

Louvain School of Management

GDP, Genuine Progress Index and CSR

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Foreword

The thesis you are about to read is the most important achievement of my academic journey for obtaining my master degree in Economics and Business management.

When selecting my Master, I have had many conversations and one in particular had drawn my attention. It was to complete my bachelor in economics with a master in management at Louvain school Management at the University of Louvain.

Having had the opportunity to accomplish my academic curriculum across two reputable universities was an immense privilege that has allowed me to learn different perspectives and developed the required economic critical mindset that have tremendously enriched my university degree. I have enjoyed every minute of my master both academically and personally.

My prime aim when selecting this Master thesis related to the growth indicators was to be able to understand the impacts of growth on the welfare of populations. The results, detailed in my thesis, are demonstrating that continuous growth may have some negative consequences, environmentally and socially.

When I started this project, I had little knowledge about the subject of Genuine Progress Indicators, but I knew what I wanted to attain. I wanted to learn and acquire strong macroeconomic knowledge in regards to those indicators.

I would like to thank Prof. Laurent Taskin for steering my research. His sustainable vision, inspiring comments and guidance have been enormously helpful in my work.

I am very grateful to Prof. Bertrand Hamaide for proposing me to explore the subject of Genuine Progress Indicator. I would also like to thank him for accompanying me throughout my thesis on a day-to-day basis. His dedication and availability were second to none. He has been a true coach and has motivated, challenged and energised me to deliver the best that I could. He has shared a tremendous amount of his knowledge with me that has allowed me to achieve what I was aiming at.

Last but not least, I would like to thank my family and friends for sharing with me their own visions and helping me to reach my goals.

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1. Introduction

The question of a possible negative relation between continuous growth and the welfare of a population queries the legitimacy of using the Gross Domestic Product as the sole or the quasi exclusive indicator of welfare. As Giannetti et al said (2014), *the misuse of Gross Domestic Product as a measure of public wellbeing results from the idea that economic growth is always synonymous with enhanced quality of life, disregarding the fact that the economy profits from natural, social, and human capital*. We can then solicit a possible alternative indicator which could measure the well-being of a population by considering economic, social and environmental elements. As Costanza et al said (2004), *the Genuine Progress Indicator (GPI), a version of the Index of Sustainable Economic Welfare (ISEW), is a significantly more comprehensive approach to assessing economic progress than conventional measures like gross domestic product (GDP)*.

More and more people are questioning present day indicators of economic well-being. As a matter of fact, there have been demonstrations on the streets to call for changes in governmental policies, along with creating a more sustainable world with long term visions (Laville, 2009). The questioning of GDP as the sole indicator of the well-being of the population may not be new however, voices continue to question worldwide the economic system and the very way of life. This thesis is therefore a reconsideration of GDP as a well-being measurement and a study of an alternative measure named, the Genuine Progress Indicator.

The thesis will be divided into three main parts. Firstly, there will be a study of GDP and GPI theoretically. Then, national and regional GDP and GPI computations will be undertaken and conclusions about their relations will be drawn. Finally, there will be a discussion regarding an adaptation of the results to the micro environment, considering the performance of firms, instead of the performance of nations.

As previously stated, the first part of the thesis is devoted to the theoretical study of the two indicators, GDP and one of the existing alternative indicators, namely, GPI. This part is important as it defines and explains what those indicators are specifically, how they are measured, their characteristics, as well as their problems and limitations. This allows the groundwork to be laid for the analytic part.

The analytical part represents the core of the work. In this section, national data of GDP and GPI will be studied, then displayed graphically and lastly compared so as to draw conclusions. This part is divided into five main sections, the introduction, the explanation of the chosen countries, the data analysis, followed by the results and comparison and finally, the conclusion. The analysis will be performed country by country. At the end of this section, a comparison between countries will be made to generate overall results. Based on those results, research questions will be discussed and answered.

The last part of the thesis will open the discussion to a deeper study of the existence of a positive relation between the level of sustainable performance of a state with the level of performance of its companies. Concretely, a transposition of the macro dynamics to the micro reality will be proposed considering that companies also have a role to play in the form of transition operated.

To conclude the thesis, it will first answer to the research question. Then, final results emerging from the second and third part will be summarized and detailed. Finally, two relevant recommendations will be developed in order to invite further improvements regarding the subject.

2. Theoretical part

This paper is a call for a better indicator to measure economic, environmental, social progress and the well-being of the World's population. As Costanza (2009) stated in his paper regarding the need for a better alternative to measure progress, the gross domestic product (GDP) was an indicator created in the past for the purpose of re-creating a strong economy which had been completely destroyed by the two World wars (1914 and 1940), and the tensions of a potential new global conflict in the late sixties. In the past, based on the activity's growth, the GDP was a signal that the world was getting better. At that time, economic development was a sign of social conflict reductions, job increases and higher personal incomes. However, the world in which is lived in today is different from the one discussed at the Bretton Woods Conference. The 21st century can be represented as a world that focuses on production and consumption, with continuous demographic growth and inequalities. This economic activity discussed is out of breath and is driving the world in the wrong direction. The emphasis on the over material expansion is at the expense of a true balanced and complete progress (Costanza, 2009). As Bley (2007) held, the Gross Domestic Product is used in the traditional neoclassical economy as a reliable measure of the national welfare. However, as the author also revealed in his paper and as will be discussed later, this indicator was never created for this purpose.

For numerous years and still today, the GDP has dominated the political debate with a strong presence on the globe. Countries, governments and institutions have developed their national policies driven by the GDP's formula. This indicator has separated society into two different kinds of function, the productive and non-productive ones. According to this theory and to Adam Smith, the wealth and the wellbeing of a country is only created by the sum of the productive work of all individuals. For the classical economists such as Smith, other types of services do not carry any intrinsic economic value. As Ricardo also said, the value of a good depends on how many hours of work a service requires. Accordingly, contemporary nations measure their wealth depending on the GDP's formula and requirements. There is no possibility to miss the importance of this indicator as the best known 'tool' to measure economic activity and its extreme power. (Fioramonti, 2013)

However, many have tried for a considerable period of time to point out the problems, the irrelevancies and the anomalies of the GDP (Fioramonti, 2013). In that continuity, this essay

will convey the inappropriate use of the GDP as an indicator of well-being and of a nation's welfare. Then, the benefits of a potentially better alternative called as the Index of Sustainable Economic Welfare (ISEW or GPI), will be discussed.

A. Gross Domestic Product

The GDP was created and developed in the United States, as well as in the United Kingdom respectively in the 1930's and 1940's. At that time, the two World Wars and the Great Depression had created various major social and economic issues, moreover another global War was imminent. In this unstable period of time, the GDP had the responsibility to measure and to prove that the US/UK's economies had sufficient equipment and provisions to enter a third World war, whilst maintaining enough production of goods and services (Costanza, 2009). This indicator of economic progress was then reinforced by the Bretton Woods Agreement, where economic growth was seen as the way to enhance the economic well-being. As Costanza (2009) stated in his paper, the GDP has become today the *sine qua non condition* for economic progress. Indeed, it is "the wellbeing" reference for most nations and most economists.

A.1. General definition

GDP can be computed from three different approaches (Fioramonti, 2013), namely the expenditure approach (the sum of all expenditures), the income approach (sum of all incomes earned, and costs incurred in the process of production) and finally, the value-added approach (sum of the value added in the production process). For the sake of clarity, the definition of Mankiw (2014) as the reference will be used. According to this author, the GDP is "*the market value of all final goods and services produced within a country in a given period of time.*" The GDP is divided into four components: consumption, investments, government purchases, net exports (Mankiw, 2014).

As said the GDP measures the total expenditure of goods and services in all different markets in the nation's economy. It is also important to notice the difference between real GDP and nominal GDP. Real GDP measures the quantity of goods and services produced, valued over time at constant prices. On the contrary, the nominal GDP is a valuation method at current prices.

This indicator measures two different components at once: the total income of the citizens in the nation's economy and at the same time the total expenditure on the economy's output of goods and services (Mankiw, 2014).

A.2. Formulation

Using the expenditure approach, GDP can be defined as such:

$$\text{Formula of GDP} = C \text{ (consumption)} + I \text{ (Investment, capital formation)} + G \text{ (Government expenditures)} + (NX = X - M) \text{ (net exports)}$$

In order to be more accurate, as seen from the calculation above, the results are combined with other annual surveys such as retail sales that are based on estimations, and data held by the national system accounts (Costanza, 2009).

In order to understand the different elements of this formula, they will be explained one by one.

Firstly, the consumption element, refers to the sum of all spending carried out by households on the goods and services provided by an economy over a given period of time. These goods are those, which are durable and non-durable. Secondly, investments are linked to the spending on capital equipment, inventories and on the structures. Thirdly, government purchases are constituted through the spending on goods and services carried out by a national government. Finally, the net exports refer to the spending on domestically produced goods and services by foreigners minus purchases of foreign goods by domestic residents (Mankiw, 2014).

A.3. Limitations of GDP – Problems

Based on the definition of the GDP, some assumptions can be made regarding the well-being of a nation. The GDP is a measure for the economy's total income and the total expenditure on goods and services. Thus, as for most of the time, people would prefer a higher income, it could be assumed that GDP is a measure of the well-being of the population (Mankiw, 2014).

However, even though this indicator is used and recognized world-wide, some critics and issues can ensue. The statistical systems created in the past are challenged today, and certain doubts regarding their relevance have been raised (Cassiers, Thiry, 2009). The purpose of this section is not to give a subjective opinion about the GDP, but mainly to have an objective vision of this measure with its strengths and weaknesses. It is important to notice that the GDP is not per se incorrect or damaging, but it only measures a small part of the overall economic activity (Giannetti et al, 2014). Indeed, the GDP is not incorrect, but it can be misused.

First of all, a transfixion on material items and higher incomes should not be dwelled upon when thinking about well-being. Certain other factors which cannot be measured by “the” indicator can also contribute to satisfaction and the quality of life. Indeed, three important points can be highlighted, regarding this assumption. On the one hand, leisure is an element that is omitted from GDP. Indeed, the indicator can be a factor, such as an increase in the level of hours spent at work, and subsequently a decrease in leisure time that will offset the gain from creating more goods and services. On the other hand, since GDP only values marketable goods, it does not consider most of the home’s activities, such as preparing meals for the family, as well as educating the children etc. These kinds of activities are nevertheless a great source of well-being for most people. Moreover, and finally, the quality of the environment and the distribution of income among the population are not taken into account when measuring economic activity (Mankiw, 2014).

As demonstrated by this first argument, certain crucial elements of well-being are omitted, thereby jeopardizing the validity of the GDP as a measure of the quality of life. By measuring only monetary transactions that are linked to the production of goods and services, the measurement offers an incomplete image of the whole system in which the economy is evolving (Giannetti et al, 2014). By calculating only monetized activities, the GDP forgets the notion of social, natural and human changes, which are inherent to the well-being of the community (Costanza et al, 2009).

Another particular concern linked to GDP is related to sustainability. Seen more and more as a conventional economic metrics, GDP has not followed progressive environmental politics (Mankiw, 2014). In order to support this assumption, a first point can be raised. According to Costanza (2009), the index emphasizes the depletion of the environmental resources of a country faster than nature can renew itself. In a society of over-consumption

where the faster the production goes, the better it is, the GDP indicator could be seen as a synonym of a reduction of the natural resources as it encourages economic growth without considering its costs. The GDP is thus a measure of economic quantity and not economic quality (Costanza et al, 2009). The GDP omits the environment by forgetting the ecological costs, the depletion of natural resources and on the contrary, includes as an additional value of the cost of environmental degradation (Giannetti et al, 2014). As a consequence, to the first point raised above, the degradation of ecosystems encouraged by GDP leads to a reduction of the public services that were in the past freely available to humans. For example, the fresh air we breathe has become monetized. In large cities, some districts are more expensive than others due to the quality of the atmosphere being better. (Costanza et al, 2009).

GDP is also criticised as a measurement of societal well-being. Indeed, as Kenny et al (2019) stipulated in their report, the index could lead to specific negative societal outcomes. Since it is neglecting the social (and the ecological) dimension, the indicator does not care about activities that can enhance healthy societies and wrongly recognizes the market economy as an end to itself. An example is, that the cost of crime, pollution and other negative elements are taken into account as being positive in its calculation, and on the contrary, it does not take into account education, nor social inequalities (Kenny et al, 2019).

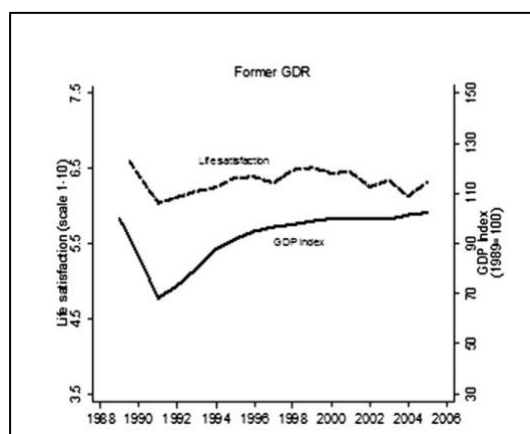
Furthermore, another complication that has been raised concerning GDP as an indicator of economic growth is linked to the threshold effect. Indeed, according to the GDP's definition, the growth has a central place in the equation. The country having the major economic activity is seen as being the best one. However, a point that has been forgotten by this theory is that, from a certain point (the threshold area), the overall quality of life is no longer increasing. Indeed, at this point, the gains in GDP are neutralized by the costs created by the increases of the inequalities, the depletion of natural resources and the reduction of recreation time. According to McKibben (2008), after a certain level of income, the well-being of the population is in decline. Indeed, the number of suicides and depressions is in constant augmentation from the threshold area.

As an example (Figure 1), in the former East Germany, from 1991 to 2006 the GDP index is in constant augmentation. However, when life satisfaction from 1991 to 2006 is examined it can be noted that it has not followed the same track. Indeed, from 1999 to 2004, while the GDP increased, the well-being of the population declined. The authors Easterlin et al

(2010) decided to study the former East Germany, as well as Estonia and the Russian Federation as country examples to compare GDP and life satisfaction from 1991 to 2006. The results from the two other countries (Estonia and the Russian Federation) are more or less the same, this is the reason why East Germany has been chosen to be the focus. In order to understand this graph correctly, two words need to be explained. First of all, the GDP index is as previously mentioned, an index of productivity, income and expenditure growth. Secondly, life satisfaction is linked to the level of happiness (Easterlin et al, 2010). Based on this definition and on the interpretation above, it can be concluded that this graph is a concrete representation of the threshold effect created by the GDP. As Easterlin et al (2010) stated, even if the income per capita during the selected period has almost doubled, the average level of happiness does not show the same upward trend (Easterlin et al, 2010).

Figure 1. Life satisfaction and GDP index

Source: Easterlin et al, 2010



Finally, regarding the environmental Kuznets curve, Neve and Hamaide (2017) stipulated that many studies had already emphasized the weaknesses of the representation of the GDP as an indicator of national economic welfare. According to them, in order to continue to develop over time, the shift of focus towards a more sustainable policy measure has become decisive. By measuring income but not equality, by measuring growth but not the destruction of resources and by ignoring social cohesion and environmental values, it is inaccurate to say that GDP is capturing well-being (OECD, 2004).

A.4. Section Conclusion

Gross domestic product is defined as the sum of goods and services produced over a selected period of time in a specific country. Although very criticised, this indicator can be a comprehensive measure that takes into account the total production of a nation. Considering the difficulty of the sophisticated system currently lived in, along with the complexity of the statistics available, if well used, GDP can be quite useful.

Nevertheless, it is right to say that many other dimensions should be considered when measuring the well-being of a country rather than only concentrate on the measures of the market economy (OECD, 2004). *Instead of differentiating costs from benefits, productive activities from destructive ones and sustainable from unsustainable ones, GDP wrongly assumed that every economic transaction can be added to the well-being of the population. GDP forgets everything that concerns non-monetized activities, regardless of its importance to that (Talberth et al, 2006).*

B. Alternative to GDP, the ISEW (GPI)

B.1. How to overcome GDP

Since the seventies, critics against the most widely used economic indicator GDP, have been growing. Those critics have become stronger as the breach between the economic growth and well-being of the population has risen (Stockhammer et al, 1996), although opinions against GDP have always existed regarding its misuse as a measure of public well-being (Comment, 2014). Even if ecological economists think that this continued growth the GDP is emphasizing is both undesirable and environmentally unsustainable (Lawn, 2002), there is a contradiction regarding the use of GDP (Stockhammer et al, 1996): on the one hand, most scientists, economists and governments understand explicitly that measuring the economic welfare with GDP can be controversial, but on the other, they continue to use GDP, when measuring welfare (Stockhammer et al, 1996).

According to the latest report from the Club of Rome, critics concerning GDP as a measure of economic welfare and the environment have increased over time (stockhammer et al 1996). Their various reports call for a change in the political sphere by initiating strong redirections of the policies in place, such as environmental and social norms. They claim that

the condition for maintaining a sustainable and attractive future, is to deviate policies away from the current ones (Kubiszewski et al, 2013). According to the European Union, countries have to reinforce their legislation regarding ecological and social issues, such as quality standards for water, air and waste management (European Union, 2019).

The world needs new indicators which will measure welfare through attaining economic, environmental and social goals at the same time; indicators that will include ecological and social dimensions with sustainability. In order to enhance the progress through sustainability, nations, economists, scientists and ecologists have been working closely together to develop new indicators that go further than the pure economic activity, wealth and income (Giannetti et al, 2014). There is a multitude of new measures that have been developed to overcome GDP issues.

Starting in the 1970s, a group of progressive thinkers and intellectuals have tried to replace GDP with better numbers. At that time, the change was still limited with minor adjustments made to the formal GDP by adding to and removing certain elements from it. Gradually, opinions regarding the need for change have grown and some scientists have begun to enlarge the number of new indicators different from the “aggregate” GDP indexes. In order to diminish the influence of the old indicator, a new variety of sustainable measures have arisen (Fioramonti, 2013).

In recognition of the weaknesses of GDP, various types of indexes have been studied and proposed. They can be classified into four different categories that will be explained shortly: the corrective indexes, the “non-GDP user” indexes, the composite indexes and finally the indicator suites. The corrective indexes as indicated by their names are those that use GDP as their basis from which some extra components are either added or subtracted. This type of indicator tries to correct GDP by addressing its problems. Index of sustainable economic welfare (ISEW), Genuine progress indicator (GPI), green GDPs and Genuine wealth make up the corrective indexes (Costanza et al, 2009). The ‘non-GDP user’ indexes are alternatives to the first category because they do not use the GDP as their foundations. In opposition, they attempt to start from a different point of view with a different way of thinking. Rather than measuring economic activity, they directly measure ecological and social activities in order to evaluate the well-being, as well as the changes that can occur in the environment and in the social or human sphere. The ecological footprint, the subjective well-being and the gross

national happiness belong to this category (Costanza et al, 2009). The composite indexes try to combine different and multiple approaches to create a single measure. They can start from or without the GDP as their first component and the most well-known indexes in this particular category are; the Human development index, the living planet report and the happy planet index (Costanza et al, 2009). The final category is that of the indicator suites. Although the previous index attempts to aggregate a large number of components into a “composite” index, this last category does not. It does not want to attain this step but tries to address many different indicators separately. It is more or less an open discussion with the users concerning a potential answer to the question regarding the meaning of all of this. National income satellite accounts, Calvert – Henderson quality of life indicators, millennium development goals and indicators are the indexes composing of the last class. (Costanza et al, 2009).

Measuring the welfare, the well-being and the development at the same time can be quite challenging. As aforementioned, several new alternatives have been proposed and mentalities for moving away or at least adding complement and alternative indicators to GDP are evolving. Better informed policy decisions are necessary to raise the world global awareness toward sustainability (Kenny et al, 1962-2013).

B.2. Choice of the ISEW

According to Kenny et al (2019), the 21st century has witnessed an increasing magnitude in political and public awareness towards social and environmental issues globally. This positive trend has created a constructive opportunity and space for alternative methods that want to measure those factors, in order to understand their impacts on well-being. With the intention of improving the quality of life (QOL), an alternative indicator must understand what the human needs are and how they can be met (Costanza, 2007). As a consequence, the Index of sustainable welfare (ISEW), named also as the Genuine progress indicator (GPI), is a possible alternative to the GDP. While measuring well-being still creates debates around it, understandable measures, such as those provided by the ISEW can help to diminish these contradictions (Kenny et al, 2019). It is obvious that many other new indexes exist but, for the purpose of this report, and in accordance to certain reasons below, there will be a focus on the ISEW.

As a first reason and according to Kenny et al (2019), by integrating social and environmental capital elements, GPI is improving GDP. While the latter does not make any

distinction between activities that can enhance or decrease well-being (Talberth et al, 2006), ISEW includes social and ecological costs into the economic measurement of well-being. It does not incorporate subjective components, it rather employs an economic and non-economic estimation of the social and environmental elements that can contribute to life satisfaction (Kenny, 2019). The new index emphasises the positive and negative elements perceived by most people in a country when measuring its value.

Moreover, the study to choose GPI as “the” alternative to GDP is due to its large scope. This index is widely used throughout the entire world on a national scale. Contrary to other alternatives, ISEW has already been studied and measured in many countries such as Australia, Belgium, Chile, The Netherlands, Sweden, Thailand, United States of America and many others. This large scope allows a deeper learning about it. Accessible Data, interesting scientific papers and methodological improvements have been decisive elements in the choice of this index (Kenny, 2019).

Furthermore, since ISEW’s creation twenty years ago, it has already undergone many evolutions and ameliorations that will be explained later in this chapter. By expanding its existence in multiple jurisdictions, ISEW is accelerating its itinerary in order to become a measure of well-being on its own rather than only being an alternative (Kenny, 2019).

Finally, even though there are many critics regarding GDP, some positive elements have to be pointed out and maintained. Through ISEW, the opportunity to both use the strengths of GDP such as its notoriety and at the same time change the perception of it, has been seen. Starting from this well-known indicator can only help to be more credible among communities.

B.3. General definition.

B.3.1. ISEW: a corrective and single index

According to Costanza (2009) in his article concerning measuring the progress, and as previously mentioned in the introduction of new alternatives, there are four different kinds of new indexes that want to lift the difficulties linked to the misuse of GDP. The chosen index ISEW, is related to the first category of indicators, the corrective ones. By trying to solve the problems of GDP, these indexes are making corrections to solve the main difficulties. ISEW

uses GDP as its foundation, and then adds or removes some components (Costanza et al, 2009). By using GDP as its base, the ISEW is a complex and wider indicator that includes more specific components (Giannetti et al, 2014). As a matter of fact, this kind of indicator wants to consolidate the environmental, the economic and the social aspects into a common plan to measure progress.

As Stockhammer et al (1996) said in their paper, The ISEW is a single Index. Although it is not very clear whether nations should use a single indicator or an association of indicators to measure the well-being, some scientists have observed that a few problems can arise from the use of multiple indicators. According to Jagodzinski et al (1987), for most of the time, relying on multiple indicators brings problems into the equation because of their non-coherence and non-global view of problems. As every indicator focuses on one specific angle, the clustering of these indexes can create certain disorders. According to Hak et al (2007), the most profound challenge is the ability to find the right indicator for the right measure and rallying different indicators can be very complex and biased. This is the reason why many scientists continue to use a single indicator in practice to avoid any discordance (Martin, 2005). An assumption can then be drawn that using a single indicator could potentially be more accurate for this research, even if some scientists would argue the opposite.

B.3.2. Origins and definition

The index of Sustainable Economic Welfare (ISEW), or later revised as the Genuine progress indicator (GPI), is a single indicator which measures the sustainable welfare and the nation's progress at a particular point of time (Lawn, 2002). By considering the depreciation of the capital as a cost, the index is trying to be more accurate than the GDP in its calculation (Giannetti et al, 2014).

The ISEW or GPI takes from the old index (GDP) the economic transactions that are appropriate to well-being and then tries to adjust those components. This “new” indicator links the factors that are purely economic to those that are defined most of the time as essentially social and environmental (Cobb et al, 1999).

The Index of Sustainable Welfare was first introduced by Herman Daly and John Cobb in 1989, in their book, *For the common Good*. At that time, this book and in particular the idea

of a new sustainable index, had generated much interest. This new welfare index was revolutionary as it was considering the human progress in parallel to the environment (Giannetti et al, 2014). Their work was meaningful because they were the first to create an index measuring the welfare of a population, whilst at the same time taking into consideration inequalities, income distribution and environmental destruction (Brennan, 2008).

B.4. Evolution – modifications

Five years after the creation of this indicator, the authors decided to edit their methodology in order to add new components to be more accurate and to create a new valuation method (Bleys, 2007). The multiple reformulations of the ISEW include major changes and also lesser ones compared to the ISEW that was originally created by Dally and Cobb (Stockhammer et al, 1996).

The first major change is the displacement and the re-ordering of the different groups' items of the indicator. Each group is classified under a heading and there exist three main ones; the consumption base, the subtraction elements and finally the distribution index. In opposition to this, in the first formulation of the ISEW, there was no distinct group, but each item was explained individually. The alternative structure is clearer and enables to understand in an easier way the different components of each group. There are five different reasons for this re-formulation. First of all, the major reason for this was to make the ISEW more consistent and to do, so three requirements were needed. First, a clear distinction between stocks and flows needed to be created due to the fact that only flows can be present for the calculation. The reason for this is that flows represent the rate at which the stock is fluctuating. Secondly, the subtraction and the addition of negative and positive elements of each field have to be studied in an analogous manner. Indeed, the researcher has to define the clear steps of the exercise and maintain it for each component. In addition, items that will be present in the formulation have to be defined before doing any calculation. Thirdly, in accordance with the goal of the indicator to measure and indicate the future consumption and according to the first requirement, the net capital growth takes into account the total capital productivity and total capacity (Stockhammer, 1996). Then, public consumption that was left behind by Daly and Cobb in their first formulation, is then considered as the private consumption. Finally, when considering the distribution of economic welfare, the revised ISEW takes work effort into consideration, and

the entire index is weighted by the distribution index (and not only the private consumption) (Stockhammer, 1996).

Another change can be linked to the theoretical basis. Even though Daly and Cobb were not very clear about their theoretical foundations due to the use of a mix of market analysis that were combined with a predominantly macro theory, the revisited ISEW had no specific economic paradigm. Indeed, some influences from neoclassical economics can be found, as well as Marxian ones. Through time, further changes have also incurred within some countries and have led to the creation of multiple ISEWs, which evolve differently depending on where they are calculated, due to political reasons (such as corruption, democracy, etc) or various data availabilities (Stockhammer, 1996).

In 1995, the ISEW was once again revised and renamed GPI following a new proposal to replace GDP. As the GPI uses the same methodology as the ISEW; measuring the progress of a nation, as well as attempting to measure sustainable prosperity (Giannetti et al, 2014). Created as Redefining Progress, new items were also incorporated in its valuation. Even if ISEW and GPI can differ in terms of formulation, as many scientists such as Stockhammer and Costanza had also assumed in their paper, for the purpose of this study, they will be considered as a synonym even if in reality some elements can differ (Talberth et al, 2006). The six formulations used will be explained later in the section.

B.5. Specificities

As seen below, in addition to its other specificities such as its formulation studied in the next point, its evolution, goals, objectives and proper definition, ISEW is also characterised by two other important points, which must be raised. First of all, the existing link between GPI and strong sustainability will be considered and then the theory of the red flag linked to the threshold effect will be explained.

B.5.1. Strong sustainability

The ISEW represents a quite strong and robust indicator. According to Dally and Cobb, the necessity of considering welfare in the context of sustainability is crucial. When creating the indicator, they emphasised the importance of maintaining intact the various elements of capital and supported the strong sustainability path to enhance sustainable development. In other words, they insisted on the maintenance of the different types of stocks undamaged. In their theory, the two types of capital, physical and natural, are complements and not substitutes. One cannot replace the other in order, to avoid overconsumption. They wanted to determine a feasible maximum level of production with the intention of being sustainable (Brennan, 2008). According to Talberth et al (2006), GPI is closely related to strong sustainability because it takes into account the costs associated to the loss of wetlands, forests and farmland and is opposed to the theory of the weak sustainability that only recommends the stability of the entire stock of capital thus, allowing for substitution between the various forms of capital.

B.5.2. Threshold effect

As previously mentioned, national studies have shown that beyond a certain level of growth, GDP increases do not correlate anymore with economic welfare. According to Talberth et al (2006), the undesirable side effect of growth is, that it brings some improvements in the well-being of a nation up to a point (the threshold point) and then even if this growth is still increasing, the QOL begins to deteriorate. The GPI is then trying to raise a “red” flag to show that growth and wellbeing are not automatically synonyms. Since the GPI considers certain positive and negative components in its calculation, the indicator is able to identify which factors can increase welfare and which ones cannot (Kubiszewski et al, 2013). According to some scientists, such as Kenny et al (2019), a lot is needed to be done to improve the well-being of a nation. Due to huge recent economic growth, environmental damages and a flat social progress, well-being has been tarnished.

To conclude this point, two elements of the GPI which make this indicator really specific is first of all, that it is a strong and sustainable indicator which does not allow any substitution effect between the two kinds of capital. And secondly, it can determine which of the components can increase or decrease economic welfare and moreover, when economic growth can begin to be negative for the well-being of a nation.

B.6. Formulation

According to Lawn (2002), the calculation of GPI starts with GDP as its foundation. Indeed, beginning from the personal consumption expenditures, it is similar to the GDP's formula. Then, additional adjustments are made to take into account the various positive and negative items of economic activity that GDP does not. Their valuation method includes social and ecological benefits, along with costs that intrinsically escape from market appraisal.

As can be seen in the table below (Figure 2), GPI includes positive and negative factors that can be summed in, with the aim of creating a final index number that is usually valued in real rather than nominal terms for enabling a comparison over time. All the factors below are calculated in monetary values.

Figure 2: Items used to calculate the GPI

Source: Lawn, 2002

Table 1 Items used to calculate the GPI for USA from 1950 to 1995	
Personal consumption expenditure (+)	
Index of distributional inequality (+/–)	
Weighted personal consumption expenditure	
Cost of consumer durables (–)	
Services yielded by consumer durables (+)	
Services yielded by roads and highways (+)	
Services provided by volunteer work (+)	
Services provided by non-paid household work (+)	
Cost of noise pollution (–)	
Cost of commuting (–)	
Cost of crime (–)	
Cost of underemployment (–)	
Cost of lost leisure time (–)	
The cost of household pollution abatement (–)	
The cost of vehicle accidents (–)	
The cost of family breakdown (–)	
Net capital investment (+/–)	
Net foreign lending/borrowing (+/–)	
Loss of farmland (–)	
Cost of resource depletion (–)	
Cost of ozone depletion (–)	
Cost of air pollution (–)	
Cost of water pollution (–)	
Cost of long-term environmental damage (–)	
Loss of wetlands (–)	
Loss of old-growth forests (–)	
TOTAL = sum of all positive and negative items = GPI (valued in dollars)	
(+) = positive item	
(–) = negative item	
(+/–) = item that may be either positive or negative	
Source: Redefining Progress, 1995 .	

In practice, according to Stockhammer et al (1996), there are two main steps in the ISEW calculation. The first one is the consumption base. This primarily measures private consumption, public consumption and the value of unpaid household labour. Private consumption is referred to as the consumption goods, consumed by different private households. Public consumption includes items from the public entity, but because there is no market price for public goods, they are implicitly calculated by the production costs of the public goods. In addition, the value of unpaid household labour is estimated. For the latter, as there are some existing problems linked to its measurement, three methods of calculation have been created: pricing outputs of this labour by market prices, or pricing the inputs with either

opportunity costs, or market prices. It is important to notice that the consumption base is mainly composed of private consumption.

Secondly, Step 2 considers what needs to be subtracted from personal consumption. As has already been seen in Figure 2, and as Stockhammer (1996) states, the items that are added and subtracted from the consumption base differ from one author to another and from one country to another. The most important and relevant ones will be highlighted. Fourteen costs compose of the hard core of this calculation (and some will be explained to avoid misinterpretation):

- The social defensive costs. This covers all expenditures that do not enhance social welfare but that are necessary to repair damages caused by economic activity.
- The cost of commuting. Part of the private consumption and refers to the separation between the place where people live and work.
- The cost of car accidents.
- The cost of urbanization. Because of the development of urbanisation, prices and rental payments are increasing.
- The cost of advertising.
- The environmental defensive cost.
- The cost of cultivation of soil.
- The loss of natural areas.
- The cost of air pollution.
- The cost of water pollution.
- The cost of noise pollution.
- Defensive health expenditure.
- The future reduction of economic welfare
- The depletion of non-renewable resources

Authors including Stockhammer et al (1996), Lawn (2002) and Costanza et al (2004) consider the elements below as positive ones, which can contribute to well-being. These values are linked to household labour, the value of volunteer work, the services of highways and streets and finally education.

To conclude this important point, considering the multiplicity of different valuation methods existing, this method (as below) was chosen as the valuation method for the ISEW in order to create coherency. It will begin, from total personal consumption expenditure and then compute it with the different positive and negatives items enumerated previously.

$$\text{Valuation method of ISEW/GPI:}$$

$$(\text{Personal consumption expenditures} + \text{positive items} - \text{negative items})$$

B.7. Barriers and Opportunities

In this section, the different barriers linked to GPI, will be investigated. Potential users of this alternative measure have identified 3 main ones, which will be explained shortly. The different opportunities the barriers can offer, will be considered afterwards.

B.7.1. Barriers

The debate regarding ISEW as an alternative measure of economic welfare is not new. While this indicator has been around for more than 25 years, its policy impact is still relatively limited. The different barriers are regrouped into three main categories and are configured around distinctive factors (Bleys and Whitby, 2015).

Firstly, according to Bleys and Whitby (2015), there are some context factors, which are built on the idea that policy contexts and time agendas can determine the environment in which GPI is evolving. An economic crisis or public opinion can either be barriers or opportunities for an indicator. In 2008, the financial crisis was at the beginning predicted as an opportunity for reinforcing the presence of an alternative measure such as ISEW, but then many observers proved that this context redirected governments to traditional instruments. The impact of this crisis on the ISEW was then relatively limited as many years after this crisis, the quest for economic growth was still central and budgets allocated to research and development has dropped significantly. The context in which the alternative measure is evolving is essential as government targets and findings are necessary for development.

However, despite this difficult context, some public support can also be observed in reaction to the increased dissatisfaction with the traditional measures (Bleys and Whitby, 2015).

Furthermore, the second category of barriers is composed of the indicator factors. The quality of an indicator depends on specific factors we are listing below. First of all, one difficulty ISEW can encounter is the lack of standardized methodology. In order to be credible

and objective, an indicator needs to be comparable across studies. Scientists have criticised the lack of comparability between the different GPI studies. Due to being in a globalised world, this point is particularly important. Comparing different methodologies of ISEW is then considered as comparing apples to oranges. Secondly, there is a need for a better relevance of data. Indeed, studies need to be released promptly to reflect the reality and the most recent trends. The delay in data availability decreases the possibilities for stakeholders, such as policy makers or media to compare results to the conventional economic measurements. Finally, some methodological issues can also ensue with an alternative measure of economic welfare such as the GPI. The selection of ISEW's components is the first problem raised by Bleys and Whitby, reflecting the lack of agreements on the selected components for the calculation. Also, the validity of ISEW is dependent on the quality of data. The difficulty of GPI to measure certain components, such as the value of household labour is pointed in that argument (Bleys and Whitby, 2015).

The final category of barriers seen can be related to the users of ISEW, their opinions, their preferences and the institutional culture they are living in. First of all, as Bleys and Whitby (2015) said, a new indicator can face some reluctances and problems of acceptance from the users themselves. Secondly, the nature of GPI can provide additional barriers, due to it requiring additional competences when constructing the process and using it efficiently. These uncommon inter-disciplinary competences are then providing additional limitations to a broad diffusion because of the extent necessity of training linked to the new multidisciplinary components (Bleys and Whitby, 2015). Finally, the economic, social and environmental characteristics of GPI reinforce the difficulty to fit them into public and governmental economic and financial mandates.

B.7.2. Opportunities

In this section, two different important opportunities for ISEW that can be used and explored to increase its value, will be outlined. Naturally, these opportunities are directly linked to the barriers discussed above. While this alternative measure has its own limits, several points can be improved (Bleys and Whitby, 2015).

First of all, in view of the lack of standardized methodologies, there is a significant opportunity to harmonize its own methodology (GPI) in order to overcome and diminish the

barriers enumerated before. With some efficient use of policies, better communication and strong comparability, ISEW could underpin its own presence (Bleys and Whitby, 2015). Besides the improvement of the method and the reinforcement of its credibility, harmonizing the methodology can increase stakeholder involvement thanks to the minimization of the incompatibilities (Bleys and Whitby, 2015).

Secondly, improving the communication concerning the GPI/ISEW represents a significant opportunity. In order to effectively prove the credibility and the relevance of this indicator as an alternative measure for economic welfare, widening the audience and developing political messages around ISEW has become crucial and vital. The context of economic instability and uncertain future sustainability represents a “chance” for this indicator to prove its own value and necessity.

B.8. Section Conclusion

According to Bleys and Whitby (2015), the positive correlation between GDP and indexes for other dimensions of well-being is less and less present. As a consequence, promoting financial and economic growth is not as relevant as before and environmental costs need to be taken into account. According to the Living Planet Report, written by WWF in 2014, in order to support the needs of the current world population, one and a half planets is required.

Over time, it has been recognized to a greater and greater extent that GDP was never constructed to measure the economic welfare and the well-being of the population (Cassiers, Thiry, 2009). The growth emphasized by the GDP is no longer the only relevant indicator in our 21st century as a national objective. At the sight of the increasing difficulties of today's world regarding the income distributions, social inequalities and ecological problems, it is time to revisit policies in these areas. While surely not flawless and perfect, the GPI could be a better alternative to these numerous problems we are facing nowadays. The purpose of measuring the economic welfare of a nation can be answered by the GPI. In view of the work carried out by Ida Kubiszewski et al (2013), who estimates the ISEW of seventeen countries, the most significant trends in order to measure a more global GPI may now be gauged, (according to the author, the world economic welfare has risen since 1978). This question about globality will be raised in the next section through a practical case. Is it possible to create an index that could be global?

If a sustainable future for the next generation is to be maintained, the implementation of other policies regarding sustainability such as the 17 sustainable development goals (SDGs), is required (Costanza, 2009). As will be studied later, the quest for human well-being improvement might be answered by GPI. A change is never easy to install and will require strong involvement of the multiple stakeholders at a global scale to shift the focus towards social and environmental issues and not only towards economic ones.

3. Analytical part

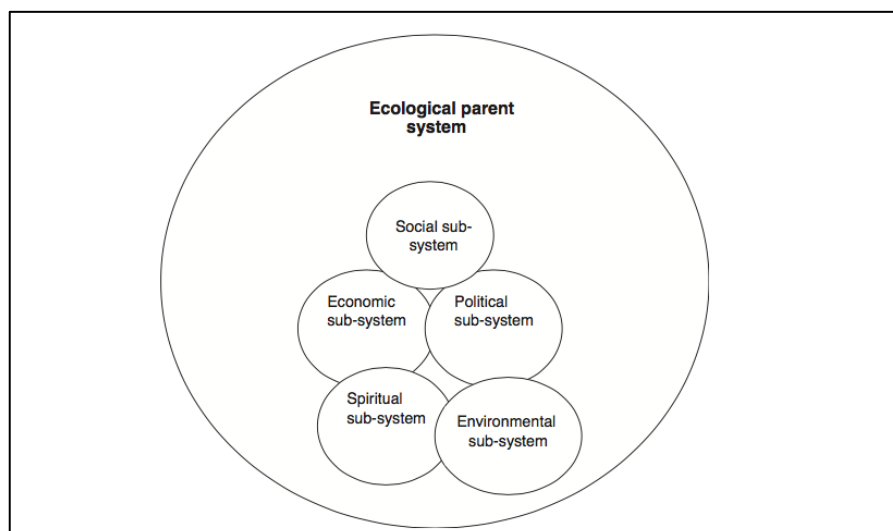
A. Introduction

According to Clarke and Islam (2005), many studies have already been carried out regarding the ISEW and they all concluded that, until the late 1970s and early 1980s, the increases of welfare were in line with economic growth. The outcome of these studies was that from a certain point (the threshold point), economic growth starts to generate some costs that outweigh the benefits. When focusing on policy implications, the authors have noticed that these are significantly challenging the *underlying tenants of mainstream economics, that economic growth is central and fundamental in order to improve welfare* (Clarke and Islam, 2005).

As the economy is part of large interconnected and interrelating systems, alternative measures of national income should incorporate benefits and costs of achieving economic growth. The consideration of society as being composed of interconnected systems implicitly underlines the need to take into account the wider welfare implications of accomplishing economic growth (Clarke and Islam, 2005). As can be seen on Figure 3, society is composed of hierarchical and interconnected systems. The ecological system can be seen as the parent system and economic, social, environment, political and spiritual are considered as sub-systems. Each has certain direct impact on the well-being of the Society. Consequently, measures of welfare have to consider each sub-system to be as most accurate as possible.

Figure 3. Representation of system and subsystems.

Source: Clarke and Islam, 2005



The adjustments made to the personal consumption expenditure can be summarized according to the multiple systems and sub-systems. However, as will be seen in the following section, these adjustments differ from one country to another depending on their politics, economy, etc.

They can be regrouped as follows:

- The Economic Sub-system: personal consumption adjusted by the income inequalities
- The Social Sub-system: public expenditure on education and health, private expenditure on health and finally urbanisation/commuting
- The Political Sub-system: consumer durables, government streets, corruption, debt
- The Environmental sub-system: air/water/noise pollution, loss of forests, non-renewable resources and long-term environmental damages
- The Spiritual sub-system

From the environmental and social point of view, governments and national accounts fail to consider the effects of natural resource depletion, degradation of the environment and their impact on welfare (Castaneda, 1998).

ISEW tries to combine multiple and various impacts that come from changes in the environment and in social conditions. In order to understand the purpose of the creation of GPI, the word “sustainability” has to be explained. As Hicks (1939) defined, the Hicksian income is the maximum amount of goods consumed over a selected period of time without deteriorating the future wellbeing. A sustainable consumption refers to the maintenance of various existing capital stocks. ISEW attempts to approximate this sustainable consumption by first measuring this consumption in a better way than only measuring marketed goods and services, located on national accounts, and secondly by taking into account the changes in value in each of the capital stocks. Sustainable levels of consumption then need the following capital stocks to be maintained. Five different types of capital exist and GPI attempts to incorporate their changes in value in its measurement. Firstly, the Built capital is composed of stocks of physical machinery and buildings, necessary to keep sustainable levels of consumption. These stocks can deteriorate over time and need to be protected. The second capital is Financial assets. In order to sustain investment to build capital assets, the nation needs to keep low its level of accumulating foreign debts to avoid repayment of them. Thirdly, the conservation of stocks of Natural capital is crucial for maintaining sustainable consumption in the future. Moreover, Human capital is also important due to it representing amassing the health skills and experience

humans have learned and developed to be more productive. Lastly, the Social capital refers to communities and legal institutions (Hamilton, 1998).

Regarding interconnected systems and the importance of sustainability, the second section will be devoted to questions regarding the relationship between economic growth and welfare. The answers to these theoretical questions “Is ISEW a more plausible method to measure welfare? Is GDP completely old-fashioned? Does the threshold point really exist in the reality?”, will try to be found.

First of all, the choice of countries to analyse will be explained. Secondly, the analysis of ISEW for each selected country will be performed and results will be compared to each other. Finally, problems linked to the analysis of GPI will be enounced and explained. Further recommendations will be shared at the end of this section and a conclusion will be performed.

B. Choice of Countries

The choice of countries to analyse was not straightforward for two reasons. First of all, the number of national studies for ISEW/GPI was limited, therefore narrowing selection. After decisive analysis, five different nations such as Belgium, Australia, Thailand, Chili and United states of America were chosen to investigate. As will be explained later in this section, these countries have been selected for strategic and methodological reasons. Secondly, it is also important to note that among these countries, there is still a considerable amount of dat missing. According to Bleys (2006), *as numerous monetary estimates used in the compilation of the index are based on incomplete data or on outdated valuation methods, improvements can still be made*. When analysing what the author said, it can be concluded that this field has undergone improvements in data availability and in the methodology, but the need for better measurements remains present.

Based on these two main difficulties, how to organise this second part of the paper had to be selected. Computing ISEW on its own for different countries and diverse national accounts proved quasi impossible. Rather it was chosen to analyse what scientists had already found out about and compare these results with each other and with countries’ GDP estimations.

There has been an attempt to be as diversified as possible regarding the choice of countries to analyse (Belgium, Australia, Chili, Thailand, United States of America (and Vermont in particular). Countries which have already carried analysis out regarding the measurement of ISEW, has been focused on. After having selected different studies, the ones that were measured for the same period were chosen in order to, allow comparisons at the end. Each country has its own particularities and specificities. Firstly, Belgium was selected because it is a European country. This choice was based on the complete analysis made by Bleys regarding the ISEW. Secondly, regarding Australia, it was concluded that a developed country from OECD different from Belgium would be interesting. Thirdly, an analyse of developing countries, Thailand and Chili, was thought necessary. There is an increasing number of studies regarding ISEW for high income developed countries, but very few for developing ones. We concentrated on developing countries with high economic growth and will try to compare those results with developed nations. Finally, even if many details regarding United States of America were unavailable, a decision to analyse this country was taken. Seen the recent changes in policies made by President Trump (economic, social and environmental), it was thought that important key learning points could be raised. For this nation, data found by Kubisweski, has been used.

Regarding the United States of America, an analyse and comparison of results from smaller regions was intended. For Vermont in the United States of America, studies regarding GPI have been completed and compared to national results. For the latter, it was wanted to be seen whether data would be easier to collect for a smaller area, and to verify whether there were some differences with national results or not.

C. Data Analysis per Country

In this section, an analysis of ISEW country by country will be undertaken. It will begin with an introduction for each nation, in order to completely understand its origins and specificities. Then an analysis of the methodology used in order to measure GPI, will follow. Data found by scientists to create graphs for ISEW and compare it to GDP, will be used. And finally, there will be an analysis of results and comparisons.

C.1. Belgium

C.1.1. European country

Belgium is a country in Western Europe and is bordered by France, Luxembourg, The Netherlands and the North Sea. It covers an area of 30.528 square kilometres and has a population of 11.267.910 inhabitants. Its capital city is Brussels but cities like Antwerp, Bruges and Ghent are important. As an independent country, Belgium is relatively young as the country only declared its independence in 1830. This nation is a federal constitutional monarchy with a parliamentary system and a prime minister. Belgium is confronted by a complex situation with three autonomous regions (Flanders; Brussels capital and Wallonia). This country is one of the first six founding countries of the European Union and its capital city Brussels, is the capital city of Europe hosting official seats of the European Commission, Council, and Parliament. As stated previously, Belgium is a developed country with a high income. Its GDP in 2014 was approximately 402 billion Euros and its annual growth between 1992 and 2014 was around 1.7%. It has a high standard of living with a high quality of life, good educational system and healthcare (Belgique.be, 2019).

When investigating environmental politics in Belgium, it is important to note that distinctions between Wallonia, Flanders and Brussels have been created. This could be an issue when calculating ISEW for the entire nation. However, when thinking nationally, Belgian environmental law has been created for all three regions. This body of law includes several legal rules dealing with protection, use and management of the environment, such as water and air protection, waste management and forest protection. The word environmental responsibility has a lot of importance in Belgium (Actualité du droit Belge, 2014).

Regarding income and social inequalities, poverty reduction is one of the top objectives in Belgium even if income inequalities do persist. Even if Wealth across the country is on the rise, it is more and more concentrated amongst a few privileged people. However, when comparing Belgium to Europe, it ranks amongst the highest in terms of income inequalities. Its indicators such as the Human development index (HDI) are better than in most other countries. When looking at social protection, Belgium has good results. These are mainly due to the country's very robust social protection system and its strong social cooperation in the regions. However, it is also important to notice that while revenues are stable across the entire

population, there are still large variations among regions and segments of population (Metro, 2018).

C.1.2. ISEW

C.1.2.1. Methodology

The starting point of Bley's methodology was that of the UK ISEW created by Jackson et al (1997). The development of the methodological framework for the Belgian index is then made by this previous study with some adjustments, in order to overcome problems linked to data availability (Bleys, 2007).

First of all, the methodology Bleys used can be summarized as follows. The personal consumption expenditure is the starting point for the measurement of the index. Then in order to understand how income inequalities affect welfare, the Atkinson Index ($\epsilon=0.8$) is used to measure it. This index is based on after tax per capita income data. After that, the author estimates the value of household work based on the time spent on it, valued at an average wage rate of the domestic workers and also adding the non-defensive public expenditure. Subsequently, the defensive public expenditure on health and education, the costs of environmental degradation and the depletion of natural capital are subtracted. Finally, some capital adjustments are made in order to correctly deal with consumer durables, net capital growth and also the change in the net international investment position of Belgium. In conclusion, the ISEW is composed of a series of adjustments made to personal consumption expenditure. The basic methodology will be elaborated in detail later; it is summarized in Figure 4.

The ISEW was calculated from 1970 to 2004 because of data availability. Figure 5. details how Bleys (2006) computes each element of the ISEW. Gathering data for years prior to 1970 created some difficulties because national accounts in Belgium were digitalized from this point. Moreover, According to Bleys (2006), both social and environmental data required certain creativity in order to be measured and to extend the time series of available information and data.

Figure 4: Basic methodology used by Bleys

Source: Bleys, 2007

ISEW = personal consumption expenditures
 – losses from income inequality
 + value of domestic labour
 + non-defensive public expenditures
 – defensive private expenditures
 – costs of environmental degradation (direct and long-term)
 – depletion of natural capital
 + capital adjustments

Figure 5: Summary of adjustments for the Belgian ISEW

Source: Bleys, 2007

Table 1 – Summary of adjustments for the Belgian ISEW			
Item	Impact	Rationale	Methodology
Personal consumption expenditures	+	Personal consumption expenditures	From national accounts
Losses from income inequality	–	Welfare effects of income inequality	Atkinson index ($\epsilon=0.8$) based on after tax per capita income data (deciles)
Value of household work	+	Value of domestic labour	Time spent on household work valued at the average wage rate of a domestic worker
Services from durable consumer goods	+	Capital adjustment	20% of estimated stock of durable consumer goods
Public expenditures on health and education	+	Non-defensive public expenditures	Half of government expenditures on health and education
Private expenditures on health and education	–	Defensive private expenditures	Half of private expenditures on health and education
Expenses on durable consumer goods	–	Capital adjustment	From national accounts
Costs of commuting	–	Defensive private expenditures	Percentage of private transportation costs that can be attributed directly to commuting activities
Costs of personal pollution control	–	Defensive private expenditures	Average cost to households of waste processing facilities
Costs of car accidents	–	Defensive private expenditures	Property damage and insurance administrations costs of car accidents
Costs of water pollution	–	Environmental degradation (direct)	Rescaled US point estimate for 1972 spread over study period using an index of the quality of surface water for Belgium
Costs of air pollution	–	Environmental degradation (direct)	Emissions of different types of air pollution are valued using estimates of the related marginal social costs
Costs of noise pollution	–	Environmental degradation (direct)	Estimated costs of noise from road traffic
Loss of farmlands	–	Natural capital depletion	Cumulative portion of farmland loss attributable to urbanization valued at an estimate of the forgone benefits
Depletion of non-renewable resources	–	Natural capital depletion	Primary fuel consumption is valued using a replacement cost factor that increases over time
Costs of climate change	–	LT environmental degradation	Cumulative carbon dioxide emissions are valued at an estimate of their marginal social cost
Costs of ozone depletion	–	LT environmental degradation	Cumulative CFC consumption estimates are valued at a fixed estimated unit cost
Net capital growth	+/-	Capital adjustment	5-year rolling average of the changes in the net capital stock adjusted for fluctuations in the number of people employed
Change in net international position	+/-	Capital adjustment	5-year rolling average of the changes in the net international investment position

According to Bleys (2006), there are seven important steps in order to measure ISEW. Each step is composed of sub-steps. The summary of this methodology can be found in Figure 5, where all items are elaborated, based on their impacts and their methodology.

The first step of this methodology is personal consumption (PCE). As said before, this element is considered as the key one within the GPI methodology. Bleys (2006) has found data on PCE from the Belgian national accounts and this data was available on the website, BelgoStat.

Secondly, loss from income inequality is taken into account. As the distribution of income has an important impact on Belgian welfare, the PCE are weighted according to some income distributions. The index used for these income inequality measurements is the Atkinson index. This index is different from the GINI index because it does not only reflect the difference of distribution among different groups, but also the preference of a nation for less or more equality. As Bleys (2006) explained, this preference is named as the parameter e and represents the total amount of money a nation is willing to lose in the process of transferring money from wealthy people to poor ones. In Belgium the value for this “ e ” is 0,8. After the measurement of income inequalities, the PCE is adjusted in order to take into account the losses from these income inequalities (Bleys, 2006).

Thirdly, domestic labour is considered for the calculation. In order to value household work, two methods exist. As unpaid household work contributes largely to the economic welfare, it has to be included in the measurement. However, with both valuation methods some problems can arise. The first one is working with opportunity costs, but this method is very hard to defend from an economic welfare standpoint. The second method, the one used by Bleys (2006), is using market prices. For this method, two options are possible as valuing the inputs or the outputs of household labour. Bleys (2006) opted for the valuation of household labour with inputs as its basis. He then measured the number of hours spent on household labour rather than what they produced during those hours (Bleys, 2006).

Then, non-defensive public expenditures need to be measured. These expenditures are added to the GPI and are related to health and education. In the GDP’s methodology, most public expenditure is not considered to raise the economic welfare, but GPI does consider it. From an economic welfare point of view, expenditures linked to health and education represent consumption and investments. For the purpose of GPI’s measurement, half of the expenditure on health and education is included, having been found on the website BelgoStat. However, as

Bleys (2006) said, more accurate data and methodology regarding the non-defensive public expenditures are required.

Fourthly, Bleys (2006) considers the defensive private expenditures for the measurement of GPI. It is an important part of personal expenditure, which does not contribute to the well-being and welfare of a nation. This element is composed of four different sub-elements. Firstly, the costs of commuting linked to the modern urbanisation. More and more travel, is needed to maintain the economic activity, subsequently having a cost on welfare. Secondly, the costs of personal pollution control linked to personal expenditure on pollution abatements and controls (for example the personal expenditure on an air filter). Then, the costs linked to car accidents as well as, the cost of noise pollution.

Fifthly, the next step is linked to the costs of environmental degradation and is divided into four points. Firstly, there is some costs linked to water pollution. For this element, no data exists regarding the costs. Bleys (2006) used the US water pollution cost that had already been calculated in the past and matched it to Belgium's ISEW. He then used the Belgian Biotic index to verify the quality of surface water. Secondly, Bleys (2006) also measured the costs of air pollution. Seen the limitation of data availability concerning air pollution costs, the valuation method used to measure this element was used to evaluate four types of pollutants (NO, PM and NVMOS) based on their marginal social costs. Thirdly, there is also some costs linked to climate change. As human activity places some pressure on the environment, these costs cannot be neglected. Even if there is no agreement whether taking the costs on the future generation into account today, Bleys (2006) has decided to measure it for its ISEW. In order to give a value to the costs of climate change, the author took historical data on the CO₂ emissions for Belgium from the national institute of statistics. The author used them in order to value the actual costs of CO₂ emissions by their marginal social cost. He thought that this method would be the least arbitrary and more conservative. Finally, there is a certain cost linked to the ozone depletion (Bleys, 2006).

Moreover, the natural capital depletion is also taken into account with the loss of farmland, the depletion of non-renewable natural resources. And Finally, there are some capital adjustments which have to be made within the methodology of the Belgian ISEW: the treatment of durable consumer goods, the net capital growth and the change in net international investment position (Bleys, 2006)

All of these steps create the ISEW for Belgium, by adding and subtracting elements.

C.1.2.2. Graphs and results

In order to compare GPI and GDP of Belgium, data provided by Bleys (2007) has been used and graphs have been created. Figure 6 represents the GPI and the GDP per capita expressed in constant euros 2000. Figure 7 also represents GPI and GDP per capita but expresses in index 100. Finally, euros 2000 have been converted into US \$ 2012 in figure 8, for later comparison with other countries.

Figure 6: GPI/GDP per capita euros 2000

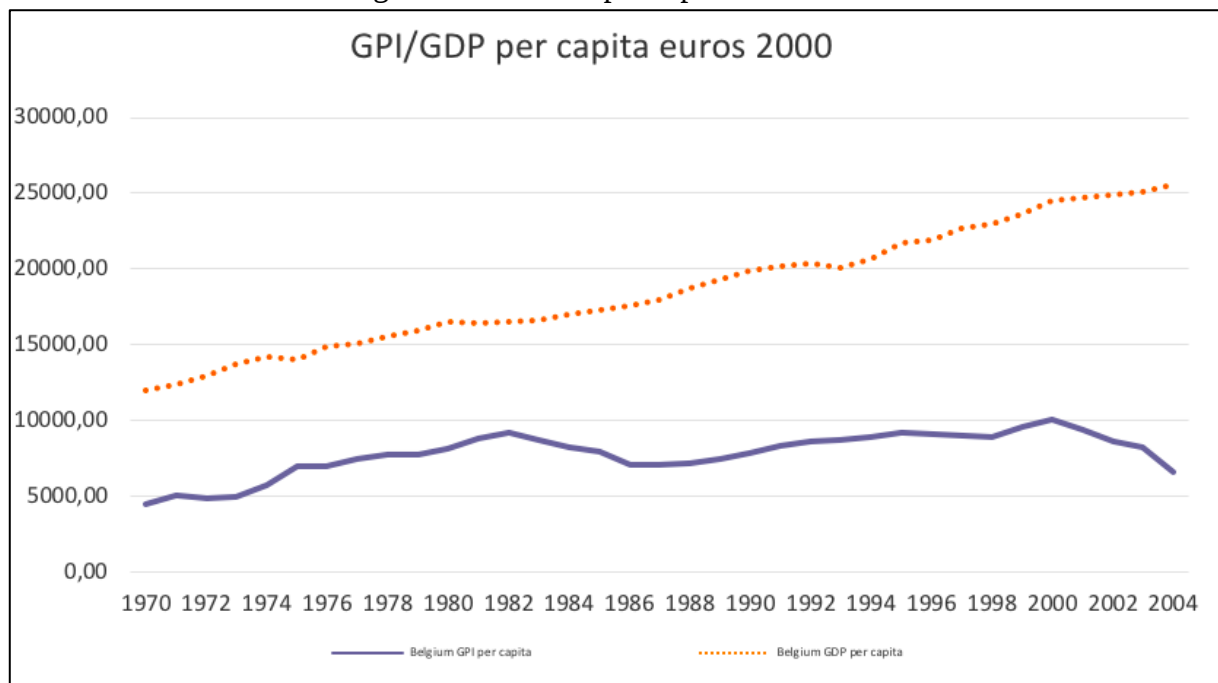


Figure 7: GPI/GDP per capita Indice 100

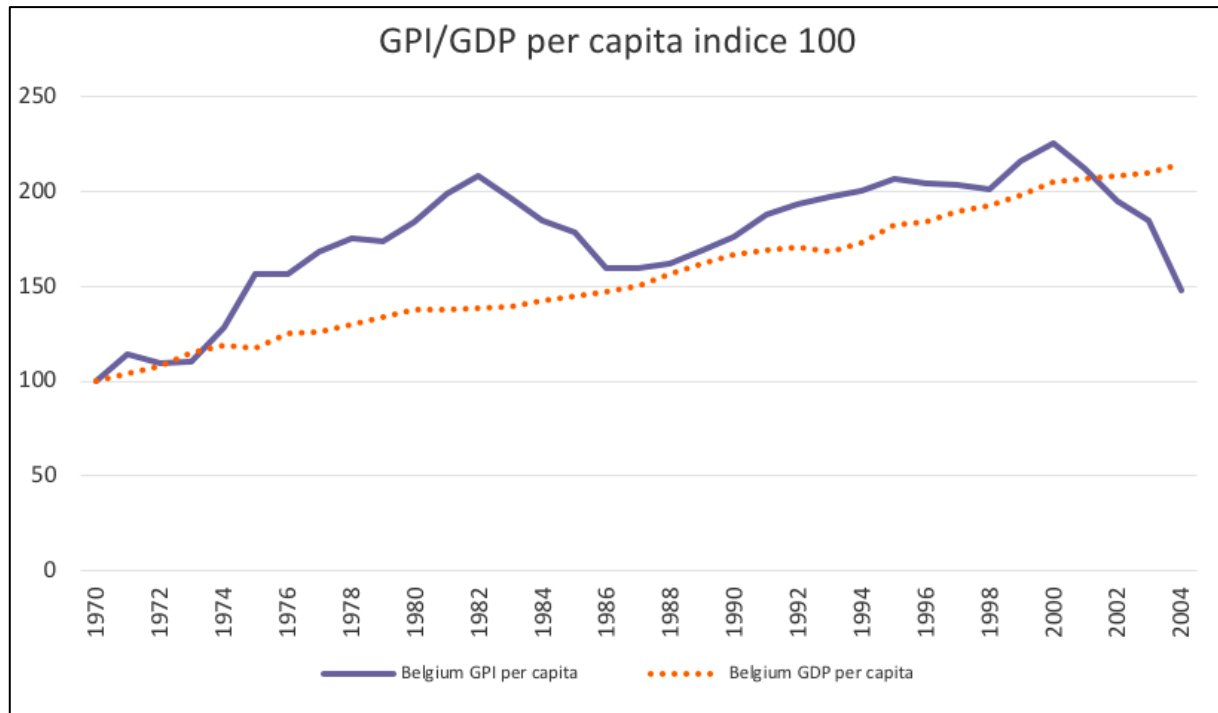
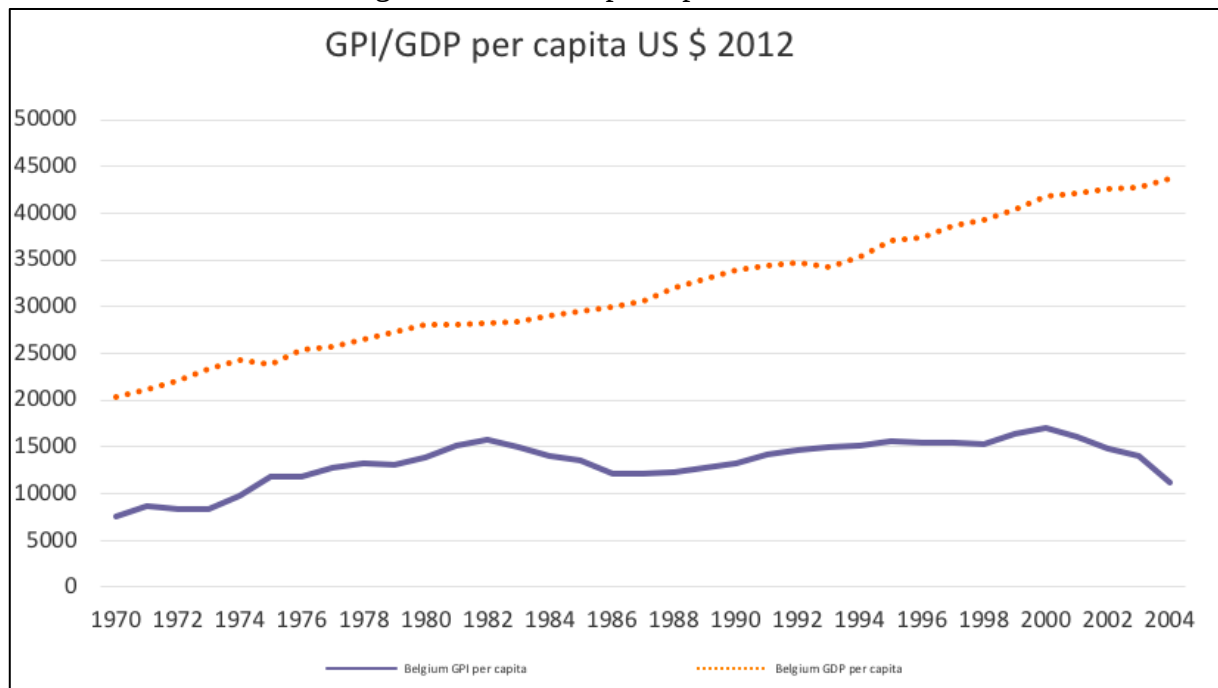


Figure 8: GPI/GDP per capita US \$ 2012



When analysing the graphs, certain points have to be highlighted. First of all, the GDP has shown an almost continuous increase from 1970 to 2004, even if there were some variations over the period selected (only in 1975, 1981 and 1993 GDP fell). ISEW had two relatively long

periods of increase and some shorter periods of sharp decrease. When comparing their growth from 1970 to 2004, GDP showed a growth rate of 114% and GPI of 48%.

Concerning ISEW's details, there are certain driving forces behind the two periods of decline. Economically speaking, in 1980, the net capital growth decreased due to economic welfare recession. Environmentally speaking, the cost of the depletion of the ozone layer rose with the increase of CFC's in the atmosphere and the cost of the depletion of natural resources also increased.

The major significant items which influenced ISEW are negative however, there are some positive ones. The positive items are private consumption expenditure and household labour. The negative ones are the depletion of natural resources, the long-term effects on the environment and the loss of income inequality. These negative elements have increased over the years and it is important to notice that all of these items are not equally important.

When comparing GPI per capita to GDP per capita, it can be noted that the gap between the two has increased over the years and has drastically increased over the last decades. This is true in absolute value (Figures 6 and 8) but not in relative terms (Figure 7), where the growth rate of ISEW and GDP is fairly similar over some time periods such as, in the 90s (even though it was no longer the case at beginning of the 21st century). Until 1980, the two curves had the same trends. However, after this point, they were no longer and from 2000, ISEW began to decrease. This confirms the threshold hypothesis and could be clarified by two points. Firstly, this period of decrease can be explained by a market decrease in Belgium's net international investments' position and a decline in net capital growth (Bleys, 2007). This growing divergence between the two allows to conclude that production and consumption have not always set in motion an increase in well-being. In fact, these increases in economic growth have not always resulted in an increase in welfare, more specifically after 2000.

C.2. Australia

C.2.1. OECD country

Australia is a sovereign country composed of the Australian continent, the island of Tasmania and other smaller islands. This country is surrounded by Papua New Guinea, Indonesia and

New Zealand. It covers an area of 7.692.024 square kilometres and has a population of 25.324.400 inhabitants. Its capital city is Canberra and its largest city is Sydney. There are also major cities, including Melbourne, Brisbane and Perth. Australia maintains a stable liberal democratic political system that has a federal parliamentary constitutional monarchy with six states and ten different territories. Its GDP in 2018 was approximately one and a half trillion dollars and its annual growth between 2017 and 2018 was 2.3%.

Australia is a synonym for diversity given its variety of landscape (deserts, rainforests, mountain ranges) and also its population density remains amongst the lowest on the entire planet. Australia is a developed country with a high-income economy, its revenues coming from exportations, telecommunications, banking etc. It is part of the Organisation for Economic Co-operation and development (OCDE) (ABS, 2019).

Issues regarding the environment are extremely present in Australia. In some areas, the temperate zones and coastal ecosystems have already been drastically altered. Many wetlands have also already been degraded. Climate change is extremely present in this area of the globe and has resulted in a severe decline in the distribution of species, as well as a reduction of natural resources. It also faces deforestation, agriculture overgrazing, overfishing and pollution (Panda, 2018). However, Australia benefits from its environmental protection and Biodiversity conservation act, which lists eight matters of national environmental significance such as, the world heritage properties, the protection of migratory species and the commonwealth marine areas (Panda, 2018).

When considering well-being, Australia has the third highest human development index and is ranked among the most democratic countries in the world. The country is reputed for its high quality of life, its education and health. However, in terms of income inequality, there are many disparities. For example, the population in the highest 20% of the income scale resides in a household with five times as much income, as someone in the lowest 20% of the income scale (Acoss, 2018).

C.2.2. ISEW

C.2.2.1. Methodology

Concerning Australia, the methodology of Kenny et al (2019) is used in order to measure the GPI. As seen in Figure 9, the method used to calculate ISEW is different from the one used by Bleys (2007) for Belgium. As a matter of fact, each country has its own specifications and points to take into accounts. For example, in contrast to Belgium, Australia's ISEW measures the cost of unemployment, transport accidents, the loss of native forests, as well as the cost of crime, etc.

Figure 9: Components of Australia GPI

Source: Kenny et Al, 2019

Column name	Description of indicator
A Personal consumption	+ Private final consumption expenditure
B Income distribution	Share of lowest quintile in total income
C Weighted personal consumption	Personal consumption weighted by index of changing income distribution
D Public consumption expenditure (non-defensive)	+ Value of non-defensive government consumption spending
E Value of household and community work	+ Hours of household and community work performed each year valued by the housekeeper replacement method
F Costs of unemployment	- Value of hours of idleness of the unemployed
G Costs of underemployment	- Value of hours of idleness of part-time employees who want to work full-time
H Costs of overwork	- Value of hours of work done involuntarily
I Private defensive spending on health and education	- Health and education spending that offsets declining conditions
J Services of public capital	+ Contribution of public investment in non-defensive works (eg. roads)
K Costs of commuting	- Time spent commuting valued at opportunity cost
L Costs of noise pollution	- Excess noise levels valued by cost of reducing noise to acceptable level
M Costs of transport accidents	- Costs of repairs and pain and suffering
N Costs of industrial accidents	- Costs of pain and suffering etc.
O Costs of irrigation water use	- Damage to environment measured by the opportunity cost of environmental flows
P Costs of urban water pollution	- Damage to environment measured by the control cost of improving water quality
Q Costs of air pollution	- Damage to humans and environment from noxious emissions measuring mainly by health costs
R Costs of land degradation	- Costs to current and future generations from soil erosion etc. measured by forgone output
S Costs of loss of native forests	- Environmental values denied to future generations measured by willingness to pay
T Costs of depletion of non-renewable energy resources	- Costs of shifting from oil and gas to renewables
U Costs of climate change	- Annual emissions valued by future impacts on humans and environment
V Costs of ozone depletion	- Annual emissions valued by future impacts on humans and environment
W Costs of crime	- Measured by property losses and household spending on crime prevention
X Net capital growth	+ Growth in net capital stocks per worker
Y Net foreign lending	- Change in net foreign liabilities

Although detailing each point of Belgium's ISEW, it was deemed unnecessary to do the same for Australia, but when looking at figure 9, it can be understood what points are taken

into account for GPI's measurement and how it is valued. It started from private consumption expenditure and then has subtracted or added economic, social and environmental factors. In measuring GPI, Kenny et al (2019) were interested in flows (the net annual change in different capitals).

C.2.2.2. Graphs and results

For Australia, data was taken from Kenny et al (2019). Graphs have been based on that. The data was already expressed in US \$ 2012 therefore, it was unnecessary to convert it. Figure 10, represents the GPI and GDP per capita in US \$ 2012 and Figure 11, represents the same but indexed at 100 for the base year.

When analysing Figure 10, it can be seen that GPI shows a modest but steady increase over time. GDP increased from 1962 to 2012 with few variations over time. For example, following the financial crisis in 2008, the GDP slightly decreased, whilst the GPI increased. This shows that the effects of industries were smaller in that period.

Even if the threshold point is not verified here, it can be seen that the gap between GPI and GDP per capita increased both in absolute (Figure 10) and relative (Figure 11) terms. This entire period is called “uneconomic growth” because at all points, GDP exceeds GPI (Kenny et al, 2019). On figure 11, GPI is in the majority increasing, but far less compared to the GDP.

In order to determine what are the important effects on GPI, three distinct directions need to be studied, the economic, environmental and social directions. The central positive impacts on GPI were rising personal consumption expenditure and the higher value attributed to the social indicators of volunteer work. The most significant negative ones were the cost of non-renewable resources depletion, along with the cost of climate change.

When discussing the three key directions of GPI, particular comments need to be made. Firstly, economic trends make up the largest proportion of the GPI and are consistently positive. Environmental trends have contributed negatively to the GPI and the highest costs are those of climate change and of non-renewable resources depletion. Regarding the cost of ozone depletion, it has decreased since the signing of the Montreal protocol and the removal of

Chlorofluorocarbons (CFC's) from production in 1987. Other costs such as air and water pollution have also risen but, at a much lower rate than the previously. Socially speaking, this element remains stable. The higher social positive impact is the value of housework and the negative, is the cost of commuting (due to transport planning issues in Australia).

It is also important to take into account that Australian economists, such as Kenny et al have faced many problems with data availability and moreover, specifically with environmental indicators. They have made certain assumptions for the missing data.

In order to conclude the analysis of Australia's GPI and GDP, it can be said that Australia could be heading in the right direction. There is much to be done to improve Australian societal well-being, but still it has increased. Inevitably, further investigations need to be carried out to confirm this assumption.

Figure 10: GPI and GDP per capita US \$ 2012

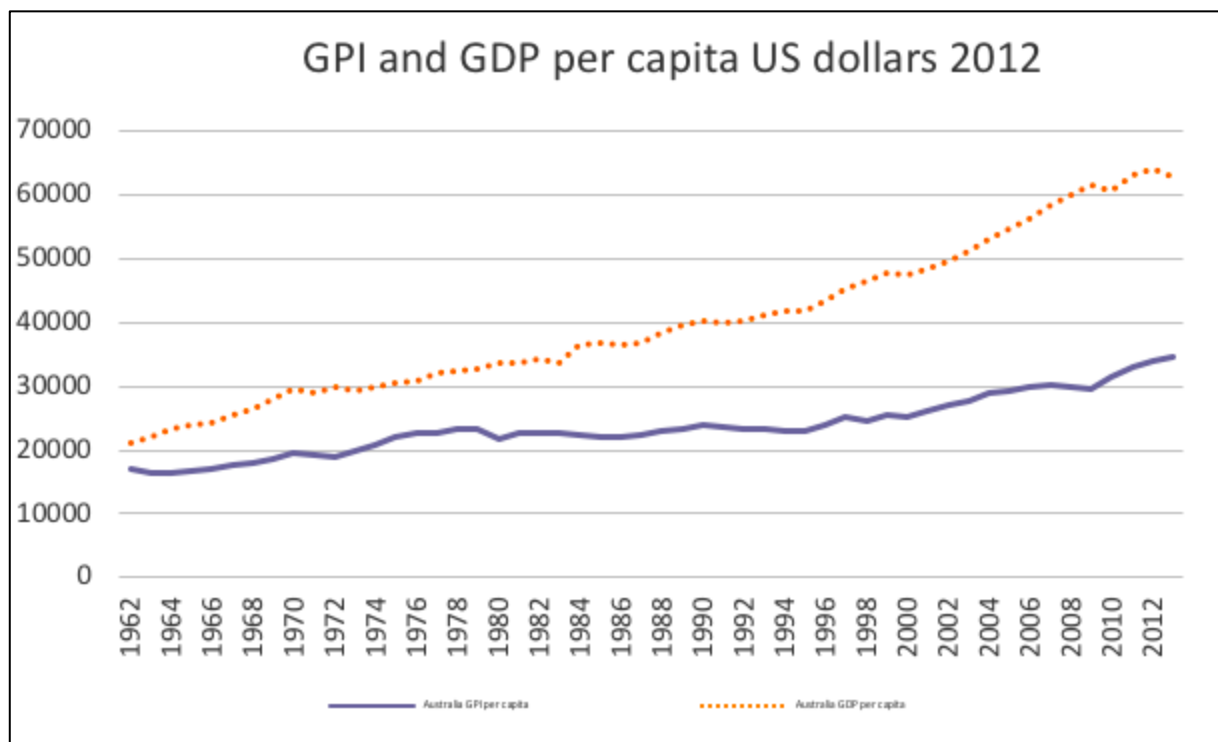
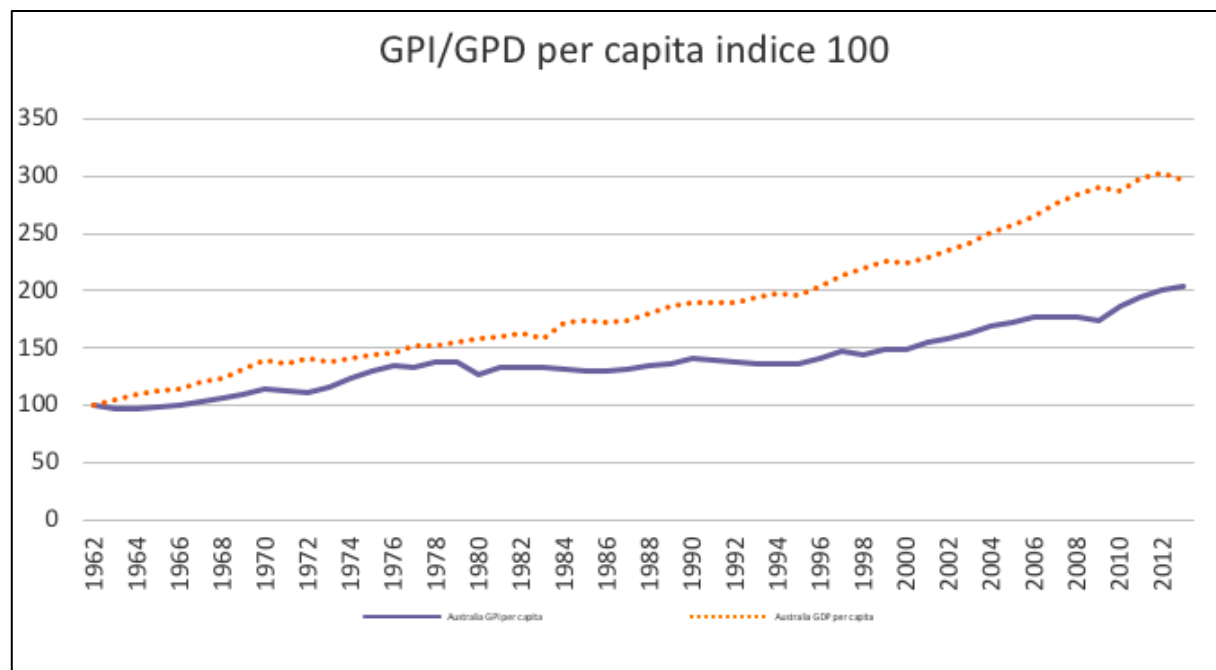


Figure 11: GPI and GDP per capita indice 100



C.3.Thailand

C.3.1. Developing country

Thailand is a Kingdom located in the centre of the South Asian Indochinese peninsula. It is composed of 76 provinces, with 68 million people and covers an area of 513,000 squared kilometres. Its capital is Bangkok but other cities such as Phuket are also vital for the economy and tourism. It borders Myanmar, Laos, Cambodia and Malaysia. Although Thailand is officially known as a unitary parliamentary constitutional monarchy, the military dictatorship is well implemented there with the military junta. Economically speaking, Thailand is considered as the second largest economy in South Asia and is classified as a newly industrialized economy. Its main revenue comes from tourism and agriculture, and GDP was estimated around 490 billion US dollars in 2018. Geographically speaking, Thailand is comprised of several distinct areas which roughly correspond to its provincial groups. Mountainous areas can be found in the north of the country, and flatter landscapes near the sea, are located in the South (World Bank, 2019).

Since the 1970s, Thailand has enacted laws in order to protect the nation's environment and natural resources. It also tries to focus on social and economic developments. Although its performance regarding ecology is improving, it is still considered as mediocre. Air quality is

very poor, having strong environmental effects on the agriculture industry. Furthermore, CO2 emission levels are increasing. Its rapid economic growth is not in line with the protection of the environment, but the enforcement of environmental laws is becoming a priority (Just Laws and consult, 2018).

Socially speaking, Thailand has the largest wealth gap in the world according to Credit Suisse. Indeed, only 1% of the total Thai population controls more than 67 % of the entire country's wealth. Thailand is then ranked as one of the most unequal countries in the world with Russia, Turkey and India. What is even more alarming is that this wealth inequality continues to grow drastically (Asean today, 2019).

C.3.2. ISEW

C.3.2.1. Methodology

Regarding Thailand's methodology to calculate ISEW, the focus of the research undertaken, is by Clarke and Islam (2005). The methodology is quite similar to the previous two cases, as can be seen in Figure 12. Indeed, the authors start from personal expenditure and then have added and subtracted some elements. As previously stated, Thailand differs from other countries because it is not a developed country. As a developing country, Thailand has different specifications. What differs from others is the fact that Thailand's ISEW considers the costs of debt, and commercial sex work. As a matter of fact, certain adjustments within ISEW have been made to fit for this particular nation (Clarke and Islam, 2005).

Figure 12: Summary of adjustments
Source: Clarke and Islam, 2005

Item	Positive/negative	Rationale	Methodology
Personal Consumption		Basis of ISEW	From Thai National Statistics Office (NSO) (1997, 1999)
Income Inequality		Accounting for inequality	Equally distributed equivalent level of income Atkinson's (1970)
Adjusted Personal Consumption		Adjusted base for index	
Public Expenditure on Education	Positive	Adding in non-defensive expenses	75% of public expenditure on education due to low base (NSO, 1997, 1999).
Public Expenditure on Health	Positive	Adding in non-defensive expenses	75% of public expenditure on health due to low base (NSO, 1997, 1999).
Commuting	Negative	Subtracting costs for time lost	US\$219 per car calculated in 1990 extrapolated to cover all years (Tanaborrboon, 1990)
Urbanisation	Negative	Subtracted for defensive private expenditure	18% of Bangkok personal income is spent for access to clean water and air (World Bank, 1999)
Private Expenditure on Health	Negative	Subtracted for defensive private expenditure	50% of all private health expenditure (Cobb and Cobb, 1994; NSO, 1997, 1999)
Public Expenditure on Roads	Positive	Accounting for services not included in public expenditure	50% of all public expenditure on roads (Daly and Cobb, 1990; NSO, 1997, 1999)
Consumer Durables	Positive	Accounting for services not included in public expenditure	10% of expenditure on private consumer durables (Daly and Cobb, 1990; NSO, 1997, 1999)
Corruption	Negative	Subtracting for unaccounted political costs to society	0.0088% of GDP (1975–1981), 0.0074% of GDP (1982–1988), 0.007% of GDP (1989–1999) based on Phongpaichit and Piriyaarangsarn (1994)
Debt	Negative	Subtracting for unaccounted political costs to society	50% of interest paid on public Debt (NSO, 1997, 1999)
Air Pollution	Negative	Subtracting costs of environmental damage	Costs of pollution abatement for CO ₂ , CO, NO _x , SO _x , SPM (Guenno and Tiezzi, 1998; Dept of EDP, 1990).
Water Pollution	Negative	Subtracting costs of environmental damage	Costs of cleaning water is 7.5 baht per kilogram of Biochemical Oxygen Demand (BOD) (Phansawas et al., 1987; TESCO, 1993; Dept of IW, 1986)
Noise Pollution	Negative	Subtracting costs of environmental damage	1% of GNP (Daly and Cobb, 1990; NSO, 1997, 1999)
Deforestation	Negative	Subtracting costs of environmental damage	886 baht per hectare of forest lost is cost of soil erosion (Panayotou and Parasuk, 1990)
Long Term Environmental Damage	Negative	Subtracting costs of environmental damage	Estimated damage for each tonne of carbon emissions is 21.59 baht (Nordhaus, 1991; Dixon, 1999)
Commercial Sex Work	Negative	Unaccounted costs to spiritual system	3% of GNP (Phongpaichit et al., 1998; NSO, 1997, 1999)

C.3.2.2. Graphs and results

In order to have complete and detailed data about ISEW, two different studies have been combined. The data of Clarke and Islam (2005) was used as the basis, and then extra data was added from Costanza et al (2004). Firstly, data from 1975 to 1999 was sourced and then the ISEW was measured for the following years 2000, 2003 and 2005 from Costanza et al (2004). In order to have comparable data, it was converted from US \$ 2005 into US \$ 2012 with the rate of 1,17 (CPI, 2019).

When analysing Figure 13, it can be said that GDP showed a constant increase apart from 1995 to 1999, due to economic recessions. After 1999, GDP significantly accelerated. GPI

on the graph increased at a lower rate than GDP and showed some decrease from 1999. They are many variations and divergences in the two trend lines and the gap between GPI and GDP has increased over time. However, it is also important to notice that GPI levels were already particularly low in 1975 (Clarke and Islam, 2005).

When looking only at Figure 13, it can be noted that Thailand is considered as a poor case. However, when looking at Figure 14, the level of growth of GPI is reasonable (apart from 2003). It is low, but the evolution is sound.

Finally, we can also say that in absolute terms, Figure 13 confirms the threshold hypothesis. An increase in economic growth cannot always lead to higher welfare. However, further studies on multiple developing countries have to be made in order to confirm this allegation.

Figure 13: GPI and GDP per capita US \$ 2012

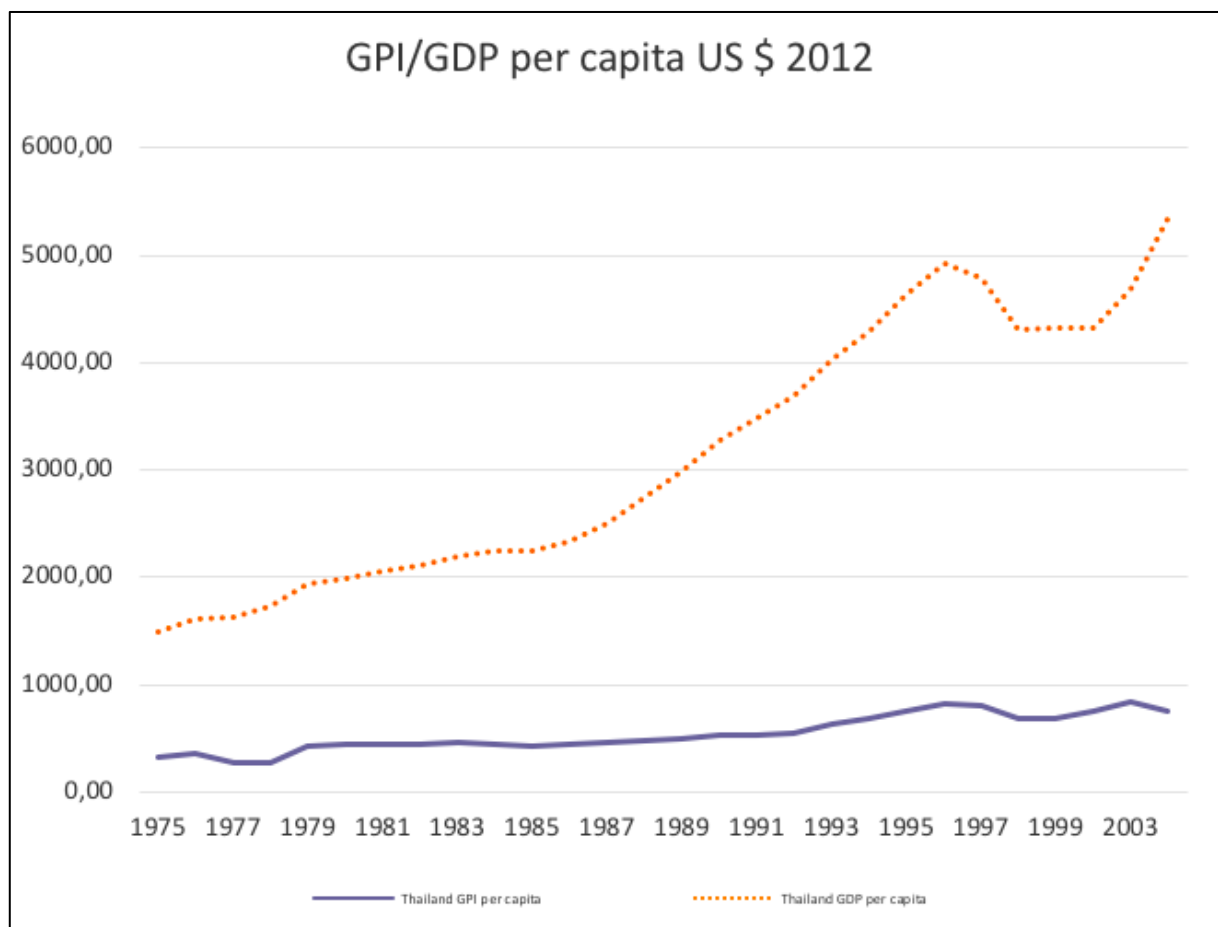
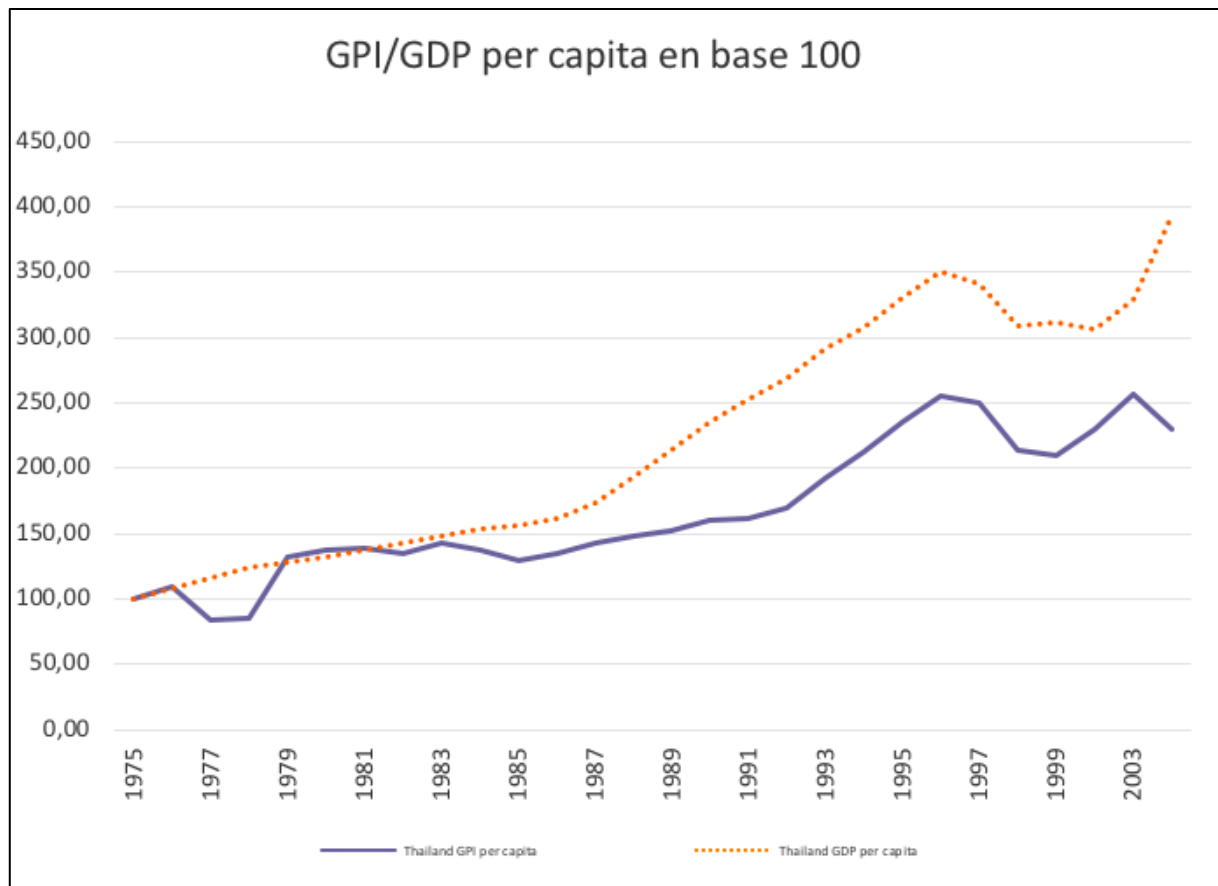


Figure 14: GPI and GDP per capita indice100



C.4.Chili

C.4.1. Developing country

Chili is located in South America occupying a long tight strip of land between the Pacific Ocean to the west and the Andes to the east. It is surrounded by Peru, Bolivia and Argentina. Its principal language is Spanish, and its capital city is Santiago. It covers an area of 756.096 square kilometres and has a population of 17.570.003 inhabitants. The Chilean constitutional republic is composed of a president, a national congress, a senate and a chamber of Deputies. Referenced as a prosperous nation, this country is part of the most economically and socially stable in South America, with a GDP nominal of 305 billion US dollar in 2018. Chili is attempting to reinforce its own competitiveness and income per capita. This developing country is part of the OECD (World Bank, 2019).

Environmentally speaking, Chili has an environmental programs department dealing with ecological matters. The main significant environmental issues are deforestation, soil

erosion, as well as, air – water – land pollution (National Encyclopedia, 2009). However, according to the United Nations (UN) environment (UN environment, 2019), Chile is taking action on air pollution. Indeed, as air pollution is part of the major environmental challenge, Chile is trying to tackle this issue strategically. Secondly, Chile is committed to the clean seas' campaign in order to introduce legislations, regarding plastics bags in coastal cities. Furthermore, in terms of ecological transformations, it wants to implement transparent laws which encourages participation and free access to environmental justice (UN environment, 2019).

Socially speaking, on November 2nd, 2011 the United Nation's released its Human development report for Chile. It was explained that 75% of the total wealth went to the 10 % of the richest people. Even if local media and politicians tend to omit who benefits from growth, according to the UN and some statistics, the majority of Chileans are not represented by this growth (OECD, 2017).

C.4.2. ISEW

C.4.2.1. Methodology

For this country, the focus of research is based on two studies. The paper written by Castadena (1998) and along with that of Kubiszewski et al (2013). They have both measured ISEW for Chile, and Kubiszewski et al (2013) have used data from Castadena (1998). Their results are then the same, as well as their methodologies.

When analysing the summary of Chile's ISEW methodology in Figure 15, it can be seen directly that even if some items differ from prior countries' methodologies, the base is the same. They have started from the personal consumption and then added or subtracted some elements. This methodology is very similar to that of Thailand's methodology, due to the fact that costs of crime and loss of farmlands were also subtracted.

Moreover, its specific methodology for each item on Figure 15, can also be considered. For example, in order to measure household work, Castadena (1998) looked at women's wages and multiplied it with the workforce dedicated to domestic labour. In addition, in order to measure the costs of crime, he extrapolated costs using the number of crimes during that period.

This difference in methodology is linked to the fact that Chile is a developing country, thereby having different specifications from those of westernised developed countries.

Figure 15: Summary of ISEW methodology

Source: Castadena, 1998

Item	Pos./Neg.	Rationale	Methodology
Consumer expenditures (A)		Basis for the index	From Chilean National Accounts
Income distribution (B)		Accounting for income inequality	Gini coefficient
Weighted personal consumption	A/B	Adjusted base for the index	
Services from domestic labor	+	Incorporate non-monetarized contribution to welfare	Women's wages times workforce dedicated to domestic labor (Universidad de Chile, 1989a; INE, 1965–1996)
Services from consumer durable	+	Accounting for service value of consumer stock	22.5% of total expenditures on durable (Banco Central de Chile, 1983; Universidad de Chile, 1989b)
Services from street and highways	+	Accounting for service provided not included in personal consumption	6% of GDP on transportation and communication (10% depreciation, 64% non-commuting, of which 10% is real service to the consumer (Banco Central de Chile, 1983)
Public expenditures on health and education	+	Adding in non-defensive expenses	Half of the government final consumption on education and health (Banco Central de Chile, 1983)
Expenditures in consumer durable	–	Accounting for defensive expenditures on stock replacement	Total expenditures on consumer durable (Banco Central de Chile, 1983)
Private expenditures on health and education	–	Accounting for defensive expenditures	Half of the private expenditures on health and education (Banco Central de Chile, 1983)
Cost of commuting	–	Subtracting defensive private expenditures	36% of total expenditures on personal travel in 1994 (Zegras, 1997)
Cost of car accidents	–	Subtracting defensive private expenditures	US average values per accident times number of car accidents in Chile (INE, 1965–1996)
Cost of crime	–	Subtracting defensive private expenditures	1994 cost extrapolated using number of crimes (Guzman, 1994)
Cost of water pollution	–	Subtracting cost of environmental damage	1992 cost of imputed cases of Typhus fever, extrapolated using number of imputed cases. (Fereccio et al., 1994)
Cost of air pollution	–	Subtracting cost of environmental damage	1992 health cost associated with increases in PM10, extrapolated using amount of PM10 (Ostro et al., 1994)
Cost of noise pollution	–	Subtracting cost of environmental damage	Omitted
Loss of wetlands	–	Accounting for loss in natural capital	Omitted
Loss of farmland	–	Accounting for loss in natural capital	Productivity (Ag GDP/total Ag surface) times 1000 ha lost each year due to urbanization minus 1% of total Ag land that is consider eroded (Banco Central de Chile, 1983)
Depletion of non-renewable resources	–	Accounting for loss in natural capital	Cost of replacing each barrel of oil equivalent (US\$75) consumed with a renewable source (INE, 1965–1996)
Depletion of renewable resources	–		Hotelling rent (Vincent, 1996; Cloude and Pizarro, 1995; FAO, 1994, 1995)
Long-term environmental damage	–	Subtracting cost of environmental damage	Energy consumption times accumulative damage value (US\$0.50; INE, 1965–1996)
Cost of ozone depletion	–	Subtracting cost of environmental damage	Omitted
Net capital growth	+	Accounting for formation of manmade capital	Minimum capital per worker required for the next period (Banco Central de Chile, 1983)
Changes in net international position	+	Accounting for international stability	Omitted

C.4.2.2. Graphs and results

As stated before, Castadena (1998) and Kubiszewski et al (2013) were used to create the graphs. First of all, data from 1965 to 1995 was taken in pesos 1990 and converted into US \$ 2012, using the rate of 0,0021 (CPI, 2019).

Figure 16 represents the first step of the work with data expressed in pesos 1990. Here, there is a comparison of GPI and GDP per capita from 1965 to 1995. More recent information was wanted but due to issues related to data availability, this was restricted. Figure 17 represents the evolution in percentage of GPI and GDP per capita, and figure 18 represents this data converted in US \$ 2012.

When analysing results and more specifically in Figure 16, it can be said that GDP per capita has increased of 80% during a 30 year period, with an annual rate of 2,95%. On the contrary, ISEW decreased by 4,9% over 30 years and had an annual rate of -0,16%. Secondly, GDP decreased in 1970 and in 1980 due to the two recessions occurring in Chile at that time, as well as reductions in personal consumption produced were also consequences (Castadena, 1998).

When looking at ISEW in particular, it can be noted that its evolution is quite parallel to GDP from 1965 until 1985. After the second recession, Chile's GDP per capita almost doubled whilst, ISEW decreased. Indeed, ISEW grew slower than GDP as Chile's exportation is high. The most positive element influencing GPI is household labour, due to the increase of women's wages, as well as in the population. The most negative ones are linked to the environment, the depletion of natural resources and defensive costs which increased over the last five years.

Even though GDP per capita almost doubled in the last 12 years, welfare did not increase. This led to a change in the consumer's basket. Indeed, money was then spent on defensive expenditures rather than on basic needs (Castadena, 1998). When looking at Figure 17, the importance is placed on the non-exclusivity of GDP as a measure of economic welfare. In order to measure the total welfare of the population, environmental and social consequences have to be taken into account. In Chile, even if the GDP has increased significantly, it is

absolutely not the case for ISEW. It is clear that Chile is the worst example of the selected sample, with an increasing GDP and a decreasing GPI.

Figure 16: GPI and GDP per capita pesos 1990

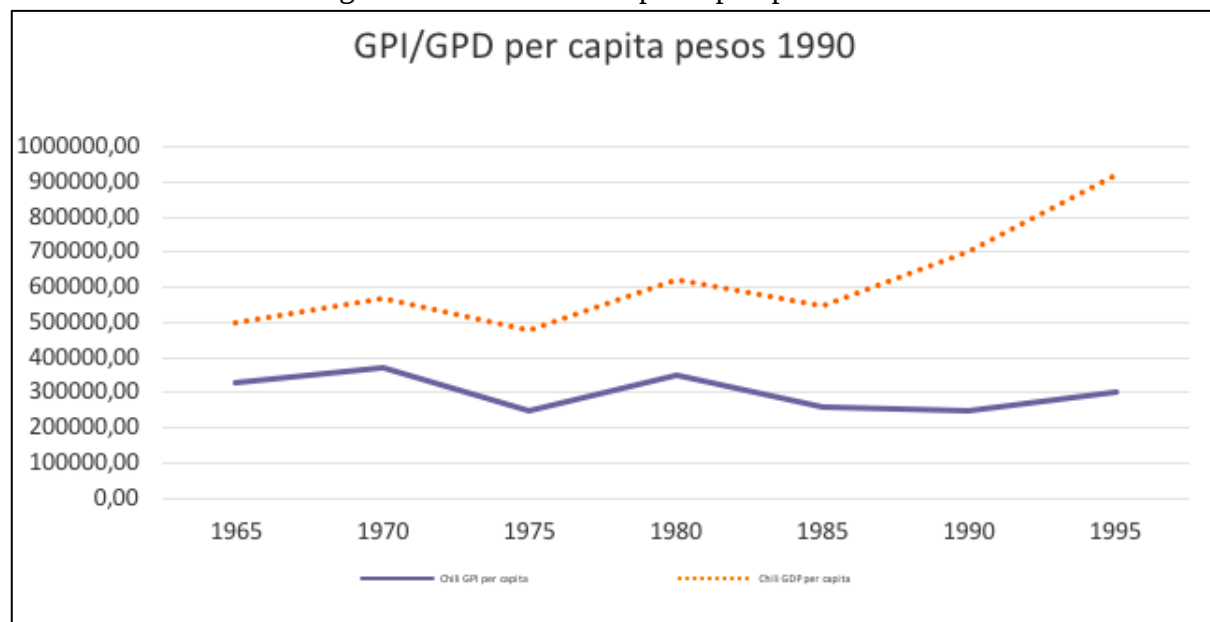


Figure 17: GPI and GDP index 100

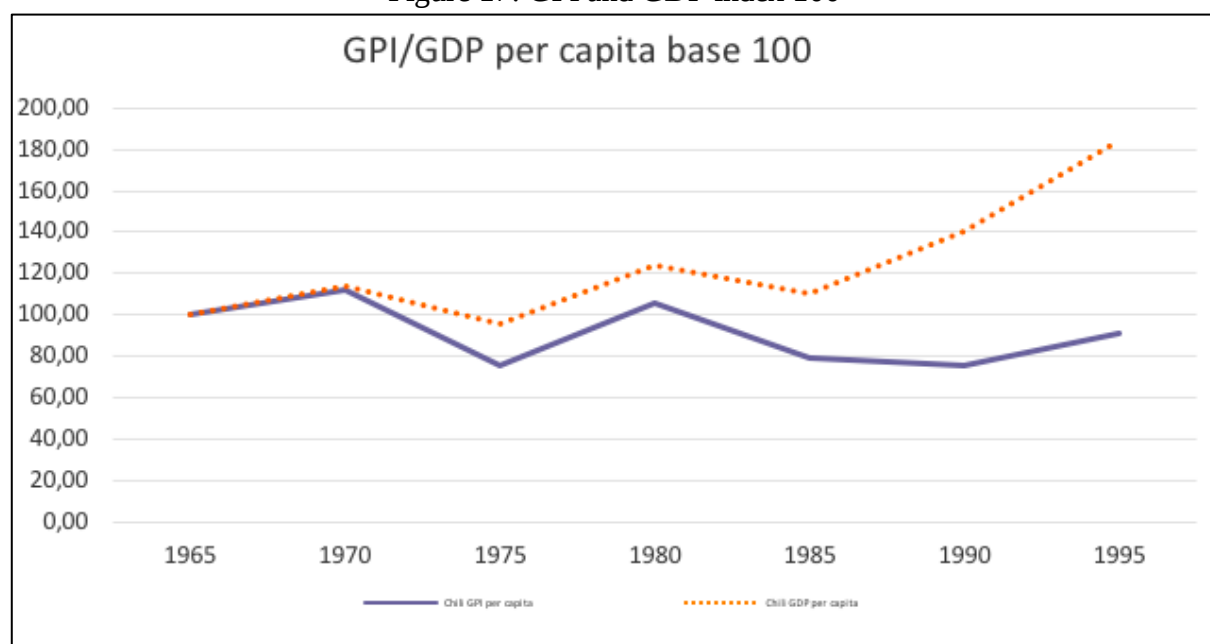
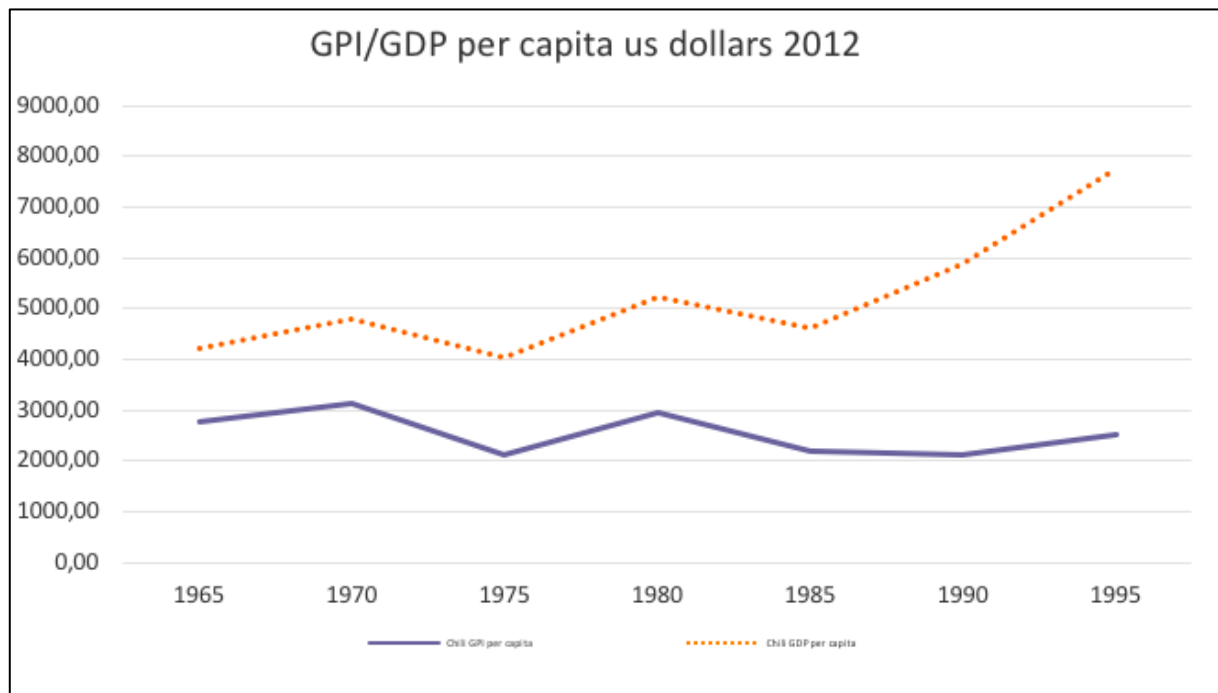


Figure 18: GPI and GDP per capita US \$ 2012



C.5. United States of America

C.5.1. North American country

The United States of America is a country situated in North America. It covers an area of 9 833 500 square kilometres and has a population of 327 167 430 inhabitants. Its political regime is a federal constitutional republic with a president. This country is composed of fifty states, Vermont being one of them. Its border countries are Canada and Mexico. Geographically speaking, this nation is diversified with a variety of fauna and flora. The capital city is Washington, with other significant cities including Los Angeles, New York and Boston. In 2019, the United States was considered as the third most populated country in the world, after China and India. Its economy is based on a pure capitalist system with high importance on industries, services and also agriculture (Cosmovisions, 2005).

Due to high living standards of Americans, environmental issues have increased. The USA is the second largest contributor to global CO₂ emissions, due to its overconsumption of food, gas and electronic commodities. Because it failed to ratify the Kyoto protocol, the USA has been significantly criticised. Moreover, American environmental policies are currently

undergoing a radical shift due to President Trump's new priorities. It must be noted that he is against global warming (Azocleantech, 2012).

Concerning income inequalities, the USA has installed a capitalism system over the years, where the rise of inequalities is affecting every region of the country. Its persistent social problem had created an enormous gap and in 2015, the top 1 % of the population in the United States made more than 25 times more money than the population in the bottom 99% did (Cnbc, 2018).

C.5.2. Isew

C.5.2.1. Methodology

The papers of Costanza et al (2004)'s and Kubiszewski et al (2013)'s have been studied for the United States of America. Then an analyse of the methodology used by them was carried out, in order to measure the ISEW. On Figure 19, their method can be followed from personal consumption to the addition and subtraction of positive and negative items.

What differs from other methodologies are the negative items subtracted. For example, in the USA's methodology, the loss of forests and also the cost of household pollution abatement have been measured and used.

After having studied the United States of America in its entirety, a particular state of it, Vermont was chosen to examine. The purpose of this analysis was to compare both GPI to see whether the national trend of US GPI was similar to that of Vermont. As will be discussed later in this section, certain differences regarding environmental policies are present.

Figure 19: Methodology for USA

Source: Costanza et al, 2004

Item	Pos./Neg.	Rationale	Methodology
Consumer expenditures (A)		Basis for the index	From Chilean National Accounts
Income distribution (B)		Accounting for income inequality	Gini coefficient
Weighted personal consumption	A/B	Adjusted base for the index	
Services from domestic labor	+	Incorporate non-monetarized contribution to welfare	Women's wages times workforce dedicated to domestic labor (Universidad de Chile, 1989a; INE, 1965–1996)
Services from consumer durable	+	Accounting for service value of consumer stock	22.5% of total expenditures on durable (Banco Central de Chile, 1983; Universidad de Chile, 1989b)
Services from street and highways	+	Accounting for service provided not included in personal consumption	6% of GDP on transportation and communication (10% depreciation, 64% non-commuting, of which 10% is real service to the consumer (Banco Central de Chile, 1983)
Public expenditures on health and education	+	Adding in non-defensive expenses	Half of the government final consumption on education and health (Banco Central de Chile, 1983)
Expenditures in consumer durable	–	Accounting for defensive expenditures on stock replacement	Total expenditures on consumer durable (Banco Central de Chile, 1983)
Private expenditures on health and education	–	Accounting for defensive expenditures	Half of the private expenditures on health and education (Banco Central de Chile, 1983)
Cost of commuting	–	Subtracting defensive private expenditures	36% of total expenditures on personal travel in 1994 (Zegras, 1997)
Cost of car accidents	–	Subtracting defensive private expenditures	US average values per accident times number of car accidents in Chile (INE, 1965–1996)
Cost of crime	–	Subtracting defensive private expenditures	1994 cost extrapolated using number of crimes (Guzman, 1994)
Cost of water pollution	–	Subtracting cost of environmental damage	1992 cost of imputed cases of Typhus fever, extrapolated using number of imputed cases. (Fereccio et al., 1994)
Cost of air pollution	–	Subtracting cost of environmental damage	1992 health cost associated with increases in PM10, extrapolated using amount of PM10 (Ostro et al., 1994)
Cost of noise pollution	–	Subtracting cost of environmental damage	Omitted
Loss of wetlands	–	Accounting for loss in natural capital	Omitted
Loss of farmland	–	Accounting for loss in natural capital	Productivity (Ag GDP/total Ag surface) times 1000 ha lost each year due to urbanization minus 1% of total Ag land that is considered eroded (Banco Central de Chile, 1983)
Depletion of non-renewable resources	–	Accounting for loss in natural capital	Cost of replacing each barrel of oil equivalent (US\$75) consumed with a renewable source (INE, 1965–1996)
Depletion of renewable resources	–		Hottelling rent (Vincent, 1996; Cloude and Pizarro, 1995; FAO, 1994, 1995)
Long-term environmental damage	–	Subtracting cost of environmental damage	Energy consumption times accumulative damage value (US\$0.50; INE, 1965–1996)
Cost of ozone depletion	–	Subtracting cost of environmental damage	Omitted
Net capital growth	+	Accounting for formation of manmade capital	Minimum capital per worker required for the next period (Banco Central de Chile, 1983)
Changes in net international position	+	Accounting for international stability	Omitted

Table 1
Description of the main elements of the GPI and the basis of their regional estimates

GPI column	Contribution	Summary of calculation	Basis of regional estimates
A: Personal consumption expenditures	Base value	(Per capita personal income for each scale) × (ratio of personal consumption expenditure to personal income based on national data)	BEA data on per capita personal income available for VT (1950–2000) and CC (1970–2000). CC (1950–1960) calculated based on ratio of CC to VT in 1970. BT calculated by multiplying ratio of BT annual average wage to CC annual average wage based on local data (Center for Rural Studies) to CC per capita personal income. Data available for all years for all three levels.
B: Income distribution	Negative or positive	(Gini coefficient in year times 100) / (base year [1970] Gini coefficient)	
C: Personal cons. adj. for income inequality	Adjusted base value	(Column A/column B) × 100	Calculated
D: Value of household labor	Positive	(Hours spent on housework by gender) × (hourly wage for maids, housecleaners and cleaners)	Eisner (1989) estimates scaled by population for 1950–1980. For 1990–2000, Eisner's estimate of hours spent on housework used as base; wage rates averaged from BLS national mean 1990 wage for laundry, cleaning and garment services and VT 2001 wage for maids, housekeepers and cleaners.
E: Value of volunteer work	Positive	(Volunteer hours) × (average hourly wage rate)	Volunteer hours estimate based on education level (U.S. Department of Labor, 2002). Average hourly wage rate calculated as per capita personal income for VT and CC (from BEA) divided by 2000 hrs. For BT, CC hourly wage was used.
F: Services of household capital	Positive	(Cost of consumer durables [column L]) × (depreciation rate of 12.5%)	See column L for details on cost of consumer durables. Depreciation rate estimated as 12.5% based on a fixed rate of 8 years.
G: Services of highways and streets	Positive	(Total expenditures for streets and highways) × (7.5% annual value)	Total expenditures data from VT DOT, US DOT and BT. The 7.5% annual value assumes that 10% of net stock is the annual value and 75% of all miles driven are for pleasure.
H: Cost of crime	Negative	(Direct cost of crime [out-of-pocket expenditures and the value of stolen property]) + (indirect [defensive expenditures to prevent or avoid crime])	Average cost per crime estimated by dividing value of stolen property (Vermont Center for Justice Research, 2001) by no. of property crimes (FBI, 2000). This cost was multiplied by the no. of property crimes in 1950–2000 (FBI, 1950/1960/1970/1980/1990, 2000). CC and BT scaled by population. Indirect costs scaled from national GPI figures by % households.
I: Cost of family breakdown	Negative	(Cost of divorce) + (social cost of television viewing)	Cost of divorce: no. of divorces in VT (Census Bureau). Cost est. at US\$8922/divorce plus US\$13,380/child. Est. 0.89 children per divorce. Scaled VT est. by pop. for CC and BT. Cost of TV viewing: time spent watching television by families (h/day/household) × (365 days) × (no. of family households at each scale) × (0.5—the proportion of family households with children) × (US\$0.54/h) × (% of households with televisions in each decade).
J: Loss of leisure time	Negative	(Employment level) × (estimated lost leisure hours) × (average hourly wage rate)	Employment level available from BLS. Estimated lost leisure hours: national GPI scaled down by population (see Leete-Guy and Schor, 1992). Average hourly wage: see column E.
K: Cost of underemployment	Negative	(Total number of underemployed persons) × (unprovided hours per constrained worker (Leete-Guy and Schor, 1992)) × (average hourly wage rate)	No. of underemployed persons calculated using a data from BLS and Schor (1997) using a quadratic equation to est. underemployment rate from unemployment rate. Unprovided hours used data from Leete-Guy and Schor (1992). Average hourly wage: see column E.

Table 1 (continued)			
GPI column	Contribution	Summary of calculation	Basis of regional estimates
L: Cost of consumer durables	Negative	(Per capita pers. inc. for each scale)×(ratio of consumer durables to personal income from national data)	Personal income levels were again used as the starting point. Then, a ratio of personal income to consumer durables was determined from national data (BEA). We assumed this ratio to also be true for Vermont. It was multiplied times personal income at each time and geographic scale to determine the cost of consumer durables.
M: Cost of commuting	Negative	(Direct costs for vehicle purchase and maintenance)+(cost of public trans.)+(indirect cost for lost time)	Direct costs: for VT, no. of new vehicles registered in each decade obtained from VT DMV. For BT and CC, scaled VT no. by pop. Multiplied no. of vehicles by ave. purchase price of new vehicles from National Automobile Dealers Assoc. (for cars and trucks) and Cycle World 2000 Buyers Guide for motorcycles. Earlier decades' prices extrapolated based on trend from American Automobiles Manufacturers Assoc. Cost of Public Transportation: Based on operating costs of all public transportation agencies in VT. For CC, summed 2000 operating costs of CCTA and SSTA. For BT, CC total scaled by pop. Previous decades est. based on trend from 1996 Motor Vehicle Facts and Figures (~25% increase/decade) and founding dates of agencies. Indirect costs for 1990 and 2000 were calculated by doubling aggregate daily commuting time to work for workers 16 years and over from the Census multiplying it times a reduced average hourly wage rate (to be consistent with the National GPI) times a 250-day work year. Previous decades were extrapolated based on a trend from the American Automobile Manufacturers Association trend of total miles travels nationally.
N: Cost of household pollution abatement	Negative	(Automobile emission abatement expenditures)+(septic system installation and cleaning costs)+(solid waste disposal costs)	Automobile emission abatement expenditures after 1977 were assumed to be the cost of a catalytic converter (US\$100) times the no. of cars and trucks. Prior to 1977, they are assumed to be zero. Septic system installation and cleaning costs: For 1960–1990, the no. of houses on septic, sewer and no hook-up were counted in the Census. For sewers, no. of houses times cost of sewage charged by BT Public Works Dept. average family output of 12,000 ft ³ (Adams, 2003). For septic, cost was est. based on the no. of houses on septic, US\$4000 for installation and a US\$200 cleaning cost/5 years. Solid waste disposal costs: The amount of waste per capita was available for VT for 2000. To calculate other years, this figure was multiplied times % change in waste nationally from EPA times population at each scale times % of residential waste (0.60) (EPA) times US\$100/ton (Franklin Associates, 1997).
O: Cost of automobile accidents	Negative	(Direct costs, including property damage and healthcare exp.)+(indirect costs, including lost wages, pain and suffering)	No. of fatalities from automobile accidents (National Safety Council) times cost of all motor vehicle crashes on a per death basis—US\$4.68 million (National Safety Council)

C.5.2.2. Graphs and results

For Figure 20 and 21, data from Kubisweski et al (2013), was used. This data was already expressed in US \$ 2012 therefore, a conversion was not required. When comparing GPI and GDP per capita certain conclusions can be made. First of all, there was an increase in GPI per capita which was correlated with GDP per capita until 1970. After 1970, GPI per capita began

to be flat, and eventually decreased. Secondly, when looking at GDP per capita, this showed a continuous upward trend from 1960 to 2005.

It is also important to analyse the most important points leading the ISEW to decrease. The authors Kubiszewski et al (2013), attempted to explain this indicator with other indicators, such as the Human development index having, the ecological footprint which increased sharply, and the biocapacity per capita which also decreased. Moreover, an increase in income inequality combined with strong environmental and social costs rising faster than consumption related benefits, led to this decrease in GPI.

Figure 20: GPI and GDP per capita US \$ 2012

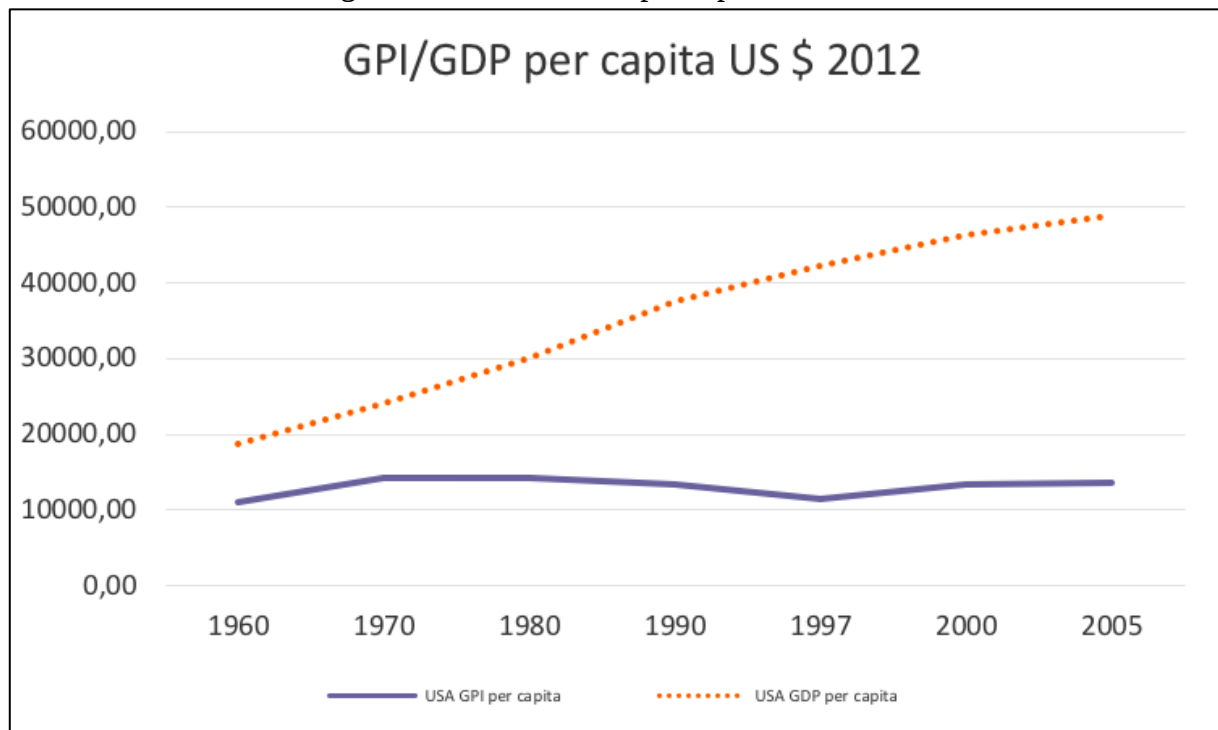
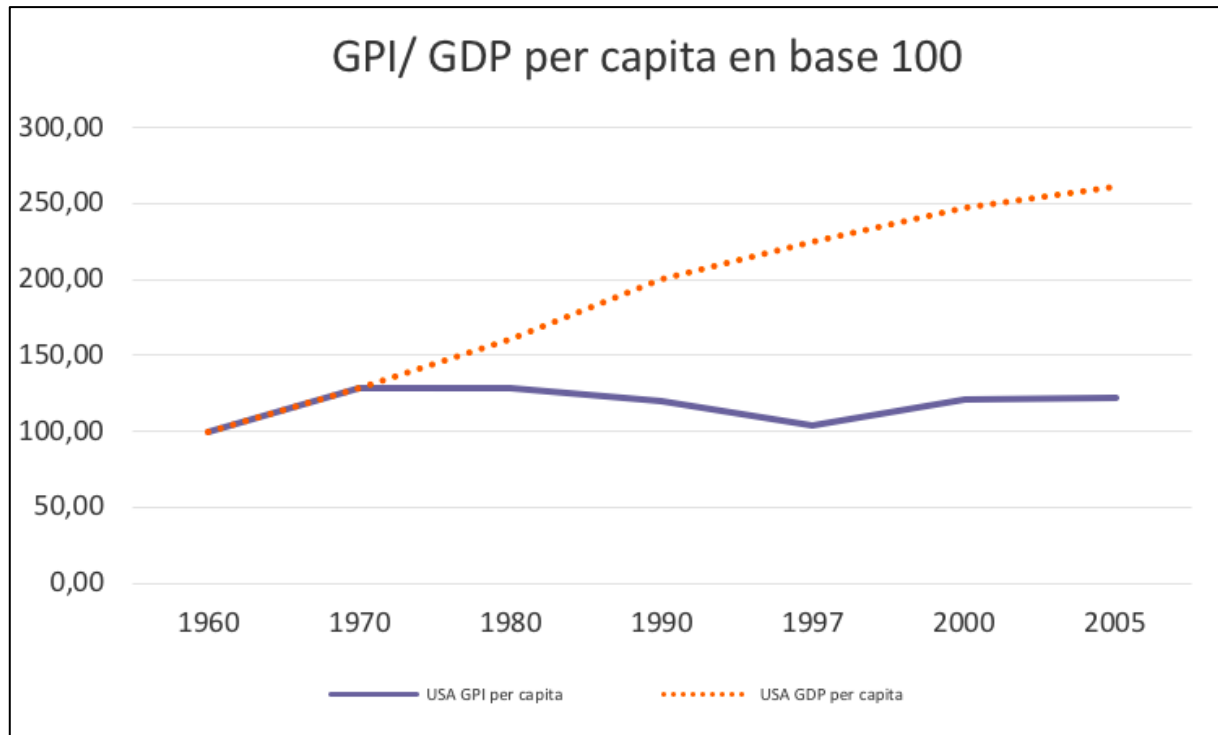


Figure 21: GPI and GDP per capita index 100



After having studied Figures 20 and 21, a decision to specifically study Vermont to analyse the differences between them was taken. The purpose of this sub-analysis is to understand whether any environmental, economic and social disparities can occur among a selected country. It was wanted to investigate through this analysis, whether if some differences among states had to be made or not.

C.5.2.3. Vermont

Vermont is an American state located in the New England region of the North-eastern United States. This state is surrounded by Massachusetts, New Hampshire, New York and Quebec, a Canadian province. The Vermont republic was established in 1777 as an independent state and was admitted to the United States in 1791. It covers an area of 24.923 square kilometres and has a population of 626.299 inhabitants. Because of its low total density of population, Vermont is the second-smallest state in the USA. The state capital is Montpelier and its largest city is Burlington. The state of Vermont is famous for its Marple syrup and for its secure and safe area. Vermont's economic activity was ranked as the 34th in gross state product of the United states with 26 billion US dollars as, for their activities (History, 2009).

Concerning income inequalities in Vermont, they are quite the same as the United States of America. However, environmentally speaking, Vermont has considerably improved its techniques and methods regarding sustainability, as will be seen later in this section. The existence of variance amongst different areas within a country, will also be explained.

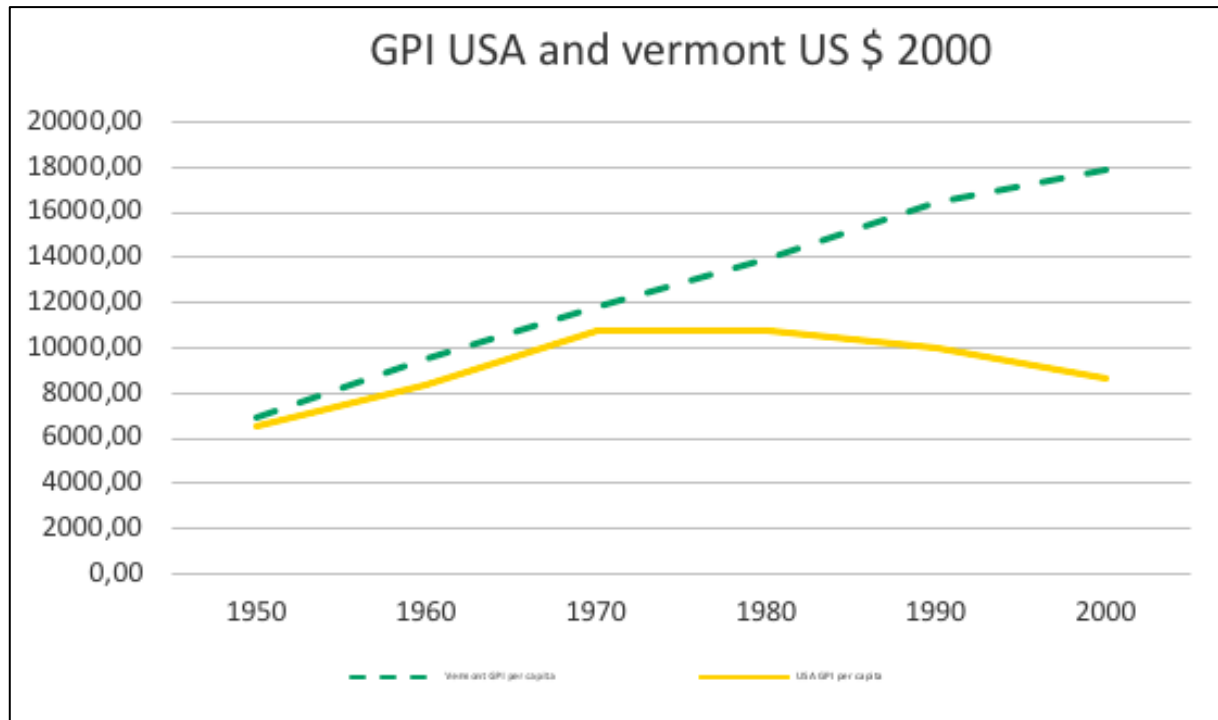
C.5.2.3.1. Graphs and results

USA's GPI per capita has showed some increases from 1950 to 1970 but, then to only decreased. When comparing that to Vermont's GPI per capita, it can be note that Vermont's GPI is much better. Over a period of more than 35 years, USA's GPI has not improved, unlike Vermont's GPI.

There are some major differences within the multiple states in the United States of America. Vermont's GPI has improved significantly, due to the regrowth of North-eastern forests as farming and timber production moved westward. Furthermore, strict planning and zoning regulations protecting farmlands, forests and wetlands, has been implemented. Moreover, Vermont has a lower population growth that allows to put less pressure on the environment (Costanza et al, 2004).

To conclude, when looking at Figures 22 and 23, some disparities amongst a country is apparent and Vermont has a much better environmental performance than the entire average in the post 1980 period. It cannot be stated that nothing has been improved in USA when analysing it state by state. This conclusion allows moderation when considering the conclusion of GPI evolution within the US.

Figure 22: GPI of USA and Vermont per capita in US \$ 2000



D. Results and comparison

After having studied country by country, different ISEW's and GDP's, it was decided to compare them against each other. Firstly, GPI and GDP per capita in US \$ 2012 on Figure 23, were compared. Secondly, in Figures 24 and 25, the GDP and GPI and more precisely indexed at 100 for the base year, were analysed.

First of all, in order to create Figure 23, an attempt was made to be as detailed as possible with the data available. Data was found from 1962 until 2000, with some countries beginning in 1965 or 1975. GPI and GDP per capita for Belgium, Australia, Thailand, Chili and the United States of America, were then compared. When analysing the graph, multiple points can be noted.

- Concerning GPI, Australia has continuously increased even if there were some variations over time. For USA and Belgium, it has increased until 1990, then decreased. Finally, for Thailand and Chili, the GPI stagnated and then decreased. Australia has the highest ISEW compared to others, followed by Belgium (after 1990), then USA and finally, Chili and Thailand.

- Concerning the GDP, Australia, USA and Belgium experienced a growth rate, increasing over time. Chilean GDP also increased over time although at a lower growth rate, the same can be said for Thailand.

When comparing all of these countries, Australia is stronger economically, environmentally and socially speaking, whereas developing countries are considerably behind. It is also important to notice that even if USA has a higher GDP per capita than Belgium, its ISEW is lower. This affirms that growth does not always increase the welfare of population.

Even if developing countries are considered as poor cases, in Figure 23, it is important to moderate affirmations. Indeed, when looking at Figure 24, Thailand's growth rate of GPI is higher than the others, moreover it is increasing over the period considered here but, not after 1995 (percentage of increase). Chilli's GPI growth rate has also been positive, since 1990. Moreover, when regarding Figure 25, it can be understood that Thailand has a higher GDP than the others in relative terms.

To conclude this comparison, it can be firstly said that Australia has shown better improvements in its welfare than other countries selected. Secondly, the relatively higher GPI of Belgium compared to USA is significant. Indeed, it can be concluded from this that economic growth is not always positive for welfare, as well as the fact that other indicators have to be taken into account. Finally, developing countries are far from developed countries, however some of them are improving, in terms of GDP and GPI.

Figure 23: GPI/GDP per capita US \$ 2012

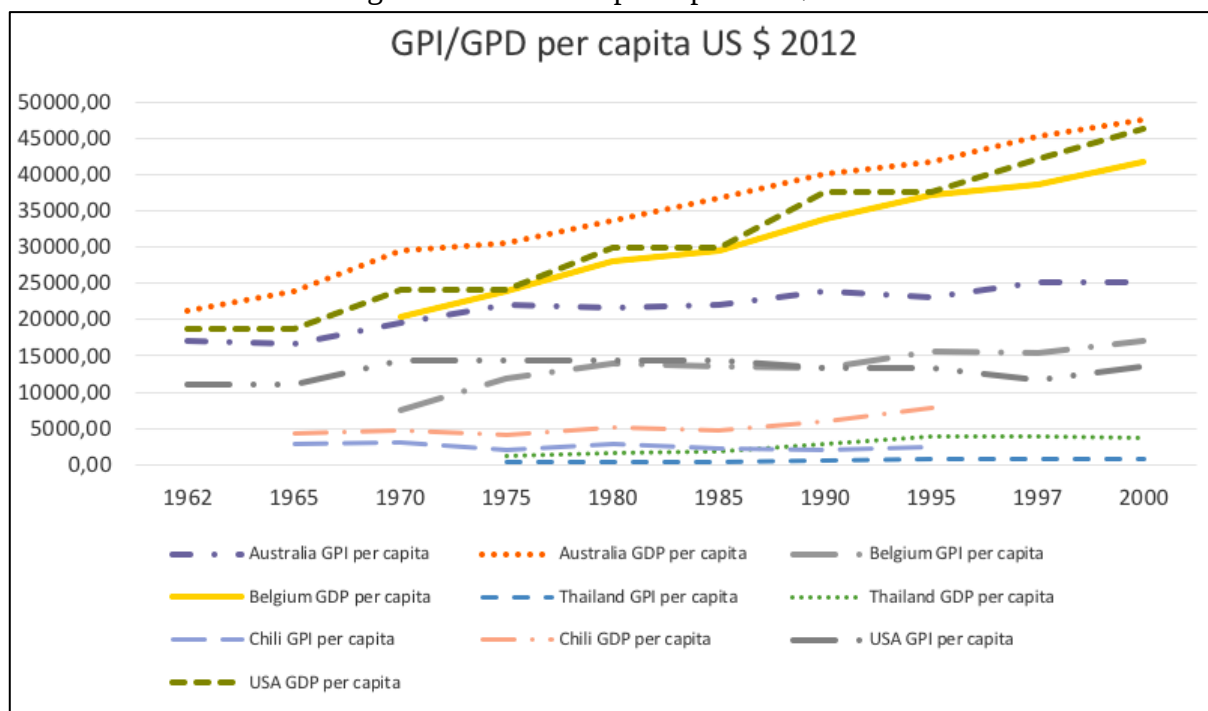


Figure 24: GPI per capita index 100

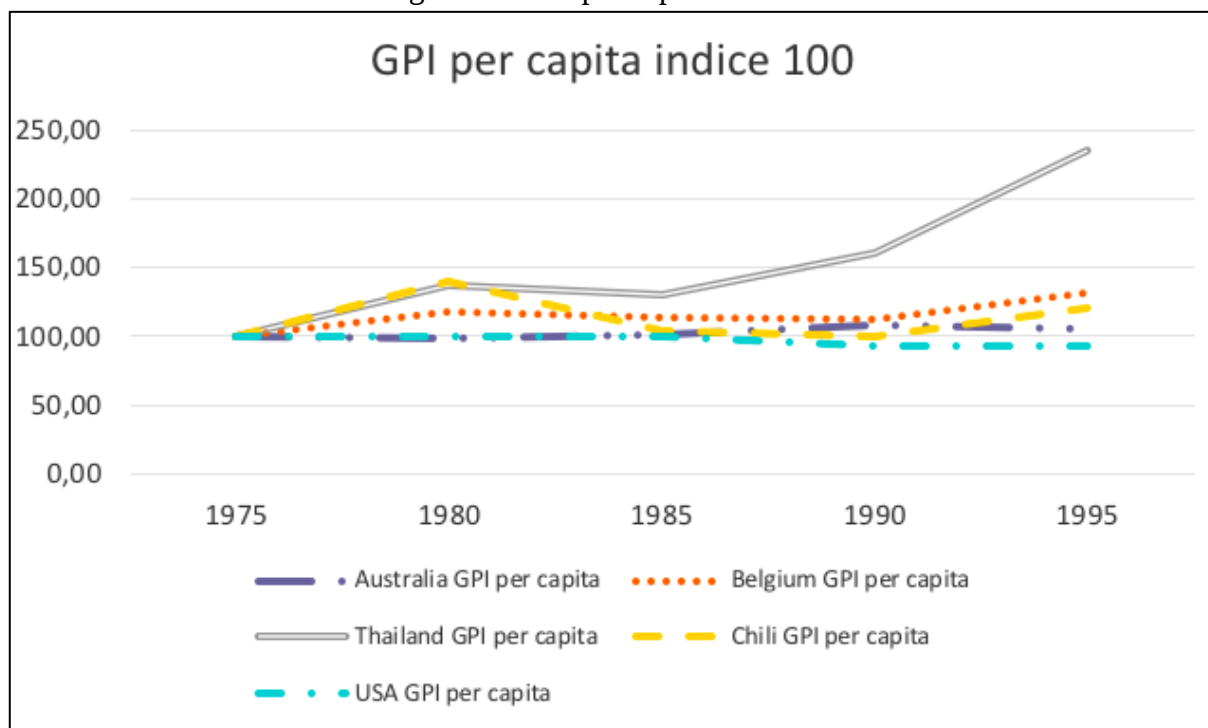
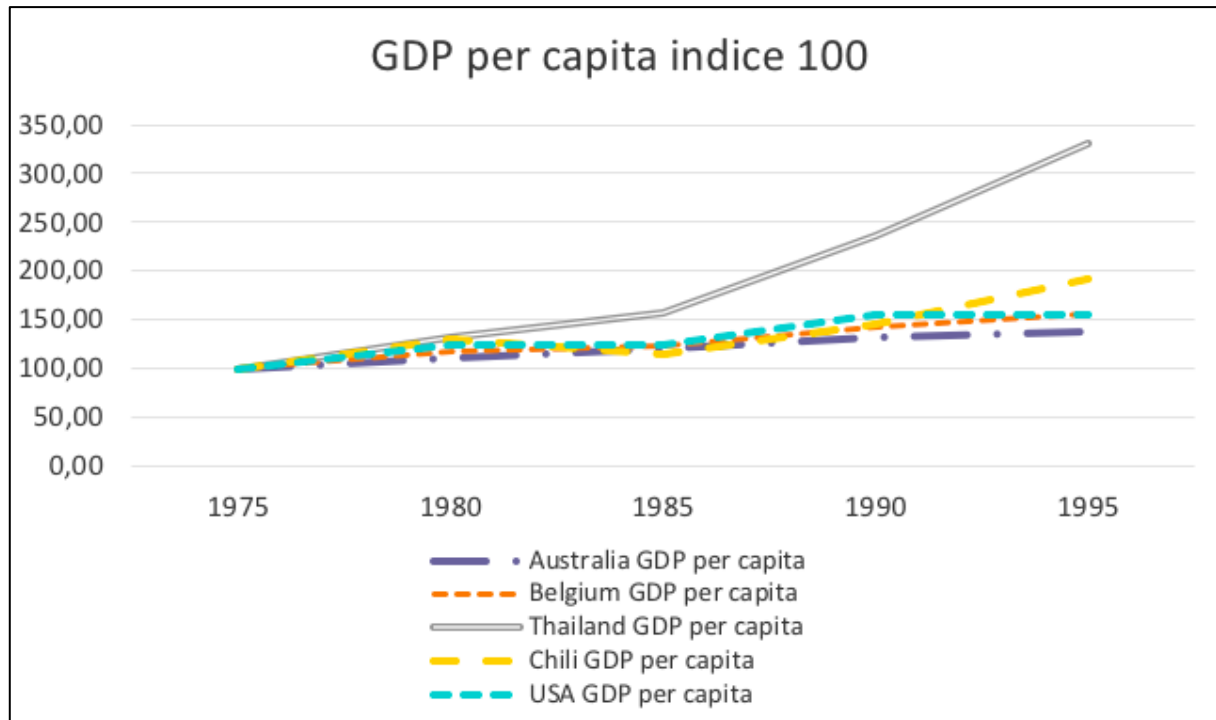


Figure 25: GDP per capita index 100



E. Chapter Conclusion

E.1. Problems Identified in the Analysis

As we already have spoken about theoretical problems linked to ISEW, we will only cover practical issues linked to the use of GPI. After having studied country by country multiple ISEW, we have found out that there are two main problems.

Firstly, according to Bleys (2006), there is a problem linked to various methodologies existing. Indeed, because of the non-standardization of ISEW in the world, the comparison between them becomes difficult. How can we compare indicators that do not have the same methodology? For him, minors difference in adjustments to these valuation methods can have significant impacts on GPI and on the conclusions we can draw from ISEW studies.

Secondly, the biggest constraint of GPI is the collection of data and in particular the environmental elements. Since there are some consistent difficulties to collect data linked to social and environmental items and that sources of data are too much varied compared to economic elements, there is high subjectivity in the calculation of ecological and social

components. Some other consequences such as omissions of certain elements and extrapolations can also exist. Authors cannot always choose what are their preferred method of valuation because they have to work with other methods due to the lack of data available (Kenny et al, 2019).

E.2. Conclusion and Future Recommendations

E.2.1. Conclusion

Finally, an opinion was wanted to be given along with a critical analysis concerning what was achieved so far. Firstly, in order to respond to the question asked previously, “is economic growth always increasing welfare?”, the answer is no. Indeed, as analysed before, many cases have proven that from a certain point, welfare is harmed by excessive economic growth.

Secondly, in order to respond to some critics regarding GDP, it is really important to moderate them. Indeed, it cannot be said that GDP is ineffectual, it is only misused. It is thought that on the one hand, GDP is an excellent index of economic growth. On the other hand, it is also considered that new indexes should be added to this index, such as ISEW. As a matter of fact, other components, such as environmental and social elements should be considered in order to have a more global view of welfare.

It can be concluded by saying that ISEW is a suitable starting point for a more sustainable future, although certain improvements have to be undertaken if it is to be recognized throughout the world.

E.2.2. Recommendations

In order to overcome these practical problems, some authors have proposed further recommendations. First of all, according to as Kenny et al (2019), methods are required to compensate for the missing and inadequate data (this problem is not limited to developing countries). The need for universal standards for GPI regarding methodology and data collection is present. According to Bleys (2006), efforts are required at national level. In response to that requirement, Kenny et al (2019) first proposed to implement and to adopt a system of environmental and economic accounting. This system could provide a series of indicators for economic and ecological indices to better capture their relationship. The authors also proposed

the creation of specific data sets by relevant governmental agencies which could collect data. The purpose of this was to construct a more streamlined, consistent and accurate methodology measurement.

Secondly, As Clarke and Islam (2005) articulated in their paper, further ISEW analysis and studies for other developing countries are required to make a conclusion. Indeed, as previously stated, not enough studies are available to generate some plausible conclusions and to compare economic growth of other developing countries.

Finally, as Castadena (1998) proposed regarding GPI, it would be interesting to not only compare GPI with GDP but also with personal consumption (the starting point of ISEW). According to him, if the relative importance of ISEW is looked at with respect to private consumption ($ISEW/PC$), a value smaller than 1 would indicate that an increase in PC does not always lead to the increase of ISEW and would decrease welfare.

4. From Macroeconomic to Microeconomic environment

For this third and last part of this thesis, we have decided to enlarge our field of vision to the microeconomic environment. We have already brought up the topic of the importance of a broader vision regarding the evaluation of a country's performance. Indeed, in the macro-environment, the evaluation of a country performance has evolved and GDP has been challenged by the ISEW, an alternative measure of a country performance. In parallel, this statement can be compared with the assessment of company performance at the micro level. The evaluation of the performance of an enterprise can also be seen in a broader way by moving from current standards (turnover, net profit, valuation, ...) to broader standards. More precisely, we would like to propose a transposition of the macro dynamics to the micro reality, considering that companies also have a role to play in the form of transition that is operated. We want to present indicators of performance which are not limited to financial components (for example, the sustainable balance scorecard).

In this section, we will first introduce the topic by explaining the new trends that can affect the corporate system. Indeed, new issues related to sustainability are mentioned and questions about the contribution of businesses to the environment and social issues are raised. Secondly, we will embrace an important point regarding corporations. Since companies represent important entities in a country, those also need to change their way of measuring their performance to become more sustainable. Companies are relevant units of change and sustainability is considered as the secret of their future success. Thirdly, in order to explain how this macro transition affects the micro environment, an example of a sustainable company will be given. The purpose of this analysis is to understand how a company could adapt its performance measurements. We will also provide a justification for the choice of this company and the operational context of the company will be considered. Then, the fourth section will be dedicated to those new performance measurements. On the one hand, there will be an explanation of the evolution of the performance measurement systems. On the other hand, various non-financial indicators will be covered and one specific new indicator will be detailed. Moreover, we will concentrate our research on the impact of those changes on the performance of a business and the consequences of those new sustainable measurements. Finally, the

conclusion will answer our initial question regarding this transition and some limitations will also be considered.

A. Introduction

According to Aggeri and Godard (2006), sustainable development has recently become a burning issue in the business sector. Historically formed as a political project, this development has also emerged in the last decade as a managerial project. Those new administrative practices and forms of regulation have hustled traditional performance systems of businesses. Since 2000, in the view of the craze for sustainable development, many sustainable development reports have emerged (Martinet and Reynaud, 2004) and some new types of consultants, auditors and certifiers have been created (Aggeri and Godard 2006).

Management sciences have seen new problematics appearing regarding performance and control in regards to this relatively new concept of sustainable responsibility (Bollecker, 2007). Those evolutions resulting from social and economic transformations of our corporate environments are leading companies to enlarge their own responsibility regarding society as a whole.

Today, industries and corporations are questioned for their social and environmental impacts and also for their own institutional and commercial practices. There is an important rise of corporate morality and every enterprise from any industry is concerned. Those issues are complex as are the challenges, but the game is worth the candle. Indeed, this new way of thinking is an opportunity to mix companies' growth and environmental improvement. Traditional systems that were created after the first industrial revolution need to be changed and an important transition is significantly needed (Laville, 2009).

“A company need to make profit, otherwise it will die. However, if we only focus our goals on profit, then it will also die because it will not have any existing purpose” (Laville, 2009).

Managerial projects and performance measurements in line with sustainable development have two important characteristics, as they first concern every area of activity (from the strategy to the governance, the communication, the remuneration process, the design and the production

of goods) and they also aim at reconciling their own preoccupations to those of the society (Aggeri and Godard, 2006).

New ecological and social imperatives are existing, and companies need to deal with them. Indeed, ignoring them would significantly increase the risks of a potential and brutal crisis. New volunteer norms and codes of conduct are emerging in order to help companies to face those challenges. “*Anticipate to not suffer with a proactive strategy*” (Laville, 2009).

In the 1990s, a hybridization between sustainable development and corporate social responsibilities has occurred. Indeed, from that point, companies have become responsible with regards to communities, stakeholders and also future generations. This sustainable development practices are now considered a winning strategy for companies and affirm that economic, social and environmental elements are not in contradiction. This new movement is also related to the emergence of new civil regulations with the rise of NGOs (Aggeri and Godard, 2006).

B. Corporations: Relevant places of change and secret of success

B.1. Relevant places of change

We have found out that the new macro trends of this last decade that encourage change in the way countries can measure their performance can also be found in the micro-level with the corporations. We have found out that this “revolution” has no barrier and that sustainability is present everywhere (Laville, 2009).

As Laville (2009) said in its paper, corporations have the power to create some changes much more rapidly than any regulation and can act much faster than the politics. Indeed, some multinationals are bigger than multiple states reunited. Nowadays, corporations represent important entities in societies by having an impact on the nature of our daily interactions. As this power has been over used, it has led companies to act in a selfish way without taking care of the society. As a reaction to that, corporate environment has to change and has to evolve with respect of well-being of the society. Even if companies may at times be responsible for negative nuisances and externalities, they are also the best entities to make some changes. In order to become the leader of this change and to follow the macro transition, companies have to start

the transformation by using the right tools and models. They represent today the future and a strong powerful energy of change (Laville, 2009).

We have seen that people have become more and more aware of that change, and that things are moving at the macro (from GDP to ISEW) and at the micro level (more sustainable corporations with new performance measurements) (Laville, 2009). These trends are complementary since their goals are similar. We have also studied that corporations have the power to change things, would it be then a useful help to get things done much faster?

B.2. The secret of success.

As exposed below in the case-study, Patagonia has understood that sustainability is the key secret for their success. According to its CEO Yvon Chouinard, *“people do not see that there is another manner to see things and when considering profit, our actions are creating a lot of money”*. The goal of sustainable management is not to deprive companies of profit but on the contrary, it tries to help them grow in order to sustain their missions. A prosperous sustainable company is in a virtuous spiral where she receives and donates (Laville, 2009).

C. Rethinking the purpose and the value of the business. Redefining the success criteria and the goals.

In order to understand how this evolution is impacting corporations, their performance and their systems, we have decided to study the case of Patagonia. This company is a perfect example of a sustainable corporation that tries to be more ethical and that concentrates its mission on the 3 Ps: people, planet and profit (Teulon, 2006). We will first speak about Patagonia in general, what they are doing and why they are considered as a leader in the sustainable market. Secondly, we will study their innovative system of performance and their processes. Finally, we will try to find out how these new processes and indicators of performance are impacting the overall performance of the company. We will also explain the learning points for this case study that are linked to our question regarding the influence of the ISEW on the micro – economic level (Teulon, 2006).

C.1. Patagonia, a sustainable example

Patagonia is a medium-sized company that is producing high quality sport products. They stand out from their main competitors thanks to their marketing mix and also their strong identity linked to environmental values, inspired by the founder of the brand, which are in the center of their strategy and orientations. This company differentiates itself by taking its “social responsibility” very seriously and tries by many means not only to set up an environmentally friendly model but also to become a model and an example for other companies (Etudier, 2011).

Their strategical choice, inspired by their goals of respect for people and also nature, can appear quite contrary to the precepts of a good and powerful management. Indeed, they have abandoned the pitons markets (climbing equipment) even though the company was the world leader in those products and they have reduced their product ranges. However, this company is continuously growing and its profits are steadily increasing. The question of the link between the company's commitment to sustainable development, its capacity for continuous innovation and its industrial and commercial success is raised (Teulon, 2006).

As we will see later on this section, this business model is a success. Even if it has fewer comparative advantages than its competitors in terms of costs, distribution and communication, their strategy is consistent with their overall business model and this has led them to be successful. Their sustainable performance measurements are also very innovative and not only based on financial metrics. (Etudier, 2011).

C.2. Rethink the process and the performance measurements

C.2.1. Sustainable strategy

Thanks to their sustainable strategy, Patagonia has successfully created some coherence between the organisation and their actions while stimulating its innovative capacity. Two essentials factors have made their success possible. Firstly, the absence of shareholders pressure regarding profitability has allowed Patagonia to think in long term perspective. Secondly, because the segment of the population who buys outdoor marketed products is very sensitive to environmental issues, the company's sustainable positioning has strong impacts. (Teulon, 2006).

The company has an internal development strategy. This strategy is based on the fact that they do not only seek to maximize their profits but rather to use their business to inspire and implement some environmental and social solutions. They are continuously innovating in terms of technology and they are also distributing some of their resources and revenues to associations. (Etudier, 2011).

C.2.2. Differentiation

Patagonia is different from its competitors because it is trying to offer a unique experience. Indeed, the mainspring of the group is the passion for the sport, the protection of the environment, solidarity and an innovative technology. Patagonia is aware that our planet is in danger and they want to use their available resources (their voice, their imagination, their company) in a positive manner. They are trying to stay faithful to their values with high criteria (functionality, durability and reparability) in order to cause less impact on the environment and to protect nature (Patagonia, 2019).

C.3. Impact on the overall performance

How can Patagonia balance its mission with financial excellence? How can Patagonia be successful? What are the consequences of their sustainable strategy on their performance? How can we link the case of Patagonia to the macro transition? This is the object of this sub-section.

In order to respond to the first question regarding the link between sustainability and financial success, the chief operation officer (COO) Doug Freeman answered that they have the chance to build the best product and that they can price it out at what makes sense for them. For him, their product has to be extremely durable because it is the product that they want people to use for decades. They do not want to be partly responsible for the trend where the consumer is throwing away dozens of pounds of clothes each year. Their products are not inexpensive, but they think that there is a high value attached to what they are doing and that their products can represent a sort of an investment. They also think that people have to buy what they need, and that price in the long run is very competitive. They want to combine profitability and general interest (Conscious company media, 2017).

Regarding their performance and as we have said earlier, thanks to their specific sustainable strategy, Patagonia has successfully grown and is very profitable. Each year, they are donating 1% of their profits to sustainable associations. The question as raised before is linked to their performance measurement. Are they still looking at their profit? At some financial metrics? Or only at sustainable indicators? In response to that, the COO claimed that they are at the same time looking at financial metrics and at non-financial metrics. Moreover, regarding financial metrics, he argued that in order to keep score, the company needs to have financial excellence. They are conscious that in order to improve lives of the people in their supply chain and to improve their environment, business can help find and create sustainable solutions (Conscious company media, 2017).

In order to explain how Patagonia represents a relevant example linked to our research question, several points have to be highlighted. Unlike traditional companies that have a classical culture of results, the economic dimension that generates a measurement system only based on financial metrics is not the primary focus for this company. Indeed, Patagonia is a company based on strong values and strong human culture. They have set up a system based on human resources and on sustainability. They have based their performance on two objectives, the individual ones and the organisational ones. Secondly, we can link the performance system of Patagonia to the Morin et al (1994) performance theory. According to them and as we can see in Figure 26, an efficient performance model is a system based on four dimensions (the human resources, the economic efficiency, the external legitimacy of the organisation and the sustainability of the organisation). As we have seen earlier in this section with the COO of Patagonia, this organisation is multidimensional and tries to measure its performance based on multiple criteria (financial and non-financial ones). It is then quite relevant to link the Patagonia performance system to this theoretical model. Based on this model, we have learned that the organizational effectiveness is the product of these four dimensions that can converge. New performance measures are added to classical systems such as the well-being and the productivity of the employees, the client's satisfaction, the quality of the products... Patagonia has been impacted by the sustainable macro trend by integrating other non-financial measures of performance. For example, the quality and the durability of their products is an important reference for them, they want to provide effective and efficient clothes and this quality is seen as performance measure (Jacquet, 2011).

Figure 26 : 4-dimension model
Source : Translation from Jacquet, 2011

Human resources values	Economic efficiency
Employee morality – employee efficiency Employee development	Resources economics - productivity
Organisational legitimacy	Sustainability inside the organisation
Customer satisfaction – community satisfaction	Product quality – financial profitability – competitiveness

To conclude this point, Patagonia represents one of many companies that have evolved over the last decade. We find here at the micro level the same interests of widened classical indicators as the ISEW did in macro. They have understood that this sustainable trend has no barrier and that they should put in place new performance indicators. Other companies in different places all over the world have followed the same trend such as Veja (famous company that produces sustainable shoes) or also Spentys (Start-up with ecological plasters printed in 3D) (Jacquet, 2011). As we will see in the following section, performance measurements are important in a company since it can organise and decide what its main objectives are.

D. Theoretical indicators

D.1 Evolution of the performance measurement systems.

The increasing interest of many companies for sustainable responsibilities has created an evolution in the corporate system of performance measurements. Those systems have been adapted to organisational strategies and to their environment (Bollecker, 2007).

First of all, multiple contributions have been created regarding the financial valorisation of the societal performance thanks to some accounting systems. Those systems are trying to inform the civil society on the environmental practices in the corporations (Bollecker, 2007).

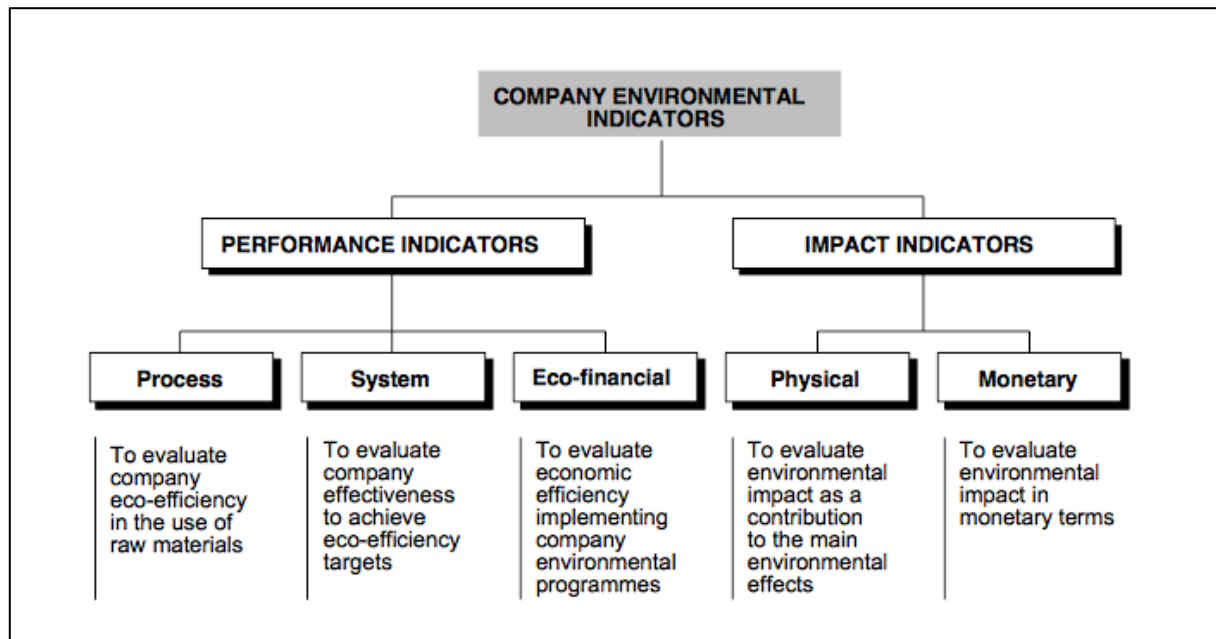
Secondly, some specialists have also proposed to add to the traditional representation of the organisation, a qualitative representation with the integration of non-financial information. The purpose of measuring those non-financial elements was to measure and control the multiple stakeholders' information. The idea, elaborated later on this section, is to represent the societal dimension in a sustainability balanced scorecard (Bollecker, 2007).

Finally, new tools for measuring the performance based on wider criteria such as societal performance have been created. The Global Reporting Initiative (GRI) is one of them. This new tool was created in 1997 and proposes some guidelines to help the companies to produce economic, social and environmental reports. Other models have also been created such as the Baldrige quality Awards (BQA) and the European Foundation for Quality Management (EFQM). The development of those tools shows the evolution in the performance measurement towards the consideration of the corporate social responsibility (Bollecker, 2007).

As we can see in Figure 27, there are two kinds of indicators depending on their meaning: there are some indicators linked to performance that are describing what is happening in the company and in their production processes. The other kind of indicators, the impact indicators, is reflecting what has changed in the environment due to the organisation's activities (Tyteca, 2002).

Figure 27: Company environmental indicators

Source: Tyteca, 2002



The choice of which indicator to use in a company is not easy and has to be balanced. Indeed, sustainable indicators must be in line with the commitments of the company but also with the requirements of stakeholders of the company. The role of these indicators is to inform managers and all the stakeholders about the social and environmental impacts of the company's activities, on the one hand, and the quality of relations between the firm and its stakeholders on the other. Moreover, financial indicators are not unnecessary and have to be taken into account at the same time as other indicators. What is important here is to have a balance between the use of financial and non-financial indicators. (Tyteca, 2002).

D.2. Examples of non-financial indicator

Performance indicators are considered as any quantitative, qualitative, financial or non-financial data that can be used to measure and monitor pre-established results or goals. Those indicators are primarily tools for control and management in a company. Their significant role is then to influence the behavior of multiple agents to maintain and improve their performance. With this definition, we can automatically understand their importance regarding sustainability. Since those indicators are controlling the company and their objectives, implementing new

performance indicators that are not only focused on financial goals is necessary to become more sustainable (Essid, 2009).

Academic studies regarding management control and performance have considered that the first two indicators used by a company to measure its efficiency and effectiveness were the Return On Investment (ROI) and the Earnings before interest and taxes, depreciation and amortizations (EBITDA). Performance indicators can however no longer be limited to being financial or quantified and hence should go beyond those two well-known indicators (Essid, 2009).

As we can see in Figure 28 and as seen in Figure 26, there are several types of basic financial and non-financial indicators; for example, the turnover and the net benefit as financial indicators and water consumption and net employment creation as non-financial indicators (Essid, 2009).

Figure 28: Basic financial and Non-financial indicators

Source: Translation from Essid, 2009

Indicators Category	Examples
Economic performance indicators	Turnover – net Benefit
Sustainable performance indicators	Water consumption – Energy consumption – Waste – CO2 emissions
Social performance indicators	Net employment creation – work accident

The four tools (balanced between financial and non-financial) that are the most talked about are the Sustainability Balanced Scorecard, the Skandia's Browser, the SD21000 and the Societal report. One is not necessarily above the others as their use really depend on the sector in which the firms of interest are acting (Hansen and Schaltegger, 2016).

For the purpose of this thesis, we have decided to concentrate on **the Sustainable Balance Scorecard (BSC)**. This is a performance measurement and a management system that aims to find a balance between financial and non-financial elements. Based on the work of Kaplan and Norton (2001), modifications and innovations to the original BSC have been

implemented over the years. In order to integrate environmental, social and ethical issues to the performance measurement of a company, the BSC has evolved and has been renamed ‘Sustainable Balance Scorecard’ (SBSC). In this model, companies no longer consider financial tools only when measuring their performances, but also ecological, social and organizational tools. For example, Shell is using the SBSC and has decided to set goals according to the multiple axes of the SBSC (can be specific and adapted for every company); and their leaders are paid according to their achievement of all those objectives. The aim of this system is to enable managers to understand that focusing on sustainable and social factors can affect the financial performance (Essid, 2009).

To conclude this point, nowadays, companies are evolving when using performance measurement systems. Financial indicators are no longer their only reference and non-financial indicators, such as those discussed earlier in this section, are emerging.

E. Sustainability and performance

E.1. Leverage

According to a study done by France Strategie, there is a difference in performance of around 13% on average between companies that have implemented some sustainable performance measurements or practices and those that do not. Indeed, the companies that are implementing sustainable policies are on average more efficient than the others (Fournier, 2018). As we have seen in the case of Patagonia, sustainability is a great opportunity for companies to grow in a more respectful manner while increasing profitability. New performance measurements are influencing the way the company sets its objectives and the way they reward their employees.

The reason for this is that sustainable management and performance measurement is a strategy that aims to improve the resilience of the company in various areas such as the environmental protection and the social dimension. By implementing this new way of thinking and measuring, the company is able to identify their risks and weaknesses in their management practices, their recruitment processes and so on. They use this to find the right levers. In the short run, it can be costly, but generally, in the medium run, the company can already see some overall improvement of their internal processes and thus in their overall performance.

Sustainability is then considered as a lever for performance (financial performance but also non-financial performance) (Fournier, 2018).

E.2. Difficulties of measurement

It is also important to notice that this performance gain is not easy to quantify and can raise some questions regarding subjectivity (as the ISEW does). They are some methodological weaknesses that are linked to the time period (too short) and also linked to the multiple different variables that have to be considered (that differ from one company to another). These two difficulties make the comparison between performance indicators difficult (Ory and Petitjean, 2014).

F. Chapter Conclusion

As we have seen earlier, new sustainable trends are evolving and are not limited to the macroeconomic sphere but can also be applied to microeconomic units such as the firms. Section one and two were devoted to the emergence of new welfare indicators such as the ISEW (GPI) in the macro-level. Section three was devoted to the illustration of the transposition of the results found in previous sections to the micro level.

We have seen that companies are significant and relevant entities to implement changes. The changes required at the macro-level can influence the micro-level in a way that corporations have to (and in more and more cases are willing to) change their own performance measurements. Companies have to evolve as their nations need to redirect their focus on non-financial components on top of classical financial macroeconomic and microeconomic analyses. Indeed, companies have to adapt their performance measurements in order to face the 21st century challenges and so do countries as a whole. In order to create a feasible and coherent sustainable movement at the macro level, companies have to follow the lead. This change is only possible if everyone gets involved, especially businesses (Laville, 2009).

An increasing number of companies are putting in place specific and relevant measurements to calculate their global performance (economic, environmental and social dimensions). As the ISEW does in the macro level, new indicators and systems such as the

SBSC are considering non financial components on top of classical financial elements. Those companies and in particular their performances are evaluated by new elements such as their social and ecological contributions (Essid, 2009).

However, this implementation presents several difficulties and stays a fragile practice. Indeed, as we have said before, setting quantified objectives on the ecological and social dimensions are not an easy task and can weaken the construction of relevant and objective measurements. Moreover, since this is fairly new, there may also be a lack of motivation and involvement from some employees which may complexify the implementation and the effective use of those indicators within companies. The movement is on the move, but continued improvements and wider use are obviously needed... (Essid, 2009).

5. Discussion

This thesis aimed to question the absolute prominence of GDP as a tool for economic welfare by proposing a new alternative indicator such as the GPI or the ISEW. Based on theoretical and practical analysis of the two indicators, it can be concluded that GDP was not created in order to measure well-being of a population. The results indicate that GDP is a relevant indicator of economic activity but other indicators such as the GPI are needed with the intention to measure well-being. Indeed, other components such as environmental and social elements have to be considered while calculating the total welfare in a specific area.

After having analysed and computed GPI and GDP for multiple countries (Belgium, Australia, Thailand, Chili and United states), some findings can be summarized. First of all, as concluded in the second section, GPI and GDP followed the same track and were parallel until the late 1980's and the beginning of the 1990's in each country studied. After that, GDP continued its steady and at times exponential increase while GPI began to flatten or even decreased due to some negative environmental and social elements. Secondly, this previous result lead to the potential presence of a threshold hypothesis. Indeed, in the beginning of this thesis, questions regarding the existence of this hypothesis were asked. Even if this assumption was not verified for every country studied, it has been observed that from a certain point (threshold point), ISEW is no longer increasing (Australia, for example) and can even decrease (Belgium, for example). Thirdly, comparisons between national results have shown that Australia was the leader of our sample when considering economic welfare and wellbeing. Undeniably, Australia was better economically, environmentally and socially speaking. It has also been noticed that, even if USA had a higher GDP per capita than Belgium, its ISEW per capita was lower. This affirms that growth had not always increased welfare of population. Belgium was located in the second place in terms of well-being, followed by the USA. Developing countries lag behind, but after having compared their relative values of GPI, it can be seen that they have carried out certain significant improvements. Another important point which will also be covered in the recommendations part, is related to the standardization of GPI. Indeed, difficulties linked to multiple and various specificities of each country have been encountered. Each national GPI's formulation is specific and differs from the others due to the components used when measuring ISEW. For example, Thailand's GPI measures the cost of crime and the loss of wetlands whilst the Belgian does not. These differences in the components

of GPI have created some problems in the comparison of the different national ISEW. Finally, we have also noticed specific differences within countries. For example, the state of Vermont in the United States shows a significant higher ISEW than the global ISEW of USA. These variances have raised questions regarding the regional disparities within large countries and the relevance of a national ISEW. It is then important to mitigate one's words when drawing general conclusions, concerning a country's wellbeing.

The third part of this thesis has opened the discussion of a more profound study of the question; of a positive relation between the level of sustainable performance of a state with the level of performance of its companies. It has been determined that the new sustainable trends countries are encountering today can also be found in the micro level of corporations. Companies also have to adapt their performance indicators to more sustainable ones and have to regard this trend as a significant opportunity to create long term growth. It has been perceived that companies such as Patagonia are adopting highly sustainability strategies, along with performance measurements, which happen to have a positive impact on the company's global profitability. The discussion has been opened to further research regarding the link between these two levels.

Some recommendations have also been addressed throughout the thesis. The two main ones are related to the GPI standardization and the relation between micro and macro performance. First of all, when examining standardization, it has been uncovered that further research regarding ISEW has to be conducted in order to create a world-wide formulation which every country could use. Indeed, current formulation varies among countries and prevents some relevant comparisons. A "global GPI" was attempted to be created for this thesis but the conclusions were mistaken. It was decided to measure diverse GPI for different countries by considering only elements held in common. With this direction, it was found out that some significant components had been neglected and hence no sensible conclusion could be taken. Extra studies have to be conducted in order to find the right way to improve this indicator. The second recommendation was to examine if wider national indicators such as ISEW at a macro scale can also be seen at the micro scale by analyzing wider indicators of firms' performance. Even if this topic was not the centre of the thesis, a discussion was opened to encourage an in-depth analysis. It was discovered that companies represent significant entities to implement certain changes in the society. Further studies would be needed in order to complete affirmations.

Without change there is no innovation, creativity, or incentive for improvement. Those who initiate change will have a better opportunity to manage the change that is inevitable (Brainquote, 2018). Based on this quote it can be concluded that changes have never been easy to implement and can require strong involvement. Today, both nations and corporations (and also common citizens) have to change their habits and systems to move towards a more sustainable world.

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