Green economy: Why optimism should be coupled with the skepticism of reason[1]

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Introduction

AMID THE many systemic crises affecting modern society, the "Green Economy" initiative proposes a specific alternative: to make the economy dynamic by expanding sectors with low environmental impact. The definition of Green Economy proposed by UNEP[2] is that of an economic system dominated by investment, production, marketing, distribution and consumption, so as to respect the limits of ecosystems, but also as a system which produces goods and services that improve the environment, i.e., that have a positive environmental impact. In this sense, the environment is no longer seen as a constraint to the economy, but rather as a force that creates new economic opportunities. According to this logic, income and employment growth is driven by investments that reduce carbon emissions and pollution, enhance energy and resource efficiency, and prevent the loss of biodiversity and ecosystem services. A major challenge is to reconcile the competing aspirations of economic development of rich and poor countries in a world economy that is facing increasing climate change, energy insecurity and degradation of ecosystems. The green economy initiative aims to address this challenge by reducing the perverse correlation between economic growth and the depletion of environmental assets, so as to enable both rich and poor countries to continue to grow and develop. It is the repetition of old ideas in a new guise.

In the 1990s, an empirical study gave new status to economic growth by considering that it would be beneficial to the environment from a certain level of wealth as measured by per capita income. The study examined the relationship between the behavior of per capita income and four types of indicators of local environmental deterioration. According to the authors (Grossman and Krueger, 1995), there was a strong upward trend in pollution levels during the initial period of economic growth, but which would gradually decrease as countries became richer. In short, it is the idea that initial growth degrades

the environment, but continued growth solves environmental problems. This model became known as the Environmental Kuznets Curve (EKC).[3] Although based on the argument that rich countries should continue to grow to reduce the environmental impact, from the perspective of poor or emerging countries the green economy initiative rejects the idea that environmental losses are a necessary cost of economic development (Young, 2011).

Destroy the environment to grow?

According to the logic of the EKC, in poor and/or emerging countries, public policy makers have to decide whether to increase the level of employment and income or decrease economic growth in pursuit of environmental preservation. To counter this hypothesis, Young (2011) built scenarios using the Brazilian 2005 input-output matrix to compare different possibilities of economic growth by using the employment and wage generation as a measure of economic growth. The article sought to answer which sector generates greater employment and wage growth: the expansion of the primary sector, which is intensive in natural resources, or of the manufactured goods and services sectors.

To be comparable, all these scenarios should be based on similar increases in final demand through an exogenous increase in exports. The economy was divided into three major sectors (commodities, manufactured goods, and services), and the overall increase in final demand (R$ 40 billion) was distributed according to the following scenarios: (1) the increase in final demand occurred only in primary activities; (2) the increase in final demand occurred only in manufactured goods; and (3) the increase in final demand was distributed between the service, utility and construction sectors (Young, 2011).

The increase in scenario 3 showed a good performance of employment (the second largest number of jobs created) and the highest increase in total wage. This scenario would be the one closest to the "greening" of the economy, as it expands civil construction (sanitation, for example) and the service sector, thus enabling the "dematerialization" of growth based on knowledge, culture and technology (Young, 2011). The scenarios that showed the most consistent results for improving economic activity measured by employment and wage creation were precisely those with less dependence on the consumption of natural resources and lower levels of degradation. Therefore, there would be no reason to believe that, as predicted by the "Environmental Kuznets Curve", the decline in environmental quality is a necessary trajectory to increase economic output up to a certain income level: scenarios with more pollution and resource depletion would lead to reduced increase in employment and wages as compared to "green" growth scenarios.

The analysis of Young (2011) is undoubtedly not only attractive but also logical. More income and employment is generated in the service sector – which are at the top of the food chain of modern society – as well as in the cleaning, construction, banking, medicine, research, aviation and pharmaceutical indus-

tries, all of which are labor and brain-intensive activities. His point is that the proposition that to have environmental quality we must sacrifice employment is misleading and has never been proven empirically in a systematic way. Hence the importance of his work, as this proposition is probably the major obstacle standing in the way of a sound environmental policy.

The analysis is logical, since the possible uses or functions of the environment are scarce goods which require the use of labor factors for their restoration, preservation and substitution. In other words, labor must be used to maintain scarce environmental functions. In view of a technology based on fossil resources as a rule, it takes more time (working hours) for achieving a certain goal without degrading the environment than it would if degradation was permitted. That is, the environmental problem can be construed as a process that involves the steady substitution of time, or working hours, through environmental depletion (Hueting, 1996). If environmental conservation was to be achieved at the expense of employment, then "clean" production and consumption should require less time and would be cheaper than "dirty" production and consumption. Therefore, there would be no environmental problem! When, in fact, there is an environmental problem precisely because clean production creates structurally more employment – and therefore is more expensive - than dirty production. This higher cost is what drives us to produce and consume in a way that overloads the environment (ibid.).

Besides the attractiveness and logic of Young's (2011) analysis, the argument based on scenarios conveys an implicit idea of substitution, since economic sectors are compared, giving the impression that these sectors would be "replaceable" and that one could choose to grow "in services" instead of growing in resource-intensive activities (Daly, 2000). The difficulty of actually replacing the growth of a sector with the growth of another is therefore the first limit of the green economy. In purely monetary terms, it is even possible to achieve a quasi-substitution between the sectors that make up GDP, but it is a veil that conceals the real importance of the primary sector regardless of its nominal contribution to GDP.

The idea implicit in the Environmental Kuznets Curve that over time economic growth, by itself, leads to environmental improvement, i.e., to the reduction of the environmental impact, finds no evidence for global environmental problems with possible irreversible consequences. Although environmental improvements have proven to be true for a small group of developed countries and for some local and reversible environmental problems, the same cannot be said for global problems like climate change and permanent loss of biodiversity (Stern, 2003, Stern et al., 1996). Even if there is nothing deterministic about the development trajectory of each country that causes it to be necessarily dirty, there are serious limits to growing without increasing the extraction of energy and material resources and waste generation, particularly CO_2, in absolute

terms. Therefore, the second limit of the green economy lies in the difficulty for the global economy to continue growing without transcending the limits of the global ecosystem.

The money metric trap

Reducing both ecological impacts and economic sectors to monetary values means neglecting the fact, for example, that energy is one of the most critical factors in the history of humanity. Besides, it masks the biophysical limits of the renewal of natural resources and waste assimilation, to the extent that they do not affect GDP significantly.

The notion that economic sectors would be "replaceable" and that one could choose to grow "in services" instead of in resource-intensive activities is sort of an illusion created by the money metric that compares each and every economic activity in terms of the price of the good or service produced. The argument of economists to show the relative insignificance of nature's resources and services is always based on their importance in relation to GDP. Since the oil industry represents only one percent of world economic output, or since energy represents only about five percent of production costs, or still, since energy costs as a percentage of GDP are declining, this resource is not important (Gowdy, 2006). Measuring the importance of agriculture by its percentage of GDP alone means belittling its importance and uniqueness in the economic system. Industry and service sectors rely on primary sector activities such as agriculture and mining. And more importantly, it is not possible to treat all the activities that make up GDP as replaceable (Daly, 2000), as implied in Young's (2011) simulation. In this reasoning there is no distinction between the types of goods and services that generate utility for consumers. This is like saying that since the human heart is only five percent of total body weight, we can live without it.

The same reasoning underlies the formulation of policies to evaluate the economics of climate change. The most commonly used type of model focuses on finding the most efficient result of how much should be emitted. The economically efficient result occurs when the costs of an additional reduction of emissions match the additional benefits of a slightly cooler climate (Nordhaus, 2001). The use of society's scarce resources to try to mitigate climate change is only justified if it results in a net increase in economic output. The theoretical justification is that it would be possible to improve the situation of some individuals without worsening the situation of others. In this approach, the only consequences of climate change that matter are those that affect GDP.

This is the main reason for the difficulty in considering propositions related to sustainability: not everything that matters can be measured with a unit value alone. And the trap in comparing everything in the money metric lies in the false impression of replaceability. Although money is interchangeable, neither the real goods and services produced nor natural resources and ecosystem services are easily replaceable.

Grow to improve the environment?

The Environmental Kuznets Curve has another facet that was not mentioned by Young (2011), which is the implicit proposition that production must increase for the environmental impact to decrease. It is the idea that environmental damages follow a predictable relationship with economic growth. However, the study that led to the hypothesis of the Environmental Kuznets curve has been harshly criticized (Stern, 2003, Stern et al., 1996), especially as regards the methodological insufficiency and poor predictability of results, when applied to the many countries left out of the original research, i.e., over 97 percent of the planet. In addition, global environmental problems were not included in this model.

Some empirical evidence for the UK seems to support the hypothesis that the peak in the use of natural resources would have occurred at the beginning of the last decade, before the economic downturn started in 2008, and that the trend now would point towards a decrease in resource extraction (Goodall, 2011). The evidence presented is for products like automobiles, cement and fertilizers, which are the most energy- and material-intensive of all. Goodall (2011) concludes that growth in mature economies can reduce environmental impacts, thus agreeing with the hypothesis of the Environmental Kuznets Curve.

Much more research, however, will be needed before we can conclude anything about causation. If GDP growth helps to reduce the use of resources, wouldn't recession help to increase it? That is not what the numbers have shown during the recent recession and during the recession of the 1980s and early 1990s. On the contrary, the use of resources experienced a sharper decline during those periods. Furthermore, while primary energy production peaked in 2001 according to the evidence raised by Goodall, emissions of greenhouse gases in the UK increased over the years of uninterrupted growth between 2000 and 2006 (Monbiot, 2011). And that does not take into account cross-border emissions (those produced by other countries during the manufacture of products consumed in the UK). Thus, while Goodall's analysis is valuable, the idea that environmental improvements are a spontaneous result of economic growth remains very probably false (Jackson, 2011).

Unfortunately, the Living Planet Report 2010 corroborates the increased pressure on the global ecosystem. The Ecological Footprint[4] of humanity has more than doubled since 1966. In 2007, the last year for which data are available, humanity consumed one and half planets to support its activities (WWF, 2010). A portion of the world population is now adopting lifestyles that require more natural resources and services than the planet is able to renew and absorb. And the major cause for the exacerbated ecological footprint is the accumulation of greenhouse gases in the atmosphere, to which the main contributors in the last forty years have been the countries that today have high per capita income.

Will efficiency increases save us?

In developed countries, the service plays a major role in the economy. Also, these countries are generally more efficient in the use of energy and materials than poor and emerging countries. Still, it is difficult to "dematerialize" the economy from a certain point. Technical progress results in less use of energy and materials to produce one unit of a certain good. However, it is not possible to achieve full production efficiency. According to thermodynamics, the amount of matter and energy incorporated into final goods is less than that contained in the resources used in their production. Once the thermodynamic limit of efficiency is achieved, production becomes fully dependent on the existence of the provider of additional resources, which is natural capital. The difficulty and cost of each technological advance increases as one gets closer to that limit (Georgescu-Roegen, 1976, 1979; Cechin & Veiga, 2010).

Technology enables goods and services to be produced with fewer resources and fewer emissions, and some evidence support this assumption. For example, the amount of primary energy required to produce each unit of global economic output has fallen more or less steadily over most of the last fifty years. Global "energy intensity" - the energy required per unit of global GDP – is now 33 percent less than it was in 1970 (IEA, 2010). Of course, this is true in the money metric and when resource extraction and the emission of pollutants is a ratio of GDP. That is, the relative dematerialization of GDP is mistaken for the absolute dematerialization of the economy.

Absolute dematerialization is anchored in the idea that a more efficient use of energy and materials could decouple economic growth from the use of such energy and materials in absolute terms. However, despite reductions in the intensity of use of energy and materials, economies continue to grow at speeds greater than the reduction in intensities. Efficiency gains brought by technologies have been negatively offset by increases in the scale of economic growth (Polimeni et al., 2008).

The decoupling of GDP from energy use is not so new. The Industrial Revolution was accompanied by continuous technological improvements, in which each new steam engine was more energy efficient than the previous ones. Increased efficiency in coal use led to higher (rather than lower) demand for coal. This improvement in fuel efficiency or the economical use of a fuel is what makes the industry what it is. That is what Stanley Jevons showed in 1865 in his book *The Coal Question*. The economical use of energy that leads to greater use of the energy source rather than to its conservation is known as Jevons or rebound effect.

Goodall's (2011) argument is that his evidence is consistent with a hypothesis much stronger than that of relative dematerialization. The UK may have started a process of absolute dematerialization in which the use of resources decreases even in periods of growth. However, when considering the increase

in carbon intensity in import partners such as China, this supposed absolute dematerialization disappears. There is not much to argue about the net impact of the global economy: global extraction of resources is increasing inexorably in almost all categories, as are carbon emissions (Jackson, 2011). That is exactly what has happened in the last decades. Although material intensity decreased 26 percent from 1980 to 2007, global GDP increased by 120 percent and the world population by 50 percent, resulting in an absolute increase of 62 percent in the global extraction of resources (Seri, 2010). This means that the overall environmental impact continues to grow in absolute terms.

Green economy: Beyond goodwill

Economic growth is conventionally understood as an increase in real GDP or, sometimes, in real per capita GDP, generally from one year to the next. While GDP is often interpreted as the size of an economy, at best it is only a measure of the value of the economy's output and not of the economy per se (Victor, 2010). In the past, GDP growth was associated with the increased use of materials and energy. Although in recent years there have been examples of relative decoupling, i.e., a decrease in the use of materials and energy per unit of GDP, the same has not occurred with the absolute amount of materials and energy used.

The extent of the demands placed by an economy in its environment is largely a matter of *scale*, *technology* and *composition* (Victor, 2010). A large economy will require a larger environmental space than a small economy if both produce and consume similar mixes of goods and services and employ comparable technologies. Changes in the composition of goods and services produced in an economy and changes in technologies for the production, distribution, use and disposal of materials and energy associated with these goods and services offer the possibility, in principle, of GDP growth even in a finite environment.

It is not uncommon for the composition and technology parameters to be reduced to intensity. To define "green" growth and distinguish it from several other growth features, Victor (2010) uses two parameters: scale and intensity. Scale refers to the size of the economy measured by GDP while the intensity of the environmental impact per unit of GDP is a function of composition and technology. The idea of green growth is to simultaneously reduce environmental impacts and have economic growth. In terms of scale and intensity, green growth requires that the rate of impact reduction per unit of GDP exceeds the growth rate of GDP, so that the environmental impact, which is determined by multiplying the two variables, can decrease over time. If the reduction rate of intensity is less than the growth rate of GDP, the environmental impact will increase. This can be considered "brown" growth. "Black" growth happens when economic growth occurs simultaneously with the increase in intensity, i.e., in the environmental impact per unit of GDP.

For the green economy initiative to go beyond goodwill, the environmen-

tal impact should be reduced at a rate higher than that of economic growth. This requires rapid and significant change in the composition of GDP (increase in the share of services) and in the efficient use of natural resources. Let us take the reduction of CO_2 emissions as an example. It is a matter of simple arithmetic that any future reduction of CO_2 emissions can be achieved through a variety of combinations of changes in GDP and in intensity. The higher the growth rate of GDP, the greater the reduction of intensity should be for achieving a given target of reduction in total emissions (Victor, 2010).

In fact, if the scale is increased using the same technologies, more natural resources will be needed, more waste disposal and pollution will be generated, and more land will be occupied and proportionally transformed. A point that should be obvious is that to mitigate global climate change, what is relevant is the total amount of emissions into the atmosphere and not necessarily emissions associated with each unit of output (intensity). The carbon intensity of economies, i.e., emissions per dollar of GDP, is not an appropriate indicator to analyze development patterns and their impact on climate change, for at least three reasons linked to the composition and technology.

First is the fact that new and improved technologies enable doing more with less; however, increased efficiency can result in a rebound effect, i.e., boost an increase in the scale of use of these resources, as discussed in the previous section (Polimeni et al. 2008). Second, if on the one hand an economy in which most of GDP is comprised of services may have low carbon intensity on the other it can have extremely high per capita emissions in absolute terms. That is, the level of materialization relating to GDP determines much of its carbon intensity, but not of per capita emissions. Increased efficiency in the use of resources and in the service sector share, however, cannot alone explain the lower carbon intensity of an economy. Therefore, the third reason why carbon intensity is not an appropriate indicator for analyzing development patterns and trends and their impact on climate change is that the economies are not isolated, world trade plays an important role in the behavior of industrial sectors and emissions patterns.

In most cases, mutual gains are achieved when there is trade, but emissions are attributed to the producing country. Therefore, it is possible to "outsource" emissions to other countries. If a rich economy replaces its own steel production with imports, the environmental impacts of steel production will also be "outsourced" to the country of origin of the imports. Changes such as this in the composition of world trade may give the impression that the growth of a rich country is good for the environment, but only if seen from the rich country's perspective and transboundary environmental impacts are ignored (Martinez-Alier, 2007).

Higher rates of economic growth require faster reductions in intensity to meet any desired reduction in emissions. Any failure to recognize this makes

ambitious emission reduction targets (IPCC, 2007) even more difficult, if not impossible to be met. Even so, as the process in rich countries has been based also on outsourcing polluting activities to poorer countries, one cannot just look at the low environmental impact of isolated nations and continue to ignore the transboundary effects.

Degrowth...

The combination of increased global production and consumption with environmental sustainability is highly uncertain and implausible. It would require technologies that are simultaneously sufficiently clean, do not deplete natural renewable resources, find substitutes for non-renewable resources, leave the land intact, allow enough space for the survival of plants and animals, and are cheaper in real terms than the technologies currently available, because if they are more expensive in real terms, growth would be reduced. Bringing all these six conditions together for the entire spectrum of human activities is almost inconceivable, which means that environmental sustainability most likely cannot be achieved through increased global production and consumption (Hueting, 2010).

...of GDP?

This is the most logical interpretation, in that it is likely to be understood as such by most economists, politicians and newspaper readers. The reason for that is because it sounds like the opposite of (economic) growth, which as commonly used by the media is synonymous with GDP growth. However, it makes no sense to prioritize GDP degrowth in the hope that the result will be environmentally positive, since nothing prevents GDP degrowth from being dirty. Such a focus ends up neglecting the important role of the composition of consumption and production, which can be considerably altered in response to strict environmental regulations (Van de Bergh, 2011). Worse, it would continue to assign great importance to the GDP indicator, while failing to realize that this is not a good indicator, even of wealth itself. GDP as an indicator of economic growth does not explain what grew, how it grew and who reaped the fruit of growth. Moreover, this indicator cannot be a good measure of wealth, because it is related to stocks, while GDP measures cash flows (Van de Bergh, 2010). This means that there can be growth with reduced wealth if this growth occurs, for example, at the expense of the destruction of entire forests or oil reserves that took millions of years to develop. Therefore, it is neither effective nor smart to insist on GDP degrowth.

... of physical size?

Large and expanding populations, growing urbanization and increased economic production have changed the face of the planet, often at the expense of humans and other species. However, the idea of degrowth, when it first emerged, did not refer to GDP, but to the size of the economic system vis-

à-vis the ecological system. It was Georgescu-Roegen who raised the issue in response to the idea of steady state.

Herman E. Daly, the most important ecological economist today, has rescued an idea that is dear to classical economists: the Steady State. It is understood as the state in which the amount of natural resources used would be sufficient only to maintain capital and population steady. Primary resources would only be used to qualitatively improve capital goods. A good analogy is that of a busy library in which the arrival of a new book would require discarding another of inferior quality. The library improves without increasing its size. Transposed to society, this logic means achieving development without material growth: the size of the economy is kept steady while qualitative improvements occur (Daly, 1973, 1997, Daly & Townsend, 1993).

The problem with this proposal is that it conveys the idea that it would be possible to maintain indefinitely the standards of life and comfort already achieved in wealthy countries, and gives the false impression that stopping growth and maintaining a certain standard of living, with steady capital and population, do not imply the dwindling of land-based sources of energy and materials, in addition to pressure on ecosystems. Georgescu-Roegen (1976, 1977, 1995) considered it a "myth of ecological salvation", and proposed that a process of degrowth should be initiated voluntarily in rich countries, rather than being a result of the scarcity of resources.

The materials and energy necessary for everyone to have access to health, education, leisure and a life worth living are limited. Regardless of how much technological innovation advances and the service sector grows, these limits will still exist. Therefore, an effective environmental policy should aim to reduce the use of energy, materials and ecological space. Since there is a huge gap between the share of the world's conspicuously consuming population and the share of the population with no access to the most basic goods and services, the issue under debate is much more "how?".

Countries that are highly developed and have a high per capita income should kick-start a transition towards reduced production and consumption, in order to allow ecological space for countries with low per capita income and human development index to transform their natural resource into a better life for their populations. Furthermore, sectors and activities of higher environmental impact besides those aimed at conspicuous consumption by the high per capita income share of the population would need to degrow in absolute terms, with GDP degrowth being treated as a possible consequence.

Conclusion

The green economy initiative carries with it the optimistic view that the economy can and should be driven by investments in clean sectors, activities and technologies, as opposed to the extraction of natural resources and polluting industries. However, there is no guarantee that increased efficiency in the use of resources will result in conservation thereof, and there are serious limits

to replacement between sectors of an economy in real terms. Therefore, one cannot be fooled by seemingly low carbon intensities in rich countries, since it is possible to achieve lower energy use and fewer emissions per unit of GDP while having high per capita emissions. Moreover, as the process has been based on the outsourcing of polluting activities to poorer countries, caution must be taken before decreeing the absolute dematerialization of a rich country, despite evidence that such country has achieved an absolute reduction in the extraction of natural resources. One of the biggest environmental disasters has been the willful ignorance of transboundary effects.

Can a society based on growth really undertake this dematerialization fast enough to prevent an ecological disaster? This is the kind of analysis that is missing to determine if the efforts of a green economy are actually leading to reduced use of resources and of carbon emissions in absolute terms. It is important to keep in mind that the growth of economic sectors of low environmental impact such as the service sector, or even those more directly linked to conservation, would only result in a green economy if the dirty production were not outsourced to other countries via international trade, and if the new sectors were replacing in real terms those of high environmental impact, at a speed greater than that of the growth of the economy as a whole, something that does not happen easily, given the interdependence between sectors.

Decreasing carbon emission activities in the world is a pressing need. And it is clear that reducing emissions to achieve the targets emphatically suggested by the international scientific community seems to be an impossible task with modest or no GDP growth, let alone with high growth rates. The optimistic view contained in the green economy initiative must be coupled with the skepticism of reason. It will be necessary to deepen the discussion on degrowth without ignoring the different situations of each country, and that within a country, besides the activities that need to/can be reduced, there are activities that need to grow further for advancing in what matters the most: human development.

Notes

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2 The theme "Green Economy" was adopted in 2009 by the UN General Assembly as one of the themes of the Rio+20 Conference.

3 Kuznets et al. (1955) introduced the hypothesis that the per capita GDP - income inequality ratio has the shape of an upside down "U" in the chart. There would be an initial phase in which income inequality would increase along with the increase in per capita GDP. From a certain level of per capita GDP on, further increases would reduce income inequality. It is the idea of "growing the pie" before sharing it.

4 Instrument that translates into global hectares (ha) the amount of land and water that would be needed to support consumption by a population.

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Abstract – The green economy initiative carries with it the optimistic view that the economy can and should be driven by investments in clean activities as opposed to the extraction of natural resources and polluting industries. However, there are limits to the emphasis that is often put on efficiency improvements and on the substitution between sectors of an economy. For the economy to be green, the reduction in environmental impact per unit of GDP should be higher than GDP growth over a period. Even though recent evidence shows that some countries have apparently overcome the peak in the use of materials and energy, global extraction of natural resources and CO_2 emissions has increased. A probable cause is that rich countries have outsourced polluting activities to poorer countries. It is time to bring the skepticism of reason to the debate and seriously discuss degrowth, not of GDP or of opportunities for human development, but of the global resource extraction and carbon emissions.

Keywords: Green economy, Environmental Kuznets Curve, Dematerialization, Degrowth.

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