CLAND CHALLENGE 3- The transition towards integrated management

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Background

Mitigation Roadmap

1. Massive electrification
2. Decarbonizing electricity production
3. Switching to less carbon-intensive materials and diets
4. Improving efficiency and reducing waste in all sectors
5. Preserving and increasing natural carbon sinks

Climate Impacts

1. Yield loss
2. Impact on livestock through heat stress and water scarcity
3. Increased variability
4. CO_2 fertilization effect
5. Reduced multi-cropping potential

(Vogt-schilb et al., 2017)

⇒ Need for a approach integrating a wide range of knowledge to account for the large number of interactions

Objectives

Integrate into a common approach the knowledge acquired from challenges 1 and 2 to assess policies options to optimize adaptation and mitigation while limiting impact on the environment

Approach

- Different scales: national to global scale
- Different methods:
  - Coupled biophysical and economic modelling
  - Econometry
  - Meta_analysis
  - ….
- Sectorial approach: crop, livestock, forest and their interactions

Research lines

- **Research Line 3.1. Mapping conditions for robust and sustainable articulation of the multiple roles of land**
- **Research line 3.2 –Policy options for transitioning to sustainable land-uses futures**
- **Research Line 2.3 – Conditions for kick-starting the transition**

Timeline for the challenge

Phase 1 (3-4 years) :

- Preparing tools and data for the integrative assessment
- Focus on research line 3.1 and 3.2

Phase 2 :

- Integration of tools from first two challenges
- Building of scenarios and analysis
- Focus on research line 3.3

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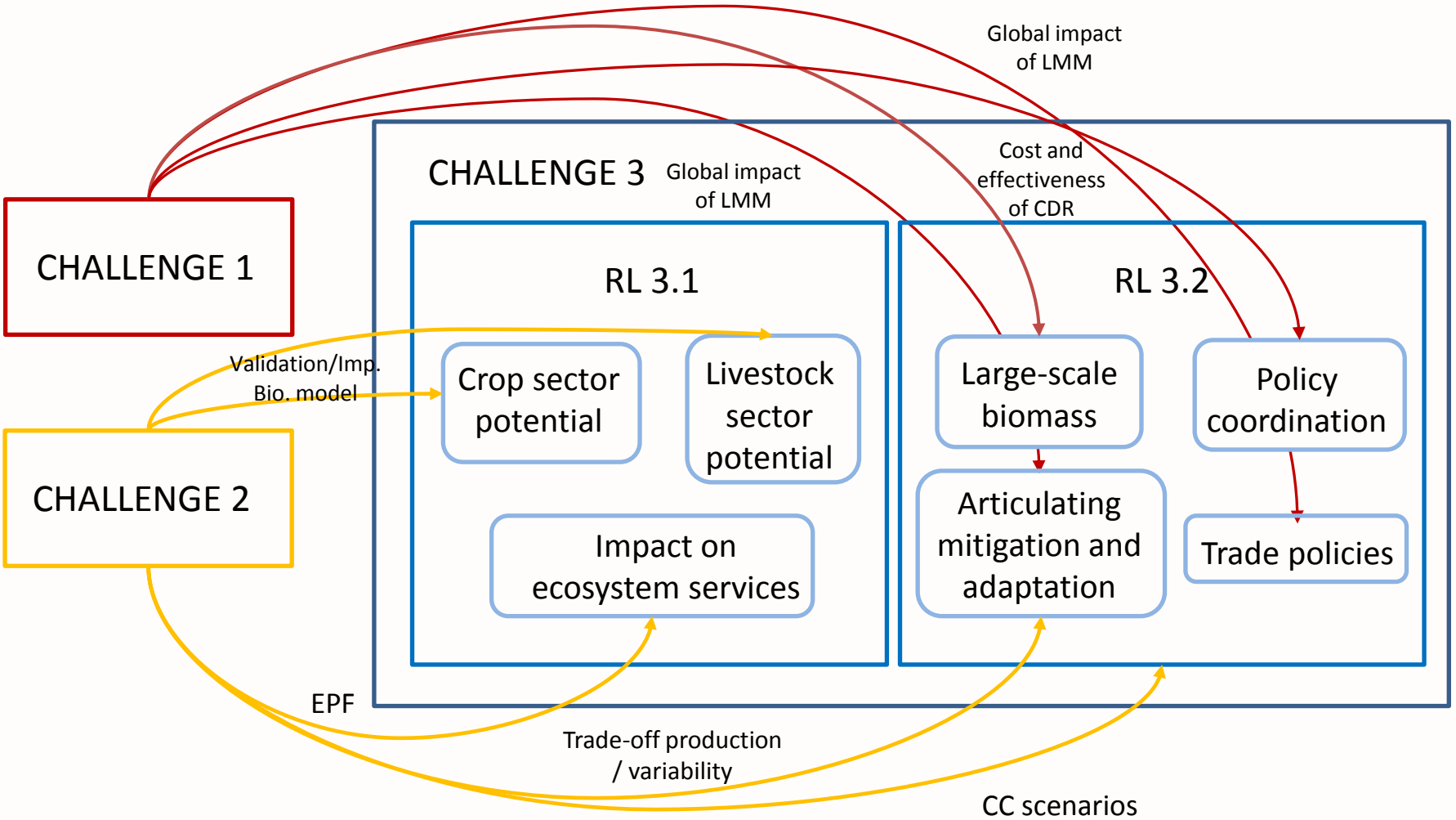
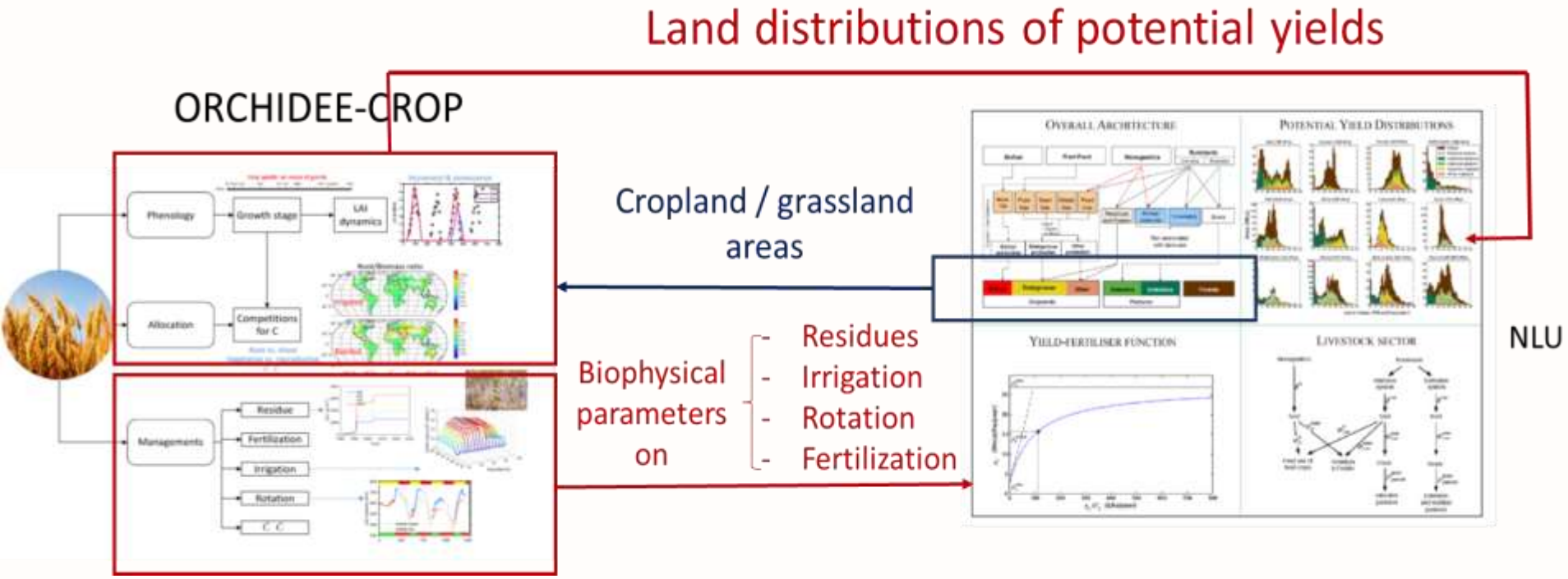

Global impact of LMM
CHALLENGE 3
Global impact of LMM
Cost and effectiveness of CDR
CHALLENGE 1
RL 3.1
RL 3.2
Validation/Imp. Bio. model
Crop sector potential
Livestock sector potential
Large-scale biomass
Policy coordination
CHALLENGE 2
Impact on ecosystem services
Articulating mitigation and adaptation
Trade policies
EPF
Trade-off production / variability
CC scenarios

- **Research Line 3.1. Mapping conditions for robust and sutainable articuliation of the multiple roles of land**
- **Research line 3.2 –Policy options for transitioning to sustainable land-uses futures**
- **Research Line 3.3 – Conditions for kick-starting the transition**

RL 3.1: inventory of land-based mitigation options

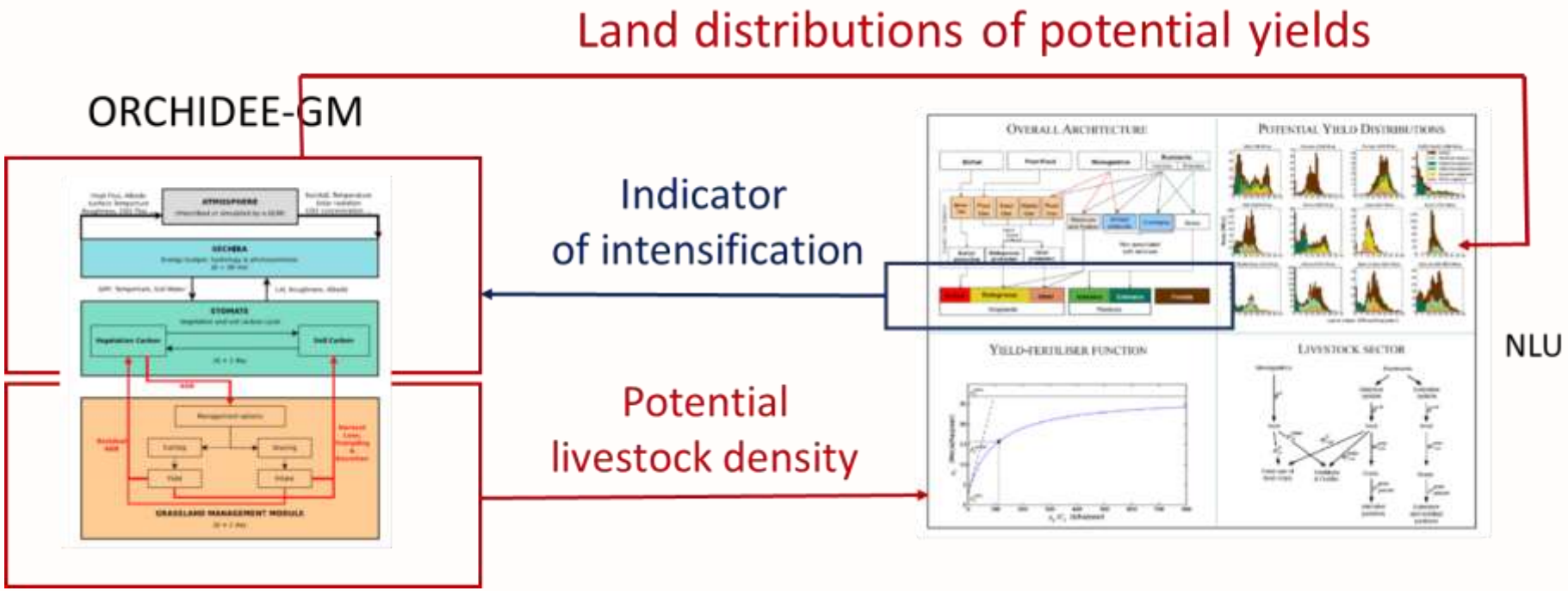
- WP1: Production potential of the crop sector
- WP2: Production potential of the livestock sector
- WP3: Evaluation of impacts on ecosystem service

RL 3.1 / WP1: Production potential of the crop sector



Link with R.L 2.1: validation and improvement of biophysical modeling framework

RL 3.1 / WP2: Production potential of the livestock sector



Link with R.L 2.1: validation and improvement of biophysical modeling framework

RL 3.1 / WP3: Evaluation of impacts on ecosystem services

- Use ecological production functions (EPF) defined in RL 2.2 and biophysical modeling framework of RL 3.2 to link various ecosystems services (e.g., carbon balance) and environmental impacts to production potential (food + bioenergy).

Link with R.L 2.2: use EPF defined in RL 2.2
Link with R.L 1.1 and RL 1.2: validation and improvement of biophysical model to simulate Large scale mitigation stategies.

- **Research Line 2.1. Mapping conditions for robust and sustainable articulation of the multiple roles of land**
- **Research line 2.2 –Policy options for transitioning to sustainable land-uses futures**
- **Research Line 2.3 – Conditions for kick-starting the transition**

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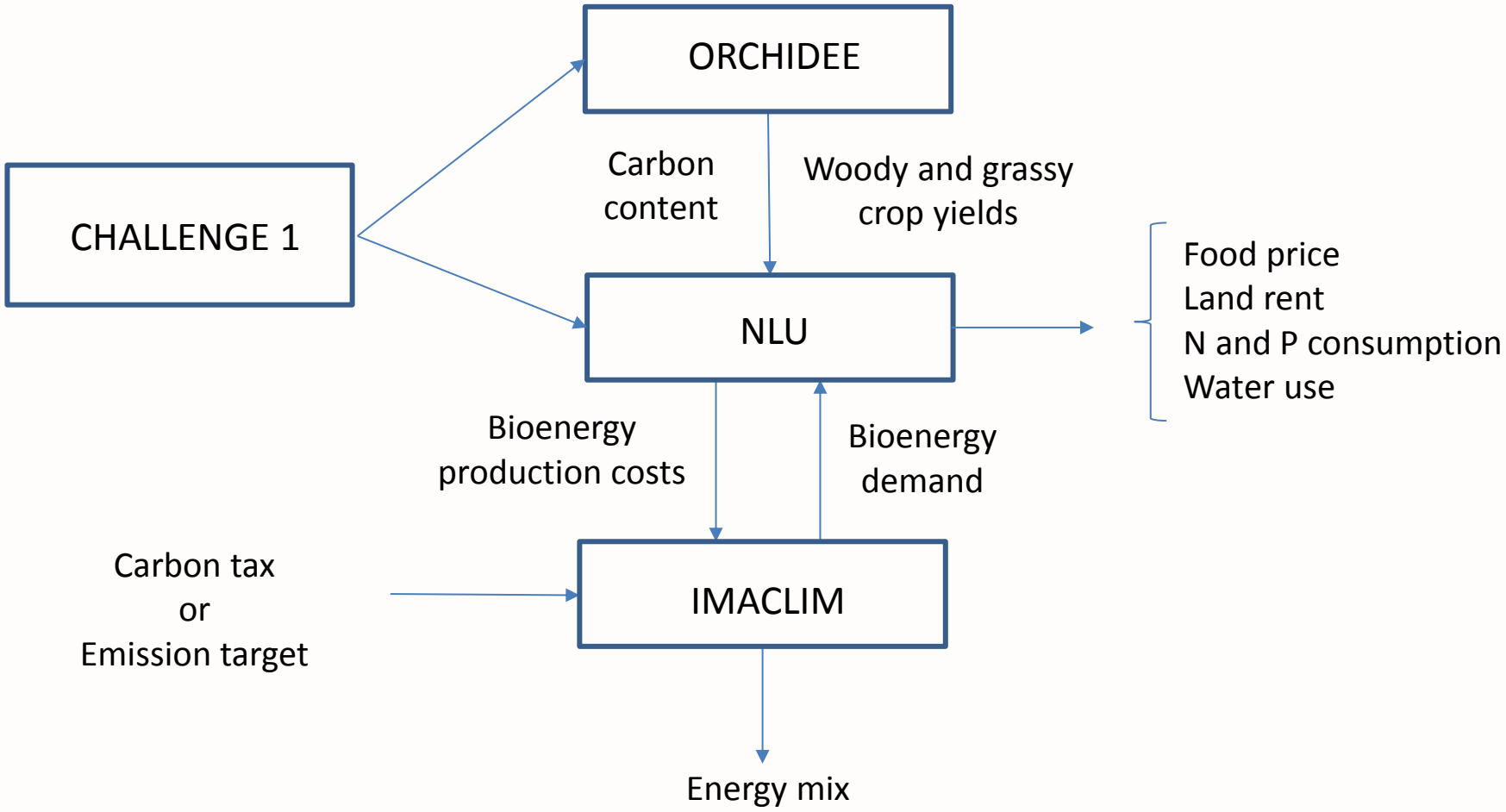
- WP1: Evaluating the role of large-scale biomass in decarbonizing the energy sector
- WP2: Articulating mitigation and adaptation strategies
- WP3: Coordinating different policy objectives: Water/Food/Energy/Biodiversity
- WP4: Trade policies

RL 3.2 / WP1: Evaluating the role of large-scale biomass in decarbonizing the energy sector



RL 3.2 / WP2: Articulating adaptation and mitigation strategies

Objective: Exploring synergies and trade-off between mitigation and adaptation goals, to ensure a sufficient availability and access of/to good quality food

- At EU level: Explaining land use choices though econometric methods to study trade-off between ecosystem services
- At global scale: Studying the impact of a portfolio of farming practices, such as agroecology or increased use of leguminous crops, on GHG emissions and agricultural production under climate change
- Impact of specific mitigation strategies (e.g., reforestation) on water regimes

RL 3.2 / WP3:
Coordinating different policy objectives: Water-Food-Energy-Biodiversity nexus

Objective: Assess and design policies affecting the water-food-energy sectors and their relationships with biodiversity and the environment

Methodology: Representing the causality chain, from a given policy choice to economic and environmental impacts based on:

- A set of economic, biophysical and ecosystem services models
- Case studies covering a large range of European regions

Expected results:

- Assessment of negative externalities induced by a given policy
- Options to bridge conflict between objectives (e.g., increased resource use efficiency)

RL 3.2 / WP4: Trade policies

Research question: How can trade policies mediate mitigation and adaptation costs

Methodology: Design an agricultural trade sub-model able to represent trade flows of agricultural goods, with a specific focus on substitution between different crops and different livestock systems

Expected results:

- Assessment of indirect effects through international market channel
- Effect of regional efficiencyiy differentials on emissions (food miles)