International Institute for Applied Systems Analysis
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science for global insight

SEVENTH FRAMEWORK PROGRAMME

GLOBAL IQ
IMPACT QUANTIFICATION OF GLOBAL CHANGES

WP3: Harmonization & IIASA Model Developments

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GLOBAL-IQ Progress Meeting

10-12 October, Prague

EUROPEAN COMMISSION
European Research Area

Task 3.1 Harmonization of G-IQ Models

- Objectives:
  - Alignment of models' assumptions on exogenous trends preserving model-specific structures
  - Maximize exchange of information among models – e.g. by soft-links – to produce consistent and accurate impact estimates & adaptation options in WP4 & WP5

Task 3.1 Harmonization of G-IQ Models II

- Steps:
  1. Analyze sector coverage, models and possibilities for information exchange
  2. Collection of driver information from all models (harmonization of outputs, units, …, align assumptions on exogenous variables, exchange of endogenous variables)
  3. Harmonization strategy

Task 3.1 Harmonization of G-IQ Models III

	Agriculture & forestry	Water, energy, fuels availability, energy security	Transport, infrastructure, tourism	Competition labor market, international trade, financial stability	Population, health, migration
WITCH		X	X		
GLOBIOM	X	X			
MagPIE	X	X			
ICE				X	X
ICES					
REMIND		X	X	X	

Task 3.1 Harmonization of G-IQ Models IV

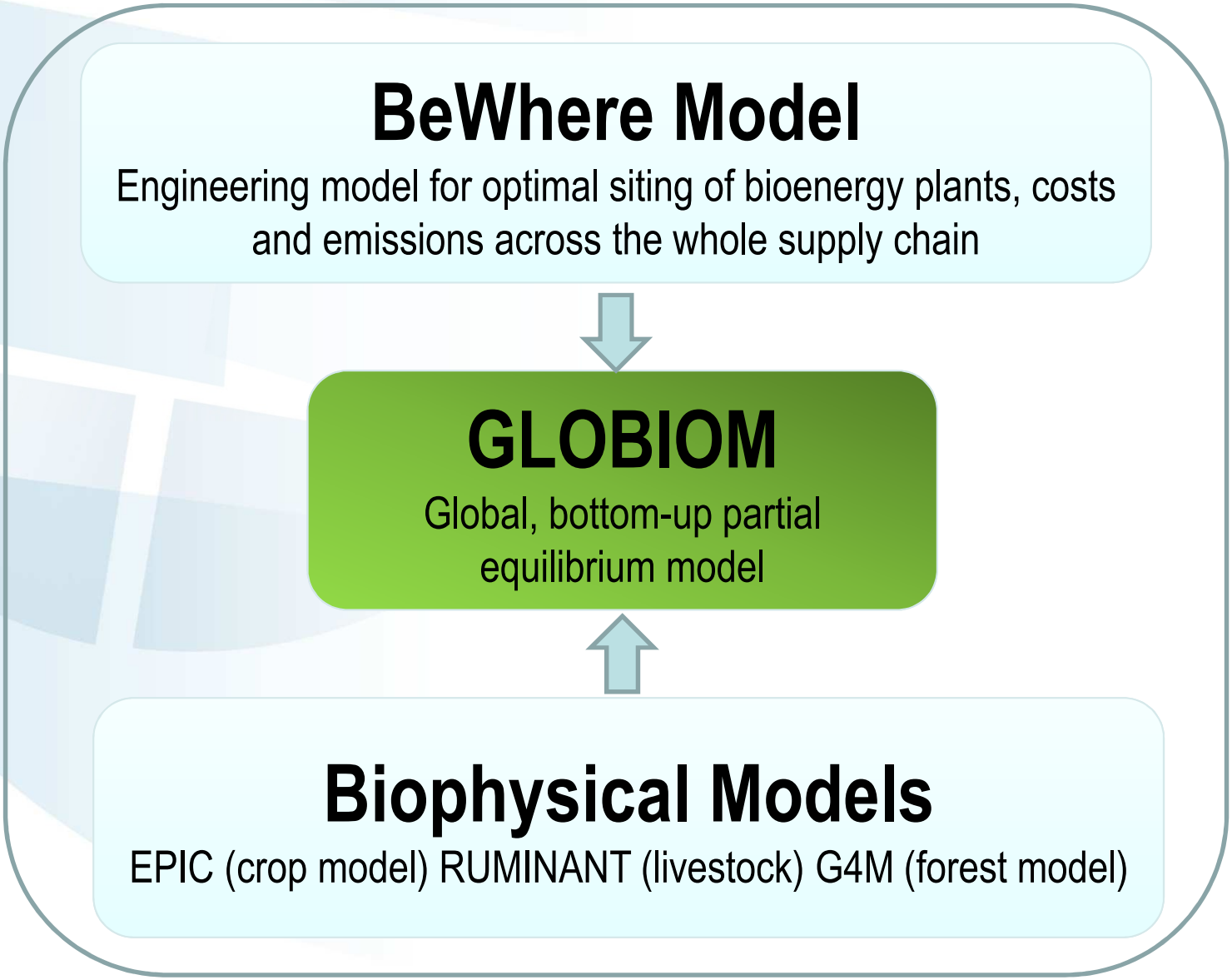
I/O Model Template for GLOBAL-IQ Models

Model	GLOBIOM			WITCH			ICE			REMIND			MagPIE			ICES		
Variables	*units*	*I/O*	*descr.*	*units*	*I/O*	*descr.*	*units*	*I/O*	*descr.*	*units*	*I/O*	*descr.*	*units*	*I/O*	*descr.*	*units*	*I/O*	*descr.*
Population	Heads	exog.	can be aligned with other models	Heads	exog.	can be taken from db, to be aligned with other models				Heads	exog.	can be aligned	10^6 Heads	exog.	can be aligned with other models	units and rates of growth	Exog. (I)	defined for the regions of the model
GDP	$2,000	exog.	can be aligned with other models	USD 2005	end.		USD 2007 (can be rebased)	input/output	can be projected to fit baselines	$2000 MER	(input), output	path can be influenced via labor efficiency growth	US$	exog.	can be aligned with other models	2004 $ Millions	Endog. (O)	defined for the regions of the model. Can be forced to replicate given BAU scenarios
Productivity	tons/ha	exog./ endog.	via crop yield improvements	% change of gdp/cap	endogenous/ exogenous		range of productivity coefficeints by sector/inouts/region	exogenous/endogenous	TFP, specific factor productivity, input efficiency, transport/trade efficiency	-	input	factor productivity for production factors in CES nest	ton/ha	exog.	from LPJmL. Available CCS	Rate of change	Exog. (I)	Mny productivity factors are considered. Total, industry and factor specific
Energy demand	GJ	exog.	Various biofuel and bioenergy demand projections POLES, WEO,...	EJ	end.		Value of energy purchased by sectors	Endog. (O)	Specified by region and industry	EJ	output	primary, secondary, final energy demand	10^6 GJ per year	exog.	Projection from REMIND; also soft coupled with REMINED	Value of energy purchased by sectors	Endog. (O)	Specified by region and industry
CO2 emissions	CO2eq	output	from land use sector, not only CO2, but also non-CO2, e.g. methane		end.	from LULUCF exogenous in bau, endogenous in climate policy	Mt CO2eq	endo.	CO2 (can map to other satellite accounts as well)	GtC	output	from energy sector and landuse, also other GHGs	Mt CO2eq	endo.	CO2, N2O, CH4	Co2 eq.	Endog. (O)	Specified by region and industry, non-CO2: CH4, N2O, PFCs, HFCs, and SF6

Task 3.1 Harmonization of G-IQ Models V

- Three-pronged approach to harmonization:
  1. Sharing assumptions on basic model drivers such as GDP and population by (a) choosing common socio-economic pathways (WP1), (b) considering to absorb some drivers from those models, in which they are exogenous.
  2. Indirect harmonization by moving models as closely as possible to storylines formulated in collaboration with WP1 with targeted model adjustments.
  3. Soft-linking of models

Task 3.2 Developments IIASA Models



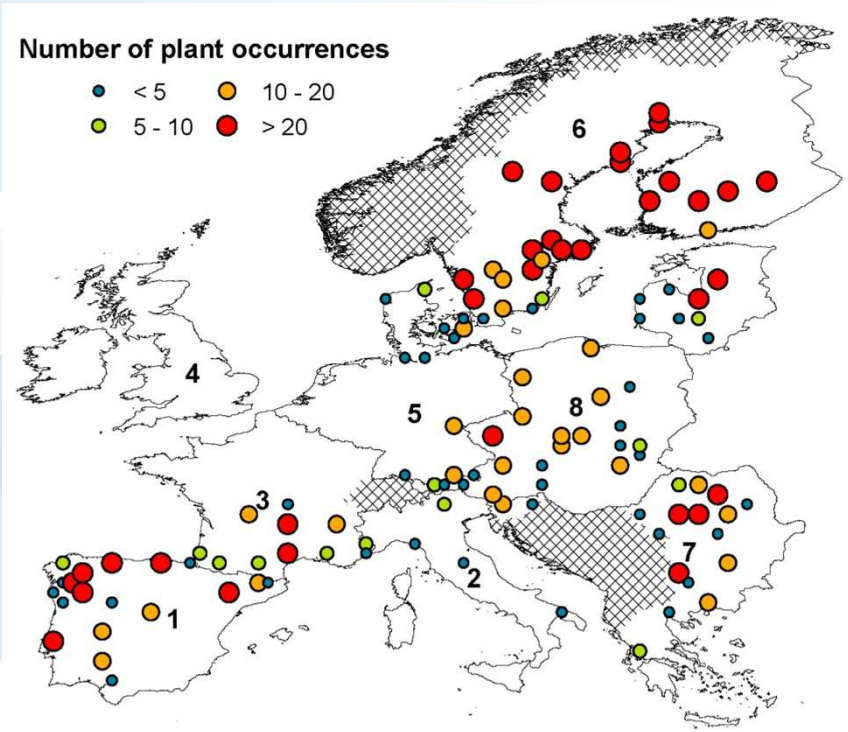
Task 3.2 Developments IIASA Models II

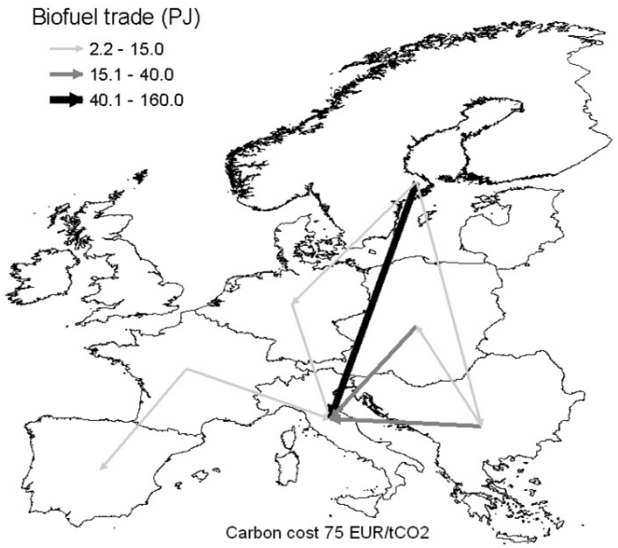
- BEWHERE extensions:
  - Implementation at the European level
  - Inclusion of different feedstocks: lignocellulosic biomass (e.g. forestry residues, crop residues, household waste)
  - Multi-commodity production: heat, power, biofuels
  - Expansion of technologies: gasification, hydrolysis and fermentation, combustion

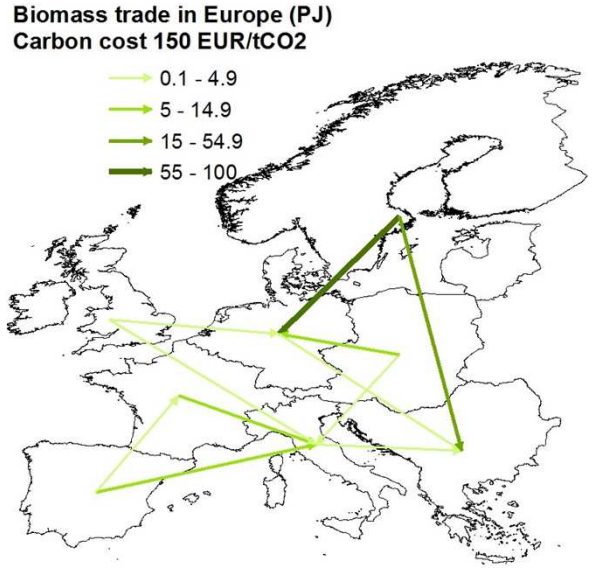
Task 3.2 Developments IIASA Models III

- BEWHERE cont'd:
  - Trade of feedstock and biofuel between different countries based on transportation cost.
  - Ready for linkage with the EU-GLOBIOM
    - BEWHERE-GLOBIOM linkage will first be tested at EU level (work in progress).

Example results – EU



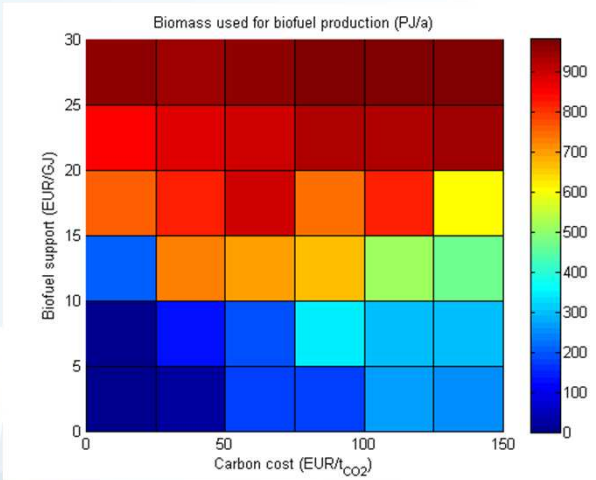




Biofuel Support vs Carbon Cost

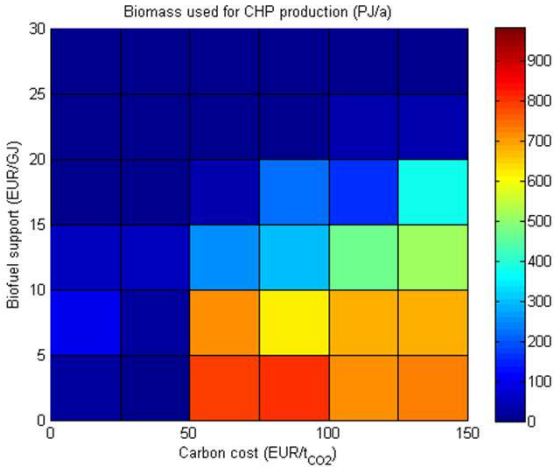
Biomass used (PJ/a)

Biofuel support



Biofuel

Biofuel support



CHP

Task 3.2 Developments IIASA Models IV

- BEWHERE cont'd:
  - Global BeWhere:
    - new version of EU-BeWhere under development based on country-specific experience (e.g. simplified transport matrix, better pre-selection of optimal location of production plants)
    - expected to be operational by summer 2013
  - Household-based energy demand from WP2 (tbd)

Task 3.2 Developments IIASA Models V

- GLOBIOM:
  - Soft-link GLOBIOM-WITCH
    - Major steps with decision to go **beyond** soft-linking
    - 3 dimensional look-up table: CO2 price, biomass for bioenergy price, year.
    - First version of a look-up table passed from GLOBIOM to WITCH to allow for integration in WITCH

Task 3.2 Developments IIASA Models VI

- GLOBIOM:
  - Improvement GLOBIOM-EPIC link
    - Climate change
    - Managements
  - Better representation of water
    - New hiring – work in progress

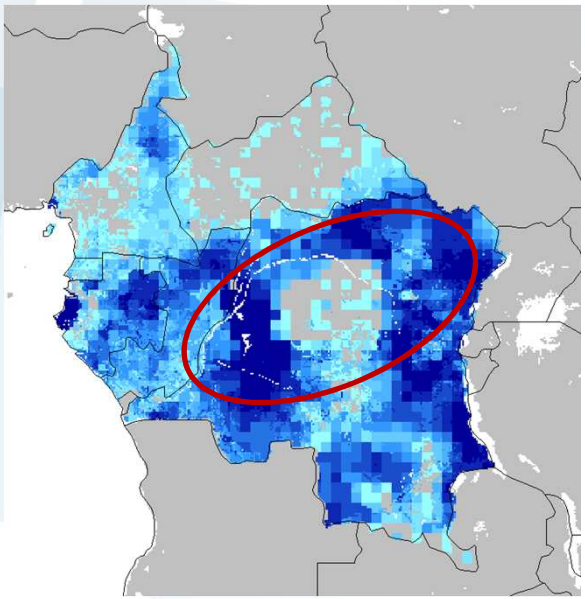
Task 3.2 Developments IIASA Models VII

- GLOBIOM:
  - Better representation of infrastructure and trade
    - Good progress on improvement of transport cost in GLOBIOM
    - Impacts of improved infrastructure on e.g. deforestation
  - Future work: comparison with other models LPJmL/MagPIE & sensitivity analysis (Task 3.3)

Impact of improved infrastructure on deforestation in the Congo Basin

- Infrastructure scenario : + 0.6 Mha deforested/year (x3)
  ⇒Deforestation in DRC dense forest

Transport cost difference (USD/Ton)



Deforestation due to cropland (1000 ha/year/SimU)