Increasing population and consumption put an unprecedented pressure on land resources but the impacts on natural systems are poorly understood. Investigating how to satisfy growing resource demands while maintaining biodiversity and ecosystem functions that underpin these resources is a major challenge for humankind.

In November 2010, the German Federal Ministry of Education and Research (BMBF) launched the collaborative research programme ’Sustainable Land Management’. Using trans-disciplinary research approaches, the programme aims to improve our understanding of interacting ecological and socio-economic systems and help design better land management policies.

INTERACTIONS BETWEEN LAND MANAGEMENT, CLIMATE CHANGE AND ECOSYSTEM SERVICES

In this funding measure, ’Interactions between land management, climate change and ecosystem services’ is the overarching topic of the module. Twelve regional projects that belong to this module conduct research in various parts of the world. In close cooperation with their local partners in science and practice, these projects seek strategies for maintaining important ecosystem functions and services. The projects will develop exemplary solutions for sustainable land management and mitigation of climate change (greenhouse gas emissions – GHG).

All projects are supported by the scientific coordination and synthesis GLUES.
**Carbiocal**

Carbon sequestration, biodiversity and social structures in Southern Amazonia: Models and implementation of carbon optimized land management strategies

**research questions**
- How is the tropical rainforest-particularly question 1) land-use change sensitivity to climate change?

- Drivers
  - Agricultural expansion, access to diverse, change climate, socio-political interventions and land-based wind energy.

- Indicators
  - Carbon loss and methane emissions, biodiversity, soil quality, socio-economic development and quality of life.

**Production**
- Soy, rice, cash, cattle pastures

**Country**
- Brazil

**Study sites**
- Nova Progresso (Pará), Sinop (Mato Grosso), Doce and Paraiba (Minas Gerais)

**Area**
- 25,000 and 200,000 km²

**Duration**
- June 2015 to May 2016

**website**
- www.carbiocal.de

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**CC-LandStrad**

Interdependencies between land-use and climate change - Strategies for a sustainable land-use management in Germany

**research questions**
- What are the trade-offs of ecosystem services in diverse landscapes and climate scenarios?

- Drivers
  - Land-use change, forest management, urban development, agricultural development, forest management and urban development for agriculture.

- Indicators
  - Forest dynamics, terrestrial ecosystem services, biodiversity, forest development, urban development, agricultural productivity, urban development, agricultural productivity.

**Production**
- Agriculture and biodiversity

**Country**
- Germany

**Study sites**
- Germany

**Area**
- 1,200 km²

**Duration**
- November 2010 to October 2015

**website**
- www.cc-landstrada.de

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**COMTESS**

Sustainable coastal land management: The Baltic, Mediterranean, and Black Seas

**research questions**
- What are the trade-offs of ecosystem services in diverse landscapes and climate scenarios?

- Drivers
  - Sea level rise, higher storm frequency (frequency, storm), climate change sensitivities.

- Indicators
  - Biodiversity, level of habitat, soil, sediments, and functional networks, greenhouse gases.

**Production**
- Agriculture and biodiversity

**Country**
- Sweden, Poland, Germany

**Study sites**
- 5 Finnish sites, 22 sandstone areas, 300 model experiments, 10,000 km²

**Area**
- January 2011 to December 2015

**website**
- www.comteess.cs.ing.noe.no

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**INNOVATE**

Interplay between the multiple uses of water resources: Innovative coupling of subsurface and terrestrial ecosystems

**research questions**
- How do ecosystem figures of subsurface systems and ecosystem services under climate change vary?

- Drivers
  - Water management (land-use changes, water resources management).

- Indicators
  - Biodiversity, ecosystem function, accessibility, soil and water balance, sustainability indicators.

**Production**
- Agriculture and biodiversity

**Country**
- China, India, Indonesia, Pakistan, South Africa

**Study sites**
- 100 catchment areas (South china River Basin, India, Indonesia, Pakistan, South Africa)

**Area**
- 202,000 km²

**Duration**
- December 2011 to December 2016

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**KULUNDA**

How to prevent the next Global Dust Bowl? Ecological and socio-economic strategies for sustainable land management in the Russian steppes: A potential solution to climate change

**research questions**
- How do topical relations and drought processes function in the development and management of sustainable land management practices?

- Drivers
  - Large-scale forest removing, climate change, market prices.

- Indicators
  - Biodiversity, human culture, top soil depth, degree of desertification, product variability.

**Production**
- Agriculture and biodiversity

**Country**
- China

**Study sites**
- 8 regions (Europe, Middle Asia, Central Asia, Java, South and Central America)

**Area**
- 400,000 km²

**Duration**
- October 2011 to September 2016

**website**
- www.kulunda.eu

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**LEGATO**

Land-use intensity and ecological engineering: Assessment tools for risks and opportunities in irrigated rice based production systems

**research questions**
- How is the following by sustainable development of South-East Asia irrigated rice-based land-use?

- Drivers
  - Social system, climate change, land-use, drought.

- Indicators
  - Plants, pollination and natural enemies of pests, plants, indicators of soil composition, consumer behavior, manure, the regulation of N,P, equilibrium.

**Production**
- Agriculture and biodiversity

**Country**
- Vietnam and the Philippines

**Study sites**
- Trang An, Trang Vinh and Suoi Tien (Vietnam)

**Area**
- 100,000 km²

**Duration**
- March 2011 to February 2016

**website**
- www.legato-project.net

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**GLUES**

Global assessment of land-use dynamics, greenhouse gas emissions and ecosystem services

**Scientific Coordination and Synthesis of the BMBF-funding measure ‘Sustainable Land Management’**

**research questions**
- How do land-use changes and management strategies affect biodiversity and ecosystem services?

- Drivers
  - Agriculture, forestry, settlement & transport, urban expansion, infrastructure, energy policies, policy on nature and environmental protection.

- Indicators
  - Agriculture, forestry, settlement & transport, urban expansion, infrastructure, energy policies, policy on nature and environmental protection.

**Production**
- Agriculture and biodiversity

**Country**
- Brazil

**Study sites**
- Brazil

**Area**
- 7,500 km²

**Duration**
- 2011 to 2016

**website**
- www.legos-land-use.de

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**LUCCI**

Land-use change and climate interactions in the Yu Gu Tig River Basin, Central Vietnam

**research questions**
- What is the current land-use changes and management strategies?

- Drivers
  - Demographic change, increasing energy demand, climate change, land-use change.

- Indicators
  - Biophysical indicators for land-use change, land-use change.

**Production**
- Agriculture (dry and arable), forest, settlement, Industry

**Country**
- Central Vietnam

**Study sites**
- Yu Gu Tig River Basin

**Area**
- 13,500 km²

**Duration**
- July 2010 to April 2015

**website**
- www.lucci-vietnam.info

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**SACUSA**

Sustainable land management and adaptation strategies to climate change for the Western Saharan cor-belt

**research questions**
- How do ecosystem figures of subsurface systems and ecosystem services under climate change vary?

- Drivers
  - Natural and anthropogenic impacts on land-use change.

- Indicators
  - Agriculture and biodiversity

**Production**
- Agriculture and biodiversity

**Country**
- Western Saharan

**Study sites**
- 3 x 15 x 15 km² areas

**Area**
- 36,000 km²

**Duration**
- July 2011 to April 2014

**website**
- www.sacusa-monster.de

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**SuMaRio**

Participation research to support sustainable land management on the Morobase Plateau in South-western Mozambique

**research questions**
- How do ecosystem figures of subsurface systems and ecosystem services under climate change vary?

- Drivers
  - Climate change, post-conflict economic recovery, urban expansion, deforestation.

- Indicators
  - Agriculture, forestry, settlement & transport, urban expansion, infrastructure, energy policies, policy on nature and environmental protection.

**Production**
- Agriculture and biodiversity

**Country**
- Mozambique, Tanzania, Malawi, Zambia

**Study sites**
- 6 x 15 x 15 km² areas between Sinyard and Ethon

**Area**
- 2,200 km²

**Duration**
- July 2014 to July 2017

**website**
- www.sumarion-rice.org

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**SUMERIN**

Sustainable rural calabasses in the Mesoamían region: Developing an integrate land-use concept in the context of sustainable land management

**research questions**
- How can sustainable land-use systems be developed?

- Drivers
  - Climate change, land use change, biodiversity, productivity, biodiversity, sustainability.

- Indicators
  - Agriculture, forestry, settlement & transport, urban expansion, infrastructure, energy policies, policy on nature and environmental protection.

**Production**
- Agriculture and biodiversity

**Country**
- Russia | Siberia

**Study sites**
- 3 regions: 1) region Michailovskoje (dry, typical steppe), 2) region Junevskoje (dry, typical steppe), 3) region Kiprinskoje (wet, typical steppe)

**Area**
- 6,000 km²

**Duration**
- February 2011

**website**
- www.sumerin-research.de

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**The Future Okavango**

Scientific support for sustainable land and resource management in the Okavango basin

**research questions**
- How can we improve land management strategies for land and water resources management with scientific knowledge?

- Drivers
  - Land and water resources management, changing land-use patterns, environmental degradation.

- Indicators
  - Land and water resources management, changing land-use patterns, environmental degradation.

**Production**
- Agriculture, forestry, settlement, Industry

**Country**
- Namibia, Angola, Botswana

**Study sites**
- Okavango Delta, Okavango-Kavango Basin

**Area**
- 530,000 km²

**Duration**
- September 2010 to August 2015

**website**
- www.thefutureokavango.de