



Project No 282846

LIMITS

**Low climate IMpact scenarios and the Implications of required Tight
emission control Strategies**

FP7-Cooperation-ENV

Collaborative project

Small or medium-scale focused research project

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Project presentation - brochure, fact sheet, and .ppt

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PP	Restricted to other programme participants (including the Commission Services)	
RE	Restricted to a group specified by the consortium (including the Commission Services)	
CO	Confidential, only for members of the consortium (including the Commission Services)	

Project presentation - brochure, fact sheet, and .ppt

Name of all participants to the redaction of the report ^a

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ASSOCIATED RESEARCH ORGANISATIONS



Battelle
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www.pnnl.gov



National Institute for Environmental Studies (NIES), Japan
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LIMITS

LOW
CLIMATE
IMPACT
SCENARIOS
AND THE
IMPLICATIONS
OF REQUIRED
TIGHT
EMISSION
CONTROL
STRATEGIES

THE CHALLENGE

Implementing an effective response to climate change is a tremendous challenge, especially when dealing with stringent objectives such as those compatible with the 2°C target.

Such a transformation would require a fundamental restructuring of the way energy and land are managed, which would not be costless and would require unparalleled policy commitment and coordination. Putting a climate strategy into action will require the involvement of all the major economies, which account for most of the emissions and host the largest mitigation capacity.

Research can highlight a series of critical questions which are especially relevant for climate policy making and which will be the cornerstone of the LIMITS project:

- What is the economic, technical and political feasibility of attaining stringent climate policies ?
- How can we jump start investments and innovation into clean energy technologies?
- What is the role of policies in promoting mitigation and adaptation, recognizing the diversity of regional and national interests?
- What is the role of technologies and their advancements to meet the change in energy infrastructure?

By using state-of-the-art methodological instruments to assess climate policies, LIMITS aims at carrying out a rigorous assessment of what a stringent climate policy entails, and what is needed to overcome major impediments.

LIMITS

Low climate **IM** pact scenarios and the Implications of required **T**ight emission control **S**trategies

LIMITS' main objective is to provide an assessment of the emissions reductions strategies at the level of the world and the major global economies, and to assess their implementation in terms of:

- Defining the feasibility of low carbon scenarios and the associated emission reduction pathways according to different assumptions about technology availability, policy regimes, implementation obstacles, and level of commitment at the regional level
- Assessing the investment requirements to implement these transformation pathways and the financing mechanisms such that these resources can be best raised and allocated. Evaluating the national and international policies which are needed to ensure that the transition to a low carbon energy infrastructure is attained efficiently, given specific obstacles in the respective economies
- Quantifying the changes in the energy infrastructure and land use which major economies would need to implement to attain stringent climate policies, and assessing the feasibility and risks of such changes
- Evaluating the linkages of climate policies with other pressing social and environmental issues such as energy security, air pollution and economic development

PROJECT STRUCTURE

LIMITS is a 3-year research project (starting in October 2011), with ten partners from Europe, China, India, and collaborators from the US and Japan. The project brings together experts in several different domains which include integrated assessment modelling, energy system analysis, finance, economic development, land use and agriculture. Many of the researchers involved in the project are also authors of the IPCC for the 5th assessment report.

LIMITS is articulated in 7 main workpackages and aims at carrying out and disseminating original and innovative research in the field of climate and energy policies.

Several meetings will be held in Italy, Austria, Germany, the Netherlands, China and Belgium. Key stakeholders from both private and public sectors, covering a wide range of expertise, will be involved throughout the project, and especially in 3 dedicated workshops.

主要研究机构



Eni Enrico Mattei 基金会 (FEEM) - 意大利
www.feem.it



国际应用系统分析研究所 (IIASA) - 奥地利
www.iiasa.ac.at



Potsdam 气候影响研究所 (PIK) - 德国
www.pik-potsdam.de



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www.lse.ac.uk



荷兰能源研究中心 (ECN) - 荷兰
www.ecn.nl



欧盟环境与可持续联合研究中心 (JRC-IES) - 意大利
ies.jrc.ec.europa.eu



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合作研究组织



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低气候影响情景以及对强化碳排放约束策略的影响

面临的挑战

采取有效的措施以应对气候变化是一项巨大的挑战，尤其当面临强化减排目标，如与2° C 相兼容的目标等。

这种转型需要对能源和土地的利用管理做出根本性变革，这种变革的代价必须在可承受范围内，并且需要有一系列政策协调相配合。推动气候政策的实施，需要全球主要经济体都行动起来，因为它们是最大的排放国，也具有最强的减排能力。

该研究将回答如下关键问题，它们与气候政策的制定密切相关。LIMITS项目将构筑在这些问题之上：

- 有哪些经济，技术和政治条件将影响强化减排目标的可行性？
- 我们该如何利用投资与创新，以发展清洁能源技术？
- 在承认地区与国家利益多样性的事实基础上，政策将扮演何种角色以促进适应与减缓气候变化？
- 技术及技术进步将扮演何种角色，以利于能源基础设施建设的变革？

通过综合使用现有的方法与工具，LIMITS旨在对强化的气候政策作出评估，并评估相关策略以克服行动障碍。

LIMITS

低气候影响情景以及对强化碳排放约束策略的影响

LIMITS主要宗旨在于为减排策略提供全球层面和主要经济体层面的评估，并达到如下目标：

- 在不同的技术条件、政策框架、实施障碍的假设下确认不同低碳情景的可行性，及与之相关的减排路径，并评估主要经济体的地区减排义务。
- 评估投资需求，以更好地获取与分配转型所需的资金支持。评估国家与国际政策以保证（研究中的）各国在特定的实施障碍下有效地向低碳能源基础设施转型。
- 就主要经济体为达到强化气候目标所应作出的，在能源基础设施与土地利用方面的变化做出量化，并评估各项变化的风险与可行性。
- 评估气候政策与其他社会环境问题的联系，如能源安全，大气污染和经济发展等。

项目实施计划

LIMITS是一个三年的研究项目（始于2011年10月）。主要合作者来自欧洲，中国与印度；其他合作者来自美国与日本。

项目汇集了来自包括综合评价建模，能源系统分析，金融，经济发展，农业与土地利用等各领域的专家。许多项目研究者也为IPCC第五次评估报告的作者。

LIMITS包含七个主要的单元工作包，旨在进行与推广在气候与能源政策领域的原创性与创新性研究。

一系列项目与利益相关者会议预计将在意大利，奥地利，德国，荷兰，中国和比利时召开。来自私人与公共部门的主要利益相关者，包括各领域专家将全程参与项目，尤其将参加三个与项目有关的研讨会。

LIMITS

AT A GLANCE

Title: Low climate IMpact scenarios and the Implications of required Tight emission control Strategies

Instrument: SP I-Cooperation

FPx, Funding Scheme: FP7-Cooperation-ENV, Collaborative project

Total Cost: 4,462,878.50 €

EC Contribution: 3,462,863.00 €

Duration: 36 months

Start Date: 1st October 2011

Consortium: 10 partners from Europe, China, India, and collaborators from the US and Japan.

Project Coordinator: Fondazione Eni Enrico Mattei – FEEM (Italy)

Project Web Site: <http://www.feem-project.net/limits/>

Key Words: Climate mitigation and adaptation policy, Integrated assessment models, Energy infrastructure, Energy Security, Land Use, Air pollution, Climate finance, Sustainable Development

THE CHALLENGE

LIMITS' challenge is to highlight questions especially relevant for climate policy making:

- What is the economic, technical and political feasibility of attaining stringent climate policies?
- How can we jump start investments and innovation into clean energy technologies?
- What is the role of policies in promoting mitigation and adaptation, recognizing the diversity of regional and national interests?
- What is the role of technologies and their advancements to meet the change in energy infrastructure?

By using state-of-the-art methodological instruments, LIMITS aims at carrying out a rigorous assessment of what a stringent climate policy entails and what is needed to overcome major impediments

PROJECT OBJECTIVES

LIMITS' intends to provide an assessment of the emissions reductions strategies at the level of the world and the major global economies, assessing their implementation in terms of:

- Defining the feasibility of low carbon scenarios and the associated emission reduction pathways according to different assumptions about technology availability, policy regimes, implementation obstacles, and regional level of commitment
- Assessing the investment requirements to implement these transformation pathways and the financing mechanisms such that these resources can be best raised and allocated. Evaluating the national and international policies needed to ensure that the



transition to a low carbon energy infrastructure is attained efficiently

- Quantifying the changes in the energy infrastructure and land use which major economies would need to implement to attain stringent climate policies, and assessing the feasibility and risks of such changes
- Evaluating the linkages of climate policies with other pressing social and environmental issues (i.e. energy security, air pollution, economic development)

METHODOLOGY

LIMITS takes advantage of the best methodological instruments to assess climate policies, whose analysis will interact with policy evaluation.

Key global integrated assessment models will run climate mitigation and adaptation scenarios under new conditions and constraints, and the policy implications will be thoroughly evaluated. 13 models will be used throughout the project covering a wide range of different aspects. Using these models, LIMITS will explore the implications and uncertainties in reaching a 2°C target under different assumptions regarding the remaining leeway for greenhouse gas emissions, technology availability, the participation of different regions in international climate policy, and implementation obstacles.

The input on local knowledge on the major economies is provided by local partners in China

and India, but also in the USA (PNNL) and Japan (NIES) through external collaborations, and thanks to the interaction with key local experts and stakeholders.

In addition, a strong dissemination and communication component aims to disseminate the policy implications of the project results.

EXPECTED RESULTS

The LIMITS project aims at generating original insight into how 2°C compatible targets can be really made implementable:

- The technological challenge of achieving a low carbon world. The outcome of the scenario work and the regional infrastructural change will provide a novel view of the physical challenge of transitioning to a low carbon world
- Climate finance. The project is meant to advance the status of knowledge on the issue of how to finance the low carbon transition
- Local versus global policy instruments: the project will advance our understanding of the interplay of climate and energy policies at different geographical scales
- Multidimensional analysis of climate change with specific assessments on the relation between climate and other (health, security, development) policies
- Will provide original research on the potential role of negative emissions technologies (such as biomass burning with CCS) on the timing and actions involved in meeting stringent climate policies

PROJECT PARTNERS	
Fondazione Eni Enrico Mattei (FEEM)	IT
Internationales Institut für Angewandte Systemanalyse (IIASA)	AT
Potsdam-Institut für Klimafolgenforschung (PIK)	DE
Universiteit Utrecht (UU)	NL
London School of Economics and Political Science (LSE)	UK
Energy Research Centre of the Netherlands (ECN)	NL
Joint Research Centre, Institute for Environment and Sustainability, European Commission (JRC-IES)	IT
Central European University (CEU)	HU
Energy Research Institute of the National Development and Reform Commission (NDRC-ERI)	China (RC)
Indian Institute of Management (IIM)	India (IN)





Project description

Massimo Tavoni

FEEM

Milan, 10 October 2011

**Low climate Impact scenarios and the Implications of required
Tight emission control Strategies**



The research leading to these results has received funding from the European Community's Seventh Framework Programme FP7/2007-2013 under grant agreement n° 282846 (LIMITS)

1. The context

2°C DICHOTOMY

- *Signpost of science*
- *Active debate among economists on whether it is optimal in CBA*
- *Always mentioned in international climate agreements*
- *But apparently inconsistent with short term action*
- *Confusion on whether GHG concentrations (or temperature) can be overshoot*
- *and with which probability one wants to attain it*

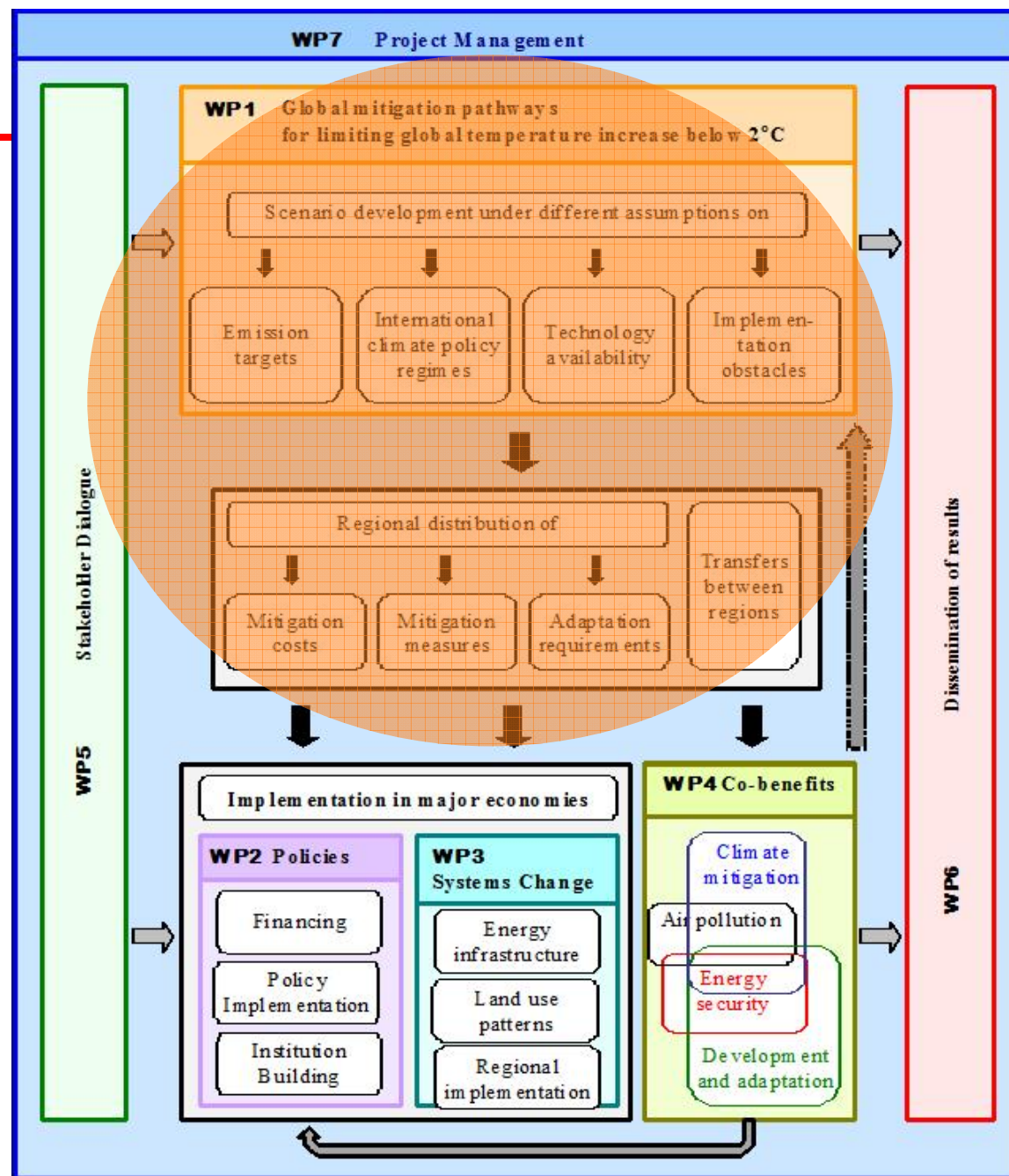
LIMITS is a **unique opportunity** to carry out an authoritative, comprehensive, and analytical assessment of what it takes to get to 2°C. Focus on integrated actions that the major economies can carry out, without neglecting the associated risks, and accounting for the diversity of national priorities and capabilities.

2. LIMITS in a nutshell

LIMITS' main objective is to provide an assessment of the emissions reductions strategies at the level of the world and the major global economies, and to assess their implementation in terms of:

- Defining the **feasibility space of low carbon scenarios** and the associated emission reduction pathways according to different assumptions about technology availability, policy regimes, implementation obstacles, and level of commitment at the regional level
- Assessing the **investment** requirements to implement these transformation pathways **and the financing** mechanisms such that these resources can be best raised and allocated. Evaluating the **national and international policies** which are needed to ensure that the transition to a low carbon energy infrastructure is attained efficiently, given specific obstacles in the respective economies
- Quantifying the changes in the **energy infrastructure and land use** which major economies would need to implement to attain stringent climate policies, and assessing the feasibility and risks of such changes.
- Evaluating the linkages of climate policies with other pressing social and environmental issues such as **energy security, air pollution and economic development**.

Structure

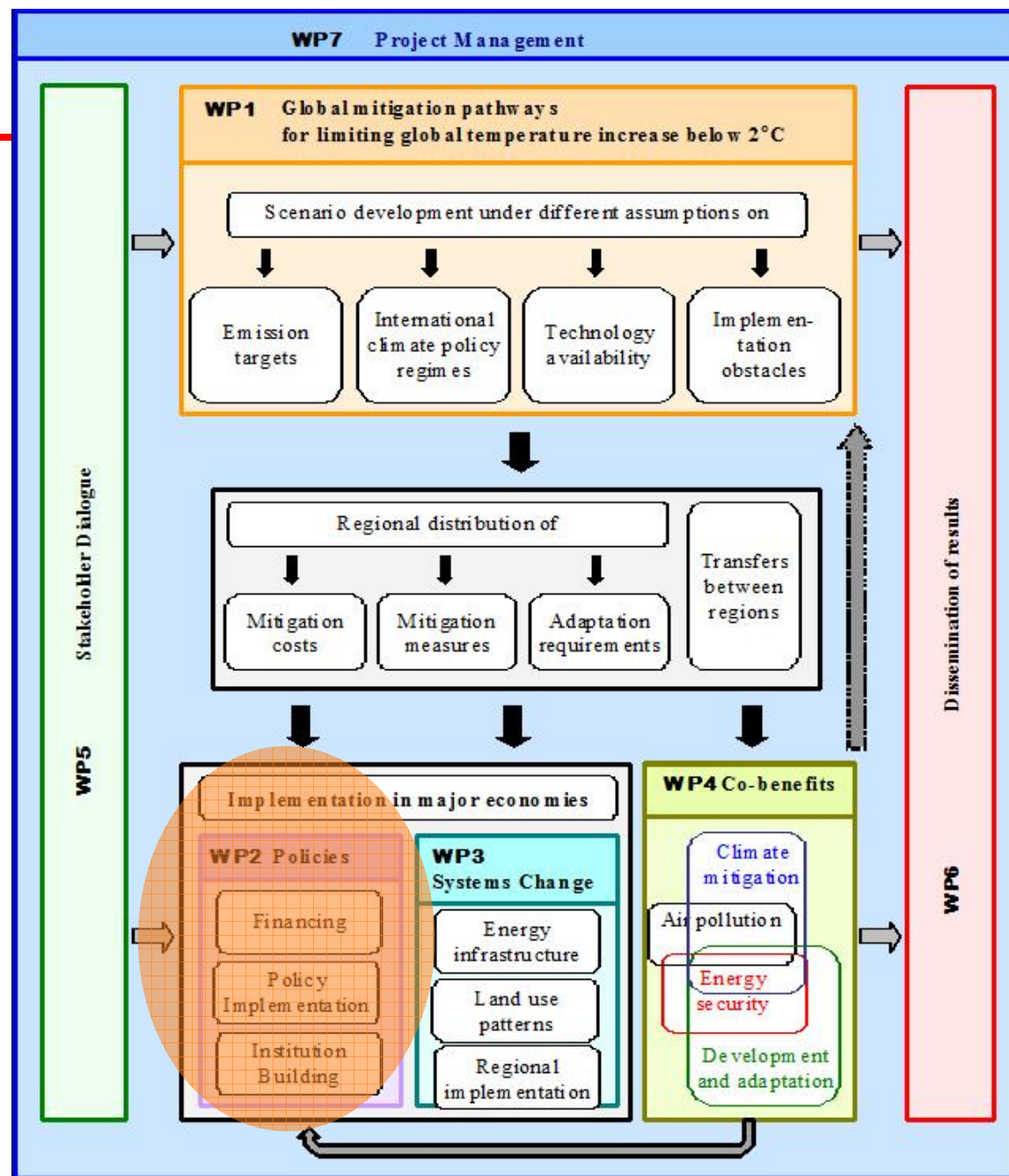


WP1: Global mitigation pathways for limiting global temperature increase below 2C (Lead: PIK)

The main questions that the WP addresses are:

- How do different interpretations of the 2C target (not to exceed during the 21st century or overshoot and obtain at the end of the 21st century? Reaching it with which probability?) translate into a range of carbon budgets for the global economy, and what does this imply for the feasibility and costs of reaching the 2C target?
- What are the key factors for reaching the 2C target (under the range of carbon budgets it implies) in terms of (i) availability of mitigation options, (ii) degree of global cooperation and (iii) sectoral and species coverage of a greenhouse gas reduction regime. What are the limiting technologies, regions, sectors and greenhouse gas species?
- How will burden sharing regimes and compensation mechanisms affect the regional distribution of mitigation efforts and costs?
- How can a useful set of global 2C scenarios be derived, taking into account the need to establish a large degree of what, where and when flexibility of emissions reductions early in the 21st century (requiring compensation and technology mechanisms)?

Structure

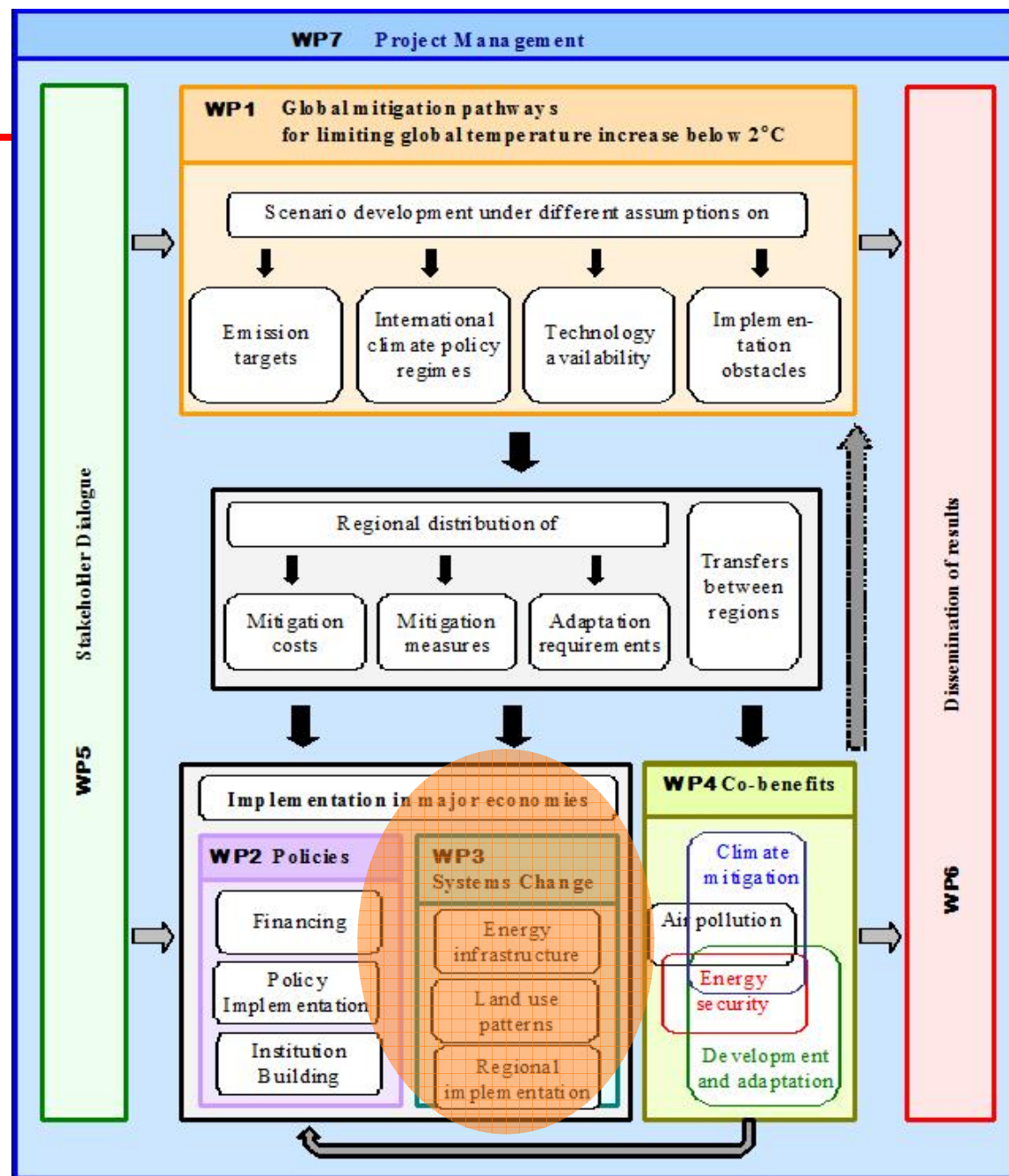


WP2: Implementation in major economies: Policy, institutional and financing needs (Lead: FEEM)

The main questions that the WP addresses are:

- Given the investment needs to achieve mitigation and adaptation compatible with 2° Celsius, how can these resources be best raised and allocated? What kind of interplay between the public and private sector is needed to ensure that the economic investments are carried out in due time and are scaled up sufficiently? Which mechanisms need to be established to hedge the risks of investing and innovating in low carbon technologies?
- What kind of national and international policies on climate and energy are needed to ensure that the transition to a low carbon energy infrastructure is attained efficiently, given specific obstacles in the respective economies? What mix of market based and regulatory policies is required to promote both low carbon investments and innovation, and how does it relate to current policies? How do these efficient policies interact with complementary policies on energy and the environment?
- What institutions and governance are needed to assist major developing countries in adopting low carbon technologies and adapting to a changing climate? How should the funds be raised and allocated?

Structure

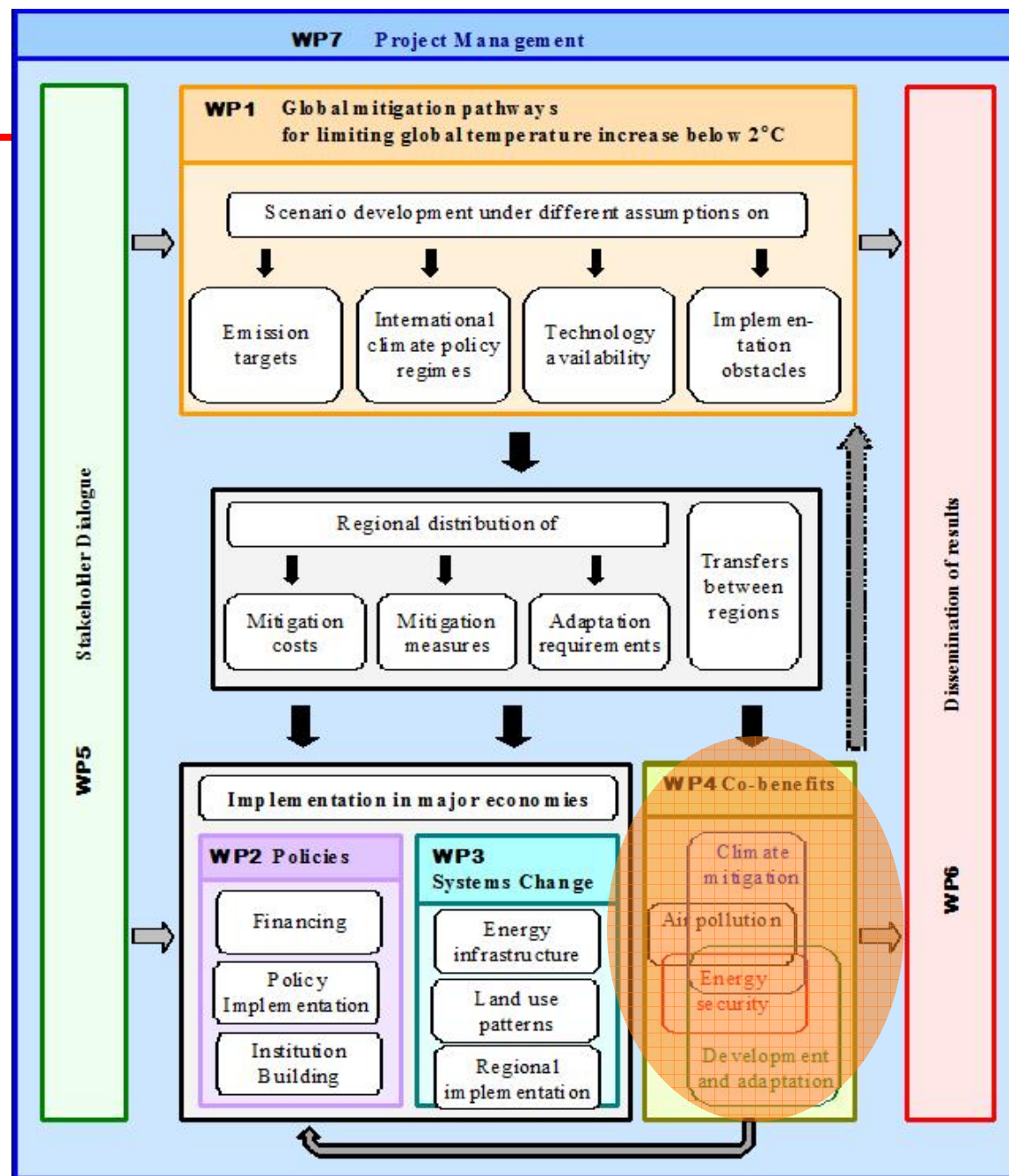


WP3: Implementation in major economies: Changes to energy infrastructure and land use patterns (Lead: UU)

The main questions that the WP addresses are:

- What changes in the energy system and land use of major economies are necessary in order to limit global mean temperature to 2C (assuming the different scenarios explored in work package 1) – and what would be the implications of these changes?
- What can locally available information on current policies and potential for greenhouse gas emission reduction in major economies tell us on the feasibility of the global scenarios?
- How can lifestyle changes contribute to achieving 2C climate targets?
- What are the land use implications of 2C scenarios under different assumptions, eg feedbacks on agricultural production, ecosystem diversity, and reduced adaptation needs because of climate mitigation policies?

Structure

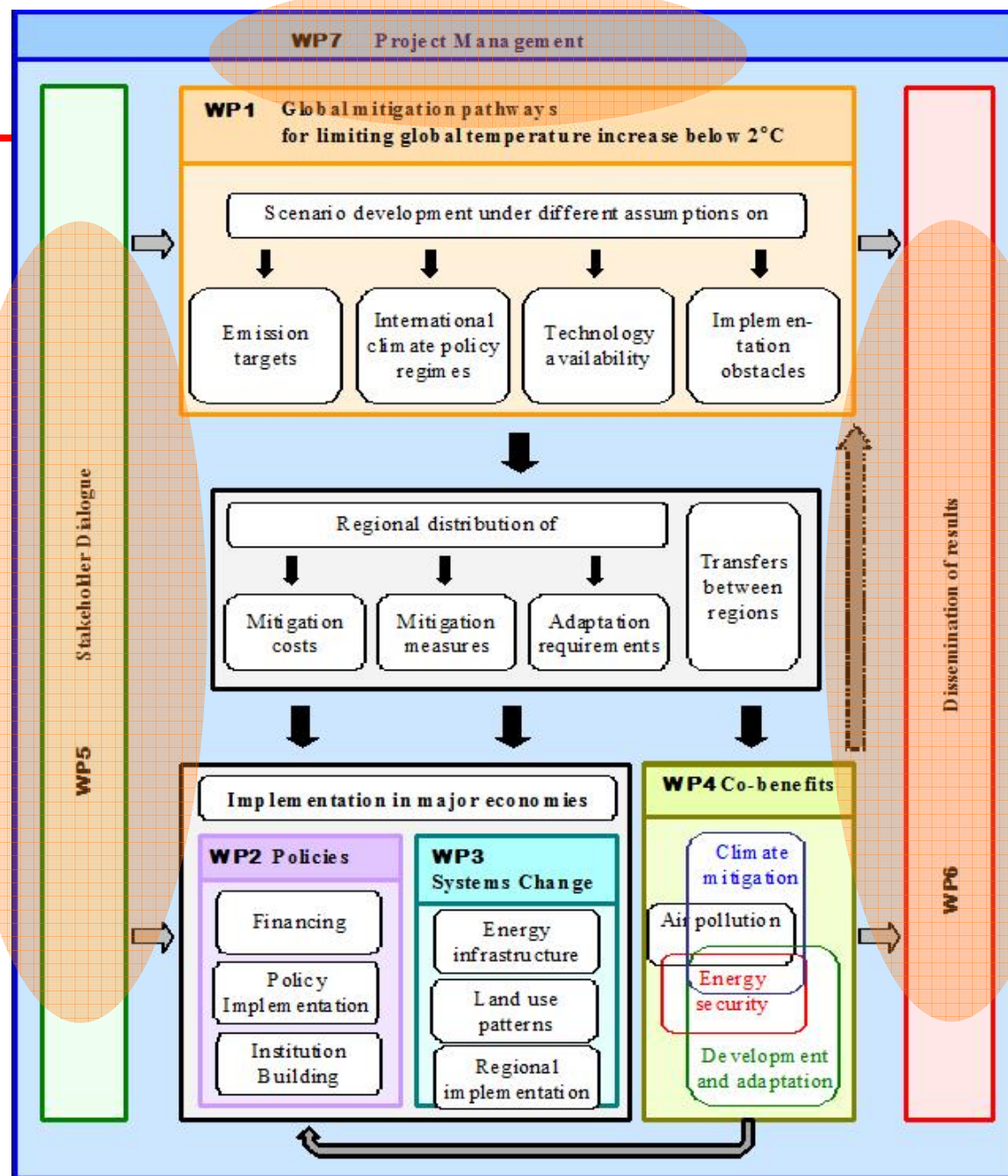


WP4: Multiple benefits of climate mitigation and implications for development (Lead: IIASA)

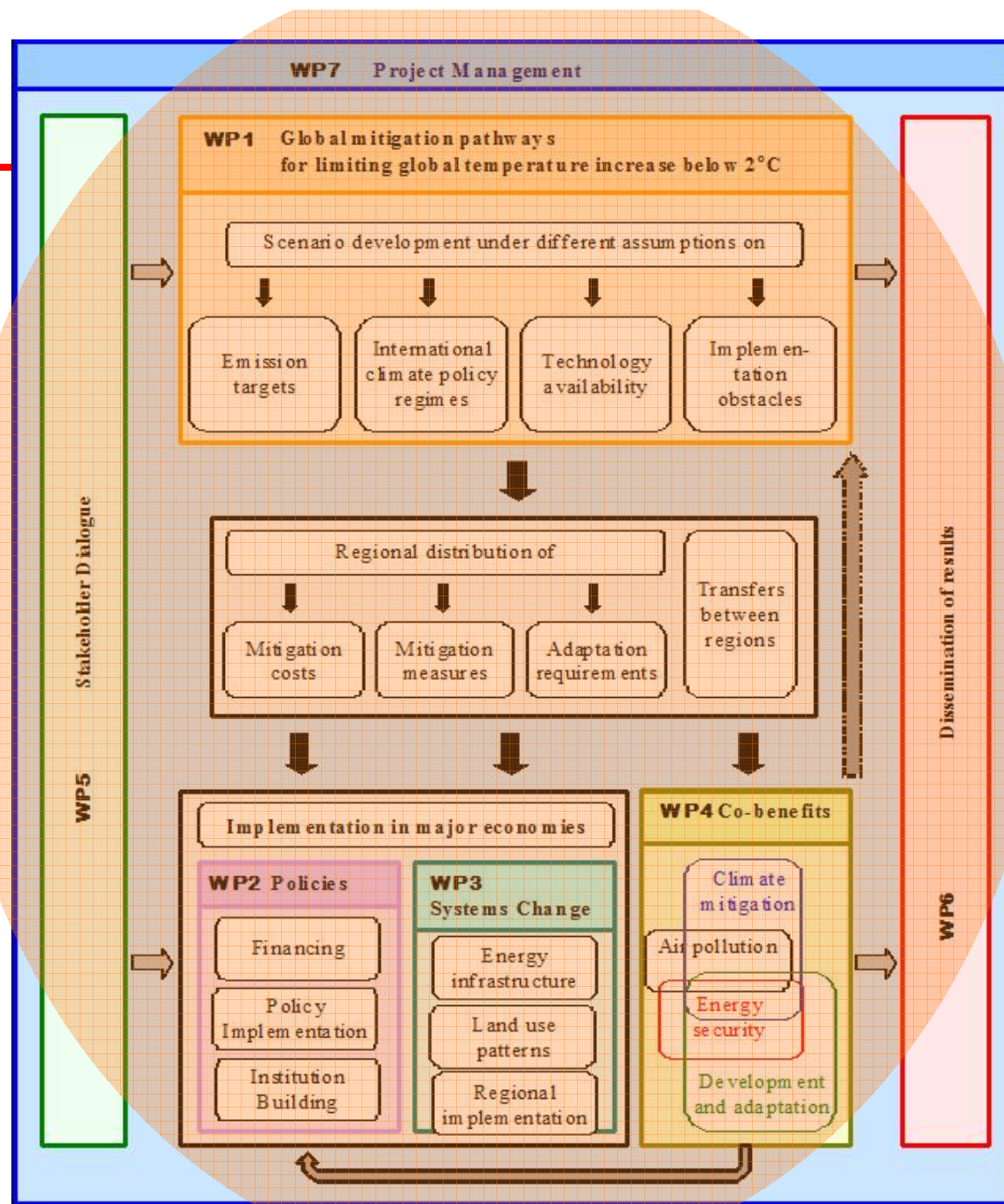
The main questions that the WP addresses are:

- Can stringent climate mitigation policies provide an entry point for other major local policy priorities, such as air pollution control, energy security, or broader development objectives?
- Which combination of climate mitigation measures, and in what economic sectors, would lead to the largest synergies for local air-pollution and energy security objectives, thus leading to “win-win” strategies in addressing local policy objectives?
- What is the regional/local benefit of climate mitigation for urban air pollution and human health, and what are the potential short-term tradeoffs for the climate given the removal of short-lived cooling agents (eg sulphur and OC)?
- What is the return of climate mitigation investments in terms of reduced pollution control costs and improved energy security? Can the benefits of climate mitigation for other priorities create sufficient incentives to mobilize the financial resources necessary for meeting the 2°C target?
- What are the implications of integrated climate-pollution-security policies for economic growth in major economies, and how big is this effect compared to meeting local policy objectives in absence of climate policies?

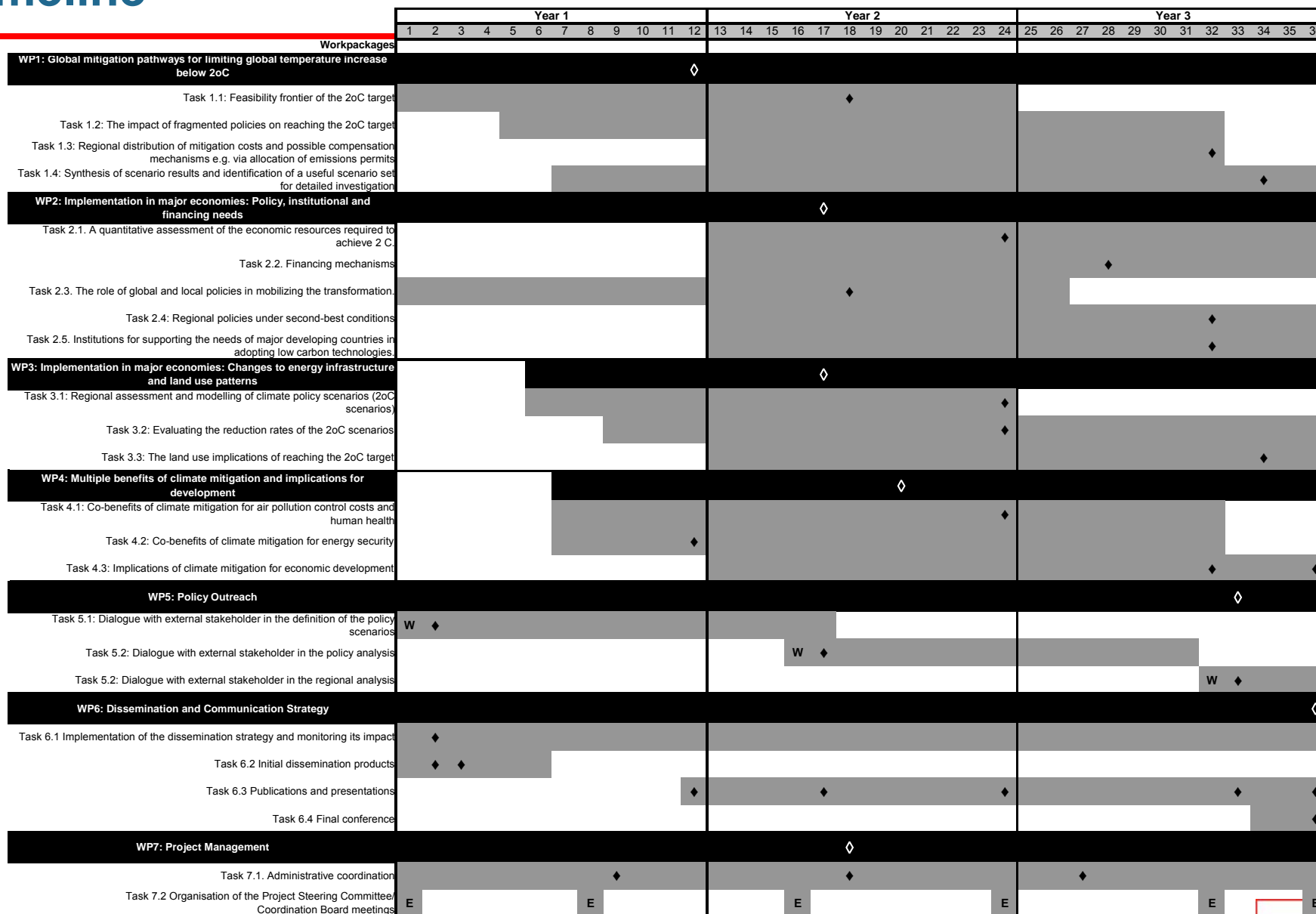
Structure



Structure



Timeline



Colourcode:

Duration of the task
Duration of the WP

♦ deliverable(s)

◇ milestone(s)

E project meeting(s)

W stakeholders workshop(s)

A great team!

 **Fondazione Eni Enrico Mattei (FEEM)**, Italy
www.feem.it

 **Internationales Institut für Angewandte Systemanalyse (IIASA)**, Austria
www.iiasa.ac.at

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www.uu.nl

 **London School of Economics and Political Science (LSE)**, United Kingdom
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 **Energy Research Centre of the Netherlands (ECN)**, Netherlands
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 **Joint Research Centre, Institute for Environment and Sustainability, European Commission (JRC-IES)**, Italy
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 **Central European University (CEU)**, Hungary
www.ceu.hu

 **Energy Research Institute of the National Development and Reform Commission (NDRC-ERI)**, China
www.eri.org.cn

 **Indian Institute of Management (IIM)**, India
www.iimahd.ernet.in

ASSOCIATED RESEARCH ORGANISATIONS

 **Pacific Northwest National Laboratory, Joint Global Change Research Institute at the University of Maryland (PNNL)**, USA
www.pnnl.gov

 **National Institute for Environmental Studies (NIES)**, Japan
www.nies.go.jp

Focus	Tools
Economics of CC and innovation	WITCH/WITCH-AD/GLOBIOM model
Energy and system analysis	MESSAGE/GLOBIOM model
Economics and science of CC	REMIND/MagPIE/PRIDE model
Integrated science and policy	IMAGE model
Development and environ. economics	Theoretical and applied economics
Energy policy	TIAM-ECN model
Air pollution	TM5 FAST model
Energy security	Energy economics
Energy modeling	IPAC model
Economics of sust. development	GCAM-IIM and Markal India
Integrated analysis of CC	GCAM model
Integrated analysis of CC	AIM model

LIMITS



Thanks!

The research leading to these results has received funding from the European Community's Seventh Framework Programme FP7/2007-2013 under grant agreement n°282846 (LIMITS)



**Low climate IMpact scenarios and the Implications of required
Tight emission control Strategies**

项目介绍

Massimo Tavoni

FEEM

米兰, 2011年10月10日



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1. 项目内容

2°C 目标解析

- 科学给出的阐述
- 经济学家之间的成本-收益分析之争
- 在国际气候协议中经常被提及
- 然而与短期行动并不相符
- 温室气体浓度（或气温）是否可以被预支
- 这一目标可达成的概率有几成

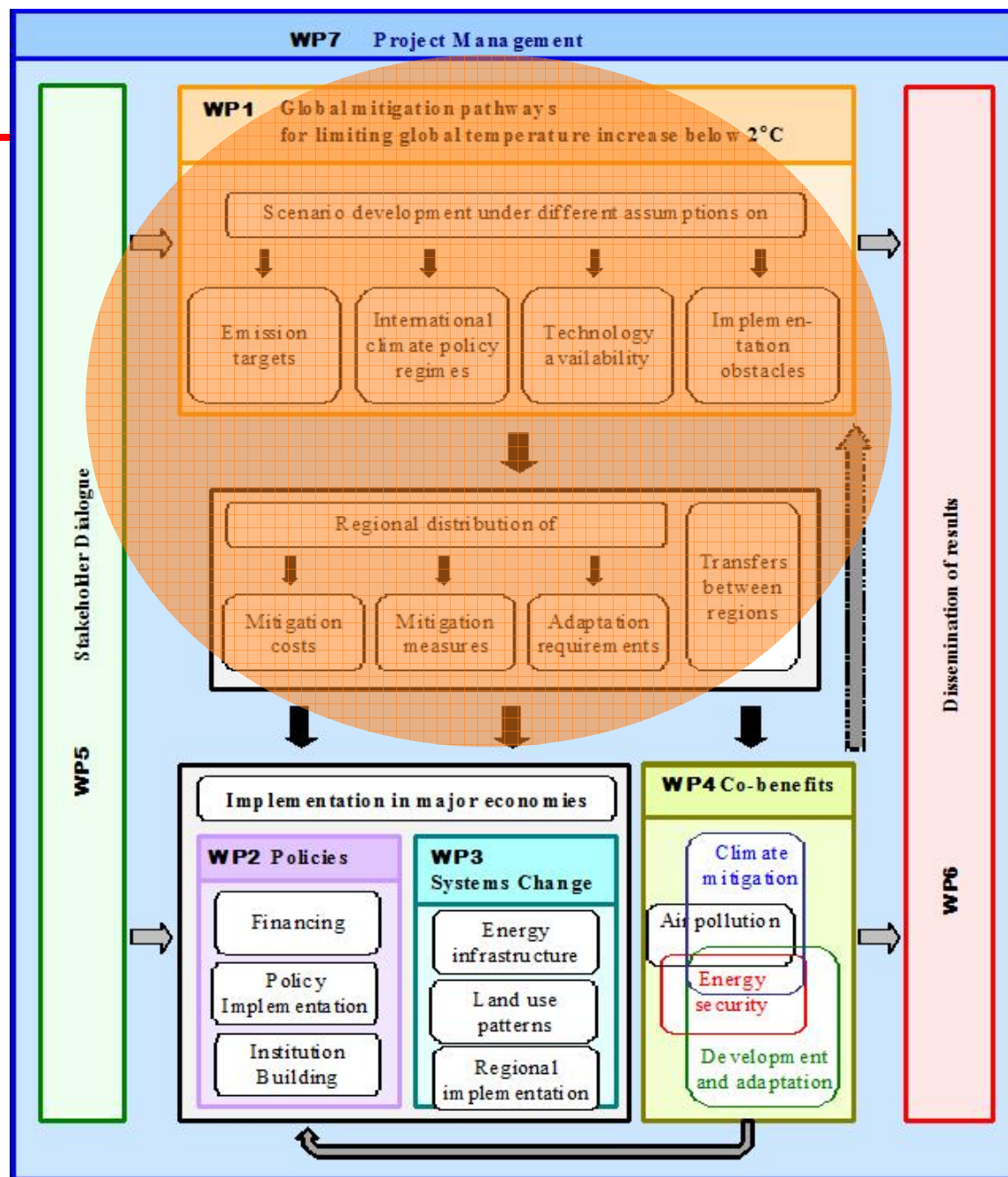
LIMITS提供了难得的机会，对达成2°C目标的方法进行权威而全面的分析评估。该项目将着眼于主要经济体所能采取的综合行动，并将与之相关的风险和国家目标能力的多样性纳入分析框架。

2. 项目框架概述

LIMITS的主要目标在于为减排策略提供全球及主要经济体层面的评估，并评价该类策略在以下几方面的意义：

- 定义**低碳情境的可行性空间**，及在不同的假设前提之下定义与之相关的减排路径。各类假设前提包括可行性技术、政策体制、政策推行障碍、地区性义务等。
- 评估推行转型路径所需的**投资需求和金融机制**，以求这类经济资源能被最佳利用和分配。评价各类在国家和国际层面上的政策，以保证能源基础设施建设能有效地向低碳转型，即使在特定经济中存在某些政策推行障碍。
- 就主要经济体为推行强化气候政策所应作出的变革进行量化分析，诸如**能源基础设施、土地利用**等，并评估这些变革的可行性及与之相关的风险。
- 评价气候政策与其他社会环境问题之间的关联，如**能源安全、大气污染及经济发展**等。

Structure

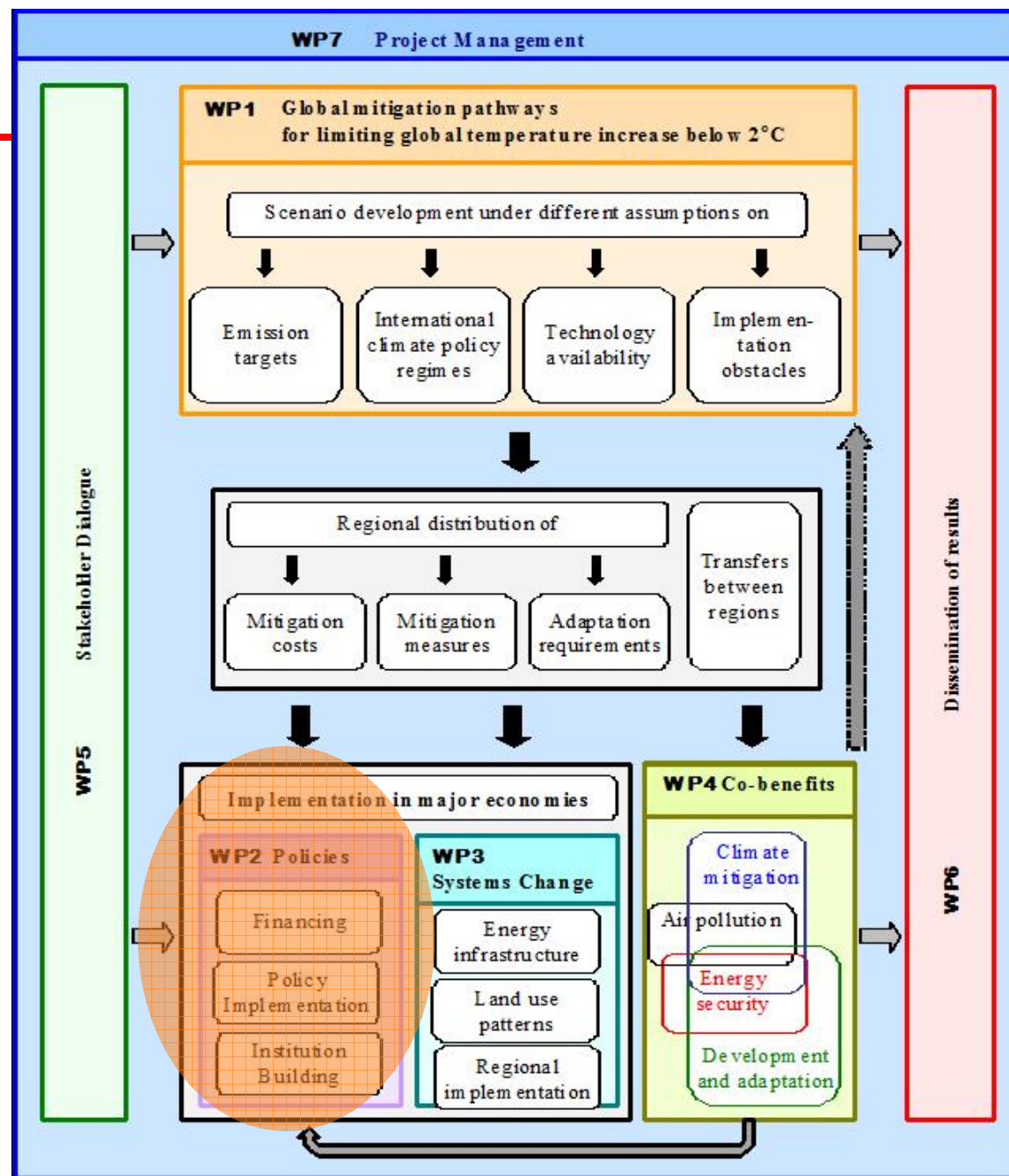


工作细目1: 全球2C减排路线 (负责: PIK)

这一工作细目将就如下问题进行阐述:

- 目前对2C目标存在不同理解（将本世纪的气温升高值一直控制在2C以内，还是允许在某一时间段高于2C但最终控制在2C之内？目标达成的可能性有多大？），如何将不同的理解转换成全球碳排放预算的区间值？这些对于2C目标的可行性和达成成本将产生何种影响？
- 有哪些关键因素将对达成2C目标产生影响（在碳排放预算的区间内）？可能的影响因素包括（1）减排策略的可获得性；（2）全球合作程度；（3）不同温室气体减排机制，考虑部门与种类的不同。在技术、地区、部门、种类等不同方面存在何种制约？
- 目标共享机制和补偿机制将如何影响减排行动和减排成本的地区分配？
- 考虑到在本世纪初，我们需要建立一个在时间、空间和内容上具有相当灵活性的减排机制，如何获得有效的全球2C情境（这些都需要相关补偿机制与技术机制的支持）？

Structure

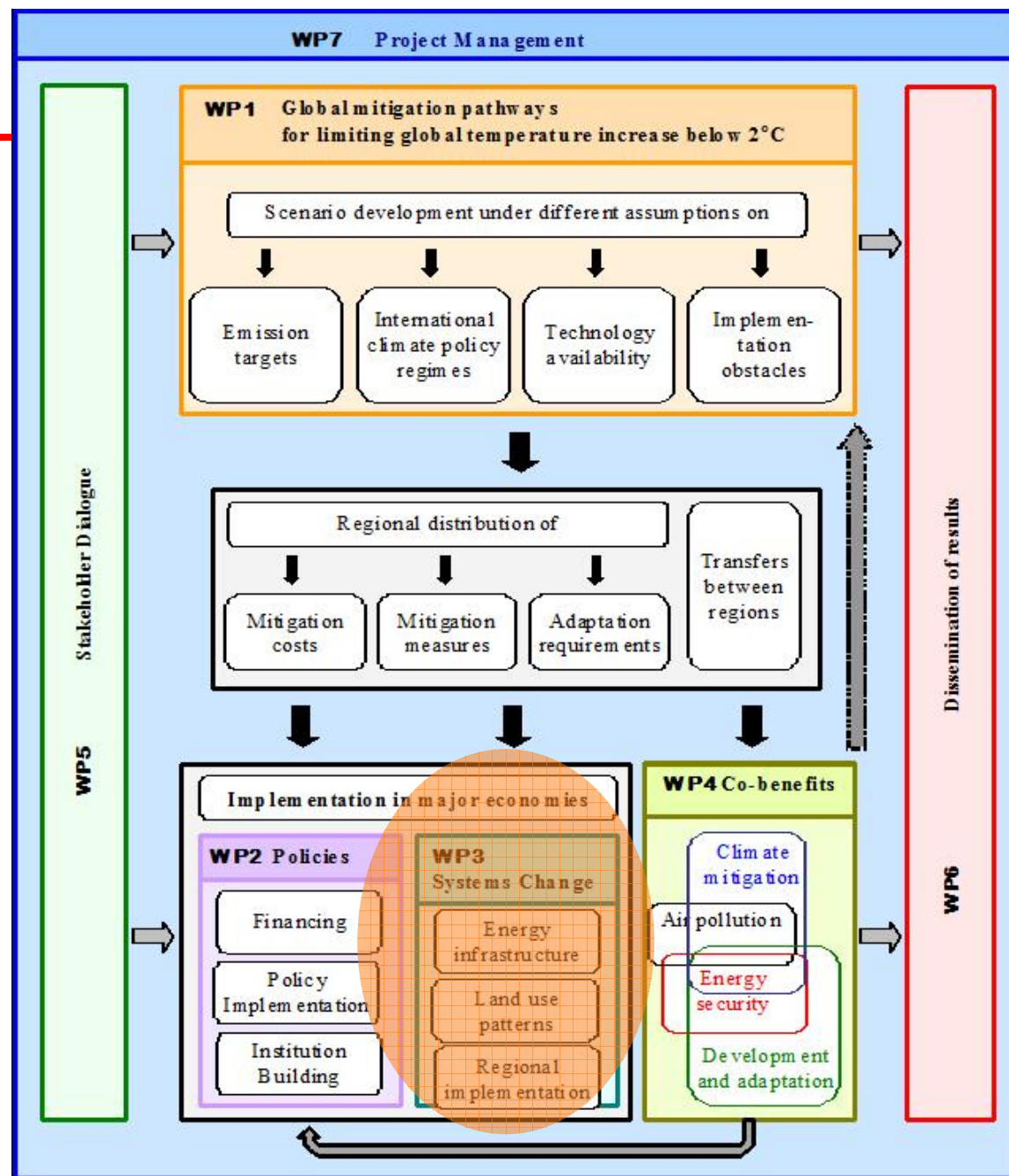


工作细目2: 主要经济体如何贯彻目标:政策、制度和经济需求 (负责: FEEM)

这一工作细目将就如下问题进行阐述:

- 一系列的减排与适应计划将与2C目标相一致, 在给定这些计划所需投资的前提下, 如何获得及有效分配这些经济资源? 公共部门和私人部门之间应如何互动, 以确保投资能在正确的时间被合理利用, 投资规模能充分扩大?
- 应设计何种机制以便对冲投资风险与低碳技术的创新风险?
- 考虑到各经济体特定的障碍, 应贯彻何种国家及国际气候与能源政策, 才能得以确保向低碳能源基础设施有效转型? 如何将市场机制和规制政策相结合, 以促进低碳投资与创新, 如何与现有政策相关联? 它们与能源与环境政策如何互动, 如何互补?
- 需要何种制度与管制, 以帮助主要的发展中国家发展低碳技术, 适应气候变化? 所需的资金应如何募得并分配?

Structure

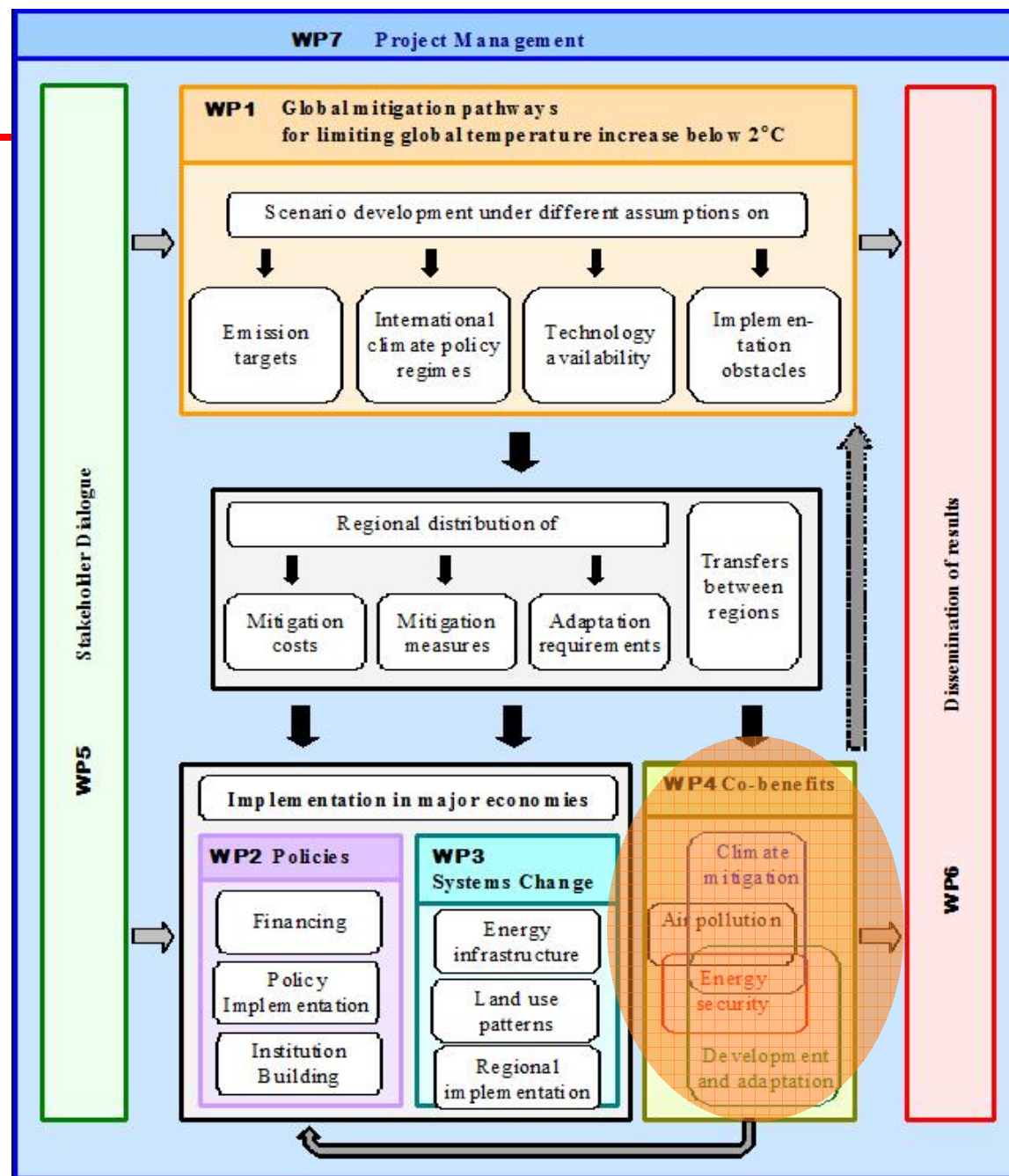


工作细目3: 主要经济体如何贯彻目标: 能源基础设施和土地利用方式的变革 (负责: UU)

这一工作细目将就如下问题进行阐述:

- 为将全球平均气温升高控制在**2C**之内（参考工作细目1所假设的各种情景），对主要经济体的能源系统和土地利用方式必须作出何种变革 – 这些变革将产生何种可能的影响？
- 在主要经济体当地可获得的资料，如现行政策，减排潜力等，将传递何种关于全球情景可行性的信息？
- 生活方式的改变如何为达成**2C**气候目标作出贡献？
- 在各类假设前提之下，**2C**情景将如何影响土地利用，例如，农业生产、生态多样性、由于减排政策带来的适应性要求的降低等。

Structure

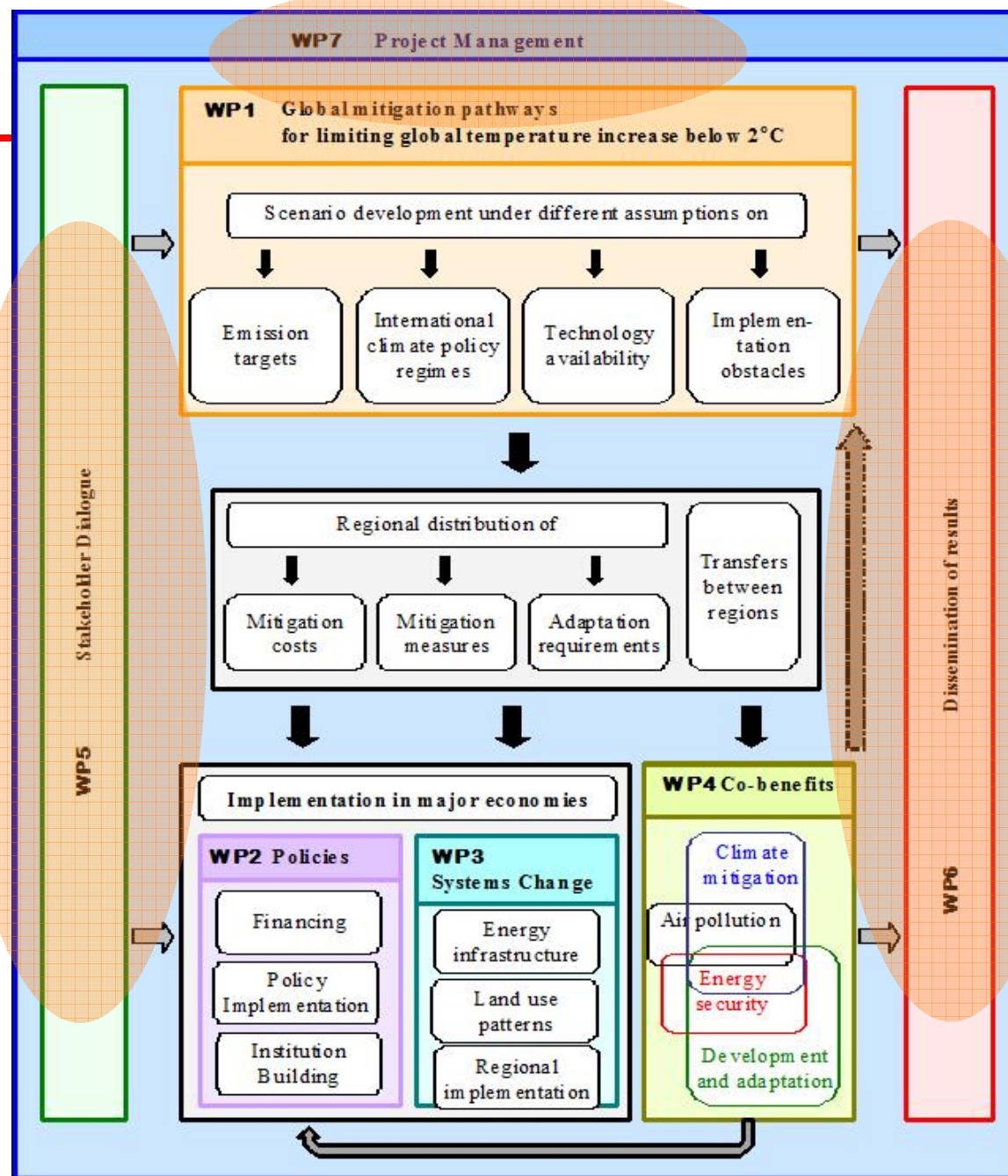


工作细目4: 减排的多重积极效应及对发展的影响 (负责: IIASA)

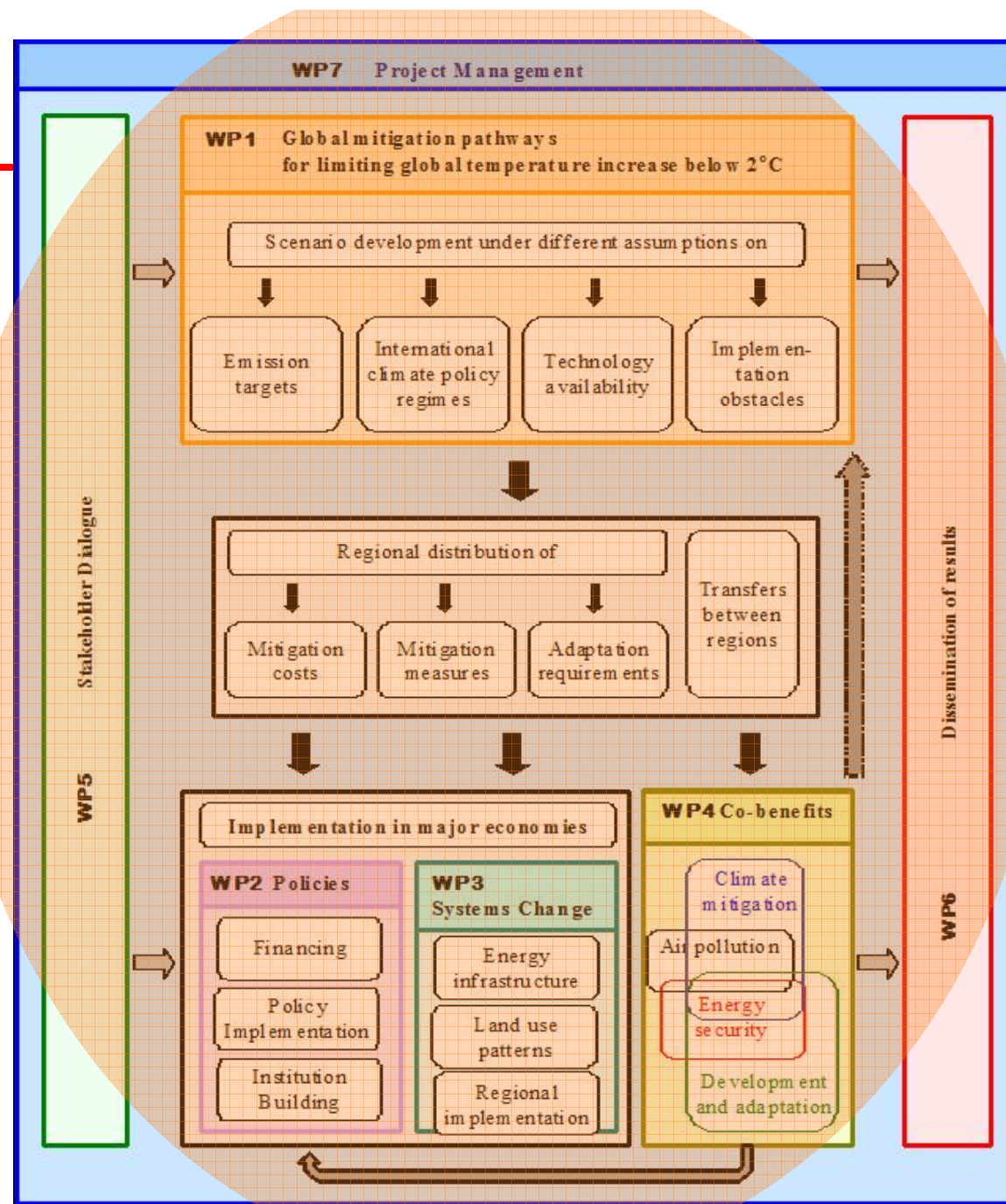
这一工作细目将就如下问题进行阐述:

- 就主要经济体而言, 强化的减排政策是否能为其他方面的当地政策寻求到突破口, 例如大气污染控制、能源安全、以及更宽泛的发展目标?
- 各类减排策略应在何种经济部门间, 以何种方式相结合, 方能最大限度地达到控制大气污染及确保能源安全的双重目标, 以便确保实现当地政策目标的双赢?
- 地区性/当地的减排措施将如何对城市大气污染和人类健康产生积极影响? 如何处理一些相当于大气制冷剂的短效气体(如硫, 有机碳等)与治理大气污染的短期关系?
- 就降低污染控制成本, 提高能源安全而言, 减排的投资回报有哪些? 减排对其他政策需求的积极效应是否将使经济资源获得足够的动力, 以便为达到2C目标实现自由流动?
- 气候-污染-安全的综合政策将对主要经济体的经济增长产生怎样的影响? 与在无气候政策的条件下达到政策目标相比, 该影响又有几何?

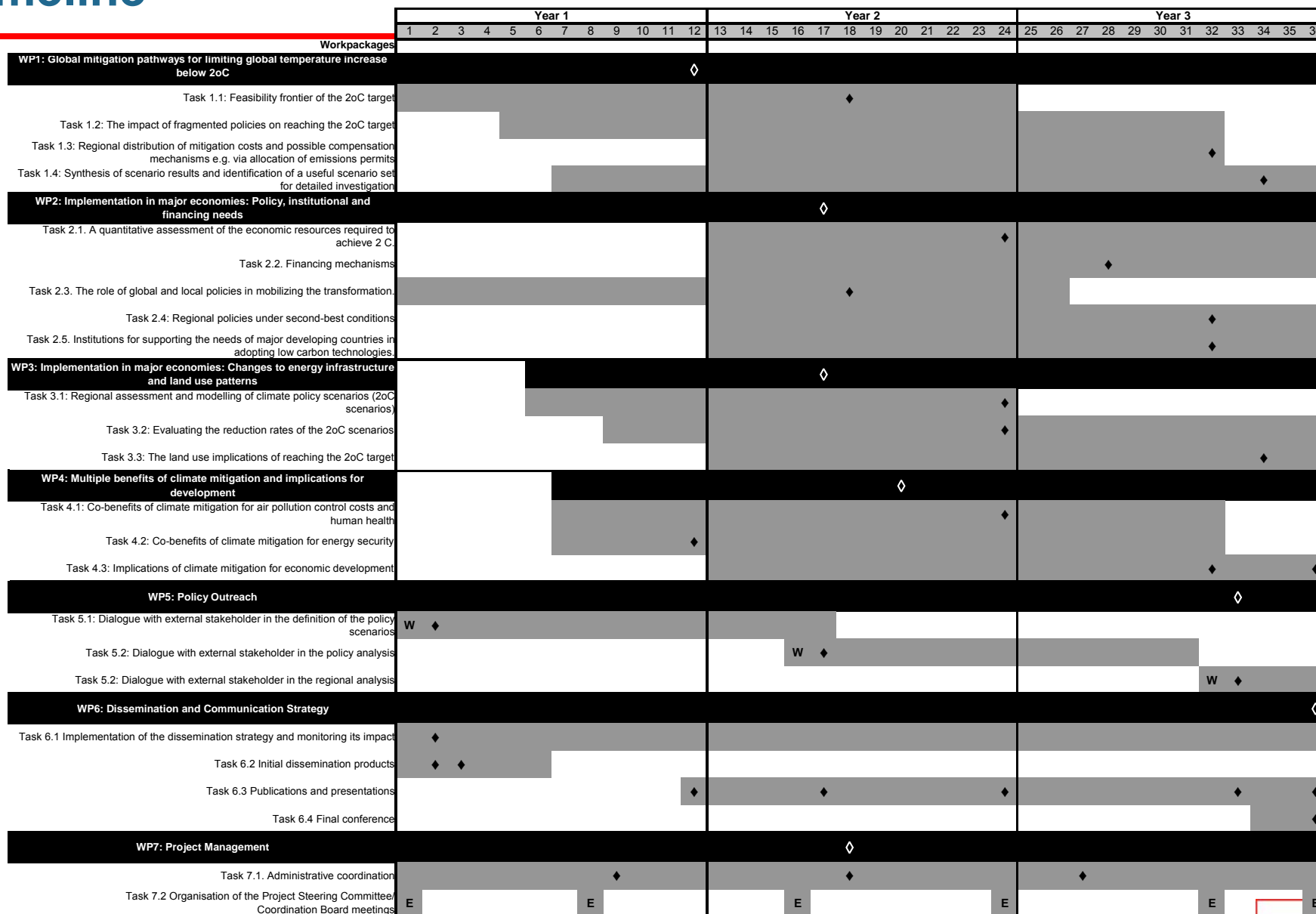
Structure



Structure



Timeline



Colourcode:

■ Duration of the task
■ Duration of the WP

◇ deliverable(s)

◇ milestone(s)

E project meeting(s)

W stakeholders workshop(s)

A great team!

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目标	工具
气候变化与创新经济学	WITCH/WITCH-AD/GLOBIOM 模型
能源与系统分析	MESSAGE/GLOBIOM 模型
气候变化经济学与科学	REMIND/MagPIE/PRIDE 模型
综合科学与政策	IMAGE 模型
发展与环境	理论及应用经济学
能源政策	TIAM-ECN 模型
大气污染	TM5 FAST 模型
能源安全	能源经济学
能源建模	IPAC 模型
可持续发展经济学	GCAM-IIM and Markal 印度模型
气候变化的综合分析	GCAM 模型
气候变化的综合分析	AIM 模型



非常感谢！

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