Assessing Green Jobs for Evidence-Based Policy Making

International Research Conference

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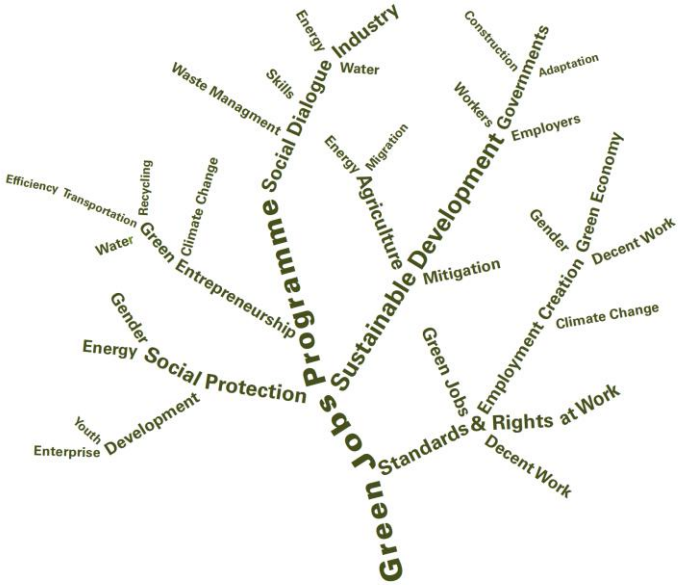
- Conference Report-



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1. Introduction

The International Research Conference "*Assessing Green Jobs for Evidence-Based Policy Making*" held on 9 and 10 December 2013 at the ILO headquarters in Geneva, offered an opportunity to discuss and assess the different methodological approaches in assessing national green jobs potential. These include input-output tables, social accounting matrixes and other economic models. The objective of the conference was to contribute to improved capacities for evidence-based green jobs policy making in the context of sustainable development strategies.

The 2-day event gathered researchers, policy-makers and technical experts from research and academic institutions, the ILO and other international organizations. The discussions were based on the results of on-going or complete green jobs assessments implemented with technical assistance from the ILO. The sessions were structured around panel presentations on country examples from a range of countries in Asia, Latin America, Africa and the OECD. Discussions focused on: (i) the methodological approaches; (ii) the comparison of output and employment multipliers of conventional and green industries; and (iii) the projections of investment and policy scenarios.

In addition, in the spirit of south-south and triangular cooperation, countries currently conducting green jobs assessments were invited to explore ways for stronger cooperation, contributing therewith to the capacity of national institutions for evidence-based green jobs policy dialogues.

Apart from raising various methodological and statistical questions, the Conference engaged with policy-makers to discuss opportunities for translating green jobs assessment results into sound policy recommendations. The Conference concluded with discussions on policy-making for green jobs.

This event was a direct follow-up to the Inter-agency Workshop on "*Employment and Social Inclusion in a Green Economy*" organized by the ILO in collaboration with UNEP, UNIDO and UNITAR in March 2013. The Green Jobs Assessment Institutions Network (GAIN) – a network of policy research institutions and experts on assessing employment-related effects of greening policies, was initiated as an outcome of that workshop. It aims to fill a clear institutional and capacity gap for green jobs related assessments particularly in developing and low-income countries.

2. Overview of ILO tools for green jobs assessments

The Conference kicked-off by presenting an overview of ILO tools available for assessing green jobs. This laid out all statistical and methodological issues for undertaking green jobs assessments nationally. Discussions enabled to review the different approaches to highlight their strengths and weaknesses and define areas for future follow-up.

2.1. International Guidelines for the Statistical Definition and Measurement of Employment in the Environmental Sector

With an increasing number of countries embarking on green economy strategies there is a need for harmonized methodologies and statistics on green jobs. Such statistics are important to: (i) gain a better understanding of the impact of various green policy initiatives on the labour market; and (ii) ensure that effective policy measures and tools are formulated to respond to this shift to a greener economy.

At the 19th International Conference of Labour Statisticians (ICLS) held from 2 to 11 October 2013 in Geneva, labour statisticians adopted new guidelines for the statistical definition of employment in the environmental sector, based on the System of Environmental and Economic Accounting (SEEA) definitions. The guidelines define the environmental sector as all economic units producing, designing and manufacturing goods and services for the purposes of environmental protection and resource management. They draw a distinction between employment in the production of environmental goods and services for consumption by other economic units i.e. *employment in production of environmental outputs*, and for consumption by the economic unit in which the activity is performed i.e. *employment in environmental processes*. Green jobs are specifically referred to as a subset of employment in the environmental sector, meeting the requirements of decent work, including adequate wages, safe conditions, workers' rights, social dialogue and social protection.

With statistical definitions and measurement methods still in the initial phase, intensive testing and piloting is required to accumulate country experiences. There is also a need for further research on methodologies and approaches for estimating employment in the environmental sector. In addition, guidelines for estimating job creation and job losses caused by either climate change or environmental policies present key areas for future work.

- *Draft guidelines for the statistical definition and measurement of employment in environmental sector*:
  http://www.ilo.org/global/statistics-and-databases/meetings-and-events/international-conference-of-labour-statisticians/19/WCMS_223914/lang--en/index.htm

2.2. Green Jobs Assessment Methodologies:

Various methodologies exist to assess the employment potential of green economy policies. The Input-Output (I-O) analysis, Social Accounting Matrices (SAMs) and Dynamics SAM (DySAM) capture current and future green jobs potential nationally. These have been used extensively by the ILO for assessing green jobs and normally draw on information from national accounts.

I-O analysis and SAMs rely on the construction of a matrix or table listing all sub-sectors and industries in an economy. They detail how outputs from one industry sector are used as inputs in others. The rows show the total output of an industry that is consumed by other sectors. The columns show the share of inputs a sector uses in order to reach its final output. Whilst I-O tables provide a disaggregation of the economic system of production and can illustrate the interactions within it, SAMs go further by describing the interrelationships of income and transfer flows between different institutional units, such as government, households, enterprises, and therefore focus on social transfers.

Differentiating green and conventional industrial activities and identifying green industries is an essential precondition to carry out green jobs assessments. Following the statistical guidelines, such disaggregation can be based on three distinct methods (i): the *process-based* method, which involves identifying enterprises adopting clean and efficient production systems; (ii) the *output-based* method based on identifying activities and jobs producing environmental friendly goods and services; and (iii) the *natural resource conservation* method that examines industries directly contributing to natural resource conservation and with protecting or enhancing environmental quality.

The input–output modelling approach enables to estimate the effects on employment resulting from an increase in final demand for the product or service in a given industry by capturing the direct, indirect and induced multipliers. Thus, such modelling can be used to answer questions such as: “For a given level of investment, which industry or sectors would yield the greatest number of jobs?” Indeed, I-O models and SAMs can be used to provide short to medium term projections for policies, allowing for the comparison of conventional and green growth scenarios.

The Dynamic SAM (DySAM) takes the work of I-O analysis and SAMs a step further by simulating full economy responses to exogenous changes. The methodology is based on empirical data, usually in the form of the I-O tables or SAMs, to which time series data and economic equations have been added to capture the dynamism and complexity of an entire economy. The DySAM shows the consistent evolution of the economic structure, for periods covering the years before and after the static SAM. With the DySAM combining different levels of analysis- macro policies and their impact on economic sectors and at meso-micro levels- it can thus explore the effects of different green policies over time on a variety of macroeconomic parameters, including future employment scenarios.

- *Methodologies for Assessing Green Jobs- Policy Brief*: http://www.ilo.org/global/topics/green-jobs/publications/WCMS_176462/lang--en/index.htm

3. Green jobs country assessments in Asia

3.1. India

The National Council for Applied Economic Research (NCAER), with the support of the ILO, completed in 2012 a study on the nature of job creation due to the expansion of the wind energy sector in India's state of Gujarat. To contextualise, in 2009 the Government of Gujarat announced an amendment in the Wind Power Policy to tap the 10,000 MW potential along the coastal areas of the state. The study therefore aimed to quantify and capture the employment potential of this emerging sector.

The construction of the state Input-Output table relied on both secondary and primary data, such as the national Input-Output Table 2006-2007 and surveys, to create a sector transaction matrix for Gujarat. The seven sectors in the table include: agriculture, mining, manufacturing, construction, electricity, other services and public sector. For the purpose of the assessment, the wind energy sector was disaggregated from the electricity sector and was thus included as the eighth sector in the newly developed state Input-Output (I-O) table to calculate for both output and employment multipliers.

Gujarat's I-O analysis highlights that the wind energy sector creates value in the economy, as an increase in wind energy output of 1 INR creates 2.96 INR of output in the local economy. The wind energy sector also generates income (capital and wage) across the economy, since an increase in output of the wind energy sector by 1 INR generates INR 0.26 in the wind energy sector itself, and INR 0.81 in other sectors. In terms of employment, the sector reveals to be slightly more labour intensive per output of energy produced than the conventional electricity sector. A unit increase of wind energy output generates a total employment of 0.334 man-year compared to 0.268 man-year for conventional electricity. Direct employment generated in the economy due to wind energy sector is lower than the conventional electricity sector. Yet, indirect employment is significantly higher in comparison, i.e. 0.331 man-year vs. 0.242 man-year, notably due to manufacturing and construction of wind turbines. Besides, an increase in output of wind energy in the state of Gujarat exhibits strong linkages with income and indirect employment generation in other states in India. Overall, the findings reveal that investing in the wind energy sector in Gujarat entails net employment benefits, as it offers considerable employment opportunities both within the sector but also across other economic sectors.

Subsequently to Gujarat's wind energy study, a national level assessment on India's green jobs potential is currently being undertaken. This on-going study likewise follows the I-O methodology. The assessment aims to calculate relevant output and employment multipliers through modelling and simulations for policy-making projections, by disaggregating 5 green sectors and incorporating such extensions to the national Input-Output table. The 5 sectors of focus for this nation-wide study are: forestry, watershed development, wind energy, mass rapid rail and railways.

3.2. Indonesia and Malaysia

As a follow up to the green jobs mapping studies conducted in 2012 for Indonesia and Malaysia, the ILO has pursued research based on the construction and use of a Dynamic Social Accounting Matrix in Indonesia (DySAM 2010) and a Social Accounting Matrix in Malaysia (SAM 2005). This involved the expansion of existing SAM and DySAM, with the inclusion of green jobs sectors, and the extension of corresponding employment and green (e.g. CO_2 and waste emissions) satellite accounts. The study aims to estimate the employment and income distribution impacts of environment driven policies, such as fiscal policies through scenario simulation. It focuses on 9 distinct sectors across the Indonesian and Malaysian economies by comparing disaggregated conventional and green sector accounts.

Malaysia's green SAM fiscal stimulus package that simulates the expansion of infrastructure reveals that the green construction civil engineering sector presents the highest activity growth rate out of all analysed sectors. Green construction special trade works also exhibits high growth rates from the simulation. In addition, the multiplier analysis indicates that the intra-account effects in Malaysia are stronger than in the case of Indonesia, pointing to Malaysia's industrialised and well-integrated economy. Thus, investing in those green industrial activities with high rates may offer significant output growth and employment opportunities across the economy. Notwithstanding, there are some green sectors that show among the lowest growth rates, e.g. Green Other Transport Equipment Motor Vehicles & Transport Equipment, Green Food Processing Preservation of Seafood and Green Food Crops Organic Poultry Farming.

Indonesia's DySAM labour multipliers and fiscal stimulus package simulation findings, aimed at expanding infrastructure, highlight that the biggest labour activity multiplier is for organic crops. Green sustainable plantations, green forest services and green construction rural roads also display high labour activity multipliers, whereas coal and metal petrol exhibit the lowest multiplier and green renewable energy is a poor performer. The assessment results also show that the costs for labour creation are generally cheaper for green industrial activities in comparison to conventional one. The cost of creating a labour place in green jobs activities decreases with the importance of technological requirements. To illustrate, the cost of creating labour in organic farming was identified as entailing the lowest cost whereas renewable energy represents the highest jobs creation jobs. Indonesia fiscal stimulus package scenario simulation results also identify and confirm that the greatest employment impact is in organic crops, green sustainable plantations, and green construction rural roads, which overall mainly favour female over youth employment, apart from construction jobs.

4. Green jobs country assessments in Latin America

4.1. Mexico

A nation-wide assessment was conducted in Mexico to estimate the current and potential for green jobs. This four-step study followed ILO's methodological approach outlined in the practitioners guide[1].

Firstly, a general description of Mexico's economic and employment structure was undertaken based on the National Survey of Employment and Occupation of 2011. This revealed that the GDP growth rate has been shrinking (from 5.2 in 2010 to 3.9 in 2012) and job creation in the conventional sectors has been very limited (from 37.6 million in 2010 to 39.1 million in 2012). Unemployment in Mexico was registered at 5%, yet 60% of the working population is in engaged in the informal economy.

Secondly, the study identified nine key green economic activities, namely: organic agriculture, sustainable forestry, renewable energy, sustainable construction, clean industry, public transport, waste management, sustainable tourism and certain government functions.

Thirdly, the study estimated the size of the environmental sector in Mexico based on the identified green economic activities. A total of 1.8 million jobs related to green activities were identified, representing approximately 5% of the total national working population in 2011. In order to account for green jobs, the study developed a decent work index which included four variables: adequate payment, proper working hours, stability and employment security, and social protection. Jobs within the environmental sector which met an index of at least 70% were considered as green jobs. Sectors containing the highest decent work index are sustainable forestry and renewable energy.

Fourthly, an Input-Output matrix of 2008 was extended to integrate green industries to calculate and compare the output and employment multipliers of the green and conventional sub sectors. The analysis reveals that 1.8 million direct environmental jobs create another 971,000 indirect jobs across the economy. Findings highlighted that all green activities have an employment multiplier larger or equal to their corresponding conventional activities. Sectors identified as creating the most jobs while moving towards greener activities are agriculture, construction, and electric energy.

The assessment has triggered a green jobs policy dialogue in Mexico. The Ministry of Environment has set the goal to double the number of green jobs in the country by the end of 2018. Besides, the study has initiated interest to collaborate with the National Statistics Institute (INEGI) to generate official and continuous statistics on green jobs nationally. Moreover, the findings have provided the basis to form a public, social and private partnership whose aim is to generate dialogue about green jobs and increase awareness of the topic among decision makers.

- *Green Jobs in Mexico*: http://www.ilo.org/global/topics/green-jobs/publications/WCMS_236143/lang--en/index.htm

[1] *Assessing Green Jobs Potential in Developing Countries: A Practitioner's Guide* (ILO, 2013)

4.2. Brazil

A Social Accounting Matrix was undertaken for the Brazilian Amazon Region for 2005. The aim of the study was to provide insight on the labour creation potential of forest activities in the Brazilian legal Amazon, with a specific focus on non-timber extractive activities and products. The assessment specifically explores the employment and income linkages of different activities in the Amazon on the local economy. To note, the Brazilian legal Amazon region accounts for 59% of the Brazilian territory and encompasses 25 million people, representing 13% of the population.

The Brazilian Amazon offers many products, which include: timber, vegetable charcoal, açai (palm tree fruit), Brazil nuts, rubber, and fisheries. Yet, timber, agriculture, fishing and livestock still remain economically important sectors in terms of income and employment in the Amazon. The findings reveal that timber extraction generates an income of US$ 445.88 million and represents 1.37% of total regional employment. In contrast, the extraction of rubber, Brazil nuts and açai generate an income respectively of 2.66, 12.20 and 21.79 US$ million. In terms of employment they only account for 0.06%, 0.11%, and 0.11% of total regional employment. Besides, average wages for workers in timber are higher in comparison to other forest extractive activities, making timber still attractive.

The SAM multiplier analysis highlights that extractive industries such as rubber, Brazil nuts and açai are very labour intensive in comparison to timber. For instance, the employment multiplier for rubber is 718, which represents the highest multiplier of the extractive activities. The employment multipliers for Brazil nuts, açai and river fishing are also high and represent respectively 249, 157, and 250. However, the employment multiplier for timber extraction is much lower as it stands at 122. Moreover, study findings also reveal that the income and labour multipliers are higher for Brazil nuts and açai processing in comparison to timber processing. To illustrate, the income multiplier for Brazil nuts processing is 1.22 whereas for timber products it is 1.05 and the employment multiplier is 131 compared to 69 for timber processing. Yet, it is important to note that timber products entail significant forward and backward linkages in comparison to the other extractive and processing industries.

The SAM multiplier analysis for the Brazilian Amazon points to the income and job creation potential of other non-timber extractive and processing industries, such as fruits, nuts and rubber. Indeed, they present great opportunities for the regions local economic development. However, increasing such extractive and processing activities within the Amazon region would certainly require the sustainable management of fisheries, fruits and nuts and the application of environmentally sound processing systems.

5. Green jobs country assessments in Africa

5.1. Mauritius

The Maurice Ile Durable (MID) project, launched in 2008 by the Prime Minister, intends to make Mauritius a model of sustainable development. Agreed by national stakeholders was the need for Mauritius to promote amongst others, the efficient use of resources, the reduction, reuse and recycling of wastes, a decline in pollution, equitable access to resources for all and decent work. In the context of the MID project, a particular opportunity is the promotion and creation of green jobs. Against this background, the ILO provided assistance to a team of researchers from the University of Mauritius to undertake a green job assessment in Mauritius in 2011-2012.

In order to quantify for green jobs in Mauritius, the sustainable component of each economic industry was disaggregated from its conventional counterpart in terms of output and employment. To note, the assessment analysed the following industries: sugar agriculture, non-sugar agriculture, fishing, forestry sugar, textile, manufacturing, construction, energy and electricity, water, hotel, transport, sewage and environmental protection services, recreational services, and financial services. The process-based method, the output-based method, and the natural resource conservation method were used to identify green jobs across the different sector industries. Green jobs identified under the natural resource conservation method (i.e. job functions that safeguard and improve the quality of the natural environment) include employment in the forestry and water industries. Under the process-based method, energy and water efficiency were used as indicators to identify enterprises adopting sustainable practices and moving towards cleaner production systems. The textile and hotel industries were assessed using these two resource efficiency indicators. The output-based method, which identifies activities and jobs producing environmental friendly goods and services, was notably applied to the sugar agriculture, construction, energy and electricity, and recreational service industries. Regarding specifically the decency aspect of green jobs, formal contracts and compliance with Mauritian national law were used as indicators for the assessment. Additionally, where possible, certifications have also been used as a proxy for decent work.

The assessment findings reveal that green jobs in Mauritius account for 6.3% of total employment, representing 35,160 jobs out of a total of 558,100 in 2011. Case studies on green construction, green practices within the hotel industry, clean production methods in the textile industry, recycling enterprises and renewable energy were provided to exemplify green job practices in Mauritius. Moreover, the study compares the multipliers of both the green and conventional industrial activities, through the Input-Output (IO) model. The IO table of the Mauritian Central Statistics Office provided the basis for the IO analysis but was extended to feature the green extensions, which involved adjusting the technological coefficients to reflect the production linkages of the various green industrial activities. The results of the IO direct and indirect income and employment multipliers demonstrate the potential of green jobs creation resulting from a total aggregate demand of 1 million Mauritian rupee (MUR) in each industry. For instance, the output and employment multipliers are higher for renewable energy in comparison to conventional fossil fuel energy, respectively 2.55 vs. 1.58 and 1.4 vs. 0.8. In addition, the

study seeks to answer the question "what would be the potential change in employment and output resulting from a 2.5% GDP growth scenario driven by green and conventional industrial activities?" The growth of the green components of the sugar agriculture, textile, hotel and financial service industries are compared to their conventional counterparts through this "what if" scenario projection. Findings reveal that an increase in final demand in those sectors by a combined total of MUR 10 billion would lead to an increase of 21,600 jobs in the green scenario as opposed to 15, 250 jobs when following a conventional growth path.

The current number of green jobs in Mauritius is quite small, reflecting the various ad-hoc initiatives and strategies implemented by Government authorities, private enterprises and other institutions. The assessment points to the necessity of a green employment strategy by prioritising sectors and industries and identifying barriers impeding green jobs creation. The assessment informed a policy validation and planning workshop held in 2012 in Mauritius to develop an Action Plan whereby various policy options were suggested for industries across the economy. For instance, green agricultural certification, awareness campaign for green products, agricultural extension training, and green public employment schemes for climate change adaptation, were amongst policy recommendations to green agriculture nationally.

5.2. Tunisia

Under the framework of the project: "Promotion of Renewable Energy and Energy Efficiency in Tunisia", the GIZ commissioned a study to explore the potential future employment benefits of developing renewable energies and energy efficiency in Tunisia. Such an analysis is key given that Tunisia has over the past 20 years experienced a rapid growth in energy demand due to its economic development and strong government energy subsidies. Consequently, since the turn of the century Tunisia has entered an energy deficit phase. National initiatives such as the Tunisian energy policy and Solar Plan (PST) certainly provide opportunities for the creation of employment resulting from the development of energy efficiency and renewable energies.

The study firstly assesses direct employment creation within the framework of Tunisian sustainable energy programmes during the 2005-2010 period. The findings reveal that a total of 3,400 direct jobs were created in the renewable energy and energy efficiency sectors. The largest employment share is in renewable energy, generating 1,445 jobs (45% of total direct employment created). Energy efficiency created 931 jobs in the 5-year period, representing 27% of total direct employment creation, and 975 jobs were also generated in cross-sectional activities, i.e. research, consulting and the promotion of renewable energy and energy efficiency. Moreover, the study exposes that most employment was created in the installation, operation and maintenance of renewable energy capacities and from increasing energy efficiency in buildings. It also underlines that more than 70% of jobs entail a minimum of academic skills. Besides, the study applies two indicators in order to understand the impact on employment of the various energy programmes: the 'energy' employment potential ratio (jobs/ktoe-year) defined as the relationship between jobs created and the annual quantity of energy saved; and the 'economic' employment potential ratio (jobs/TND million) defined as the relationship between jobs

created and capital invested. The analysis suggests that renewable energy presents the highest energy employment potential ratio with 36 jobs/ktoe- year compared to 2.3 two jobs/ktoe-year for energy efficiency. However, renewable energy also presents high investment costs for each quantity of energy savings in comparison to energy efficiency.

Additionally, the study provides a perspective on future jobs creation potential in renewable energy and energy efficiency in Tunisia until 2030. Since the study aims to estimate employment potential from the PST and beyond, it considers the DivRen (renewable diversification) scenario with a 30% penetration rate for renewable energy in the electricity sector. This scenario sets to reach 1520 MW capacity of wind energy installed, 1930 MW capacity of photovoltaics (PV) installed and 595 MW capacity installed of Concentrated Solar Power (CSP). A total of 11,065 GWh electricity from renewable energy sources is projected in this scenario. It sets an investment path of TND 7.1 billion for the purchase and installation of facilities and a total of TND 343 million for their operation and maintenance. The DivRen scenario is supplemented by a development path for solar water heaters, biogas and waste electricity generation. For instance, it anticipates continued development of solar water heaters with annual installation of 37 MW and a total additional capacity of 700 MW installed by 2030. In sum, a total investment of 8.3 TND billion in renewable energy is modeled with total renewable energy capacity installed for electricity generation of 4,045 MW. In terms of an energy efficiency scenario, an average of TND 80 million per year invested in energy efficiency measures in both residential and industrial sectors is projected, summing up to a total of more than TND 1.5 billion investments by 2030.

The study measures the employment effects of these future scenarios by applying an adjusted input-output analysis model for Tunisia. A combination of technology-specific input-output tables, labour intensities of respective productions, country-specific input-output tables and country-specific statistical data were used. To note, information about the cost structure of five different renewable energy technologies and on the increase in energy efficiency of buildings and within the main industry sectors were required for the technology-specific tables. Moreover, depending on the shares of imported goods and services and domestic production, domestic employment figures were obtained by combining these tables with the domestic input-output structure.

The study results indicate that increases in renewable energy and energy efficiency in Tunisia according to the PST and others could generate additional employment between 7,000 and over 20,000 people until 2030. Findings suggest that with 85% of energy systems imported 7,000 jobs could be created in 2021. However, employment figures could rise significantly reaching 23,000 jobs in 2018 if imports were to be lowered to only 10% on average. The study demonstrates that indeed renewable energy and energy efficiency have a positive effect on employment and economic development.

6. Green jobs assessments in OECD countries

6.1. Global and multi-regional Input-Output modeling

EXIOPOL- A New Environmental Accounting Framework Using Externality Data and Input-Output Tools for Policy Analysis- was an EU funded project executed between 2007 and 2011. It created a detailed, global and multi-regional environmentally extended input-output database called EXIOBASE for the base year 2000. Covering 43 countries and one rest of the world region, 129 industry/product sectors, 30 emitted substances and 80 resources and including full trade matrices, this database enables to estimate external costs of global production and thus helps examine how final consumption in a particular country causes impacts along global value chains. The project accounts for both production structures and consumption activities in major world regions, and thereby covers broad environmental flows. The database offers a global perspective on environmental issues, with focus placed on the European Union. Indeed, the project aimed to support analysis of technologies, policies, and standard setting, in relation to EU sustainability policies. As such, EXIOPOL's detailed model helps estimate environmental impacts and external costs of different economic sectors for countries in the European Union.

As a follow-up project, CREEA (2011-2014) focuses on compiling and refining environmental and economic accounts and aims to update and build on the EXIOBASE database. The project uses the same country classification but further disaggregates sectors to comprise 163 industries and 200 products with a focus on additional detail for the waste and energy sectors. It expands the database with improved extensions for water, land use and other natural resources, and in addition creates the first global physical environmental extended input output table. Based on the CREEA, the project DESIRE (2012-2016) aims to develop and apply an optimal set of indicators to monitor European progress towards resource-efficiency. It proposes a combination of time series and indicators to capture country, sector and product group level impacts of production and consumption both inside and outside the EU. In doing so, it will update EXIOBASE with a time series of IO tables ranging from 1995 to 2011.

Based on the EXIOPOL database preliminary employment multipliers were calculated in green and conventional sectors for comparison. The difference between employment multipliers in green and conventional sectors revealed to be very small for European countries. For instance, the employment for green sectors is on average 8.1 and 7.4 for conventional sectors for Nordic countries. Likewise, for Western and Southern European countries the employment multipliers for green sectors stands at 12.3 and is only slightly higher than for conventional sectors which is 9.8. However, the employment multipliers difference for emerging and middle income countries is significant, i.e. 263.8 versus 223.5. To illustrate, the employment multiplier for green sectors in South Africa is 150.7, whereas only 33.2 for conventional sectors. Moreover, the findings suggest that there is great scope for increasing labour productivity in OECD and EU countries in terms of energy intensity. Indeed, such countries present high gross energy use per worker and emissions to air per worker.

6.2. Germany

The Institute of Economic Structures Research in Germany has undertaken an ex post analysis to calculate and estimate both direct and indirect jobs in environmental sectors in terms of environmental goods and services, and has paid particular attention to renewable energy in its analysis. Data made available from the German Statistical Office on investment and expenses along with sectoral data and information obtained from trade associations helped constitute the Input-Output analysis framework.

Results reveal that approximately a total of 580,000 people work in green production in Germany. Significantly, the findings highlight that indirect jobs contribute more than half of total employment from production, with indirect jobs representing 51% of jobs. Environmental services contribute to 1.2 million jobs nationally, notably in the area of trade, repair and maintenance, which account for 216,000 jobs. To note, environmental services are grouped into different categories including primary, industrial and business services. Additionally, an estimated 380,000 people were identified as working specifically in renewable energy. Overall, employment in environmental goods and services whose purpose is environmental protection and resource management represents 4% of Germany's workforce.

A specific examination of the employment effects of increasing renewable energy in Germany has also been undertaken. Input-Output tables were thus extended to include the specific input structure of the renewable energy sector to explore and account for the gross and net employment effects of investment in renewable energy, by also considering the export and import of facilities. This was modeled according to Germany's PANTHA RHEI[2] macroeconomic model. Simulation results for instance indicate that when exports are to a minimum, this has a negative job impact from increases in renewable energies. Indeed, higher exports contribute to increased job creation opportunities from investing in renewable energy in Germany.

[2] For further information: http://www.gws-os.com/de/content/view/172/110/

7. Policies for green jobs

7.1. A macroeconomic outlook

The greening of economies and the creation of green jobs across economic activities represents a structural transformation for countries, which will not happen without the implementation of appropriate policy measures and public and private investments. It is thus important for governments to identify constraints impeding this market-based transition to determine policies that can best create an enabling environment which promotes decent and environmentally sustainable jobs. Generally, the lack of finance, infrastructure and skills are the most recurrent constraints. Overall, the aim of such policy interventions is to help accelerate and increase the scale of the transition process to unleash the national green jobs potential.

7.2. Green jobs policy instruments and approaches

The main policies that help drive the transition to environmental sustainability include macroeconomic policies, sectoral policies and social and labour policies. The shaping of the right mix of policies is very much country-specific for promoting green jobs and in order to minimize job losses, maximise employment gains, and protect workers and enterprises in a just transition process.

Macroeconomic policies are essential as they can redirect consumption and investment through price signals and incentives for enterprises, consumers and investors towards green economic activities. Such policies can include taxation, price guarantees, subsidies, finance and public investment.

Sectoral policies for key economic sectors as well as groups of enterprises, in particular SMEs, have proven important in the green economy transition, either as stand-alone policies or, more effectively, as a complement to macroeconomic and regulatory policies. Such policies include most environmental regulation as well as mandates, such as the share of renewable energy in power supply, average energy consumption thresholds for car fleets, or biodiversity set-asides in agriculture and forestry. In addition, most public investment into environmental sustainability is also aimed at key sectors such as transport, land and water management.

Social and labour policies should ideally include a combination of social protection, employment, skills development and active labour market policies. As the transition will entail both job creation and the transformation of many jobs and occupations, labour market institutions and policies are critical for setting out the framework conditions for labour markets to adjust to the transformation required. Good governance and cooperation between social partners will certainly matter for the speed and form of adjustment and to ensure a just transition process.

Moreover, it is also important to integrate and mainstream policies for green jobs into existing policy frameworks such as national development plans and climate change strategies.

7.3. Assessing skills needs for green jobs

Paying close attention to the occupation requirements of green economy strategies is crucial since the shift to greener economies will bring about structural changes in national labour markets. The transition will mostly affect existing occupations but new job profiles, mostly at higher skill levels, will also emerge. The occupational profiles across sectors will change and require for the most part new and different skills. This poses the great challenge of retraining and upgrading the skills of those workers who will lose their jobs and providing the right skills to those entering the changing labour market.

Skills gaps already pose a major barrier to transitions to green economies and green job creation. Multiskilling requirements and shortages of teachers and trainers have been identified as major challenges, especially for developing countries. Various reasons explain national skills shortages, but for the most part, the absence of policy coherence is the most contributing factor. Good practices that address and anticipate skills needs include amongst others: effective social dialogue among all stakeholder to define skills and education policies; a combination of top-down and bottom-up approaches to better reflect training provision needs; and public-private partnerships for skills and capacity development. To best tackle the skills challenge of greener economies, coordinated, coherent and forward looking policies are necessary.

Assessing skills for green jobs is necessary is essential to inform policy choices. The ILO is undertaking work on the integration of skill needs assessment into green jobs assessment to identify skill needs at all levels. This requires a three-stage process: (i) the inclusion of skills proxy variables in the DySAM analysis; (ii) additional empirical data collection, notably through questionnaire survey; (iii) and a closer look into occupation and competencies change through qualitative research.

7.4. Country examples: Mauritius and South Africa

Mauritius and South Africa offer two interesting examples of national policy approaches to promote green jobs. The Mauritius' Île Durable (MID) strategy which was launched in 2008 has been developed through a series of multi-stakeholder consultations at national level. In June 2013, Mauritius approved the MID policy, strategy and action plan, comprising 138 actions and focusing on five main areas, known as the '5Es': Environment, Energy, Economy/Employment, Education and Equity. It will be executed through four main programmes, namely: Green Economy; Ocean Economy; Cleaner, Greener and Pollution Free Mauritius; and Energy. The MID sets targets for the 5Es, which include increasing green jobs to 10% by 2020 and achieving 35% renewable energy by 2025.

In South Africa, the Government, through the Department of Environmental Affairs (DEA) has allocated R1.1 to establish a Green Fund. The DEA appointed the Development Bank of Southern Africa (DBSA) as the implementing agent of the Green Fund. The Green Fund represents a critical resource mechanism to accelerate the transition to a low carbon, resource efficient and climate resilient development path delivering high impact economic, environmental and social benefits. The Fund only supports initiatives which would not have been implemented without its support and demonstrate a funding gap. It places a

strong focus on innovative projects that have the potential to be scaled up and/or replicated. The Green Fund provides support through three funding windows, namely: Green Cities and Towns; Low Carbon Economy; Environmental and Natural Resource Management. Funding across the thematic windows support project development, capacity building and research and development initiatives. The Green Fund will establish an useful evidence base of lessons learnt through programme and project implementation and good practices. Projected job creation numbers are estimated at 12500 through the Green Fund. This funding mechanism fits within South Africa's comprehensive policy environment in promoting a green economy and green jobs. Indeed, the Green Economy Accord launched in South Africa in 2011 aims to create 300,000 green jobs by 2020, which falls within the framework of South Africa's New Growth path which sets to create five million new jobs by 2020. Besides, other policies promoting sustainability in South Africa include the National Strategy for Sustainable Development and Action Plan and The National Development Plan.

8. Conclusion

The conference concluded by reinforcing the importance of translating green jobs assessment results into sound and coherent policy recommendations. Indeed, assessments reveal the labour market implications of going green, and thereby offer an important means to help shape policy-making. For instance, they can identify sectorial entry points for investment to promote green jobs nationally, and help best inform policy formulation through the setting of specific goals and targets. Thus, for research to be most informative and effectively supportive of policy formulation and implementation, the interface between researchers and policy-makers needs to be strengthened.

Increasing the technical capacity and understanding of decision makers on the various methodologies and models available to assess the employment potential of green economy policies is therefore key. Likewise, engaging with policy-makers early on when defining research assumptions is essential to ensure that findings best link with national policy and development objectives.

South-south cooperation offers an important channel to exchange knowledge and peer-review green jobs assessment studies. In addition, promoting south-south and triangular partnerships can open new fields of research and can also develop regional and not solely country perspectives.

In light of increasing interest to undertake national green jobs assessments, it was suggested to develop a global report exposing different green jobs assessments to show the different methodological approaches and highlight the challenges and policy implications.

9. Annexes

9.1. Conference Agenda

Day 1 Room IX ILO Building: 9 December 2013	
10h00 – 10h20 *Facilitated by Moustapha Kamal Gueye*	**Welcome and introduction** • Peter Poschen, Director, Enterprises Department, ILO • Anita Amorim, Head of the Emerging and Special Partnerships Unit, ILO
Session I: **10h20 – 11h15** *Facilitated by Kees van der Ree*	**Rationale and objective: Why do jobs matter in moving towards a greener economy?** Panellists: • Raymond Torres, Director, Research Department, ILO • Steven Stone, Chief, Economics and Trade Branch, UNEP • Monia Braham, Director of Economic Studies, Ministry of Equipment and Environment, Tunisia • Ulrike Lehr, Senior Expert, Institute of Economic Structures Research, Germany
11h15-11h45	*Coffee break*
Session II: **11h45 – 12h45** *Facilitated by Massi La Marca*	**Overview of ILO tools for green jobs assessments** Panellists: • David Hunter, Department of Statistics, ILO • Marek Harsdorff, Green Jobs Programme, ILO • Christoph Ernst, Development and Investment Branch, ILO
12h45 – 14h15	*Lunch break*
Session III: **14h15 - 15h30** *Facilitated by David Kucera*	**Green Jobs country assessments in Asia** *Presentation of country studies in India, Indonesia, Malaysia* Panellists: • Rajesh Jaiswal, National Council of Applied Economic Research, India • Jorge V. Alarcon, Institute of Social Studies, Netherlands Discussant: • Xin Zhou, Institute for Global Environmental Strategies, Japan • Odonchimeg Ikhbayar and Lakshimi Boojoo, Economic Policy & Competitiveness Research Center, Mongolia
15h30-16h00	*Coffee break*
Session IV: **16h00 - 17h00** *Facilitated by Anita Amorin*	**Green Jobs country assessments in Latin America** *Presentation of country studies in Mexico and Brazil* Panellists: • Elena Catalina Jauregui Nolen, Empleos Verdes, Mexico • Joaquim Bento de Souza Ferreira Filho, University of São Paulo, Brazil Discussant: • Tair Kasztan, Ministry of Labour and Social Security, Uruguay

Day 2 Room IV ILO Building: 10 December 2013	
Session V: **9h30 – 11h00** *Facilitated by Moustapha Kamal Gueye*	**Green Jobs country assessments in Africa** *Presentation of country studies in Mauritius and Tunisia* Panellists: • Riad Sultan, University of Mauritius • Sami Marrouki, ECO-Ser/ALCOR, Tunisia Discussant: • Calvin Atewamba, United Nations University - Institute for Natural Resources in Africa, Accra • Hussein Abaza, Centre for Sustainable Development Solutions, Egypt
11h00 – 11h30	***Coffee break***
Session VI: **11h30 - 12h30** *Facilitated by Rob Visser, UNITAR*	**Green Jobs assessments in OECD countries** Panellists: • Konstantin Stadler, Norwegian University of Science and Technology • Ulrike Lehr, Institute of Economic Structures Research, Germany • Marek Harsdorff, Green Jobs Programme, ILO
12h30 – 14h00	***Lunch break***
Session VII: **14h00 – 15h30** *Facilitated by Alice Vozza*	**Policies for Green Jobs** *Discussion on country experiences in designing and applying relevant policy tools and instruments, at macroeconomic and sectoral level, including skills and entrepreneurship promotion* Introductory presentation on green job policy instruments and approaches: Moustapha Kamal Gueye, Green Jobs Programme, ILO Panellists: • Osman Mahomed, MID, Prime Minister's Office, Mauritius • Olga Strietska-Ilina, Skills and Employability Branch, ILO • Yan Islam, Employment and Labour Markets Branch, ILO (tbc) • Christina Behrendt, Social Protection, ILO (tbc)
15h30-16h00	***Coffee break***
Session VIII: **16h00 - 17h00** *Facilitated by Kees van der Ree*	**Linking green jobs research with policy making: strategic outlook and future agenda** Panellists: • Peter Poschen, ILO • Massi La Marca, Research Department, ILO • Jenitha Badul, Department of Environmental Affairs, South Africa • Jane Romero, Asian Development Bank
Session IX: **17h00 - 17h30** *Facilitated by Moustapha Kamal Gueye*	***Closing remarks*** • Kees Van Der Ree, Coordinator, Green Jobs Programme, ILO • Anita Amorim, Head of the Emerging and Special Partnerships Unit, ILO

9.2. Participants List

Country Delegates

	Country	Institution	Participant Name
Africa			
1.	Mauritius	University of Mauritius	Mr. Riad Mohammed Akthar Sultan
2.	Mauritius	Prime Minister Office	Mr. Osman Mahomed
3.	South Africa	Department of Environmental Affairs	Ms. Jenitha Badul
Americas			
4.	Brazil	University of Sao Paulo (USP)	Prof. Joaquim Bento de Souza Ferreira Filho
5.	Mexico	EMPLEOS VERDES	Ms. Elena Catalina Jauregui Nolen
6.	Uruguay	Ministry of Labour and Social Security	Ms Tair Kasztan
7.	USA	USA Mission to the UN Geneva	Ms Lisa Brodey
Asia and the Pacific			
8.	India	National Council of Applied Economic Research (NCAER)	Mr. Rajesh Jaiswal
9.	Japan	Institute for Global Environmental Strategies (IGES)	Ms. Xin Zhou
10.	Mongolia	Economic Policy & Competitiveness Research Center (EPCRC)	Ms Odonchimeg Ikhbayar
Arab States			
11.	Egypt	Centre for Environment and Development for the Arab Region & Europe (CEDARE)	Mr Hussein Abaza
12.	Tunisia	ECO-Ser/ALCOR	Mr. Sami Marrouki
13.	Tunisia	Ministry of Environment and Equipment	Ms. Monia Braham
Europe and Central Asia			
14.	Turkey	Middle East Technical University (METU)	Mr Hakan Ercan
15.	Germany	Institute of Economic Structures Research (GWS)	Ms Ulrike Lehr

16.	Netherlands	Institute of Social Studies (ISS)	Mr Jorge V. Alarcon
17.	Norway	Norwegian University of Science and Technology (NTNU)	Konstantin Stadler

UN & Development Agencies

	Country	**Institution**	**Name**
18.	Ghana	United Nations University – Institute for Natural Resources in Africa (UNU-INRA)	Mr Calvin Atewamba
19.	Philippines	Asian Development Bank (ADB)	Ms Jane Romero
20.	Switzerland	United Nations Institute for Training and Research (UNITAR)	Ms Maya Valcheva
21.	France	United Nations Institute for Training and Research (UNITAR)	Mr Rob Visser
22.	Switzerland	Global Footprint Network	Ms Nicole Grunewald
23.	Switzerland	United Nations Environment Programme (UNEP)	Mr Steven Stone
24.	Switzerland	United Nations Environment Programme (UNEP)	Mr Richard Scotney
25.	Switzerland	WWF International	Ms Céline Beaulieu

ILO Staff

Ankara, Turkey	
26.	Mr Ozan Cakmak
Mexico City, Mexico	
27.	Ms Regina Galhardi

Turin, Italy (ITC-ILO)	
28.	Ms Alice Vozza
29.	Mr Valter Nebuloni
Geneva, Switzerland	
30.	Mr Peter Poschen
31.	Mr Raymond Torres
32.	Mr Kees van der Ree
33.	Ms Anita Amorim
34.	Ms Olga Strietska-Illina
35.	Mr Yan Islam
36.	Mr Daniel Samaan
37.	Mr David Kucera
38.	Mr David Hunter
39.	Ms Lene Olsen
40.	Mr Massimiliano La Marca
41.	Mr Christoph Ernst
42.	Valentina Stoevska
43.	Mito Tsukamoto
44.	Aurelio Parisotto
45.	Maria Theresa Gutierrez
46.	Mr Marek Harsdorff
47.	Mr Moustapha Kamal Gueye
48.	Ms Dorit Kemter
49.	Ms Anna-Maria Fyfe
50.	Mr Stefano Falcone
51.	Ms Cristina Maldonado
52.	Ms Irais Martinez Esparza
53.	Mr Nuno Tavares-Martins