Green DySAM-based Modelling and Policy Support Simulations
(Green Township Scenario Simulation and Application in Organic Agriculture Exports)

An output of the Green Jobs Malaysia Project and a brief prepared for the International Workshop on Employment Implications of Environment and Climate Change-Related Measures and Policies (Crafting Malaysia's Roadmap to a Green(er) Economy, 5-6 May 2015.[1]

Background

The first objective of the ILO Green Jobs Programme for Asia and the Pacific is to enhance the capacity of ILO constituents to engage in dialogue on green jobs at the local, national and regional level through access to quality data and information. Subsequently, enabling the ILO constituents to effectively support the preparation of road-maps for a just transition towards a green(er) economies, based on sound and solid analysis. In this context, and in the context of the objectives of the Green Jobs Malaysia Project, a comprehensive step-wise approach for research work on green jobs at the national level, has been carried out in the country. This include the national study which mapped out the existing green jobs in selected key sectors (Phase 1) as well as an analytical research with the help of a Green Dynamic Social Accounting Matrix (Green DySAM).

Box 1. Four-phased Approach: Understanding the Environment-Employment-economy linkages at national level

Phase 1	Phase 2	Phase 3	Phase 4
Green Jobs Mapping	Development of Analytical Models (I-O tables, Dynamic Social Accounting Matrix/SAM)	Simulations focusing on green policy and employment	Capacity-Building/ Planning for monitoring and evaluating green policies

Under these phases (2 and 3), impact of green measures and policies throughout the economy, on the labour market and on the environment are analysed and simulated. Such an analysis will help policy makers better understand the linkages and transmission channels between specific external shocks (climate change policies such as low carbon policies), public (environmental) policies, technology/sectoral implications and their impacts on employment and the environment. Through scenario modelling, governments and all stakeholders will be provided with policy alternatives and be able to devise programmes for the promotion of green employment opportunities, as well as conduct discussions on the mainstreaming of green jobs into social, employment and economic development policies.

Green DySAM in Malaysia

The ILO and the Government of Malaysia through a team of international and national experts led by the Malaysia Ministry of Human Resources- Institute of Labour Market Information and Analysis, carried out the green jobs assessment in the country following the step-wise approach. The exercise addressed and estimated the amount of environment-related jobs that are existing, reduced or need to be reinforced in key sectors. The methodology used is Social Accounting Matrix (SAM) based and is complemented with scenario analysis to assess policies aiming at the greening of the economy with better quality jobs. The problem of a dated SAM is tackled by using the latest SAM extracted from the dynamic SAM algorithm (DySAM). The scenario simulation used the data and premises related to the building a "Green Township" proposed by the Malaysian government and set-up within the context of green-jobs vs. brown-jobs technology to measure impacts on the economy, employment creation and CO_2 emissions by targeting green-jobs vs. brown-jobs technology using sectors. Another application of the methodology is demonstrated vis-à-vis Organic Agriculture Exports.

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A Snapshot of Findings: Building a Green Township- Economy, Employment and Co2 Emissions

A. Summary of Economy-wide Macro Findings

Correlation of partial and cross backward linkages:

- Between production accounts (Co and PA) are unity and correlations of production accounts with the income accounts are low; *and*
- Factor incomes (FP) show correlation with commodities and activities close to unity and Institutional incomes (HHOI) have high correlations with production.

The implication is that factor and institution incomes policies are compatible with growth and thus complementary with growth policies but not conversely.

Green township scenario: All; Green-jobs; Brown-jobs and Hybrid-jobs sectors.

The package can be considered as a type of "fiscal stimulus package" implemented by the government via tax reliefs and/or subsidies in order to improve infrastructure and activities related to the development of the green township.

15 commodities are implicated in the simulation, of which 6 are green-jobs, 6 are brown-jobs and 3 are hybrid (mixed) technology produced commodities. The scenario injection total amounts to 1,025.3 million Ringgit (MR). The allocation is according to their weight, e.g. green-jobs commodities 229.37 MR or (22.4%); brown-jobs 340.93 MR or 33.4% and hybrid-jobs 455.0 or 44.4%. (JVA see table below).

The scenario simulation comprises one ALL, where all 15 commodity injections are included, and three sub-scenarios: 1) green-jobs sub-scenario that includes only the 6 green commodities, 2) brown-jobs sub-scenario that includes only the 6 brown commodities and 3) hybrid-jobs scenario that includes only the 3 hybrid commodities. The sum of the sub-scenarios adds up to the ALL scenario.
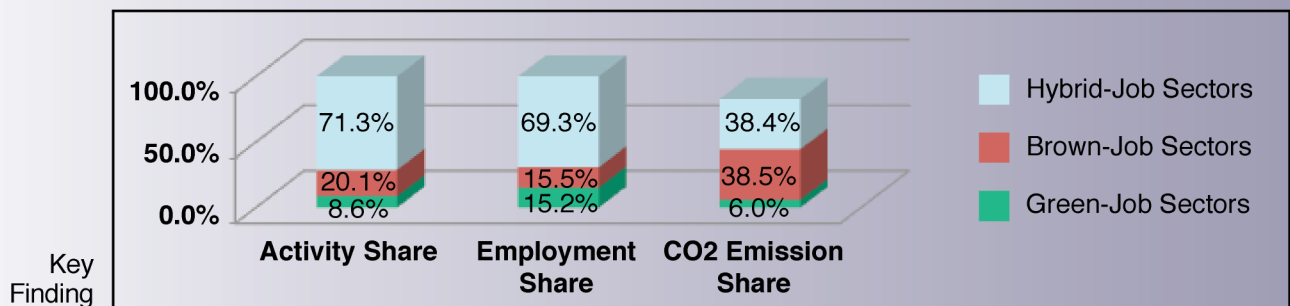
Key Finding

Key Finding: Greening of the Malaysian Economy is at early stages.

The participation rates of green-jobs technology are the lowest in the totals, e.g. production 9%, employment 15% and CO2 emissions 6%. Hence, greening is in its early stages (2011 Malaysia). Employment share in green-jobs is at par with brown-jobs but is less than one third in terms of production share. *(Refer to Table 1 above)*

Resulting Macro impacts of the green township scenario & contributions are:

0.11% — Production growth rate
Largest contribution Hybrid-jobs (43%)

0.11% — Factor income growth rate
Largest contribution Hybrid-jobs (51%)

0.10% — Institutions income growth rates
Largest contribution from
Hybrid production (52%)

0.16% — Employment growth rate
Largest contribution from
Green-jobs production (45%)

0.12% — Activity CO2 emission growth rate
Largest contribution from
Brown-jobs production, an indication
of mainly direct impacts (47%)

0.11% — Household consumption growth rate
Largest contribution from
Hybrid production, an indication
of mainly induced impacts (49%)

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Green Township Scenario Injection and Aggregate Impacts on Activities, Employment and CO_2 by Simulation Type	All Simulation	Green-Jobs	Brown-jobs	Hybrid-Jobs
Injection Level by Scenario Type	1,025.30	229.37	340.93	455.00
Injection Share by Scenario Type	100.0%	22.4%	33.3%	44.4%
Production Activity (PA) Impact (million Malaysia Ringgit)	6,538.1	1,400.8	2,182.5	2,954.8
All scenario contribution (ALL PA Scenario growth rate 0.11%)	100.0%	22.2%	34.7%	43.0%
Employment (Emp) Impact – Number of jobs created	14,627	6,614	3,913	4,100
Emp scenario contribution (ALL Emp Scenario growth rate 0.16%)	100%	45.2%	26.8%	28.0%
Activities (PA) CO2 Emission (Giga grams)	358.1	88.9	167.8	101.4
PA scenario contribution (ALL PA Scenario growth rate 0.12%)	100.0%	24.8%	46.9%	28.3%
Household Consumption (HHC) CO2 Emission (Giga Grams)	63.0	12.6	19.6	30.8
HHC scenario contribution (ALL Scenario growth rate 0.11%)	100.0%	19.9%	31.1%	48.9%

B. Summary of Economy-wide Meso Findings

Sectors: The backward linkages of green jobs-sectors is significant, while linkages of brown jobs sectors is less significant and employment growth rate in green jobs is higher compared to that of brown employment.
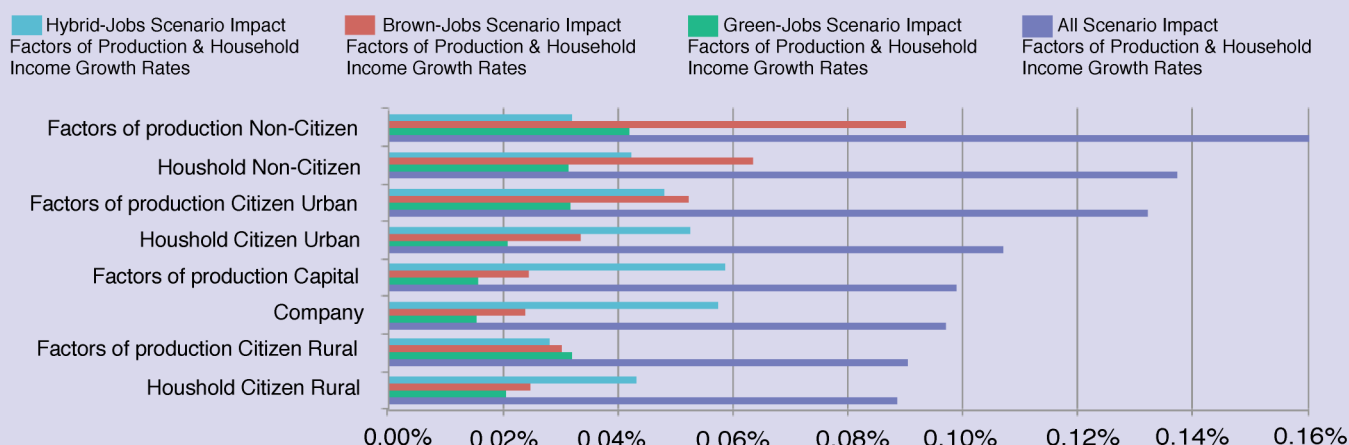
In the **ALL scenario** green township, the targeted subsectors remain, on the whole, at the top with shifts in ranking order. **The ALL scenario generates higher growth rate for most of the green sub-sectors** (i.e., Green Construction Residential, Green Other Transport Equipment Motor Vehicles & Transport Equipment, Green Construction Special Trade works, Green Domestic Appliances, Green Transport & Communication, and Green Water Works Electrical, Gas & Water) rather than brown sub-sectors (i.e., Brown Construction Non-residential, and Brown Construction Civil Engineering).

Logically the targeted subsectors and those sectors directly supporting the green-jobs scenario experience higher growth rates. Conversely, the brown-jobs sectors experience a low growth rate. An indication that backward linkages among the green-jobs sectors is significant, whereas the backward linkages among brown-jobs sectors less significant. Even more, the backward linkages between green-jobs and brown-jobs subsectors (i.e. Green Domestic Appliances and Green Transport & Communication) is strong in the brown-jobs scenario. As a result **employment growth rate in green-jobs is the highest (0.07%,) compared to brown employment growth rate (0.04%).**

Factors and Institutions:

The induced effects are reflected by the growth rates impacts of factors income and institutions. The two highest growth rates belong to "Factors of production Non-Citizen (0.16%)" and "Household Non-Citizen (0.14%)". While the lowest growth rates belong to "household citizen rural (0.09%)" and "factors of production rural (0.09%)".

The highest induced effects resulting from both green-jobs and brown-jobs scenarios are on "Factors of production Non-Citizen" followed by "Household Non-Citizen". Induced effects under brown-jobs are greater than under green-jobs for all factor and institution incomes. "Factors of production citizen rural" have the highest growth rates, an indication that rural labour has a participation in the green village development process.

Hybrid-Jobs Scenario Impact Factors of Production & Household Income Growth Rates   Brown-Jobs Scenario Impact Factors of Production & Household Income Growth Rates   Green-Jobs Scenario Impact Factors of Production & Household Income Growth Rates   All Scenario Impact Factors of Production & Household Income Growth Rates

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Employment:

The top 5 sectors account for about 75% of all job creation and the largest job creation takes place in "Green Construction Residential" with 5,000 jobs or about 34 % of all created job places, the second highest is Business & Private Services with 2,038, and in third place is "Brown Construction Non-residential" with 1,943 jobs.

The overall green township scenario shows that the impact on youth and female employment creation is highest in two of the targeted subsectors (i.e., Green Construction Residential and Business & Private Services) with 123 and 60 for youth employment respectively; and with 358 and 840 for female employment respectively.

Cost of Employment Creation:

The two highest cost of creating one job place are "Manufacture of Office, Accounting & Computing Machinery" sector (381,761 Ringgit) and "Manufacture of Radio, Television" (377,866 Ringgit).The overall average cost of creating one job is 277,536.

Key Finding: Green-jobs shows the lowest average cost (190,750 Ringgit) compared to, brown-jobs (285,173 and hybrid-jobs with 295,369). On the whole the most expensive jobs are in sector using relatively high capital intensive techniques.

C.   Summary CO_2 Emission Generation Economic Activity and Households Scenario Impacts

Findings show that for ALL, green-jobs and brown-jobs scenarios out of the total of CO_2 emissions, the top two sectors account for more than 50%, the top 7 account for more than 70%. The top 15 polluters emit more than 90% of the total of CO_2 emissions.

Among the top polluters are six of the direct targeted (four brown-jobs and two green-jobs) and some related sectors. Green-jobs contributes to the total CO_2 only 20%%, compared to 31% and 49% for brown and hybrid-jobs, respectively. Note that there are 49 PA in total, of which 12 are green jobs, 11 are brown jobs are 26 are hybrid.

The CO_2 household emissions account for only 15% of the total arising out the scenario. Urban citizen are responsible for almost 90% of all household emissions and non-citizen generate only 0.7%.

Findings show urban citizen households turn out to be the third most polluting in the overall ranking, their CO_2 is comparable to "Brown construction non-residential", it should be remembered that the latter and several household goods and services are among the targeted variables.
To finalize we should remember that CO_2 emissions are calculated via placeholders and therefore not much can be said regarding policy, hence, once placeholders are replaced by Malaysian CO_2 emissions and the results are validated and properly analysed and assessment of CO_2 can be made. Notwithstanding, the rankings seems to reflect what we know about the main polluters in most economies.

Green Jobs Programme for Asia and the Pacific

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