

Green+: Monitoring the preconditions for sustainable development

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“Not everything that can be counted counts, and not everything that counts can be counted”

William Bruce Cameron

Preface

The ideas presented in this document have emerged over seven years, starting at the end of my time with the United Nations Statistics Division (UNSD). While at UNSD I worked on environment statistics and environmental economic accounts. In 2009 I started to wonder whether there might be opportunities to create statistics directly linked to 'green' concepts. The 'green economy' had emerged as a concept during the global financial and economic crises of 2008 and there was some political interest in green growth, green jobs and other related measures. An early idea was to create a green Consumer Price Index (CPI), in which the basket of goods and services used to compile the CPI are substituted with goods and services produced using certified 'green' production standards. Later, I discovered that the US Green Jobs Survey undertaken by the United States Bureau of Labor Statistics had also used green production standards coupled with revenue and staff data, to estimate green jobs figures. It occurred to me that instead of estimating green jobs, it could be possible to estimate the value of green production, or put in other terms, Gross Domestic Green Production. I found this to be very exciting, and I wanted to bring these ideas out into a wider forum.

In 2012 I started drafting this document, with the goal of sharing it with others interested in sustainable development and the green economy including researchers, policy makers and the wider official statistics community. The purpose of the document was to review existing indicators and statistics, as well as their application and use, and then present ideas for a whole new set of indicators and statistics that directly measure characteristics of the green economy, including green growth, inflation and jobs. I also thought I should briefly review the role of indicators and statistics with regards to audiences for these information and their use, or lack of use, in policy. Finally, I felt it necessary to set out indicator and data quality criteria. As such, this document covers each of these things, and is organized into three parts. The first part covers definitions along with the applications of statistics and data quality criteria. The second part of the document reviews existing indicators and statistics along with their application and use to date. The third part of the document presents the so call 'Green+' set of indicators, statistics and underlying concepts.

While drafting this document, new thoughts, ideas and concepts have emerged, many of which are captured in the text and are presented in diagrams and tables. The most important realization was that the proposed 'green' indicators and statistics do not show whether development is sustainable, but rather, indicate that the preconditions for sustainability are being put in place. In this light, Green+ indicators and statistics have the potential to be a useful addition to sustainable development related data and information such as environmental economic accounts, the genuine progress indicator, the ecological footprint and SDGs.

I personally think indicators and statistics based upon green certification standards have the great promise in terms of being policy relevant and timely. For example, to increase the number of green jobs, a policy maker simply has to get more businesses to apply certified green production standards. However, there may be unintended consequences associated with the promotion of certified green production standards. There certainly will be issues of data quality. A logical next step is to undertake further research.

I am eager to engage policy makers, researchers and others interested in research on the collection, compilation and application of green+ indicators and statistics. I will also be grateful for critical feedback.

In this light, I hope you enjoy reading the document and I look forward to your feedback.

Executive summary

The Sustainable Development Goals (SDGs), like the Millennium Development Goals (MDGs) before them, serve to orient international cooperation, national development and other development activities, around a set of internationally adopted development goals. However, can we expect to be any more successful in achieving the SDGs than we were in achieving the MDGs? While significant progress has been made towards achieving the MDGs, greenhouse gas (GHG) emissions have been growing and accumulating in the atmosphere and biodiversity has been declining. The dilemma is that the economic growth required to lift people out of poverty and sustain levels of wellbeing for others, is driving climate change, straining ecosystems and causing an irreversible decline in biodiversity and species numbers.

SDGs consisting of 17 goals, 169 targets and over 300 proposed provision indicators. Proposed provisional indicators can assist in monitoring progress towards targets, however, there remains a need for overarching indicators that assess overall sustainability of development. Furthermore, detailed statistics are required to assess issues and options, including the optimization of interventions towards achieving the SDGs and national development goals. The implementation of green production standards may be one such intervention.

Prior to the adoption of the SDGs, a wide array of headline indicators, indicator sets, and statistical concepts sources and methods had been developed related to sustainable development, the green economy and green growth. Together these can be used to form a monitoring system that flag issues, and support the analysis of policy options and other interventions. Examples of headline indicators include ecological footprint, genuine progress indicator and even the gross national happiness index from Bhutan. Indicator sets include the green growth indicators from the OECD, while statistics include the System of Environmental Economic Accounts (SEEA) and initiatives such as Wealth Accounting and Valuation of Ecosystem Services (WAVES). To date these sustainable development and green growth related indicators and statistics have been implemented in part or not at all by many countries, and there is limited direct use of such data in policy making, implementation or regulation.

In addition to the SDGs and existing indicators and statistics, there is an opportunity to develop new measures that directly assess characteristics of the green economy, drawing from methods developed by the United States Bureau of Labor Statistics green jobs survey. Specifically, it is proposed that jobs, value addition, economic growth and even inflation could be measured in relation to goods and services created using certified 'green' production standards. Measures could include a green Consumer Price Index (gCPI), Gross Domestic green Production (GDgP), in addition to green jobs. These measures are don't assess whether development is sustainable, but rather give an indication of whether the preconditions for sustainability are being implemented. Such indicators would be responsive to interventions that expand the use of green production standards, while other existing indicators take longer to respond given the time it takes for such interventions to have a meaningful impact on the environment and society. As such, the proposed 'green+' measures are a potential supplement to existing indicators and statistics and the SDGs.

There remain questions around key concepts related to the green economy as well as sustainable development. In this report, a frame for organising green+ related data is proposed consisting of: dark green ecologically restorative economic activities, light green activities that directly interact with the

environment but do no harm to ecosystems, yellow activities that have very limited direct interaction with the environment, orange activities have limited direct negative impact on ecosystems, and red economic activities that contribute to the breaching of ecological limits. In addition to ecological considerations, decent work and other social standards related to production should also be considered, in alignment with the UNEP ILO green economy conceptualization. It is an open question as to who should determine economic activities and production standards should be considered green or not, but a panel consisting of government, business, and civil society representatives could be one way of doing this.

There are also questions regarding the data sources and methods for compiling proposed green+ measures. As such further research is required if the concepts discussed in this report are to become a reality and contribute to green growth, sustainable development or the achievement of the SDGs. In this light, critical feedback will be welcome along with expressions of interest in further research and implementation.

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Acronyms and abbreviations

AIDS	Acquired Immunodeficiency Syndrome
BLS	United States Bureau of Labor Statistics
CO ₂	Carbon dioxide
CPC	Central Product Classification
CPI	Consumer Price Index
CSD	Commission on Sustainable Development
CSOs	Civil Society Organisations
CSR	Corporate Social Responsibility
DPSIR	Driving Force Pressure State Impact Response
eaGDP	environmentally adjusted Gross Domestic Product
eaNDP	environmentally adjusted Net Domestic Product
EPEA	Environmental Protection Expenditure Accounts
FAO	United Nations Food and Agriculture Organisation
FDES	Framework for the Development of Environment Statistics
FTE	Full Time Equivalent
gCPI	green Consumer Price Index
GDE	Gross Domestic Expenditure
GDgP	Gross Domestic green Production
GDI	Gross Domestic Income
GDI _{mu}	Gross Domestic Income adjusted for marginal utility
GDP	Gross Domestic Product
GGBP	Green Growth Best Practice Initiative
GHGs	Greenhouse Gases
GIS	Geographic Information Systems

GNH	Gross National Happiness
GPI	Genuine Progress Indicator
GRI	Global Reporting Initiative
GWP	Global Warming Potential
gPPI	green Producers Price Index
HDI	Human Development Index
HFCs	Hydrofluorocarbons
HIV	Human Immunodeficiency Virus
IAEG	Inter-agency and Expert Group
IEA	International Energy Agency
IET	International Emissions Trading
ILO	International Labour Organisation
IPCC	Intergovernmental Panel on Climate Change
IRWS	International Recommendations for Water Statistics
ISIC	International Standard Industry Classification of All Economic Activities
MA	Millennium Ecosystem Assessment
MDGs	Millennium Development Goals
NAICS	North American Industry Classification System
NDP	Net Domestic Product
NGOs	Non-government Organisations
NSOs	National Statistical Offices
OECD	Organisation for Economic Co-operation and Development
PSR	Pressure State Response
PSUT	Physical Supply and Use Table
Rio+20	United Nations Conference on Sustainable Development

SDGs	Sustainable Development Goals
SDIs	Sustainable Development Indicators
SEEA	System of Environmental and Economic Accounting
SNA	System of National Accounts
TEEB	The Economics of Ecosystems and Biodiversity Study
UNCED	United Nations Conference on Environment and Development
UNCSD	United Nations Conference on Sustainable Development
UNDESA	United Nations Department of Economic and Social Affairs
UNDP	United Nations Development Programme
UNSD	United Nations Division of Sustainable Development
UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change
UNSC	United Nations Statistical Commission
UNSD	United Nations Statistics Division

1 Introduction and outline of the report

1.1 SDGs and socially inclusive green economies

“A bold new global agenda to end poverty by 2030 and pursue a sustainable future was unanimously adopted today by the 193 Member States of the United Nations” states the press release from the United Nations on 25 September 2015 (UN 2015). Furthermore, “...adoption of the new Sustainable Development Agenda... was met with a thunderous standing ovation from delegations that included many of the more than 150 world leaders who will be addressing the Summit”. Sustainable development, often noted over the last 20 years as being a fad or the latest thing, is now firmly at the apex of all international cooperation efforts. Furthermore there is a real enthusiasm around the 17 goals, 169 targets and over 300 proposed provisional indicators that make up the Sustainable Development Goals (SDGs) and wider monitoring framework.

The SDGs, like the Millennium Development Goals (MDGs) before them, serve to orient international cooperation, national development and other development activities, around a set of internationally adopted development goals. However, can we expect to be any more successful in achieving the SDGs than we were in achieving the MDGs?

While significant progress has been made towards achieving the MDGs, greenhouse gas (GHG) emissions have been growing and accumulating in the atmosphere and biodiversity has been declining. For example, since 1990 extreme poverty has been reduced by half (a reduction of 700 million people) and child mortality has also been halved¹. Despite this progress, poverty and deprivation still exist and many challenges remain including the need to: lift 1.2 billion people out of poverty; reduce maternal mortality; and, improve sanitation for the billion people that still defecate in open areas¹.

The dilemma is that the economic growth required to lift people out of poverty and sustain levels of wellbeing for others, is driving climate change, straining ecosystems and causing an irreversible decline in biodiversity and species numbers. Meanwhile there is a growing risk of climate change and the degradation of ecosystems undermining development with the greatest risk being to the poorest¹. Compounding this dilemma are “*The risks of abrupt or irreversible [climate] changes increase as the magnitude of the warming increases*”².

Economies will necessarily need to be green and socially inclusive if the SDGs are to be achieved. Living in an information age, it might be taken for granted that we have already have the required indicators, statistics and geographic information to inform policies, instruments and effective interventions towards the achievement of the SDGs. However, as the global financial crisis of 2008 demonstrates, even with an abundance of information there remain issues with regards to interpretation of data, the linking of information with interventions and the effective management of economies.

¹ UN 2014. The Millennium Development Goals Report 2014. Available online 31/01/2015: www.un.org/millenniumgoals/2014%20mdg%20report/mdg%202014%20english%20web.pdf

² Page 16, IPCC 2014. Climate Change 2014 Synthesis Report: Summary for Policy Makers.



Figure 1: Sustainable Development Goals (SDGs)

In this light, this report reviews existing headline indicators, indicators, statistics and other types of information that are related to green growth and sustainable development. Each of these information are discussed in terms of their quality and policy relevance. Finally the report identifies a conceptual framework for monitoring green growth and other characteristics of the green economy, in a way that is highly responsive to policy interventions and directly linked to the standards required to creating a socially inclusive green economy. Finally the report makes recommendations on next steps for developing the concepts discussed into indicators and statistics that supplement the existing green growth indicators, as statistical systems such as the System of Environmental Economic Accounting (SEEA) for example.

1.2 Outline of the report

The introduction addresses the context in which this report has been prepared, including the adoption of SDGs, along with the overarching political and economic influences surrounding the drive to find a green economic model.

Following the introduction, the report is organized into three parts. Part I covers definitions along with the applications of statistics and data quality criteria. Part II of the document reviews existing indicators and statistics along with their application and use to date. Part III of the document presents the so call 'Green+' set of indicators, statistics and underlying concepts.

Part I of the report consists of Chapters 2 to 4. Chapter 2 addresses green economy and related concepts and definitions including statistical definitions that can be used to define and frame indicators, statistics and other data. Definitions are drawn from UNEP the ILO as well as the System of National Accounts. The chapter also sets out a statistical definition for the green economy and frames the relationship between the green economy, green growth and the economy as a whole. Chapter 3 regards the use of data and information. The chapter highlights sets out the different types of information that exist and their users.

This includes headline indicators, indicator sets, statistics and other types of data such as found in Geographic Information Systems (GIS). The chapter also notes that data are not always used as a basis for decisions, but when they are used, they can help optimise decisions. The chapter also highlights the relationship data and information has with policy, regulatory and management instruments. Chapter 4 regards the data quality criteria that indicators and statistics need to meet if they are to be trusted and useful for monitoring development and informing policy, regulation or management decisions. These criteria are used later in the report, particularly in the discussion, to assess the relative merits and roles of the indicators, statistics and other data types related to the green economy.

Part II of the report consists of Chapters 5 to 7, regarding headline indicators, indicator sets, as well as statistics and other information. In each of these chapters specific indicators, statistics and data are highlighted, described and briefly discussed in the context of green economy, green growth and development. The application and use of these data are also discussed.

Part III of the report consists of Chapters 8 to 11. Chapter 8 builds a conceptual framework for organising indicators and statistics. This includes a classification of economic activities in relation to their ecological impacts, starting with dark green restorative activities through to red activities that contribute to the breaching of ecological limits. Chapter 9 addresses how green indicators and statistics might be collected based upon certified green production standards. It also discusses some of the possible indicators and statistics that might be collected and compiled such as Gross Domestic green Production for example. Chapter 10 addresses the role of green+ indicators and statistics in relation to existing indicators and statistics, as well as in support of SDGs. Each of these elements are treated as being part of a monitoring system for assessing progress as well as policy issues and options for interventions. Chapter 11 briefly discusses the need for further research.

Part I: Definitions, applications and quality criteria

2 Green economy and related concepts and definitions

For statistics to be collected and compiled on any subject there first needs to be clearly defined concepts, in this case the concept of “green economy”. It is only after concepts are defined that data sources can be identified and methods for compiling indicators, statistics and other data can be designed or discussed. UNEP the OECD and ILO have all undertaken work in support of the green economy, green growth and green jobs respectively and their definitions are presented below. Furthermore, a statistical definition for green economy is proposed at the end of the chapter, drawing from the concept of “economy” as presented in the System of National Accounts (SNA).

2.1 Background

The term green economy has been used for at least two decades, but rose to prominence during the global financial crisis in 2008. At this time there was an opportunity for political leaders, business and civil society to reflect on the implications accumulated debt and an interlinked world both in relation to finance, but also in terms of the way we as a species have been exploiting natural resources, and putting ever more pressure on ecosystems and the environment. Indicators such as levels of global warming, biodiversity loss and material flows all pointed to unsustainable development and an ever increasing environmental deficit.

Like the environmental movement, the green economy concept is not new. During the financial crises the green economy was put forward as a chance to pivot from taking ever more environmental risk towards sustainably creating new jobs and meeting human and development needs. At the core of this re-orientation was the need to explore issues of the environment and economy and come up with alternative models and socio-economic paradigms that support human welfare within environmental limits (Jenkins and Simms 2012). Reflecting this focus, “*a green economy in the context of sustainable development and poverty eradication*” was one of two themes for the Rio+20 United Nations Conference on Sustainable Development (UNCSD) held in Rio de Janeiro, Brazil, 20 - 22 June, 2012^{3,4}.

The concept of the green economy, or its application, is not universally accepted. Concerns have been raised by many developing countries that the green economy concept may be misused or taken out of context, and that the promotion of the green economy may give rise of unhelpful or negative developments (Shreekaracharya and Sequeira, 2012). Undoubtedly there are a number risks such as a one dimensional approach, a one size fits all approach, environment for trade protection, gaining market access through the guise of environment, and new conditionalities for example (Shreekaracharya and Sequeira, 2012).

In support of SDGs, a movement towards a green economy has the potential to affect every dimension of development. Developed and developing countries each have different concerns and priorities with

³ For more information on the green economy in the context of the Rio+20 Conference see:

<http://www.uncsd2012.org/rio20/index.php?menu=62>

⁴ Note: The Rio+20 conference follows the United Nations Conference on Environment and Development (UNCED) commonly referred to as the “Earth Summit”, held 20 years ago in Rio de Janeiro (1992) and the World Summit for Sustainable Development held 10 years ago in Johannesburg, South Africa (2002).

regards to the green economy, green growth and development, as well as varying data and information available to inform leaders, government, business, civil society or the public. In some cases existing data and information will be available to support evidence based decision making and in other cases new and innovative indicators and statistics may be required. The key issue is how to build an information system of indicators, statistics and other data that is linked to policy instruments and meaningfully supports economic, social and environmental decision making.

There is a growing body of literature, research and practice related to measuring and assessing elements of the green economy. In terms of practice, the United States Bureau of Labor Statistics (BLS) has estimated the number of green jobs in the United States and the OECD has developed a set of green growth indicators. Towards understanding what data and information already exists on the green economy and the key issues that National Statistics Offices (NSOs) may need address, Statistics Korea and the United Nations Statistics Division (UNSD) jointly organized an International Seminar on Green Economy and Official Statistics in Seoul, Korea, 6-8 July, 2012. Other organizations are also investigating such issues, and often start with the definition of the green economy. This is because key concepts (such as what is meant by the green economy) need to be defined before data sources and methods for collecting and compiling statistics on the green economy can be developed (Jarvis et al 2011). Linking issues of green growth monitoring as well as green growth policies and practices, the international Green Growth Best Practices (GGBP) Initiative undertook a series of case studies 2013 and published these in 2014 (GGBP 2014).

Despite a growing number of environmental economic indicators and statistics over the last thirty or more years, there are only a limited number of countries collecting and compiling such indicators. Perhaps of more concern are the limited number of examples where such data has been used for policy purposes (GGBP 2014). Unlike GDP, inflation measures and employment data which are all produced frequently and are linked directly to policy for example monetary policy, there do not appear to be such linkages between environmental economic data and environmental and economic policy instruments.

2.2 UNEP – Green economy

There are various definitions for the “green economy”, however a widely accepted definition of green economy is:

“... an economy that results in improved human well-being and social equity, while significantly reducing environmental risks and ecological scarcities” (UNEP 2010)

The definition is focused on the objective of green growth, however, it is difficult to get a sense what the green economy means in concrete terms such as economic activity or production processes. Furthermore the definition leaves open many questions as to what is meant by: improved human wellbeing, social equity, reduced environmental risks or ecological scarcities for example.

2.3 Green growth and green jobs

Surrounding the term green economy are a range of other terms and definitions, each of which highlight certain aspects of the development process and desired development outcomes. Two key definitions regard green growth and green jobs.

According to the OECD, which has led work on green growth indicators:

“Green growth is about fostering economic growth and development while ensuring that natural assets continue to provide the resources and environmental services on which our well-being relies. To do this, it must catalyse investment and innovation which will underpin sustained growth and give rise to new economic opportunities.”

Following the green stimulus spending in many countries there has been an interest in green jobs. According to the ILO and UNEP a green job is:

“...direct employment created in different sectors of the economy and through related activities, which reduces the environmental impact of those sectors and activities, and ultimately brings it down to sustainable levels. This includes “decent” jobs that help to reduce consumption of energy and raw materials, de-carbonize the economy, protect and restore ecosystems and biodiversity and minimize the production of waste and pollution.”

These definitions for the economy, the green economy, green growth and green jobs are important as they define fundamental concepts for which data sources and methods can be developed to measure things. As such, these concepts and definitions are referred to when reviewing discussion various indicators, statistics and other types of data and information especially in the discussion in Chapter 9.

2.4 System of National Accounts - Economy

Internationally, the System of National Accounts (SNA) defines how to measure various characteristics of economies, including for example Gross Domestic Product (GDP). Drawing from the SNA and related statistical documents, the economy can be considered as:

“the sum of economic activities of production, consumption and accumulation undertaken by entities within an economic territory. These entities include the economic units that can engage in economic transactions and are capable of owning assets and incurring liabilities on their own behalf” (P17, IRWS 2012)

2.5 Proposed statistical definition - Green economy

Following the statistical definition of the economy above, the green economy can be considered statistically as:

“the sum of economic activities of production, consumption and accumulation considered to be green (i.e. sustainable) undertaken by entities within an economic territory”

Given the social and labour dimensions to the concept of green economy, an important additional condition to add, is:

“while at the same time providing decent jobs and being socially inclusive”

In economic terms, you could argue that a green economy is an economy without negative social and environmental externalities, essentially consisting of productive activities that do no harm.

In terms of applying such a definition to economic units (i.e. establishments), in some cases all the activities of an economic unit such as a wind farm generating electricity can be considered green, while in other cases an economic unit may have some green economic activities and some grey economic activities, for example an electricity generator may rely on solar and wind power when conditions are suitable, but revert to diesel generation overnight or when demand is greater than supply.

Figure 2 shows that the total “economy” as defined by the SNA, can be said to have a green part and a grey part (i.e. not green part). Economic growth as traditionally measured using change in Gross Domestic Product (GDP) is represented by the dotted outline of the economy in grey expanding. Importantly, green growth is represented as the green part of the economy growing over time as reflected by the dotted green line expanding. Many people in the sustainable development community would like to see the green economy grow as a proportion of the total economy, hence the economy as a whole would be ‘greener’.

The model presented in Figure 2 is a simple representation of the green economy and related concepts. Chapter 8 elaborates on how the green economy and rest of the economy are related, including concepts around dark green restorative economic activities, light green sustainable economic activities, yellow economic activities that have limited direct impact on the environment, and red economic activities that have direct negative impacts on the environment and people. The discussion will also explain why these concepts are presented using a traffic light colour scheme.

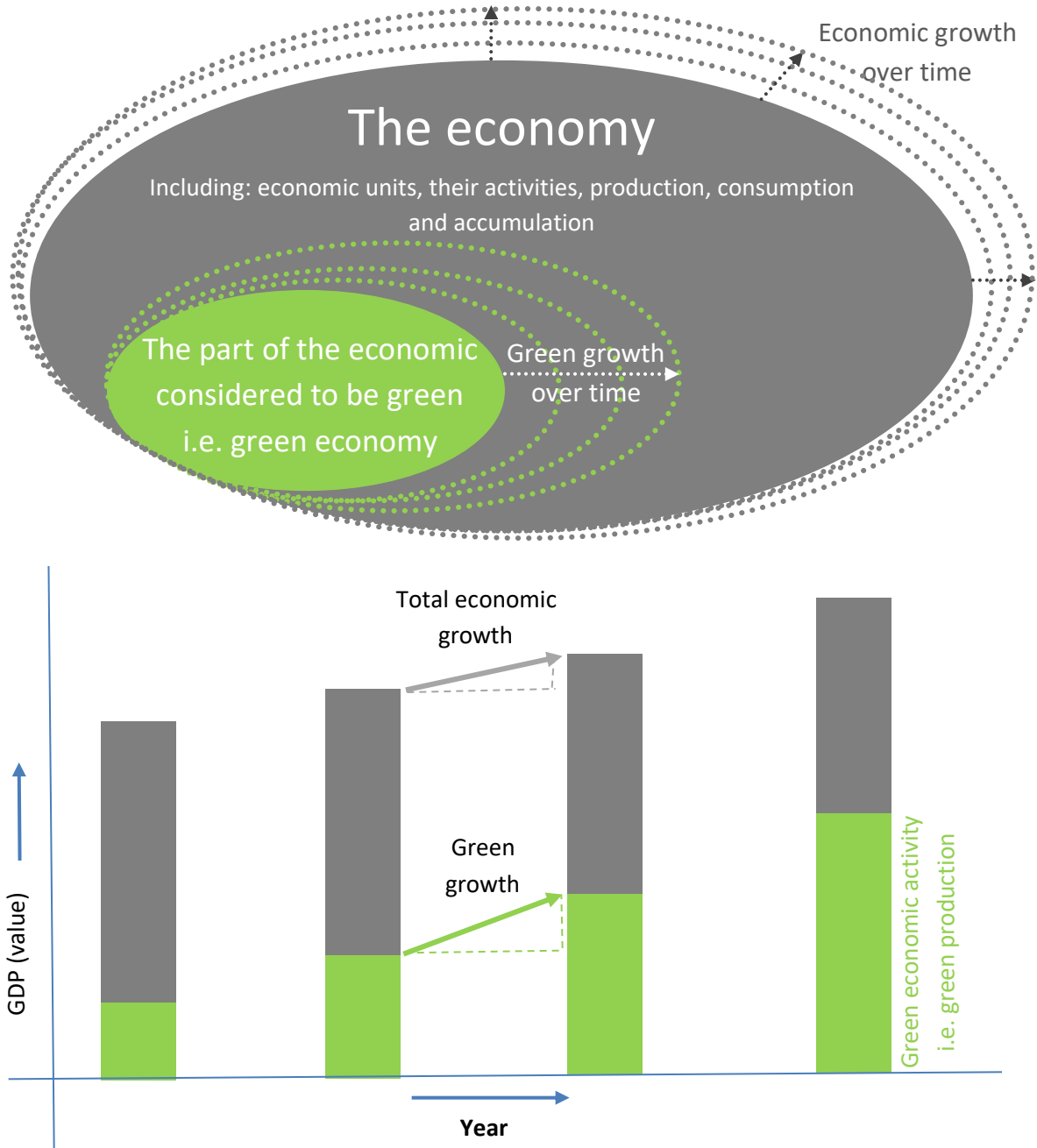


Figure 2: A simple conceptual model distinguishing the part of the economy considered to be green from the economy as a whole.

3 The use of data and information

There are many types of data and information including for example headline indicators, indicator sets, statistics, geographic information systems (GIS) and even contractual information. This chapter sets out the types of data and information that can potentially be used to support decisions, discusses the audiences for these information along with the policy applications of these information. The chapter includes a section on decision making which notes some of the complicating factors such as vested interests, incentive structures and biases that affect how data may actually be used. The chapter finishes with a section discussion how data and information are linked to policy interventions and the 'real world'.

The types of data listed in this chapter are discussed further in the following chapters on headline indicators, indicator sets, statistics and other information (Chapters 5, 6, and 7 respectively). The discussion of data and its uses in this chapter also sets the frame for the discussion in Chapter 10 on how existing and new data might better support decision making.

3.1 Types of data and data users

Data and information can be thought of in terms of an information pyramid (Hammond et al. 1995, UNSD 2012, SNZ 2003, GGBP 2014). At the top of this pyramid are headline indicators, while under this there are indicator sets, national and sectoral statistics as well as data and information for large geographic areas (Figure 3). Below this there are data and information at the contractual or project level, at the level of case studies and for individual businesses, households (i.e. microdata) or small geographic areas.

For each type of data and information there are different actual and potential data users (Figure 3). For headline indicators there is a very wide audience, including decision makers from government, the business and civil society, researchers, and the general public. For national and sectoral statistics and geographic information across relatively wide areas there is a smaller user community that includes policy analysts, researchers and managers from government, business and civil society. For microdata, project data and geographic data for small areas, the main users are specialized researchers from government, the private sector and civil society or individuals according to their own personal interest.

3.2 Classifications and frameworks

Classifications and frameworks are used to organize data and information including indicators, and facilitate the generation of comparable indicators, statistics and other information. National Statistical Offices (NSOs) typically use classifications and frameworks adopted at the United Nations Statistical Commission, while researchers often develop their own classifications and frameworks according to the theories and concepts being investigated. Data and information collected for the purposes of fulfilling contractual agreements typically follow guidelines or methodologies either agreed between the parties involved in the contract or according to some wider standards, for example defined at the international level. The classification and frameworks used fundamentally affect how data and information can be used.

3.3 Uses of indicators, statistics and other information

Data and information at each level of the pyramid in Figure 3 are used in different ways and for different purposes. Indicators are used to monitor key issues, and typically indicate if trends are positive or negative often in relation to stated goals. When indicators flag that a situation is negative, it is rare that indicators alone are sufficient to analyze the situation or to understand the underlying issues and the implications of available options. Instead, national and sectoral statistics may be used along with models to look at underlying issues and assess the possible consequences, intended and unintended, of policy options. Such modelling exercises can also look at the contribution each policy intervention might have towards achieving SDG goals and targets, by modelling the impact on specific SDG proposed provisional indicators.

In many cases there may be a lack of sufficient national or sectoral statistics, or such statistics are not sufficient on their own, and case examples may be useful in helping understanding the dynamics of green growth and development at the level of specific businesses, communities, households, projects or small geographic areas. In most NSOs, statistics at this level (i.e. microdata) are confidential and are not publically available (IRWS 2012). However, researchers from research institutions, business groups and civil society may have valuable data and information at this level.

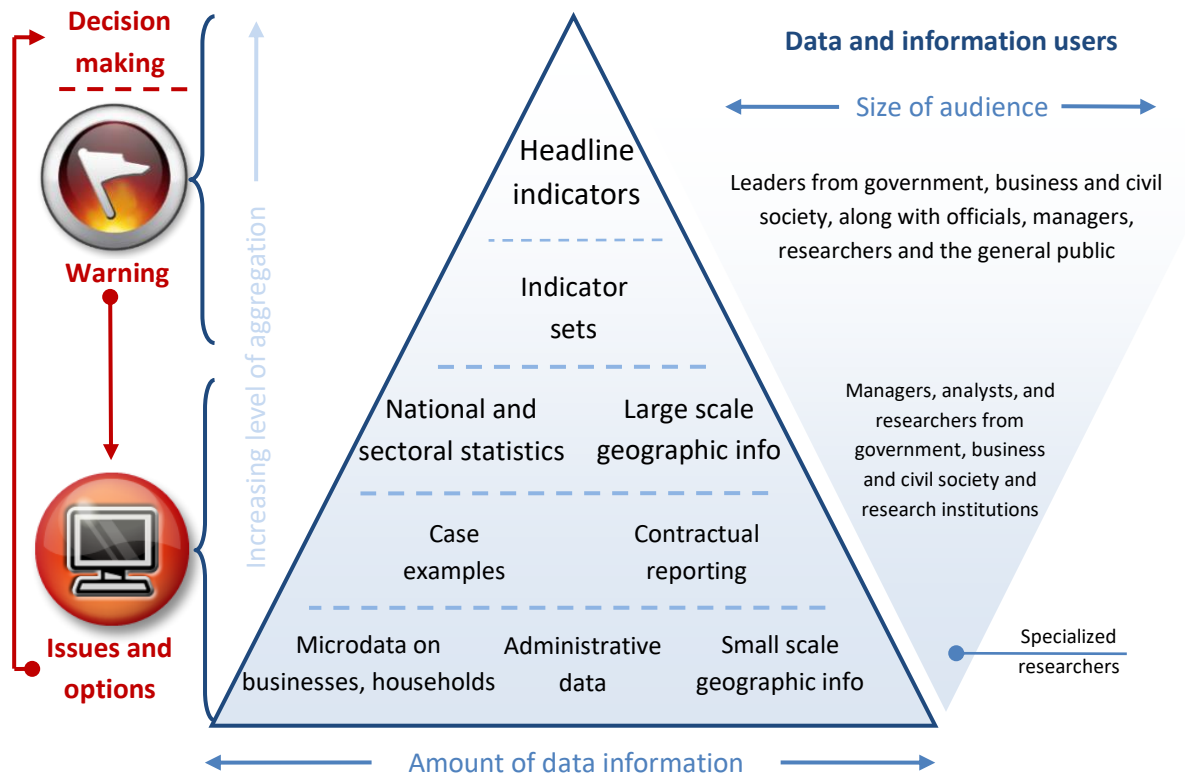


Figure 3: The data and information pyramid showing different types of data and information, the level of aggregation relative to the amount of information, and the inverse pyramid showing data and information users and how they use indicators to flag issues and more detailed information for decision making.

Some data and information may not be collected and compiled for policy analysis purposes, but will be collected, compiled and sometimes audited as a part of some contractual arrangement related to green growth and development for example Clean Development Mechanism (CDM). However these data may have additional policy uses.

3.4 Policy related applications

The value added of using data and information in decision making is not just in choosing between various development options, but also in optimizing these options. For example if a city has no data or information on its waste, city authorities can always use the five R's to assist decision making with regards to managing waste. The five R's⁵ are principles for managing waste in order of importance from a sustainability perspective. However, without information on the quantity and composition of waste from the city it is not possible to optimize waste management options for example in terms of recycling versus sending waste to landfill and the capacity such facilities should have. Hence data is essential for optimization of options.

Sectoral policy analyses, the assessment of new business opportunities or the analyses of emerging issues are infrequent applications that typically require significant volumes of data and information. In the case of policy analysis, this typically requires politicians and governments to mandate such analyses; and such mandates usually coincide with some issue becoming important to a government. As such, it is not possible to predict when data and information suitable for analyzing the green economy will be required for policy analysis, but data producers still need to pre-empt such demand to ensure sufficient data and information is available to support a thorough investigation of the issues, and optimize available options. Similarly businesses can not necessarily pre-empt opportunities that may arise or the required data and information to further investigate these opportunities, nor can civil society, think tanks or other groups necessarily pre-empt the various social, economic or environmental issues that may arise. In such circumstances it is important to ensure there are ongoing data collections so as to ensure time series information are available when the need arises.

Frequent applications of data and information in decision making include, for example, monetary policy which typically relies upon a mix of: quarterly inflation data, employment and unemployment data coupled with contextual information on state of the economy and development such as economic growth rates, other indicators and statistics. In such cases the frequent production of indicators is required to inform monetary policy adjustments. In other cases, data and information are required for managing resources, sectors, cities and rural development for example. For some applications such as managing electricity generation, information on the storage in artificial reservoirs used for hydro-electricity generation may be required on a daily basis while housing and population data may be required every 2 to 5 years for urban planning and rural planning purposes for example regarding the location and required capacity of schools.

⁵ The five R's are: 1. Reduce consumption therefore reducing the flow of waste; 2. Reuse products and therefore reduce the flow of waste; 3. Recycle and therefore reduce the amount of waste having to go into the environment; 4. Recover energy from waste; 5. Refuse i.e. the waste goes into landfill or some other part of the environment.

In the context of the green economy, the frequency data and information are required for decision making will depend upon the types of applications, or decisions, these data and information are being used to support. If data and information are coupled with economic instruments or management applications then the data and information will be required frequently. For the purposes of changing policy direction, data and information are likely to be required infrequently coinciding with the political demand for such analyses.

3.5 Data and decision making

Decision making processes are complicated involving not only data and information but also different actors, incentives and motivations all of which have a bearing on how issues are framed and which options are assessed for example. Due to the complexity of decision making the role of data and information should not be overstated, and nor should the potential for data and information to optimize decisions be understated. It is only by understanding the role of data and information in decision making coupled with other influences, that a discussion of data and information systems can be had in the context of green decision making.

It is often said that decisions cannot be made without data and information. This is an ideal view of the world and in many cases not necessarily true. Even evidence based decisions are made based upon data and information with gaps. In such cases, principles can be used to assist in guiding decisions where there is a lack of data and information. In the worst case, decisions are made without any reference to available data and information but are rather based upon ideology, dogma or special interests. Between these extremes are a spectrum of practices with regards to decision making, the various interests being addressed and how data and information are used. Along these lines, the European Union (EU) funded Policy Use and Influence of Indicators (POINT) project, identified three primary roles for green growth indicators (Bell et al., 2011), consisting of the:

1. instrumental use of indicators to manage environmental problems or improve environmental conditions;
2. conceptual use of indicators to shape ideas in public debates; and
3. political use of indicators to legitimize, or delegitimize, policies or policy actors.

Beyond these uses of indicators, statistics and other information, there are many factors that contribute to how data and information are used, or not used, in decision making. These factors include:

- The existence of data and information
- Availability of these data information to potential users
- Awareness by potential users that such data and information exist
- The ability of potential users to use the data and information, for example in models or as part of a suite of information towards making a decision

Potential data users have a range of motivations for using data and information, and in as much as data and information may contain biases, users may have even more fundamental biases. In the best case, from a utilitarian perspective, potential users attempt to be objective and use data and information in a

positive way to support evidence based decision making. However, such applications of data and information are not universal. In some cases data users may simply use data in a normative way so as to reinforce and back up preconceived ideas, political positions, business interests, or preconceptions of how the society and development should be.

Despite the risk of data and information being misused, it is better have data and information available for decision makers and also to allow debate on the best possible development options (Figure 4) between government, business, civil society and any other stakeholders. In the best case scenario, information may well save a country, city or some other administrative unit literally millions or billions of dollars through optimization, and ultimately contribute to the achievement of national and international development ambitions as elaborated in national development plans and the SDGs respectively.

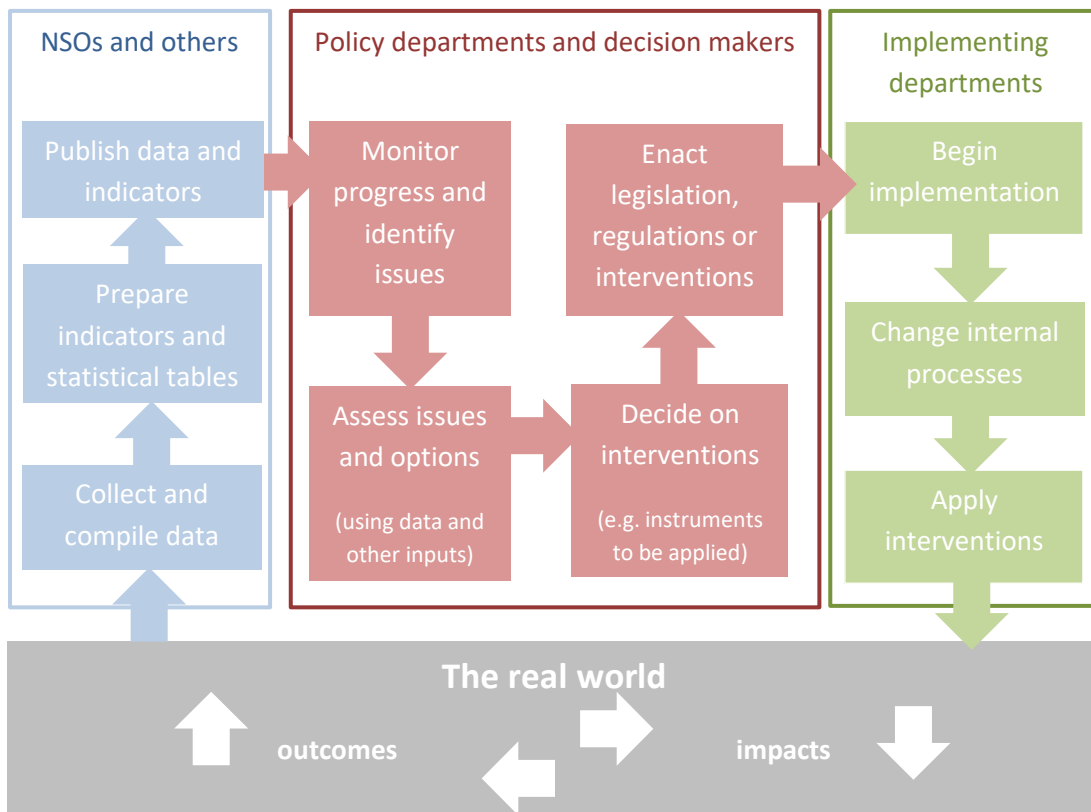


Figure 4: The role of data in government decisions and interventions.

4 Quality criteria

This chapter provides a reference for assessing the quality of indicators, and by extension indicator sets, as well as data in general. The chapter draws upon existing indicator and data quality criteria. Indicator quality criteria and data quality criteria are treated separately reflecting the different uses of these information as discussed previously in Chapter 3.

The quality criteria presented in this chapter are referred to in the following chapters when assessing strengths and weaknesses of indicators, statistics and other information including how fit for purpose these information are for decision making.

4.1 Indicator quality criteria

Before reviewing and discussing headline indicators or indicator sets, it is useful to first discuss what constitutes a good indicator including the criteria that a good indicator should satisfy. Currently there is no single internationally accepted standard, or set of criteria, against which to assess indicators in terms of the quality of an indicator⁶. However, following a review of international and national indicator best practices, Statistics New Zealand in collaboration with several other government departments, produced Indicator Guidelines (SNZ 2004a) that contain 12 criteria that an indicator should meet regardless of its use. These 12 criteria are:

1. Be valid and meaningful
2. Be sensitive and specific to the underlying phenomenon
3. Be grounded in research
4. Be statistically sound
5. Be intelligible and easily interpreted
6. Relate where appropriate to other indicators
7. Allow international comparison
8. Ability to be disaggregated
9. Consistent over time
10. Be timely
11. Linked with policy or emerging issues
12. Compel, interest and excite

There are many other possible criteria that can be used to assess the quality of indicators, including for example SMART criteria (Doran, 1981):

- Specific – target a specific area for improvement.
- Measurable – quantify or at least suggest an indicator of progress.
- Assignable – specify who will do it.
- Realistic – state what results can realistically be achieved, given available resources.

⁶ In many cases the criteria used to assess indicators are specific to a sector or area of interest such as the environment, for example the OECD Criteria for environmental indicators.

- Time-related – specify when the result(s) can be achieved.

Regardless of which criteria are used to assess an indicator, the important thing is that the criteria used should reflect the purpose for which indicators are being developed. In addition to specific criteria it is useful to consider whether an indicator is “fit for purpose”, which has emerged as a key condition internationally for official statistics and indicators (Paris 21, 2005).

4.2 Data quality criteria

Statistical and other data can also be assessed in terms of quality. The criteria for statistical data quality are different to that for indicators. This is due to the fact that statistics are typically used for detailed analyses while indicators are typically used to monitor progress, flag issues and are often part of a wider public debate on future development directions.

It is important to note that data quality is not restricted to the accuracy of the data which is the degree to which the data correctly represents the real world (IRWS 2012). Instead there are a mix of quantitative and qualitative criteria, many of which are interrelated. The OECD (2003)⁷ has 8 criteria for assess data quality that are widely used internationally. These are:

- Prerequisites of quality
- Accessibility
- Accuracy
- Coherence
- Credibility
- Interpretability
- Relevance
- Timeliness

Data quality criteria for geographic information are generally the same, and like with statistics, metadata are very important (see Section 7.3 for more information on GIS metadata standards).

⁷ OECD 2003. Quality Framework for OECD Statistical Activities Version 2003/1. [Online 09/12/2010: http://www.oecd.org/document/43/0,3343,en_2649_33715_21571947_1_1_1_1,00.html].

Part II: Indicators and statistics reviewed

5 Headline indicators

This chapter defines and sets out what headline indicators are and then goes on to review headline indicators of sustainability, equality or inequality and specific green indicators such as green jobs.

5.1 Headline indicators

Headline indicators are indicators used to monitor key issues and are commonly found in media headlines when they are published. Examples include: GDP growth rates; inflation i.e. rates of change in the Consumer Price Index (CPI); employment and unemployment figures; and, income figures.

The following sections address headline indicators of sustainability, equality, and then specific green headline indicators.

5.2 Indicators of sustainability

Indicators of sustainability are indicators that give some sense of whether the current situation can continue into the future or not. While there is an ever growing list of such indicators at the headline indicator level, this report restricts itself to summarizing the ecological footprint, environmentally adjusted Net Domestic Product (eaNDP), genuine savings, genuine progress indicators and the gross national happiness index. For each of these indicators have concepts and methods which are presented in the context of the green economy.

5.2.1 Ecological footprint

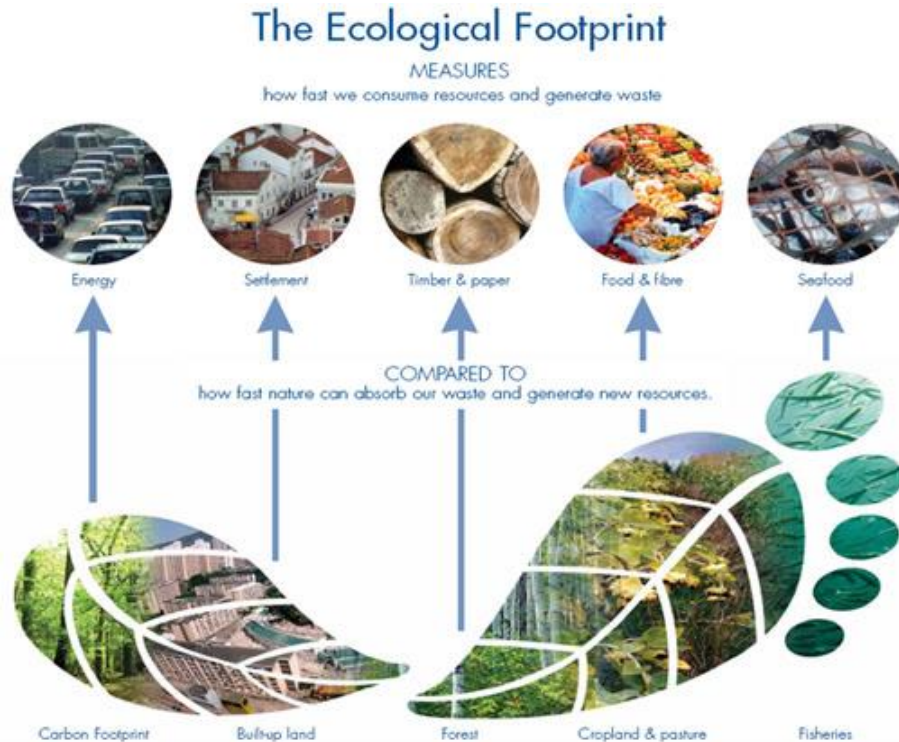
The ecological footprint “*measures how much land and water area a human population requires to produce the resource it consumes and to absorb its carbon dioxide emissions, using prevailing technology*”⁸. The ecological footprint is related to the concept of carrying capacity, and assesses how many planets are required to sustainably provide the resources consumed by people at the global level for example. However, it should be noted that the ecological footprint does have a bias towards overestimating the footprint, for example all fossil fuel use is assumed to require an equivalent amount in forested land, but fossil fuels do not require such land endowments as they are a stock that can be drawn down (for a while at least). Despite such drawbacks, the ecological footprint is useful in giving a sense of whether trends are positive or negative and has been an excellent awareness raising indicator, although its sensitivity over the short to medium term is limited. It is useful for identifying sectors that are straining the carrying capacity of the planet, but does not provide much information on the activities, goods and services that are not straining the carrying capacity of the planet and might be scaled up.

The ecological footprint has been co-developed by William Rees (Rees 1992) and Mathis Wackernagel who is currently the President of the Global Footprint Network. The Global Footprint Networks has worked with a range of partners, and its figures have been used in a wide range of reports, including for example in the World Wildlife Foundations report Living Planet Report 2012: On the road to RIO+20 (WWF 2012). The WWF 2012 report included the global ecological footprint as well as national ecological footprints.

⁸ The global footprint network. Online 13/07/2012:
http://www.footprintnetwork.org/en/index.php/GFN/page/footprint_basics_overview/

More information can be found on the concepts, sources and methods used to calculate the ecological footprint online (GFN 2010):

http://www.footprintnetwork.org/images/uploads/National_Footprint_Accounts_Method_Paper_2010.pdf.



Source: Global Footprint Network (http://www.footprintnetwork.org/en/index.php/GFN/page/footprint_basics_overview/)

Figure 5: The ecological footprint and what it measures.

5.2.2 Green GDP and environmentally adjusted Net Domestic Product (eaNDP)

A key question is how green is an entire economy? Green GDP is a measure of sustainable income but is best measured not in terms of GDP adjusted by environmental depletion and degradation, but rather by other methods such as Net Domestic Product adjusted by environmental depletion and degradation (eaNDP) (SEEA 2003). This follows the concept of sustainable income where some portion of income needs to be reinvested in capital if income is to be sustained at current levels (Hicks 1939). The current concept of sustainable income simply acknowledges the need to retain natural capital over time in addition to other forms of capital. If the change in environmentally adjusted NDP (eaNDP) is positive then it can be said that the economy is sustainable or 'green', while if the number is negative it can be said that the economy is not green.

There are several drawbacks to using eaNDP as an indicator: eaNDP is not sensitive to underlying phenomenon affecting green growth and development, has statistical deficiencies and is not easily interpreted. Essentially: it would take a significant period of time for most policies to affect the indicator; NDP is not usually estimated by NSOs due to the margins of error on estimates of consumption of fixed capital (i.e. the wear and tear on manmade capital); most countries would only be able to measure some aspects of environmental depletion and cannot estimate the cost of degradation; and, most people will

have little understanding of what such an indicator means, in the same way there are only a limited number of people that understand the issue of internalising externalities. Another drawback regards the question of whether natural capital and other forms of capital are substitutable.

Currently no country or organisation produces any form of green GDP or eaNDP, although China had planned on producing a green GDP (Wang et.al. 2004), but has not published a green GDP figure and appears unlikely to do so.

5.2.3 Genuine savings, adjusted net savings and the wealth of nations

The Genuine Savings (GS) indicator, adjusted net saving as well as the wealth of nations are headline indicators developed by the World Bank that are related to the concepts of capital and sustainable income (Hicks 1936). GS is focused on changes in manmade and natural capital (i.e. savings). The underlying logic being, if we have savings (i.e. increased capital) then economic activity will be more sustainable (Hamilton 2000). In principle GS should include human capital but in practice this was not the case when the indicator was first compiled by the World Bank (Equation 1). However, the World Bank's net adjusted savings rate does include human capital in the form of current expenditure on education (Equation 2) (Bolt et al, 2002).

Equation 1: Genuine savings.

GS = investment in man-made capital
- net foreign borrowing
+ net official transfers
- depreciation of man-made capital
- net depreciation of natural capital
+ current education expenditures

Equation 2: Adjusted net savings rate

$$\text{NAS} = (\text{GNS} - \text{Dh} + \text{CSE} - \sum \text{Rn},i - \text{CD}) / \text{GNI}$$

Where:

NAS = Adjusted Net Savings Rate

GNS = Gross National Saving

Dh = Depreciation of produced capital

CSE = Current (non-fixed-capital) expenditure on education

Rn,i = Rent from depletion of natural capital

CD = Damages from carbon dioxide emissions

GNI = Gross National Income at Market Prices

The World Bank's Wealth of Nations report assesses levels of capital (i.e. wealth) for countries across the world. In addition to measuring total capital, the World Bank assessed levels of produced (i.e. manmade) capital, natural capital and intangible capital. Intangible capital including things such as human and social capital, as well as the quality of institutions for example (World Bank 2006, World Bank 2011).

With regards to strengths and weaknesses, the GS and adjusted net savings rates measures have been criticized for taking a weak sustainability approach and implicitly assuming that capital can be substituted i.e. that you can replace natural capital with manmade capital (Dietz and Neumayer 2006). It is also curious as to why GS and adjusted net savings rates do not take into account changes in social capital, as social capital is included in the wealth of nations. Presumably the difficulty in measuring or estimating levels of social capital is a key consideration in this regard. On the positive side, GS, net adjusted savings rates and total wealth estimates have been welcomed as a recognition by the World Bank that there is a need for other measures in addition to GDP to assess the state of economies (Dietz and Neumayer 2006).

5.2.4 Genuine Progress Indicators

The Genuine Progress Indicator (GPI) is a headline indicator that attempts to measure aggregate sustainable economic welfare by adding positive, and subtracting negative, dimensions of development taking into account environmental and social issues (Talberth and Webb 2014 a). A common criticism of such indicators is that the judgment of what is positive and negative is often subjective and depends upon the principles applied and assumptions made (Jackson and McBride 2005). Without understanding all the reasons for what is added and what is subtracted it can also be difficult to understand what the indicator means, and many potential users will not have the time to investigate such methodological concerns or the implications in terms of green growth or development.

The GPI has been produced at city level (e.g. Baltimore and Edmonton) to national scale (e.g. the United States and Finland) and at least 17 countries have compiled GPIs or related applications (Kubiszewski et al. 2013, Posner 2010, Anielski and Johannessen 2011). For the United States categories of contributions and deductions were assessed (see Table 1) and it was estimated that genuine progress amounted to USD 4.419 trillion in 2004 compared with GDP of USD 10.760 trillion in the same year (Talberth 2012).

Table 1: Contributions and deductions from genuine progress for the United States in 2004.

Contributions	Deductions
Personal consumption expenditures	Cost of crime
Weighted personal consumption expenditures (adjusted for inequality)	Loss of leisure time
Value of housework and parenting	Costs of unemployment and underemployment
Value of higher education	Cost of consumer durable purchases
Value of volunteer work	Cost of commuting
Services of consumer durables	Cost of household pollution abatement
Services of streets and highways	Cost of auto accidents
Net capital investment (positive in 2004, so included in contributions)	Cost of water pollution
	Cost of air pollution
	Cost of noise pollution
	Loss of wetlands
	Loss of farmland
	Loss of primary forest cover
	Depletion of non-renewable resources
	Carbon emissions damage
	Cost of ozone depletion
	Net foreign borrowing (positive in 2004, so included in deductions)

Source: Talberth 2012

5.2.5 Gross National Happiness

In recent years there has been substantial progress in exploring the measurement of human wellbeing, but limited progress in establishing headline indicators. Bhutan is perhaps the exception with the Gross National Happiness (GNH) index. The current version of the index is based upon an equally weighted combination of nine domains and 33 indicators grouped within these domains (Ura et al, 2012). These domains consist of: community vitality; cultural diversity and resilience; ecological diversity and resilience; education; good Governance; health; living standards; psychological wellbeing; and, time use⁹ (Figure 2). Indicators in each domain are weighted.



Source: Ura et al, 2012

Figure 6: Indicators and domains of the Gross National Happiness Index.

While there GNH is naturally attractive due to its focus on happiness (who does not want to be happy?) there are a number of weaknesses like with any index. For a start the responses and data are subjective and qualitative based on reported happiness on each indicator. Similarly, the weightings placed on the indicators under each domain are subjective to some extent. However, there are a number of strengths including the fact that data can be broken down by domains as well as rural and urban areas, and by

⁹ Gross National Happiness Index (online: <http://www.grossnationalhappiness.com/>)

various geographic and demographic groupings. This allows a deeper exploration of issues and can help with regards to identifying what might be causing increases and decreases in happiness.

Beyond Bhutan, there are no other countries producing such happiness indexes but rather work seems to be focused on developing and improving indicators sets and statistics related to wellbeing and social equity. The *“Report by the Commission on the Measurement of Economic Performance and Social Progress”* (Stiglitz, Sen and Fitoussi, 2000) provides more information on headline indicators related to human wellbeing.

5.3 Indicators of equality and inequality

Equity regards issues of fairness often in the context of social welfare or in terms of access to opportunities. The issue of equity has recently hit the headlines following the publication of the book titled *“Capital in the Twenty-First Century”* by Thomas Piketty (2014). A holistic concept of equity is difficult to measure, however one aspect of equity that can be readily measured is income equity and inequity. Studies have found that with increasing income inequity there are a range of other consequences at the individual level and at the social level, with many such phenomena summarised in the Joseph Stiglitz’s book titled *“The price of inequality”* (2012).

5.3.1 Gini coefficient for income

A headline indicator commonly used is the Gini Coefficient for income distribution, which measure income inequality as a value from 0 to 1, with 1 indicating extreme income inequality while 0 would mean everyone receives that same income. The Gini coefficient is named after Corrado Gini who developed the measure in 1912 in his study of variability and mutability (Gini 1912). The gini coefficient for income is a simple and easy to understand indicator to compare income inequalities between countries, regions or sectors. It simply shows where there is more or less income inequality. However the methodology for the production of the Gini coefficient is moderately complex, but methodological guidance is readily available (e.g. World Bank 2015a).

Many different organisations and researchers have used the Gini coefficient including the World Bank and OECD (World Bank 2015b, OECD 2015).

5.4 Issue specific green indicators

5.4.1 Green jobs indicator

Since the financial crisis in 2008, there has been significant interest in green jobs. A number of countries as well as the ILO have undertaken work developing methods and estimates for green jobs. This includes Bangladesh, Brazil, Spain and the United States. Perhaps the most prominent example is the green jobs survey of the United States.

As part of his 2008 presidential campaign, then candidate Barack Obama discussed and promoted green jobs in response the financial crisis at the time. After Barack Obama was elected President of the United States, the Bureau of Labor Statistics was funded to conduct a green jobs survey and monitor: the number of green jobs and trends over time in green jobs; the industrial, occupational, and geographic distribution

of green jobs; and, the wages of the workers in green jobs¹⁰. As such the BLS conducted surveys in 2010 and 2011, developed the green jobs indicator, and figures were published in 2012 and 2013. It should be noted, however, that the green jobs survey was stopped due to the United States Budget Sequester¹¹ in April 2013.

Included as green jobs (BLS 2012) are:

- A. *Jobs in businesses that produce goods and provide services that benefit the environment or conserve natural resources. Green goods and services fall into one or more of five groups:*
 - 1. *Energy from renewable sources*
 - 2. *Energy efficiency*
 - 3. *Pollution reduction and removal, greenhouse gas reduction, and recycling and reuse*
 - 4. *Natural resources conservation*
 - 5. *Environmental compliance, education and training, and public awareness*
- B. *Jobs in which workers' duties involve making their establishment's production processes more environmentally friendly or use fewer natural resources. These technologies and practices fall into one or more of four groups:*
 - 1. *Energy from renewable sources*
 - 2. *Energy efficiency*
 - 3. *Pollution reduction and removal, greenhouse gas reduction, and recycling and reuse*
 - 4. *Natural resources conservation*

The ILO methodology for assessing green jobs has notes that for developed countries, “...environment related jobs tend to be concentrated in sectors/activities directly linked to decarbonizing energy supply and improving energy efficiency, pollution control and eco-friendly services” (Page 11, Jarvis et al 2011). Meanwhile in developing countries, jobs in “...other sectors may be at least as important, in particular: those involving the sustainable use of natural resources, including agriculture, forestry and fisheries; and activities relating to adaptation to climate change” (Page 11, Jarvis et al 2011).

Both the US BLS and ILO methodologies are limiting with regards to green jobs. The US BLS restricts its green jobs to those that are either environmentally restorative or are about improving the environmental integrity of production processes. According to the BLS “The proportion of an establishment’s total revenue associated with producing green goods or providing green goods is used to estimate the number of GGS employees contributed by the establishment” (Page 4, BLS 2011). Using this methodology, the 2010 and 2011 green jobs surveys found the percentage of jobs considered green consisted of less than 3% of the total number of jobs in the United States, although there was a rise in the number of green jobs of 0.1% over the year. However, like the Jarvis et al (2011) noted, it is possible to include jobs engaged in production activities that are considered environmentally sustainable (i.e. doing no harm to ecosystems or the environment) particularly in developing countries. Jarvis et al (2011) specifically mentioned jobs “involving the sustainable use of natural resources, including agriculture, forestry and fisheries; and,

¹⁰ US BLS Website. Measuring green jobs. Available online 03/08/2013: <http://www.bls.gov/green/>

¹¹ US BLS 2013. Employment in Green Goods and Services.

activities relating to adaptation to climate change” (Page 11). Presumably including such jobs would result in a greater number of ‘green’ jobs and would better reflect the number of jobs that are involved in environmentally sustainable production processes.

The ILO captures the social dimension of green jobs by assessing whether environmentally sustainable jobs are also decent jobs. The process includes identifying jobs that are environmentally sustainable and then from these jobs, counting only the decent jobs as being green jobs (Jarvis et al 2011). In many developed countries it can be assumed that labour laws and issues of health of safety will already be resolved, and as such, green jobs can be counted only using environment related criteria.

Unlike eaNDP, the ecological footprint or GPIs, which assesses that state of the economy or system as a whole, the green jobs indicator focuses on the part of the economy that is considered green and simply measures one key characteristic, the number of green jobs (Harrison et al 2014). From the concepts, sources and methods used in the BLS green jobs indicator it may be possible to develop other green indicators that focus on the green part of the economy. In fact Jarvis et al (Page 50, 2011) hint at the possibility of measuring the “*growth rate of green activity*” as an “*economic indicator for activity*”. In this regard, see Chapter 9 for more on how it may be possible to estimate Gross Domestic ‘green’ Production and green growth rates.

At the aggregate level the number of green jobs and the rate of growth in green jobs are headline indicators. However, underneath these headline indicators are green jobs statistics by sector and as such, there is a rich dataset beneath the headline indicator in which to do further research to inform green growth and development decisions. Other questions that arise include not only how many jobs are there in the green economy, or the rate of growth in green jobs, but what type of jobs are associated with the green economy, and are they well-paying compared to the grey economy?

More detail on the definition of green jobs and the concepts, sources and methods used to estimate the number of green jobs is available on the BLS website (<http://www.bls.gov/green/>). For more information on ILO green jobs assessment methodologies as well as the modelling of wider economic impacts related to green jobs, please see Jarvis et al (2011) online:

<http://www.uncsd2012.org/content/documents/230assessing%20green%20jobs%20potential%20ILO.pdf>.

5.4.2 Green cost of living index

Banzhaf (2002) conducted a study in which changes in air quality in Los Angeles over the 1989-1994 was incorporated into a cost of living index for Los Angeles. The underlying reason for doing this is that cost of living indexes are designed to measure the cost of achieving a desired standard of living, and as such, environmental costs should also be included. It was also noted that price indices are a compliment to accounts, however, green national price indices had largely been overlooked while environmental accounting had received significantly more attention (Banzhaf 2002).

It was noted that following the conceptualization by Konüs [1924] (1939), “...*a cost-of-living index is defined as the ratio of money expenditures needed in two scenarios to hold a representative household's utility constant*” (Page 2, Banzhaf 2002). Two methods were used to incorporate air quality into the cost

of living index for Los Angeles. The first was to add additional goods into the cost of living index and use their implicit or virtual price. The second method was to use data regarding a weak complement to the non-essential market good. A weak complement is a good that is only used when some other good or service (i.e. complement) is used. This could include a national park only being used if transport to the national park is used.

For the both methods changes in house prices were assessed in relation to air pollution using hedonic regressions. However, the way the information was integrated into the cost of living index differed for the two methods. Without going into more detail on the methods and calculations used, Banzhaf (2002) found that including air quality in the cost of living index resulted in a significant 0.1% per year change (i.e. reduction in inflation) as pollutions levels dropped over the period.

Unlike the green jobs data above, the green cost of living index does not directly measure a characteristic of the green economy, but rather like the eaNDP, the green cost of living index internalizes environmental impacts.

While the methodology used in the study is very interesting it is complex and as a consequence it is difficult to see how policy makers who do not come from an environmental background would trust, relate or use such data. However, at a minimum Banzhaf (2002) highlights the need to look at green price indices as well as issues such as standards of living in relation to the green economy, green growth and development.

5.5 Other headline indicators

There are other system wide indicators that can provide some gauge on development and its overall nature, for example the Human Development Index (HDI). However, these are beyond the scope of this document.

6 Indicator sets

This chapter describes indicator sets and frameworks including: green growth indicators; Sustainable Development Goal Indicators, Millennium Development Goal Indicators; sustainable development indicators; national development goal indicators; pressure, state and response indicator frameworks and other indicator frameworks.

6.1 Indicator sets

Indicator sets are simply a group of indicators assessing multiple dimensions of a situation, for example the SDG indicators are used to assess the progress of countries towards achieving sustainable development goals and targets. To help organize data and information, ensure coherence within data sets and comparability across data sets, frameworks, classifications and standards are used by data producers.

In the case of the green economy such indicator sets are designed to assess various dimensions of the green economy. Currently the OECD, UNSD, and UNDSO are undertaking exercises towards making recommendations on green growth indicators (UNSD 2011)¹², although the OECD has progressed its work the most. In addition to green growth indicators, the green economy is inextricably linked to sustainable development, and as such the post 2015 development agenda and Sustainable Development Goal Indicators, Millennium Development Goal Indicators, sustainable development indicators, and national development indicator sets are also reviewed below.

There are many approaches taken to selecting indicators, for example taking a systems approach, however in many cases a panel of experts are used to define a set of indicators said to represent sustainable development, green growth, or some other important set of issues. To guide the selection of indicators it is common to not only have a panel, consultations and a selection process but also to use indicator frameworks such as the Pressure State Response framework, or variants such as the Driving force, Pressure, State, Impact, Response framework. In other cases indicators are selected in relation to particular goals, for example in the context of National Development Plans.

6.2 Post 2015 Development Agenda and Sustainable Development Goal (SDG) Indicators

At the United Nations Conference on Sustainable Development held in Rio de Janeiro in 2012, “Member States decided to launch a process to develop a set of Sustainable Development Goals (SDGs), which will build upon the Millennium Development Goals and converge with the post 2015 development agenda.” On 25 September 2015, the UN (2015) made a press release stating that “A bold new global agenda to end poverty by 2030 and pursue a sustainable future was unanimously adopted today by the 193 Member States of the United Nations”. Furthermore, “...adoption of the new Sustainable Development Agenda... was met with a thunderous standing ovation from delegations that included many of the more than 150

¹² As a note: it will be interesting to see how many of the indicators are drawn from existing international indicator sets and how many are from new data sources.

world leaders who will be addressing the Summit". The agenda includes goals, targets and proposed provisional indicators.

The 17 Sustainable Development Goals are as follows:

1. End poverty in all its forms everywhere
2. End hunger, achieve food security and improved nutrition and promote sustainable agriculture
3. Ensure healthy lives and promote well-being for all at all ages
4. Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all
5. Achieve gender equality and empower all women and girls
6. Ensure availability and sustainable management of water and sanitation for all
7. Ensure access to affordable, reliable, sustainable and modern energy for all
8. Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all
9. Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation
10. Reduce inequality within and among countries
11. Make cities and human settlements inclusive, safe, resilient and sustainable
12. Ensure sustainable consumption and production patterns
13. Take urgent action to combat climate change and its impacts*
14. Conserve and sustainably use the oceans, seas and marine resources for sustainable development
15. Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss
16. Promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable and inclusive institutions at all levels
17. Strengthen the means of implementation and revitalize the global partnership for sustainable development

Below these targets are 169 targets. For each target there typically two provisional proposed indicators (UNSC, 2015). In March 2015 the United Nations Statistical Commission (UNSC) bureau produced a technical report which included the results of a survey of Member States regarding the feasibility, suitability and relevance of 304 proposed provisional indicators. Importantly, the survey had responses from 70 countries as well as the Secretariat of the Pacific Community which coordinated a response from 12 of its Members. As such, the survey can be considered representative of the international official statistics community.

Of the 304 provisional proposed indicators, 50 were considered very relevant, easily feasible (i.e. methodology exists and data is available), and the national statistics office supported the inclusion of the indicator as an SDG indicator. However, according to the analysis by the Bureau of the UNSC, 212 of the 304 provisional proposed indicators needed to be discussed further and other indicators might need to be considered. In terms of feasibility, 98 of these provision proposed indicators were considered difficult to collect and compile, even with strong effort.

From the assessment of the technical report of the Bureau of the UNSC (UNSC 2015) it is clear that it is difficult to find good quality indicators that are related to SDG targets. In fact, in over two thirds of cases, there may be a need to discuss other options for indicators related to targets. Given the number of goals, targets and indicators, for example in comparison to the MDGs, there is a question as to whether the SDGs and related indicators will have the same mobilizing influence the MDGs had?

6.3 The Millennium Development Goal (MDG) Indicators

The Millennium Development Goal (MDG) Indicators were organized to monitor progress in achieving the Road Map towards the Implementation of the United Nations Millennium Declaration (UNSG 2001) which was adopted by the United Nations General Assembly in 2001. This followed the adoption of the Millennium Declaration (UNGA 2000) that defined the MDGs and was signed by 147 heads of state.

MDGs and the MDG Indicators were revised in 2007 (UNGA 2007) and the indicators used to monitor the MDGs¹³ were recommended by Inter-agency and Expert Group (IAEG) on MDG Indicators. The MDG indicators consist of 60 indicators monitoring progress towards achieving 21 targets under 8 overarching goals (Table 2).

The MDG indicators (Table 2) were produced and analysed by an Inter-agency and Expert Group (IAEG) on MDG Indicators, and this work was coordinated by the United Nations Statistics Division (UNSD). The MDG indicators covered various dimensions of development, but were not framed in such a way as to directly assess issues of green growth or development.

While there are 60 indicators it is important to be aware that many countries still lack data for many of the indicators. Table 2 shows the percentage of countries for which there is at least one data point. In some cases, nearly 100% of countries have at least one data point, but for 11 of the 60 indicators 75% of countries have no data points (UNSD 2015). As such, there is much more to monitoring progress towards development goals than simply creating goals, targets and indicators, and there still remain significant challenges in terms of actually collecting and compiling indicator sets.

What the MDGs do show is that having specific goals can galvanise efforts into focusing development efforts. Furthermore, by linking indicators with specific targets and goals, there has been greater effort to generate data and statistics on issues related to development beyond measures of GDP and economic growth.

¹³ Current list of MDG Indicators, online 05/07/2012:
<http://mdgs.un.org/unsd/mdg/Host.aspx?Content=Indicators/OfficialList.htm>

Table 2: Millennium development goals, targets, indicators and data availability.

Goals and Targets (from the Millennium Declaration)	Indicators for monitoring progress	Percentage of countries with at least one data point
Goal 1: Eradicate extreme poverty and hunger		
Target 1.A: Halve, between 1990 and 2015, the proportion of people whose income is less than one dollar a day	1.1 Proportion of population below \$1.25 (PPP) per day	55%
	1.2 Poverty gap ratio	55%
	1.3 Share of poorest quintile in national consumption	66%
Target 1.B: Achieve full and productive employment and decent work for all, including women and young people	1.4 Growth rate of GDP per person employed	54%
	1.5 Employment-to-population ratio	85%
	1.6 Proportion of employed people living below \$1.25 (PPP) per day	51%
	1.7 Proportion of own-account and contributing family workers in total employment	72%
Target 1.C: Halve, between 1990 and 2015, the proportion of people who suffer from hunger	1.8 Prevalence of underweight children under-five years of age	63%
	1.9 Proportion of population below minimum level of dietary energy consumption	75%
Goal 2: Achieve universal primary education		
Target 2.A: Ensure that, by 2015, children everywhere, boys and girls alike, will be able to complete a full course of primary schooling	2.1 Net enrolment ratio in primary education	85%
	2.2 Proportion of pupils starting grade 1 who reach last grade of primary	82%
	2.3 Literacy rate of 15-24 year-olds, women and men	71%
Goal 3: Promote gender equality and empower women		
Target 3.A: Eliminate gender disparity in primary and secondary education, preferably by 2005, and in all levels of education no later than 2015	3.1 Ratios of girls to boys in primary, secondary and tertiary education	90%
	3.2 Share of women in wage employment in the non-agricultural sector	96%
	3.3 Proportion of seats held by women in national parliament	85%
Goal 4: Reduce child mortality		
Target 4.A: Reduce by two-thirds, between 1990 and 2015, the under-five mortality rate	4.1 Under-five mortality rate	86%
	4.2 Infant mortality rate	86%
	4.3 Proportion of 1 year-old children immunised against measles	86%
Goal 5: Improve maternal health		
Target 5.A: Reduce by three quarters, between 1990 and 2015, the maternal mortality ratio	5.1 Maternal mortality ratio	79%
	5.2 Proportion of births attended by skilled health personnel	79%
Target 5.B: Achieve, by 2015, universal access to reproductive health	5.3 Contraceptive prevalence rate	80%
	5.4 Adolescent birth rate	98%
	5.5 Antenatal care coverage (at least one visit and at least four visits)	74%
	5.6 Unmet need for family planning	60%
Goal 6: Combat HIV/AIDS, malaria and other diseases		
Target 6.A: Have halted by 2015 and begun to reverse the spread of HIV/AIDS	6.1 HIV prevalence among population aged 15-24 years	50%
	6.2 Condom use at last high-risk sex	38%

Goals and Targets (from the Millennium Declaration)	Indicators for monitoring progress	Percentage of countries with at least one data point
	6.3 Proportion of population aged 15-24 years with comprehensive correct knowledge of HIV/AIDS	39%
	6.4 Ratio of school attendance of orphans to school attendance of non-orphans aged 10-14 years	31%
Target 6.B: Achieve, by 2010, universal access to treatment for HIV/AIDS for all those who need it	6.5 Proportion of population with advanced HIV infection with access to antiretroviral drugs	45%
Target 6.C: Have halted by 2015 and begun to reverse the incidence of malaria and other major diseases	6.6 Incidence and death rates associated with malaria	42%
	6.7 Proportion of children under 5 sleeping under insecticide-treated bednets	45%
	6.8 Proportion of children under 5 with fever who are treated with appropriate anti-malarial drugs	47%
	6.9 Incidence, prevalence and death rates associated with tuberculosis	94%
	6.10 Proportion of tuberculosis cases detected and cured under directly observed treatment short course	94%
Goal 7: Ensure environmental sustainability		
Target 7.A: Integrate the principles of sustainable development into country policies and programmes and reverse the loss of environmental resources	7.1 Proportion of land area covered by forest	98%
	7.2 CO2 emissions, total, per capita and per \$1 GDP (PPP)	94%
	7.3 Consumption of ozone-depleting substances	80%
Target 7.B: Reduce biodiversity loss, achieving, by 2010, a significant reduction in the rate of loss	7.4 Proportion of fish stocks within safe biological limits	0%
	7.5 Proportion of total water resources used	74%
	7.6 Proportion of terrestrial and marine areas protected	99%
	7.7 Proportion of species threatened with extinction	0%
Target 7.C: Halve, by 2015, the proportion of people without sustainable access to safe drinking water and basic sanitation	7.8 Proportion of population using an improved drinking water source	94%
	7.9 Proportion of population using an improved sanitation facility	93%
Target 7.D: By 2020, to have achieved a significant improvement in the lives of at least 100 million slum dwellers	7.10 Proportion of urban population living in slums[b]	44%
Goal 8: Develop a global partnership for development		
Target 8.A: Develop further an open, rule-based, predictable, non-discriminatory trading and financial system		
	Official development assistance (ODA)	
Includes a commitment to good governance, development and poverty reduction – both nationally and internationally	8.1 Net ODA, total and to the least developed countries, as percentage of OECD/DAC donors' gross national income	13%
	8.2 Proportion of total bilateral, sector-allocable ODA of OECD/DAC donors to	13%

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Goals and Targets (from the Millennium Declaration)	Indicators for monitoring progress	Percentage of countries with at least one data point
<p>Target 8.B: Address the special needs of the least developed countries</p> <p>Includes: tariff and quota free access for the least developed countries' exports; enhanced programme of debt relief for heavily indebted poor countries (HIPC) and cancellation of official bilateral debt; and more generous ODA for countries committed to poverty reduction</p>	<p>basic social services (basic education, primary health care, nutrition, safe water and sanitation)</p> <p>8.3 Proportion of bilateral official development assistance of OECD/DAC donors that is untied</p>	12%
	<p>8.4 ODA received in landlocked developing countries as a proportion of their gross national incomes</p>	11%
	<p>8.5 ODA received in small island developing States as a proportion of their gross national incomes</p>	22%
Market access		
<p>Target 8.C: Address the special needs of landlocked developing countries and small island developing States (through the Programme of Action for the Sustainable Development of Small Island Developing States and the outcome of the twenty-second special session of the General Assembly)</p>	<p>8.6 Proportion of total developed country imports (by value and excluding arms) from developing countries and least developed countries, admitted free of duty</p>	100%
	<p>8.7 Average tariffs imposed by developed countries on agricultural products and textiles and clothing from developing countries</p>	NA
	<p>8.8 Agricultural support estimate for OECD countries as a percentage of their gross domestic product</p>	6%
<p>Target 8.D: Deal comprehensively with the debt problems of developing countries through national and international measures in order to make debt sustainable in the long term</p>	<p>8.9 Proportion of ODA provided to help build trade capacity</p>	13%
	Debt sustainability	
	<p>8.10 Total number of countries that have reached their HIPC decision points and number that have reached their HIPC completion points (cumulative)</p>	NA
<p>Target 8.E: In cooperation with pharmaceutical companies, provide access to affordable essential drugs in developing countries</p> <p>Target 8.F: In cooperation with the private sector, make available the benefits of new technologies, especially information and communications</p>	<p>8.11 Debt relief committed under HIPC and MDRI Initiatives</p>	22%
	<p>8.12 Debt service as a percentage of exports of goods and services</p>	53%
	<p>8.13 Proportion of population with access to affordable essential drugs on a sustainable basis</p>	0%
	<p>8.14 Fixed-telephone subscriptions per 100 inhabitants</p>	98%
	<p>8.15 Mobile-cellular subscriptions per 100 inhabitants</p>	98%
	<p>8.16 Internet users per 100 inhabitants</p>	98%

Source: UNSD 2008, UNSD 2015

6.4 Green growth indicators

The OECD, as part of its Green Growth Strategy, has developed an indicator framework and set of green growth indicators to facilitate international comparison. Another stated aim of the green growth indicators is to “*help governments measure progress towards green growth*” and these indicators should be “*capable of sending clear messages which speak to policy makers and the public at large*”, presumably in support of decision making.

The green growth indicators focus on four areas:

- Environmental and resource productivity
- Economic and environmental assets
- Environmental quality of life
- Economic opportunities and policy responses

Under each of these areas are a series of indicators (see Table 3). In addition to listing the indicators, the OECD also list the related OECD work from which many of these indicators come from. Essentially the OECD green growth indicators are a grouping and re-organisation of indicators and statistics already in use, but in this case framed to assist in monitoring various dimensions of green growth.

Regrouping and reusing indicators has the benefit of allowing existing time series data to be used to analyse an issue, however it may raise questions about how well the data relates to the issue at hand.

Table 3: OECD green growth indicators.

Main indicator groups	Topics covered	Related OECD work
The socio-economic context and characteristics of growth		
Economic growth, productivity and competitiveness	Economic growth and structure Productivity and trade Inflation and commodity prices	Economic outlook Economic surveys Going for growth
Labour markets, education and income	Labour markets (employment / unemployment) Socio-demographic patterns Income and education	National accounts Productivity database Employment outlook Education at a glance Health at a glance Society at a glance
Environmental and resource productivity		
Carbon and energy productivity	1. CO2 productivity (demand-based, production-based) 2. Energy productivity Resource productivity 3. Material productivity (demand-based, production-based) Non-energy materials, waste materials, nutrients 4. Water productivity Multi-factor productivity	IEA scoreboard CO2 emissions database OECD input-output tables Environmental indicators Environmental reviews Environmental outlook Material flows & resource productivity Agri-environmental indicators Productivity database

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Main indicator groups	Topics covered	Related OECD work
	5. Multi-factor productivity reflecting environmental services	
Natural asset base		
Renewable stocks	6. Freshwater resources	Environmental indicators Environmental reviews Measuring progress Material flows & resource productivity
	7. Forest resources	Environmental outlook
	8. Fish resources	Agri-environmental indicators
Non-renewable stocks	9. Mineral resources	
Biodiversity and ecosystems	10. Land resources	
	11. Soil resources	
	12. Wildlife resources	
Environmental quality of life		
Environmental health and risks	13. Environmentally induced health problems and related costs	Measuring progress-How's Life? Environmental indicators Environmental reviews Environmental outlook
	14. Exposure to natural or industrial risks and related economic losses	
Environmental services and amenities	15. Access to sewage treatment and drinking water	
Economic opportunities and policy responses		
Technology and innovation	16. R&D of importance to GG	Innovation strategy Science, technology & industry scoreboard Patent database R&D database Aid activity database Database on environmental policy instruments Agri-environmental indicators

Source: OECD (http://www.oecd.org/document/58/0,3746,en_2649_37425_48303098_1_1_1_37425,00.html)

6.5 Sustainable development indicators

Many countries have developed Sustainable Development Indicators (SDIs) and have reported these nationally or internationally¹⁴. The Commission on Sustainable Development (CSD) Indicators of Sustainable Development have served as a reference for countries looking to develop SDIs. Accompanying these indicators is the Indicators of Sustainable Development: Guidelines and Methodologies (UNSD 2007)¹⁵ which were prepared by the United Nations Division for Sustainable Development with other experts.

The framework used for the Indicators of Sustainable Development contained 14 themes, consisting of:

- atmosphere;
- biodiversity;
- consumption and production patterns;
- demographics;
- economic development;
- education;
- freshwater;
- global economic partnership;
- governance;
- health;
- land;
- natural hazards;
- oceans, seas and coasts; and,
- poverty.

These themes are related to issues of the green economy but are not specifically targeted towards monitoring green growth or development. Instead the themes provided a frame with wide coverage including prominence to environment related themes such as oceans, the atmosphere, freshwater, biodiversity, natural hazards and land.

6.6 National development goal indicators

Many countries, particularly developing countries, have national development goals. National development goals are very important as they reflect the ambitions of the governments of sovereign states. As such, they provide a sense of a national priorities. Development goals, and how they are organized, provide the framework for organizing indicators. In many cases there will be specific targets related to indicators that are used monitor progress. Various institutions may be involved in defining and monitoring the relevant indicators, depending upon the national institutional arrangements and political decisions.

¹⁴ For example, some countries report their SDIs to the United Nations Commission on Sustainable Development (online: http://www.un.org/esa/dsd/dsd_aofw_ni/ni_index.shtml)

¹⁵ Indicators of Sustainable Development: Guidelines and Methodologies, Third Edition. (Online: <http://www.un.org/esa/sustdev/natlinfo/indicators/guidelines.pdf>)

Ideally countries will have green growth as an integral part of their national development plans or perhaps as part of a green growth strategy under the national development plan. If green growth is already integrated as part of a country’s development, then it is develop and monitor indicators that can give a sense of whether the country moving towards achieving these green growth or development goals.

The recent Green Growth Best Practices initiative (GGBP 2014), noted green growth related planning examples from Chile, China, Colombia, Ethiopia, Mexico, Nepal, South Africa, South Korea and the USA (Table 4). In many cases the main entry point for assessing green growth was to relate growth with climate change related plans. However, it should be noted that there are many other environmental and social issues related to growth in addition to climate change.

Table 4: Countries engaged in green growth planning processes and case examples used for the GGBP initiative.

Country	Case
Chile	Mitigation Action Plans and Scenarios (MAPS)
Colombia	Low Carbon Development Strategy
Ethiopia	Climate Resilient Green Economy (CRGE) Initiative
Mexico	Climate Change Action Plan
Nepal	Climate change and development process
Rwanda	Green Growth Strategy
South Africa	Long Term Mitigation Scenarios (LTMS) and the National Planning Commission’s Vision 2030 (NPC2030)
South Korea	Green growth planning process
USA	Subnational processes

Source: GGBP 2014.

While it is ideal to have green economy and green growth related issues integrated with national plans, as is the case in Ethiopia, in many countries there may be significant capacity and other practical issues that limit the effective implementation of green growth and other plans (Fikreyesus et al 2011). This includes limiting the ability to collect, compile and monitor related indicators. Another complicating factor is whether there are policy instruments that can readily be applied to achieve national development plans or to influence key indicators. In some cases it is not obvious what to do to achieve specific targets.

6.7 Pressure state response (PSR) framework

The pressure state response framework was developed by the OECD (1993) and can be used to organize environmental and other indicators in a logical order. The PSR framework and variants such as the Driving Force, Pressure, State, Impact Response (DPSIR) framework, are flexible can be readily applied to most environmental and other issues. However, such frameworks imply causality between the indicators of pressure, state and response and in many cases such causality cannot be justified based upon available data, especially since in most cases there are other factors affecting the indicators in addition to those things the indicators are attempting to monitor. Caution needs to be applied when using such frameworks and it best to undertake sensitivity analyses and ensure users are aware of complicating factors when using PSR indicators.

6.8 Decent work

While the green, or environmental, dimension of a green economy or green growth has been the main focus of the indicator sets above, the ILO's work on the green economy with UNEP, has emphasized the need for jobs to be decent. The ILO has and Decent Work Agenda consisting of: employment opportunities; adequate earnings and productive work; decent working time; combining work, family and personal life; work that should be abolished; stability and security of work; equal opportunity and treatment in employment; safe work environment; social security; and, social dialogue, employers' and workers' representation. Under each of these agenda items are statistical and legal framework indicators (Table 5).

Table 5: ILO decent work indicators.

Substantive element of the Decent Work Agenda	Statistical indicators	Legal framework indicators
Numbers in brackets refer to ILO strategic objectives: Standards and fundamental principles and rights at work; Employment; Social protection; Social dialogue.	Selection of relevant statistical indicators that allow monitoring progress made with regard to the substantive elements. M – Main decent work indicators A – Additional decent work indicators F – Candidate for future inclusion / developmental work to be done by the Office C – Economic and social context for decent work (S) indicates that an indicator should be reported separately for men and women in addition to the total.	L – Descriptive indicators providing information on rights at work and the legal framework for decent work. Description of relevant national legislation, policies and institutions in relation to the substantive elements of the Decent Work Agenda; where relevant, information on the qualifying conditions, the benefit level and its financing; evidence of implementation effectiveness (as recorded by ILO supervisory bodies); estimates of coverage of workers in law and in practice; information on the ratification of relevant ILO Conventions.
Employment opportunities (1 + 2)	M – Employment-to-population ratio, 15-64 years (S) M – Unemployment rate (S) M – Youth not in education and not in employment, 15-24 years (S) M – Informal employment (S) A – Labour force participation rate, 15-64 years (1) [to be used especially where statistics on Employment-to-population ratio and/or Unemployment rate (total) are not available] A – Youth unemployment rate, 15-24 years (S) A – Unemployment by level of education (S) A – Employment by status in employment (S) A – Proportion of own-account and contr. family workers in total employment (S) [to be used especially where statistics on informal employment are not available] A – Share of wage employment in non-agricultural employment (S) F – Labour underutilization (S) Memo item: Time-related underemployment rate (S) (grouped as A under “Decent Working Time”)	L – Government commitment to full employment L – Unemployment insurance
Adequate earnings and productive work (1 + 3)	M – Working poverty rate (S) M – Low pay rate (below 2/3 of median hourly earnings) (S) A – Average hourly earnings in selected occupations (S) A – Average real wages (S)	L – Minimum wage

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Substantive element of the Decent Work Agenda	Statistical indicators	Legal framework indicators
	A – Minimum wage as % of median wage index A – Employees with recent job training (past year / past 4 weeks) (S)	A – Manufacturing wage index
Decent Working Time (1+3)*	M – Excessive working time (more than 48 hours per week; 'usual' hours) (S) A – Usual hours worked (standardized hour bands) (S) A – Annual hours worked per employed person (S) A – Time-related underemployment rate (S) F – Paid annual leave (developmental work to be done by the Office; additional indicator)	L – Maximum hours of work L – Paid annual leave
Combining work, family and personal life (1+3)	F – Asocial / unusual hours (Developmental work to be done by the Office) F – Maternity protection (developmental work to be done by the Office; main indicator)	L – Maternity leave (incl. weeks of leave, and rate of benefits) L – Parental leave*
Work that should be abolished (1+3)	M – Child labour [as defined by ICLS resolution] (S) M – Other worst forms of child labour (S)** A – Hazardous child labour (S) A – Forced labour (S)**	L – Child labour (incl. public policies to combat it) L – Forced labour (incl. public policies to combat it)
Stability and security of work (1, 2+3)	Stability and security of work (developmental work to be done): M – Precarious Employment rate** A – Job tenure** A – Subsistence worker rate** A – Real earnings casual workers** (S) Memo item: Informal employment grouped under employment opportunities.	L – Termination of employment* (incl. notice of termination in weeks) <u>Memo item:</u> 'Unemployment insurance' grouped under employment opportunities; needs to be interpreted in conjunction for 'flexicurity'.
Equal opportunity and treatment in employment (1, 2+3)	M – Occupational segregation by sex M – Female share of employment in senior and middle management* (ISCO88 groups 11 and 12) A – Gender wage gap A – Share of women in wage employment in the non-agricultural sector A – Indicator for Fundamental Principles and Rights at Work (Elimination of discrimination in respect of employment and occupation) to be developed by the Office A – Measure for discrimination by race / ethnicity / of indigenous people / of (recent) migrant workers / of rural workers where relevant and available at the national level. F – Measure of dispersion for sectoral / occupational distribution of (recent) migrant workers F – Measure for employment of persons with disabilities Memo item: Indicators under other substantive elements marked (S) indicator should be reported separately for men and women in addition to the total.	L – Equal opportunity and treatment* L – Equal remuneration of men and women for work of equal value*
Safe work environment (1+3)	M – Occupational injury rate, fatal A – Occupational injury rate, nonfatal A – Time lost due to occupational injuries A – Labour inspection (inspectors per 10,000 employed persons)	L – Employment injury benefits* L – Safety and health labour inspection

Substantive element of the Decent Work Agenda	Statistical indicators	Legal framework indicators
Social security(1+3)	M–Share of population aged 65 and above benefiting from a pension (S) M–Public social security expenditure (% of GDP) A–Healthcare exp. not financed out of pocket by private households A–Share of population covered by (basic) health care provision (S) F–Share of econ. active population contributing to a pension scheme (S) F–Public expenditure on needs based cash income support (% of GDP) F–Beneficiaries of cash income support (% of the poor) F–Sick leave (developmental work to be done by the Office; additional indicator) [Interpretation in conjunction with legal framework and labour market statistics.]	L–Pension L–Incapacity for work due to sickness / sick leave L –Incapacity for work due to invalidity <u>Memo item:</u> ‘Unemployment insurance’ grouped under employment opportunities.
Social dialogue, workers’ and employers’ representation (1 + 4)	M–Union density rate (S) M – Enterprises belonging to employer organization [rate] M – Collective bargaining coverage rate (S) M–Days not worked due to strikes and lockouts** F–Indicator for Fundamental principles and rights at work (Freedom of association and collective bargaining) to be developed by the Office	L – Freedom of association and the right to organize L – Collective bargaining right L – Tripartite consultations
Economic and social context for decent work	C– Children not in school (% by age) (S) C– Estimated % of working age population who are HIV positive C– Labour productivity (GDP per employed person, level and growth rate) C– Income inequality (percentile ratio P90/P10, income or consumption) C– Inflation rate (CPI) C– Employment by branch of economic activity C– Education of adult population (adult literacy rate, adult secondary-school graduation rate) (S) C– Labour share in GDP C (additional) – Real GDP per capita in PPP\$ (level and growth rate) C (additional) – Female share of employment by industry (ISIC tabulation category) C (additional) – Wage / earnings inequality (percentile ratio P90/P10)	L – Labour administration** Developmental work to be done by the Office to reflect environment for Sustainable enterprises, incl. indicators for (i) education, training and lifelong learning, (ii) entrepreneurial culture, (iii) enabling legal and regulatory framework, (iv) fair competition, and (v) rule of law and secure property rights. Developmental work to be done by the Office to reflect other institutional arrangements, such as scope of labour law and scope of labour ministry and other relevant ministries.

*Wording modified by ILO in the pilot phase;

**Indicator added by ILO in the pilot phase.

Source: ILO 2008.

There are many dimensions to decent work and the number of indicators under the decent work agenda reflect this. It is important to note that the UNEP and ILO definition does not reduce the social dimension of green growth to decent work but simply highlights that decent work is important. Decent work is not something that many of the other green economy and green growth related indicator sets have addressed in detail. However, as with all indicator sets, there is a question of how many indicators, and how much detail, to include in a set.

6.9 Other indicator sets and frameworks

There are many other indicator sets, such as the European sustainable development indicators or indicators around quality of life and wellbeing, but in many cases various indicator sets share particular measures. These measures may be used as indicators of different things depending on the context in which it is being applied. More information on headline indicators and statistics related to human wellbeing and other dimensions of development are discussed in detail in the “*Report by the Commission on the Measurement of Economic Performance and Social Progress*” (Stiglitz, Sen and Fitoussi, 2000). This report is available online: http://www.stiglitz-sen-fitoussi.fr/documents/rapport_anglais.pdf.

7 Statistics and other information

Statistics and other information include official statistics produced by national statistics offices using internationally agreed frameworks, classifications and standards, such as the Systems of Environmental Economic Accounts (SEEA) or the Framework for the Development of Environment Statistics (FDES). In addition the chapter also covers the organization of data under frameworks such as those used in Wealth Accounting and the Valuation of Ecosystem Services (WAVES), the Millennium Ecosystem Assessment and The Economics of Ecosystems and Biodiversity (TEEB), Geographic Information Systems.

7.1 National and sectoral statistics

In official statistics there are many types of statistics covering demographic and social issues, economic issues, natural resources and the environment. Reflecting the diversity of statistics that may be available for any particular country or sector is the classification of statistical activities (Table 6).

Table 6: Classification of Statistical Activities

030 General statistics

031 Demographic and social statistics

1. Demographic statistics
2. Population statistics
 - i. Population censuses
 - ii. Statistics on population groups of special interest
3. Housing statistics
 - i. Housing censuses
 - i. Other housing statistics
4. Labour statistics
5. Education and training statistics
6. Culture statistics including mass communication
7. Statistics of household income and expenditure and their distribution
8. Social security statistics
9. Health statistics
10. Gender statistics
11. Other social, demographic and related statistics

032 Economic statistics

1. National accounts
2. Agriculture statistics
3. Forestry and fishery statistics
4. Industrial statistics
5. Energy statistics
6. Distributive trade statistics
7. International trade statistics
 - i. Trade in goods
 - ii. Trade in services
8. Transport statistics
9. Communication statistics
10. Tourism statistics
11. Statistics of services not included elsewhere
12. Money, finance and insurance statistics
13. Fiscal statistics
14. Balance of payments statistics

- 15. Prices statistics
- 16. Statistics of science, technology and patents
- 17. Other economic statistics
- 033 Natural resources and environment statistics
 - 1. Natural resources and environment statistics
 - 2. Natural resources and environment accounting
 - 3. Meteorology statistics
- 034 Activities not classified by field
 - 1. Organization and operation of statistical services
 - 2. Technical infrastructure and other cross-cutting issues
 - 3. Dissemination and support for secretariat activities
 - 4. Other activities not classified by field

Source: UNSD 2006

For NSOs, a framework, classification or some other document related to statistical concepts, sources or methods, is only considered a standard if it is adopted by the United Nations Statistical Commission as a standard. The Statistical Commission also adopts other guidance documents without necessarily giving them the status of being a standard but all such documents have to ensure consistency with existing standards and assure coherence in terms of concepts, sources and methods across the international statistical system including national statistics (UNSD 2014a, UNSD 2014b).

For information on statistics standards see the global inventory of statistical standards, available on the United Nations Statistics Division's website: <http://unstats.un.org/unsd/iiss/MainPage.ashx>

7.1.1 Environment statistics and environmental accounting frameworks

In the area of environment statistics and environmental accounting there exist two frameworks for organizing statistical data and information: the System of Environmental and Economic Accounting (SEEA 2012); and, the Framework of the Development of Environment Statistics (UNSD 2013).

The 2012 SEEA is a “*conceptual framework that describes the interactions between the economy and the environment, and the stocks and changes in stocks of environmental assets*”¹⁶. The SEEA organizes physical and monetary data so that they are directly comparable according to common concepts and classifications. Furthermore, data organized according to the SEEA are also consistent with the System of National Accounts, the system in which headline indicators such as GDP are defined.

The 2012 SEEA consists of three volumes: The Central Framework (UN et al 2012a), Experimental Ecosystem Accounting (UN et al 2012b), and Applications and Extensions (UN et al 2012c). The Central Framework is the part of the 2012 SEEA that has been adopted as an international standard by the United Nations Statistical Commission (UNSC 2012). The Central Framework starts with an introduction to the SEEA Central Framework and followed by Chapter providing an overview of the accounting structure for example covering the stocks, flows, statistical units, and accounting principles. Chapter 3 regards physical

¹⁶ Page 4 of the Revision of the System of Environmental Economic Accounting (SEEA): SEEA Central Framework. Background document to the Statistical Commission Forty-third session, 28 February – 2 March 2012. Item 3 (e) of the provisional agenda: Environmental-economic accounting. Prepared by the Committee of Experts on Environmental Economic Accounting. (Online: http://unstats.un.org/unsd/statcom/doc12/SEEA%20Central%20Framework_Ch1-6.pdf)

flow accounts including accounts for energy, water, and materials. Chapter 4 is on environmental activity accounts and related flows including environmental protection expenditures and environmental goods and services. Chapter 5 regards asset accounts which present physical stocks and their asset values. Asset accounts are presented for mineral and energy resources, land, soil resources, timber resources, aquatic resources, other biological resources, and water resources. Finally, chapter 6 addresses the issue of how to integrate and present the different accounts (UN et al 2012a).

The Experimental Ecosystem Accounts shows how ecosystems and the System of National Accounts can be incorporated. The document provides guidance and while the accounts are experimental, it is an important step towards developing norms and potentially standards in the future. The document starts with an introduction addressing what ecosystems accounting is including their policy relevance. The second chapter sets out the principles of ecosystem accounting including key concepts such as environmental units for which characteristics such as ecosystem services and ecosystem assets are measured. Chapter 3 looks at accounting for ecosystem services in physical terms while Chapter 4 looks at accounting for ecosystem assets in physical terms including special sections on accounting for carbon and for biodiversity. Chapter 5 provides guidance on current approaches to valuation for ecosystem services and ecosystem assets. Chapter 6 addresses accounting for ecosystems in monetary terms. Importantly the document finishes with an annex regarding the research agenda for ecosystem accounts, reflecting the experimental nature of the accounts.

The third volume of the 2012 SEEA is on extensions and applications starting with an introduction followed by Chapter 2 on applications of SEEA data. Applications addressed in Chapter 2 include: the use of indicators in environmental analysis; analysis of resource use and environmental intensity; analysis of production, employment and expenditure relating to environmental activities; analysis of environmental taxes and environmental subsidies and similar transfers; and, selection, interpretation and presentation of indicators. Chapter 3 looks at analytical techniques including: environmentally extended input-output tables and techniques for the analysis of input-output data. Chapter 4 addresses extensions of the SEEA such as spatial disaggregation of SEEA data, extensions of SEEA to the household sector, and extensions to present environmental-economic accounts data by themes such as tourism.

Related to environmental accounts are environment statistics. Environment statistics can feed into environmental accounts or can be used directly for analyses or to fill indicator frameworks. The Framework for the Development for Environment Statistics (FDES) was endorsed by the United Nations Statistical Commission in 2013 and provides guidance for countries regarding the design of their environment statistics programmes. This includes setting out: the scope of environment statistics in the context of official statistics, identifying data needed along with potential sources, the development of data collections and databases, and the coordination of environment statistics including across institutions. However, the most important part of the FDES are the 6 components, 21 sub-components and 60 topics under which various environment statistics are set out (Figure 7) (UNSD 2013a).

The FDES also provides a core set of statistics for countries to focus on when developing environment statistics (i.e. Tier 1). “Tier 1 is the Core Set of Environment Statistics which are of high priority and relevance to most countries and have a sound methodological foundation. Tier 2 includes environment

statistics that are of priority and relevance to most countries but need more investment in time, resources or methodological development. Tier 3 includes environment statistics which are either of less priority or require significant methodological development.” (Page 3, UNSD 2013b).

Importantly, the FDES is compatible the SEEA, DPSIR frameworks, and the MDGs indicator framework. The FDES is also compatible with other social and economic statistical frameworks.

Component 1: Environmental Conditions and Quality

...

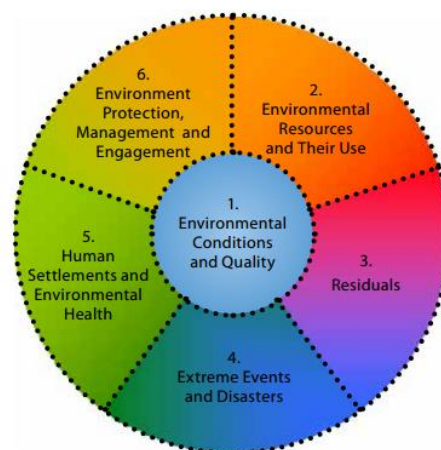
Sub-component 1.2: Land Cover, Ecosystems and Biodiversity

...

Statistical topic 1.2.3: Biodiversity

- a. Flora statistics - terrestrial, freshwater and marine
 - 1. Number of known species by status category (Tier 1)
 - 2. Species population (Tier 2)
 - 3. Number of endemic species (Tier 2)
 - 4. Number of invasive alien species (Tier 2)
 - 5. Habitat fragmentation (Tier 3)
- b. Fauna statistics - terrestrial, freshwater and marine

...



Source: UNSD 2013b

Figure 7: Components of the Framework for the Development of Environment Statistics (FDES).

In addition to standards there are other guidance materials that support the development of environment statistics, for example the International Recommendations for Water Statistics (IRWS), or statistical publications and methodological notes from NSOs as well as international organizations.

Table 7: Summary of results from the 2007 global assessment of environment statistics and environmental-economic accounting.

Environment statistics			Environmental-economic accounting		
	Number of countries	Percentage of countries		Number of countries	Percentage of countries
All countries					
Total	38*	100	Total	38*	100
Water	32	84	Energy and emission accounts	30	79
Agriculture	27	71	EPEA	21	55
Air	25	66	Water Accounts	20	53
Energy	25	66	Forest Account	20	53
Forest	24	63	MFA/Waste accounts	20	53
Land	23	61	Mineral Asset Accounts	12	32
Waste	22	58	Land and Ecosystem Accounts	10	26
Mineral	18	47	Fisheries Accounts	7	18
Transport	18	47	PSUT	4	11
Biodiversity	13	34	Other	8	21
Environmental Protection Expenditure	11	29			
Other	21	55			
Developed countries					

Environment statistics			Environmental-economic accounting		
	Number of countries	Percentage of countries		Number of countries	Percentage of countries
Total	25	100	Total	25	100
Water	19	76	Energy and emission	20	80
Agriculture	18	72	EPEA	15	60
Energy	17	68	MFA/Waste accounts	14	56
Air	15	60	Forest Account	12	48
Waste	15	60	Water Accounts	9	36
Forest	14	56	Mineral Asset	4	16
Land	13	52	Land and Ecosystem	4	16
Transport	11	44	Fisheries Accounts	3	12
Environmental Protection	11	44	PSUT	2	8
Mineral	7	28	Other	5	20
Biodiversity	4	16			
Other	12	48			
Developing countries					
Total	13	100	Total	13	100
Water	13	100	Water Accounts	11	85
Mineral	11	85	Energy and emission accounts	10	77
Air	10	77	Mineral Asset Accounts	8	62
Forest	10	77	Forest Account	8	62
Land	10	77	Land and Ecosystem Accounts	6	46
Agriculture	9	69	MFA/Waste accounts	6	46
Biodiversity	9	69	EPEA	6	46
Energy	8	62	Fisheries Accounts	4	31
Waste	7	54	PSUT	2	15
Transport	7	54	Other	3	23
Environmental Protection	0	0			
Other	8	62			

Source: UNSD 2007

In 2007 the United Nations Statistics Division published the results of a Global Assessment on the development of environment statistics and environmental-economic accounts (Table 7) (UNSD 2007). In 2015 the results of a follow up survey on the implementation of environmental economic accounting were published (UNCEEA 2015). Unfortunately, only 38 countries responded to the survey in 2007. That said, the survey provided a sense of the environment statistics and accounts most likely to be produced as official statistics. For environment statistics, water statistics are most prevalent while for environmental-economic accounting water accounts are most prevalent among developing countries followed by energy and emissions accounts, and for developed countries energy and emissions accounts are most prevalent. For developed countries the next most prevalent set of accounts were environmental protection expenditure accounts followed by material flow accounts, while for developing countries statistics and accounts regarding natural resources such as minerals, forests and land were more prevalent, perhaps reflecting differing environmental priorities.

The survey in 2014 regarding environmental economic accounting showed similar results but had a much better response rate with 85 countries responding in total. Water accounts were most prevalent for developing countries followed by energy accounts for developing countries, meanwhile for developed

countries, air emissions accounts including energy related greenhouse gas emissions, were the most prevalent, followed by accounts on environmental taxes and subsidies. From the survey results, the SEEA is more widely used among developed countries than developing countries.

Table 8: Summary of results from the Global Assessment of Environmental-Economic Accounting and Supporting Statistics
Global Assessment of Environmental-Economic Accounting and Supporting Statistics.

All Member States		Developed countries		Developing countries	
Account/module	Number of countries	Account/module	Number of countries	Account/module	Number of countries
Air emission accounts	34	Air emission accounts	27	Water accounts	12
Material accounts ^a	32	Environmental taxes and subsidies	25	Energy accounts	11
Energy Accounts	30	Material accounts	24	Material accounts	8
EPEA ^b	28	EPEA	21	Air emission accounts	7
Environmental taxes and subsidies	27	Energy accounts	19	EPEA	7
Water accounts	23	EGSS	17	Forest accounts	6
EGSS ^c	18	Water accounts / Forestry accounts	11	Land accounts	6

a. Including Material Flow Accounts and Supply and Use Tables for Material

b. Environmental Protection Expenditure Accounts

c. Environmental Goods and Service Sector Accounts

Source UNCEEA 2015

One thing the surveys did not address was the actual use of data for policy. It would be ideal to also assess volumes of data available and gaps, as work might be conducted on in the area of water, but there might also be large gaps in data, for particular variables or in time series.

An interesting example of a policy application using data from environmental economic accounts is the work by the New Zealand Treasury on optimal carbon tax levels taking into account the impact on businesses and households (Creedy and Sleeman 2004a, Creedy and Sleeman 2004b). The working two papers produced by the New Zealand Treasury were based on data from Statistics New Zealand's first energy and emissions accounts (SNZ 2004b). The reason energy and emissions accounts data were used instead of energy balance data that was readily available was because the accounts used national accounting conventions and the Australia New Zealand Industry Classification (ANZIC) allowing the accounts data to be plugged directly into existing Treasury general equilibrium and related models. This was particularly important when it came to transport fuel use and related emissions as energy balances treat all fuel used by transport as a single aggregate, while accounts split the use for transport by the industries actually purchasing the fuel and creating the emissions. This means the impact of a carbon tax on fuel could be modelled for each industry category.

It should be note, however, that emissions related accounts are especially relevant for policy analyses using tools such as general equilibrium models. However, many other environmental issues are highly location specific, for example a national analysis of water is far less relevant to water policy than individual catchment analyses. This poses a problem for many accounts compiled at the national level.

7.1.2 Wealth Accounting and the Valuation of Ecosystem Services

Wealth has many elements including produced capital (e.g. buildings and machines), intangible capital (e.g. human and social capital along with institutions and the rule of law), net foreign assets (i.e. belonging to a country in other countries) and natural capital (e.g. land, minerals water, and protected areas). Wealth Accounting and Valuation of Ecosystems Services (WAVES) is focused on natural capital accounting including accounts that follow the SEEA Central Framework as well as the SEEA Experimental Ecosystem Accounts document. The World Bank and others are supporting the WAVES Global Partnership Programme (GPP) which has the goal of promoting “...sustainable development worldwide through the implementation of comprehensive wealth accounting that focuses on the value of natural capital and integration of “green accounting” in more conventional development planning analysis” (Page 1, World Bank 2012).

Botswana, Colombia, Costa Rica, Madagascar and Philippines are pilot countries and other developing countries are also being engaged by the World Bank. The pilot countries will compile accounts as well as test what policy applications the accounts will have. To date there is a limited body of literature around policy applications of environmental economic accounts, but the application of accounts in developing countries may help fill this gap and better define the strengths, weaknesses of the accounts for supporting the assessment of policy issues and options. It will be interesting to see what applications are found for data other than energy and energy related greenhouse gas emissions (see previous section for an example from New Zealand).



Source: World Bank 2015c.

Figure 8: WAVES and its focus on natural capital.

7.1.3 Economic, social and demographic statistics frameworks

There exist a range of frameworks for organizing economic, social and demographic data and information. For economic statistics these include the System of National Accounts (SNA), International Recommendations for Industrial Statistics (IRIS), Methodological manual on purchasing power parities, and the Manual on Statistics of International Trade in Services to name just four. Similarly for social and

demographic statistics there are the Principles and Recommendations for Population and Housing Censuses, Recommendations on Statistics of International Migration, and the Manual on Victimization Surveys to name but three. Other such frameworks include the FAO Concepts and Definitions for Agricultural Statistics and the International Recommendations for Tourism Statistics for example.

There are many more statistical frameworks, containing concepts, sources and methods for economic, social and demographic data and information. By having an international statistical system where consistent and coherent concepts, sources and methods are used, it allows comparison between datasets and across data sets for any number of purposes. This may include for the purposes of assessing progress or issues related to the green economy, green growth and development. It should be noted that statistical standards also facilitate the sharing of solutions regarding concepts, sources and methods for collecting and compiling data, making the improvement of the statistics far more efficient.

7.1.4 Frameworks for assessing social and human wellbeing

The measurement of human wellbeing has recently emerged as an issue the Official Statistics community is willing to address. In 2008, then President Nicholas Sarkozy of France established “The Commission on the Measurement of Economic Performance and Social Progress” (Stiglitz et al 2009). Report included prominent economists, Stiglitz, Sen and Fitoussi, who reviewed various measures that might inform aspects of wellbeing. The United Nations Statistics Commission established a group called the Friends of the Chair Group on Broader Measures of Progress with the mandate to *“build a work programme to develop broader measures of progress based on a stocktaking exercise of current national, regional and international practices in this field, and to conduct a technical review of these existing efforts with a view to identifying good/best practices and to facilitating the sharing of knowledge, especially for the benefit of developing countries”* (Page 19, UNSC 2013).

At the national level there have been a number of initiatives related to the measurement of wellbeing, happiness and other related metrics. This includes the Office of National Statistics (ONS) in the United Kingdom which now measures wellbeing so as to “provide a fuller picture of how society is doing by supplementing existing economic, social and environmental measures” (ONS 2016).

7.1.5 Statistical classifications

Classifications group and organize information meaningfully and systematically into a standard format that is useful for determining the similarity of ideas, events, objects or persons. The preparation of a classification means the creation of an exhaustive and structured set of mutually exclusive and well-described categories, often presented as a hierarchy that is reflected by the numeric or alphabetical codes assigned to them (IRWS 2012). Classifications are essential as they allow statistics to be grouped and compared, and all other statistical standards and guidance documents require classifications. Internationally there are a range of standard classifications used for official statistics (see Annex 2).

In addition to these classifications there are other classifications sometimes contained within other standards or guidance documents. For example, within the SEEA there are also a range of statistical classifications related to the environment and economy for example the classification of environmental activities.

For the purposes of assessing the green economy the Central Product Classification (CPC) is particularly important. Internationally, the Central Product Classification Version 2 (CPC Ver. 2)¹⁷ is the comprehensive classification of all goods and services produced by the economies of the world¹⁸. Each type of good or service classified in the CPC Ver. 2 is defined in such a way that it is normally produced by only one industry as defined in the International Standard Industrial Classification of All Economic Activities (ISIC)¹⁹. Unfortunately, no individual good or service can be considered green without further information on whether sustainable or improved production process used. In most cases, no single industry or establishment can be considered green without further information on production processes used.

7.1.6 The statistical classification of green goods and services

The BLS, as part of its methodology for classifying jobs as being green, has first classified which goods and services can be considered green. In most cases individual goods or services cannot be classified as being green or not green without further information, such as whether a particular good was produced using some certified sustainable production method for example. As such, for each type of good or service, the good or service produced will only be considered green depending on whether sustainable or improved production processes were used.

The BLS modified the NAICS classification system for example see Table 1.

Table 9: Industries where green goods and services are classified by the United States Bureau of Labor Statistics.

NAICS 2007	Title	BLS GGS in scope	Green goods and services category					Examples	
			3/15 GGS in scope	Units moving IN scope from 3/15	Units moving OUT of scope from 3/15	1. Energy from renewable sources	2. Energy Efficiency		3. Pollution reduction and removal, greenhouse gas reduction, and recycling and reuse
326191	Plastics plumbing fixture mfg	Y	Y					x	EPA WaterSense certified plumbing fixtures
326192	Resilient floor covering manufacturing	Y	Y				x	x	LEED eligible floor coverings

¹⁷ Central Product Classification Version 2 (CPC): <http://unstats.un.org/unsd/cr/registry/regcst.asp?Cl=25>

¹⁸ Note: the CPC Ver. 2 is aligned with the Harmonised Commodity Description and Coding System (or HS) maintained by the World Customs Organization: http://www.wcoomd.org/home_online_services_hs_online.htm

¹⁹ An industry is a group of the establishments within the economy that are engaged in the same, or similar, kinds of production activity (see 2008 SNA paragraph 5.5). An establishment is an economic unit that is situated in a single location and in which only a single (non-ancillary) productive activity is carried out or in which the principal productive activity accounts for most of the value added (see 2008 SNA paragraph 5.3).

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326199	All other plastics product manufacturing	N	Y	Move d out		
326211	Tire manufacturing, except retreading	N	N			
326212	Tire retreading	Y	Y		x	Retreaded tires
326220	Rubber and plastics hose and belting mfg.	N	N			
326291	Rubber product mfg. for mechanical use	N	N			
326299	All other rubber product manufacturing	Y	Y		x	Reclaimed rubber from waste or scrap
327111	Vitreous china plumbing fixture mfg	Y	Y		x	EPA WaterSense certified plumbing fixtures
327112	Vitreous china and earthenware articles mfg.	Y	Y		x	EPA WaterSense certified plumbing fixtures
327113	Porcelain electrical supply mfg	N	N			
327121	Brick and structural clay tile mfg	Y	Y		x	LEED eligible construction materials
327122	Ceramic wall and floor tile manufacturing	Y	Y		x	LEED eligible construction materials
327123	Other structural clay product manufacturing	Y	Y		x	LEED eligible construction materials
327124	Clay refractory manufacturing	Y	Y		x	LEED eligible construction materials
327125	Nonclay refractory manufacturing	Y	Y		x	LEED eligible construction materials
327211	Flat glass manufacturing	Y	Y		x	Flat glass from recycled inputs (cullet)
327212	Other pressed and blown glass and glassware	Y	Y		x	Glassware from recycled inputs (cullet)
327213	Glass container manufacturing	Y	Y		x	Glass containers from recycled inputs (cullet)

Source: BLS 2010.

Within the official statistics community the issue of classifying goods and services, or anything else as being green is a contentious issue. At the core of the issues is whether it is possible to objectively and consistently classify things as being green or not. In many cases it may require subjective judgments. For these and other reasons, the official statistics community has expressed that it should not be involved in the classification of whether things are green or not green (UNSD 2011).

At this point it is important to acknowledge that many countries are still struggling to collect and compile economic and social statistics that are taken for granted in the developed and large emerging countries (PARIS 21, 2005), which typically dominate statistical forums such as the United Nations Statistical Commission. The reasons for this are complex and go well beyond issues of capacity, and include for example, a lack of appropriate methods to address data collection, compilation and processing from informal sectors.

7.2 Ecosystems and biodiversity

7.2.1 Millennium Ecosystem Assessment and the classification of ecosystem services

The Millennium Ecosystem Assessment (MA) was an assessment made by over 1,360 experts from across the globe of the consequences of ecosystem change on human wellbeing based on the best available

scientific evidence of the time. The MA was first called for by the United Nations Secretary-General Kofi Annan in 2000, and was then initiated in 2001, and completed in 2005. The MA findings were presented five technical volumes and six synthesis reports and provided an appraisal of the state and trends in the world's ecosystems and the services they provided, practical options for the sustainable use of ecosystems, and options for the restoration, conservation and enhancement of ecosystems. Importantly, the MA developed and used a framework for making the assessment, including a classification of ecosystem services as well as types of ecosystems for example.

For more information on the MA and its finding please see: <http://www.maweb.org/en/index.aspx>.

According to the framework for assessing ecosystems and human wellbeing, "an ecosystem is a dynamic complex of plant, animal, and microorganism communities and the nonliving environment interacting as a functional unit. Humans are an integral part of ecosystems..."²⁰ and "the benefits people obtain from ecosystems"²⁰ are considered ecosystem services.

The MA divided these ecosystem services into:

- provisioning services – e.g. food and water
- regulating services – e.g. regulation of floods, drought, land degradation, and disease
- cultural services – e.g. recreational, spiritual, religious and other nonmaterial benefits
- supporting services – e.g. soil formation and nutrient cycling

The framework also considered human well-being, which was stated as having "...multiple constituents, including basic material for a good life, freedom and choice, health, good social relations, and security. Wellbeing is at the opposite end of a continuum from poverty, which has been defined as a "pronounced deprivation in well-being." The constituents of well-being, as experienced and perceived by people, are situation-dependent, reflecting local geography, culture, and ecological circumstances"²⁰. Importantly, the MA links ecosystem services to determinants and constituents of wellbeing.

7.2.2 The Economics of Ecosystems and Biodiversity (TEEB) Study and its framework

The Economics of Ecosystems and Biodiversity (TEEB) study is an international initiative that brings together expertise from the fields of science, economics and policy which makes assessments on the economic benefits of ecosystems and biodiversity. The TEEB is hosted by the United Nations Environment Programme (UNEP) and was proposed by the German government when they called for a study on "The economic significance of the global loss of biological diversity" as part of the so-called "Potsdam Initiative" for biodiversity. From this a proposal was prepared and then endorsed by G8+5 leaders at a meeting 6-8 June 2007, and work on the TEEB study began in the same year.

Currently the TEEB is in its third phase and is focusing on focuses on facilitation and support for national, regional, local and sectoral studies being initiated around the world. In the second phase the TEEB included a synthesis of related work and the first phase consisted of a set of preliminary findings.

²⁰ Page 3, Ecosystems and Human Well-being: A Framework for Assessment, Summary. Millennium Ecosystem Assessment, 2005. [Online 07 06 2012: <http://www.maweb.org/documents/document.48.aspx.pdf>]

In 2009, the TEEB study produced a set of draft chapters defining the conceptual foundations for linking fields of economics and ecology and for example addressing the relationship between biodiversity and ecosystem services and their value to people. These draft chapters were revised and incorporated into a book titled: *The Economics of Ecosystems and Biodiversity: Ecological and Economic Foundations*, in 2010. The draft chapters are available freely online while the book has to be purchased.

The Ecological and Economic Foundations chapters draw from the Millennium Ecosystem Assessment coupled with other research to form a framework for conceptualizing and assessing the value of ecosystems, their services and biodiversity to people.

7.3 Geographic information and Geographic Information Systems (GIS)

Geographic Information Systems (GIS) bring together geographic data, software and hardware and to capture, manage, process, analyse and display geographically referenced information.

Geographically referenced information may include remote sensing information collected by satellites or aircraft for example, ground based observations or estimates based on other data and information. GIS is used for meteorological, hydrological, agricultural, economic, social and environmental and many other types of data. GIS is used for planning, designing and managing infrastructure as roads, or related to electricity and water. GIS can also be used as a platform for modeling and integrating a range of datasets for in depth analyses by geographic area.

Table 10: GIS and its three views (i.e. parts)

Views	Description
Database view	GIS is a database (geodatabase) for any dataset that is georeferenced. A dataset may have a very large number of variables or only a few variables, but each variable is referenced with geographic coordinates. The housing census and population census datasets are two statistical datasets that are georeferenced.
Map view	GIS software packages have an array of visualisation tools for presenting datasets on maps. For example a dataset may be displayed as a map, or specific data may be represented as graphs above a map at the geographic locations to which the graphs relate.
Model view (processing and analysis)	GIS software packages contain an array of data processing, modeling and analysis tools that can be used to analyse data and even generate new datasets.

For more information on GIS please see: <http://www.gis.com/whatisgis/index.html>.

The underlying framework for GIS is the spatial reference frame in terms of coordinates for vector (i.e. shape) based information or cells for raster (i.e. image) based information. As such it is used for a variety of data and information, sometimes in support of official statistics, climate science, carbon credits or for other purposes.

Without going into any detail there are a range of classifications and standards used for various layers of information, but one of the most important standards is that for metadata. “Metadata are the information about a set of data in terms of the concepts, sources and methods used to collect, compile and disseminate statistics” (P117, IRWS 2012). Internationally ISO 19115 is the standard for geographic information metadata. Some regions of the world have adapted this standard according to their requirements.

For more information on ISO 19115 geographic information metadata, please see:

- http://www.iso.org/iso/catalogue_detail.htm?csnumber=26020
- http://www.iso.org/iso/catalogue_detail.htm?csnumber=39229

Part III: Green+ innovation

8 Green+

8.1 Green economy

The UNEP definition of the green economy, “... an economy that results in improved human well-being and social equity, while significantly reducing environmental risks and ecological scarcities” (UNEP 2010), is focused on desired outcomes. The reduction of risks and ecological scarcities is consistent with the categories of jobs counted as being green jobs by the ILO as well as the US BLS Green Jobs Survey, which counted: “A. Jobs in businesses that produce goods and provide services that benefit the environment or conserve natural resources”; and “B. Jobs in which workers' duties involve making their establishment's production processes more environmentally friendly or use fewer natural resources”.

By contrast, the ILO practitioners guide for “Assessing green jobs potential in developing countries” (Jarvis et al 2011) acknowledges the need to include jobs in sustainable agriculture, fishing and forestry as well as climate change adaptation in developing countries. As such, Jarvis et al expand the assessment of green jobs in developing countries beyond the ILO definition into sustainable productive activities that do no harm. This is consistent the OECD definition of green growth.

The OECD definition of green growth focuses more on issues of sustainability, for example “...ensuring that natural assets continue to provide the resources and environmental services on which our well-being relies...”. Sustainability would include activities within the economy that improve the physical environment (such as those included in the UNEP and ILO definitions) as well as other activities that ‘do no harm’ to the environment and society. As such the OECD green growth definition is wider than that of UNEP and the ILO.

8.2 Shades of green - light and dark

The UNEP and ILO definitions could be said to be mainly focused on the dark green part of the economy, specifically activities within economies that improve the physical environment as well as providing livelihoods and providing benefits to society as a whole. The OECD definition could be said to include growth in both the dark green part of the economy as well light green part of the economy consisting of activities that interact directly with the environment but are sustainable.

Hence, the green part of the economy appears to have two parts, the dark green part and the light green part. Currently efforts to measure green jobs mainly focusses on the dark green part of the green economy, and as such limits the number of jobs counted to a small fraction of all jobs (i.e. ~ 3% of jobs in the United States).

8.3 + other colours of the economy (yellow, orange and red)

It would seem that the community of researchers, policy makers and data producers around the green economy and green growth have been focusing on defining the green economy, green growth and other concepts without looking into what is not green. The not green part of the economy may be an important part of the solution space. For example, if the goal of having a green economy is to have sustainable development, then this raises a question: Is there space for not green activities within sustainable

development? It is only possible to answer this question if there is an understanding of the not green part of the economy and its interactions with the green economy.

It would be easy to assume that all activities that are not green are inherently dirty and unsustainable. However, such an assumption is not particularly instructive when it comes to policy or measurement. In the context of the green economy, green growth and development, it may be useful to ask: To what degree are different parts of the economy dirty or unsustainable?

The literature on the green economy does not address such questions, however it is possible to break down the rest of the economy (i.e. not green part of the economy) into three distinct parts, consisting of:

1. Yellow - activities that have limited direct impacts on the environment, but rely on goods and services from other economic units that may have a significant direct impact on the environment
2. Orange - activities with significant negative direct impacts on the environment
3. Red - activities with very significant negative direct impacts on the environment, and are contributing to the breaching of the limits of ecosystems to adapt

8.3.1 Yellow – activities with limited direct environmental impact

The first category consists of activities that have limited direct interaction with the environment, but rather have an impact based upon their consumption. For example a law office may have little direct impact on the environment but if the electricity to power the office is from a coal fired power plant, then it will be contributing to climate change. Alternatively, if the office is powered by electricity generated by renewable energy resources, then will have sustainable electricity consumption. Such activities have limited direct impact but rather depend on other economic units being sustainable if they are to be considered sustainable.

8.3.2 Orange – activities with negative direct environmental impacts

The second category of activities are those activities that directly interact and impact the environment negatively, such as mining or unsustainably managed agriculture, fishing or forestry. Similarly manufacturing and construction may also have significant direct negative impacts on the environment due to emissions of greenhouse gases, emissions of pollutants to air, water or land or through the disturbance of sensitive environments.

8.3.3 Red – activities with negative direct impacts breaching ecological limits

The third category of activities consists of those activities that not only interact and negatively impact the environment but are directly contributing to the breaching of ecological limits, risking the very survival of ecosystems. Coal fired electricity generation would fit into this category, as it is clear from IPCC fifth assessment report that any new emissions are unsafe, i.e. above the threshold for 1.5 degrees of global warming and are likely to contribute to an aggregate level of climate change of greater than 2 degrees Celsius based on emissions scenario modelling.

These categories of not green activities are presented, along with relevant policy interventions, in Table 11.

8.4 The traffic light economy

Bring together the green and not green elements of the economy, it is possible to define the economy in terms of: the green parts of the economy contributing to ecological sustainability; the yellow part of the economy that has limited direct impact on the ecosystems but might be able to influence sustainability through its consumption choices; the orange part of the economy that has direct negative impacts on the environment without breaching ecological limits, and the red part of the economy and human activity that is breaching ecological limits (Table 11).

Like traffic lights, each colour has an implication regarding next steps. For example a green light would indicate that it is ok to proceed, while orange would suggest slowing down, while red indicates that it is time to stop (Table 11).

Table 11: Types of productive activities that could be used to assess green growth and development.

Colour following a traffic light scheme	Activities	Policy interventions
Dark green	Restorative activities (e.g. land rehabilitation and decontamination)	Seek balance depletion and degradation of the environment and damage to ecosystems through restorative activities
Light green	Sustainable activities that interact directly with the environment (e.g. sustainable agriculture or sustainable forestry), as well as environmentally protective economic activities (e.g. waste management and disposal that meet set standards)	Encourage sustainable practices and standards in agriculture, fishing, forestry, mining, construction, and manufacturing
Yellow	Activities that have limited direct impacts on the environment, but rely on goods and services from other economic units that may have a significant direct impact on the environment (e.g. a rest home or law office)	Encourage consumption of green goods and services coupled with sustainable buildings and infrastructure
Orange	Activities with significant negative direct impacts on the environment (e.g. poorly managed agriculture where soils are being depleted and waterways contaminated)	Wherever possible, implement sustainable production standards. Where the implementation of sustainable production standards is not possible, ensure that any damage is addressed by restorative activities (e.g. a mine area will be damaged during mining, but after the close of the mine, restoration activities will return the area into a safe environment hopefully with a vibrant ecosystem)
Red	Activities with very significant negative direct impact on the environment, and are contributing to the breaching of the limits of ecosystems to adapt (e.g. in the context of climate change a coal fired power plant)	Limit activities and reduce such activities, so that they no longer threaten ecological limits

8.5 Green+ model of sustainable development

The green+ model of sustainable development includes the dark green (restorative) and light green (sustainable) parts of the economy as well as yellow (dependent) activities and some orange (unsustainable) activities, hence 'green+' (Figure 9). The most important innovations in this model of a sustainable development is the acknowledgement that:

- there is no place for economic activities that contribute to the breaching of ecological limits
- there is a role for unsustainable activities so long as they do not breach ecological limits in the widest sense, and there is restoration afterwards
- there are dependent activities reliant on other economic activities that need to be separately accounted for

There is no place for economic activities that contribute to the breaching of ecological limits. This might include the poaching of rhinoceros for their horns or the banning of coal fired power plants that generate electricity. In the case of coal fired power plants the case can be made that the concentration of carbon dioxide in the atmosphere are sufficiently high, (i.e. over 350 ppm and rapidly approaching 450 ppm) that it is no longer justifiable to generate electricity by burning coal, given its high carbon dioxide emissions intensity. In this case the key to applying the model, or collecting statistics on red activities, is defining what is meant by ecological limits.

The role of orange unsustainable activities that do not breach ecological limits is very important. For example, to generate renewable electricity there is a need for mining of rare earth elements and other metals along with the extraction of petroleum. Without these materials it is not possible to construct wind turbines or solar panels. However, mines disturb local ecosystems. So long as this disruption is contained and the areas are restored after mining, the ecosystem is sustained. After banning red activities, it is the relationship between dark green restorative activities and orange unsustainable activities is what determines if the economy as a whole is ecologically sustainable.

Yellow activities have minimal direct interaction with the physical environment but are dependent on other activities for goods and services, many of which will have an environmental impact. An example of such a business establishment could be a firm of lawyers that have a rented office. Included in the rent is electricity supply, heating, water and maintenance. The firm may purchase computers and teleconferencing facilities and may use transport services to reach clients. If the electricity provided is from sustainable sources and the firm uses public transport then the firm could be said to be sustainable. If the electricity purchased is from coal fired power plants then the firm could be said to be unsustainable. However the firm may or may not have the option of choosing electricity by type of generation. The sustainability of the firm depends upon the sustainability of the rest of the economy.

Yellow activities, which in many cases will be services, are important because they are less policy relevant when it comes to achieving sustainable development. The yellow part of the economy are consumers and may lobby for cheap or affordable goods and services. However, government policy for achieving ecological sustainability will typically focus on other parts of the economy that have significant direct interactions with the physical environment, either in terms of extraction or in terms of dumping wastes.

From a statistical perspective it is important to acknowledge that a significant part of the economy may never fit in the green part of the economy, nor should it be classified by default as being unsustainable.

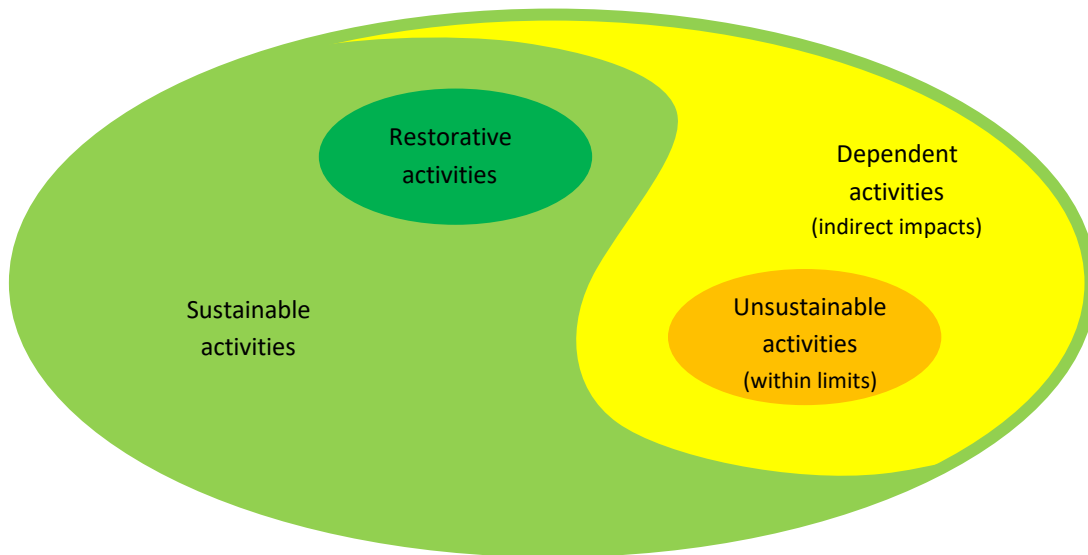


Figure 9: Green+ model of a sustainable economy.

8.6 Social dimensions

From the text and diagram above, it is clear that the social dimensions of sustainable development are not captured in the green+ model of a sustainable economy. This is in part deliberate, so as to avoid complicating the classification. As such the traffic light classification of the economy follows an ecologically driven frame and set of concepts.

To ensure social dimensions of sustainable development are included it is recommended in the next chapter that labour and other social dimensions be included through the certification of productive activities. Examples of such certification include garments that are certified under the Worldwide Responsible Accreditation Production (WRAP). There are important questions around whether such certification and standards are adequate, both when it comes to social and environmental dimensions of development. For more in these issues, please see section 9.1 Certification based statistics, below.

9 Green+ data sources and methods

The following sections will discuss the possibility of establishing a system of green certification based statistics, under which data are collected and compiled for the traffic light categories identified in the previous chapter. There will be a short introduction to what is meant by certification based statistics, including the limitations of certification schemes. The application of certifications schemes to create statistics will be discussed in the context of extending the green jobs survey methodology used in the United States. Potential headline indicators, indicator sets and statistics will be presented and finally there is a brief discussion on how these indicators and statistics can be used to help monitor the establishment of the preconditions for sustainable development.

9.1 Certification based statistics

Since the 1980's a growing list of certification schemes have emerged that seek to ensure good and services have been produced using certain minimum standards (i.e. production standards). Examples include fair trade, various eco labels and standards around the treatment of staff in garment manufacturing. While there are many actors, motivations and certification standards, some level of coordination and harmonization is emerging, for example through the Global Reporting Initiative (GRI) and the Global Compact at the international level, as well as other initiatives at the national level often related to Corporate Social Responsibility (CSR).

Certification schemes are no panacea and on close inspection all certification schemes have deficiencies, strengths and weaknesses. However, as the Green Jobs Survey has demonstrated (see 5.4.1 Green jobs indicator), it is possible to collect and compile data related to the application of green production standards and make green jobs estimates. The question, in the context of the traffic light model of sustainable development presented above, is whether this greens jobs survey methodology can be applied to generate meaningful statistics on green, yellow, orange and red jobs and other indicators.

9.2 Green jobs survey+

The green jobs survey serves as methodological template for future attempts to collect and compile statistics related on green and other types of production. Importantly, it serves as a template for measuring the characteristics of business establishments applying certified green production.

However, the categories outlined in Section 8.4 The traffic light economy differ from the BLS Green Jobs Survey as they have an ecological limits focus which can be coupled with social and labour related standards as appropriate. This means suitable production standards will need to be identified that help ensure ecological, social and labour standards are not breached. Such standards may include international production standards, but in many cases will require local production standards and related certification schemes to be reviewed.

9.2.1 Green production standards selection process and responsibility

The official statistics community have stated that they do not want to engage in the subjective matter of deciding what is green or not green (UNSD 2011). As such, it is suggested here that the identification and selection of green production standards should not be the responsibility of NSOs, but rather, a panel consisting of 'green' certification related experts from government, business, civil society and academia

could determine what types of production are considered dark green (i.e. restorative) through to red (i.e. breaching ecological limits).

For dark green and light green categories, the panel could review certification schemes and assess new schemes. For yellow, orange and red categories of production, it may be necessary to treat industries, or all non-certified production as being yellow, orange or red. For example, uncertified agricultural production might be considered orange as the establishments interact directly with the environment and it cannot be guaranteed that the establishments are not creating some level of harm to the ecosystem. Meanwhile, some office based services might be classified as being yellow, for example legal practices. A case could be made for coal fired power plants to be classified as being red, given the carbon dioxide emissions that come from coal fired power plants, and the fact that the atmosphere already has over 400 ppm carbon dioxide yet in the long term humanity is aiming for an atmospheric concentration of 350 ppm (UNFCCC 2015). Similarly all transport using combustion could be considered red, while electric powered transport could be considered green. These are examples of the issues a panel would need to consider and make decisions on.

In practice, the terms of reference for the panel will very much depend on the information required to make statistical estimates. The information required depends on the methods being used to make estimates. Table 12 presents potential methods that might be used to estimate green and other jobs, production and income for example.

Table 12: Potential methods for estimating green and other types of jobs, production and income.

Colour	Jobs	Production (value added)	Income
Dark green	Estimated based on the proportion of revenue attributed to green production (using certified standards)		
Light green			
Yellow	Estimated based on characteristics of the economic activity (i.e. services that have very limited direct impact on ecosystems)		
Orange	Estimated as a residual (i.e. economic activity that has direct interaction with the ecosystem and is not using a certified green production standards, and is not classified as contributing to the breaching of ecological limits)		
Red	Estimated based on the characteristics of the economic activity, the technologies used and the ecological context		

It will be important for any panel deciding which types of production and considered green, yellow, orange or red, to regularly review classification decisions. In some cases certification schemes that were once effective may become ineffective, or alternatively implementation or monitoring may be lacking. Meanwhile new certification schemes and production standards may emerge.

Changes in certification schemes accepted as being green will have an impact on statistics like the number of green jobs. However, references like poverty lines are regularly changed to ensure they reflect reality. The important thing will be to ensure the integrity of measures, and making sure any changes in standards are backdated allowing meaningful time series analyses.

9.2.2 Green+ business survey

Based on the determination of the panel, NSOs could collect new information on the application of production standards, and compile statistics on the characteristics of dark green, light green, yellow, orange and red parts of the economy. Like the BLS Green Jobs Survey, the percentage of revenue estimated to be from green production activities can be multiplied against the number of jobs to estimate the number of green jobs. The same method could be applied to other characteristics, such as the value added of production or the income earned by staff engaged in green production.

Additional questions could be added to existing questionnaire used to collect information from business establishments. Characteristics such as revenue, staff numbers, costs and capital are already collected in such business surveys. The addition of questions related to the application of green production standards including labour standards, and the estimated proportion of revenue attributable to green production, potentially allows green jobs, green value added and green income to be estimated.

9.3 Green+ price survey

Once production activities have been classified as being green or not green, it is conceptually possible to create a green Consumer Price Index (gCPI) that could be compared with the regular Consumer Price Index (CPI).

The CPI is calculated based on price data for a 'basket' of goods and services. If the prices were collected for goods and services that are certified as being 'green', then it would be possible to compare gCPI with CPI and see if there is convergence or divergence of prices. For some goods or services there may be little difference between prices suggesting that green production standards are not particularly onerous.

A similar approach could be taken towards estimating a green Producer Price Index (gPPI), which would yield important information regarding the ability to find cost competitive green sources for inputs to production.

9.4 Green+ headline indicators and other statistics

Following the information pyramid from "Section 3.3 Uses of indicators, statistics and other information" Figure 10, illustrate how the business and price survey data might be collected and aggregated to form statistics, indicator sets and headline indicators. From adding questions to pre-existing business surveys it is possible to compile statistics on dark green (i.e. restorative) through to red (i.e. contributing to the breaching ecological limits) production including figures for jobs, value addition and income by industry. By collecting price information on certified green goods and services it is possible to produce statistics on green and regular prices for specific goods and services. From these statistics it is possible to select and calculate indicators for example changes in green prices for broad categories of goods and services, or national totals, proportions or rates of change in green and other categories of production.

Green+: Monitoring the preconditions for sustainable development

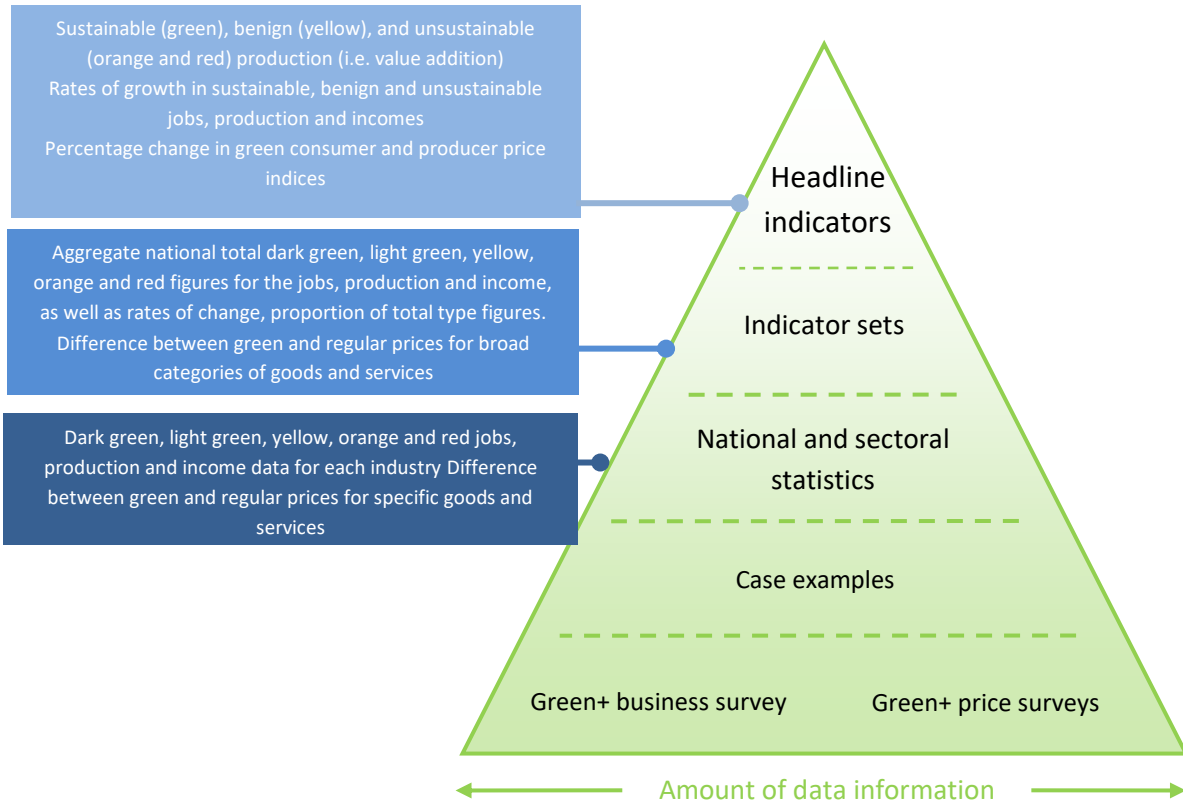


Figure 10: The data and information pyramid showing different types of green+ data and information and the level of aggregation.

Following Statistics New Zealand (2004a) indicators should, amongst other things: compel, interest and excite. This is especially true of headline indicators such as GDP or CPI inflation indicators. Related to issues of GDP, Slaper and Krause (2009) highlighted the need to be able to measure the green economy's size, rate of growth as well as associated jobs, and have gone so far as to suggested that a "green economy satellite account" could be produced for this purpose. By applying methods similar to the BLS Green Jobs Survey to production (i.e. value addition) it is possible to estimate the Gross Domestic green Production (GDgP). If done, this would be a direct estimate of size of the green economy, and it would also be possible to directly estimate green growth in addition to green jobs. This is an exciting prospect, one that needs to be tested.

From price surveys a green CPI could be compiled and relative levels of inflation between green and regular measures could be compared (Figure 11, Figure 12). Together with the statistics and headline indicators that come from business surveys, it is possible to assess the characteristics of the green economy in ways that are familiar and comparable with existing measures and methods. Together, these headline indicators have the potential to address many interesting questions such as how well paid are people in green jobs or how large is the green economy (Figure 11)? However, a question remains, do these proposed green+ statistics actually measure whether an economy is sustainable or not?

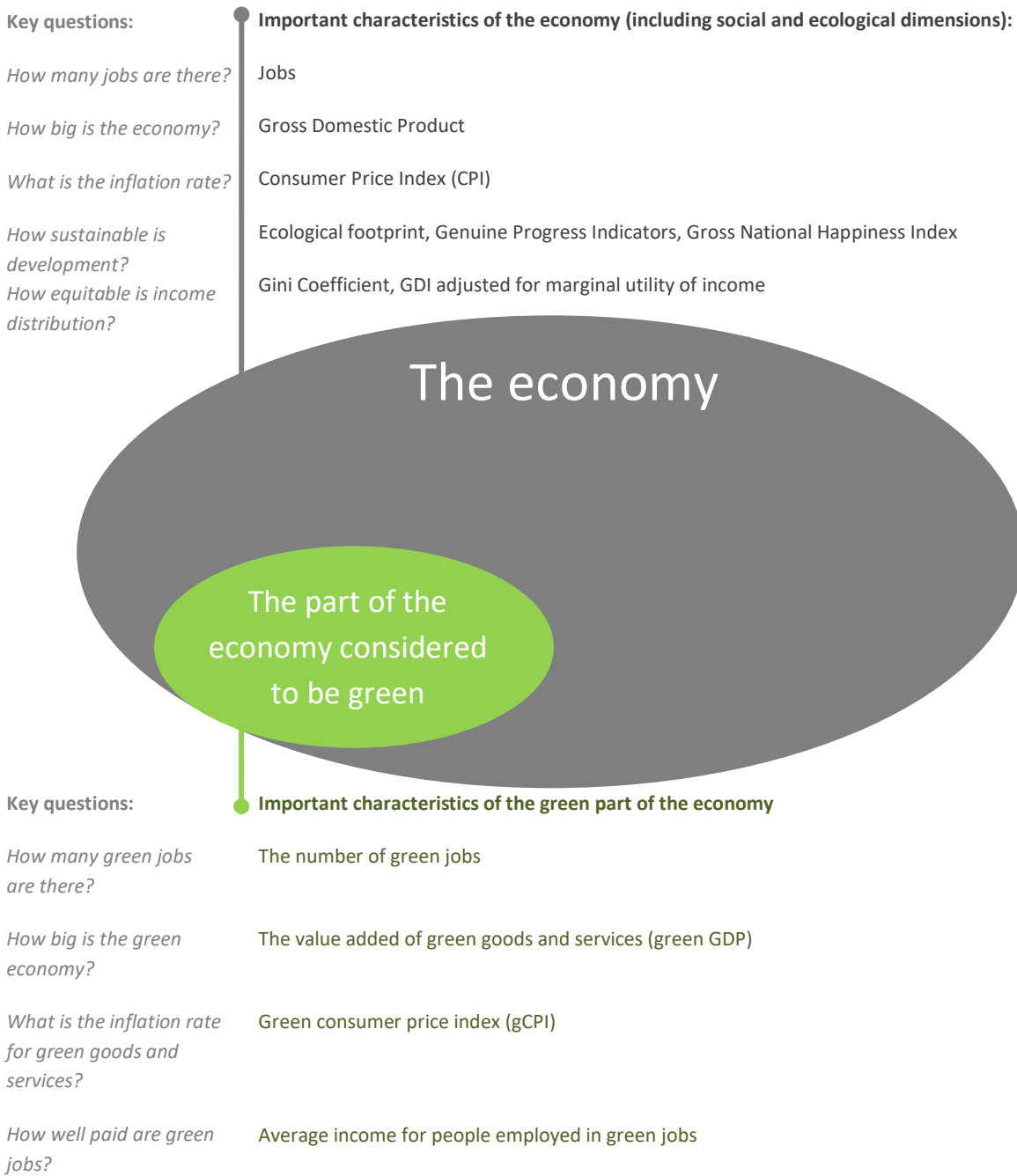


Figure 11: Conceptual model of the economy as a whole and the green part of the economy, including key questions and important characteristics that could be measured to form headline indicators.

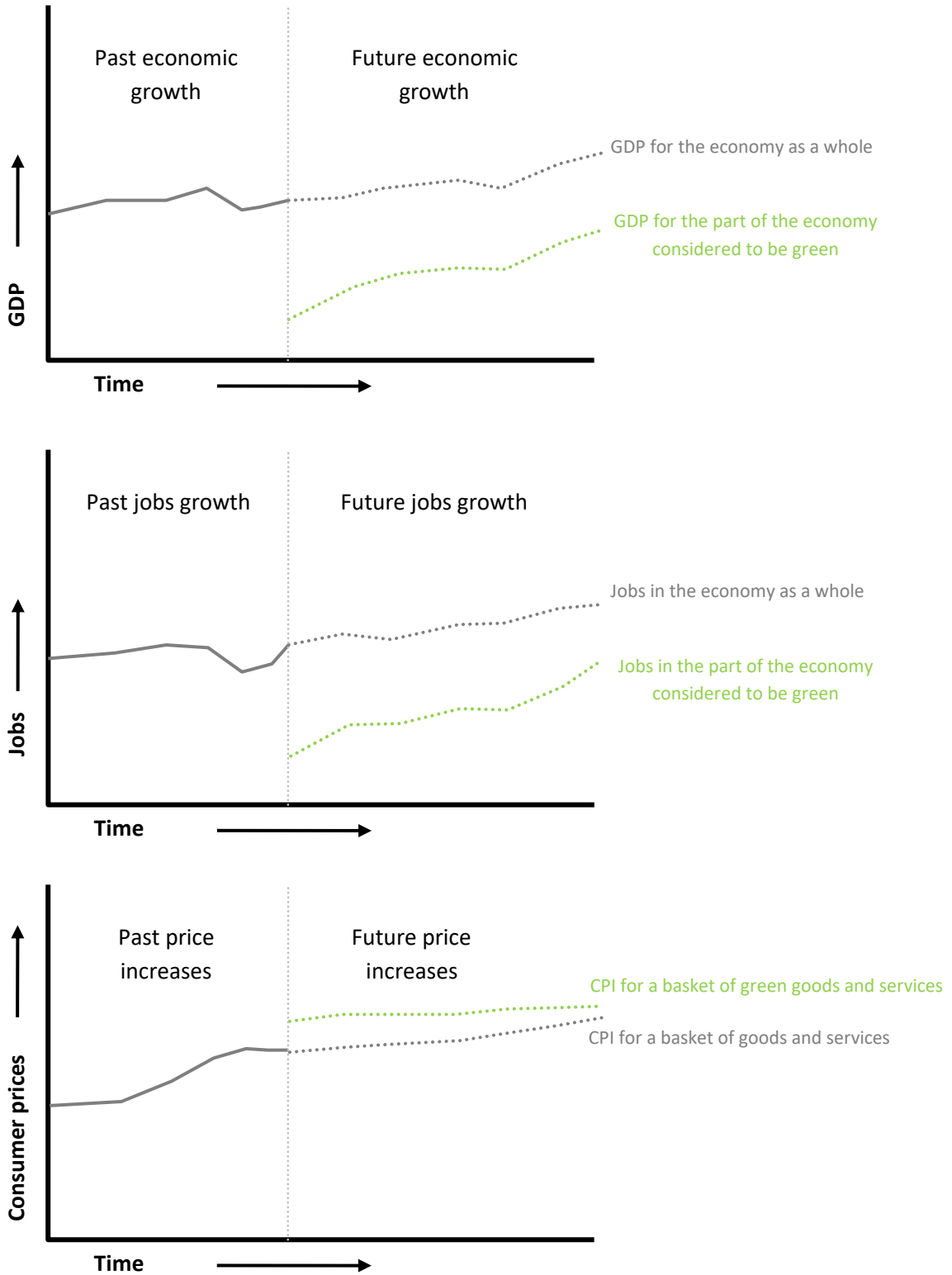


Figure 12: Potential headline indicators for making comparisons between the green part of the economy and the economy as a whole. Note: the curves are hypothetical and reflect the trends that would be desirable to see.

Table 13: Potential green+ headline indicators.

Colour	Headline indicators
Dark green	Green jobs as a proportion of all jobs Percentage change in green production (i.e. green growth) Green production as a percentage of all production
Light green	Median green income Percentage change in median green income Percentage change in green CPI Percentage change in green PPI
Yellow	Benign jobs as a proportion of all jobs Growth of benign production Benign production as a percentage of all production Median benign income
Orange	Unsustainable jobs as a proportion of all jobs
Red	Growth of unsustainable production Median unsustainable income

9.5 Monitoring the preconditions for sustainability

Green production standards, in and of themselves, do not constitute sustainable development, but rather the preconditions for sustainable development. For example, if a sustainable fishing standard is only partially implemented, or is only adopted by a few fishermen, then it is likely that the fishery will be unsustainable in the long run. However, it is interesting to know how many fishermen have adopted the standard, the proportion of the catch they represent, the jobs they support, the income they earn and the value to provide to the economy. It is also useful to know whether the fish they catch sell for a premium or are sold at regular prices. More important are trends and whether the green standard is being ever more widely adopted or declining.

The Indicator Guidelines (SNZ 2004a) and data quality standards generally, note the need for indicators and data to be timely. This criterion is a struggle in the context of environmental sustainability. Generally, economies respond much quicker to policy than the environment, as do society. Further complicating the timeliness of environmental data are difficulties of observation, data collection and processing.

One of the benefits of measuring statistics based on the application of certified production standards, is that the information generated is timely. For example, if a government decided that a green production standard was to become mandatory, the green jobs, production and income figures would go up immediately. With time, such interventions can be checked against environmental observations to check if the mandatory application of the standard had the intended effects. As such, green+ is a supplement to the existing suite of statistics and indicators related to sustainable development, a supplement that comes with strengths, weaknesses, risks and opportunities.

10 Monitoring green growth and sustainable development

10.1 Discussion

Given that the ecosystems, the people that live within them and the economies they generate are complex, a multipronged approach is required to understand issues, assess policy options and evaluate past successes and failures. Green+ offers a new avenue of investigation, linking policy interventions (i.e. the application of certified production standards) with concepts of sustainable development, green growth and the green economy. While green+ statistics may well be responsive and provide timely data, they are limited to measuring progress towards putting in place the prerequisites of sustainable development.

The international community has set out its sustainable development agenda with the SDGs at its heart. The SDGs consist of 17 goals, under which there are 169 targets and 304 provisionally proposed indicators. Of these indicators only 50 were considered very relevant, easily feasible, and were supported by NSOs for inclusion as an SDG indicator. Meanwhile another 212 needed to be discussed further along with alternatives. As such there remains significant work on the definition of SDG indicators. However, one thing all SDG indicators have in common is that they are designed monitor progress towards targets. As such the underlying assumption is that achieving the SDG targets will lead to sustainable development. It is important to note that while the ultimate goal of the SDGs it to ensure development is sustainable, there is no one headline indicator for assessing this.

Many of the existing headline indicators and indicator sets described in part two of this document attempt to measure whether development is sustainable, for example the ecological footprint, or assess elements of sustainability and green growth for example the OECD green growth indicators. The lack of specific indicators for the 17 SDG goals is a drawback of the SDGs, and the lack of a single indicator of sustainability is a further limitation to understanding overall progress. These are gaps that might be addressed using some existing headline indicators and indicator sets.

The SEEA and WAVES have coupled environmental and ecological systems data with a stock and flow framework consistent with the SNA, the very system used to assess the state of economies. In doing so the SEEA framework addresses externalities and creates the opportunity for modelling of macro-economic environmental interactions. An example of the power of integrating environmental and economic accounts are the Treasury Working Papers from New Zealand on possible carbon tax levels and their impacts on specific industries and households of varying income levels. However many ecological and environmental issues are geographically constrained while accounting frameworks assume fungibility within markets. So while this works for greenhouse gas emissions, other environmental issues are limited to specific catchments or ecological areas. However, efforts to couple environmental accounts with GIS may afford more analytical power to these systems of data.

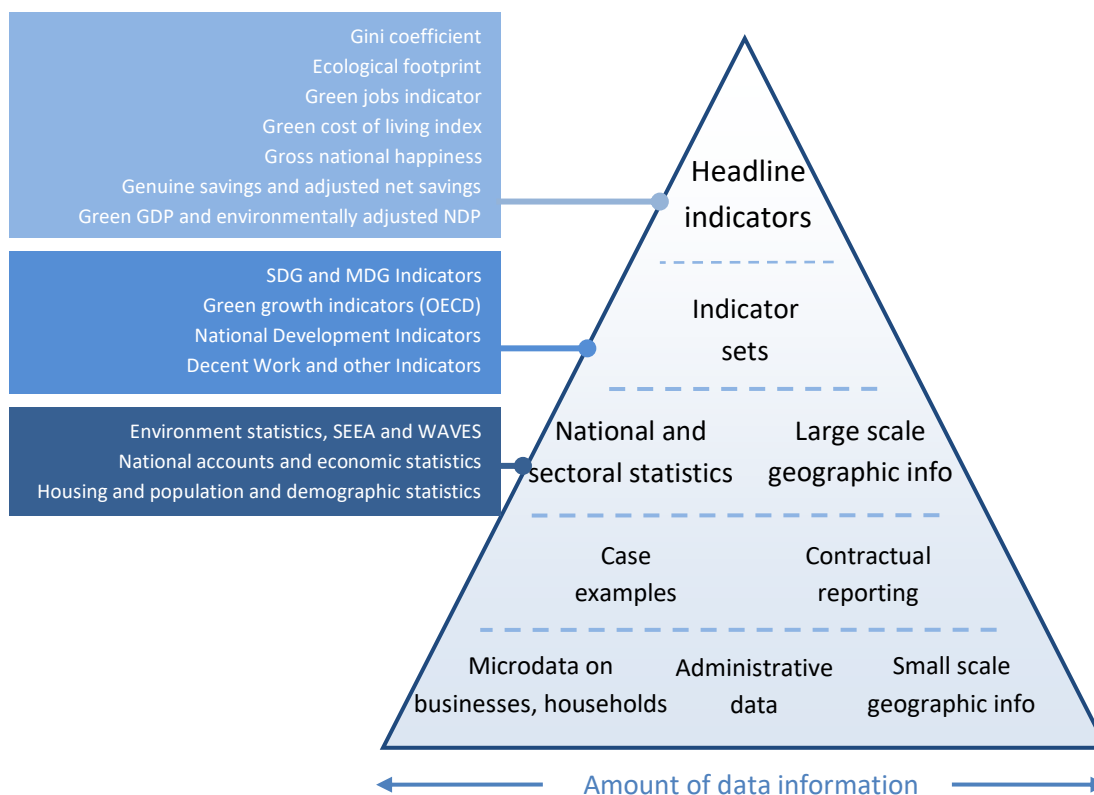


Figure 13: Headline indicators, indicator sets and statistics from Chapters 5 to 7 in relation to the data pyramid.

Like other environmental accounts, green+ statistics also seek to build off the SNA, although dividing production not only by industries but also by their ecological impacts. The innovation with green+ is the use of certified production standards as a basis for collecting and compiling statistics. This means that the statistics are highly responsive to any policy interventions through the application or expansion of production standards. The production standard serves to simplify ecological and other issues into something that theoretically can be applied. However, the use of production standards is one of many possible policy interventions. While expanding the application of such standards may seem like a no brainer, any such intervention should undergo a deeper analysis, that might include the use of natural resource accounts and geographic data to get a sense of economic, social and ecological consequences, intended and unintended.

The normative and agenda setting aspect of the SDGs means that goals and targets can be used as anchor points for orienting statistics, indicators and policy interventions. For example goal 12 on responsible production and consumption is an area that green+, the SEEA and most other green growth related indicators can help support. In addition, green production standards may also have a role. Goal 8 regards decent work and economic growth, reflecting the ILO decent work agenda, which is also an important element of green growth. Other goals that might be assisted by the implementation of green production standards include: Goal 3 good health and wellbeing; Goal 6 clean water and sanitation; Goal 7 affordable and clean energy; Goal 9 industry, innovation and infrastructure; Goal 11 sustainable cities and communities; Goal 13 climate action; Goal 14 life below water; and, Goal 15 life on land (Figure 12).

There are many other goals and targets that could be discussed, and as such, this should be a focus of research going forward.

Figure 14 presents the wider monitoring system that green+ might become a part of. At the international apex of the sustainable development monitoring system are the SDGs consisting of 17 goals, 169 targets and 304 proposed provisional indicators. The key question being addressed by these indicators is whether humanity is making progress towards the targets and by implication our goals. Below the SDGs, at the national level, are information systems taking the form of the information pyramid. Figure 14 draws from Figure 10 and Figure 13 showing the green+ and existing suite of headline indicators, indicator sets, national and sectoral statistics. The presentation of both the blue and green information pyramids indicates that green+ is a supplement to the existing set of information. Green+ helps address the question of whether we have the preconditions for sustainable development, while many of the existing indicators and statistics are focused on assessing if development is indeed sustainable. In some cases existing data are used as SDG proposed provisional indicators. In other cases green+ and existing indicators will be used to flag issues. After issues are flagged research is required to assess issues and options and optimize policy. Hence, the wider system of information, including indicators and statistics are required to inform policies in support of SDGs and sustainable development generally.

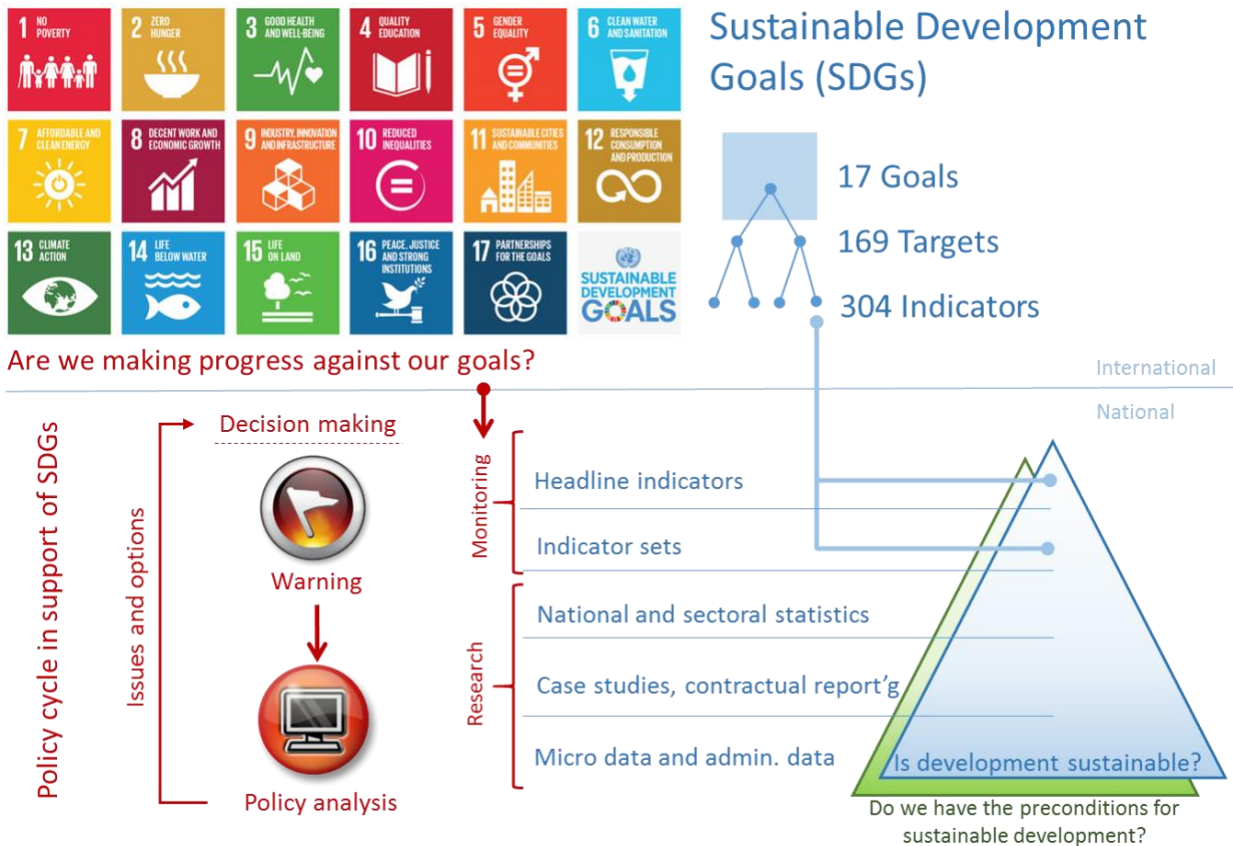


Figure 14: SDGs and related indicators, along with supporting statistics for monitoring, research and the policy analysis.

Bringing the discussion together, there are three broad questions that are addressed to varying degrees by SDGs, existing indicators and statistics related to the green economy and green+ statistics and

indicators. As noted above, the SDGs set out the goals, and indicators address the question of whether we are making progress against these goals. Existing indicators and statistics in many instances address the question of whether development is sustainable. The proposed green+ indicators and statistics address the question of whether we have the preconditions in place for sustainable development.

The benefit of focusing on the preconditions of sustainable development, is that the indicators are likely to be highly responsive to the application and expansion of green production standards. This is important as many sustainability indicators are slow to respond to interventions and provide little direct feedback to decision makers that they are on a path towards sustainability. Another benefit of green+ indicators, such as a gCPI or GDgP, is that they can readily be analysed by economists and government officials as they are familiar with such data.

From the discussion above, it is clear that there remain issues with SDGs, existing indicators, statistics and statistical frameworks. However, progress is being made, and now there is a real opportunity bolster the current information systems in countries around the world with green+ indicators and statistics. Together, green+ and existing indicators and statistics can be used together to strengthen the monitoring of the green economy, green growth and sustainable development.

11 Next steps

This document, the content and proposed green+ data are for discussion. Currently the document is being circulated selectively to gauge interest in the concepts proposed. In this light, we will be very grateful for feedback on the three parts of the document.

The author believes there is merit in investigating green+ further, in particular by testing what data sources and methods can be used to collect and compile green+ data. As such, the author and the Tiaki Institute are eager to form partnerships, and seek funding, to support further investigation of green+ concepts, sources and methods.

The author is especially interested in feedback and thoughts regarding potential policy relevance of the indicators and statistics discussed in this document, and in particular the use of certification schemes and production standards.

“Everything should be made as simple as possible, but not simpler”

Albert Einstein

Acknowledgements

The ideas presented in this paper have benefited greatly by discussions and interactions with many friends and colleagues. However, as these discussions were personal and private interactions without direct reference to this document, I will check with all involved before acknowledging them and creating an affiliation with this document.

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Annex 1: List of Statistical Standards

The United Nations Statistics Division has compiled a list of statistical standards, and this list is available online: <http://unstats.un.org/unsd/iiss/List-of-Statistical-Standards.ashx>

These statistical standards are grouped into three categories: classifications, concepts and definitions, and methodologies and procedures. The standards have been presented below in these categories. In reality, some standards could be included in more than one of the categories but for practical purposes have been placed in the category of best fit.

Classifications

- Classification by Broad Economic Categories (BEC)
- Classification of Individual Consumption According to Purpose (COICOP)
- Classification of Statistical Activities
- Classification of the Functions of Government (COFOG)
- Classification of the Outlays of Producers According to Purpose (COPP)
- Classification of the Purposes of Non Profit Institutions Serving Households (COPNI)
- Central Product Classification (CPC)
- Extended Balance of Payments classification
- FAO Commodity Classification
- Harmonized Commodity Description and Coding System
- International Classification of Standards
- International Standard Classification of Education (ISCED)
- International Standard Industrial Classification of all Economic Activities (ISIC)
- Multi Agency Classification of Non Tariff Measures
- Services Sectoral Classification List
- Standard Country or Area Codes for Statistical Use (M49)
- Standard International Trade Classification

Concepts and Definitions

- Benchmark Definition of Foreign Direct Investment BMD
- Careers of Doctorate Holders survey (CDH)
- Compilation Guide on Financial Soundness Indicators
- Consumer Price Index Manual: Theory and Practice
- Core ICT Indicators 2010
- Core set of economic statistics for Asia and the Pacific
- Data and Metadata Reporting and Presentation Handbook
- Export and Import Price Index manual (EMPI Manual)
- External Debt Statistics Guide for Compilers and Users
- FAO Concepts and Definitions for Agricultural Statistics
- Frascati Manual 2002 Proposed Standard Practice for Surveys on Research and Experimental Development

- Glossary of Environment Statistics
- Government Finance Statistics Manual GFSM 2001
- Handbook for the collection of administrative data on telecommunication/ICT
- Handbook on Constructing Composite Leading Indicators Methodology and User Guide
- International Merchandise Trade Statistics: Concepts and Definitions 2010 (IMTS 2010)
- International Recommendations for Distributive Trade Statistics 2008 (IRDTS 2008)
- International Recommendations for Tourism Statistics 2008 (IRTS 2008)
- International Reserves and Foreign Currency Liquidity Guidelines For A Data Template
- International Transactions in Remittances Guide for Compilers and Users
- Manual for Measuring ICT Access and Use by Households and Individuals
- Manual for the Production of Statistics on the Information Economy revised 2009 edition
- Manual on Statistics of International Trade in Services 2010 (MSITS 2010)
- Methodological Guide for Developing Producer Price Indices for Services
- Methodological manual on purchasing power parities (PPPs)
- Monetary and Financial Statistics Manual (MFSM)
- OECD Handbook for Internationally Comparative Education Statistics
- OECD Patent Statistics Manual
- Oslo Manual Guidelines for Collecting and Interpreting Innovation Data 3rd Edition
- Principles and Recommendations for a Vital Statistics System, Revision 2
- Principles and Recommendations for Population and Housing Censuses, Revision 2
- Quarterly National Accounts Manual 2001
- Scientific and technological activities (STA)
- Statistical Data and Metadata Exchange - Health Domain (SDMX-HD)
- The Producer Price Index Manual Theory and Practice
- The System of National Accounts, 2008 (2008 SNA)
- The UNESCO Framework for Cultural Statistics (FCS)
- Tourism Satellite Account: Recommended Methodological Framework 2008 (TSA: RMF 2008)
- Urban Indicators Programme Guidelines (UIP)

Methodologies and Procedures

- Balance of Payments and International Investment Position Manual Sixth Edition (BPM6)
- Business Tendency Surveys: A Handbook
- Common Metadata Framework
- Concepts and Methods of Environment Statistics: Human Settlements Statistics - A Technical Report
- Concepts and Methods of Environment Statistics: Statistics of the Natural Environment - A Technical Report
- Conference of European Statisticians Recommendations for the 2010 Censuses of Population and Housing
- Developing Gender Statistics: A Practical Tool

- ECB Recommendation amending Regulation 2533/98 concerning the collection of statistical information
- ECB Statistics Quality Framework and quality assurance procedures
- Framework for the Development of Environment Statistics
- Generic Statistical Business Process Model
- Guidelines for Exchanging Data to Improve Emigration Statistics
- Guide to Measuring Information and Communication Technologies (ICT) in Education
- Handbook on Deriving Capital Measures of Intellectual Property Products
- Handbook on Securities Statistics
- Industrial Statistics: Guideline and Methodology
- International Merchandise Trade Statistics: Compilers Manual (2004)
- Making Data meaningful Part 1: A Guide to Writing Stories About Numbers
- Making Data meaningful Part 2: A Guide to Presenting Statistics
- Making Data meaningful Part 3: A Guide to Communicating With the Media
- Manual for the Development of a System of Criminal Justice Statistics
- Manual on Victimization Surveys
- Managing Statistical Confidentiality and Microdata Access - Principles and Guidelines of Good Practice
- Measuring Capital
- Measuring Productivity
- Measuring Quality of Employment
- Measuring Sustainable Development
- Measuring the Non-Observed Economy - A Handbook
- Practical Guide to Producing Consumer Price Indices
- Principles and Guidelines on Confidentiality Aspects of Data Integration Undertaken for Statistical or Related Research Purposes
- Recommendation of the ECB concerning the collection of statistical information
- Recommendations on Statistics of International Migration, Revision 1
- Statistical Data Editing: Volume 1 - Methods and Techniques (1); Volume 2 - Methods and Techniques (2); Volume 3 - Impact on Data Quality
- Survey Data on Household Finance and Consumption
- Using Administrative Sources for Official Statistics: Principles and Practices
- World Programme for the Census of Agriculture (WCA)

Annex 2: Indicators and the questions they address

Table 14: Summary of existing and potential headline indicators relate to the green economy.

Question	Indicator	Level of development*	Focus
Indicators of sustainability			
How sustainable is the economy and society in terms of the earth's carrying capacity?	Ecological footprint	Well developed	Environmental
Including environmental concerns, what is the sustainable rate of economic growth of an economy?	Environmentally adjusted Net Domestic Product	Not under development	Economic and environmental
Including environmental and social concerns, what is the sustainable rate of growth of the economy?	Genuine Progress Indicators	Moderately well developed in academic spheres, but there are various versions	Economic, social and environmental
Including environmental and social concerns, what is the sustainable rate of growth of the economy?	Gross National Happiness	Well developed in the case of Bhutan	Economic, social and environmental
Indicators of equity			
How unevenly is income distributed?	Gini coefficient for income	Well developed	Social and economic
What is the utility (i.e. value) of income to society as a whole?	GDImu	New indicator to be explored	Social and economic
Indicators on the green economy and green growth			
How many jobs exist in the green part of the economy?	Green jobs	Well developed in the case of the United States Bureau of Labor Statistics	Green economy
How big is the green part of the economy?	green GDP (GDPge)	New indicator to be explored	Green economy
Are green goods and services getting cheaper or more expensive?	green CPI	New indicator to be explored	Green economy

*The level of development is assessed in terms of how well elaborated concepts, sources and methods are and whether they have been applied.

Table 15: Environment and related indicators and data.

Type of data and its use	Pre-conditions of sustainability	Sustainable development
Headline indicator	<p>Green jobs (all jobs in industries that have direct interaction with the environment and either help restore of the environment or do no harm)</p> <p>Gross Domestic green Production (GDgP) (economic production that respects ecological limits and does not create negative externalities)</p> <p>Green CPI (levels and changes in prices for green goods and services)</p> <p>Greenhouse gas emissions and accumulation in the atmosphere (levels of emissions and GHGs in the atmosphere relative to what is required to limit dangerous levels of climate change)</p>	<p>Ecological footprint (overshoot of ecological limits)</p> <p>eaNDP (sustainable income after deducting environmental degradation and depletion)</p>
Sets of indicators	<p>Green jobs (in terms of dark green, green, yellow, orange and red categories)</p> <p>Green price comparisons (for broad categories of goods and services)</p> <p>Environmental protection expenditure</p> <p>OECD Green Growth Indicators</p>	<p>Aggregate changes in stocks (changes in quantities and values of water, timber, and other environmental-economic accounts.)</p>
Statistical and geographic datasets	<p>Green jobs by industry</p> <p>Green price comparisons and changes (by specific goods and services)</p> <p>Asset accounts (showing physical stocks, their values and any changes for example extraction)</p>	
Micro data, case examples etc		

Table 16: Potential headlines answering important questions on the green economy based upon direct measurements of the green part of the economy.

Question	Indicator
How quickly is the green part of the economy growing?	rate of change in green GDP ($dGDP_{ge}$)
Are green goods and services getting cheaper or more expensive relative to general goods and services?	green CPI - CPI
Is the green part of the economy growing quicker or slower than the economy in general?	green GDP - GDP
How much of the economy is considered to be green?	green GDP / GDP
How quickly is the green part of the economy growing as a proportion of the entire economy?	$dt(\text{green GDP} / \text{GDP})$