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DYSAM MODELLING FOR GREEN JOBS IMPACT ASSESSMENT

EMP/INVEST, EMP/POLICY

International Labour Organisation
Geneva, Switzerland

CONTENT

- Why the need for employment impact assessment related to environmental issues?
- Diagnostic tools: From I-O tables to Green DySAM
- Country illustrations
- Data sets needed
- Procedures related to project implementation

WHY THE NEED FOR EMPLOYMENT IMPACT ASSESSMENT?

- **Interdependence** between environmental and social issues
- *Objective: Limit the social costs of environmental changes and environmental policies, while optimizing the positive economic and employment effect (green jobs)*
- Key aspects:

* Understand the link and transmission channels between **external shocks** (natural disasters, climate change)/**public** (environm.) **policies, sectoral implications** and **impact on workers/households**

***Technological choice** determines employment outcome

*Understand various **employment dimensions to improve targeting:**

Green jobs : new skill requirements

Households/workers negatively affected (e.g. migrants due to drought, workers of declining brown industries)

Show policy-makers how to reconcile the environmental, the social and the economic agenda

SECTORAL KNOWLEDGE IS KEY

- ✓ Not just the quantity, but also the quality (pattern) of growth matters to achieve an employment target
- ✓ This pattern requires determination of sector policies
- ✓ Environment as a driver of technology change
- ✓ Only an in-depth knowledge of sectors to be analyzed allows to draw a complete picture on the socio-economic implication of industrial policies:

ENVIRONMENTAL CHANGE AND TECHNOLOGICAL CHOICE

Greening the economy/climate change policies have the effect of technological change

Technology options: management and production methods, inputs and capital/labour requirements, local vs. national or global

- ✓ Sectoral shifts: decline of brown industries, rise of green industries
- ✓ Emergence of new « green » activities and sectors, e.g. wind energy, electrical cars
- ✓ Technological changes/innovations: « greening brown industries »
- ✓ Value chain: forward and backward linkages
- ✓ Doing the job « differently », e.g. plumber

Different technology choices have different employment outcomes:

Indonesia's fiscal stimulus package: Labour intensive road construction: 26,000 jobs, capital-intensive road construction: 9,000 jobs

FROM INPUT-OUTPUT TABLES TO DYSAM

1) INPUT-OUTPUT ANALYSIS

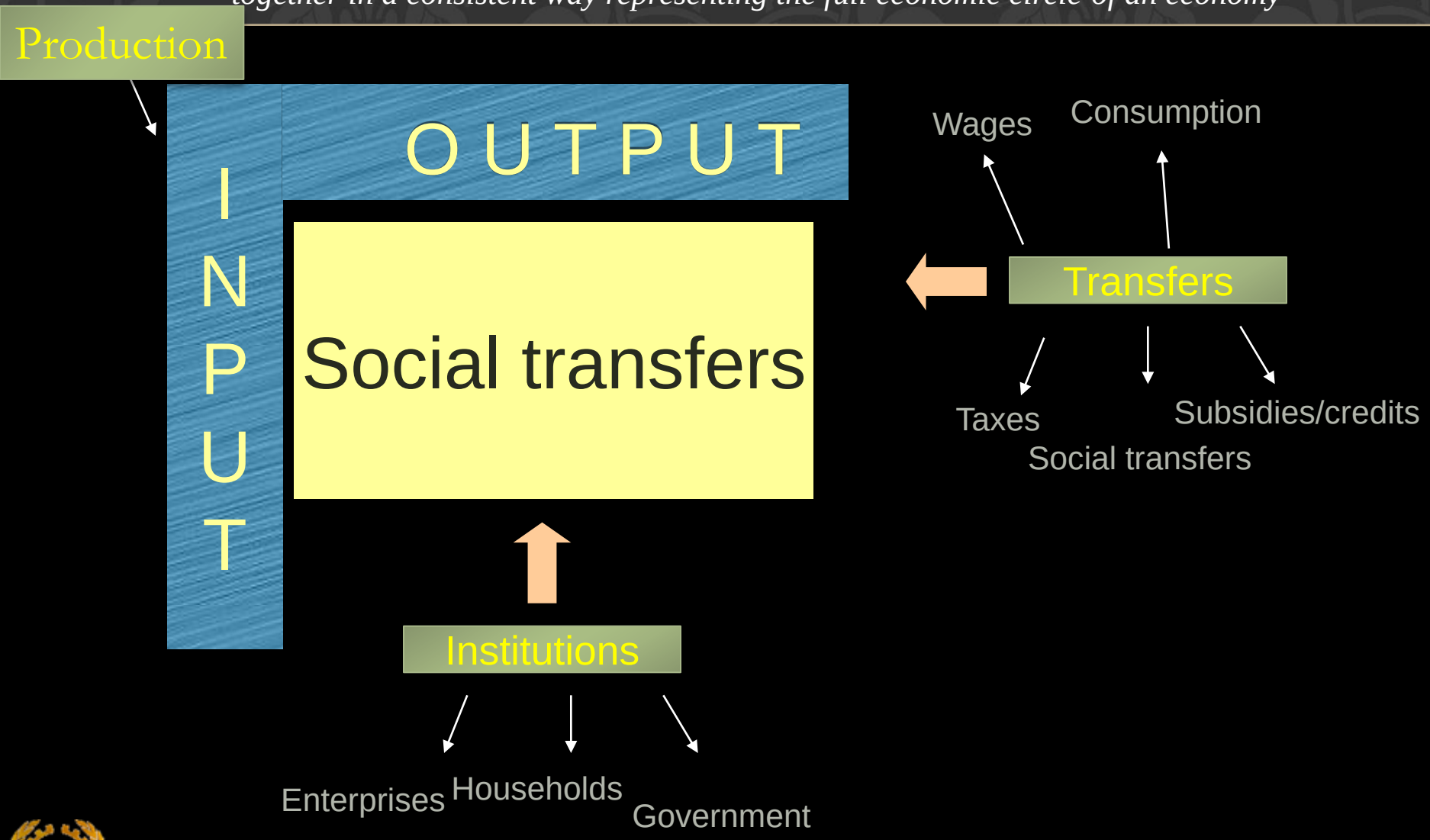
OUTPUT

INPUT

- Tables describing production – consumption circles of a nation, open-economy approach
- Input-output tables as a basis to calculate multipliers
- Calculation of direct, indirect and total employment impact
- Comparison of the effect of technology choices on employment and other macro variables
- Truncated economic circle, no feedback loops, no distribution, no inter-institutional transfers

2) Social Accounting Matrix (SAM)

Accounting framework, where major socio-economic datasets of an economy are brought together in a consistent way representing the full economic circle of an economy



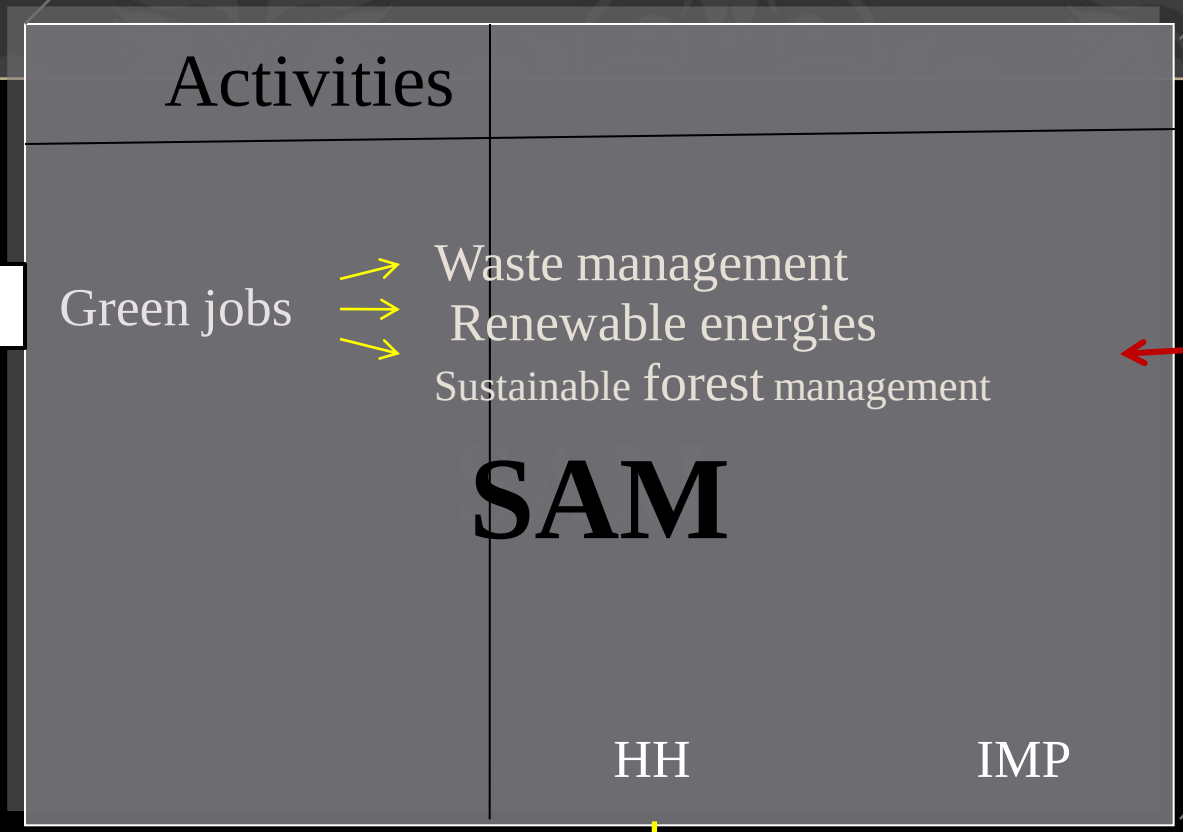
DYSAM

The term 'Dynamic SAM' (DySAM) describes an instrument based on an existing 'static' Social Accounting Matrix (SAM) for any economy and the available up-to-date time series of national accounts (SNA)

Time series of SAMs until recent year

(Green) DySAM

Time dimension
2005, 2006, 2007



Expansion

Monetary values

Real values

Employment satellite

Co2 emissions

Co2

Co2

WHY DYSAM?

Some static SAM assumptions are relaxed:

- Technology/behaviour is not fixed
- Price relatives change over time
- Dynamics generating the interdependent evolution of the economy evolution of backward and forward linkages
- The DySAM model exhibits behaviour, henceforth, is not an accounting multiplier model
- Lessens the need to calculate income elasticities
- More recent SAM available, when static SAM outdated

DYSAM SUMMARY

- The circular economic flow evolves over time, not a snapshot
- A measure/insight of the dynamics generating the interdependent evolution of the economy is available in the sequence of backward and forward linkages
- The DySAM model exhibits behaviour, henceforth, is not a pure accounting multiplier model

SKILL REQUIREMENTS FOR GREEN JOBS

Level of qualification	Type of question	Key questions	Methodology
Jobs	Quantitative	Direct jobs	Green DySAM
	Quantitative	Indirect jobs	Green DySAM
	Quantitative	Induced jobs	Green DySAM
Occupations/skills	Qualitative	Type of occupation	Qualitative
	Qualitative	People in occupation	Green DySAM/quantitative
	Qualitative	Skills&competences	Qualitative
Training & education	Quantitative	Skills availability	Quant.&qualit.
	Qualitative	Training&education	Qualitative

Data & techn. requir

INPUT-OUTPUT

+ Social transfers of /between economic actors: Government, Enterprises, Households --- **full socio-economic circle**
+ Satellite accounts: Employment, Environment

SAM

+ Time dimension (incl. up-dating years)
+ Simple economic modelling

DYSAM

ACCURACY

AN EXAMPLE OF SAM APPLICATION: PUBLIC SPENDING

1 billion of monetary unit can be invested (direct, subsidies, tax exemptions) either on:

1. Waste management
2. Organic farming
3. Green garment industry

	Activities	Commodities	Factor of production	Institutions: Government (Ministry of .)	Investment	Rest of world	Total
Activities							
Commodities e.g. organic farming							
Factors of production							
Institutions							
Investment							
Rest of world							
Total							

EMPLOYMENT ACCOUNT AFTER SIMULATION (INCL. MULTIPLIERS)

		Waste management	Organic farming	Garment
Rural	Male	16	15	8
	Female	4	25	12
	Total	20	40	20
Urban	Male	4	7	10
	Female	6	3	20
	Total	10	10	30
16-29 years		20	25	30
> 29 years		10	25	20
Total		30	50	50

OR THE OTHER WAY AROUND: CALCULATING BACK FROM TARGET

		Scenario?
rural	male	
	female	
	total	
urban	male	
	female	
	total	
16-29 years		1 Million
Over 29 years		
Total		

	Billion Unit
Waste management	1.5
Organic farming	1.3
Garment industry	1.7

What is the most (cost-) effective and environmentally sound public spending to create 1 million jobs for youth?

LOW CO2 EMISSION STRATEGY

Sector	Agriculture	Forestry	Textile	Chemical	Automobile	Construction
Emission	3.4	4.3	12.1	14.2	16.8	8.9

Objective: Lower Co2 to 50.0 (current value 59.7)

Strategy: Reconcile Co2 reduction with socio-economic goals

Sector	Economic Xer	Income Xer	EmpXer	Weighted EmpXer
Agriculture	2.7	2.8	2.5	150
Forestry	2.1	2.4	2.2	130
Textile	1.9	1.7	1.8	270
Chemical	1.5	0.9	1.1	80
Automobile	1.8	1.2	1.3	350
Construction	2.5	2.4	2.4	310

COUNTRY ILLUSTRATIONS

Social Accounting Matrix for Brazilian Amazonia forestry sector

Brazil Macro SAM 2005 (in million of R$ -Reais)

	Activities	Products	Labor	Capital	Households	Taxes	Government	Capital Account	Rest of Brazil	ROW	Total
	30	35	5	1	5	7	1	2			
Activities	0	290'719	0	0	0	0	0	0	0	0	290'719
Products	136'810	0	0	0	85'961	0	33'541	34'267	58'425	37'866	386'870
Labor	88'509	0	0	0	0	0	0	0	0	0	88'509
Capital	53'901	0	0	0	0	0	0	0	0	0	53'901
Households	0	0	88'509	53'901	1'595	0	7'508	0	0	0	151'513
Taxes	11'499	777	0	0	35'439	0	0	2'146	0	1'967	51'828
Government	0	0	0	0	0	51'829	28	0	0	0	51'857
Capital Account	0	0	0	0	28'518	0	10'780	627	14'777	-17'662	37'040
Rest of Brazil	0	73'202	0	0	0	0	0	0	0	0	73'202
ROW	0	22'171	0	0	0	0	0	0	0	0	22'171
Total	290'719	386'869	88'509	53'901	151'513	51'829	51'857	37'040	73'202	22'171	1'207'610

The SAM for Amazonia distinguishes among 5 classes of labor according to their level of wage and 5 classes of household according to their level of income

Source: Bento de Souza Ferreira Filho, 2010. *Matriz de Contabilidade Social do Setor Florestal Brasileiro.*

Goal: Find other income sources/employment avoiding activities leading to deforestation

Activity	SAM Multipliers		
	Production	Income	Employment
Extraction of wood	2,00	1,31	122
Extraction of charcoal	2,01	1,28	58
Extraction of rubber	2,02	1,33	718
Extraction of Brazil nut	2,00	1,16	249
Extraction of acai berry	2,02	1,16	157

- An increase of R$ 1 million in the final demand for extraction of wood in Amazonia, would increase the value of the regional production in R$ 2 million, due to both direct and induced effects on the final demand of the other sectors of the economy.

- An increase of R$ 1 million in the final demand for extraction of wood in Amazonia would generate an increase of 122 new jobs in the regional economy.

Source: Bento de Souza Ferreira Filho, 2010. *Matriz de Contabilidade Social do Setor Florestal Brasileiro.*

ETHANOL PRODUCTION IN BRAZIL (SAM 2004)

Primary: Sugar cane high and low technology

Processing: Ethanol and sugar for food

* Sugar cane low technology has produced less (19.4% to 80.6%), but is more labour intensive (0.83 to 0.61), contributes to less wage (24.7% to 75.3%), concentrated in less qualified workers (62.1 % in group 1 and 2)

* Ethanol produces 2.5 times less than sugar for food, generates 4.8 times less income, is less labour-intensive and requires more qualified workforce

*Primary and processing generate about the same income, but processing more for qualified workers

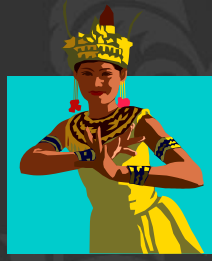
MOZAMBIQUE: DEFORESTATION AND EMPLOYMENT

- Analysis of Co^2 emissions: Households = strongest emitters of Co^2 (76 %) through the consumption of solid biomass - firewood
- Proposed strategy to reconcile environmental and employment issues:

1) Sustainable forest management
2) Installation of solar panels:

To 1)Reduce CO^2 emissions by reversing deforestation & create new jobs for low skilled: labour intensive & high income effect
To 2)Replace solid biomass consumption with solar energy, thus creating jobs for low skilled and skilled workers: higher economic multiplier

- **Environment:** Less vulnerable to natural disasters, less Co^2 emission
- **Socio-economic**: New sources of income & employment, more Inclusive and pro-poor growth



GREEN DYSAM IN INDONESIA

Definition and identification of green sectors/jobs, sectoral disaggregation

Crops : "crops2" and "organic crops"

OthAg : "OthAg2" and "sustainable plantations"

Forestry: "Forestry2", "Non-timber forest products", Sustainable Forestry Management", "Forest services"

Fishery: "Fishery2", "Sustainable fishing" and "seaweed farming"

Wood: "wood2" and "bamboo and rattan"

RestManu: "restmanu2" and "recycling"

ElecGasWater: "ElecGasWater2" and "Renewables"

Irrigation

ConstRest: "ConstrRest2" and "Green construction"

LandTransportServices: "LandtrpServ2" and "GreenTransport"

Expansion on tested dynamic SAM: Green DySAM- Green DySAM model/multiplier analysis

Issue: Green economy and climate change: adaptation and mitigation (REDD PLUS)

New: -Inclusion of job destruction due to adaptation/mitigation measures to climate change

- Extension: Co2 emission satellite account

Later on, sectoral studies (e.g. forestry , eco-tourissm) and skills need assessment

DATA REQUIREMENTS

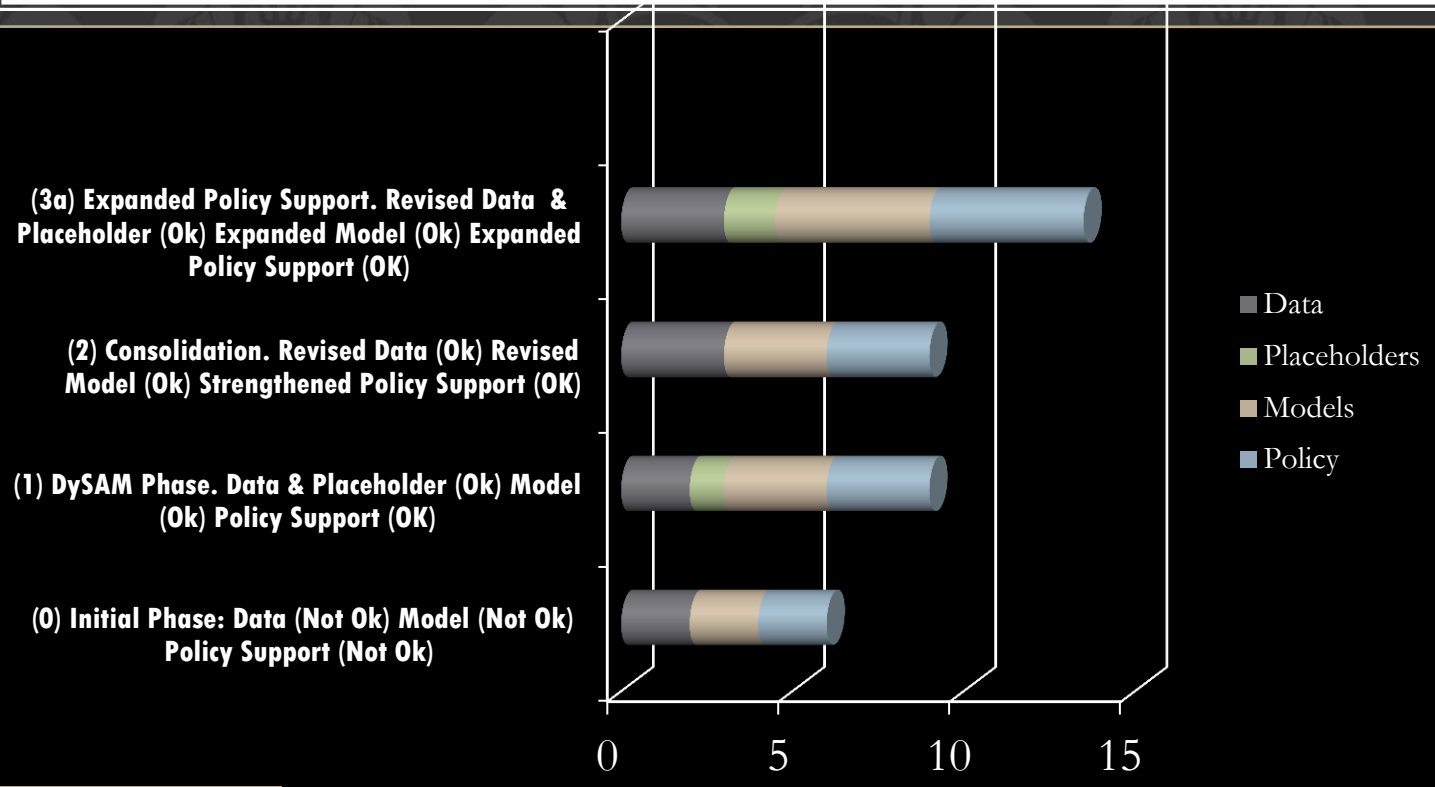
Data sets needed;

- Supply-Use Table/Input-Output Table, existing SAM
- Systems of National Accounts (SNA)
- Flow of Funds (FoF)
- Balance of Payment (BoP)
- Household Surveys (HS)
- Labour Force Survey (LFS)
- Co2 emissions (sector, households, imports)
- New green sectors: placeholder values or create data through sample surveys

Data requirements:

- Time series at least for some datasets (SNA, LFS)
- Consistency checking and creating through balancing mechanisms
- Sensitivity analysis (« constructed data can replicate the past »)

RECOMMENDED PROGRESSION: DYSAM CONSTRUCTION



The initial data is most likely to reveal inconsistencies on the real-side and financial sides as well as between macro and disaggregated measures and is therefore not ready for economy-wide modelling and policy support

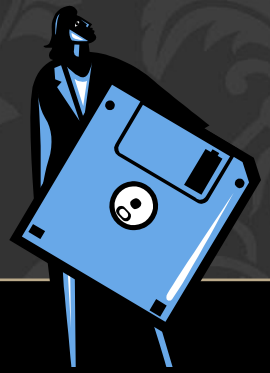
Correcting data inconsistencies using place-holders creates the conditions to estimate a sequence of SAMs (called DySAM) which measure the evolution of the economy. On this data a SAM model is built for each year to develop policy insights subject to the properties of SAM models

The consolidation phase is one of re-validation of placeholders and ALL related data ; it is strongly recommended before the phase of expanded models and policy support

The expanded policy support phase will always require expanded models to examine policy issues beyond the purview of SAM models.

KEY ASPECTS FOR DYSAM CONSTRUCTION

- **One-stop shop**: One national counterpart, familiar with SAM, who centralizes data demand from international consultants and collects required data among government institutions (Statistical Office, Central Bank, etc.)
- **Commitment by national institutions** in providing data timely and in discussing data problems
- **Data checking for consistency** by international consultants, with the support of national counterparts
- **Filling data gaps**: new « green » sectors
- **National agreement on green (jobs) sectors** before starting DySAM expansion
- General national **agreement on policies** to be simulated with DySAM, prior to the construction of the DySAM



KEY ASPECTS FOR DYSAM CAPACITY- BUILDING

Objective: Form a critical mass of national staff of which:

1. Some will be able to independently up-date and adjust a DySAM
2. Some will be able to train others in the use of DySAM (local trainers, incl. from national universities)
3. And others are able to use the DySAM for policy simulations
4. Key policy makers will have a basic understanding of DySAM and will know for which purposes to use it

What matters:

1. Initial training phase, but also continuous training after project end
2. Involvement of academia
3. Selection and identification process of appropriate candidates for training courses
4. Commitment to training: participants, their supervisors and institutions

CONCLUSION

(Dy)SAM helpful analytical tool for policy advice on green economy:

TRANSPARENCY-SIMPLICITY-REALITY

Special **environmental considerations** within SAM (expansion, disagregation, green sectors) and in satellite account (Co2 emissions, water, land use, etc.)

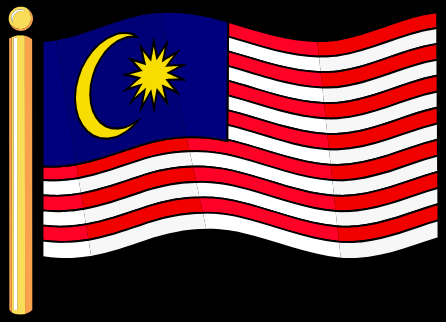
Inclusion of **technology choices, sectoral analysis**

Flexible tool with modular approach: Central/Provincial level, employment, Co2, emission, land degradation, etc.

Allows **targeting** of specific groups (e.g. unskilled rural workers) or indicators (e.g. MDG, Co2 emissions)

Shows the interactions and **interdependencies between economic, social and environmental variables** using recent data (up-dating)

Tool for **Social Dialogue** and communication/cooperation among different decision-makers



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