Funded by the European Union

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TEEB
The Economics of Ecosystems & Biodiversity

UN environment programme
International Ecosystem Management Partnership
国际生态系统管理伙伴计划

TEEBAgriFood China: Applying TEEBAgriFood in Multi-functional landscapes

Li LI

2022.06.22

Outline

1. Background and aim
2. Our approach
3. Assessing the capitals
4. Looking forward

Working from Chinese context

Status

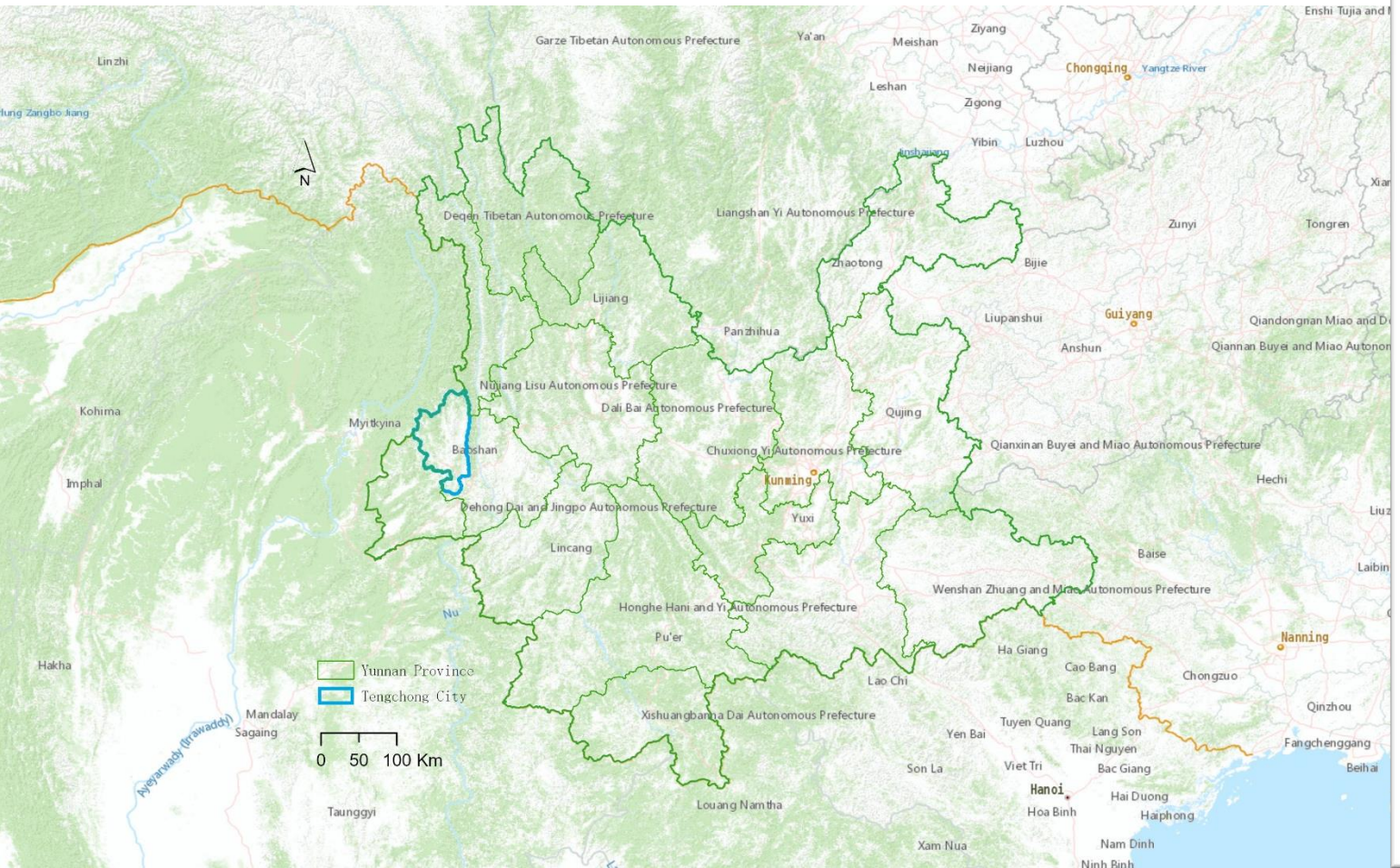
- Small-holder production
- Diverse and multi-functional agricultural landscape

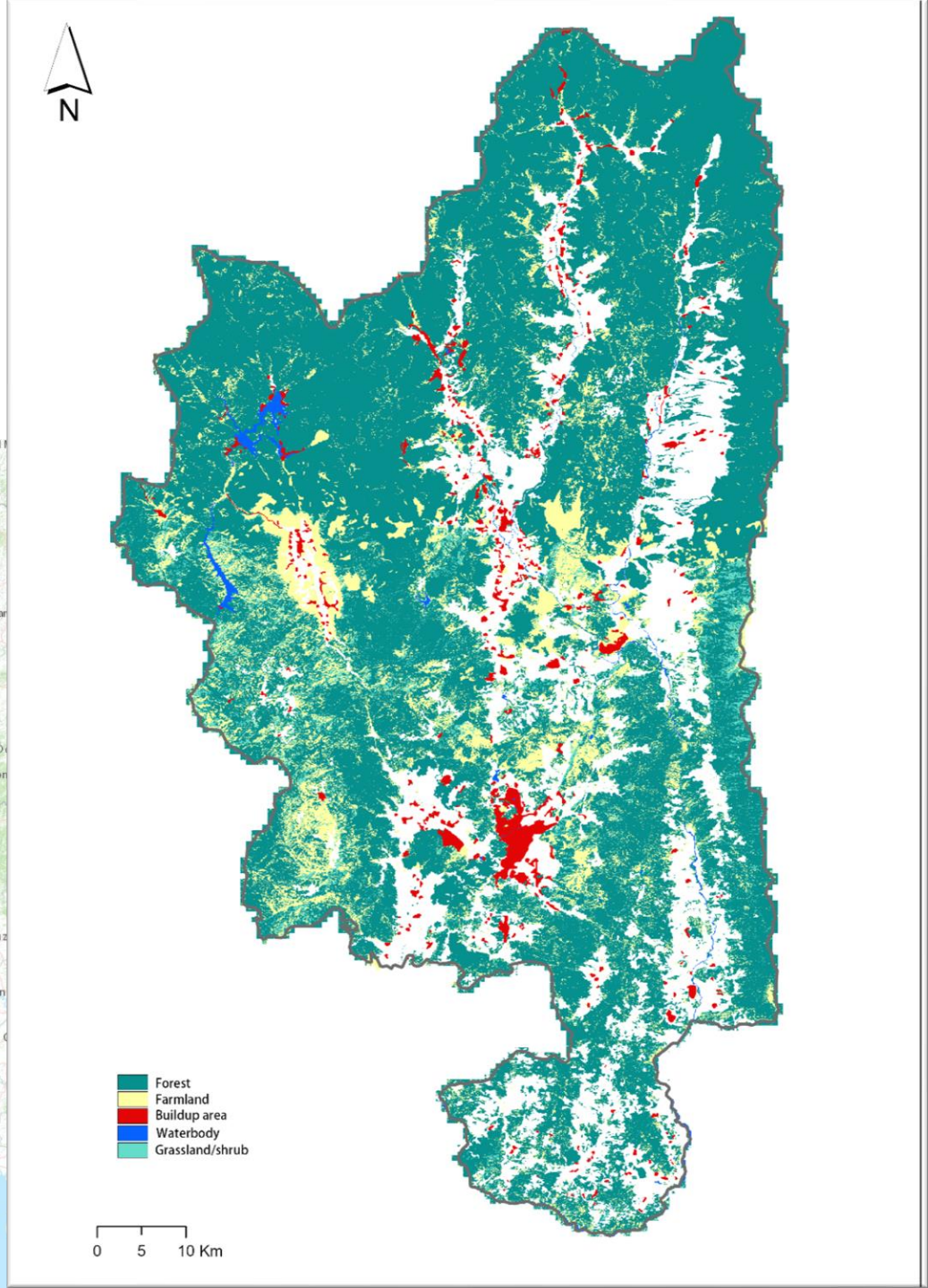
Trend

- Agricultural transition needed (ecological, structural)
  - Developing circular ecological agriculture
  - Promoting organic methods
- “**Green is Gold**”

Tengchong City

- Area: 5845 km^2
- Population: 643 thousand
- Geography: mountainous
- Climate: subtropical monsoon, annual prec. 1531mm,
- Forest coverage 75%
- Origin of Daying River



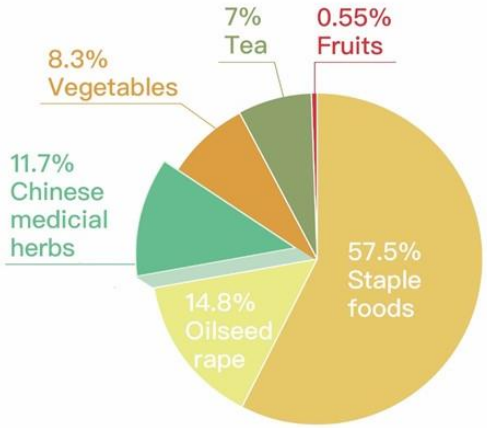


Current status and trends of Tengchong's Agricultural system

Plantation

GDP 4 billion yuan (2020 Q1–3)

Area of plantation (%)

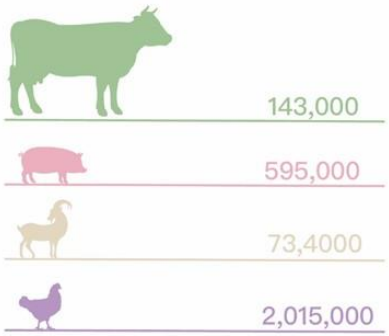


Staple foods · Oilseed rape · Chinese medicial herbs · Vegetables · Tea · Fruits

Beef cattle breeding

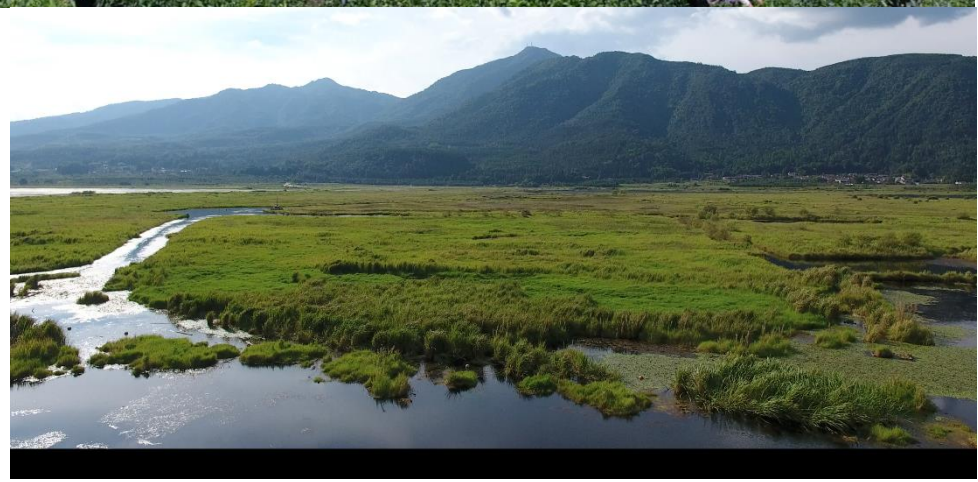
GDP 2.4 billion yuan (2020 Q1–3)

Stock (head)



Cattle · Sheep · Pig · Poultry

Data as of Q3 of 2020



Agricultural development potentials

“Green is gold” practice innovation base

- Scaling up beef cattle industry
- Reduce pesticide and chemical fertilizer levels
- Maintain endemic species plantation
- Expand medicinal herb industry (promote under-canopy plantation)
- Developing ecological tourism

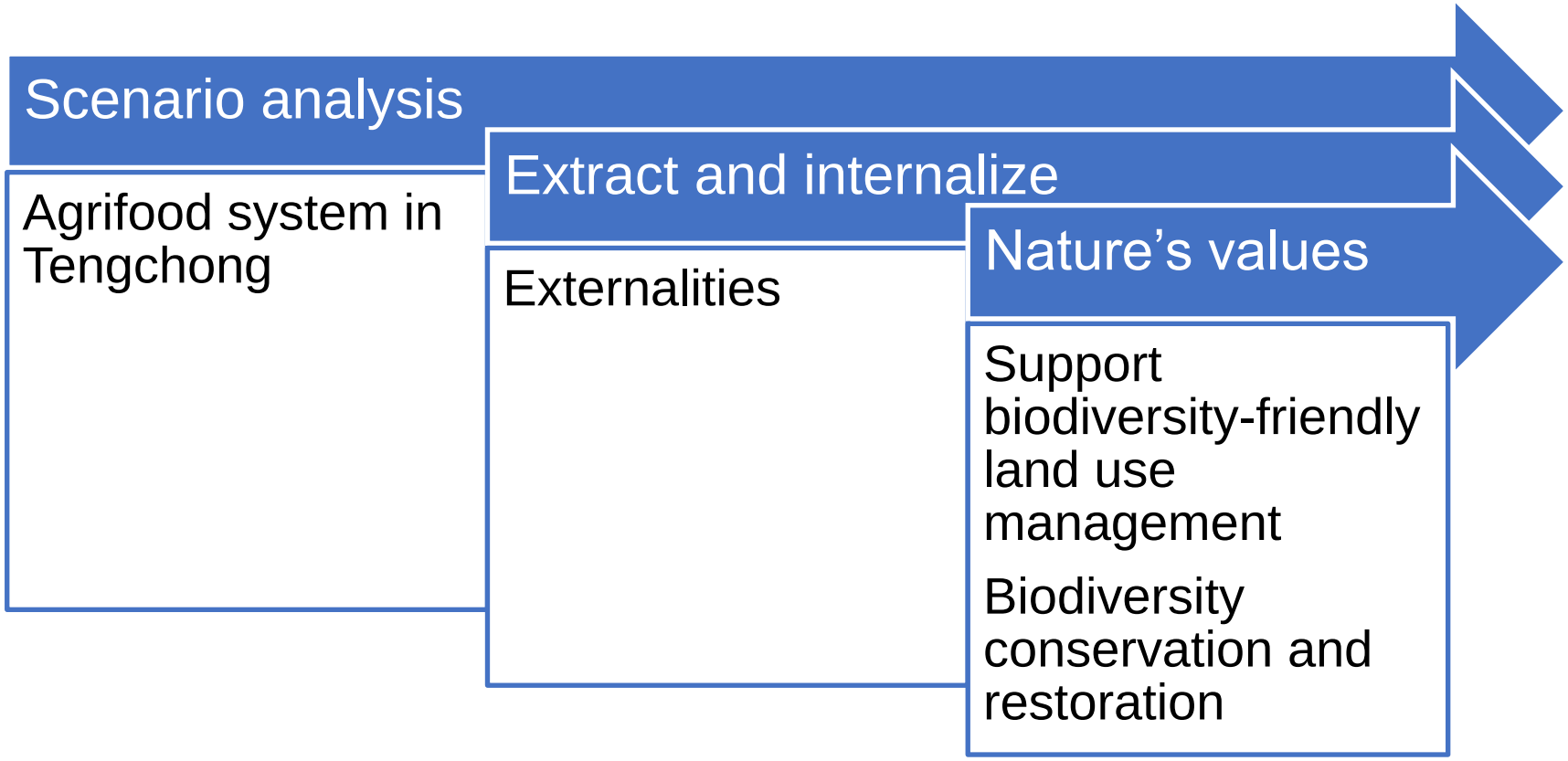
⇨

In line with national priorities

- “Green is gold”
- Prevention and control of agricultural non-point source pollution
- China Biodiversity Conservation Strategy and Action Plan (2011-2030)
- Promotion of circular economy

What TEEBAgriFood does in Tengchong

Valuing the invisible



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Scenario setting: Driving forces

Policy drivers

- Cattle breeding
  - Eco-pasture
  - Large-scale standardized breeding
  - Medium-scale planting breeding
  - Small-scale planting breeding
- Plantation
  - Reduction of pesticide and chemical fertilizers
  - Mix-cropping
  - Endemic species
  - Under-canopy

Scenario setting: Driving forces

Non-policy drivers (natural environmental & socioeconomic)

- Climate change (RCP4.5 & RCP8.5)
- GDP
- Demographic change
- Urbanization

Scenario setting: policy scenarios

BAU

- Following current development path and planning
- Beef cattle industry gradually adopts scaled production (e.g., standardized farms, eco-pastures)
- Plantation transition follows national agenda (reduced use & increased efficiency of agro-chemicals)

Optimistic

- Ecological development path
- Climate friendly methods adopted in cattle breeding (innovative methods to reduced GHG emissions)
- Plantation transition exceeds BAU parameters

Pessimistic

- Non-ecological path
- Bottom line for comparison

Scenarios developed

Scenario 1 **RCP4.5 + BAU**	**Scenario 2** **RCP4.5 + Optimistic**	**Scenario 3** **RCP4.5 + Pessimistic**
Scenario 4 **RCP8.5 + BAU**	**Scenario 5** **RCP8.5 + Optimistic**	**Scenario 6** **RCP8.5 + Pessimistic**

Short-term (2020-2025)	Mid-term (2020-2035)	Long-term (2020-2050)
• Endpoint of the 14th Five-year plan	• Basic realisation of modernisation • Formation of green production and lifestyle	• Second century-goal • Overall improvement in ecological civilization

LULC modelling

Land use/land cover change

- Existing biophysical data
- RCP: precipitation, temperature
- Cellular automata
- Different restriction matrix

Multi-source data for land-use land-cover change modelling

Data type	Indicator	Year	Data resolution	Data source
Land use data	land use	2000-2020	30m	Resource and Environment Science a Data Center (http://www.resdc.cn/)
Socio-economic driver	Administrative boundaries			
	GDP	2015	1000m	Resource and Environment Science a Data Center (http://www.resdc.cn/)
	Population	2015	100m	WorldPop (www.worldpop.org/)
	Distance from administrative center	2015	30m	National Catalogue Service for Geographic Information (www.webmap.cn)
	Distance from major roads	2015	30m	National Catalogue Service for Geographic Information (www.webmap.cn)
	Distance to highway and railroad	2015	30m	National Catalogue Service for Geographic Information (www.webmap.cn)
Natural driver	Digital elevation model (DEM)	2015	30m	Resource and Environment Science a Data Center (http://www.resdc.cn/)
	Slope	2015	30m	Based on DEM
	Slope direction	2015	30m	Based on DEM
	Soil type	1995	1000m	FAO (www.fao.org/)
	Distance from water system	2015	30m	National Catalogue Service for Geographic Information (www.webmap.cn)
	Temperature	2015	1000m	Resource and Environment Science a Data Center (http://www.resdc.cn/)
	Rainfall	2015	1000m	Resource and Environment Science a Data Center (http://www.resdc.cn/)
Future climate scenario	Temperature	2020-2035	0.25°	National Tibetan Plateau Data Center (data.tpdc.ac.cn)
	Rainfall	2020-2035	0.25°	National Tibetan Plateau Data Center (data.tpdc.ac.cn)

Restriction matrix under BAU scenario

	Built land	Farmland	Grassland	Forest	Garden	Bare land	Waterbody
Built land	1	1	1	0	0	0	1
Farmland	1	1	1	1	0	1	1
Grassland	1	1	1	1	1	1	1
Forest	0	1	0	1	1	0	0
Garden	1	1	1	1	1	1	1
Bare land	1	1	1	1	1	1	0
Waterbody	1	0	1	0	1	1	1

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Assessing the capitals

LULC **Residual emission**

InVest

LCA, toxicological modeling, econometric methods

Econometric methods

Assessing the capitals

LULC **Residual emission**

InVest

Natural capital

- Ecosystem services (provisioning, recreation, water flow regulation and purification, soil erosion, pollination, carbon storage and sequestration)
- Emissions (air pollutants, water pollutants, solid waste, carbon dioxide)

LCA, toxicological modeling, econometric methods

Econometric methods

Assessing the capitals

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Human capital

- Health impact (occupational exposure, water exposure, consumption of products)
- Quantity and quality of workforces
- Skills training

Econometric methods

Assessing the capitals

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Human capital

- Health impact (occupational exposure, water exposure, consumption of products)
- Quantity and quality of workforces
- Skills training

Econometric methods

Social capital

- Women empowerment
- Social institutions

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- Facilitated by UNEP-IEMP
- Implemented by IGSNRR, CAS and CRAES, MEE
- Inception workshop in Aug 2019
- First PSC meeting in Jul 2020
    - Tengchong selected as project site
- First stakeholder consultation in October 2020
- Second PSC meeting in Feb 2021
    - Scoping and scenario-setting report endorsed
- Second stakeholder consultation in May 2021
    - Data acquisition, questionnaires
- Third PSC meeting in March 2022
    - Data and methodology report endorsed

Looking forward

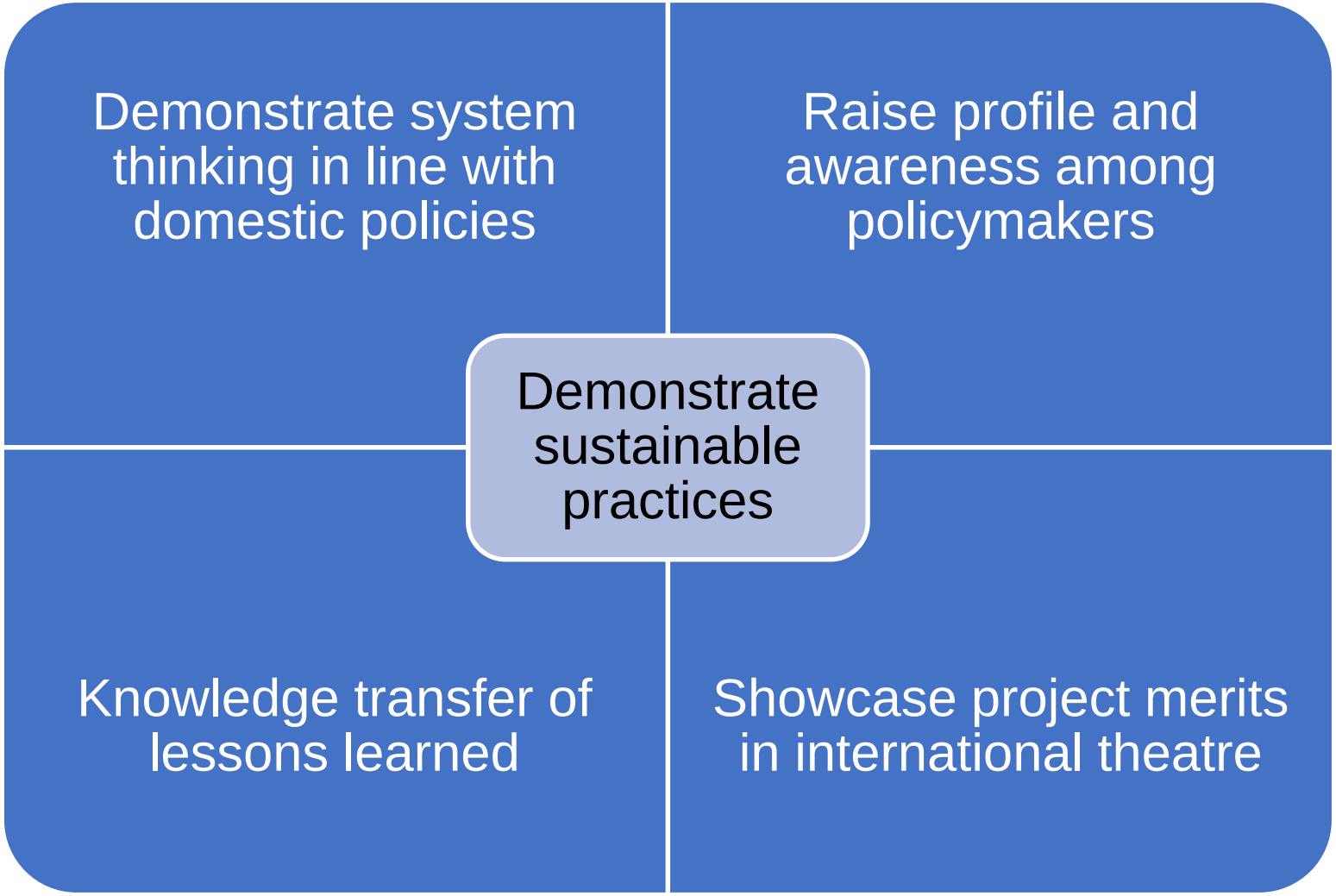
Measure and mainstream

Results ⇔ **Valuing the invisible**

Highlight links between systems

Highlight agricultural impacts

Looking forward



Thank you for your attention!

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Institute of Geographic Sciences and Natural Resources Research (IGSNRR), Chinese Academy of Sciences (CAS)

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