



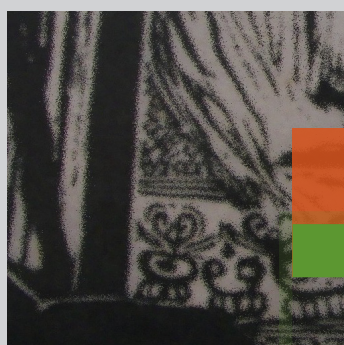
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Defining “green”: Issues and considerations

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DEFINING “GREEN”: ISSUES AND CONSIDERATIONS

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Abstract

This paper is part of a series of discussion papers that have been prepared by the International Institute for Labour Studies within the framework of the joint project “Addressing European labour market and social challenges for a sustainable globalization”, which has been carried out by the European Commission (EC) and the International Labour Organization (ILO). The discussion paper series provides background information and in-depth analysis for two concluding synthesis reports that summarize the main findings of the project. This paper relates to second part of the project “Preparing European labour markets to adapt to the long-run challenge of ensuring the joint social and environmental sustainability of globalization” and the concluding synthesis report “Towards a Greener Economy: The Social Dimensions”. An essential aspect of this discussion paper is to give meaning to the terms “green economy”, “green policy” and “green job” for the purposes of the joint EC-ILO study. The paper goes beyond a direct application to the study by providing a review and a discussion of the various definitions of “green” that have been suggested by governments, organizations and the policy literature. Similarities and problems are elaborated some conclusions on how to move forward are derived.

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DEFINING “GREEN”: ISSUES AND CONSIDERATIONS

Main findings

- While several definitions of “green” have been suggested by various organizations, no commonly accepted definition exists. It is however important to find working definitions of “green policies”, the “green economy” and “green jobs” so that the scope of this EC-ILO study is clear.
- An appropriate definition of a “green economy” or of “green jobs” is one that is useful for a previously determined purpose. Some reviewed definitions focus on the purpose of output or work when defining “green”, i.e. whether the produced goods and services can be used to “green” the economy. Others focus on environmental impacts of output and work, i.e. whether the production or consumption damages the environment or is unsustainable (“ecological footprint”).
- In general, definitions should carry a number of minimum requirements, notably: (i) transparency; (ii) identifiability of the item defined; and, (iii) the possibility to intersubjectively verify the results based on the definition.
- In terms of “green”, different environmental dimensions exist which could all be subsumed under the term “green”. No objective criteria exist that determine which aspects of the environment should be considered “green” and which not. Country specific differences may exist as well.

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- In order to have a pragmatic definition that can be used for this study, a “green economy” is considered as one in which CO₂ emissions are on low, sustainable levels. “Greening” the economy is the process of leading the economy to such a state.
 - Employment is analyzed broadly, i.e. the main focus is on employment effects arising from a transition towards a green economy. Jobs are “green” if labour is employed by industries that produce only low CO₂ emissions or if the jobs are involved in industries that produce goods and services whose direct purpose is to reduce CO₂ emissions.

A. Introduction: Why define the green economy and green jobs?

As OECD (see for example Martinez-Fernandez et al.(2010)), World Bank (2010) and others have noted, the term “green” has become a “somewhat imprecise catch phrase” (green stimulus) or is a “fuzzy term” (green job) often used as “one-size-fits-all”. The term “green” is mainly used in the context of the following applications: “green economy”, “green sector”, “green industry”, “green job”, “green policy”, “green stimulus”. A meaningful discussion and evaluation of e.g. “green policies” can only evolve after the key terminology has been specified. There is, however, great difficulty in finding a commonly accepted definition of “green”. For example, despite great interest of policy makers in creating “green jobs”, no commonly accepted definition of “green jobs” exists.

The importance of a precise and consistent framework of definitions cannot be underestimated. A limited number of explicit or implicit definitions of a green economy or a green job have been seen in the policy literature. An essential aspect of this discussion paper is to review the most common definitions for the terms “green economy”, “green policy” and “green job”. Furthermore, the paper shows how the proposed definitions differ, where they overlap and which inherent problems exist. Finally, the paper proposes a set of definitions that have been used during the joint EC-ILO study and which can be utilized and expanded in the future.

This discussion paper refers to the term “green” in the context of jobs, the economy or policy jobs interchangeably and in consequence implicitly assumes that there has to be some consistency in the use of “green”. Indeed, the paper suggests later on that it is essential to move the definition of a “green economy” in the center and to derive all other definitions in relation to this main definition.

Definitions generally have the purpose to distinguish one concept from another. A definition has all or some of the following functions:

- 1.) It has the purpose of determining the meaning or character of an item or term.
- 2.) It ascertains how an item or term is used in common daily life.
- 3.) It provides a convention or fixation of an item or term.

A definition can therefore not be true or false but only better or less able to fulfil the previously listed functions. The ultimate goal of creating definitions is to enable or facilitate communication. From a scientific point of view, definitions should allow for intersubjective validation and traceability of hypotheses and theories that are based on these definitions. A definition of “green jobs” should fulfil these requirements. Above all, it is important to create a transparent and workable definition so that results of different studies are comparable.

B. The Varied Approaches in Defining “Green”

The following section will present an overview of the current definitions of “green” that are utilized by various governments and organizations to describe the structural change towards a green economy. This structural change is supposed to lead to a (more) sustainable production of output, adding the dimension of sustainability to “green” economies and “green” jobs. It is this added dimension that presents challenges in formulating a workable definition of “green”. The following institutions have attempted to capture various characteristics of sustainability, but the practicality of their definitions is mixed.

The following analysis is then later on used to develop a working definition of “green economy” and “green jobs” for the purposes of the EC-ILO study on the labour market implications of the transition towards a green economy and to derive some general conclusions on how governments can deal with the issue of proper “green” definitions in the future.

1. UNEP/ILO/IOE/ITUC Definition under the Green Jobs Initiative

The Green Jobs Initiative defines green jobs in a broad sense, according to a wide array of environmental activities, while emphasizing the dynamic nature of “green” over time and the importance of “decency” in green jobs, according to its decent work agenda.

UNEP/ILO/IOE/ITUC (2008) provides a definition within the scope of the joint Green Jobs Initiative.

Green jobs are defined “as work in agricultural, manufacturing, research and development (R&D), administrative, and service activities that contribute substantially to preserving or restoring environmental quality. Specifically, but not exclusively, this includes jobs that help to protect ecosystems and biodiversity, reduce energy, materials, and water consumption through high efficiency strategies, de-carbonize the economy, and minimize or altogether avoid generation of all forms of waste and pollution” (see UNEP/ILO/IOE/ITUC (2008) p.3).

UNEP/ILO/IOE/ITUC (2008) also sees the concept of green job as relative: “And, given technological progress and the urgent need for improvement, the dividing line between efficient and inefficient must rise over time. (p. 3)”

UNEP/ILO/IOE/ITUC (2008) provides a framework for an additional criterion by making “decency” an element of the definition. This is a reminder that a green economy does not automatically ensure high social employment standards and that a transition towards a green economy can be used to promote decent jobs. However, if decency is made part of the definition this implies that a “non-decent” job cannot be green, even if the economy is environmentally sustainable.

2. U.S. Department of Commerce Definition

The US Department of Commerce defines the green economy for only the private sector in a broad sense, as “clean and energy efficient”. Green jobs are defined by the purpose of their output (green products and services), without consideration of the environmental impact of their production or social context.

The United States Department of Commerce (USDOC) has recently attempted to measure the size of the green economy in the U.S. and issued several reports on green industries and industry specific CO₂ emissions and CO₂ intensities (see U.S. Department of Commerce (2010a), (2010b) and (2010c)).

A green economy¹ is defined as a “clean and energy-efficient economy” (see U.S. Department of Commerce (2010a), p.5).

“The jobs that are created and supported in businesses that produce green products and services are green jobs” (see U.S. Department of Commerce (2010a), p.5).

The USDOC study furnishes highly disaggregated stock values on employment, output, products and services and several other variables of the green economy for the year 2007. For research purposes, it would be very helpful to have similar empirical information provided by other countries and over an extended period.

¹ The term “green economy” will in this section be used in the sense of the USDOC definition if not otherwise noted.

While useful and necessary for any deeper analysis, the collection of stock data alone is not sufficient to understand the impacts on the economy as a whole. A transition process towards a “green economy” should be studied more broadly and include more economic features than estimations of the size of the U.S. environmental sector in terms of output and employment.

For an operationalization of the concepts “green products” and “green services”, USDOC chose a casuistic approach. See Box 1.

Box 1: Estimating the size of the green economy - the case of the US

USDOC conducted a very detailed and illuminating study on green products and services in the U.S. economy in order to identify green jobs and enterprises that produce green goods and services. Two definitions of green products and services, a broad one and a narrow one, are used in connection with the North American Industry Classification System (NAICS) on a 6-digit level to identify specific green industries and their employment. A detailed description of the USDOC methodology including a list of industries and enterprises that are considered green is provided by the U.S. Department of Commerce (2010b). The green products and services definition and selection criteria used by USDOC also drew on the work by Eurostat (2009a). Based on these definitions, the size of the “green economy” (=environmental sector) is estimated to be rather small, representing 1 to 2 per cent of all private sector economic activity in 2007. Job estimates range from 1.8 million to 2.4 million jobs or 1.5 to 2 per cent of total private sector employment in 2007.

The USDOC definition and the USDOC study provide a very detailed picture of the U.S. environmental sector. For the EU, a wealth of disaggregated sector data as well as very detailed data on products are needed to furnish such a snapshot of the economy as has been done for the U.S. Including *all* types of environmentally related products and services in fact requires a casuistic procedure so that conflicting environmental goals can be resolved in a case-by case decision. Using a broad and a narrow definition of green products then ultimately leads to a range that describes the size of the green economy.

3. Workforce Information Council Definition

The Workforce Information Council defines green jobs in a relative broad sense, referring to work that supports environmental sustainability with specific focus on “economic activity”. Several categories (“green economic activities”) are listed in which green jobs are to be found. The dynamic nature of “green” over time is emphasized. The decent work agenda of ILO is purposefully ignored.

Another attempt to define “green jobs” and to measure employment effects in the “green economy” was made by the Workforce Information Council (WIC) (2009), a U.S. council that is led by the U.S. Bureau of Labor Statistics (BLS) and includes members of other federal and state agencies.

“A green job is one in which the work is essential to products and services that improve energy efficiency, expand the use of renewable energy, or support environmental sustainability. The job involves work in any of these green economic activity categories:

- Renewable Energy and Alternative Fuels
- Energy Efficiency and Conservation
- Pollution, Waste, and Greenhouse gas (GHG) Management, Prevention, and Reduction
- Environmental Cleanup and Remediation and Waste Clean-up and Mitigation
- Sustainable Agriculture and Natural Resource Conservation
- Education, Regulation, Compliance, Public Awareness, and Training and Energy Trading”

“The definition should be based solely on economic activity and not include factors such as wages, degree of unionization, or benefits. Information on these factors can be provided, however, for use in analyses of policy or program interest” (see Workforce Information Council (2009)).

The WIC (2009) suggests a variety of approaches in formulating an appropriate definition of green jobs for a specific purpose and how to measure green jobs according to that definition. As all other previous definitions, WIC also emphasizes that the concept of “green” may (and is likely to) change over time.

4. Bureau of Labor Statistics Definition

The Bureau of Labor Statistics defines green jobs based on the WIC framework. The definition reflects the principles recommended by the WIC (2009) for developing a measurable definition of green jobs. It is consistent with the output and process approaches.

As suggested by the WIC (2009), the definition of green jobs should conceptually consider following jobs:

- a) Involved in producing green products;
- b) Involved in greening production processes; or

- c) In the supply chain to produce green products and services.

Since establishment of the Green Jobs Study Group by the WIC (2009), the BLS received funding beginning in Fiscal Year 2010 to initiate a survey to estimate green jobs by industry and develop new data collection on green jobs. The BLS presented its official definition and approaches of “green jobs”, which heavily relies on the WIC framework and reflects the principles recommended by the WIC (2009) for developing a measurable definition of green jobs.

The BLS definition includes two components and consistent with the output and process approaches (see Bureau of Labor Statistics (2010b)). Green jobs are either:

- a) Jobs in businesses that produce goods or provide services that benefit the environment or conserve natural resources.
- b) Jobs in which workers' duties involve making their establishment's production processes more environmentally friendly or use fewer natural resources.

The goods and services are sold to customers, and also include research and development, installation, and maintenance services. As for the worker's duties, these include research, development, or use of technologies and practices to reduce the environmental impact of their establishment, or training. The green economic activities of the BLS (2010) are similar to the categories proposed by the WIC (2009). While the green goods and services fall into any of following five groups, technologies and practices fall into any of first four groups:

- a) Energy from renewable sources
- b) Energy efficiency
- c) Pollution reduction and removal, greenhouse gas reduction, and recycling and reuse
- d) Natural resources conservation
- e) Environmental compliance, education and training, and public awareness

As BLS indicated, “its green jobs definition is not based on skill differences, but instead on the environmental impact of the good or service produced or the production process used.” (see Bureau of Labor Statistics (2010b)). In the output approach, jobs are involved in production of a specific set of goods and services, which is not relevant to the environmental impact of the production process. But the process approach is related with any industry, and BLS determines whether the practices or technologies that have a favourable impact on the environment are used, regardless of the good or services produced (see Bureau of Labor Statistics (2010a)).

5. Eurostat Definition

Eurostat defines the “green” sector broadly, equating it with the environmental sector, and focuses on the purpose of green sector outputs without regard to ecological impact. This environmental purpose is either environmental protection or resource management. It also includes technology in the definition of environmental goods and services.

In its 2009 handbook about the environmental sector, Eurostat (2009) provides methods and approaches to analyze the environmental goods and services sector (EGSS). The handbook describes in great detail where and how data and statistics about the environmental goods and services sector can be collected.

“The environmental goods and services sector consists of a heterogeneous set of producers of technologies, goods and services that: 1) Measure, control, restore, prevent, treat, minimise, research and sensitise environmental damages to air, water and soil as well as problems related to waste, noise, biodiversity and landscapes. This includes ‘cleaner’ technologies, goods and services that prevent or minimise pollution; 2) Measure, control, restore, prevent, minimise, research and sensitise resource depletion. This results mainly in resource-efficient technologies, goods and services that minimise the use of natural resources.”

These technologies and products (i.e. products and services) must satisfy the end purpose criterion, i.e. they must have an environmental protection or resource management purpose as their prime objective.

Activities by the government may also be included in the EGSS. The report provides a very detailed and systematic description of which kind of products are considered to have an “environmental purpose”. Further sub-definitions and relevant functions of the environment are provided. Only a brief overview of the system can be given here. The two main subgroups are 1) environmental protection and 2) resource management.

In terms of environmental protection, the following activity groups are suggested:

- a) protection of ambient air and climate
- b) waste water management
- c) waste management
- d) protection and remediation of soil, groundwater and surface water
- e) noise and vibration abatement
- f) protection of biodiversity and landscape
- g) protection against radiation
- h) research and development
- i) other environmental protection activities

As resource management activities, the report suggests:

- a) management of waters
- b) management of forest resources
- c) management of wild flora and fauna
- d) management of energy resources
- e) management of minerals
- f) research and development
- g) other natural resource management activities

C.Problems and Challenges with Current Definitions

The main definitions currently in use, highlighted in Section B, make it clear that a commonly accepted definition of “green jobs” does not exist. While other definitions can be found in various think tanks, NGOs and political or academic institutions, they are often loosely tied to one or some of the definitions in Section B. The challenge of defining “green” in a manner conducive to labour market research has become a central theme for governments struggling to promote economic recovery.

“Green” policies are desirable components of not only post-crisis economic policy, but also of government support for transitions towards green economies, a process already begun around the world. There is an obvious need to standardize working definitions across institutions and governments in order to better inform labour market policy and to measure changes in the green economy. Otherwise, comparability of research results becomes problematic and related policy advice may stand on shaky grounds.

Coming up with a definition of the “green economy” and “green jobs” involves some

inherent problems if too many “green” aspects are included in a single theoretical definition. The previously introduced definitions are analyzed in the following to identify similarities and differences regarding their environmental scope, basis, and social context. Insights gained from this discussion are used to derive a path forward.

Table 1: Comparisons of current definitions of the “green” economy & “green” jobs

	<i>Environmental Scope</i>	<i>Basis</i>	<i>Social Context?</i>	<i>Ecological Impact?</i>	<i>Green Job vs. Non Green Job</i>
UNEP/ILO/IOE/ITUC	Broad	Impact on environmental quality	Yes	Yes	Unable to distinguish
US Dept of Commerce	Broad (green economy) Narrow (green job) Range (green output)	Output (green products and services)	No	No	Clear distinction
Workforce Information Council	Broad	Jobs, in green economic activities	No	No	Unable to distinguish
Eurostat	Broad	Purpose of green sector activities (environmental protection and/or resource conservation)	No	No	Unable to distinguish
EC Study, proposed definitions	Narrow , CO ₂ emissions	Output and Sustainability	No	Yes	Clear distinction

1. Environmental Scope of “green”– broad and narrow approaches

One challenge to determining the adequate scope of “green” stems from the desire to include all intuitive notions of green and, at the same time, the necessity to be precise in order to create a measurable concept. Most definitions identify one or several environmental functions that are considered valuable or important, like the global climate, biodiversity, or clean water, and subsequently claim all activities that serve the identified purpose(s) as “green”. For example, all economic activities that, at least to some degree, help maintaining or restoring clean water or a stable global climate, are considered “green”.

There is of course no objective criterion available to determine which environmental functions are to be considered valuable. Different countries in different stages of development may have different notions on which functions of the environment are valuable and worthy of protection.

In addition, it is difficult in specific circumstances to determine when a particular activity serves the “green” purpose, especially if the environmental function is not measured by an objective criterion (e.g. a statistic). Vague terms like “environment” or “environmental quality” need to be transformed into measurable concepts or measurable criteria before effective policies can be devised and analyzed. For example, if activity x leads to a reduction of y percent of pollutant z in sea water, and if the absence of y in sea water is considered one of the important environmental functions, one could claim that x is a “green job”. But in the introduced concepts of “green jobs”, neither x or y, nor z is specified, keeping the potential user of a “green job definition” in the dark about whether or not he has actually found a “green job” in specific circumstances.

Whether a particular activity serves the “green” purpose can be difficult to determine even if the environmental function is clearly specified and measured by an objective criterion. In economies with a high degree of division of labour, a lot of activities may contribute indirectly or unintentionally to the fulfilment of the “green” purpose, e.g. in the form of inputs that are used in another, possibly green, industry.

This problem of identifiability applies especially to the very common case in which a certain activity does not support all desired environmental functions at the same time and conflicting goals arise, e.g. if an activity contributes to maintaining a stable climate but causes toxic waste, whereby both environmental goals – avoiding toxic waste and maintaining a stable climate – are considered “green”.² The use of a general definition for

² Energy-efficient lamps, for example, reduce energy consumption considerably and therefore they reduce CO₂ emissions and hence help protecting the global climate. However, when disposed of they need to be stored on hazardous waste sites for an infinite length of time due to toxic mercury which they contain. Is the production of energy-efficient lamps a “green” activity or not?

“green jobs” or the “green economy”, i.e. a non-casuistic definition, which addresses all possible aspects of “green”, entails difficulties of this type because ecological relations are manifold and very complex. Conflicting environmental goals do often arise:

For example, policies that support a transition towards a green economy in terms of biodiversity may not be supportive of a green economy in terms of climate change. Nuclear plants, for instance, are (nearly) CO₂ emissions free and are thus preferred over coal plants in terms of climate friendliness. On the other hand, nuclear plants use river waters for cooling. Warming rivers beyond a certain point has negative impacts on the biodiversity of rivers. Thus, policies supporting a switch from fossil fuel combustion to nuclear energy are green in one sense and not green in another.³

As greater numbers of criteria are included in the general definitions of a “green economy”, of “green jobs” or of “green policies”, the more likely contradictions are to arise. One can then consider every activity⁴ “green” that meets at least one criterion, or one insists that all criteria have to be met at the same time. In other words, one is given the choice of considering every policy (activity) as “green” which helps to improve any regarded aspect of “green” or to only consider those policies (activities) that satisfy all criteria of “green”.⁵

The first case produces a very broad definition of “green” that includes policies (activities) that are green in one sense and not green in another (like in the nuclear power example). This definition can very quickly label mostly everything “green”, since every economic activity surely has some positive effect on some environmental aspect. In the second case, a very narrow definition is created that considers only a very limited amount of activities “green”.

While both strategies may still be manageable in the case of two or three dimensions, “green” becomes increasingly unclear if the scope is widened to include say 10 or 20 environmental goals.

UNEP/ILO/IOE/ITUC chooses a very broad environmental scope with no specification of concrete environmental goals. The question of measurement is also not addressed. No guideline exists about how to deal with situations of conflicting goals or the problem of

³ There exists an infinite amount of similar examples. Wind turbines, for example, which produce climate friendly energy, have several negative impacts on other environmental facets. Wind turbines require much more space per unit of power produced than nuclear plants or coal plants. They have to be built in areas which are not used by humans and they therefore potentially destroy other natural environments. Building up wind turbines in the North Sea, for example, is expected to negatively affect the sensitive ecosystem of the tide lands. Furthermore, it is undisputed that bird strikes occur with wind turbines and that some species like the sea eagle suffer heavily from the construction of wind turbines in their habitat.

⁴ “green” can refer to an “activity”, “policy”, “job”, “sector” or other substantive, depending on context.

⁵ Possible are of course also any combinations of criteria which ultimately leads to something like an index as is discussed afterwards.

direct vs. indirect “green jobs” sector. The UNEP/ILO/IOE/ITUC definition can therefore not fulfil the requirement of identifiability. Hence, it is also less apt for economic modelling.

In this sense, the UNEP/ILO/IOE/ITUC (2008) definition can be seen as a guideline, providing a framework for a wide range of global sustainability questions. This definition is able to capture employment dynamics that may be related to any kind of environmental efforts but remains vague in terms of which activities are green in particular and how to measure them.

The USDOC definitions of a green economy and green jobs are also rather broad in an environmental sense. The definitions theoretically include all kinds of environmental hazards and pragmatically specify green industries in a casuistic manner. Due to this case-by-case specification, “green” becomes identifiable and measurable in terms of output and employment and can be included in economic modelling work.

The USDOC concept is rather narrow by only considering industries in the private business sector. Furthermore, the “green economy” basically boils down to the U.S. environmental sector, which might be a too narrow an interpretation of the “green economy”. Thus, only activities that *directly* contribute to specific environmental goals are “green”.

Based on the USDOC definition, it is obvious that only a very small portion of the U.S. economy can be considered “green”. This applies to green output as well as green jobs. An evaluation of the impacts of so-called “green stimulus” on the green economy (as per USDOC definition) does not appear to be very useful. The World Bank(2010), Robins et al. (2009) HSBC (2009) and Barbier (2009) estimate the size of green components of U.S. stimulus program to be around USD 112 billion or 11.6 per cent of the total U.S. stimulus.⁶ Compared with an estimated gross output (private sector shipments and receipts) of USD 371 – 516 billion which represents about 1 to 2 per cent of total economic activity, and a total of 1.8 million to 2.4 million people employed in the green sector, it is needless to say that the green stimulus would be an extraordinary expensive undertaking if only the impact on the green economy according to the USDOC definition were deemed relevant.

The WIC definition is similar to the UNEP/ILO/IOE/ITUC definition in that it provides a general framework. The WIC has the same advantages and disadvantages of the UNEP/ILO/IOE/ITUC definition: By choosing a wide, non-operational definition, many environmental aspects can be subsumed under the term “green”. Concrete measurement, analytical work and economic modelling become rather difficult or impossible.

⁶ We avoid at this point a discussion about which components would be considered “green” according to different definitions.

Eurostat provides a broad definition and considers a variety of products in the environmental sectors. Eurostat also specifically mentions the production of environmental “technology”. Technology, in this sense, is broadly understood as “know-how”. Not all kinds of know-how can be transformed into products or services. Insofar, the Eurostat is more inclusive than the other definitions regarding technologies that are not marketable or nor marketed. And, similar to the USDOC definition, “green jobs” are basically identical with jobs in the environmental sector.

2. Basis of “green” – purpose or impact?

Definitions of “green” can be based on purpose of economic activity or environmental impact (“ecological footprint”). A focus on purpose of economic activities within industries seeks to determine whether certain activities aim to improve identified environmental goals. A focus on impact of economic activities attempts to determine the larger environmental impact of an economic activity or industry.

Thus, the question is here whether something is “green” if and only if it has no negative impact on the previously specified environmental function, or if something is “green” only if its purpose is to directly (indirectly?) support the environmental function. For example, the recycling industry directly contributes to reducing the disposal of waste and can therefore be considered “green”. At the same time, it is a quite energy-intensive industry and consequently responsible for a relative large share of CO₂ emissions. According to its impact, it can be considered a “brown” industry. On the other hand, the impact of a teacher on the environment, for example, should generally be very low. He creates little or no pollution and needs relative little energy. “Teaching” can therefore be considered a “green” activity. However, the purpose of “teaching” is totally unrelated to the environment.

The reviewed definitions do not explicitly address this question but seem to implicitly only refer to “green” if an activity has an environmental purpose.

The UNEP/ILO/IOE/ITUC bases its definition of green jobs on their “contribution” to preserving or restoring the environment. It is not entirely clear if the definition refers mainly to environmental purpose or impact. It seems to be the case that the definition intends to label activities as “green” which serve a certain environmental purpose, independently of their direct ecological footprint.

The USDOC considers the “green economy” to be the environmental sector of the economy and uses output of green products and services as its basis. Subsequently, the USDOC attempts to measure the size of the environmental sector (“green economy”) of the U.S. economy in terms of output shares. The definition focuses solely on the purpose of industry output. The environmental footprint of this output plays no role. The

environmental impact of the green economy and of the U.S. economy as a whole is disregarded.⁷

It may be questioned if the environmental sector should be equated with the green economy since the environmental sector by itself can never fulfil the function of an economy. But, at later stages of the report, the USDOC speaks of the “green share of the economy”, which appears to be more appropriate (see U.S. Department of Commerce (2010a), p.21).

A possible extension of the USDOC notion of a green economy could be achieved if combined with the results of the simultaneously released studies on U.S. CO₂ emissions and industry CO₂ intensity (see U.S. Department of Commerce (2010b) and (2010c)).

The WIC differs from all the other definitions in that it presupposes the job as the unit of observation and not the industry, the enterprise, or the product. Such a focus on the job itself is advantageous from a theoretical point of view since it allows for distinction among certain activities within an organizational unit. Thus, green jobs can be found in the entire value chain in a company. The disadvantages of this job focus stem from the high information requirements for any empirical study. Necessary information in this regard would have to be collected through surveys of individual enterprises, and these surveys may be not comparable on a larger scale or over longer periods of time. The focus is also clearly on the purpose of the activity rather than the ecological impact.

The WIC emphasizes that further specifications are necessary to arrive at a measurable concept of green jobs than be useful for empirical studies. The WIC provides no criteria to distinguish a green job from a non-green job in specific (and potentially ambiguous) circumstances. One has the choice to boil down the definition to measurable environmental targets (one-dimensional targets being the easiest to measure) or to come up with a list in which green jobs are defined on a case-by case decision.

The Eurostat definition is similar to the USDOC and WIC definitions in taking products and services as nexus. While for the most part it does not explicitly refer to “green jobs”, the report nevertheless interprets the “green sector” as the “environmental sector”. Thus, the definition refers to the environmental purpose of green sector activities, but not to the ecological impact of these activities

Eurostat is also unable to distinguish green jobs. The handbook does provide advice on how data on the EGSS could be collected or, since most data is not available in standardized form, how a database can be constructed. Generally, it is not possible to classify EGSS producers solely on the basis of standard statistical classification procedures (see Eurostat (2009)). Only when the producers are identified can data be collected on other economic variables, like employees, value added, and productivity. Eurostat suggests to start with an existing industry classification like NACE (Nomenclature statistique des

⁷ Environmental impacts were also not explicit objects of investigation in the study.

activités économiques dans la Communauté européenne) and then to use the subgroups introduced above and the definitions provided in the handbook to determine the EGSS. The number of employees in the EGSS is mentioned as one subject of interest so that we can interpret these jobs as “green jobs” in the sense of the report.

3. Social Context

Policy makers are often particularly interested in the social dimensions of the “green economy” and “green jobs”. Thus, the question arises if the social context should be made part of the definition or purposefully be left out. Including the social context into definition adds another layer of complexity to the term “green”.

UNEP/ILO/IOE/ITUC considers both ecological and social context of green jobs. The definition introduces a social context to the analysis of “green”, as it emphasizes the quality of green jobs. This aspect is unique to UNEP/ILO/IOE/ITUC.

The USDOC does not consider the social contexts, but only the purpose of output.

The WIC differs from the UNEP/ILO/IOE/ITUC definition in that it explicitly ignores social context. The WIC regards an inclusion of a decent work agenda into the definition of a green job as not useful. “The definition should be based solely on economic activity and not include factors such as wages, degree of unionization, or benefits. Information on these factors can be provided, however, for use in analyses of policy or program interest” (see Workforce Information Council (2009)). The WIC also ignores ecological impact.

The Eurostat definition only considers the purpose of output relevant, not the social context.

While the importance of the social dimensions of “green jobs” is rightfully stressed, it is questionable whether the social aspects (for example “decency”) need to be made part of the definition itself. It makes an analysis of environmentally induced employment effects in the context of “green jobs” impossible since these employment effects are, according to the UNEP/ILO/IOE/ITUC definition, not “green” unless high job quality is achieved at the same time. More helpful is an approach in which green jobs are defined in relation to environmental aspects exclusively and social dimensions of these jobs are evaluated in a logically subsequent step (see WIC definition). For example, “decent work” as promoted by ILO can be formulated as a policy goal for a green economy or for green jobs.

4. Defining “green” for the purposes of the EC-ILO joint study”

Given the previously discussed complications with finding a universally valid definition of “green”, a pragmatic definition is used for the purposes of the EC-ILO joint study. The set of definitions developed in this context can serve as the basis for a more general definition of “green” in the future.

This study narrows the scope of “green” by choosing a stable global climate as the only environmental function of importance. It is assumed the global climate change can be avoided by a significant reduction of CO₂ emissions (including CO₂ equivalents of other GHG). Thus, an economy is green if its CO₂ emissions are sustainable.

In terms of employment, this study considers both purpose of output and its environmental impact as the basis for “green” employment and “green jobs”. Thus, employment can be “green” if the industries that employ labour are low-carbon-intensive but jobs can also be “green” if labour is employed for the purpose of reducing CO₂ emissions.

The social context of “green” is ignored in the definition. Green jobs may be well paid or not well paid, require high-skilled workers or low skilled workers, and be decent jobs or not “decent” jobs. As a policy goal and as a policy question, the social context of employment in a “green” economy remains of high importance but there is no need to make the social context part of the definition which would only lead to an unhelpful level of complexity. Therefore, this study uses a simpler definition of green jobs, one that disregards decency at the terminological stage but chooses to analyze social impacts in a logically subsequent step.

The approach used in this paper and the system of applied definitions is, therefore, more promising for an evaluation of green policies. The much wider notions of green jobs and green employment effects are specifically designed to also allow for an analysis of the output and employment dynamics of the economy as a whole.

In particular, the very relevant questions of whether the green economy can be a driver for growth, employment and higher environmental quality can be addressed through the proposed definitions of this report.

The advantage of reducing the term “green” to a one-dimensional criterion (low-carbon) lies in the preciseness with which “green” can be measured. The set of definitions introduced in the next section allows for a clear distinction between green and non-green.

Clearly, one can think of a green economy in terms of other criteria of sustainability, but this would lead to higher ambiguity of what “green” is and, more importantly, of how to empirically measure and model it mathematically. There exists a trade-off between subsuming many environmental aspects under the term “green” and the clarity with which certain parts of the economy can be measured as more or less “green” in concrete policy analysis.

In case of the EU, many environmental aspects of the economy, like greater efficiency of sewage systems or improved water quality, have already been addressed at the policy level and been fully or nearly resolved in the past. Other major environmental challenges that could fall under the UNEP/ILO/IOE/ITUC definition, like deforestation of rainforests, droughts and water scarcity, are often not applicable to European Member States in the foreseeable future. Employment impacts for Europe in these areas can therefore be expected to be either static or even nonexistent. With its relative high CO₂ emissions per capita, it is obvious that Europe must focus on climate change mitigation measures in the future. It is expected that employment dynamics will mainly be related to climate change mitigation.

The limitations by the proposed definitions of this report are rather small since they are easily adjusted to accommodate environmental targets other than climate change. For example, one could consider proportions of recycled goods within the economy, or use a measure for water quality, air quality, or biodiversity, among others. Thus, the suggested definitions (for example Definitions 1 to 3) can be applied analogously to study other aspects of a “green economy”. A green economy could be defined as one which produces a sufficient level of output while maintaining the world’s biodiversity or while keeping the risk of significantly reducing the world’s biodiversity low. As in the case of climate change, one would then as next step have to operationalize the term “biodiversity”.

A possibility still exists to utilize a concise, operational definition that considers a variety of green aspects by creating an index that addresses multiple criteria. This procedure would encounter other challenges that would increase the level of complexity of analysis, such as through assigning relative levels of importance to different environmental criteria. This study refrains from such an approach, and all other aspects of “greenness” except for CO₂ emissions (climate change) are ignored.

D. A system of “green” definitions

1. Green Economy, Green Policies and the Green Sector

This study narrows down the scope of all ecological functions of the environment to only those that concern climate. Since the emission of GHGs is the principal human contribution to climate change, one may define a green economy as follows:

Definition 1:

A green economy is an economy in which a sufficient level of output is generated without producing a level of CO₂ emissions that contributes to significantly increasing the risk of raising the Earth’s average temperature.

In order to have an applicable definition, several aspects need to be further specified. The determination of a “sufficient” level of output is needed via the political decision making process. Furthermore, climate scientists and other natural scientists have to specify what levels of CO₂ emissions⁸ may be tolerated on a global scale and what the probable consequences may be. In that regard, the assessments of the Intergovernmental Panel on Climate Change (2007) may serve as a guideline.

What level of risk is still acceptable to mankind is another question that has to be resolved within political decision making processes. It should be noted that Definition 1 does not characterize a green economy as an idealized economy with zero emissions but as one in which CO₂ emissions are on an equilibrium level.

Based on this definition, green policies can now be defined as follows:

Definition 2:

Green policies are all measures implemented by the government or other governmental institution that have the purpose and the potential to reduce CO₂ emissions.

Definition 2 provides a clear measure to determine which policies are green and which are not. Two things are necessary for a policy to be green: The purpose of the policy must be to reduce CO₂ emissions and it must be potentially able to serve this goal.

Criteria are also needed in the context of policy evaluation. On a theoretical level, the effectiveness of a green policy can be measured through any resulting reduction of CO₂ emissions. Yet, it might be empirically challenging to measure these effects of some policies, making estimates or theoretical considerations more necessary. Any assessment of

⁸ In the strict sense we do not only mean CO₂ emissions but various GHG emissions. Since these GHG can be measured in CO₂ equivalents, we continue to simply speak of CO₂ emissions throughout this discussion paper.

the adequacy of a policy must include higher levels of detail, including an evaluation of efficiency aspects and process analysis.

Finally, economies in the process of greening may contain sectors that are already green and sectors that are not (yet) green.

Definition 3:

The green sector of an economy is a group of industries or enterprises whose output is relatively low-carbon-intensive and whose aggregate level of CO₂ emissions does not contribute to significantly increasing the risk of raising the Earth’s average temperature.

A few comments to this definition may be appropriate: It may be useful to subcategorize the green sector into further subgroups of interest for analytical purposes, but it remains useful to start with a rather broad definition. It is also advisable not to link the green sector to specific industries, sectors, products or services. Since the green economy will result from long-term structural change, it is very likely that products and industries will change over time.

Furthermore, the green sector may comprise different industries in different countries. This may depend on different technologies, different demand patterns or the spatial distribution of varied natural resources across countries. The suggested definition of the green sector is therefore a theoretical concept that provides an abstract conceptualization of a portion of the economy that has certain features. It can be appropriate to narrow down the previous definition and to specify certain “green” industries within the scope of specific studies or policy evaluations.

Another important aspect of Definition 3 is that the green sector is specified in both relative and absolute terms. An enterprise or industry in the green sector must be relatively low-carbon-intensive compared to other industries or enterprises in the economy, and the total CO₂ emissions of the green sector as a whole must be low enough to be sustainable. This sustainable level of emissions must be determined by scientists, and in particular, climate scientists. The definition implies that the exact “face” of the green sector is not fixed and changes over time. What may be a green industry (enterprise) today might not be green industry (enterprise) anymore in 10 years from now.

The same impermanence may apply to the level of CO₂ emissions that is considered sustainable. This level may as well change over time. Thus, not only will green sectors in different countries show variation, but also the green sector within a country may change as time elapses. Ideally, as the relative size of the green sector within a country expands so that more and more industries are considered green, the absolute level of economy wide CO₂ emissions declines over time. In that sense the expansion of the green sector would be equivalent with a transition towards a green economy.

2. Green Jobs and Green Employment Effects

The concept of green jobs is indirectly attached to the previous definitions of a green economy and a green sector. In the traditional sense, the ultimate purpose of economic activity is the generation of output for consumption purposes. Employment is, therefore, only a feature within this larger process of production of desired output. If this idea is extended to the concept of green jobs, it can be concluded that the creation of green jobs (however defined) is not and cannot be the ultimate goal of the transition towards a green economy.

In the case of a decentralized market economy, green jobs must evolve in industries that are competitive and which produce goods and services that satisfy consumption needs. Therefore, green jobs are (desirable) by-products, so to speak, of the transition towards the green economy or the expansion of the green sector.

Definition 4:

Green Employment Effects are all jobs that are maintained or created in the transition process towards a green economy.

Policy makers should attempt to capture all employment effects that are associated with a transition towards a green economy. Thus, it is appropriate to start with a broad definition of green employment effects.

According to Definition 4, there may be employment induced by greening of the economy that is created or maintained outside the green sector. Thus, not all employment in this process will be labelled as green jobs. The following, narrower definition regards only those jobs as green which are provided by sustainable industries or by industries whose output contributes to achieving a sustainable economy.

Definition 5:

Green Jobs are those jobs maintained or created in the transition process towards a green economy that are either provided by low-carbon-intensive industries (enterprises) or by industries (enterprises) whose primary output function is to greening economy.

Hence, green jobs are defined as a subset of green employment effects.

In order to provide a more intuitive definition of green jobs, it must be noted that only those jobs in industries that primarily seek to reduce CO₂ emissions and/or in industries that operate at a low-carbon-intensive level are considered green. Thus, Definition 5 uses a two-dimensional criterion whereby at least one property must be fulfilled in order to qualify as a green job.

A few things should be noted about Definitions 4 and 5:

First, (positive) employment effects of green policies can occur in the green sector and in the brown sector. To which extent these effects occur in one or the other sector depends on the industry structure of the economy and the horizontal interactions of industries.

Second, according to the proposed definitions of green jobs and the green sector, green jobs can also be created and maintained outside the green sector. This is the case if a job is maintained or created in a high-carbon-intensive industry (HCII) that has the purpose of reducing carbon emissions.

Third, not all jobs in a green economy have to be green. Once the CO₂ emissions of the economy are on a sustainable level, the transition towards a green economy is concluded. It is possible that the economy still maintains a “brown sector” although it is likely that the brown sector will be considerably reduced in size compared to the beginning of the transition process. The following subcategories of green employment effects allow for a more detailed analysis of employment effects and green jobs.

According to Definition 5 in connection with the other definitions, employment in any industry can be qualified as green or not green by looking at the CO₂ intensity of output and its relation to decreasing CO₂ emissions. “Reduction of CO₂ emissions” is a much more specific and measurable criterion than “environmental quality”.

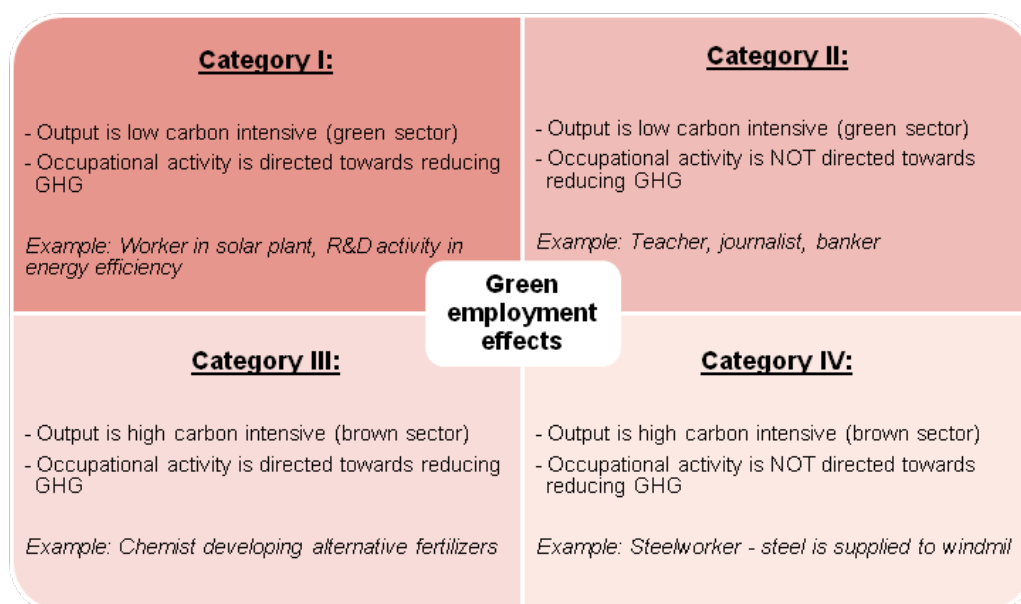
3. Four Categories of Green Employment Effects

It should have become clear that the main concern for policy makers should focus on overall employment effects of the green economy. Which of these jobs are then labelled “green jobs” is of less importance from a macroeconomic employment perspective. However, such a categorization of employment into “green” and “not green”, or “less green” may help to better understand the main characteristics of the transition process and associated challenges. Different categories can easily be created and greater numbers of more detailed subcategories than the ones proposed here can be developed if needed.

Green employment effects can be grouped into four categories (see Figure 1) of which categories I to III are green jobs. Categories I and II consist of jobs that are maintained or created in the green sector, according to Definition 3 of the low-carbon-intensive sector (LCIS). Jobs in category I do not only produce low-carbon-intensive output but the purpose of this output is to contribute to the reduction of GHG.⁹

⁹ Or to increase environmental quality if we broaden the horizon to include not only climate change policies but environmental policies in general.

Figure 1: Green employment effect



Jobs in category I are the greenest since they are green according to both the environmental impact (or ecological footprint) of the output and the purpose of the activity. Jobs in category II are also low-carbon-intensive and are accordingly maintained or created in the green sector, but the output produced does not attempt to (directly) reduce GHG emissions. These jobs are included in the broader green category since this study defines a green economy as one that does not have negative long-term impacts on the global climate. It is not necessary (and in fact would be impossible) for all employed labour in the green economy to be engaged in climate change mitigation activities.

It may seem somewhat more controversial to label Category III jobs as green, since they are in the high-carbon-intensive sector (HCIS). However, jobs in this category produce high-carbon-intensive output that is directed towards the purpose of mitigating global climate change. Thus, these jobs ultimately contribute to reducing an economy's GHG emissions and should be included in a broad definition of green jobs, since they are created or maintained in the transition towards a green economy. Category III jobs may also be acceptable or even necessary as intermediate solutions or steps towards a green structural change. In the long run, however, a shift of category III jobs to category I is desirable.

Jobs in category IV jobs are not green since they produce high-carbon-intensive output and are not related to reducing emissions. However, their importance in the transition should not be underestimated. Inputs from the HCIS will certainly be required by an expanding green sector or by jobs in category III. It is important for policy makers to determine the *overall* employment effects. From an employment perspective, Category IV jobs are not better or worse than jobs in the other categories. In fact, due to

interdependency among industries, employment effects could be extensive in Category IV, with efforts to green the economy actually creating jobs there.

4. Direct vs. Indirect Green Jobs and Green Employment Effects

While jobs in the categories I - III are *directly* affected by the transition towards a green economy, category IV jobs are only *indirectly* affected. Clearly, jobs created or maintained in the green sector (I and II) are already part of the green economy and are directly connected with the ultimate policy goal of a green economy.

While jobs in category III are not aligned with the policy goal of a green economy, due to their high-carbon intensity, they may nevertheless be necessary or acceptable as intermediate solutions or steps in the process of structural change. Thus, in the short to medium term, category III jobs are also directly connected with the stated policy goal.

Only jobs of category IV have no direct relation to the process of mitigating climate change. These jobs are created or maintained indirectly in the process, as for example, certain inputs of the HCIS may be required for the expansion of the green sector or activities of category III jobs. From an employment (and political) perspective, category IV jobs are not better or worse than jobs in the other categories and it is possible that efforts to green the economy may actually create jobs in category IV.

The proposed definition concentrates on two important features of green jobs, the ecological footprint (or sustainability) of the output and the purpose of this output. This distinguishes the current definition from many other commonly used definitions that only focus on the purpose of the output. But as it was argued before with Definitions 1-5, the need for green jobs arises from the need for a green economy of which the main feature is sustainability.

Policy makers are now tasked with increasing the environmental sustainability of economies. In order to achieve this goal, some workers – but certainly just a small portion of the labour force – must be employed in the environmental sector (categories I and III), which directly encourages the greening of the economy. But policies should not focus on this sector alone, since it would neglect many of the expected employment effects. Policy makers should first seek to create jobs that are low-carbon-intensive, or environmentally sustainable, irrespective of the purpose of those jobs. In addition, low-carbon-intensive industries (LCII) are often – but not always – service-oriented so that the green transition also means a strengthening of employment in the service sector.¹⁰ Overall, the need for

¹⁰ An example for a high-carbon service industry is the transport, in particular air transportation services.

green jobs arises from the need for greater environmental sustainability in the economy. It is irrelevant what kind of labour people perform (environmentally related or not environmentally related) in a green economy, as long as the output is sustainable and the working conditions adhere to the ILO's *Decent Work Agenda*.

Second, policy makers must also address the employment and income effects in sectors where no environmentally related output is generated, since reallocation of labour among these sectors is expected (i.e. from the brown sector to the green sector). A focus on net employment effects does not capture this important dynamic. Thus, definitions of green jobs that only consider the purpose of output as defining criteria (i.e. only jobs of category I and III in Figure 1) appear to be too narrow. Green policies act to make LCII more competitive than HCII. Growth in the low-carbon sector is promoted while growth in the high-carbon sector is weaker, and it is expected that the employment dynamics move in the same direction. Smoothing these transitions is key to boosting employment and achieving a low-carbon economy.

5. Green Labour Market Policies

Naturally, most countries would prefer to have a green economy with a high level of employment. An important research question therefore concerns the *total employment* effect triggered by a transition towards a green economy. The total employment effect refers to the evolution of an economy's total level of employment during the transition. Depending on the net employment effect of the transition, the total employment level may rise, stagnate or decrease.

Besides positive or negative net employment effects, it is clear that even if total employment remains unaffected, countries will also have to deal with employment shifts among certain sectors, industries and enterprises. Some industries may shrink in size or even disappear while other industries may become more important and increase in size. This changing industry structure requires a different employment structure, in regard to required skills or wage levels, for example. The current workforce must adapt to this challenge and additional labour market policies may be appropriate in a transition towards a green economy, i.e. a policy mix of green policies and green labour market policies. Green labour market policies are defined as follows:

Definition 6:

Green Labour Market Policies are labour market policies that intend to increase the level of employment or improve working conditions within an economy that is in the transition process towards a green economy.

Again, a rather broad definition of green labour market policies is applied which includes policies that are targeted at all four categories of green jobs and also includes policies that are designed to impact labour markets in other segments of the economy.

Following the OECD classification, one can distinguish active labour market policies from passive labour market policies. Active labour market policies attempt to increase employment and wages among persons who have difficulties attaining or maintaining employment. Passive labour market policies intend to increase the material welfare of temporary or permanently unemployed people. The OECD suggests five categories for active labour market policies and two categories of passive labour market policies.

Active labour market policies:

1. Public employment services
2. Labour Market training
3. Youth employment and training measures
4. Subsidized employment
5. Employment programs for the disabled

Passive Labour Market Policies:

6. Unemployment Insurance
7. Early retirement for reasons connected to the labour market

Principally, green labour market policies can be evaluated according to the same categories developed by the OECD. It is important to note that common labour market policies must be modified or adjusted when applied as green labour market policies.

Box 2: Mitigation, adaptation and restoration strategies

Only mitigation strategies are considered in this paper as “green policies”. While restoration policies and activities qualify as green policies according to the definitions of this report, restoration is however not possible in the case of climate change. Thus, only jobs that are related to mitigation efforts are considered green jobs. The following section distinguishes mitigation from adaptation and restoration and briefly discusses their different economic and political implications. Special attention is given to these terms since they are not used consistently in the policy literature, sometimes appearing as synonyms and other times not. The implications for green jobs, as defined in this paper, are briefly summarized at the conclusion.

There are principally two approaches to cope with the global warming problem (see also Proops et al. (1992) or Nordhaus (2008)): One can either do nothing now and adapt to the impacts as they arise or one can take a preventive approach and act now in order to mitigate¹ future damages. Thus, the world economy can run a strategy of “adaption to climate change” or a strategy of “mitigation to climate change”. Between these two approaches, one can choose to implement combinations of mitigation and adaptation. Both approaches may cause costs in terms of welfare losses to current or future generations. Much of the discussion on the economics of climate change concerns the level of costs of these two approaches and who would have to bare them.

A rich analysis of the concept of adaptation is provided by Fankhauser (1998) and his citations of Intergovernmental Panel on Climate Change (1996). According to the Intergovernmental Panel on Climate Change (1996), adaptation to climate change includes measures that serve the dual purpose of (a) reducing the damages from climate change and (b) increasing the resilience of societies and ecosystems to the impacts of climate change. Similarly, Smit (1993) describes climate change adaptation as adjustments in behaviour or economic structure that reduce the vulnerability of society to climate change. Following Fankhauser (1998), this paper distinguishes adaptation from restoration and conceives adaptation as the proactive or reactive strengthening of the economic system, whereas restoration entails more reactive actions to restore a system to its former state. While restoration strategies might be possible as environmental strategies in general (i.e. restoration is possible via a sewage plant that filters polluted water), restoration is impossible in the context of global climate change.² We are not capable of reversing climate change by technical means. Thus, as outlined before, the only options to cope with climate change are either mitigation or adaptation.

Some examples of possible adaption strategies (see Fankhauser (1998) and OECD (2008)) are the use of different crops in agriculture, fire prevention activities in the forestry sector, sea walls, or the development of new vaccines or greater distribution of existing ones. Fankhauser (1998) and OECD (2008) also attempt to estimate the

costs of adaptation strategies. In this context, it should be emphasized that the possibilities to adapt might be more limited than we can anticipate and that the costs might be much higher as well. Climate researchers have warned that climate thresholds do indeed exist and are not captured in state of the art economic growth models. Thus, a smooth trade-off between today’s mitigating costs and tomorrow’s adaptation costs may not exist. A discussion of this problem can be found in Keller et al. (2004) or Greiner et al.(2009).

An important question concerns the relation between adaptation activities and the green economy and green jobs. Since adaptation strategies deal with a behavioural change caused by the negative effects of climate change, such strategies can only be implemented if the economy is not sustainable. For this report’s applied definition of the green economy, however, sustainability (low-carbon) was the decisive criterion, so that any employment resulting from adaptation strategies is not included.

This conclusion would change if the definitions or their inherent assumptions were modified, for example if environmental aspects other than climate change are included in the analysis. One can raise the question if adaptation jobs should really be considered as “green”, at least according to the notion of “adaptation” that has been developed and applied in this paper. “Green” should intuitively refer at least to some extent to the maintenance of the environment. “Adaptation” refers to coping with a changed (destroyed or damaged) environment. It is not apparent why adaptation jobs should be seen as “green” since they neither actively nor passively help maintaining the environment. In fact, the only relation that adaptation jobs have to the environment is that they result directly or indirectly from its destruction or damage. One should also be aware that adaptation to a changing environment is not a new sphere of activity for humans. Humans have always been adapting to a changing environment, starting with activities like making fire for heating in cold regions, constructing irrigation in dry zones, or building air-conditioned houses.

Despite the determination that adaptation jobs are not green according to the definitions of this report and that it remains questionable if qualifying adaptation jobs as green jobs should even be desirable, jobs related to the adaptation of climate change may be very important from a social point of view. The potential for new jobs may be huge, and since some damages from climate change seem unavoidable, adaptation strategies may be urgently needed.

Societies can always decide to accept damages of the environment. Adaptation of society to these damages may generate jobs but adaptation strategies will usually replace mitigation strategies, and vice versa since, successful adaptation (mitigation) makes mitigation (adaptation) superfluous. In reality, a mixture of jobs in adaptation activities and mitigation activities should be expected, in particular, since a full mitigation strategy is probably not possible anymore. In general though, adaptation

jobs will be created at the expense of green jobs (mitigating jobs). For the reasons stated above, only jobs from mitigating activities can (or should) be regarded as green jobs in the context of this paper.³

Restoration – which as stated above is not possible in the context of climate change – has been treated separately from adaptation. Restoration may be an applicable strategy for environmental challenges other than climate change. In this more general context, restoration could be qualified as “green” and jobs associated with restoration activities could be regarded as green jobs since the activities lead to an improved environmental quality. Problematic with the idea of having restoration activities labelled as green jobs is that - as in the case of adaptation – the prerequisite for restoration is damaging or destruction of the ecosystem. In the case of activities like recycling this may be no big concern since recycling closes the cycle of the economic environmental system. However, cleaning beaches after an oil spill is also a form of restoration and jobs of this kind depend on a previous malfunction of the system. Several awkward policy conclusions may arise if these types of restoration jobs are defined as green and policies are designed to accelerate the expansion of green jobs. Since restoration strategies are not applicable in the climate change context, they are disregarded from now on.

¹ Complete prevention may be out of our hands and we therefore speak of “mitigation” instead.

² We regard the field of geo-engineering as being too little developed as to serve as a serious policy options at this time.

³ This does not exclude that jobs from non-mitigating activities can be green jobs according to our definition.

6. Green policies and employment: establishing an analytical framework

The proposed definitions of this paper have illuminated the path towards defining “green” and studying the dynamics of a green economy. The following summary suggests several steps to create a framework for consistent analytical work on the green economy and its employment effects (see also Appendix 1).

Step 1: Environmental functions that are to be increased, strengthened or supported by society should be determined. This could be done, for example, in the lines of the Eurostat definition by focussing on the functions suggested in the two main groups, i.e. “environmental protection” and “resource consumption”. (In this paper, a stable climate was chosen as the main environmental function.)

Step2: Measures should be identified to track environmental functions (quality) in order to determine different levels of “greenness” of the economy. If several functions are pursued at the same time, an index should be created. (In this paper, CO₂ emissions were chosen as the sole measure of greenness.)

Step3: Time series data on employment and output should be collected. The focus of green labour market policies extends beyond the changes in aggregate output and employment. Shifts and transitions in employment are of particular interest and data should be collected on an industry level. Furthermore, it is likely that new industries will emerge and old ones will shrink, the extent of which will depend on the environmental functions determined in step 1.

In order to fully understand the dimensions of structural change, industry classification should reflect these developments. Thus, if “stable climate” and “maintenance of energy resources” are identified as environmental functions, it is not sufficient to classify the energy sector as a single industry. Different sub-industries, enterprises or other entities within the energy sector that are affected by the pursuit of environmental functions should be accounted for (solar plants, wind parks, coal plants, nuclear plants). Only such rich data is able to reflect the structure of the economy in terms of output and employment.

The classification schemes provided in the annex of Eurostat (2009) can be used, or alternatively the annex of USDOC (2010a), which refers to goods and products. (In this paper, annual output and employment data were taken from input-output tables, as well as the EU Klems database using existing industry classifications)

(Steps 1 to 3 should provide industry specific time series data on the three variables of interest: output, employment and environmental quality (“greenness”). Correlations of these data can be used to detect the relationship between sectoral employment, output and the environment. These correlations can furthermore be used to provide insights into theoretical relationships and theoretical modelling. If data on employment quality (e.g. wages, skills, social protection, value added) are made available, a richer analysis can be performed.)

Step 4: Based on the data collected in step 3, several industries can be combined to form a “green sector” in the economy and related employment can be seen as “green jobs”. At this stage, a definition of “green jobs” or the “green sector” can be made rather pragmatic, e.g. a casuistic definition that combines certain industries according to one or several criteria.

Possible approaches are to use the Eurostat (2009) classification or USDOC (2010a). Since the evolution of economy wide, total employment is included in the time series to be collected, the problem of double counting does not exist and omission of certain “green” activities is not severe. Any “omitted” green jobs are accounted for as non-green jobs or employment outside the green sector. Industries that provide “green jobs” and industries that form the “green sector” may, but not necessarily, be identical.

Categorization of employment into green jobs and non-green jobs and of the economy into a green sector and a brown sector should be transparent and be mainly led by teleological considerations. Two criteria in particular should receive attention when identifying the “green sector” and “green jobs”. One is the environmental impact, that is, the degree to which economic activity in certain industries affects the environmental function(s) in question (the “greenness”). The second one is the degree of involvement of industries in supporting environmental functions (“purpose”). A segregation of industries according to these two criteria is useful because behavioural changes of industries are expected from both aspects in the greening process. (In this paper, the “green sector” consists of industries with low-carbon emissions and “green jobs” refers to employment provided by industries with low-carbon emissions or whose main purpose is capable of reducing carbon emissions.)

Step 5: Based on steps 1 to 4, several directions can be taken in order to include employment aspects into a theoretical framework. For detailed, industry-based analyses, the new (green) industry classification should be incorporated into input-output tables that can be extended to social accounting matrices (SAM's). This is the most promising approach to analyze economic structural change. In addition, various econometric models can be set up to utilize the systematically collected data of steps 1-4. In order to understand the involvement of the green sector with the macro economy, e.g. to study affects on inflation, aggregate output, aggregate employment and other variables, the green sector can be incorporated into a macroeconomic multi-sector model.

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Appendix 1

