Collaborative Pathways for Sustainable Food Systems: Integrating Data, Policy, and Natural Capital Modelling

Presentation to the

Africa-Europe Cluster of Research Excellence in Sustainable Food Systems (CoRE-SFS)

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Presentation Outline

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1. Introduction

Introduction

Food systems are at the heart of the 2030 Agenda for Sustainable Development and AU 2063 Agenda among others.

Without eliminating hunger and improving the health and nutrition of the world's population, the 2030 Agenda for Sustainable Development cannot be effectively realized.

Achieving Sustainable Food Systems is connected to the global challenge of reducing environmental impacts from the production and consumption of food.

Designing and implementing sustainable food systems policies and programmes in a systemic way can help achieve at least 12 of the 17 Sustainable Development Goals.

Introduction . . .

- Building sustainable food systems requires:

  - examining food systems as a whole rather than in separate pieces, valuing outcomes over processes, and embracing a variety of voices instead of individual perspectives.

  - Connecting elements within various policy agendas: Environmental, agricultural, health, trade, and industry.

  - Identify an individual or group of food systems champions.

  - Conduct a holistic food systems assessment.

  - Initiate a multi-stakeholder process for dialogue and action.

  - Strengthen institutional capacity for long term food systems governance

Introduction . . .

- Why sustainable Food Systems are important:

  - Governments are increasingly facing difficulty in their efforts to achieve sustainable food systems.
  - Outcomes include intense natural resource use, poverty and hunger, climate change and health outcome.

- Thus, modelling is key.

Introduction . . .

Natural capital modelling is the process of quantifying and representing the stocks of natural resources (such as soil, water, air, plants, and animals) and their capacity to provide ecosystem services that support agricultural production and broader environmental benefits (Farming for the Future, 2024).

Additionally, a country's ability to generate sufficient income for future generations depends on maintaining or growing its total capital (Natural and artificial) base.

However, the **process of development** is largely fueled by depleting a nation's nonrenewable resources and leaving renewable resources overexploited or even extinct.

Introduction . . .

Natural capital includes both the stock of natural resources (like forests, fisheries, clean air, water . . .) and the flow of ecosystem services (like carbon sequestration, pollination, water filtration) derived from those stocks.

- The need to include Natural Capital and Climate Variables into the macroeconomic models is on the rise across the world (Turpie et al., 2023; Bateman & Mace, 2020) and highly recommended by the World Bank following the 1st wealth of Nations report in 2006.

- This is particularly relevant for many African nations whose economies heavily rely on natural capital resources like forests, land, water, minerals, and wildlife.

- In most African countries, food production largely depends on natural factors.

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Introduction . . .

- Attaching monetary values to ecosystem services thus enables policymakers to ensure that the benefits that are derived from ecosystems are included in their planning and budgeting decisions.

- Integration of Natural Capital Accounts (NCA) in planning and budgeting improves policy and decision-making as far as the protection and sustainability of ecosystem services is concerned (Maes et al., 2012; Ouyang et al., 2020).

- This contributes to sustainable food production and security.

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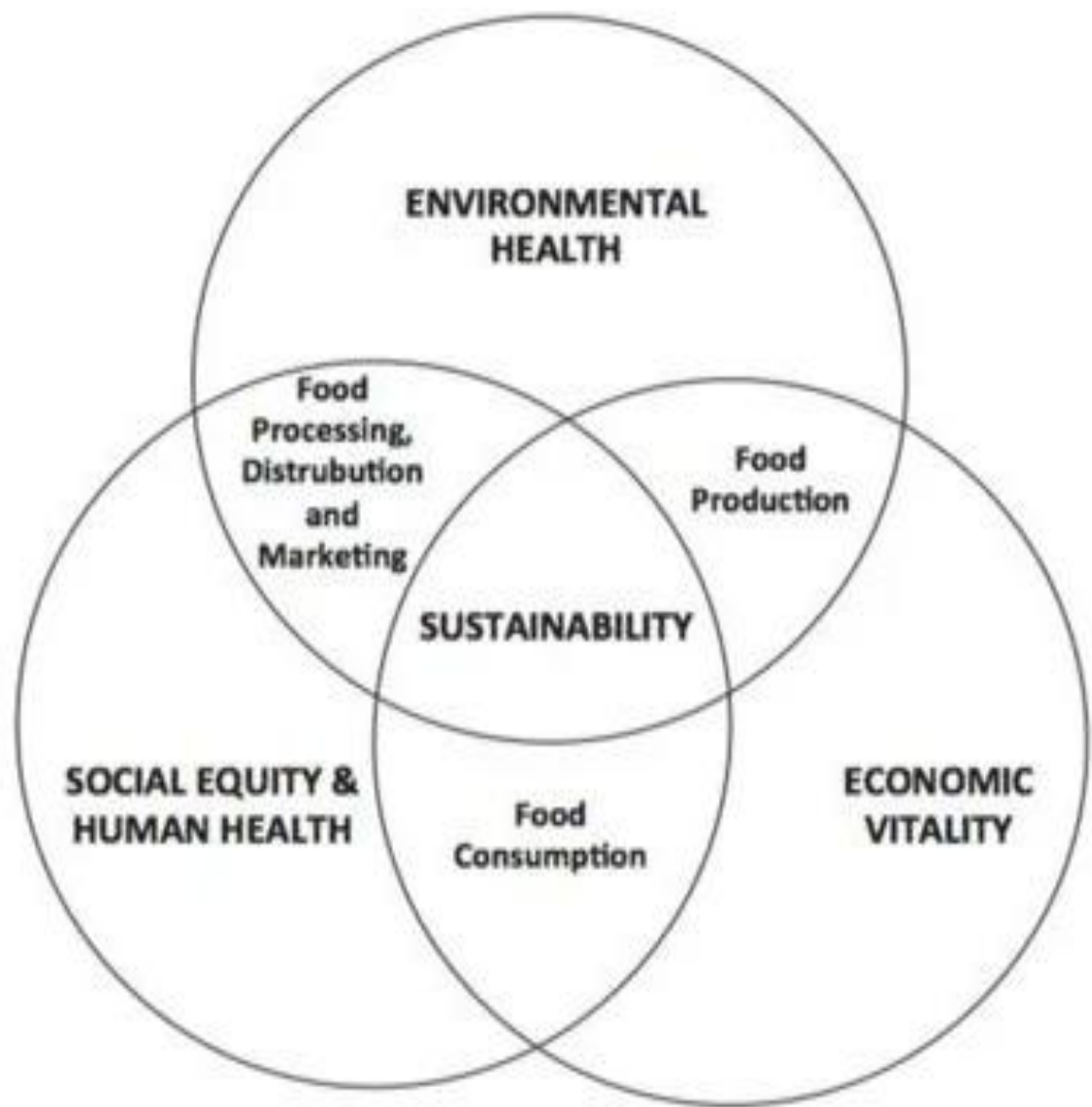
2. Sustainable Food Systems, Natural capital and Policy

Ecosystem services and Natural capital
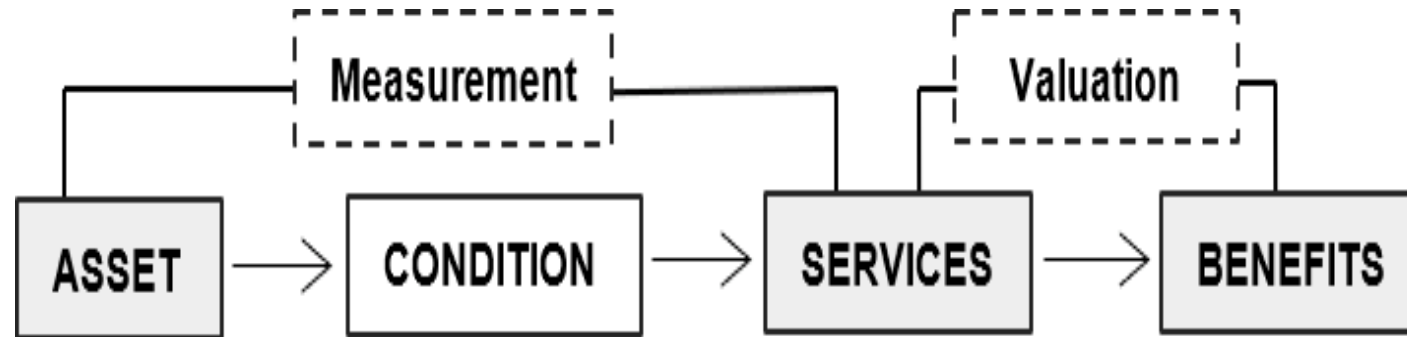

- A flowchart adapted from the Natural Capital Protocol illustrates the relationship between a natural capital *asset,* the *condition* of that asset, **the ecosystem** *services* that flow from the asset, and the *benefits* such as *water, energy, among others* that those services provide to the economy and hence contribute to various macroeconomic variables such as, agricultural productivity, GDP, employment, services among others.
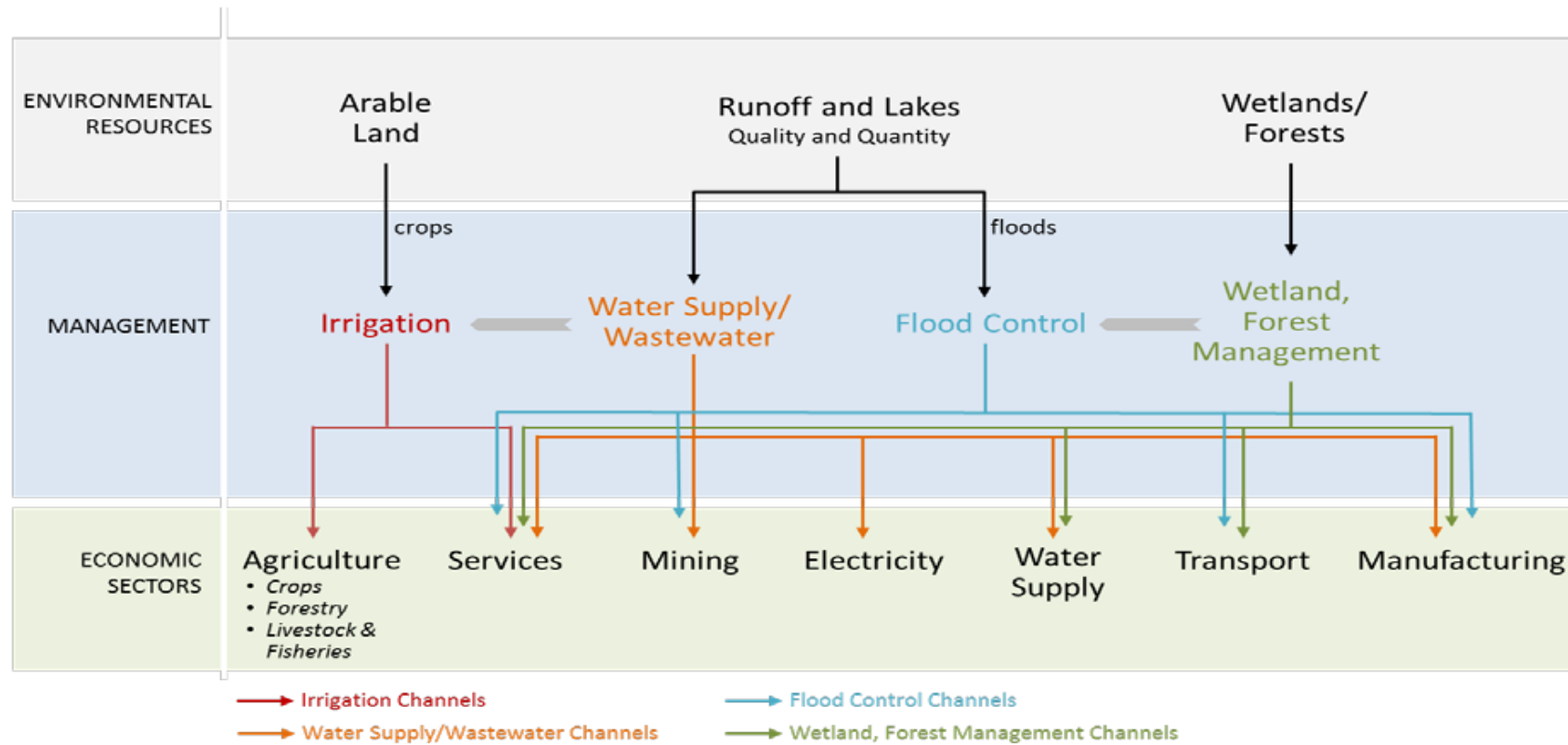
Linkage Between Selected NCA and Economy
Source: Modified from Strzepek et al. 2016
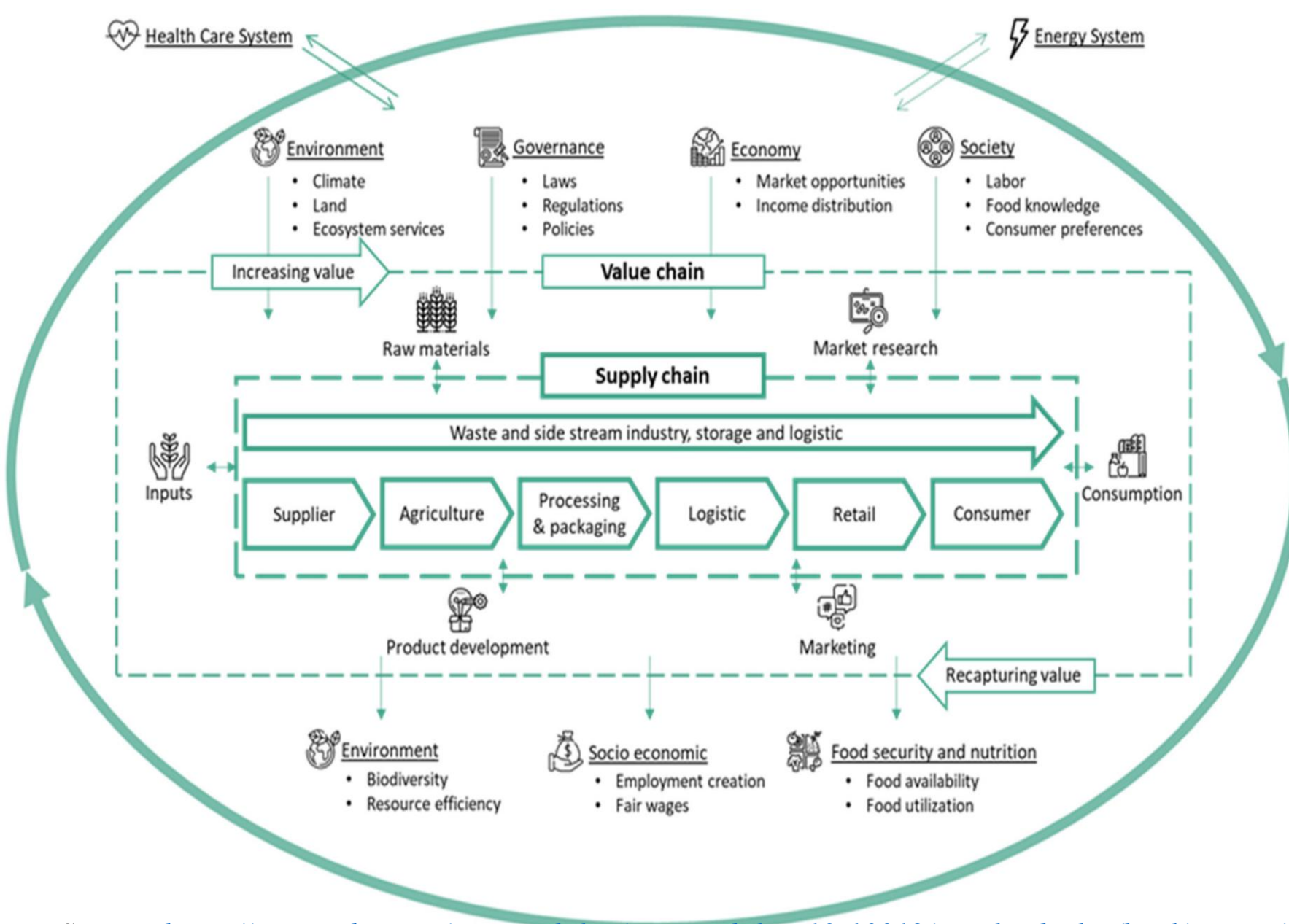
Sustainable food systems

Food systems span agriculture, health, environment, trade, and social protection policies.

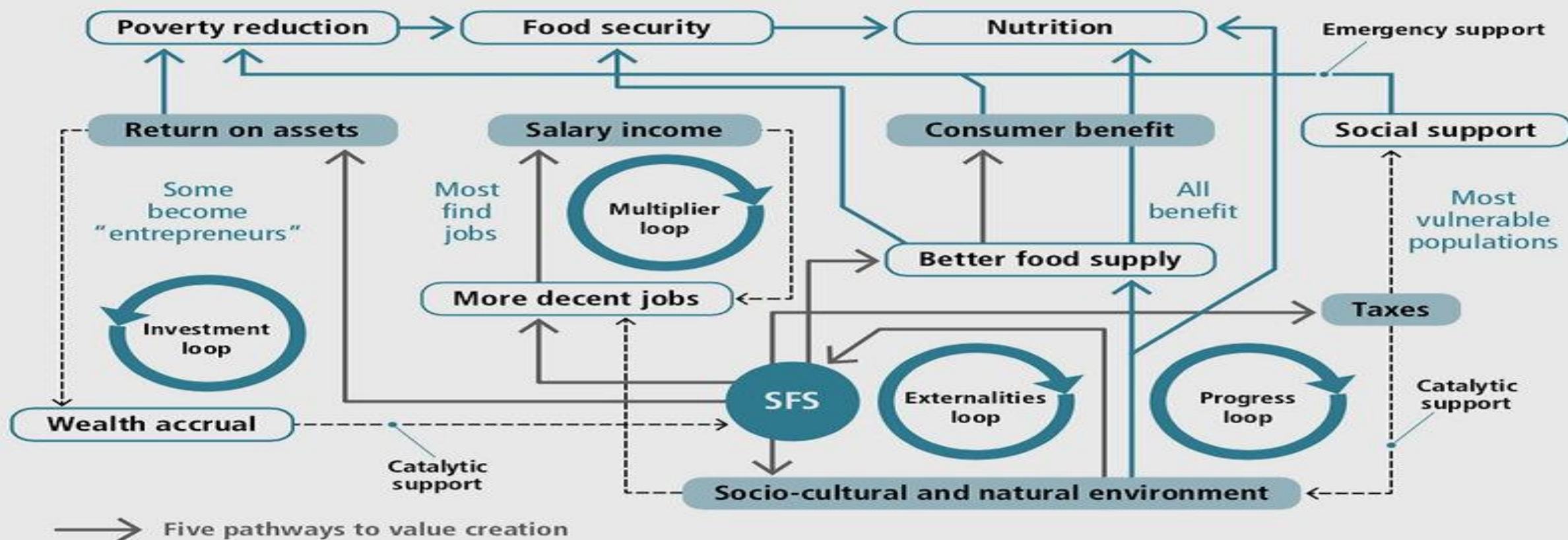Ecosystem services include pollination, nutrient cycling, water purification, carbon sequestration.

Modelling helps to quantify service flows, impacts of degradation, and supports sustainable management.

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Food and Agriculture Organization of the United Nations

Poverty reduction → Food security → Nutrition ← Emergency support

Return on assets — Salary income — Consumer benefit — Social support

Some become "entrepreneurs"

Most find jobs — Multiplier loop

All benefit

Most vulnerable populations

Investment loop

More decent jobs — Better food supply

Wealth accrual

SFS — Externalities loop — Progress loop — Taxes

Catalytic support

Socio-cultural and natural environment

Catalytic support

→ Five pathways to value creation
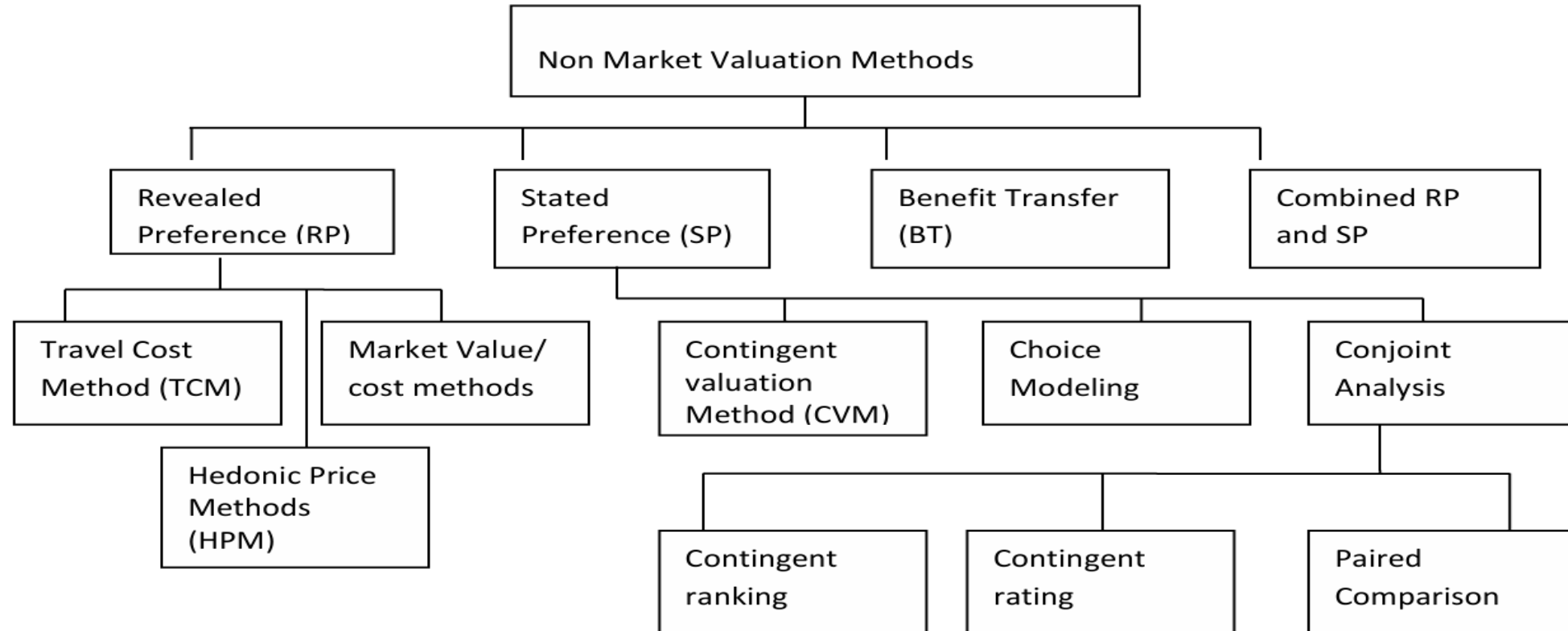
Source: Adapted from FAO, 2014.

NCA Data Collection Methods

Figure 5.1 A taxonomy of economic values
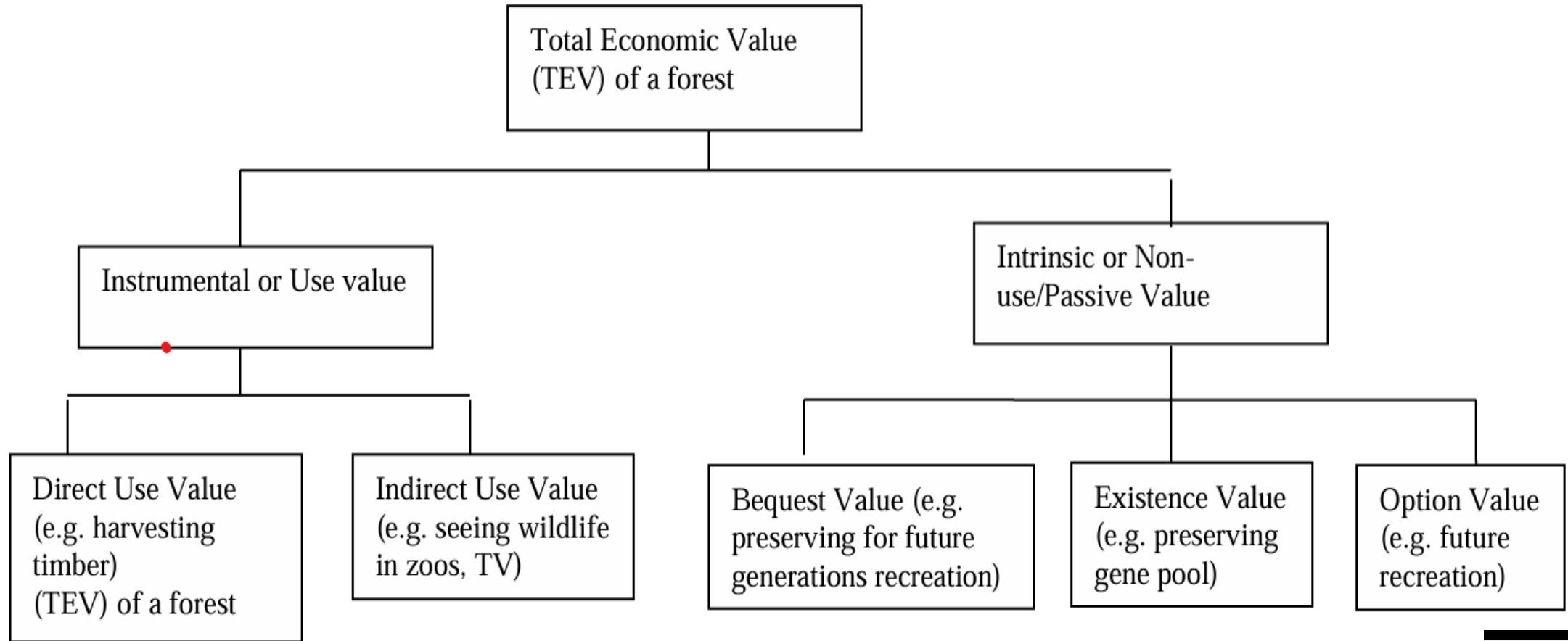
NCA Data Collection Methods . . .
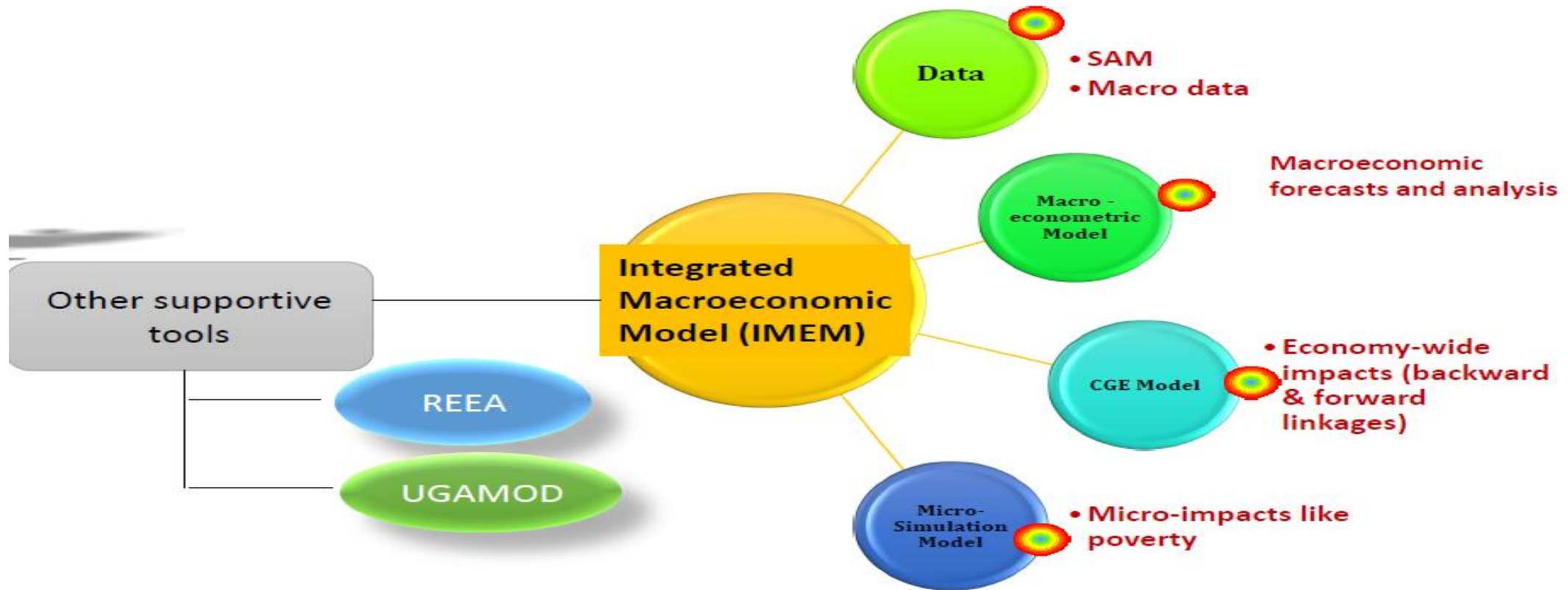

Figure 5.2: Classification of Valuation Methods

3. Steps by Government

An example from MoFPED, Uganda

- **Ministry of Finance, Planning and Economic Development** has made efforts to integrate natural capital in macroeconomic modelling in various ways with data provided by UBOS as illustrated below:

Figure 1: Integrated Macroeconomic Model for Uganda

Source: Ministry of Finance, Planning and Economic Development (2024)

Steps in Modelling

SEEA & NC Accounting

Institutional framework & coordination

Data manipulation for environmental accounting

Model development & Use

Results interpretation

Required capacity:
1. Development of Natural Capital Account (NCA)
2. Advanced Excel Functions & commands for Economists
3. Introduction & Advanced Environmental SAM Multiplier Tool
4. Policy Analysis and drafting Policy Notes/Papers

4. Significance of Modelling NCA

Significance

Offers an opportunity to design climate change-sensitive, economically viable, and environmentally responsive policies to contribute to food production sustainably.

Provides evidence that natural capital is economically important in order to determine a cost-benefit analysis acting as a platform for budget allocation and lobbying.

Provides useful information for a country deciding whether to deplete its capital stock to increase current economic activity and welfare or to save it for the future and, ultimately, the well-being of future generations (Barbier 2019).

Modelling Limitations

Data quality and availability with missing on key natural capital and climate variables including value chains that is making it hard for inclusion into the macroeconomic models.

Natural capital concepts and applications are complex Mace (2019, 61) affecting accounting and valuation.

Gaps regarding knowledge of NCA methods, ecological principles and statistical analyses.

The concept of NCA largely new and thus not well appreciated.

Integrating natural capital accounting into policy and decision-making process thus remains a challenge.

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Way Forward

Value Nature in Policy
Integrate ecosystem services into national accounts.

Bridge Data Gaps
Expand remote sensing and community monitoring to improve model accuracy.

Build Capacity & Coordination
Train government teams; form an inter-ministerial Task Force for shared goals.

Conclusion

Sustainable food systems are both achievable and measurable when diverse stakeholders unite around a common vision.

By quantifying ecosystem services alongside traditional economic indicators, hidden values are revealed that inform smarter decisions, strengthen institutional partnerships and empower local communities.

This charts a clear path toward resilient, equitable agricultural landscapes and hence sustainable food security for all.

Thank you!

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