GLOBAL-IQ – Partners Meeting

Prague – 10-11&12 October 2012

WP1
Concepts and Scenarios of Global Challenges

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GLOBAL-IQ FOCUS

Global macro- drivers

Population

Affluence

Technology

Global concerns

Global warming

Non-renewable energy resources depletion

Environmental threats
(Land, water & natural resources depletion; loss of ecosystems services/biodiversity)

Global competition/ interdependence

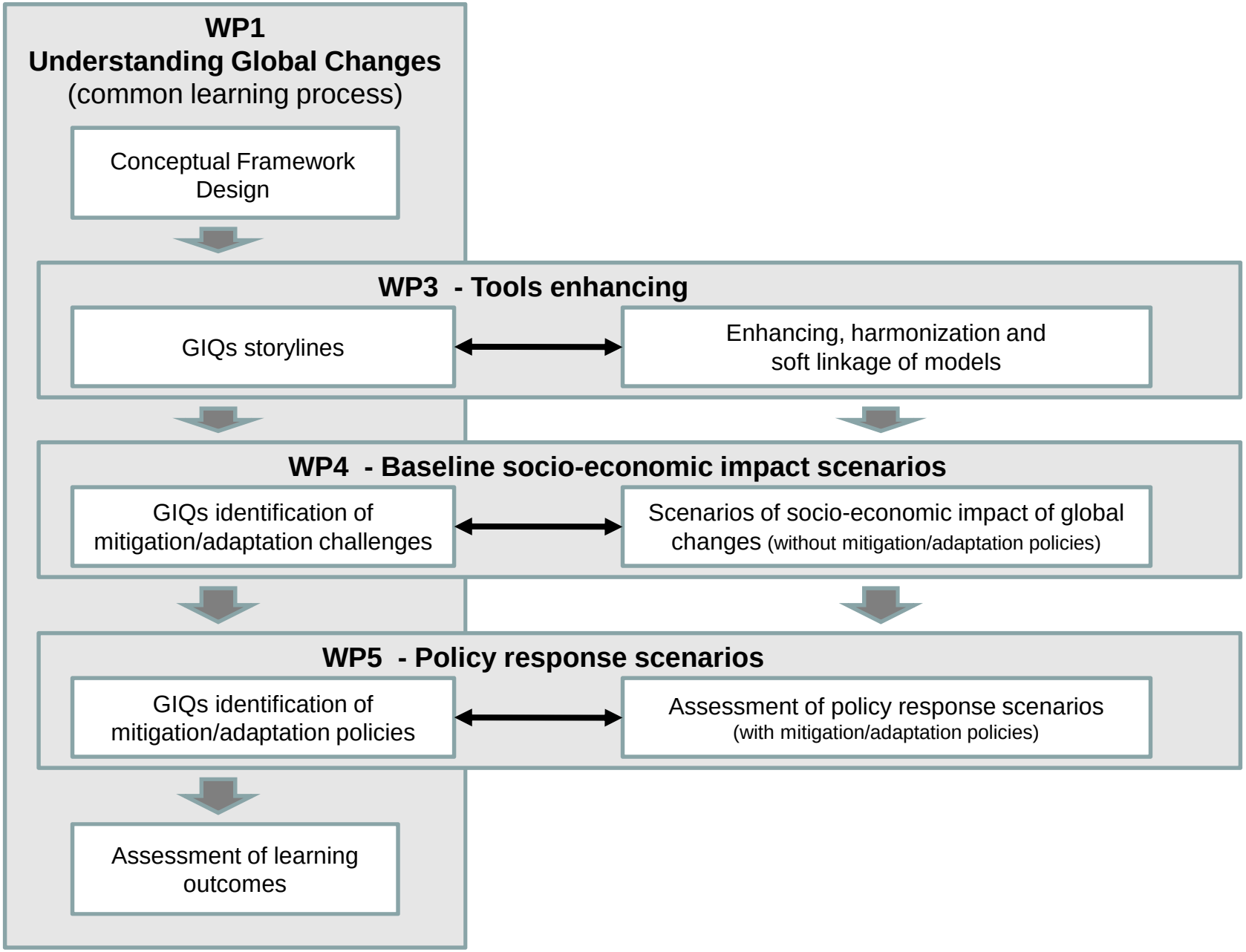
Global policy responses

Mitigation

Adaptation

Optimal mix
(depending on which scenario will unfold next)

GLOBAL-IQ FRAMEWORK – Process Overview



Key concepts/steps framing the GLOBAL-IQ scenario exercise

SSPs are used by all modelling teams to frame the uncertainty about future development of GHG emissions and relevant socio-economic factors (autonomous and policy-driven) ⇨ *Sensitivity Analysis*

Key steps:

1. Identify global challenges

1. Identify what the models can do to analyse which global changes

3. Built qualitative SSPs combining those changes into different storylines. Qualitative narratives are complemented with quantitative evolution of key variables driving model outputs

4 Frame 3 socio-economic impact scenarios by considering the SSP2 “middle of the road” scenarios and two variants with different mitigation and adaptation capabilities (e.g. SSP1 “sustainable development” and SSP5 “coal & gas growth”)

5. Analyze policy variants where specific strategies are implemented to contrast the negative effects of global changes

SHARED POLICY ASSUMPTIONS

		GLOBAL CHALLENGES				
		Global warming	Non-renewable energy resource depletion	Environmental threats	Global competition/ interdependence	
POLICY VARIABLES	Unrelated					Baseline Scenarios of socio-economic impacts of global change (WP4)
	Affected by					
	Affecting	• Mitigation • Adaptation	• Mitigation • Adaptation	• Mitigation • Adaptation	• Mitigation • Adaptation	Policy Response Scenarios (WP5)

Overview of the Global-IQ system (before Prague meeting)

	GLOBAL COMPETITION CHALLENGES	GLOBAL ENERGY CHALLENGES	GLOBAL ENVIRONMENTAL CHALLENGES	GLOBAL WARMING CHALLENGES
GLOBAL COMPETITION CHALLENGES	• *Shared Socioeconomic Pathpawys (SSPs) about population, growth, technology and market governance* • *Shared global competition policy assumptions (SPAs)*	Effects on global energy challenges	Effects on global environmental challenges	Effects on climate change
GLOBAL ENERGY CHALLENGES	Feedbacks of global energy to global competition challenges	• *Shared Socioeconomic Pathpawys (SSPs) about energy consumption, supply mix, technologies and markets* • *Shared global energy policy assumptions (SPAs)*	Effects on global environmental challenges	Effects on climate chenge
GLOBAL ENVIRONMENTAL CHALLENGES	Feedbacks of global environmental to global competition challenges	Feedbacks of global environmental to global energy challenges	• *Shared Socioeconomic Pathpawys (SSPs) about land use change, land productivity, ecological factors* • *Shared global environmental policy assumptions (SPAs)*	Effects on climate change
GLOBAL WARMING CHALLENGES	Feedbacks of global warming to global competition challenges	Feedbacks of global warming to global energy challenges	Feedbacks of global warming to global environmental challenges	• *Shared Socioeconomic Pathpawys (SSPs) about global mitigation and adaptation challenges* • *Shared global climate policy assumptions (SPAs)*

= Shared assumptions = Interactions

Overview of the Global-IQ system (after Prague meeting)

	GLOBAL DEMOGRAPHY CHALLENGES	GLOBAL COMPETITION CHALLENGES	GLOBAL ENERGY CHALLENGES	GLOBAL ENVIRONMENTAL CHALLENGES	GLOBAL WARMING CHALLENGES
GLOBAL DEMOGRAPHY CHALLENGES	•*Shared Socioeconomic Pathpawys (SSPs) about population growth, ageing, migration* • *Shared global competition policy assumptions (SPAs)*	Effects on global competition challenges	Effects on global energy challenges	Effects on global environmental challenges	Effects on climate change
GLOBAL COMPETITION CHALLENGES	Feedbacks of global competition to global demography challenges	• *Shared Socioeconomic Pathpawys (SSPs) about growth, productivity, trade and market governance* • *Shared global competition policy assumptions (SPAs)*	Effects on global energy challenges	Effects on global environmental challenges	Effects on climate change
GLOBAL ENERGY CHALLENGES	Feedbacks of global energy to global demography challenges	Feedbacks of global energy to global competition challenges	• *Shared Socioeconomic Pathpawys (SSPs) about fossil fuels availability, energy consumption, technologies and markets* • *Shared global energy policy assumptions (SPAs)*	Effects on global environmental challenges	Effects on climate chenge
GLOBAL ENVIRONMENTAL CHALLENGES	Feedbacks of global environmental to global demography challenges	Feedbacks of global environmental to global competition challenges	Feedbacks of global environmental to global energy challenges	• *Shared Socioeconomic Pathpawys (SSPs) about water availability, biofuels and land use changes* • *Shared global environmental policy assumptions (SPAs)*	Effects on climate change
GLOBAL WARMING CHALLENGES	Feedbacks of global warming to global demography challenges	Feedbacks of global warming to global competition challenges	Feedbacks of global warming to global energy challenges	Feedbacks of global warming to global environmental challenges	• *Shared Socioeconomic Pathpawys (SSPs) about mitigation and adaptation challenges* • *Shared global climate policy assumptions (SPAs)*

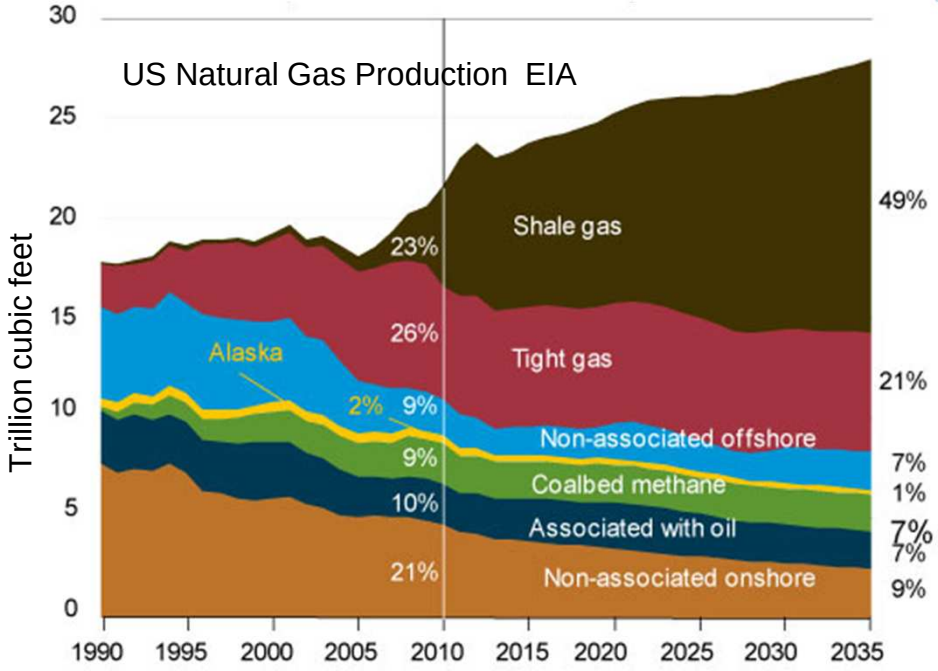
= Shared assumptions = Interactions

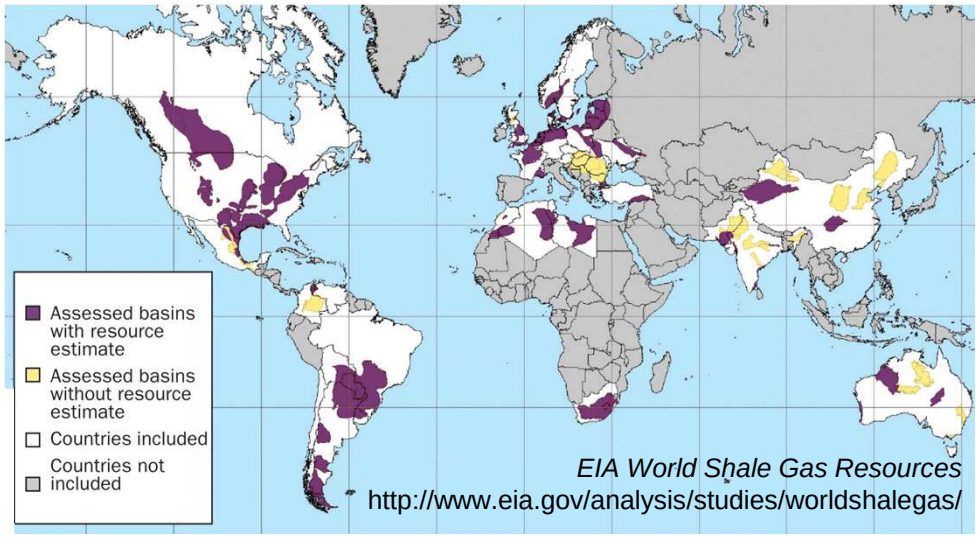
Shale Gas and Hydraulic Fracturing (Source: George Crabtree, University of Illinois at Chicago)

Abundant
Inexpensive

	$/MBTU
peak 05-08:	$12
non-peak 05-08:	$8
Jan 2012:	$2

Source: EIA





Potential Game Changer
carbon emissions
energy security
diversity of sources and uses

Hydraulic Fracturing Science Challenges (*Source:* George Crabtree, University of Illinois at Chicago)

Operation

Distant horizontal drilling into thin shale layers

Local explosions fracture rock

High pressure hydraulic fluid opens fissures

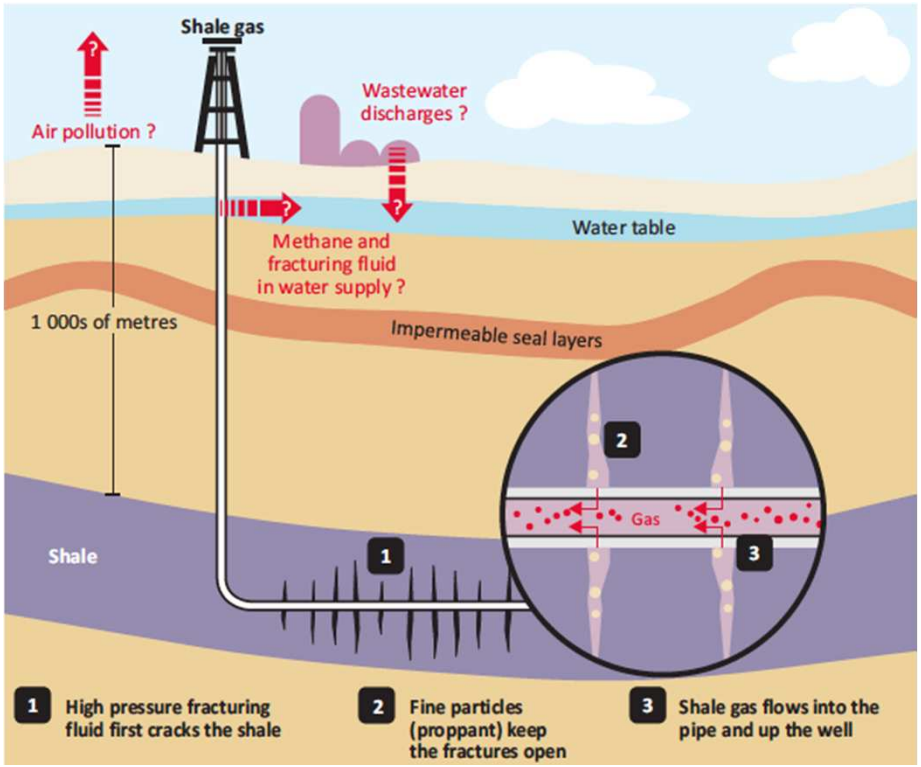
Sand driven into fissures to prop open

Gas and oil flow out

Challenges

Flow of fluids in mesoporous rock

- contamination of water, air
- initial rush of gas
- sharp decline in first year
- only 15% of shale gas recovered



Source: Rachel Ehrenberg, Science News 182, 20 (2012)

Understand fissure mechanics, pore formation, fluid flow in fractured rock