on the management of human consumption.

Management of Environment and Natural Resources

This is a direct approach because decisions and actions are focused on the state of the environment and natural resources. It is based mainly on information obtain from earth and environmental sciences and conservation biology. Nevertheless, this management is of the 'end-of-pipe' type since it is directed at the end of a long series of indirect causal factors that are initiated by human consumption. In the broadest sense, sustainability and environmental management involves managing the oceans, freshwater systems, land, and atmosphere, according to sustainability principles.

For instance, the management of the atmosphere comprises assessment of all aspects of the carbon cycle to identify opportunities to address human-induced climate change and this has become a major focus of scientific research because of the potential catastrophic effects on biodiversity and human communities.

Despite of public awareness, better understanding of nature's processes and enhanced environmentally friendly technologies, on some fronts there has been little progress. Something within the human system is preventing changes to a sustainable mode of behaviour. That system attribute is systemic change resistance - organizational resistance, barriers to change, or policy resistance.

Management of Human Consumption

A second approach is through demand management of human consumption of resources. This indirect approach is also based on information obtained from economics. More recently in the article 'Toward some operational principles of sustainable development', (Daly, 1990) has suggested several broad criteria for ecological sustainability:

- Harvest rates should equal regeneration rates (renewable resources should provide a sustainable yield); and

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- Waste emission rates should equal the natural assimilative capacities of the ecosystems into which the wastes are emitted.

Natural capital and human-made capital should be managed at optimal levels, which could be maintained over a very long time. Regarding the question of the right composition of both 'capitals', and if they are they complements or substitutes, Daly argued that they are basically complements, and only very marginally substitutable.

Next Daly addresses the use of non-renewable resources also in light of sustainability, arguing that they can be exploited in a "quasi-sustainable manner by limiting their rate of depletion to the rate of creation of renewable substitutes". Moreover, for Daly the aim is always to limit resource throughputs, and to emphasize technologies that increase the amount of value extracted per unit of resource, rather than increasing the throughput itself. From a macroeconomic perspective, the number of inhabitants times the resource use per capita must remain within the limits of certain region's carrying capacity. Thus, "quantitative growth in populations of both people and commodities must ultimately end, but qualitative improvement can continue in a regime of sustainable development". (Daly, 1990, p. 5)

Nonetheless, he admits that some development goals will be difficult to obtain without growth, like fighting poverty. For that, he advocates greater focus on population control in developing countries, while controlling over-consumption in the wealthier nations, and bigger efforts in redistribution of wealth.

Goods and services should be analysed and managed through the chain of consumption, and at all scales, taking into account the effects of lifestyle choices and spending patterns, resource demands, impacts of specific economic sectors, and so on. The analysis of consumption patterns should relate the use of resources with their impacts on environmental, social, and economic domains.

There are several tools for understanding the impacts of consumption. For instance, analyses of resource use (total resource use to produce certain goods or services), resource intensity (measure of resources needed for the production, processing and disposal of a unit of a good or services – resource efficiency), and resource productivity (the quantity of a good or services obtained through the expenditure of a unit of resource - yield per unit resource).

Resource intensity and its inverse, resource productivity, are key concepts in measuring sustainability. A sustainability objective could be to maximize resource productivity or, equivalently, minimize resource intensity.

In 2007, the UNEP facilitated the creation of an 'International Resource Panel' (IRP)³⁷, composed by a group of independent experts, aiming to help countries to use their natural resources in a more sustainable way but without compromising economic growth and human needs. In 2010, IRP published the first global scientific assessment (UNEP/IISD, 2010), on the impacts of consumption and production and identified priority actions.

The study stated that the most critical impacts were related to ecosystem health, human health, and resource depletion. Regarding production, it asserted that fossil-fuel combusting processes, agriculture

³⁷ More information available at: <http://www.unep.org/resourcepanel/>

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activities, and fisheries had the most important impacts. Regarding consumption, it asserted that household consumption related to mobility, shelter, food, and energy-using products caused the majority of life-cycle impacts of consumption. “The combined conclusions from a production, consumption, and materials perspective lead to a clear picture: food/agriculture and all processes involving fossil fuels have the highest relevance”. (UNEP/IISD, 2010, p. 1)

The report goes even further. “The impacts related to these activities are unlikely to be reduced, but rather enhanced, in a business as usual scenario. Population and economic growth will lead to a higher demand for energy and food, and most probably a comparatively high demand for meat and dairy products which are the most environmentally intensive categories”. (UNEP/IISD, 2010, p. 1).

Sustainable Consumption and Production

Regarding the management of human Consumption, the concept ‘Sustainable Consumption and Production’ (SCP) is nowadays gaining momentum. “SCP is an overarching objective of and an essential requirement for sustainable development”, as recognised in the Johannesburg Plan of Implementation (JPOI) of the World Summit on Sustainable Development (WSSD), in 2002 (UNEP, 2012).

SCP is defined³⁸ as “the use of services and related products, which respond to basic needs and bring a better quality of life while minimising the use of natural resources and toxic materials as well as the emissions of waste and pollutants over the life cycle of the service or product so as not to jeopardise the needs of future generations”. (UNEP, 2015)

The aim is to do more and better with less, thus to increase net welfare gains from economic activities by reducing resource use, degradation and pollution along the entire lifecycle, while increasing quality of life.



Figure II.5 - The Cycle of Sustainable Consumption and Production (SCP)

As expected, the process must involve a multiplicity of stakeholders and a systematic approach and cooperation among actors operating in all of the supply chain, from producer to consumer. It also highlights a need to engage consumers through awareness raising and education on sustainable consumption and lifestyle. For instance, the development of standards, eco-labelling and sustainable public procurement, among others.

In the world’s UN Conference Rio-92, SCP was already recognized as a central theme to link environment and development challenges.

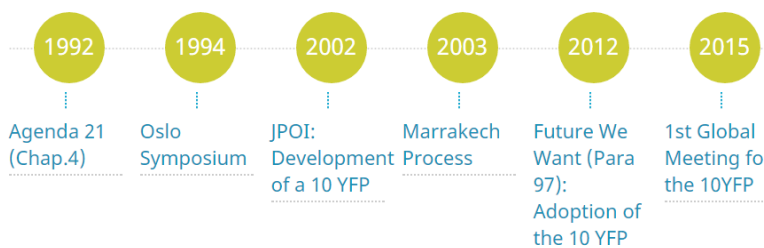


Figure II.6 - Timeline of Events of Sustainable Consumption and Production

³⁸ Speech made by the Norwegian Ministry of Environment, Oslo Symposium, 1994.

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One of its outputs, the Agenda 21, has stated: “The major cause of cause of the continued deterioration of the global environment is the unsustainable patterns of consumption and production”. (UNEP, 2015, p. 1)

In 2002, the WSSD was held, in which a JPOI was signed. Chapter 3 was dedicated to “changing Unsustainable Patterns of Consumption and Production” and declared “fundamental changes in the way societies produce and consume are indispensable for achieving global sustainable development. All countries should promote SCP patterns.”

The Marrakech Process, co-led by UN DESA and UNEP, was a global multi-stakeholder process to support the elaboration of a 10-Year Framework of Programmes (10YFP)³⁹ on SCP, as called for by the WSSD Johannesburg Plan of Implementation. Later in the 2012 UN Conference Rio+20, countries reaffirmed the JPOI declaration⁴⁰ and adopted the 10 YFP on the Global Action for SCP patterns. It was



Figure II.7 - SDGs – Areas of critical importance to humanity and planet

highlighted that the programmes included in the 10YFP are voluntary. The UNEP has created a webpage hosted in its website⁴¹.

Recently, in March 2015, UNEP released a discussion paper designated “Sustainable Consumption and Production Indicators for the Future SDGs”. It is an important milestone on the SCP process (along with the 10 YFP) and because it shows the state-of-the-art in the operation of SCP. At the same time, there are ongoing discussions and negotiations on the post-2015 development agenda⁴².

In the same spirit, the intergovernmental Open Working Group (OWG) on the SDGs put forward, in July 2014, a proposal comprising 17 goals and 169 targets⁴³. Furthermore, to achieve the SDGs, targets must be turned into tangible and measurable objectives, so a set of indicators can be defined to monitor the progress towards SCP patterns.

The before mentioned UNEP’s discussion paper points out a set of potential indicators for a sub-set of the SCP related targets which arise from the proposed SDGs. In fact, some of those indicators can be applied to measure more than one target, showing complementarities between target and goals they underpin. Moreover, the paper itself emphasizes the importance of the stand-alone goal 12, on ensuring SCP patterns, but also of having SCP related targets in other goals.

³⁹ The 10 YFP has an internet platform available at: www.unep.org/10yfp/

⁴⁰ The 10YFP has been adopted at the Rio+20 Conference (paragraph 226), as contained in document A.CONF.216/5. It was highlighted that the programmes included in the 10YFP are voluntary.

⁴¹ Available at: <http://www.unep.org/10yfp/>

⁴² Meanwhile, the UN Sustainable Development Summit 2015 was held on 25 - 27 September 2015, New York. The final documents and outcomes can be found at: <https://sustainabledevelopment.un.org/post2015/summit>

⁴³ Full list available at: <http://www.un.org/sustainabledevelopment/sustainable-development-goals/>

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Starting from around 200, the indicators were then filtered and prioritized, and “organized around six domains which can support a shift to SCP patterns:

- (1) Scale of resource use, (2) decoupling, (3) environmental impact, (4) technology and lifestyles, (5) financing and investing for SCP, and (6) policy support for SCP.

Annex G reproduces a table summarizing the above six SCP’s domains, proposed indicators and related targets under the SDGs, including a total of 24 targets. Concomitantly, each domain can be represented by a limited set of headline indicators. For instance, the domain “Decoupling economic activity from resource use and environmental impact” is represented by:

- National material efficiency – material productivity (GDP per unit of material use). And then,
 - Production side: material use measured through Domestic Material Consumption (DMC)
 - Consumption side: material use measured through Material footprint (MF)
 - But also, Domestic Material Input (DMI), disaggregated by material category
 - ❖ Relating to SDGs targets: 8.4 and 12.2
- National energy efficiency – Energy productivity (GDP per unit of energy use).
 - ❖ Relating to SDGs targets: 7.3, 8.4 and 12.2

Looking back to the SDG⁴⁴, the Goal 12 – “Ensure sustainable consumption and production patterns”. In its 12.2 sub-set item, for instance, it is determined that “by 2030 achieve the sustainable management and efficient use of natural resources”. (UNEP, 2015, p. 10)

One final note on the methodological approach. The selected targets include those that enable or indirectly relate to SCP, and also targets under SDG 12 with direct focus on SCP. There is a table summarizing the reviewed SDGs and relevant targets (UNEP, 2015, p. 14). Yet, most of the suggested indicators are global in nature, thus they may have to be adapted.

Nonetheless, the paper identifies a series of properties and objectives that contribute to the achievement of SCP (as per Annex G) and considered important to the 10YFP. For that, a set of qualitative properties for indicator selection was used:

1. Resource and critical thresholds/carrying capacity; 2. Decoupling; 3. Social benefits; 4. Universality; 5. Linkages to other targets. But also an additional property – return on investment in sustainability (RoIS)⁴⁵.

Yet, “turning the SDGs into reality will require turning the goals’ general aspirations into tangible details and implementation measures... While general efforts to develop SDG indicators are under way, there is a need for more detailed work that takes the specifics of SCP into account, helping to craft and implement SCP programs and policies relevant to the SDGs”. (UNEP, 2015, p. 9)

⁴⁴ More information on the targets an SDGs: <https://sustainabledevelopment.un.org/post2015/transformingourworld>

⁴⁵ The RoIS measures the feasibility and desirability of implementation efforts given the scale of the needed change.

Scale of Use, Dematerializing and Decoupling

As we seen in II.1.2 'The Role of Consumption in the Growth Paradigm', the last century witnessed a huge increase in the global social metabolism and a transition to a dominance of materials. According to (Krausmann, et al., 2009, p. 2703) "materials use has reached a size which matches material flows in ecosystems and continues to grow". Today, materials use has already far exceeded that boundary.

Materials use grew at a smaller rate than GDP, and material productivity continuously improved at an average rate of 1% per year, showing a relative dematerialization⁴⁶ of the world's economy. Yet, this did not translate into absolute reductions in materials use. There are many reasons such as population grown, the phase of a country's industrialization process (with initially rising and then stabilizing per-capital materials use) and even countries undergoing resource-extraction driven economic processes.

Only recently are emergent economies experiencing transition towards an industrial type social metabolism. A reduction of global materials use or at least stabilization at the current level will require major reductions in metabolic rates, above all in industrialized countries. "Gains in the efficiency of materials use could contribute to a decoupling of economic growth and materials and energy use but this requires effective strategies to avoid rebound effects, which in the past century have counterbalanced the effect of efficiency gains on material use". (Krausmann, et al., 2009, p. 2703)

While conventional economics is concerned largely with economic growth and the efficient allocation of resources, ecological economics has the explicit goal of sustainable scale (rather than continual growth), fair distribution and efficient allocation, in that order (Henkel, 2015, p. 231).

The term 'decoupling' is becoming increasingly used in the context of economic production and environmental quality, and in the debate on 'SCP'. Being related to other terms like 'dematerialization', "it refers to the ability of an economy to grow without incurring corresponding increases in environmental pressure" (Henkel, 2015, p. 231)

If an economy is able to sustain GDP growth without having an environmental negative impact, it is said to be decoupled. The IRP took the lead and in the 2011 presented a report⁴⁷ that warned, "by 2050, humanity could devour an estimated 140 billion tons of minerals, ores, fossil fuels and biomass per year – three times its current appetite – unless the economic growth rate is 'decoupled' from the rate of natural resource consumption". (UNEP, 2011, p. 1)

The report goes further by showing that currently developed countries consume an average of 16 tons per capita of those four key resources, while in India, for instance, consumption is still 4 tons per year. With the growth of both population and economic prosperity, the prospects are not good. Annex H shows the 'Global Interrelation between Resource Use and Income'.

⁴⁶ An absolute or relative reduction in the quantity of materials required to serve economic functions.

⁴⁷ Decoupling Natural Resource Use and Environmental Impacts from Economic Growth, UNEP, 2011. Full report available at: www.unep.org/resourcepanel/ResearchPublications/AssessmentAreasReports/Decoupling/

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The IRP panel notes that decoupling “demands an urgent rethink of the links between resource use and economic prosperity, supported by a massive investment in technological, financial, and social innovation, to at least freeze per capita consumption in wealthy countries and help developing nations follow a more sustainable path” (UNEP, 2011, p. 2).

II.2.3. Scale, Composition and Technique Effects

As stated in the previous section, there are several tools for understanding the impacts of consumption, such as resource use, resource intensity, and resource productivity. Sustainability studies have been analysing ways to reduce resource intensity through improved economic management, product design, or new technology. However, conflicting views can be found on whether improvements in technological efficiency and innovation will enable a complete decoupling of economic growth from environmental degradation.

On the one hand, some claim that resource use intensity could be reduced by at least four or five-fold⁴⁸, thereby allowing for continued economic growth without increasing resource depletion and pollution. On the other hand, there are extensive historical analyses of technological efficiency improvements that show that such efficiency gains were almost outpaced by economic growth. (Henkel, 2015)

The 2014 IRP report analysing existing technological possibilities and opportunities to accelerate decoupling and reap the environmental and economic benefits of increased resource productivity states that “investments in resource productivity can bring multiple gains, ranging from reduced operational costs for companies and the public sector to better environmental quality and the creation of jobs”. Moreover, “economic growth comes, partly, through investments in innovations, and policymakers can influence the nature of the innovations that receive investment through their enabling policies” (UNEP, 2014, p. 5)

This relationship between innovation and economic growth can be given by the ‘Kondratiev cycles’. It has been observed that economic growth comes in waves of prosperity, each driven by new technologies and structural economic change. The figure below illustrates that relationship and the suggestion that resource productivity could become the overarching characteristic of the new cycle:

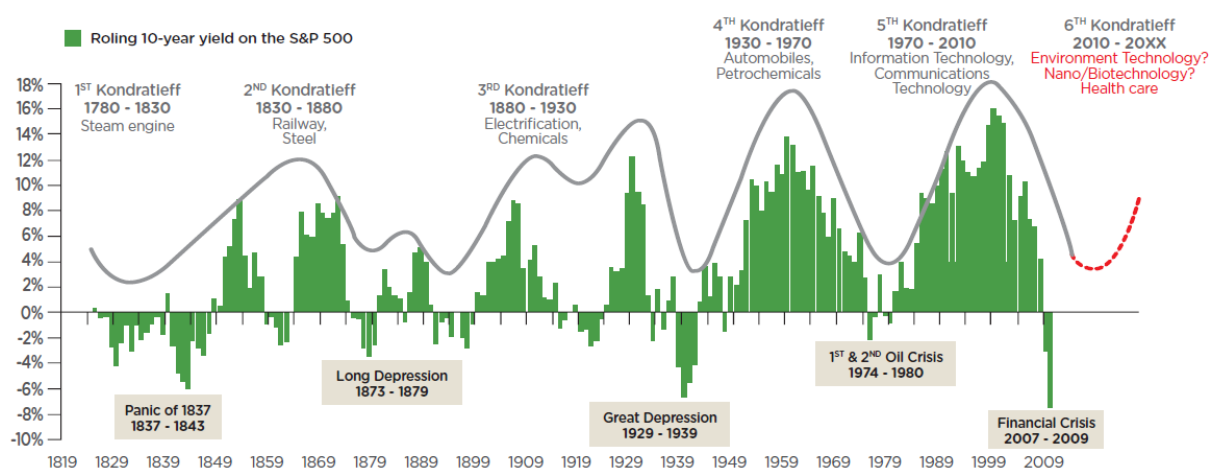


Figure II.8 - Kondratiev Cycles - relationship between innovation and economic growth

Source: (Naumer, et al., 2010, p. 6)

⁴⁸ (UNEP, 2014, p. 19) in the report Decoupling 2, suggests as much as 5 to 10-fold improvements.

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The IRP report (UNEP, 2014) recognizes that we might expect a well-functioning economy to respond naturally to resource scarcity by increasing innovations in resource productivity. Yet, in practice, there are barriers to such innovations, and policy changes may be required. Besides, it recognizes that the policy scene has been suited for promoting growth, but it is unlikely to meet challenges of the future.

Bearing in mind that decoupling can be relative or absolute, IRP advocates⁴⁹ that OCDE countries would need have an absolutely decouple of their growth from resource use, so that developing countries may have a relative advantage in decoupling⁵⁰. As today's expertise exists in the form of legislation, incentive systems, administrative measures, and institutional reform, a more strategic long-term ecologically growth is required.

For that, IRP distinguishes three types of decoupling: 1 - through maturation, 2 - through shifting to other countries the more material intensive stages in product life cycles, and 3 - through intentional resource productivity increase.

The first two "are often observed, and play a role in supporting the idea of a "Kuznets curve" for local environmental pollution, and the frequent but incorrect reasoning that the appropriate policies of countries should be to grow and get prosperous in order to deal with environmental problems". (UNEP, 2014, p. 38) (See discussion below). Yet they lead to a small-scale reduction, and resource use still increases with the economy's expansion.

While some countries have already intentionally put in place initiatives aiming at fostering decoupling, when an economy saves resources, and thus costs, in the absence of a proper reallocation, those gains may be used on investments or greater consumption.

When savings are not taken by taxation, but left in a market economy, evidence suggests that without policy change, savings from resource productivity gains for a particular resource may not reduce dependence on that resource to the extent expected, but that at least part of the savings from productivity gains will be used to buy more of the resource as further inputs. This is known as the "rebound effect" or, when it is particularly strong, the "Jevons paradox" (UNEP, 2014, p. 39)

Besides the rebound effect, there are inherent thermodynamic⁵¹ and even real-world limits to efficiency improvements, for example, when growing food. Since it is impossible to increase resource use efficiency indefinitely, it is also impossible to have endless economic growth. It is seen reasonable that economic decoupling is achieved in the short-term but not in the long-term. This has been one of the arguments for a steady state economy as a requirement for long-term sustainability.

For (Bond, et al., 2015, p. 9), "modelling how growth drives environmental quality is not straightforward, and, long-run growth trends [in overall net welfare, including income and environmental quality] depend upon the growth of inputs, the rate and direction of technological change, and the elasticities of

⁴⁹ Based on the findings of the Intergovernmental Panel on Climate Change's (IPCC) 4th Assessment Report, 2007 and 5th Assessment Report, 2013.

⁵⁰ Because they are not so strongly locked-in by resource-intensive consumption and productions patterns, infrastructure and institutions. (UNEP, 2014)

⁵¹ Because the sum of the entropies of all bodies taking part in the process is increased.

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substitution among the different factors” (Nordhaus, 1992, *apud* Bond, et al., 2015), as any potential policy responses (Smulders, et al. 2011, *apud* Bond, et al., 2015).

Increasing GDP without environmental effects may depend on offsetting the negative effects through reductions in the pollution intensity of the economy. Although the idea of offsetting human activities’ negative impacts is not new⁵², it has been appointed as a different solution to decouple economic growth from environmental degradation.

This offsetting can come in many forms and shapes, such as by purchasing carbon credits to compensate emissions, or establishing quantitative limits on emissions and then trading permits as a ‘property right’. In the Environmental Restoration approach, adherents are encouraged to donate voluntarily towards conservation efforts. Adding a fourth ‘R’ to the ‘reduce, reuse, recycle’ motto, the idea is that even a small fraction can potentially do more than eliminate the rebound effects.

The central question behind this dissertation and many of current worldwide discussions has been about the ultimate relationships between economic growth and environmental quality. The answers have been often contradictory. The Environmental Kuznets Curve⁵³ (EKC) discussion began in the 1990’s, when the concept was presented by Grossman and Krueger. (Stern, 2004)

The importance of the EKC was that it raised relevant debates. It highlighted that there were other effects than the ‘scale of the economy’ and, ultimately, economic factors may be responsible for rising or declining environmental degradation over the course of economic development.

Indeed a criticism that can be directed to the ecological economics view that economic growth and environmental quality are conflicting goals is that it considers only a scale effect. Instead, defenders of the EKC argue “at higher levels of development, structural change towards information-intensive industries and services, coupled with increased environmental awareness, enforcement of environmental regulations, better technology and higher environmental expenditures, result in levelling off and gradual decline of environmental degradation”. (Stern, 2004, p. 1421)

A framework, in the context of the EKC literature, which gives a handy help to reveal the mechanisms through which growth may affect the environment derives from the ‘Decomposition Analysis’ methodology⁵⁴, a family of non-parametric quantitative methods that are based on identities and historical data for giving insights on the major drivers of indicators over time. One good example a decomposition analysis is the IPAT model described above.

⁵² For instance a reduction in emissions of carbon dioxide or greenhouse gases.

⁵³ The EKC highlights the possibility that for some environmental pollutants there tends to be an inverted-U shaped path with respect to income, increasing at low levels of income but decreasing after some switching point.

⁵⁴ “With a long history in the energy efficiency and emissions literatures, decomposition analysis has been used to identify the empirical scale, composition, and technique effects discussed in the EKC literature. This approach has also been used by the Intergovernmental Panel on Climate Change (IPCC), among others, to analyse the relationship between energy use and carbon emissions” (Bond, Burger, & Nguyen, 2015)

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This framework can be used to clarify the 'scale effect': as an economy grows, income rises and drives up both demand for natural resources and pollution associated with economic activity. If we consider environmental impact per unit of income as constant, then pollution increases proportionately with growth. Thus, "it manifests through growth in GDP per capita and population". (Bond, et al., 2015, p. 9)

For understanding the other two 'effect' concepts, let us assume an increase in GDP and population over a period (increasing scale). Then the observation of an EKC relationship would only be possible thought decreasing intensities of a 'public bad component' per unit income. According to (Bond, et al., 2015), such a change would come from differences in production technologies, which can directly change emissions intensity (technique effects), or differences in the structure of production, which can indirectly change emissions intensity (composition effects)⁵⁵.

Indeed, it is the interplay between scale, composition, and technique effects that ultimately determines the relationship between growth and environmental quality. For instance, if the scale effect is positively related to growth, it would be need that the sum of composition and technique effects offset the scale effect in order for environmental quality to improve with income (recalling the hypothesis of the EKC). I.e., for an economy to achieve an absolute decoupling of the relationship between economic growth and environmental quality, the scale effect must be totally offset.

(Stern, 2004) focuses on analysing the EKC, its theoretical background, the econometric framework, the results of EKC studies and its main critiques (theoretical, econometric, and other evidences) but giving and introduction to alternative methods like decomposition analysis. The conclusion is that the EKC statistical analysis is not robust, and "there is little evidence for a common inverted U-shaped pathway which countries follow as their income rises". (Stern, 2004, p. 1435)

Despite the existence of an inverted U-shaped relation between some urban ambient pollutants and income, robust conclusions require more rigorous time series or panel data methods. Still, there is evidence that a particular innovation is likely to be adopted first in high-income countries and then, shortly after, in the majority of countries. In addition, innovations may have different effects in countries.

The author concludes that structural factors (both input and output sides) play a role in altering the scale effect but they are less important overall than time related effects. Another point is that emissions-reducing technological change can overcome the scale effect, especially in slower growing economies. This seems to explain, for instance, the reductions in sulphur emissions per capita in several OECD countries. In faster growing middle-income economies the effects of rising incomes is overwhelming.

(Bond, et al., 2015) use scale, composition, and technique effects to assess decoupling for environmental indicators in Australia. The authors use multiple environmental quality indicators linked to water pollution, natural resource use, and biodiversity, and overall environmental indicators. However, they recognize that the analysis was constrained by limited data on some indicators, and because the concept of environmental quality is quite broad, no set of indicators is sufficiently comprehensive. Moreover, evidence shows different patterns across indicators.

⁵⁵ In some cases, it may be possible to further decompose the relationship by sector or by decomposing terms.

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These authors provide a different judgement of the scale effect, and thus a more positive perspective of abatements due to technological improvements and policies. They find considerable evidence that for some pollutants and resources, environmental quality is increasing with growth after a certain point of the development process.

Though far from universal, this relationship is often strongest for those issues for which there is a strong policy response, and for which technological solutions, in terms of abatement, can be found. For economic growth to drive improved environmental quality, environmental intensity (e.g., emissions per unit GDP) must be decreasing due to composition or technique effects.

The literature has not broadly resolved what mechanisms cause environmental intensity to change and whether or not that change is inevitable, but current research suggests a combination of increasing returns to scale in abatement technologies and demand-side pressures to implement environmental policy play a role. (Bond, et al., 2015, p. 37)

The authors note that for some indicators, such as carbon monoxide and water pollution, environmental quality has indeed improved. This way, in some cases, growth is not linked with a decline in such indicators, as might be suggested by inflexible model, like the IPAT, where technology is constant and endogenous policy reactions to environmental pressures are not included. Although for some components the relation is not so clear and, in other cases, “such as CO₂, there is limited evidence that an absolute decoupling may currently be underway” (Bond, et al., 2015, p. 38).

For some pollutants, like nitrogen oxide, emissions will continue to grow in the next decades driven by population and economic growth, which overwhelms reductions in emissions intensity, if no significant policy or technology changes.

The relationships between the environment and human activities are clearly complex. There are conflicting views on whether improvements in technological efficiency and innovation will enable a complete decoupling of economic growth from environmental degradation. Extensive historical analysis of technological efficiency improvements has shown that they can be overtaken by economic growth (Henkel, 2015). The role of consumption therefore remains central.

II.2.4. Strong Sustainable Consumption Governance

The above-mentioned IRP report ‘Decoupling 2’ provides information about policies and actions that can lead to greater decoupling. In its conclusions, the report highlights that “trends in global consumption and exhaustion of natural resources and environmental systems imply that the decoupling of economic growth from resource use will become ever more important for stable, successful economies” (UNEP, 2014, p. 122). Although representing an opportunity, the scale of change is very large, and could reach US\$ 3 trillion per year in investments.

There are already many technologies to achieve important productivity increases, allowing fewer resource inputs, waste, and costs and thus expanding the economy. In practice, many economies do not naturally adjust in this way, but rather find obstacles preventing such a transition (UNEP, 2014). These adjustment blocks seem to lie in biases and barriers to change inside the social, political, and economic spheres, which “lock-in” existing patterns of resource use. Obstacles to decoupling can come

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from past policy decisions, and technological, behavioural, organization, organizational and institutional biases against innovation. Therefore, in order to enhance decoupling efforts, these obstacles must be removed to enable investments in resource productivity.

Developing countries may be in a better position for decoupling because they are not so 'strongly locked-in' by resource-intensive consumption and productions patterns, infrastructure and institutions. Yet it seems more probable that high-income countries would take the lead, and there is already "a wealth of experience across the world in policy to intentionally facilitate the decoupling of resource use, or impacts of resource use, from economic growth, with some notable successes". (UNEP, 2014, p. 123)

Regarding the agents in the economy, it seems reasonable that final consumers have an important role to play in terms of the shift to more SCP. Yet, some authors argue that consumers have a limited and constrained interference on the efforts towards sustainability, so it should be the state and institutions to drive the process. (Sanne, 2002, p. 273) argue that "consumers may not be so keen and willing but are rather locked-in by circumstances. Some of these circumstances are deliberately created by other interests, and a policy to limit consumption must look for adequate means over a large and varied field."

The key for success seems to rely on the role of the state and institutions. IRP sustains "chances of success appear higher where the policymaker looks at the institutional framework in which the political decision is made" (UNEP, 2014, p. 123). This means being conscious about the actors influencing the decision, their interests, relative power and the norms and assumptions that are shaping the decision. Once again, the central idea is to focus on the obstacles and resistance to policy changes.

Still, nowadays there are policy options available to promote decoupling and that take into consideration the need to remove obstacles. One example is the use of taxation or subsidy reduction to move resource prices upwards, taking into account information on energy or resource productivity increases.

Governance for a Degrowth Path

In the matter of sustainable development, as seen, two debates arise in the literature: sustainable consumption and degrowth. They have similar interest in the fundamental systemic challenges yet only recently have they started to interchange insights. In the article 'Strong Sustainable Consumption Governance - precondition for a degrowth path?' (Lorek & Fuchs, 2013, p. 36), its authors argue:

That lack of connection is due to a predominance of perspectives in sustainable consumption governance that focus almost exclusively on questions of efficiency gains. This 'weak sustainable consumption' governance, however, is not able to address the challenges to sustainable development arising from overconsumption in general or the rebound effect and distributive issues in particular.

Only a 'strong sustainable consumption' (sSC) can provide a capable scrutiny of the connexions between consumption and sustainable development that can successfully contribute to degrowth. It is because it enables a truly delineation of "role of values in governance, obstacles to political reform, and promising political strategies for the degrowth debate and literature". (Lorek & Fuchs, 2013, p. 36)

For advocating a sSC, (Lorek & Fuchs, 2013) starts from the sustainable consumption debate, which can provide useful information on the need and strategies for radical changes to the degrowth debate

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(and vice versa). Yet only part of this debate is focused on the sSC, i.e. the appropriate levels and patterns of consumption, attentive to the social dimension of well-being, and assessing the need for changes based on a risk-averse perspective.

Much of the sustainable consumption literature is dominated by a weak sustainable consumption (wSC) approach, focusing on improving the efficiency of consumption (primarily via technological improvements). In the pursuit of sustainable development, a sSC as a comprehensive approach is a precondition for degrowth. Yet, sSC governance requires a societal acceptance of degrowth. Furthermore, although sustainable consumption literature focuses a bit more on the environmental side, the degrowth debate tends to pay more attention to the social challenges.

For the sSC approach, a change in consumption levels and patterns is necessary to achieve sustainable consumption. It highlights the need to reduce overall consumption, instead of the guiding perspective of the Rio-92 agenda that focus on product-based individual consumption. Moreover, (Cohen, et al., 2010) argue that despite the recognition in 1992 of unsustainable patterns as the major cause of the continued deterioration of the global environment, the numerous strategies that have emerged to encourage solely 'greening' of consumer practices, such as e 'eco-friendly' merchandise.

The sSC approach reaches beyond consumption as an economic activity, stressing non-material contributions to a 'good life'. Attention is paid to activities like neighbourhood exchange, and increase of human well-being by social structures, instead of material possession. In this sense, sSC is a more complete approach comparably to the somewhat artificial distinction between production and consumption, which underlies traditional economic approach. This way, sSC makes a bridge between individual consumption and resource management. (Lorek & Fuchs, 2013)

The challenge for sustainable consumption is the provision of well-being. To do so, the quality of services and the degrees to which they meet human needs have to be considered. This is not an easy venture because there can be basic needs or goods like a 20th pair of shoes. "Sustainable consumption implies channelling resource use towards those consumers where marginal utility is highest. This indicates, in turn, the need to ensure that reductions in material consumption fall to those with the lowest marginal utility of consumption, the wealthy" (Beddoe et al., 2009, *apud* Lorek & Fuchs, 2013, pp. 38).

The defenders of a sSC approach therefore advocate an emphasis on social aspects, highlighting the risks of a highly asymmetric distribution of wealth. The goal is to allow a greater potential for a good life, for everybody and within the carrying capacity of the planet.

The supporters of sSC consider wSC as a necessary strategy, but insufficient: it depends on future technological solutions (insecure technological development) to solve resource scarcity (environmental uncertainty); it is unable to address the rebound effect; and it cannot solve issues related to social justice. Moreover, slight adjustments within the system, at most, can only postpone disasters.

As expected, the goal of a good life within the carrying capacity of the earth is also shared with the degrowth movement. "While emphasizing the goals of social equity (or also democratic participation) even more, the degrowth literature also aims to solve the challenge of scarce resources and their use and distribution" (Lorek & Fuchs, 2013, p. 38).

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At the same time, degrowth also examines the possibilities and need for changes in the socioeconomic paradigm for enabling long-term sustainability for societies. Thus, the sSC' insights regarding the socio-political obstacles and opportunities may be beneficial for the growth movement. In terms of policies, it is worth wondering if the degrowth adage "offers the societal component that much of sustainable consumption research and governance lost, while getting occupied with the weak SCP debate". (Lorek & Fuchs, 2013, p. 39)

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Chapter III. SUSTAINABLE DEGROWTH

SECTION III.1. AN EMPIRICAL APPROACH TO DEGROWTH

III.1.1. The Origins of the Movement

The Degrowth movement is a political, economic, and social movement based on ecological economics and other heterodox schools of thought, as well as grounded on ideas that defy mainstream beliefs, such as anti-consumerism and anti-capitalism. As a project, it has a double origin. On one side, from the advent of ecological crises, on the other, from schools of criticism of technology and development

The movement has also included international conferences, supported by a network 'Research&Degrowth', in Paris (2008), Barcelona (2010), Montreal and Venice (both 2012), Leipzig (2014), and Budapest (2016)⁵⁶. Nonetheless, degrowth is much more than that. For instance, it can also be considered an essential economic strategy to solve the limits-to-growth dilemma.

Some degrowth ideas have been in philosophical debates for centuries. The modern-day movement has roots in the 19th century, back to the anti-industrialist trends developed in Great Britain, United States, and Russia. Yet, only after the Club of Rome report 'The Limits to Growth' (1972) did the concept of 'décroissance' (French word for degrowth) appear, proposed by the Club of Rome think tank and authors like André Amar (1976), André Gorz (1977) and Nicholas Georgescu-Roegen (1979).

Because 'The Limits to Growth' report only recommended 'zero growth', it cannot be considered the founding text of the degrowth movement. It was nonetheless useful to alert the dangers of the unprecedented economic growth and to support the later advances on sustainable development.

According to (Bourke, 2012), its origins are often attributed to economist Nicolas Georgescu-Roegen and his book 'The Entropy Law and the Economic Process' (1971), where he associates each economic activity with an increase in entropy, implying a loss of useful resources. However, it was only after his book was translated into French, in 1979, under the title 'Demain la Décroissance' ("Degrowth Tomorrow") that the movement was spurred in France, from where soon extend to other countries.

Décroissance only became an activist slogan in France from 2001, in Italy from 2004 (Decrescita), in Catalonia (Spain) from 2006 (Decreixement and Decrecimiento). The English term 'Degrowth' was accepted at the first degrowth conference in Paris in 2008⁵⁷, which also marked the initiation of degrowth as an academic research area and international civil society debate (Research & Degrowth, 2015, p. 1).

Georgescu-Roegen's ideas were later developed by his disciple Herman Daly. According to (Bourke, 2012), Daly copied from Schumpeter to emphasize Miller's pre-industrial revolution concept of "stationary state" (1989). In the 1990s, several French thinkers, such as Serge Latouche, Vincent Cheynet, Bruno Clémentin, François Schneider, and Italians such as Mauro Bonaiuti, Maurizio Pallante,

⁵⁶ The fifth International Conference.

⁵⁷ The publication of the proceedings of the April 2008 international conference in Paris constitutes, as of now, the richest and most complete collection analysing various aspects of the subject (Latouche, 2010).

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and Paolo Cacciari, contributed to the theoretical development of Degrowth. Latouche has currently become one of the most renowned references (Martinez-Alier, et al., 2010).

It is also worth mentioning Ernest Schumacher's⁵⁸ 1973 book 'Small is Beautiful', where he foresees a unified degrowth movement and criticizes the neo-liberal model of economic development, arguing that an increasing 'standard of living', based on consumption, is absurd as a goal of economic activity and development. Instead, under what he refers to as Buddhist economics, we should aim to maximize well-being while minimizing consumption (Schumacher, 1973).

Borrowing from (Latouche, 2010, p. 519), the expression did not appear as such in any dictionary of social science before 2006, but only related themes such as 'Zero Growth', 'Sustainable Development' and 'Steady State'. For this author, "degrowth is not a concept, and in any case, not one that is symmetrical to growth. It is a political slogan with theoretical implications. (...) Rigorously, it would be best to speak about 'a-growth'". Besides, there has been a large debate about its best translation.

In general terms, we can say that the degrowth movement arose from concerns on the consequences of the consumerism and productivism, intrinsic to industrial societies (whether of capitalist or socialist basis) including:

- Present or forecast reduction on the availability of energy sources (e.g. oil peaks);
- Decline in the quality of the environment (e.g. global warming, pollution, biodiversity loss);
- Decline in the health of flora and fauna which humans depend on (e.g. lost resilience);
- Rise of negative societal side-effects (e.g. social inequalities, erosion of social cohesion);
- Burgeoning use of resources to satisfy ever-growing material demand.

Thus, the environment dimension is central for the degrowth movement, but also a strong societal dimension (e.g. stating in the name of the biannual events 'International conference on Degrowth for Ecological Sustainability and Social Equity'). Yet, the relation between degrowth and sustainable development has a dual nature. On the one hand, degrowth can be a complementary approach towards strong sustainable development. On the other hand, it can provide opposition to a certain form of sustainable development that relies on some forms of productivism, e.g. in the belief that productivity and growth is the purpose of human organization.

Degrowth supporters claim that most of the sustainable development outline is embedded in mainstream development ideas aiming to increase capitalist growth and consumption. Nonetheless, the concern for sustainability itself does not contradict degrowth. Hence, sustainable development may be an oxymoron if it is based on growth occurring in a finite world, which is by its very nature unsustainable.

III.1.2. The Degrowth Approach

Degrowth supporters endorse a downscaling of consumption and production, which implies a contraction of economies when using an orthodox measure as GDP. The argument is that overconsumption is the key of a long-term environmental and social inequality. One argument is that

⁵⁸ Ernst Friedrich Schumacher, born 1911 and died 1977.

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“reducing consumption does not require individual martyring or a decrease in well-being” (Lambin, 2014, p. 47), rather it aims to maximize happiness and well-being through non-consumptive means. (Research & Degrowth, 2015).

...societies will no longer have to “grow or die.”

Material accumulation will no longer hold a prime position in the population’s cultural imaginary. The primacy of efficiency will be substituted by a focus on sufficiency, and innovation will no longer focus on technology for technology’s sake but will concentrate on new social and technical arrangements that will enable us to live convivially and frugally. Degrowth does not only challenge the centrality of GDP as an overarching policy objective but proposes a framework for transformation to a lower and sustainable level of production and consumption, a shrinking of the economic system to leave more space for human cooperation and ecosystems (Research & Degrowth, 2015, p. 1).

Following Georgescu-Roegen and ecological economists, degrowth presents itself as unavoidable. But there are a variety of other areas, such as anthropology, concerned with the ‘marketization’ of human relations, cultural standardization, critical of economic development and defending a profounder meaning of life and a more participative and just democracy

Due to the multidimensionality and complexity of societies and their environmental links, degrowth contains several approaches. Some activists criticize big infrastructures, defending more environmentally friendly alternatives. Others debate the appropriate level for policy actions, such as national/international vs. local levels, as well as the role of individual vs collective action. Another debate amongst degrowth supporters pitches those who claim the need to replace existing institutions, such as financial institutions, and others who consider that institutions only require a reform, such as for Social Security. In addition, it is not clear what would be the best way to encourage a degrowth path, whether through theoretical analysis denouncing growth, or through political movements levels.

A degrowth perspective that avoids reductionism of all kinds would welcome the diversity and the complementarity of strategies (and sources). Although, how much of each strategy is needed and the priority given to them remains a subject of debate and which determine the specialization of actors. Again degrowth is far from a guideline of action (Research & Degrowth, 2015, p. 1).

On final word regarding the dimensions of degrowth. As expected, in the same way as the SCP agenda has multiple angles, a sustainable downscaling of production and consumption is not merely a GDP reduction, but must take into consideration several dimensions: “time; resources availability; hard infrastructure; finances; institutions and socio-economic organisation; inequity and social comparison; material needs; consumer imaginary” (Research & Degrowth, 2015, p. 1).

The Second International Conference on Economic Degrowth, which occurred in Barcelona in 2010, issued a Declaration⁵⁹ with several proposals related to the above dimensions. The ‘time dimension’ questions the concept of work, the division of labour, and the way we spend our free time. Thus, work sharing is an essential policy option for the degrowth movement:

⁵⁹ Available at: www.barcelona.degrowth.org/Barcelona-2010-Declaration.119.0.html

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Limits to paid working hours are needed, and their concrete level has to be researched and established in a democratic debate. A progressive income tax is needed to reduce inequality as well income ceilings. Incentives are needed to encourage companies to enable work sharing and part-time work (including provision of accessible childcare). Unpaid work needs to be shared too. Research is needed to define work and its aim in a degrowth society, as well as the contribution of unpaid, household/community work to current economy. (Research & Degrowth, 2015, p. 1)

The 'resource availability dimension' is central for degrowth, given the need to reduce natural resource extraction and consumption. Hence, the level of extraction and consumption should be capped, for instance⁶⁰:

The exploitation of natural resource is to be limited. Reduce the global throughput of energy and materials adjusting it to the carrying capacity of the biosphere. Put a limit to human appropriation of net primary production. (Research & Degrowth, 2015, p. 1)

The 'hard infrastructure dimension' is considered a core area because it encompasses big structures that enable high flows of resources. It is the case of highways, thermal or nuclear plants, and cement factories and incinerators. Because the 'built environment', i.e. human-made surroundings, provide the setting for human activity, the degrowth movement has addressed many proposals, such as:

Some infrastructure projects (e.g. nuclear-based production) should be abandoned, while others (e.g. highways) drastically limited. Reduce and eliminate production infrastructure of toxic chemicals. Reduce the transport infrastructure and make it more collective. Support social campaigns that change the imaginary of people regarding the need to travel, long distance travel, levels of consumption and production and the dependence on infrastructure. Cities should be reshaped and reformed on the basis of smaller distances and size, including a reduction in urban sprawl. Car-based infrastructure should be converted to walking, cycling and open common spaces. Make eco-cities for all, rather than for a gentrified minority. (Research & Degrowth, 2015, p. 1)

About the 'financial dimension', the degrowth movement shares many of the opinions of those who criticize the modern functioning of the world's financial and monetary sphere, and how the 'financial' surpassed the 'real' economy. One example is the 2007-08 Financial Crisis and how it led to the 2008–12 global recession and contributed to the European sovereign-debt crisis. Some of the proposals are:

Limit interest rates and money creation (e.g. by introducing 100% reserves in banks). Transition towards local currencies for trade degrowth is needed. Currencies and lending/borrowing should be physically-backed. Cooperative banks managed by communities/municipalities, leading to a social economy. (Research & Degrowth, 2015, p. 1)

The 'Institutions and socio-economic organization dimension' directs interventions to the set of rules and institutions that regulate and enable production and consumption. It can encompass many things, such as the rules which regulate environmental and social standards (e.g. common space and property), but also more general aspects like the general social-economic organization which, in turn, features the size

⁶⁰ There are also several proposals on specific sector activities, such as mining, waste, energy, transportation, and so on, resumed at the R&D' webpage: <http://www.degrowth.org/resources-caps>

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for a new era'. "The first English language book to comprehensively cover this burgeoning new literature on degrowth. It presents and explains the different lines of thought, imaginaries, and proposed courses of action that together complete the degrowth puzzle" (Latouche, et al., 2014, p. 1).

In this book, the main lines of thought are: 1. Anti-utilitarianism, 2.Bio-economics, 3.Development Critiques, 4.Environmental Justice, 5.Currents of Environmentalism, 6.Societal Metabolism, 7.Political Ecology, 8.Steady-state Economics.

Moreover, the book also covers core themes and concepts:

1.Autonomy, 2.Capitalism, 3.Care (importance and fairer distribution), 4.Commodification, 5.Commodity frontiers, 6.Commons, 7.Conviviality, 8.Dematerialization, 9.Expenditure, 10.Depoliticization, 11.Disaster Pedagogy, 12.Entropy, 13.Emergy⁶¹ (advocating a different concept of value), 14.GDP, 15.Growth, 16.Happiness, 17. Decolonization of Imaginary, 18.Jevons' paradox, 19.Neo-Malthusians, 20.Peak oil, 21.Simplicity, 22.Social limits of growth.

A special note for some of the concepts:

- 'Autonomy', it is defined as the ability to give laws and rules to ourselves independently and consciously⁶²;
- 'Care' is defined as the daily action performed by human beings for their welfare and of their community;
- 'Commodification' describes the phenomenon that markets have reached aspects in life traditionally governed by nonmarket values and norms, in which certain goods and services entered in the sphere of market exchange;
- 'Commodity frontiers' are understood as locals where extraction geographically expands, colonizing new land in search for raw materials;
- 'Commons' consists of self-provisioning and governance systems that flourish mainly outside of both the market and the State, on the periphery of mainstream politics and economics;
- 'Conviviality' refers to a society where modern tools are used by everyone in an integrated and shared manner, without reliance on a body of specialists who control supposed instruments;
- 'Emergy' is defined as the total amount of available energy that is directly and indirectly invested by the environment in a process, as a scientific measure of the biosphere's work in support of life processes on Earth.

⁶¹ Defined as the total amount of available energy that is directly and indirectly invested by the environment in a process, as a scientific measure of the biosphere's work in support of life processes on Earth.

⁶² (Bonaiuti, 2012) argues that growth has been produced but with a loss of autonomy, even, beyond a certain scale threshold, to the detriment of representative democracy.

III.1.3. Associating sSC Governance and Degrowth

In spite of the recent developments in the SCP agenda and policies, it seems there is a predominance of perspectives focusing on efficiency gains, dubbed as wSC, and discussed in the previous chapter. Only a sSC perspective, however, can provide enough scrutiny of the connections between consumption and sustainable development. It enables a true demarcation of the role of values in governance, identifying obstacles and promising political strategies.

The far-reaching changes proposed by the sSC within the system will allow a greater potential for a good life and within the carrying capacity of the planet, a goal that is shared with the degrowth movement. It also emphasizes the goals of social equity, more democratic participation, while trying to solve the challenge of limited resources and their use and distribution.

Additionally, degrowth examines the possibilities and need for changes in the socioeconomic paradigm for enabling long-term sustainability for societies. Thus, the sSC' insights may be beneficial for the growth movement. It can even be stated that "degrowth is impossible to achieve without a turn towards strong sustainable consumption" (Lorek & Fuchs, 2013, p. 41).

Meanwhile, the prospects for sSC governance depend on a much better societal acceptance of degrowth, since nowadays it is just gaining momentum, may face opposition due the current world's economic slowdown and prevailing sovereign debt, and for many other reasons. In particular, because the majority of the world's people may not be willing to accept it. Then, sSC research and governance can reinforce the arguments for degrowth and demystify some worries, and the other way around.

Since in many ways this is new ground, there are important areas for further research. Borrowing from (Lorek & Fuchs, 2013), one has to recognise that considerable knowledge on sSC and increasingly on degrowth exists. What is lacking is political action, addressing socioeconomic obstacles (see the sSC Governance section). 'Degrowthers' advocate that, to increase the pace of change, research should emphasize the need for immediate action.

It needs to come up with clear and time-bound targets of what has to be reduced by when, if we want to remain within our ecological limits. Those scenarios have to highlight the social costs of inaction and the risks for social security from a local to the global level. Scientifically solid targets have to serve here as orientation points for political and societal development. (Lorek & Fuchs, 2013, p. 41)

More research and well-grounded policy options may foster reforms and also inform the normative changes thought needed by the degrowth movement, due to current socio-technical lock-in, not only from institutions and society, but specifically from mainstream thinking where purely economic rationality dominates. Alternative ideas may help measuring and communicating the foundations of well-being.

"Research on this topic is overdue, as it has the potential to develop scenarios showing that a shrinking economy does not have to lead to social decline (unsustainable degrowth) and that degrowth with an increase in or at least stability of well-being is possible". (Lorek & Fuchs, 2013, p. 42)

It is also recognized that the social aspects of sustainable consumption need be more deeply researched, in particular how to scale up micro social innovations, leading to substantial changes in the system (regime shift). Nonetheless, there are already alternative 'cosmovisions' and political projects

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such as 'Buen Vivir' in Latin America, 'Ubuntu' in South Africa; or the 'Gandhian Economy of Permanence' in India.

These visions express alternatives to development, alternative trajectories of socio-economic system. They often put forward claims for global environmental justice. They only stand to flourish by a retreat of the growth imaginary in the Northern countries that have promoted it, if not forced it to the rest of the world (Latouche, et al., 2014, p. 5).

Yet, it is worth wondering if the degrowth, in turn, "offers the societal component that much of sustainable consumption research and governance lost" (Lorek & Fuchs, 2013, p. 39). This leads us to the final hypothesis:

- In addition to theoretical work and initiatives on a local basis, can Ecological Economics formulate the conditions and propositions necessary to successfully make the changes advocated by the degrowth movement?

SECTION III.2. THE ECONOMICS OF DEGROWTH

III.2.1. Historical Alternative Paradigms

Reintegrating Ecology and Economics

In Section II.1.2, we already introduced some historical insights regarding the raising of new concerns and approaches. It was recalled that neoclassical models of economic growth started to use natural resources in 1970s when investigating the efficient and optimal depletion of resources.

However, events from 1970s until now are a small part of the historical development of economy and ecology, from the emergence of economics from 'moral philosophy', during the second half of the 18th century, to, a century later, the appearance of the formal field of ecology from biology and natural history. "Like economics, it too was concerned with how systems as a whole could work for the common good of the species that composed them. How two conceptually complementary fields have become associated (...) is a fascinating story" (Costanza, et al., 2007, p. 29).

That long story cannot be told in the current dissertation. Yet we are not indifferent to the 'reductionist paradigm' that prevailed at the end of the 19th century, which assumed that the world could be separated into relatively isolated units to be studied individually. Although sharing theoretical concepts (and an etymological root), the two fields mostly addressed separate issues up to the moment they were reunited. The name ecological economics may have come about because economics and ecology were seen as the two disciplines most directly concerned with the central problem – sustainability.

Meanwhile, there was a growing discontent with the limitation of measures such as GDP, while ignoring the depletion of natural capital. Together they encouraged the development of accounting systems that included the environment. The creation of ISEE in 1987 and the journal Ecological Economics in 1989 are two examples of the advances following the initial efforts. (Costanza, et al., 2007).

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The Role of Ecological Economics

The reintegration of Ecology and Economics shows that Ecological Economics is not, in a strict sense, a single new paradigm because it is based in shared assumptions and theories. It is more as a commitment between experts and scholars, exploring new patterns of thinking and facilitating the implementation of new policies.

As illustrated in the figure, “one way of looking at it is to view ecological economics as encompassing economics and ecology and their existing links in the form of resource and environmental economics and environmental impact analysis” (Costanza, et al., 2007, p. 59).

This new ‘rethinking’ materializes in, for example, the spreading of the materials balance and energetic paradigm⁶³ to economic issues but also, inversely, economic concepts to understand biodiversity, e.g. arguing that natural and social systems coevolve. Either way, ecological economics expresses diverse contributions based on new patterns of thinking, which are highlighted below.

- General System Theory:

The study of systems is a key distinctive mark between “classical” and “system” sciences. While the systems scientific method initially appeared related to other fields, it is preferable for ecological economics, rather than reductionist science, because “living systems” feature strong, usually nonlinear, interactions between the parts, expressing interdependence in its parts and feedbacks. Kenneth Boulding, produced a series of books⁶⁴ establishing parallels between economic and ecological systems that helped in the founding of ecological economics as a formal effort and for dynamic computer simulation used, for instance in the ‘World Systems Model’ reported in ‘The Limits to Growth’ report.

- Open-Access Resource and Commons Institutions:

Some natural resources can be used properly when individually owned but others will be overexploited without rules governing them. Typically, societies develop rules for the use of resources held in common. However, many ecological economists argued that private property only works if nature can be divided in separated parts, hence encouraging wise use. Yet, this possibility rarely occurs because nature is a complex system. “Indeed, as population and material consumption increase, the contradictions between the indivisibility of nature and the use of private property for environmental management become ever more critical” (Costanza, et al., 2007, pp. 62-63).

In the 1920's A. C. Pigou had addressed the problem of collective resource use, but only in 1968 Garret Hardin, after publishing the article “The Tragedy of the Commons”, made it widely understood. Even so,

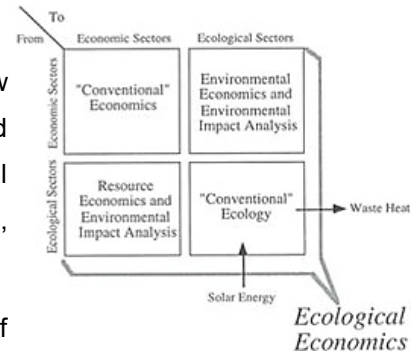


Figure III.10 - Domains of ecological economics.

Source: Costanza, Daly, and Bartholomew 1991

⁶³ Material balances include the total material throughput of the economy as a measure of mass per period.

⁶⁴ E.g. Boulding, K. E. 1978. *Ecodynamics: A new theory of societal evolution*. Beverly Hills, CA: Sage Publications.

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Hardin's problem is more that of 'open access' resources rather than "common property". Common ownership don't need be a tragedy because there are many cases of resources successfully managed as commons⁶⁵.

We now know, however, that natural assets, such as biodiversity, cannot be owned individually, so that we need common management institutions to conserve them. These can be communal, regional, national, or global. Commons institutions are central to the work of many ecological economists.

- Energetics and Systems:

We already mentioned Georgescu-Roegen's book "The Entropy Law and the Economic Process". Meanwhile, in the same year of 1971 another influential book was published by Howard T. Odum - Environment, Power, and Society. Although one was an economist and the other an ecologist, both books were about energy, entropy, power, systems, and society, thus making a major contribution to setting the stage for ecological economics.

At the time, energy was not a salient issue. Yet the 1970's energy crisis showed its importance, while the 1980's decrease in prices perturbed industrial and developing economies. Afterwards, "the role of energy became a central theme in our understanding of economic systems and how we relate to the environment" (Costanza, et al., 2007, p. 65).

Georgescu-Roegen argued that all economic processes entail using energy and that the second law of thermodynamics - entropy law, shows that the available energy in a closed system can only decline. Each economic activity can thus be associated with an increase in entropy, implying a loss of useful resources. He also established a parallel between it and the degradation of the order of materials.

After his book, many criticised his assumptions, e.g., arguing that the entropy law is not important because the earth is not a closed system. Yet, societies are based on the use of fossil hydrocarbons, which resulted from past solar energy, but current solar is of limited flow and concentration.

Moreover, some used materials return to nature as waste. At the same time, new technologies cannot create new resources - they only allow us to degrade energy through human activities, i.e. alter the composition of materials and to lower earth's biodiversity.

Georgescu-Roegen's message is controversial, in part, because it conflicts with beliefs in progress that are still strongly held by economists. The message is also difficult to interpret because it does not inform us how quickly we need to make the transition from stock energy resources to flow energy resources. In this sense, we simply need to look at resource constraints as well as the ability of the global system to absorb carbon dioxide and other greenhouse gases (...) The entropy law, however, does provide a strong bass beat to the sirens being sounded by scientists studying climate change, biodiversity loss, and soil degradation (Costanza, et al., 2007, p. 66).

Georgescu-Roegen was even more important because he motivated further discussion and inspired many to study ways to understand irreversibility and systems, and our options for the future. He also

⁶⁵ E.g., see Ostrom, Elinor (1990), *Governing the Commons: The Evolution of Institutions for Collective Action*, New York, Cambridge University Press, 270 pp. Available at: http://wtf.tw/ref/ostrom_1990.pdf

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defended an evolutionary shift, arguing that modern societies convene the earth's low entropy through rapid high entropy changes.

Meanwhile, Howard T. Odum elaborated one of the first energy flow descriptions of a complete ecosystem and contributed to his Brother Eugene P. Odum's influential textbook, *Fundamentals of Ecology* (1953), a benchmark for decades.

Although concerned with many of the same problems as Georgescu-Roegen, his approach was far-reaching. He went further by including, in general, different systems: physical and chemical systems, biological and ecological systems, economic and social systems. This author's ideas were also controversial but again with the merit of spreading debate on vital questions, such as how systems work and how they evolve.

- Steady-State Economics:

In 1966, Kenneth Boulding wrote the renowned book "The Economics of the Coming Spaceship Earth", where he describes the transition from the 'frontier economics' of the past to the 'spaceship economics' of the future, where improving well-being can no longer depend on the growth of material consumption. In 1968, Herman Daly developed these insights further by rewording economics as a life science, instead of a physical science. This implied a vital shift in the perception of resource allocation. Expressly, it refocused the analysis from marketed resources to the interdependence between ecological and economic systems.

In 1973, H. Daly gave another push to the spaceship-earth theme, and to ecological economics, with his work on "Steady State Economics". There he studies the implications of recognizing earth's material non-growing finitude, while placing the economy as a subset of it. Thus, from a material perspective, it is impossible for the economy to grow endlessly and, at the end of the day, some kind of sustainable steady state is desired. Yet as noted by (Costanza, et al., 2007, p. 71), "this steady state is not necessarily absolutely stable and unchanging. Like in ecosystems, things in a steady-state economy are changing constantly in both periodic and aperiodic ways. The key point is that these changes are bounded and there is no long-term trend in the system".

- Adaptive Environmental Management:

In 1970s the ecologist Crawford Stanley Holling, while doing applied research on the spruce budworm, realized that a more complex and dynamic view of ecosystems was needed. He was also inquired how humans interacted with ecosystems and why their attempts to manage them failed. In "Adaptative Environmental Assessment and Management" (1978), he helps to redraw conventional borders by integrating science and management.

At best, we experiment when we manage ecosystems. Of course, we only learn from experiments if we monitor them well, undertake a fair number of them, and are prepared to learn from them. Thus, environmental management agencies, rather than looking to science to determine for them what is good management practice, must consciously become a part of the experimentation and learning process (Costanza, et al., 2007, p. 72).

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Moreover, this author argued that ecosystems evolve and have multiple equilibria. A key concept is the 'coevolutionary' nature of ecological and economic systems. Models and policies should not be taken as ultimate answers but as guiding an adaptive experimentation process. Yet, more focus should be placed on monitoring and feedback in order to improve continually the models.

Adaptive environmental management has several implications outside ecology, for instance for social organization. All the stakeholders and broader public should participate, if interested in environmental issues. This is quite different from the notion that objective scientists are determining the truth, while people are passive beneficiaries.

- Coevolutionary Nature of Ecological and Economic Systems:

In 1964 the evolutionary ecologists Paul Ehrlich and Peter Raven published "Butterflies and plants: A study in coevolution", where they first warned to the importance of coevolution between species. Coevolution is important to explain why species fit together into ecosystems while both continue to change.

In 1994, Richard B. Norgaard provided ground-breaking insights on how the coevolutionary process can help us to understand natural and social systems. He suggested new directions for social organization to improve environmental sustainability and social justice. The figure considers development as a process of coevolution between five subsystems, with each relating to the others. Yet each one is also both changing and affecting the change in others through a natural selection mechanism.

For that reason, the fitting of new components depends on the characteristic of each subsystem at a precise time. By driving selective pressure on the others, they coevolve and so everything is united and mutually changing.

The coevolutionary model encloses longer-term evolutionary feedbacks, focusing on the chain of events. Some human interventions may alter the selective pressure and, therefore, the relative prominence of certain environmental characteristics that, conversely, select for values, organization, technology and knowledge, which call for new interventions on the environment.

For example, modern agricultural technologies such as the use of pesticides have the capacity to override nature by killing some pests, yet just temporarily and with perverse effects (such as pest resistance and harmful secondary effects on other species), while not fully controlling nature. "Preharvest crop losses due to pests since World War II have remained around 35% while pesticide use has increased dramatically" (Costanza, et al., 2007, p. 76).

More generally, the coevolutionary perspective is a useful way to see how economies moved from coevolving with their direct ecosystems to developing around fossil hydrocarbons. People may have individually escaped from the complexities of interacting with environmental systems, but feedbacks still occur over longer periods and distances, making them more difficult to perceive.

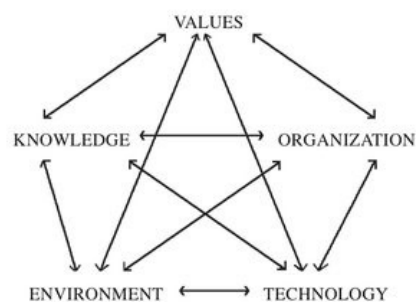


Figure III.11 – The Coevolutionary Development Process

Source: (Costanza, et al., 2007, apud. Norgaard R., 1994, pp. 74)

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Social organization coevolved rapidly around new possibilities, giving people a sense of control over nature, and the seeming ability to shape their future. Nevertheless, problems were accumulating and being left to future generations. This is a coevolutionary explanation of unsustainability, with modern societies develop based on hydrocarbons. The fact that many impacts are still distant and incompletely acknowledged makes it even more challenging to manage them. "People's confidence in the sustainability of development is directly proportional to their confidence in our ability to address these new challenges" (Costanza, et al., 2007, p. 77).

The coevolutionary perspective suggests that overcoming environmental problems goes beyond prices and market incentives, as well as regulations and the use of property. Moreover, our carbon economies have not just transformed the environment. They have selectively changed values, organization, technology, and knowledge. For instance, individualist and materialist values, the development of a reductionist understanding of the world, and bureaucratic forms of control are fit to manage the industrial apparatus but diminish a dynamical management of ecosystems.

Critical Connections between Ecological and Neoclassical Economics

Despite of the existence of alternative paradigms, Ecological Economics is methodologically pluralist and accepts the analysis frameworks of Neoclassical Economics, among others. Even subject to criticism, neoclassical market analysis is a key instrument for ecological economics. Yet, what seems to distinguish the two is how models are used, with particular assumptions. For instance, the debate we have seen in Section II.2 regarding the belief that technological advances will solve the scarcity problem and the substitution possibilities between natural and men-made capital.

As the concept of pricing lies at the heart of environmental economics, valuation of environmental costs and benefits, through direct valuation, contingent valuation or hedonistic price approaches, is an important feature of the former. Touted as a solution and reaction against the deteriorating environment and depleting natural resources, environmental economics has been criticized at more fundamental levels. For example, it has been criticized by ecological environmentalists for ignoring the complex roles and impacts of humans in relation to the larger, interconnected ecological system. It has also been critiqued from the standpoints of Marxist and critical geography for failing to deal with issues of justice and equity in the use and misuse of the environment and natural resources (Neo, 2009, p. 376).

For (Costanza, et al., 2007) there is another way in which they differ while using the same patterns of thinking and it involves the distribution of rights to resources, which affects following market outcomes.

Sustainability entails an issue of intergenerational equity. Yet, in practical terms, it is difficult to transfer assets to future generations in a world still with enormous inequities and very poor people. This is not a central matter for neoclassical economics, yet inequities matter for sustainability.

Discrepancies also constrain international agreements on managing global commons and having strong institutions. The orthodox position is that economic growth will bring about the conditions to resolve these inequities. However, after two generations of growth with the implementation of international development programmes, the results are contradictory and increasingly questioned.

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It is important to highlight that there is a tradition of not considering decisively equity in public practice. In addition, neoclassical economics does not aim to determine if one distribution of resources between people is better than another. For that reason, a moral criterion has to be used in political choices made. Yet, political decision-making is recurrently driven by the balance of power and moral discourse...

As a result, if sustainability requires intra/intergenerational redistribution, there is a need for a strong moral discourse and a boost in the democratic process. Economists must have an important role to feed the democratic debate, based on trade-offs between options, instead of employing only cost-benefit analyses. Chiefly, it is necessary to enable a 'sSC Governance'. Hence, the recognition that economics needs to work with a democratic politics and to recognize the shift in the sustainability paradigm.

While the practitioners of ecological economics are diverse, the vast majority work with the initial assumption that the Earth has limited capacity, determined by resource boundaries and ecological thresholds. In order to keep the economy within these limits, one should encourage nonconformity and creative ideas in the establishment of specific environmental policies. Degrowth is one good example of the new approaches emerging inside Ecological Economics.

III.2.2. Sustainable Degrowth - an emergent paradigm

The Economics of Degrowth

Supporters of degrowth prescribe a downscaling of consumption and production, which may imply a contraction of economies. This calls for a quite different future where societies live within their ecological means, with open and localized economies, and resources more equally distributed through new forms of democratic institutions. However, even if such economic degrowth is ecologically desirable and even inevitable, under what conditions can it become socially sustainable? Can Ecological Economics formulate the necessary propositions to achieve successfully the changes defended by this movement?

In the context of the 'growth dilemma' (see Section 1.2.5), we saw that prosperity goes beyond growth but wondered whether prosperity without growth is possible, i.e. if growth is functional in maintaining economic and social stability. The partial conclusion was that a capitalist market-oriented mixed economy may not have an easy path to a degrowth strategy nor to achieve a steady state position, due to the dynamics of the capitalist model.

In the article "The Economics of Degrowth", (Kallis, et al., 2012) further explore these issues by analysing whether degrowth can become socially sustainable. These authors review recent contributions in the economics of degrowth and identify research avenues for ecological economists:

Can we have full employment and economic stability without growth? What will happen to public spending and to public debt? How would production be organised in a degrowing economy? And under what plausible socio-political conditions could such grand changes happen? Standard economic theories and models ignore these questions, since for them growth is an axiomatic necessity. (Kallis, et al., 2012, p. 172)

The economic crisis of 2008-2012 taught many lessons and exposed the vulnerabilities of the capitalist model. Yet, the recipes have mostly been the same as in the 1930s – 'austerity' versus 'Keynesian expansion', both with undesirable consequences. Fresh economic thinking is therefore needed.

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For (Kallis, et al., 2012, p. 172), “Ecological economics is well positioned to lead the discussion over a prosperous degrowth. (...) Contributions fall under three inter-related literatures: Steady-State Economics (SSE); the New Economics (NE) of prosperity; and Degrowth (DG)”.

No matter which perspective is chosen, the three converge on the causes of the crisis. First, it was not just an economic (even financial) crisis, rather a multi-dimensional crisis of democracy, social mores, and environment. Second, a fixation with growth entailed deliberate policies of financial deregulation, easy money supply, increasing debt burdens and overleveraging to boost economies.

In the name of economic efficiency, States gave away important national decisions (e.g. money supply) to markets and independent bodies, removing them from the realm of democratic choice. A culture of greed proliferated both in the private and in public sectors as the unrestrained pursuit of short-term self-interest was legitimised because of its supposed economic benefits (Kallis, et al., 2012, p. 173).

Third is a cause but also a consequence. Restarting growth would make it easier to pay the accumulated debts. Yet, it is not a response to the crisis and it will eventually worsen environmental problems. Besides having clear ecological consequences, how do these relate to the economic crisis itself?

We can see an economy as having three levels: financial, productive, and ecological. Inflating the financial economy will result in an increase in debt. In turn, debts can only be paid by economic growth, by generating inflation or by squeezing temporarily debtors. However, economic growth of the productive economy depends on energy, materials and waste sinks such as carbon dioxide.

There are many other theories explaining the failures of capitalism. For this crisis, the immediate trigger may have been the U.S. housing bubble, but the remote causes are multiple and may point to a systemic crisis, although mainstream explanations avoid this notion because it questions the system itself.

According to (Batra, 2007), growing inequality of financial capitalism produces speculative bubbles, which have become more frequent. After bursting, it will result in a depression and, after that, in major policy changes. In addition, for this author there is a ‘trickle-down economics’ or simply ‘tricklism’, whereby prosperity is seep, drop by drop, from the top to the bottom. Such thinking fosters policies that worsen income and wealth disparities (e.g. limiting real wage increase for the labour force). In turn, the difference between wage and productivity growth explains the deficit and debt dynamics important to stock markets advance, because debt must rise to compensate an increasing wage gap/lower demand.

The Feasibility of a Prosperous Degrowth

(Jackson, 2009) admits that demonstrating the feasibility of economic degrowth⁶⁶ is difficult because it may be unstable. “It can lead to unemployment, therefore to a lack of effective demand, resulting in even more unemployment, more state expenditures for unemployment benefits and a fiscal crisis of the state”.

Nonetheless, (Kallis, et al., 2012) argue that nobody in the DG literature is preaching degrowth forever. Degrowth is rather a path of transition to a lower steady-state. The relevant question is what that level

⁶⁶ In the tradition of the sustainable development framework, feasible (viable) in economic-ecological terms means that the trajectory is corrected so it is within the biophysical limits yet still ensures a certain prosperity.

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should be: lower than today or can we reach sustainability with zero growth at the current level? The answer is difficult to obtain because it depends on several factors, such as technological and efficiency improvements, while it is acknowledged that economies have deep differences. However, many studies show that we are already overshooting the earth's capacity.

(Jackson, 2009) calls for 'prosperity without growth', arguing that degrowth is unavoidable unless a technological miracle occurs. Moreover, with current rates of growth, reaching the 450 ppm climate stabilization by 2050 would require carbon efficiency improvements (C/\$) 10 times faster per year. This would require an unprecedented pace of technological progress. "Growth as usual' is unrealistic! In addition, 'without growth' efficiency improvements would still need to be 8 times faster. A combination of degrowth and efficiency improvements is therefore necessary". (Kallis, et al., 2012, p. 173)

Many objections have been made. One is that degrowth and efficiency are neither complementary nor independent. Degrowth may lower carbon efficiency by reducing investment in renewables. Besides it may also generate unemployment, reduce state expenditures and social welfare.

(D'Alessandro et al., 2010, *apud*. Kallis, et al., 2012, pp. 173-174) have addressed the first concern with a neoclassical dynamic model and they found that "the sustainability window of the economy becomes wider by low GDP growth rates, if enough investment is redistributed to alternative energy sources, and if consumption growth is curbed".

Regarding the welfare question, (Bilancini and D'Alessandro, 2012, *apud*. Kallis, et al., 2012, pp.174) have addressed it with an endogenous growth model with externalities in consumption, leisure, and production. They found that "consumption externalities are negative through positional competition and leisure externalities are positive through formation of social capital. Under a set of reasonable parameter values transition to a balanced path is associated with production downscaling, reduction in private consumption and ongoing increase in leisure and wellbeing". The findings are in line with other heterodox scholars like those studying Happiness Economics. If shares of leisure increase, the stock of social ties and the flow of relational goods also increase. What is remarkable is that the increased leisure can more than compensate the loss in wellbeing (from a consumption reduction).

Completing these findings, (Victor, 2012, *apud*. Kallis, et al., 2012) projects possible degrowth scenarios using a dynamic macroeconomic model and assesses the effects on state expenditures and employment in Canada. The results show that 'selective growth', i.e. a structural shift to lower-intensity commodities, will not work because the production of such commodities entails intermediate expenditures on high-intensity commodities.

For that, the author analyses a degrowth trajectory, assuming a GDP in 2035 at the 1976 level, much lower compared with present trends, but 5 times higher than required to stabilise CO₂ within planetary thresholds. In a zero-growth scenario emissions would be 22% less than in 2005, but 78% less in the degrowth scenario. Another aspect is that in a degrowth scenario government expenditure would be 25% of its level under a 'business as usual' scenario. Finally, to maintain full employment, in 2035 the average work year would have to be cut, 15% in a zero-growth and 75% in a degrowth scenario.

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These results reinforce previous findings, emphasizing that in order to fight climate change effectively, unprecedented degrowth has to occur, with a vast restructuring of the State and social organization, including a reconfiguration of work. To reshape economies, some of the policies suggested by the Degrowth movement, listed in the previous section, would have to be implemented.

The NE literature sometimes avoids using the word “degrowth”. Instead, authors like Tim Jackson and Juliet Schor prefer “zero”, “without” or “beyond” growth. This may be due to the possibility that it will scare politicians and public in general. Perhaps NE writers really believe that it is possible to achieve a low carbon economy without the material sacrifice intrinsic to degrowth, i.e. making consumption less important. This may be an easier vision to sell, but it may not be a feasible one.

DG advocates have a different vision of prosperity, one based on dramatically less material abundance and consumption. They are less afraid of hair shirts, so to speak. Their vision is informed by models of voluntary simplicity, such as co-housing projects or ecological communes. The proposition is that since the people who live there consume minimally and are happy with their lives, the rest of the world could do the same too (Kallis, et al., 2012, p. 174).

At a first glance, this seems a quite simplistic and optimistic view given the path of globalization. In particular, two key problems may be pointed out. The first is ‘false extrapolation’ and the second is ‘political naiveté’. According to (Kallis, et al., 2012), simple living in peripheral communities relies on the surplus of the rest of the economy. In turn, scaling up existing confined voluntary experiences may involve much more privation relatively to the current experience of those members. Besides, although some people would not mind downshifting, the large majority might reject volunteering, including people who do not have even that choice, or those who enjoy their power and affluence.

Institutional and Political Challenges

Although the DG vision of prosperity entails some material sacrifice, and it may scare politicians and the general public, it’s the most realistic and feasible way to disrupt consumption and production patterns, enabling a truly sustainable development. For sure there are many questions to be answered and research fronts to be opened. For instance, the assessment of the policies suggested by the degrowth movement and, in more macroeconomic terms, the stabilization of the economy during the transition.

Answering these questions will help us better understand why the growth economy is failing, what is it that sustains it despite its failure, how this deadlock can be changed, by whom, under what conditions and to what direction. Ecological economists have much to offer in this exciting incipient research agenda and to the search for prosperous degrowth (Kallis, et al., 2012, p. 179).

Hence, an sSC governance is deemed necessary; otherwise, any attempt to correct the patterns will fall short. Another type of society will certainly need different institutions. In this aspect, the three literatures SSE, NE, and DG seem to agree on a basket of policies and institutions: extraction limits; resource and CO₂ caps; work-hours reductions, work-sharing and new social security guarantees; basic and maximum income; consumption and resource taxes with affordability safeguards; innovative models of communal living; commercial and commerce free zones; new and complementary currencies; high reserve ratios for banks and ethical practices; green investments in the economy; new forms of property, public goods, and cooperative firms.

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However, most of those policies are extremely hard to implement. They may clash with the current system and, chiefly, with profits and interests. So is degrowth possible within capitalist economies? Recalling (Jackson, 2009), is there something fundamental that makes capitalist economies either grow or collapse? For him, calling a society without growth capitalist or something else is of minor importance. Yet, he does not explain how it would work without a positive profit rate, an interest rate, or discounting. The answer may be found in understanding how capitalism vs. degrowth works and how the two relate.

Capitalism can be defined as a system where private property, market transactions, and capital dominate, and where capital can produce and be produced. It's a system structured around continuous accumulation. For Marxist political economists⁶⁷, capitalism has been seen historically as a process; hence, closer to today understanding as a continuous search for profit. I.e. more than the accumulation process itself, what characterizes capitalism is that it evolved around the theory where labour is the source of all new value⁶⁸, and profits are at the heart of the system.

Since accumulation requires continuous growth, a capitalist economy can only expand or collapse (restarting a new phase). Yet other authors disagree. Borrowing from (Silva & O'Neill, 2014, p. 1):

Some see a SSE as being fundamentally incompatible with capitalism's characteristics (e.g. Gorz, 1995; van Griethuysen, 2009, 2010; Harvey, 2010; Kallis, 2011; Kovel, 2007; Smith, 2010b), while others believe that capitalism can be reformed to make it compatible with a non-growing economy (e.g. Daly, 1977; Jackson, 2009; Lawn, 2011; Porritt, 2007).

For instance, (Lawn, 2011) a steady-state economist, believes capitalism can be reformed, so a green dematerialising capitalism is possible. If a government sets social and environmental limits, then capitalism will do the rest, i.e. allocate resources through prices. He accepts that firms face a restriction of 'profit or die', but not the aggregate economy. Moreover, in a steady-state economy firms can continue to thrive because, even in normal times, there are more firms failing than growing, profit does not necessarily require expansion (increase in production), and the most innovative, greener, firms and sectors will grow.

(Silva & O'Neill, 2014) explore this issue further by examining the possibility and desirability of profit-making in a SSE. They conclude that the pursuit of profit may be possible but not necessarily desirable. "Although constraining resource use would possibly guarantee a sustainable scale for the economy, leaving the market alone after limiting throughput would not automatically lead it to address socio-environmental priorities or tackle inequality". (Silva & O'Neill, 2014, p. 1)

(Kallis, et al., 2012, p. 177) present three issues sustaining that a SSE is incompatible with capitalism:

⁶⁷ Marxian economics, especially in the academic world, is diverse from Marxism as a political ideology, as well as the normative aspects of Marxist thought. It draws from a wide range of Marxist and non-Marxist sources.

⁶⁸ Adam Smith and David Ricardo as founders of modern political economy developed a labour theory of value based on the amount of labour required to produce, rather than the satisfaction it provides (neoclassical economics).

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- Firstly, they question its semantics. Will this be a 'steady-state capitalism' (in the spirit of Lawn, 2011) or a 'European-style social democracy' with extended control of public goods? The latter might be called 'socialism' embodying a very strong State.
- Secondly, there are no experiences supporting the theoretical possibility of a successful reform of capitalism. Although we will not know if an absolute dematerialisation is possible until decisive caps and taxes are implemented, "the history of capitalism is one of dramatic ups and downs". Thus, "prices are not adjusted so much by the market, as they are by crises and devaluations". This way, a smooth price adjustment resulting from an imposed limitation is unlikely to occur.
- Thirdly is the dependence of the State bureaucracies and policies on the capitalist system itself. In fact, they consubstantiate in "periodic, stable 'social structures of accumulation', i.e. institutional State-market assemblages that work to maintain the conditions for accumulation".

This included labour unions in the "Fordist" model of accumulation. Technological and economic changes and the crisis of the 1970s rendered obsolete this Statist mode of regulation that some called a "corporatist" model. It survived to some extent in Central Europe but a new variety of capitalism, the "neo-liberal" era that ensued brought deregulation, privatisation and an expansion of private property and market institutions (Kallis, et al., 2012, p. 177).

The political-economic dynamics of the last decades are an obstacle to the return of an interventionist State defended by the degrowth movement (including the three literatures, SSE, NE and DG). There are many reasons and ways by which the State perpetuates the accumulation process. One straight example is the financing of political parties from private funds.

Some DG policies are connoted as 'radical' but those criticisms are often not grounded. Was not the 40-hour workweek a drastic and unthinkable reform at the time? Nowadays, countries like Sweden are experimenting with a 30-hour workweek with voluntary support by firms and results are encouraging. In any case, historical evidence shows that many times only radical agendas can bring reformist policies, normally over electoral and social pressure.

The ultimate challenge will be enabling the acceptance of degrowth and pursuing it as an economic strategy. Social movements may have a major role to play. Some authors emphasise the centrality of policy change but forget to focus on the political side and are silent on the social and political actors or the processes that will bring a society without growth.

III.2.3. Post-Development Criticism

Degrowth Criticisms and Future Prospects

According to (Latouche, 2006, *apud*. Kallis, et al., 2012), the contemporary degrowth movement *à la française* is born at the junction of two movements: one coming from political ecologists emphasizing the effect of productivism in critical environmental problems (associated largely with the influential work of Georgescu-Roegen), and the other coming from criticism to the concept of development (less influenced by ecological economic thinking).

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The second can be seen as the 'culturalist pillar' of the degrowth movement. Its practitioners argue that a sort of 'imaginary economics' is sustaining the 'growth fetish' still standing in the dominant economic development paradigm (preserved by organizations such as the WB and the IMF), which commodifies relations between humans and of these with nature. Thus, the problem is not the idea of sustainability, rather the concept of development. This view is aligned with existing 'post-development' criticisms⁶⁹.

Hence, it can be said that the de-growth movement adheres to the idea of establishing other social ideals rather than calling for development as such. In doing so, it urges re-examination of the dominant economic values of affluent societies. In this context, de-growth thinking is centred on the question of how to be able to enjoy a 'good life', an ancient philosophical goal which finds an echo in Georgescu-Roegen's concept of "enjoyment of life". This search for happiness comes in a variety of forms, depending on the cultural context. In Northern countries, as in Ellul and Charbonneau's view, it is associated with an attitude of frugality or "voluntary simplicity" (Martinez-Alier, et al., 2010, p. 1743).

Voluntary simplicity is a dissociation from consumerism, a precondition which, in turn, entails a reduction in worktime and increased work-sharing, a more informed selection of innovations by policymakers and displacing economic activities. In ecological terms, degrowth demands for a decrease in material and energy consumption in countries already overshooting the earth's capacity, while allowing other countries to increase their consumption if impacts are low relative to their bio capacity.

Degrowth still has a long way to go. Many critics point out its contradictions, mostly because of its varied body of literature and ample body of social movements. (Martinez-Alier, et al., 2010) recognize that today ecological economics can only partially formulate the conditions and propositions needed to successfully make the changes advocated by the degrowth movement "because of the fragmented body of analyses and the incipient state of the political strategy of the tenants of this movement". (Martinez-Alier, et al., 2010, p. 1746).

Nonetheless, the significance of the concepts being discussed (i.e., sustainable development, degrowth, and others.) is worthwhile, not only because of their intellectual framing, but also due to their capacity to promote social change. Since it assumes the unsustainability of the current economic paradigm and the urgency for downscaling resource use, ecological economics seems to be in the front line for finding solutions. Additionally, in defence of ecological economics (Martinez-Alier, et al., 2010) formulate the following propositions:

- Ecological economics can contribute to the research agenda with more social analyses, to scientifically inform socio-political debates and to how to reach environmental goals;
- In addition, there is room for new technical work about the profile of a society with much less material consumption and somehow different institutions;

⁶⁹ The post-development critique holds that modern development theory is a creation of academia jointly with an underlying political and economic ideology. Influenced by Ivan Illich and other critics of colonialism and post-colonialism, a number of post-development theorists like Post-development theory arose in the 1980s through the works of scholars like A. Escobar, G. Esteva, M. Rahnama, W. Sachs, J. Ferguson, S. Latouche, G. Rist and F. Sabelli., who have challenged the very meaning of development.

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- It is common sense that if a society deliberately reduces its throughput, macro-level transactional indicators such as GDP will shrink. Simultaneously, if an economy degrows but labour productivity does not, this may generate socio-economic disruptions such as unemployment⁷⁰. Thus, economical economics can contribute to the discussion of these relations in the 'productive economy' but also in the 'financial' sphere, i.e., the implications of economic degrowth for the monetary and financial system;
- Despite the existence of extensive works, it is relevant to achieve a greater coherence on what degrowth practitioners mean by 'socially sustainable economic degrowth', not only from a theoretical perspective but also associated with grass-root social movements. The strategy by which niche local initiatives may spread to reach societal level is still to be found;
- In addition, for sustainable degrowth to be successful one important step is to arrange a common platform, on which social movements that defend a low environmental impact economy can converge. In fact, a coalition could resemble the existing sustainable development platform, although conditions must be found for such alliances to deliver more results than the sustainable development approach.

On this matter, (Anderson & M'Gonigle, 2012, p. 37) analyses the role of neoclassical methodologies in ecological economics and the contradictions these pose to the field's founding principles. They argue that mainstream (neoclassical) methodologies dominate discourse, and do so by marginalizing more critical (political economy) analyses. While jeopardizing the vision of no-growth 'steady-state', this situation also fails to address the (related) growth dynamics of capitalism. Thus, a suggestion in line with the need to improve the feasibility of a prosperous degrowth and as one research areas to develop.

Without such a critical treatment, the field's formal embrace of 'methodological pluralism' actually entails an ideological empiricism that renders ecological economics theoretically incoherent. This situation undermines the field's historical promise as an alternative economic paradigm. Ecological economics now faces a problematic future. Its survival in a form faithful to its founding vision will require an explicit choice to address its internal contradictions, and reinvent itself in ways relevant to our contemporary context. Without such a choice, ecological economics will likely succumb to an implicit acceptance of the hegemony of mainstream economic methodologies and their pro-growth imperatives (Anderson & M'Gonigle, 2012, p. 37).

Is Sustainable Development a fading adage?

Habitually, 'Degrowthers' reject the notion of Sustainable Development *à la* Brundtland Report. Even more because today it has transformed into an ecological interpretation as 'green economy', with entails, again, a new partial endeavor that delays urgent transformations need, for example, for climate change. In fact, the concept of sustainable development has largely dominated ecological economics up to recently, and also wider social and environmental debates.

⁷⁰ Mostly due to the nature of the capitalism and our locked-in social relations, e.g. rural transports depend on the location of jobs. For that reason, Degrowth advocates that for maintaining wellbeing there is a need to implement policies for reducing legal working time and delink revenue from wage employment.

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Several reasons can be found for the fading of the adage. As we have seen, its outlines are embedded in mainstream development ideas aiming to increase capitalist growth and consumption. While the concern for 'sustainability' itself does not contradict Degrowth, Sustainable Development becomes an oxymoron because, when it is based on growth in a finite world, it is by concept unsustainable. In result, it's weakening favors the success of works under the banner of degrowth.

No doubt the world has attained some progress in certain Sustainable Development objectives, since 2000 when world leaders adopted the United Nations Millennium Declaration⁷¹, with a deadline of 2015 – known as the Millennium Development Goals (MDGs).

Regarding the 'MDG7 - Ensure environmental sustainability', by conception its targets are too ambiguous, unclear and narrow, and only 2 (out of 4) of them concern directly the environment. Even worse, the (United Nations, 2013, p. 1) Fact Sheet⁷² shows poor results for the first two targets:

- ✧ Global carbon dioxide emissions have increased by more than 46 per cent since 1990.
- ✧ Nearly 1/3 of marine fish stocks have been overexploited and can no longer produce sustainable yields.
- ✧ More species are at risk of extinction despite an increase in protected areas.
- ✧ Forests, particularly in South America and Africa, are disappearing at an alarming rate.

The Millennium Ecosystem Assessment (MEA), corroborates and details the main findings:

Over the past 50 years, humans have changed ecosystems more rapidly and extensively than in any comparable period of time in human history, largely to meet rapidly growing demands for food, fresh water, timber, fiber and fuel. This has resulted in a substantial and largely irreversible loss in the diversity of life on Earth (...). The degradation of ecosystem services could grow significantly worse during the first half of this century and is a barrier to achieving the Millennium Development Goals. (Millennium Ecosystem Assessment, 2005, p. 1)

The MEA is clear when stating that appropriate actions are possible to reverse the degradation of many ecosystem services over the next 50 years, but the changes in policy and practice required are substantial and not currently underway.

The paradox is that in social terms, "although significant achievements have been made on many of the MDG targets worldwide, progress has been uneven across regions and countries, leaving significant gaps" (United Nations, 2015, p. 8). The results have been slower and biased compared to what was expected.

Additionally, these partial human well-being improvements have been fueled at the expense of the nature, through rapid extraction and resource use in material energy consumption. While this is unsustainable, others countries aspire to the same model. However, back in the 1990s, the pessimistic conclusions regarding development policies were tempered by arguing that it would take time, as structural changes could not be made overnight...

⁷¹ Available at: www.un.org/millennium/declaration/ares552e.pdf

⁷² Available at: www.un.org/millenniumgoals/pdf/Goal_7_fs.pdf

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Meantime, at the WSSD in 2002 and after, “the difficulty of obtaining overall results was somewhat concealed by partial success stories, or ‘positive initiatives’ put in the forefront as an effort to maintain commitment (Martinez-Alier, et al., 2010, p. 1745). I.e., partial results were used to obfuscate the inexistence of general results and even for raising support to continue the same strategy. Again, more recently, at the 2012 Rio+20 Summit, the outcome document failed to identify the historical and structural roots of poverty, unsustainability and inequity. (Research & Degrowth, 2015)

Furthermore, the report did not acknowledge that infinite growth is impossible in a finite world. It conceptualised natural capital as a “critical economic asset”, opening the doors for commodification (so-called green capitalism), and did not challenge unbridled consumerism. A lot of emphasis was placed on market mechanisms, technology and better management, undermining the fundamental political, economic and social changes the world needs (Research & Degrowth, 2015, p. 1).

Therefore, the historical skepticism that exposed the myths and paradigms of development is still alive (although losing some of the 1970s impetus). It questions the usefulness of a sustainable discourse which, after almost 30 years of the Brundtland Report, still leaves unsolved the same problems and even worse than at the start of the development era.

However, some justice has to be done to mainstream sustainable development. The notion of development gained momentum when it supported the distinction from economic growth, mainly due to the visibility of the Human Development Index (HDI)⁷³. Another leap promises to be fulfilled with the new post-2015 development agenda⁷⁴, approved last September 25, “a bold new global agenda to end poverty by 2030 and pursue a sustainable future” (United Nations, 2015). Particularly, Goal 12 – ‘Ensure SCP patterns’.

(Martinez-Alier, et al., 2010) assert that there is a strong body of cultural criticism, embodied in the term ‘post-development’, regarding the notion of development. It portrays the identification of development with the growth fetish, still dominant within the mindset of development economists and policy makers. In this sense, the degrowth movement vigorously supports the ‘post-development’ critique.

In eyes of de-growth proponents, economic growth, even if disguised as sustainable development, will lead to social and ecological collapse. It is thus better to promote different social values and to start adapting to forced de-growths that are likely to occur, in order to find a prosperous way down. To a certain extent we are witnessing here a turn of paradigms, as these have their own lifecycles dependent on the soundness of the theories and analysis conveyed by the concepts and also on what happens in a society.

When comparing with sustainable development, Degrowth is at a disadvantage because it confronts the fundamental structure of our society. No important actor, public, private or individual, has an incentive to support a degrowth policy. Hence, few institutional actors endorse degrowth or even steady-state, and few political programmes exist, finding no match to the abundance of actions rooted in sustainable development.

⁷³ These were conceived by in 1990 Paki Mahbub ul Haq for the UNDP’s Development Reports with the explicit purpose “to shift the focus of development economics from national income accounting to people-centred policies”.

⁷⁴ “Transforming Our World: The 2030 Agenda for Sustainable Development”.

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Despite being still a recent movement, it has the advantage of proposing and presenting issues about scale, downsizing, degrowth, fully maintaining ecological resilience and sustainable yields, change in values, non-material contributions to a good life, and so many others, instead of dodging them from technical and economic debates. Thus, ecological economics may provide us with more powerful tools in face of a multidimensional crisis.

It has become clear that degrowth clearly separates the notion of 'sustainability' from growth. Yet, for the sake of its own motto, its economics should not be reduced to monetary measures like GDP, even if is highly correlated with material throughput. Thus, unravelling the deeper roots of growth and its consequences should be a priority for enabling a fruitful dialogue, as to enrich the sustainable degrowth idea. Otherwise, degrowth will go beyond becoming a new 'anti-fetish'.

Therefore, in light of the current economic crisis, the adage of sustainable development may be fading. It must be replaced by sustainable degrowth, nourished by ecological economics, as an emissary of the post-development critique.

CONCLUSIONS

The recent Global Financial Crisis, and its effects on the global economy, is considered by many economists as the worst since the 1930s Great Depression. In spite of its negative consequences on our globalized societies, it may be considered as an opportunity to expose the failures and insufficiencies of the current economic paradigms, which have become prevalent worldwide. This leads to the starting question of this work, on whether a reduction in consumption levels, in a consistent manner, is an alternative path to a truly sustainable development enabling humanity to live within earth's capacity.

In today's world, ideals such as economic growth and development, with roots in a still remaining Eurocentric and Anthropocentric narrative, may be experiencing a fading appeal in face of multidimensional crises. In fact, the 'development' concept that emerged with the end of WWII was linked to the supreme necessity of growth and the construction of notions of modernity and progress in the collective imagination. Despite the unquestionable improvement of development approaches, namely with the introduction of sustainability in the discourse and, more recently, the green economy and the post-2015 SDG, up until now failed and problems aggravated.

The present dissertation was conducted over three main hypotheses, one for each chapter, and related concepts. The first questions if the actual development paradigm is truly unsustainable in economic (prosperity), social (well-being), and environmental (resilience) terms. The second wonders if a downscaling of consumption can be admissible in ecological-social terms (bearable), be fair in socio-economic (equitable), and be feasible in economic-ecological terms (viable). The third probes if Ecological Economics may formulate the conditions and the necessary propositions to successfully achieve the changes advocated by the degrowth movement.

After exploring each of these questions, the expected conclusion was that the narrative of (mainstream) sustainable development is diminishing. In fact, the development purpose has always been the upscaling of the economy has the ultimate solver of all problems. Consequently, it is necessary to supplement it with sustainable degrowth as a legate of a post-development critique. Yet, the advent of a paradigm shift is not yet foreseen.

The idea of modern societies having a 'growth dilemma' was mostly confirmed throughout this research. The NNS forms the intellectual foundation of the hegemonic economic thought, thus influencing the actual development paradigm. However, the 2008 Financial Crisis came as a surprise, with sophisticated econometric models and all the intellectual apparatus mostly unable to predict and advise on it, thus exposing its limitations and revealing its fragilities.

Besides, the core problem lies deeper in its fundamentals. It has become clear that neoclassical theories and approaches have had many benefits, providing material comfort and helping to take millions out of poverty. However, this has been achieved at the expense of nature and its impacts were not uniform. While continuous economic growth cannot endure forever, its benefits are limited, as beyond a certain level increasing affluence does not do much to make people happier. Prosperity goes beyond GDP.

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However, it may not be clear whether prosperity without growth is possible within the current socioeconomic context. An initial partial conclusion was that growth might be functional for stability in growth-based economies. In addition, capitalist market-oriented mixed economies may not have an easy path to a degrowth strategy nor towards a steady-state position, necessary for environmental sustainability. The capitalist model pushes economies towards expansion or collapse. This way, degrowth may be unstable if declining consumption leads to a spiral of recession.

Yet, the first hypothesis of this dissertation was confirmed, e.g., the current hegemonic development paradigm is unsustainable in economic terms (prosperity), social (welfare), and environmental (resilience). Likewise, growth is unsustainable, at least in its current form, because burgeoning resource consumption and rising environmental costs are compounding profound disparities in social well-being.

The term ‘Sustainable Development’ has maintained prominence in debates about environmental and resources policy and, in more general terms, in development policy, especially since the Brundtland Report in 1987. It was a big shift in perceptions about the environment and its connections with social and economic dimensions. It also recognizes intra and intergenerational equity issues.

Yet ecological overshoot is reality worldwide and possibilities of collapse are becoming more vivid. The challenge is to engage a true transition to sustainability, not relying on palliative measures. Nonetheless, the environmental alerts brought pressure for changes in development economics. A good example is the recent SCP motto and the ‘green economy’ concept, which have become an overarching objective of and an essential requirement for sustainable development since Rio-92.

Moreover, SCP is today a well-accepted goal, at least for the major world organizations dealing with development. In the context of the discussion on the post-2015 development agenda, SCP is reflected as a crosscutting enabler for the achievement of many of the SDGs, as well as in a stand-alone goal (goal12) on ensuring SCP patterns. Scale of resource use, decoupling and environmental impact are three of the six domains which can support a shift towards more SCP sustainable patterns.

Yet, it has become clear that the relationships between the environment and human activities are far too complex and human knowledge about natural processes still limited. Based on the information about environmental degradation, studies and actions have been developed to find ways to reduce resource intensity and environmental impacts. However, there are conflicting views on the strategies and approaches. Some believe that technological efficiency and innovation will enable a complete decoupling. Others find extensive historical analysis of efficiency improvements being overrun by economic growth. Bearing in mind the growth paradigm, the role of consumption remains central.

Now it has become clear, even for UNEP, that moving economies to more SCP is not an easy task. Indeed, despite the lack of political will and overall societal engagement, one can find obstacles to adjustment, lying in biases and barriers to change inside the social, political, and economic spheres, which “lock-in” existing patterns of resource use and ways of production. Therefore, in order to enhance the decoupling efforts, such obstacles must be removed to enable investments in resource productivity.

There seems to be a predominance of perspectives that focus mostly on efficiency gains, many times dubbed as wSC governance. Regardless of its merits, yet wSC governance may fall short to address

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the sustainable development challenges arising from overconsumption in general or the rebound effect and distributive issues in particular.

Only an sSC can provide enough examination of the connections between consumption and sustainable development, as well as to promote a successful exchange with the degrowth proposals. This is because it enables a truly delineation of the role of values in governance and addresses the obstacles to political reform, promising political strategies for the degrowth debate. I.e. the far-reaching changes proposed by the sSC within the system will be desirable because they will allow a greater potential for a good life and within the carrying capacity of the planet. Moreover, slight adjustments within the system, at most, can only postpone disasters.

The sSC vision is also shared by the degrowth movement. While putting stronger emphasis on the goals of social equity, the degrowth literature also aims to solve the challenge of scarce resources and their use and distribution. Additionally, degrowth examines the possibilities and need for changes in the socioeconomic paradigm for enabling long-term sustainability for societies. Thus, the sSC governance insights may be beneficial for the degrowth movement.

Only a change and decrease in consumption will allow real sustainable development in all three traditional dimensions. But even with SCP, an unthinkable narrative some years ago, international organizations like UNEP have so far left untouched the NNS fundamentals, and maintain a wSC perspective. While SCP patterns can correct the trajectory into the biophysical limits while ensuring a certain level of wellbeing, and within a holistic strategy promotes a certain fairness, a better allocation of income and benefits, thus a more balanced process.

Despite its many different roots, the Degrowth movement is embodied mostly in the Ecological Economics school of thought. In fact, this quite young movement is emerging as an alternative paradigm that offers many perceptions that sustainable development can or is not willing to give. It is already well established and it has been formulating propositions that may enable a change in the paradigm. Themes such as resource depletion and ecological footprint can be found at its basis, but also a strong societal dimension. While degrowth supporters claim that most of the sustainable development outline is embedded in mainstream development ideas, which aim to increase capitalist growth and consumption, the concern for sustainability itself does not contradict degrowth.

Since overconsumption is the key to a long-term environmental and social inequality, degrowth endorses a downscaling of consumption and production, which implies an economic contraction when using measures such as GDP. Yet reducing consumption does not require individual martyrdom or a decrease in well-being. Happiness and well-being can increase through non-consumptive means. Furthermore, degrowth is unavoidable whether it comes about in a smoother planned way or recklessly in the advent of collapsing economies due to growing ecological constraints.

Although several strategies and proposals for action exist, no one can have an overall picture on how post-degrowth societies would look like. Debates will continue to happen on the necessary adjustments to the socio-institutional landscapes. It is clear, however, that degrowth is impossible to achieve without a turn towards sSC. Meanwhile, the prospects for sSC governance depend on a much better societal

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acceptance of degrowth, since nowadays it is just gaining momentum and may face opposition due the current world's economic slowdown, prevailing sovereign debts, or just because people may refuse it.

Since in some areas 'Degrowthers' are breaking fresh new ground, there are important areas for further research. Considerable knowledge on sSC and increasingly on degrowth exists. What is lacking is political action, addressing socioeconomic obstacles. More than drawing scenarios, research can widen the possibilities with well-grounded proposals and should inform policymakers and public.

While normally equity is not considered decisively in public practice (even though, mostly in political discourse), and because neoclassical economics does not aim to determine if one distribution of resources between people is better than another, a moral criterion has to be used in political choices. As a result, if sustainability requires intra/intergenerational redistribution, there is a need for a strong moral discourse and a boost in the democratic process. Economists are important to feed the democratic debate, based on the trade-offs between options, instead of using merely cost-benefit analyses.

It was confirmed the existence of a socio-technical lock-in, not only from institutions and society in general, but specifically from mainstream thinking that dominates economic rational. It is also recognized that the social aspects of sustainable consumption need be deeper researched, in particular how to scale up micro social innovations, leading to substantial changes in the system (regime shift).

One critical issue is whether degrowth can be economically feasible, since a change in consumption and production patterns may be unstable and lead to a spiral of recession. Some studies show that a degrowth option is possible. Nonetheless, more research is required, supported on well-grounded theoretical and empirical models.

In order to effectively fight climate change, an unprecedented degrowth will have to occur, which may entail a vast restructuring of the State and social organization, including a reconfiguration of work. The word 'degrowth' may shock and frighten many people at first. However, such worries might diminish with better public information. Given the path of globalization and the neoliberal collective imaginary, it might be naïve to consider that degrowth will have an easy path. For example, although some people would not mind downshifting (voluntary simplicity), the large majority might not volunteer for such a change.

Although the degrowth vision of prosperity entails some material sacrifice, potentially scaring politicians and the general public, it seems to be a feasible way to disrupt consumption and production patterns, enabling a truly sustainable development. Until now, Ecological economics could only partially formulate the necessary conditions. Yet its role is crucial to promoting significant concepts that are worthwhile, not only by their intellectual framing, but also by their capacity to promote social changes. Assuming the unsustainability of the current paradigm, Ecological Economics is the front for finding solutions.

The ultimate challenge will be to enable the acceptance of degrowth and pursuing it as an economic strategy. While some authors emphasise the policy change, they forget to focus on the political side and are silent on the social and political actors or the processes that will bring a society without growth.

"You cannot solve the problem with the same thinking that created the problem"

Albert Einstein.

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ANNEX A - FROM THE KEYNESIAN REVOLUTION TO THE NEW NEOCLASSICAL SYNTHESIS

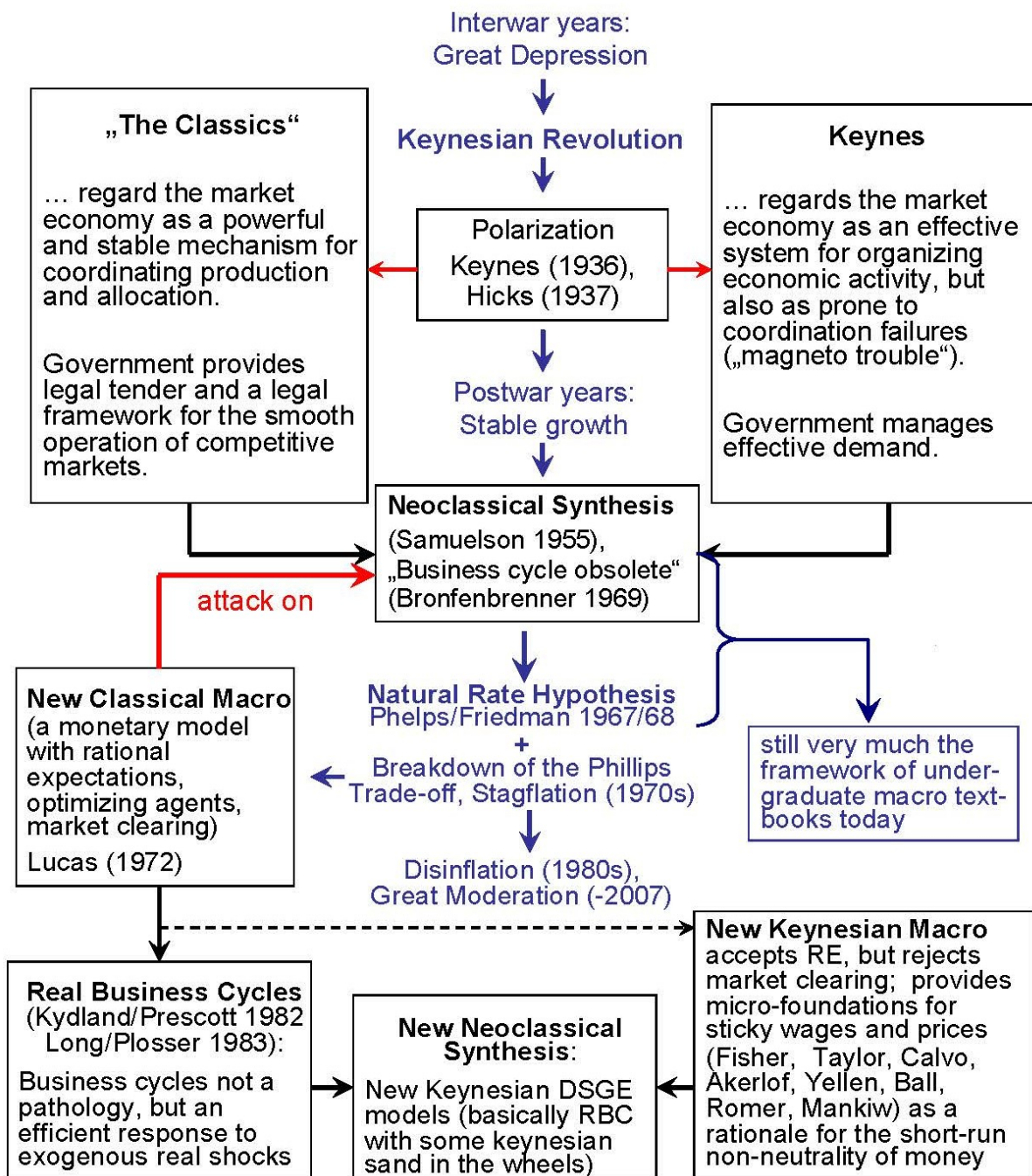


Figure A.12: From the Keynesian Revolution to the New Neoclassical Synthesis

Source: (Landmann, 2014)

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ANNEX B – MEASURES OF WELL-BEING, ECONOMIC WELFARE, AND SUSTAINABILITY: A BRIEF COMPARISON

	Utilitarianism	(Basic) Human Needs	Functionings and Capabilities
Objective Approaches	Gross Domestic Product Consumption Expenditures	Hierarchical Needs Fulfillment of Hierarchical Needs Index (Clarke 2005) Non-hierarchical Needs (Weighted) Index of Social Progress (Estes 1984; Estes 1997) Calvert-Henderson Quality-of-Life Indicators	Human Development Index (UNDP) Physical Quality-of-Life Index (Morris 1979)
Subjective Approaches	Happiness / Life Satisfaction World Happiness Database Global Values Survey Eurobarometer	Human Needs Assessment (Max-Neef 1992)	
Combined Approaches	Happy Life Expectancy (Veenhoven 1996) Happy Planet Index (New Economics Foundation)		

Table A.1 – Beyond GDP - Measures of well-Being

Source: Bleys, Brent (2012), “Beyond GDP: Classifying Alternative Measures for Progress”, *Social Indicators Research*, (online), 109 (3), pp. 355-376. Available at:

www.oecd.org/site/progresskorea/43596167.pdf

	Economic Income	Sustainable Income (Hicks 1939)	Psychic Income (Fisher 1906)
Non-Environmentally Adjusted Measures	Gross Domestic Product (GDP)	Net Domestic Product (NDP)	Measure of Economic Welfare (MEW) (Nordhaus and Tobin 1972)
Environmentally Adjusted Measures		Environmentally Adjusted Net Domestic Product (EDP) Sustainable National Income (SNI) (Huetting 1995)	Economic Aspects of Welfare (EAW) (Zolotas 1981) Index of Sustainable Economic Welfare (ISEW) (Daly and Cobb 1989) Genuine Progress Indicator (GPI) (Cobb et al. 1995b) Measure of Domestic Progress (MDP) (New Economics Foundation)
Non-Income	Index of Economic Well-Being (Centre for the Study of Living Standards)		

Table A.2 – Beyond GDP - Measures of economic welfare

Source: Bleys, Brent (2012), “Beyond GDP: Classifying Alternative Measures for Progress”, *Social Indicators Research*, (online), 109 (3), pp. 355-376. Available at:

www.oecd.org/site/progresskorea/43596167.pdf

Three-Pillar Approach	Ecological Approach	Capital Approach
Sustainable Development Indicators (a) UN Commission for Sustainable Development (b) Eurostat (c) Federal Planning Bureau Belgium	Ecological Footprint (Wackernagel and Rees 1996) Environmental Sustainability Index (Universities of Columbia and Yale)	Constant Capital Stocks Genuine Savings (World Bank) Critical Natural Capital CRITINC (Keele University)

Table A.3 – Beyond GDP - Measures of sustainability

Source: Bleys, Brent (2012), “Beyond GDP: Classifying Alternative Measures for Progress”, *Social Indicators Research*, (online), 109 (3), pp. 355-376. Available at:

www.oecd.org/site/progresskorea/43596167.pdf

ANNEX C – CHANGES IN THE COMPOSITION OF GLOBAL MATERIAL EXTRACTION

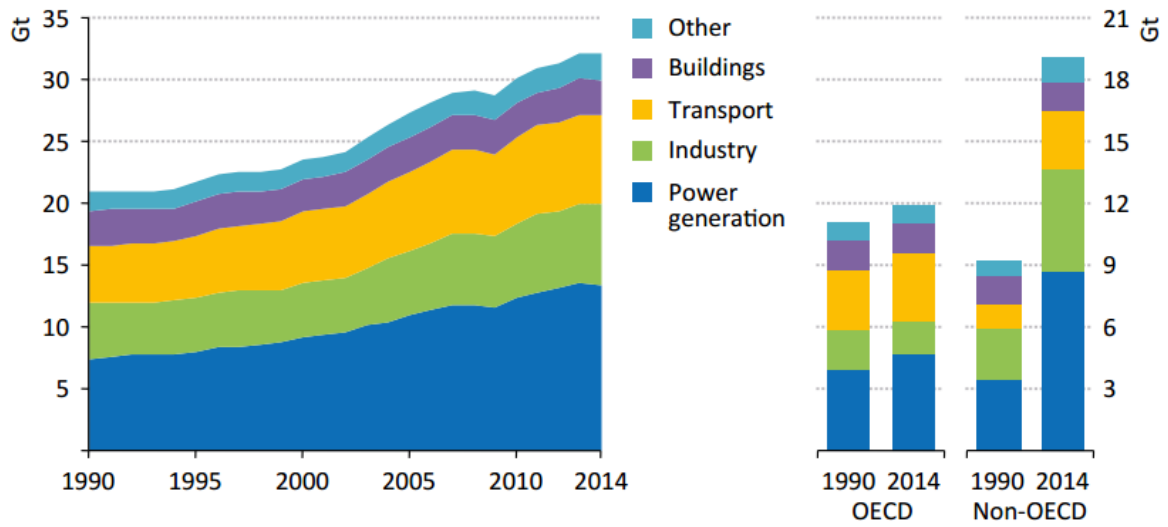
DOMESTIC RESOURCE USE⁷⁵ (DMC)	Year 1900	Year 1925	Year 1950	Year 1975	Year 2005
Biomass [mio t]	5,272	6,942	8,193	12,402	19,061
Primary crops	21.4%	23.3%	24.1%	29.4%	35.4%
Crop residues	16.1%	15.6%	17.9%	21.0%	23.1%
Roughage	47.1%	44.9%	40.6%	36.4%	30.2%
Wood	15.4%	16.2%	17.4%	13.2%	11.3%
Fossil energy carriers [mio t]	968	1,787	2,754	7,171	11,846
Coal (incl. peat)	97.5%	90.9%	75.5%	48.6%	48.6%
Petroleum	1.9%	7.5%	18.5%	38.2%	32.8%
Natural gas	0.6%	1.6%	6.0%	13.2%	18.6%
Metal ores (metal content only) [mio t]	51	87	149	552	961
Iron	95.1%	92.0%	89.2%	86.6%	85.0%
Copper	1.0%	1.8%	1.6%	1.2%	1.6%
Alumina	0.1%	0.6%	2.0%	4.7%	6.6%
All other metal ores	3.8%	5.6%	7.2%	7.5%	6.8%
Tailings (metal ores) [mio t]	142	330	538	1681	3521
Industrial minerals [mio t]	17	57	125	655	1154
Construction minerals (cm) [mio t]	667	1,269	2,389	8,445	22,931
Cement-related cm	15.2%	32.3%	40.4%	60.3%	74.3%
Asphalt-related cm	0.0%	0.9%	9.5%	14.5%	9.0%
All other cm	84.8%	66.8%	50.1%	25.2%	16.7%
Total DMC	[-]	[+47%]	[+35%]	[+118%]	[+92%]
	7,117	10,472	14,148	30,906	59,474
Biomass	74%	66%	58%	40%	32%
Fossil energy carriers	14%	17%	19%	23%	20%
Metals and Minerals	12%	17%	23%	37%	48%

Table A.4 - Changes in the composition of global material extraction

Source: (Krausmann, et al., 2009)

⁷⁵ According to standard MFA methods, being DE the domestic extraction of resources, DMC is defined as follows: DMC=DE+imports–exports. On the global level, trade equals out, and thus DE=DMC.

ANNEX D – GLOBAL ENERGY-RELATED CO2 EMISSIONS BY SECTOR AND REGION



Notes: "Other" includes agriculture, non-energy use (except petrochemical feedstock), oil and gas extraction and energy transformation. International bunkers are included in the transport sector at the global level but excluded from the regional data.

Figure A.13 - Global energy-related CO2 emissions by sector and region (1990-2014)
 Source: IEA (2015), Energy and Climate Change, International Energy Agency, (online), Paris.

Available at:

www.iea.org/publications/freepublications/publication/WEO2015SpecialReportonEnergyandClimateChange.pdf

ANNEX E - ECONOMY-ENVIRONMENT INTERDEPENDENCE SCHEME

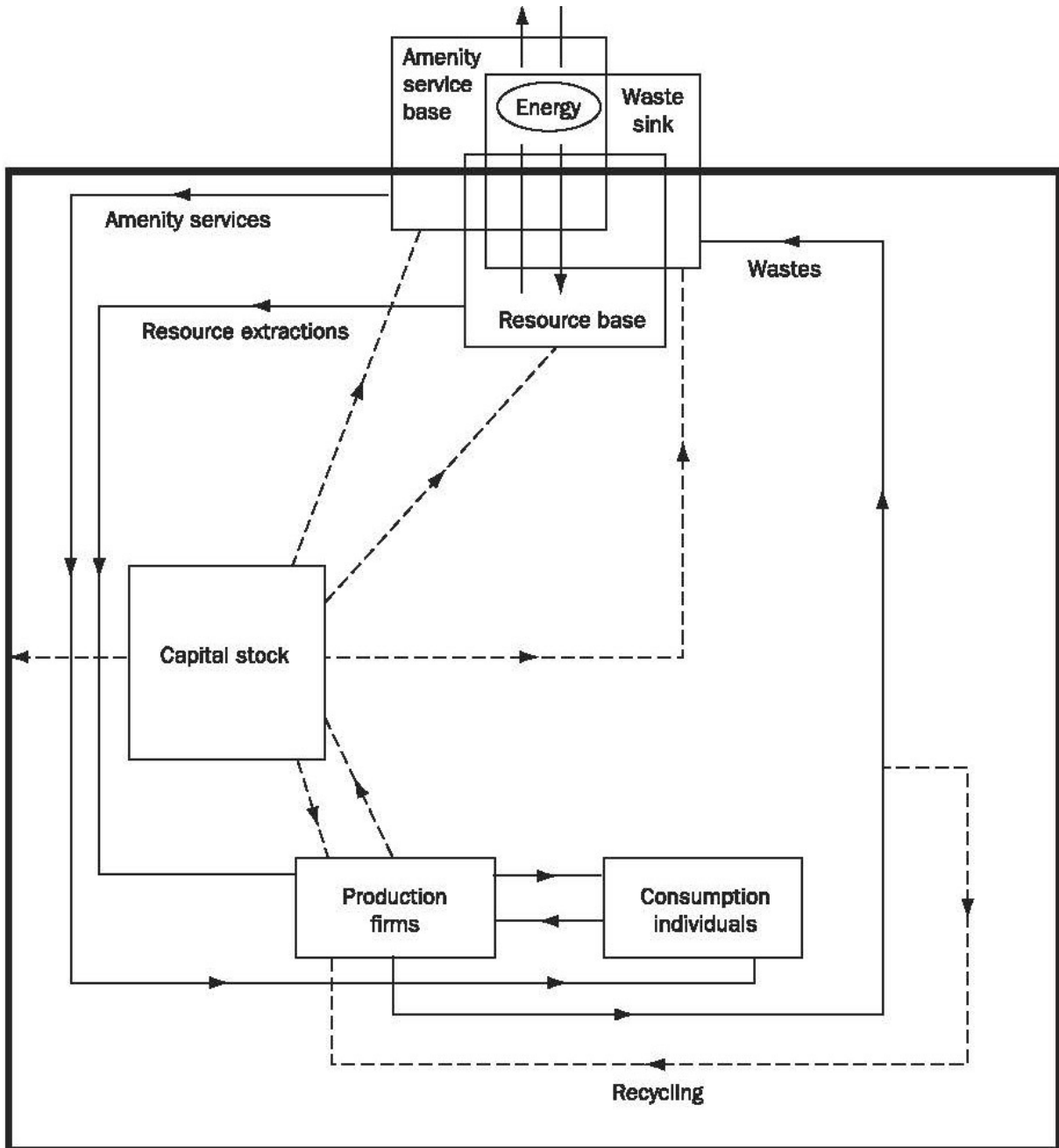


Figure A.14 - Economic activity in the natural environment
Source: (Perman, et al., 2011)

ANNEX F - TOOLS, METHODS, AND INDICES FOR SUSTAINABLE DEVELOPMENT DECISION-MAKING

Tool/Method Name	Description
Backcasting	A way of planning in which a successful outcome is imagined in the future, followed by the question: “what do we need to do today to reach that successful outcome?” (The Natural Step).
Carbon Footprinting	Calculating the total amount of greenhouse gases that are emitted into the atmosphere each year by a person, family, building, organization, or company (USEPA).
Ecological Footprinting	Calculating how much area of biologically productive land and water an individual, population or activity requires to produce all the resources it consumes and to absorb the waste it generates, using prevailing technology and resource management practices (Global Footprint Network, 2011).
Lean Manufacturing	The process of analysing the flow of information and materials in a manufacturing environment and continuously improving the process to achieve enhanced value for the customer. Lean is a systematic approach to identifying and eliminating waste (non–value-added activities) through continuous improvement by flowing the product at the pull of the customer (Wisconsin Manufacturing Extension Partnership).
Life Cycle Analysis/Assessment	A technique to assess the environmental aspects and potential impacts associated with a product, process, or service, by: compiling an inventory of relevant energy and material inputs and environmental releases, evaluating the potential environmental impacts associated with identified inputs and releases, and interpreting the results to help you make a more informed decision (USEPA, 2012).
Water Footprinting	Calculating the total volume of freshwater used to produce the goods and services consumed by the individual or community or produced by a business. Water use is measured in terms of water volumes consumed (evaporated or incorporated into a product) and/or polluted per unit of time (Hoekstra, 2011).
International Standards and Guidelines	Description
Global Sullivan Principles	Principles for company endorsement which shows support for universal human rights, equal opportunity for employees at all levels of the company, employees’ voluntary freedom of association, compensation that allows employees to meet at least their basic needs and provide the opportunity to improve their skill and capability, a safe and healthy workplace, protection of human health and the environment, sustainable development, fair competition, and civil engagement (Leon H. Sullivan Foundation).
Global Reporting Initiative	Indicators are organized into categories: Economic, Environmental and Social. The Social category is broken down further by Labour, Human Rights, Society and Product Responsibility subcategories. Principles for defining report content include materiality, stakeholder inclusiveness, sustainability context, and completeness. Principles for ensuring report quality include balance, comparability, accuracy, timelines, clarity, and reliability (Global Reporting Initiative).
AA1000 Guidelines	In addition to financial accountability, the AA1000 standard includes the principles of (1) inclusivity (the requirement to reflect the needs and concerns of all stakeholders in all stages of the social and ethical accounting, auditing, and reporting process), (2) completeness, materiality, regularity and timeliness,

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	(3) quality assurance, and (4) embeddedness and continuous improvement (Accountability).
ISO 14000 Series, 9000 Series, 26000, and Other Guidelines	See ISO (International Organization for Standardization)
for Multinational Enterprises	Recommendations addressed by governments to multinational enterprises operating in or from adhering countries. They provide voluntary principles and standards for responsible business conduct in areas such as employment and industrial relations, human rights, environment, information disclosure, combating bribery, consumer interests, science and technology, competition, and taxation (OECD, 2011).
Global Compact	Consists of 10 principles: businesses should (1) support and respect the protection of internationally proclaimed human rights (2) make sure that they are not complicit in human rights abuses, (3) uphold the freedom of association and the effective recognition of the right to collective bargaining, (4) eliminate all forms of forced and compulsory labour, (5) abolish child labour, (6) eliminate discrimination in respect of employment and occupation, (7) support a precautionary approach to environmental challenges, (8) undertake initiatives to promote greater environmental responsibility, (9) encourage the development and diffusion of environmentally friendly technologies, and (10) work against corruption in all its forms, including extortion and bribery (United Nations).
Responsible Care Global Charter	Chemical industry's global initiative that drives continuous improvement in health, safety and environmental performance, together with open and transparent communication with stakeholders. Responsible Care embraces the development and application of sustainable chemistry (International Council of Chemical Associations, 2013).
World Business Council for Sustainable Development Guidelines	The WBCSD Framework has three components: the Measuring Impact Framework Methodology, Beyond the Bottom Line (company case studies), and an Excel User Guide that helps companies carry out an assessment. The Measuring Impact Framework consists of four steps: step 1 is to set boundaries, step 2 is to measure direct and indirect impacts, step 3 is to assess contribution to development, and step 4 is to prioritize management response. The business activities are grouped into four clusters: governance and sustainability, assets, people, and financial flows (WBCSD)
Sustainability Integrated Guidelines for Management (SIGMA)	Consist of two core elements: (1) the holistic management of five different types of capital that reflect an organization's overall impact and wealth (natural capital, social capital, human capital, manufactured capital, and financial capital), and (2) the exercise of accountability by being transparent and responsive to stakeholders and complying with relevant rules and standards (British Standards Institution, Forum for the Future, and Accountability, 200 (Stahel, 1986) (Stahel, 1986)6).
SA8000	SA8000 compliance requires adopting policies and procedures that protect the basic human rights of workers. The management system supports sustainable implementation of the elements of SA8000: child labor, forced and compulsory labour, health and safety, freedom of association and right to collective bargaining, discrimination, disciplinary practices, working hours, and remuneration (Social Accountability International, 2012).
Frameworks, Concepts and Models	Description
Cleaner Production	The continuous application of an integrated preventative environmental strategy to processes, products and services to increase efficiency and reduce risks to humans and the environment (UNEP, 1991).

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Cradle-to-Cradle	Concept that “waste” equals “food” in both biological and technical material flows (McDonough & Braungart, 2002).
Circular Economy	A circular economy seeks to rebuild capital, whether this is financial, manufactured, human, social or natural (Ellen MacArthur Foundation).
Blue Economy	The blue economy is where the best for health and the environment is cheapest and the necessities for life are free thanks to a local system of production and consumption that works with what you have (Pauli, 2013).
Functional Economy	An economy that optimizes the use (or function) of goods and services and thus the management of existing wealth (goods, knowledge, and nature). The economic objective of the functional economy is to create the highest possible use value for the longest possible time while consuming as few material resources and energy as possible. This functional economy is therefore considerably more sustainable, or dematerialized, than the present economy, which is focused on production and related material flows as its principal means to create wealth (Stahel, 1986).
Green Economy	The green economy results in improved human well-being and social equity, while significantly reducing environmental risks and ecological scarcities. In its simplest expression, a green economy can be thought of as one that is low carbon, resource efficient and socially inclusive (UNEP).
Sustainable Assessment Model (SAM)	Uses 22 performance indicators to measure full lifecycle, environmental, economic and resource usage impacts of a project; the impacts are then monetized and can be summed into a single measure called the Sustainability Assessment Model Indicator (SAMi) (Bebbington, 2006).
Sustainability Capital	Capital assets are divided into four categories: produced goods or human-made capital (KM), human knowledge and skills or human capital (KH), natural capital (KN), and social capital (KS) (Pearce, 1998).
The Framework for Strategic Sustainable Development	A generic five level framework applied to the “society in the biosphere”: (1) Systems Level: Understand, describe and analyse the dynamic relationships between the ecological and social systems, (2) Success Level: In a sustainable society, nature is not subject to systematically increasing concentrations of substances extracted from the Earth's crust, and concentrations of substances produced by society, degradation by physical means; people are not subject to conditions that systematically undermine their capacity to meet their needs, (3) Strategic Guidelines Level: Guidelines for the process of moving global society strategically towards meeting basic principles of socio-ecological sustainability. The practice of backcasting is important to strategic planning, (4) Actions Level: All actions that will effectively help move the global socio-ecological system towards success by conforming to overall strategic principles (includes concrete actions, capacity-building efforts, etc.), and (5) Tools Level: Techniques, measurements, monitoring, management approaches, etc. relevant to assist in the global movement towards conformance with basic socio-ecological principles (The Natural Step).
Indices*	Description
Better Life Index	Allows one to choose the indicators that are most important to them and then rank which location is better suited to their needs. There are 11 topics and indicators within each: housing, income, jobs, community, education, environment, governance, health, life satisfaction, safety, and work-life balance (OECD).
Dow Jones Sustainability Index	The Dow Jones Sustainability Index family tracks the stock performance of companies in terms of economic, environmental and social criteria. The indices serve as benchmarks for investors who integrate sustainability considerations

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	into their portfolios, and provide an engagement platform for companies who want to adopt sustainable best practices (Dow Jones).
Environmental Performance Index	Ranks countries on 22 performance indicators spanning 10 policy categories: environmental burden of disease, water, air pollution effects on human health, air pollution effects on the ecosystem, water resources, biodiversity and habitat, forestry, fisheries, agriculture and climate change. The precursor to EPI is ESI, The Environmental Sustainability Index. ESI is a composite index tracking socio-economic, environmental, and institutional indicators that characterize and influence environmental sustainability at the national scale (YCELP & CIESIN, 2012).
FTSE4Good	A tool for responsible investors to identify and invest in companies that meet globally recognized corporate responsibility standards. For inclusion, eligible companies must meet criteria requirements in five areas: (1) working towards environmental sustainability, (2) upholding and supporting universal human rights, (3) ensuring good supply chain labour standards, (4) countering bribery, and (5) mitigating and adapting to climate change (FTSE, 2010).
Gross National Happiness Index	Uses periodic surveys that account for demographical information. Happiness itself is not seen as a one-dimensional adjective, but rather a multidimensional state that covers nine domains: psychological wellbeing, time use, community vitality, cultural diversity, ecological resilience, living standard, health, education, and good governance (Ura, Alkire, Zangmo, & Wangdi, 2012).
Human Development Index	Composite index that measures a country's progress in health, knowledge and income (UNDP, 2013).
Genuine Progress Indicator/Index of Sustainable Economic Welfare	The Index of Sustainable Economic Welfare (ISEW) is an analysis designed by Daly and Cobb that adjusts GDP to reflect a broader set of social and environmental criteria. ISEW was later revised and renamed the Genuine Progress Indicator (GPI). In GPI, all values are expressible in monetary units; in general, additions are made for volunteer work, non-paid household work, services of consumer durables, services of highways and streets, net capital investment, net foreign lending and borrowing, and income distribution adjustment, while subtractions are made for crime, family breakdown, automobile accidents, cost of consumer durables, cost of household pollution abatement, loss of leisure time, underemployment, commuting, water pollution, air pollution, noise pollution, loss of wetlands, loss of farmland, resource depletion, long-term environmental damage, ozone depletion, and loss of old-growth forests (Wilson & Tyedmers, 2013). The GPI is the total sum of all positive and negative values expressed in monetary units. The Sustainable Net Benefit Index (SNBI) The SNBI is very similar to the ISEW and GPI, but the items are sorted into "uncancelled benefit" and "uncancelled cost" accounts; the SNBI is obtained by subtracting the total of the uncancelled cost account from the uncancelled benefit account (Lawn, 2005).
Sustainable Society Index	The Sustainable Society Index (SSI) is a measure of sustainability at the national level. The index include seight categories (basic needs, health, personal and social development, nature and environment, natural resources, climate and energy, transition, economy) and twenty-one indicators (Sustainable Society Foundation).

Table A.5 - Tools, Methods, and indices for sustainable development decision-making.

Sauce: (Waite, 2013)

*For more indices, see An overview of sustainability assessment methodologies by Singh et al. in Ecological Indicators 15 (2012) 281–299, available at www.elcolegiodehidalgo.edu.mx/biblioteca/

ANNEX G - SCP DOMAINS, PROPOSED INDICATORS, AND RELATED TARGETS UNDER THE SDGS

DOMAIN	INDICATORS	RELATED TARGETS
Scale of resource use	<ul style="list-style-type: none"> Domestic Material Consumption (DMC) – absolute and per-capita values Material footprint (MF) – absolute and per-capita values 	<ul style="list-style-type: none"> Target 12.2
Decoupling economic activity from resource use and environmental impact	<ul style="list-style-type: none"> National material efficiency –material productivity (GDP per unit of material use). Production side: Material use measured through Domestic Material Consumption (DMC) Consumption side: material use measured through Material footprint (MF) National energy efficiency – Energy 	<ul style="list-style-type: none"> Targets 8.4, 12.2 Targets 7.3, 8.4, 12.2
Impacts	<ul style="list-style-type: none"> Contaminants in air, water, and soil from industrial sources, agriculture, transport and wastewater and waste treatment plants. Number of persons killed or injured by a natural and technological disaster and economic losses in USD. Ocean health, Ocean Health Index 	<ul style="list-style-type: none"> Targets 2.4, 3.9, 6.3, 12.4 Targets 1.5, 3.9, 11.5, 12.4 Targets 14.7, 12.b
Technology and lifestyles	<ul style="list-style-type: none"> Sectoral material and energy efficiency Market share of goods and services certified by independently verified sustainability labelling schemes 	<ul style="list-style-type: none"> Targets 7.3, 8.4, 12.2 Targets 4.7, 12.6, 12.8
Financing and investing to transform the economy to SCP	<ul style="list-style-type: none"> Amount of R&D spending on environmentally sound technologies Amount of fossil fuel subsidies, per unit of GDP (production and consumption), and as proportion of total national expenditure on fossil fuels 	<ul style="list-style-type: none"> Targets 12.a (impact on 12.1, 12.2, 8.4) Target 12.c (impact on 12.2, 7.2)
Policy support for SCP	<ul style="list-style-type: none"> Number of countries with SCP National Actions Plans or SCP mainstreamed as a priority into national policies, poverty reduction strategies and sustainable development strategies. Number of countries with inter-ministerial coordination and multi-stakeholder mechanisms supporting the shift to SCP. 	<ul style="list-style-type: none"> Targets, 12.1, 12.7, 11.b, 17.16 (impact on 2.4, 4.7, 8.4, 8.9, 9.a, 12.2, 12.3, 12.8, 12.a, 12.b) Target 12.1, 12.4, 12.6

Table A.6 - SCP domains, proposed indicators, and related targets under the SDGs
Source: (UNEP, 2015)

ANNEX H - GLOBAL INTERRELATION BETWEEN RESOURCE USE AND INCOME

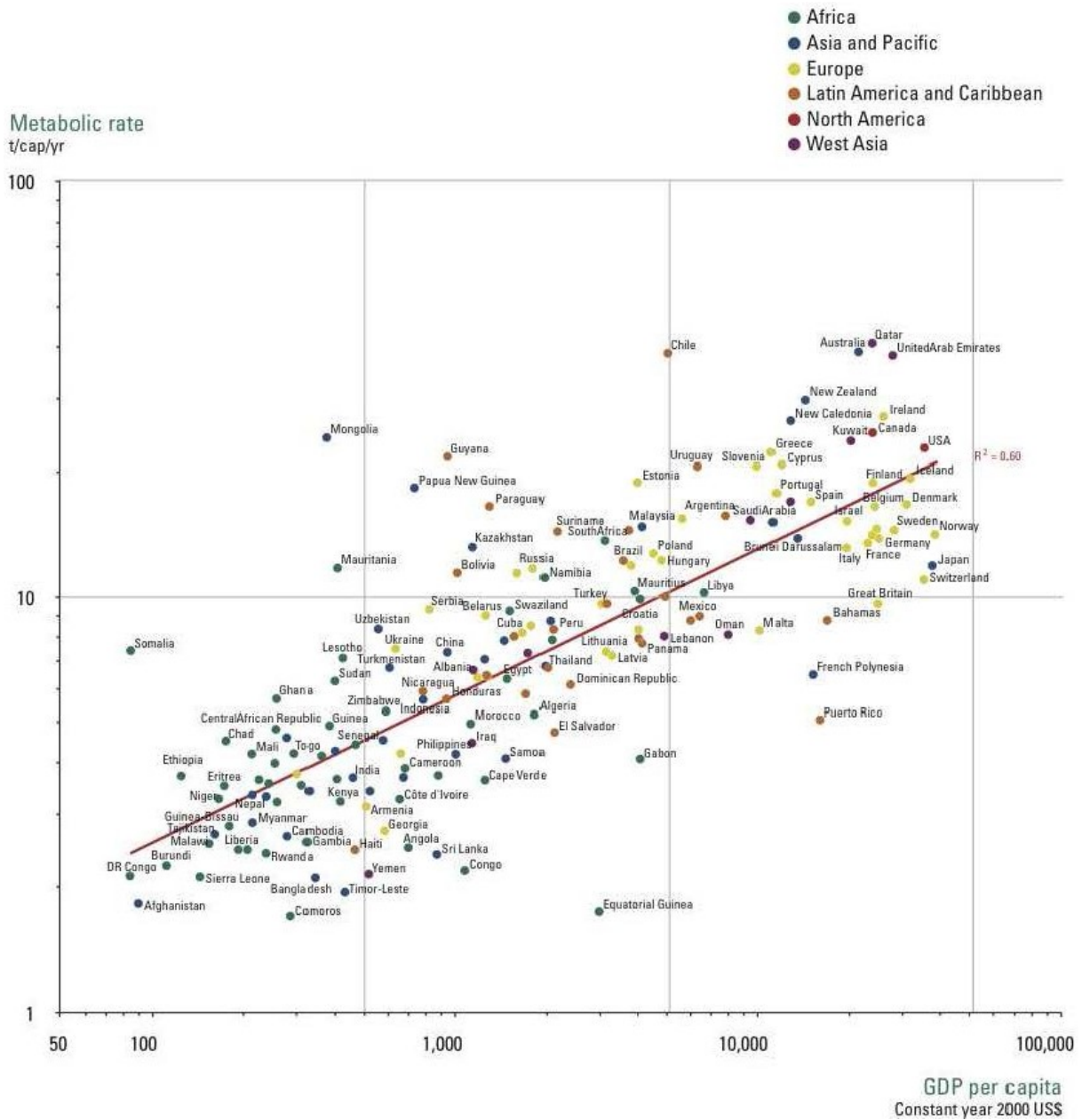


Figure A.15 – Global Interrelation between Resource Use and Income – 175 Countries, Year 2000
 Source: (UNEP, 2011, p. 10)