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Assessing ecosystem services from Canadian beef: a social-ecological systems approach

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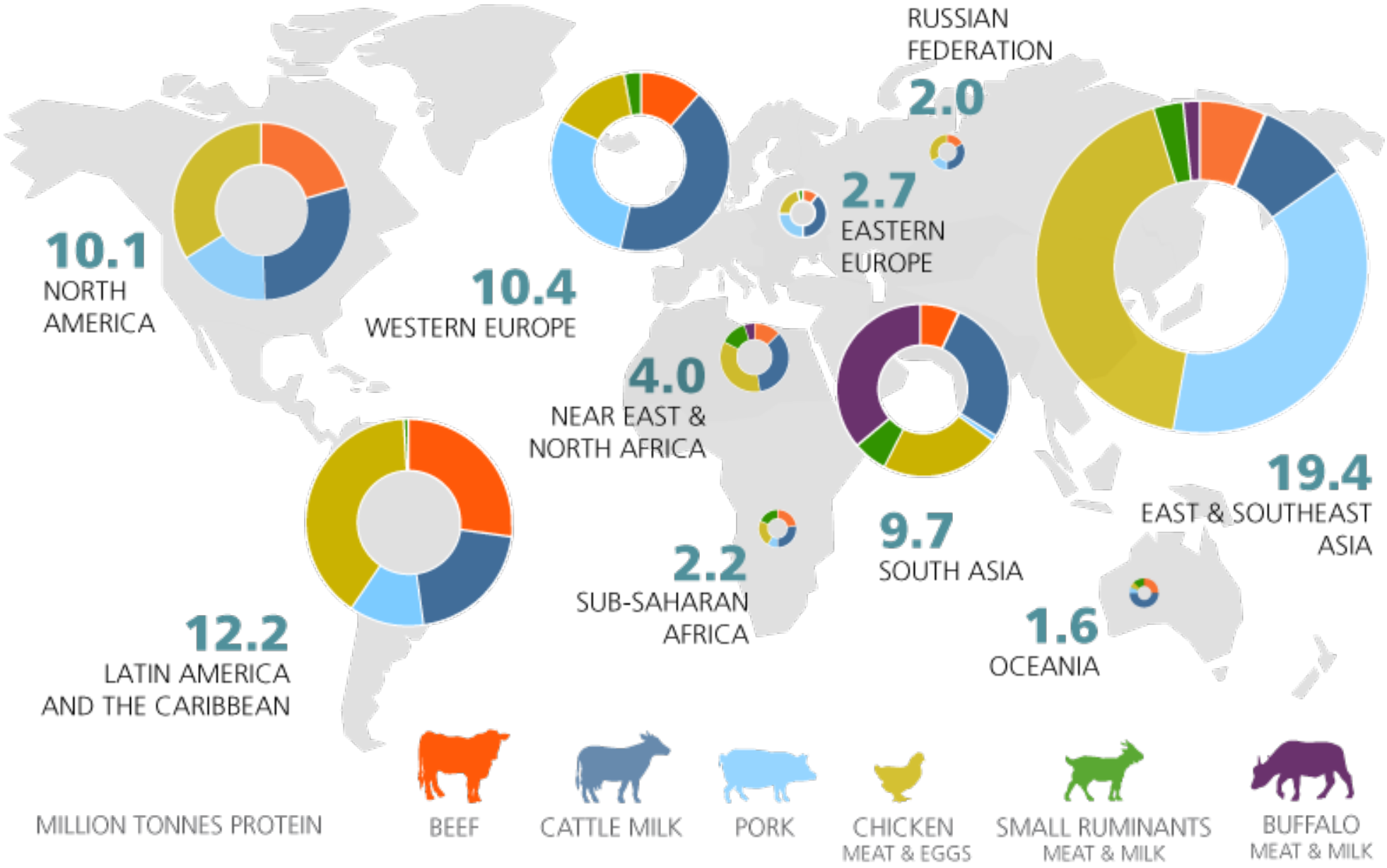
Canada

~74.3 million tonnes of protein



FAO (2017)

Canadian beef and global meat demand

$16 billion to GDP per year (2012-2016 average)

~10.5 million beef cattle in Canada in July 2017

11th largest producer

5th largest exporter of beef globally

1.9% a^{-1} increase in developing country consumption to 2050

1.3 Mt beef leather medicine manure cosmetics…

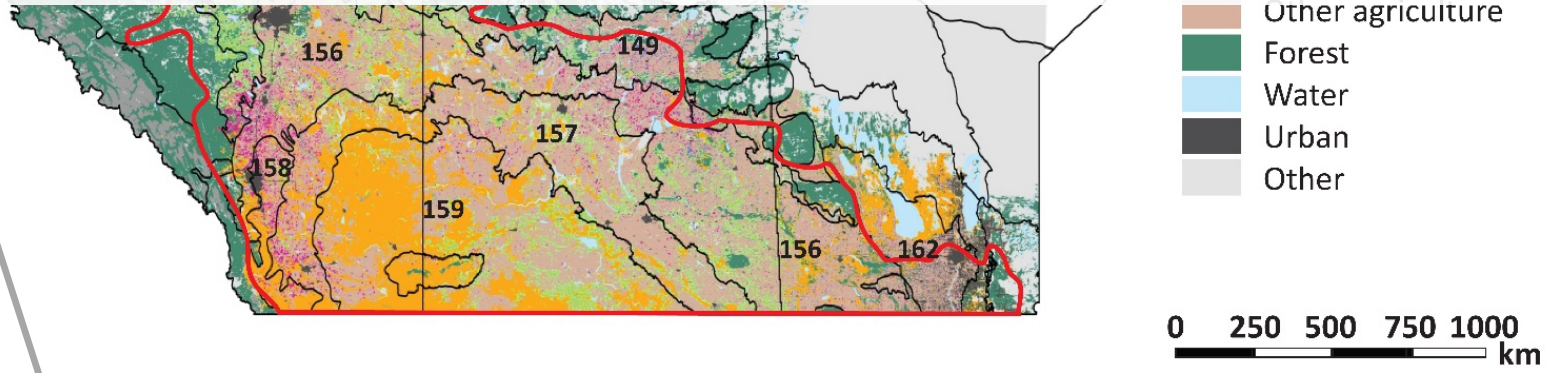
Beef production in the Canadian Prairies

~7.8 million beef cattle in prairies

Intensification of production

High population growth

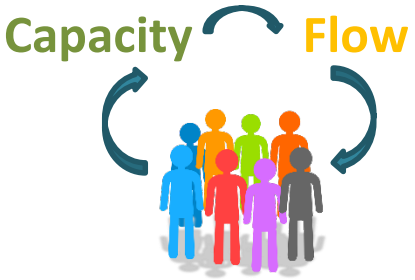
Aim: ***to construct a conceptual framework for ecosystem service assessment accompanied by a set of indicators to measure the ecological and social performance of the system***



Ecoregions, land cover (AAFC, 2016) and beef cow presence (Statistics Canada, 2014) in the Canadian Prairies

Assessing the sustainability of Canadian beef

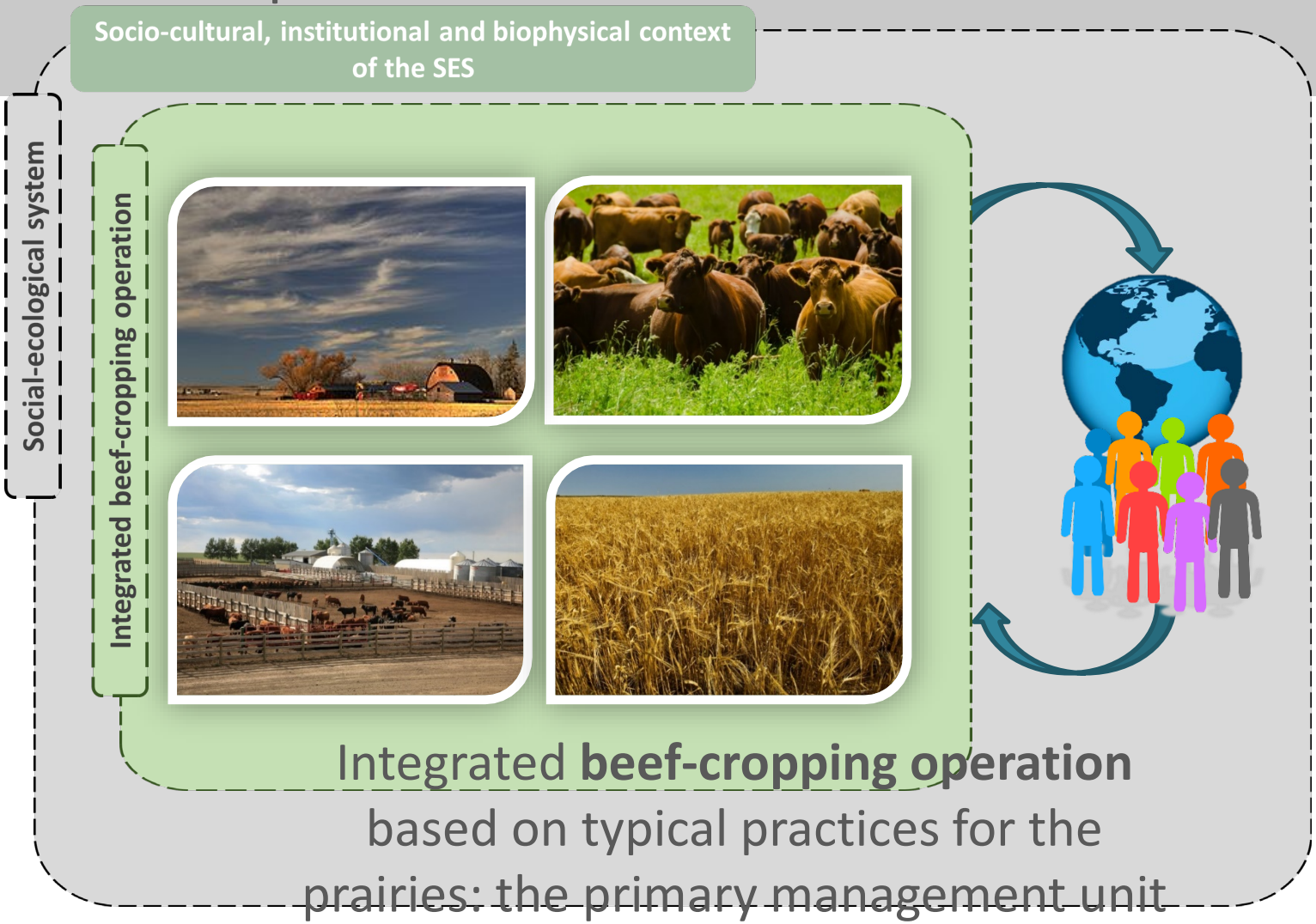
- Much ES research focussed on biophysical capacity or single/few ES
- Less information on the role of humans in the co-production of services
- Less information on service flow and impacts of changes in service flow on human well-being



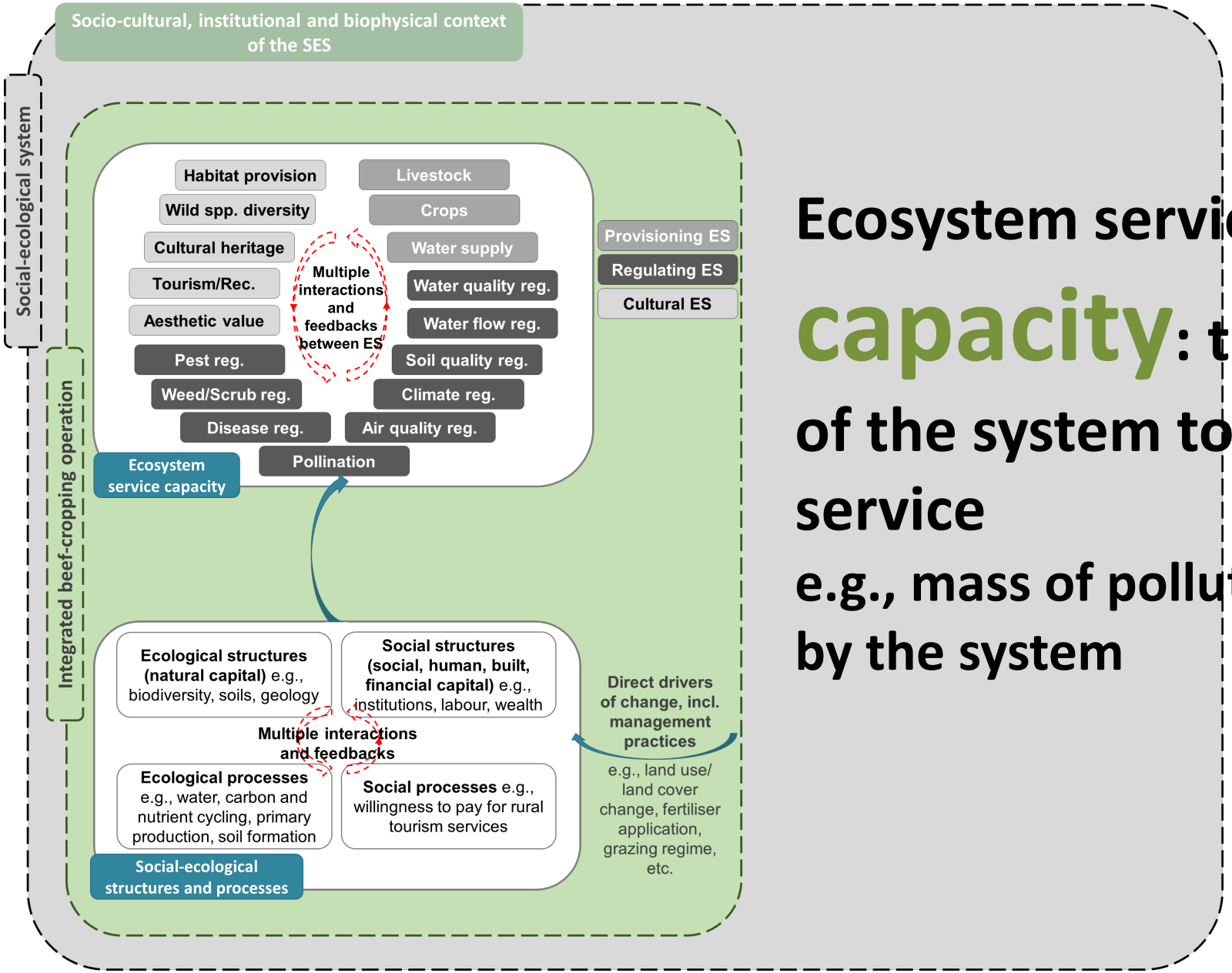
Social-ecological systems approach to ES assessment for prairie beef systems

Prairie beef production systems

The **agricultural stages** of beef production



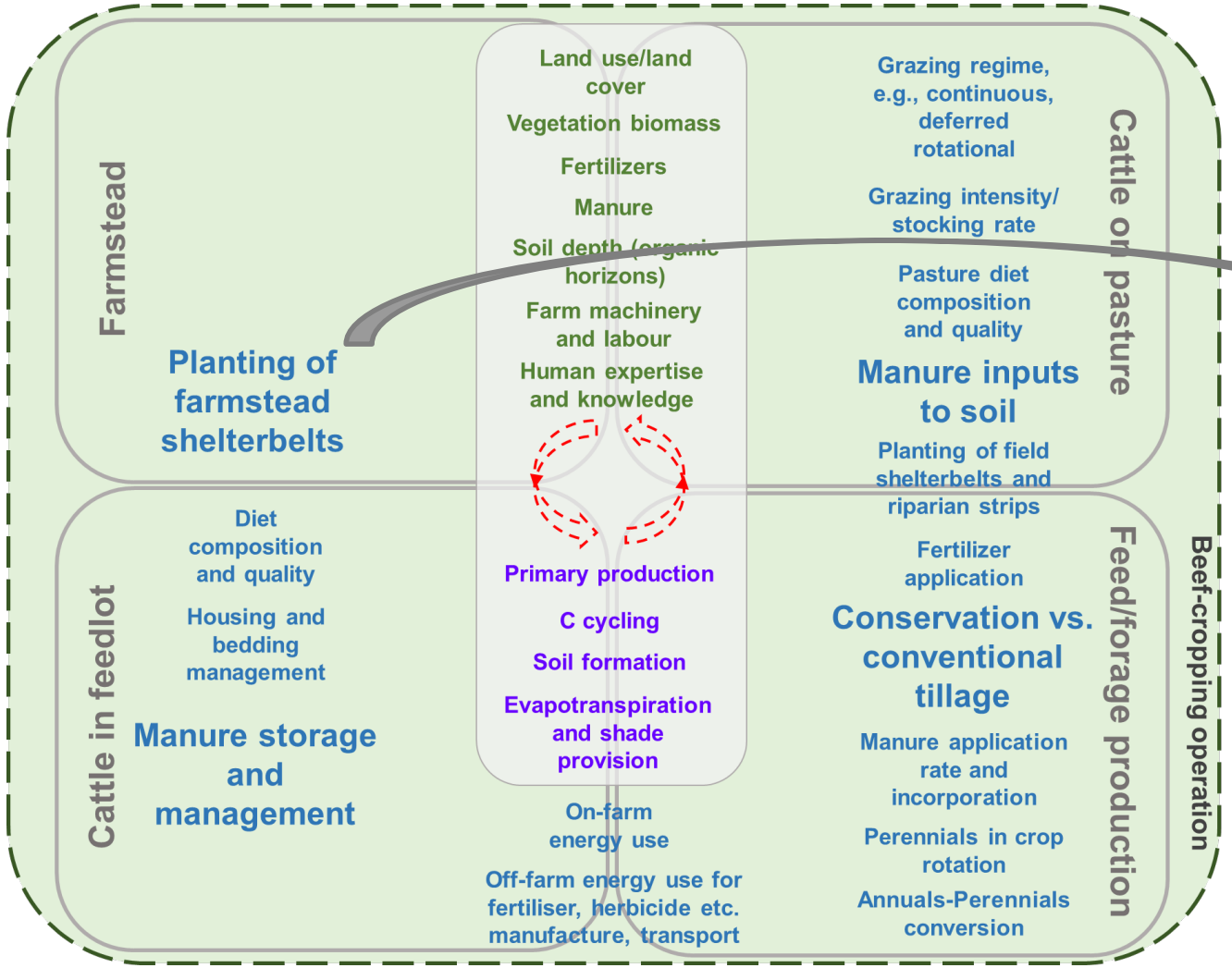
Integrated **beef-cropping operation** based on typical practices for the prairies: the primary management unit and source of ecosystem services



Ecosystem service capacity: the potential of the system to produce a service

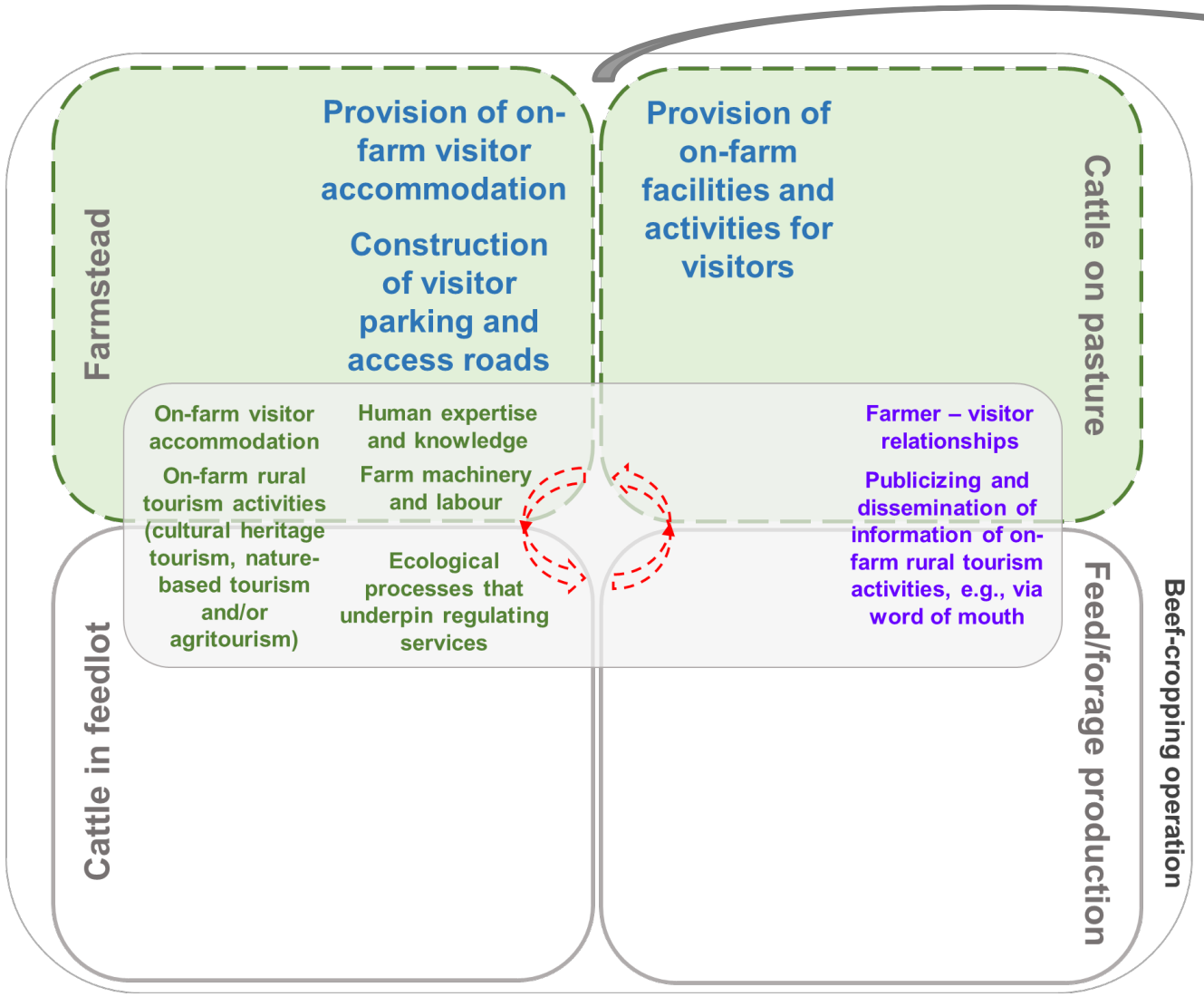
e.g., mass of pollutants retained by the system

Climate regulation



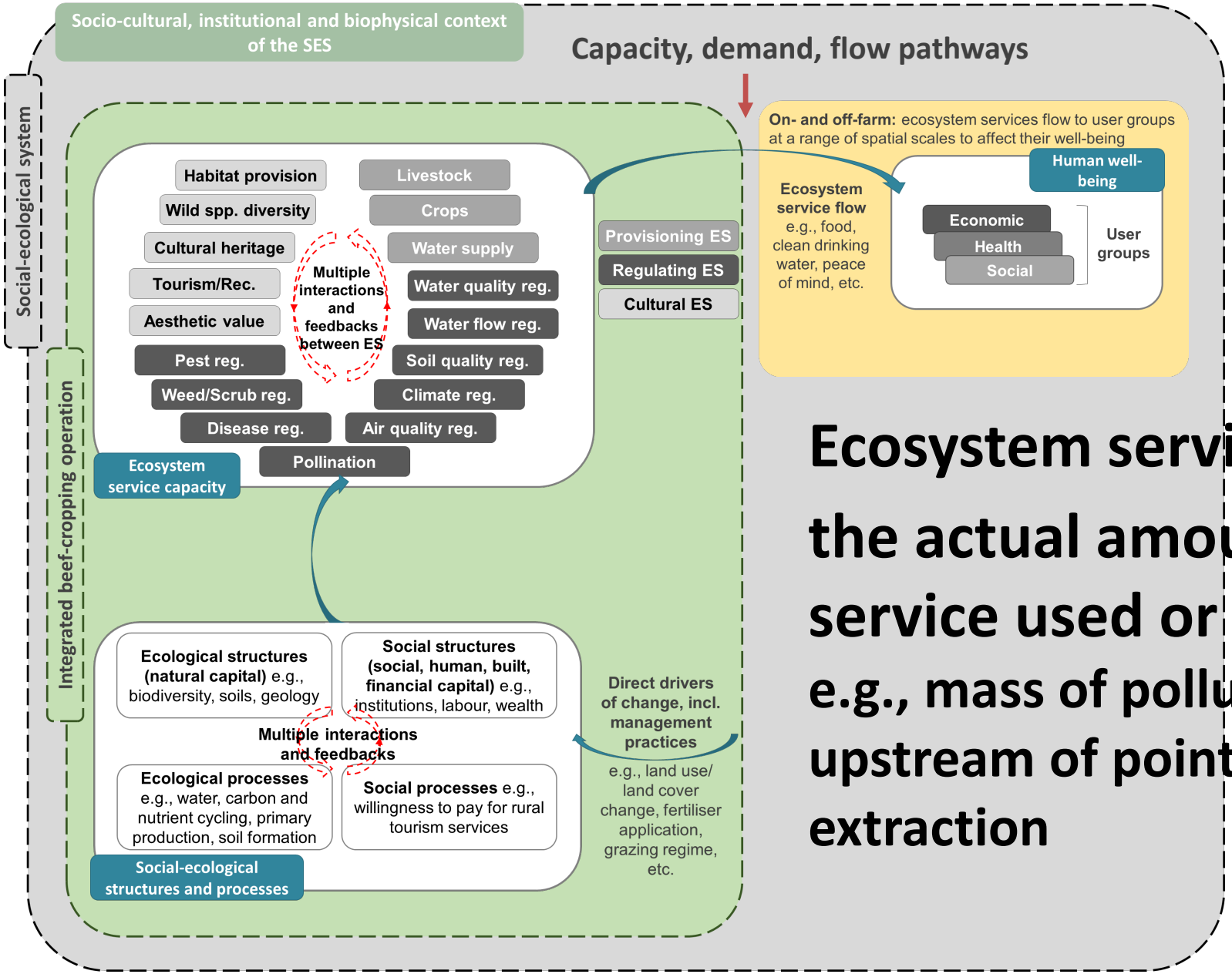
Planting of **farmyard shelterbelts** over 80 years in Saskatchewan sequestered an estimated **>130,000 t of C** in tree biomass and soils of white spruce

Rural tourism and recreation



Agritourism sector has expanded in recent decades…

Most agritourism farms and farm-based recreational activities occur **in the prairie ecoregions** of AB, SK and MB



Ecosystem service flow:

the actual amount of a service used or consumed

e.g., mass of pollutants retained upstream of point of use or extraction

Need to

disaggregate

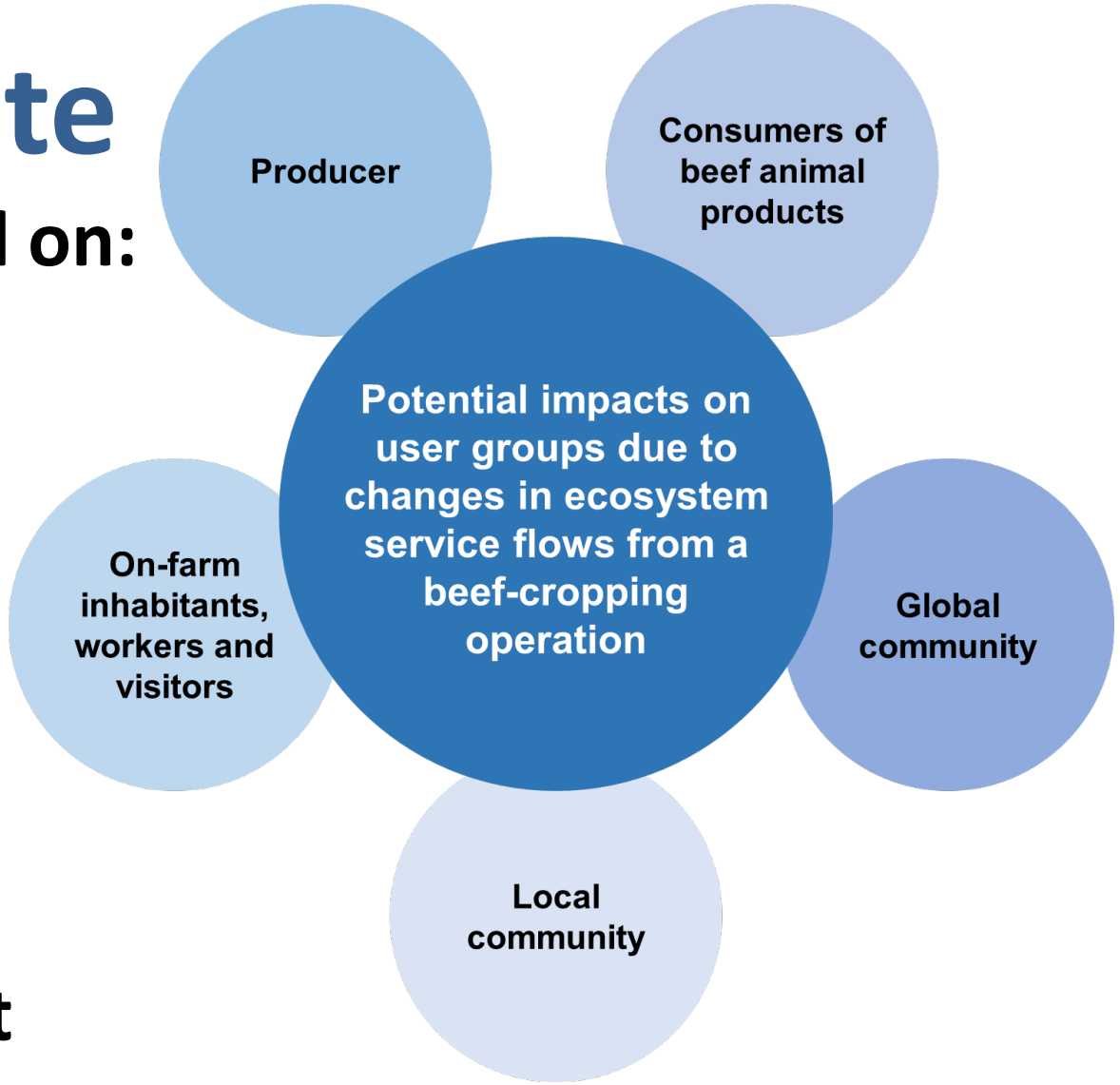
user groups based on:

who they are,

where they are,

how they consume or use a service,

how changes in service flow affect them



Climate regulation

Capacity and Flow

Soil C sequestration (t C ha^{-1} yr^{-1})

Avoided GHG emissions (t CO_2 eq. yr^{-1})

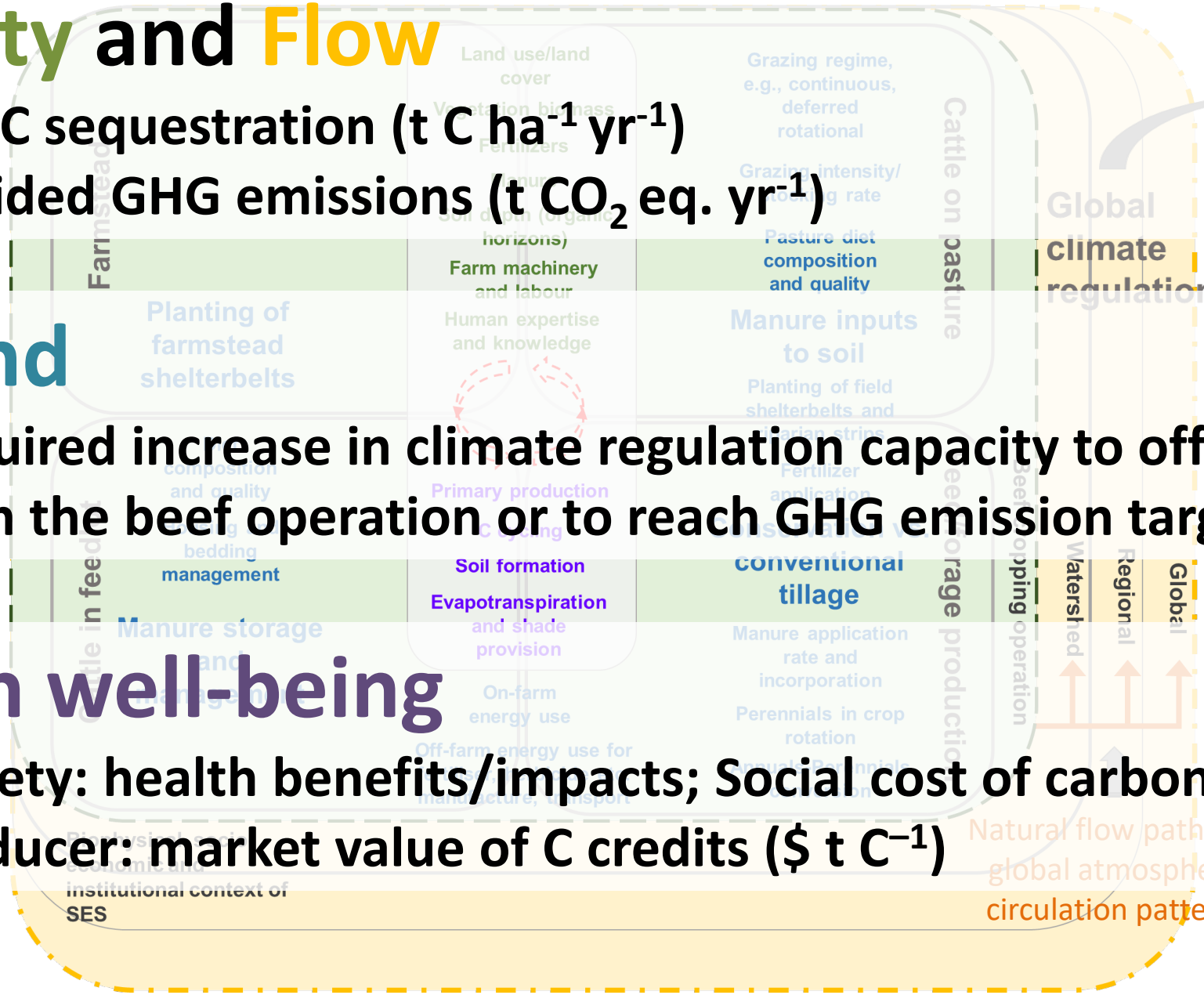
Demand

Required increase in climate regulation capacity to offset GHG emissions from the beef operation or to reach GHG emission targets

Human well-being

Society: health benefits/impacts; Social cost of carbon (SCC)

Producer: market value of C credits ($ t C^{-1})



Capacity

No. visitors beef cattle ranch can host per year for different activities

No. of fishing permits available for a stretch of river

Flow

Total visitor-days from current year

No. of people engaged in different activities

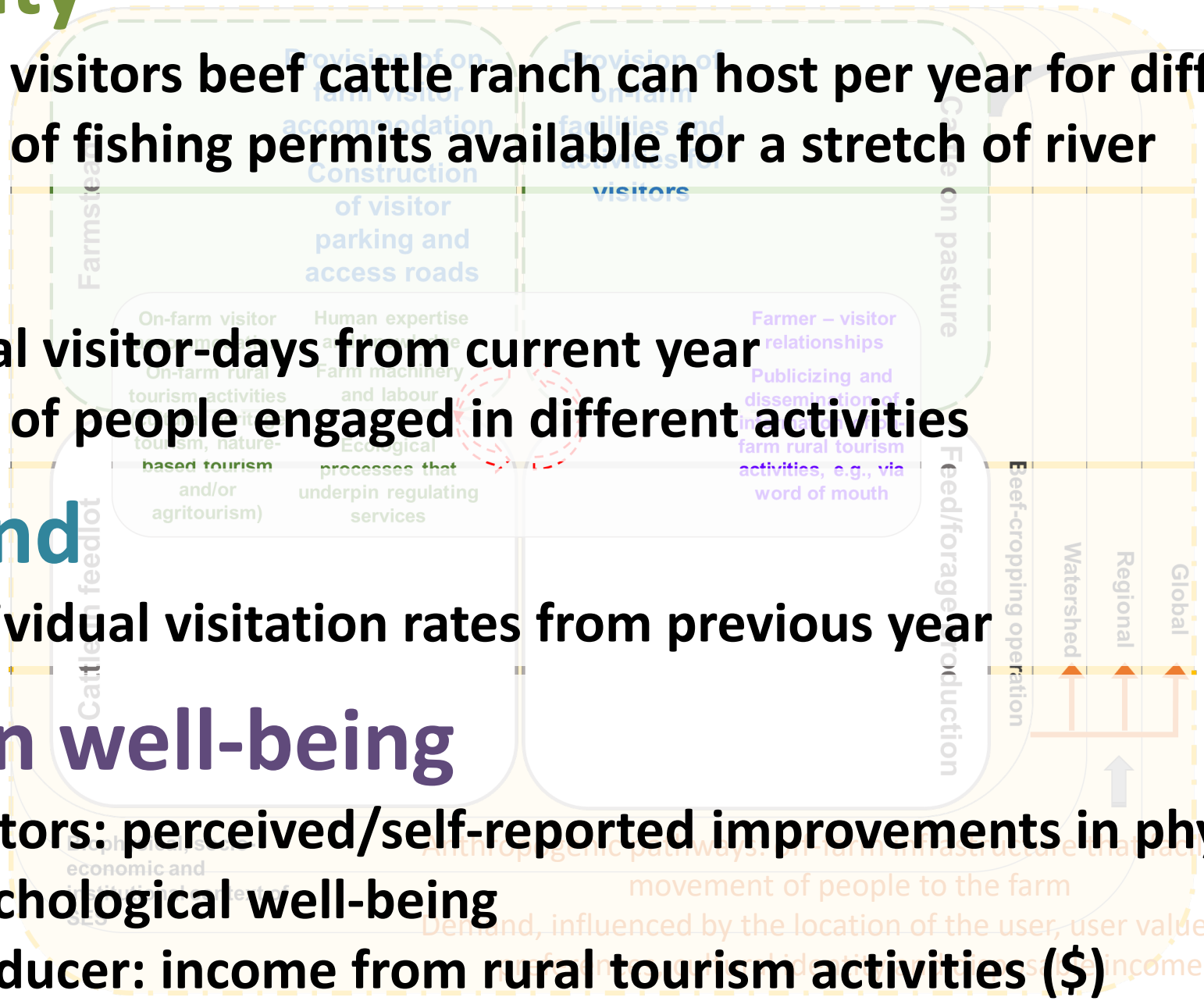
Demand

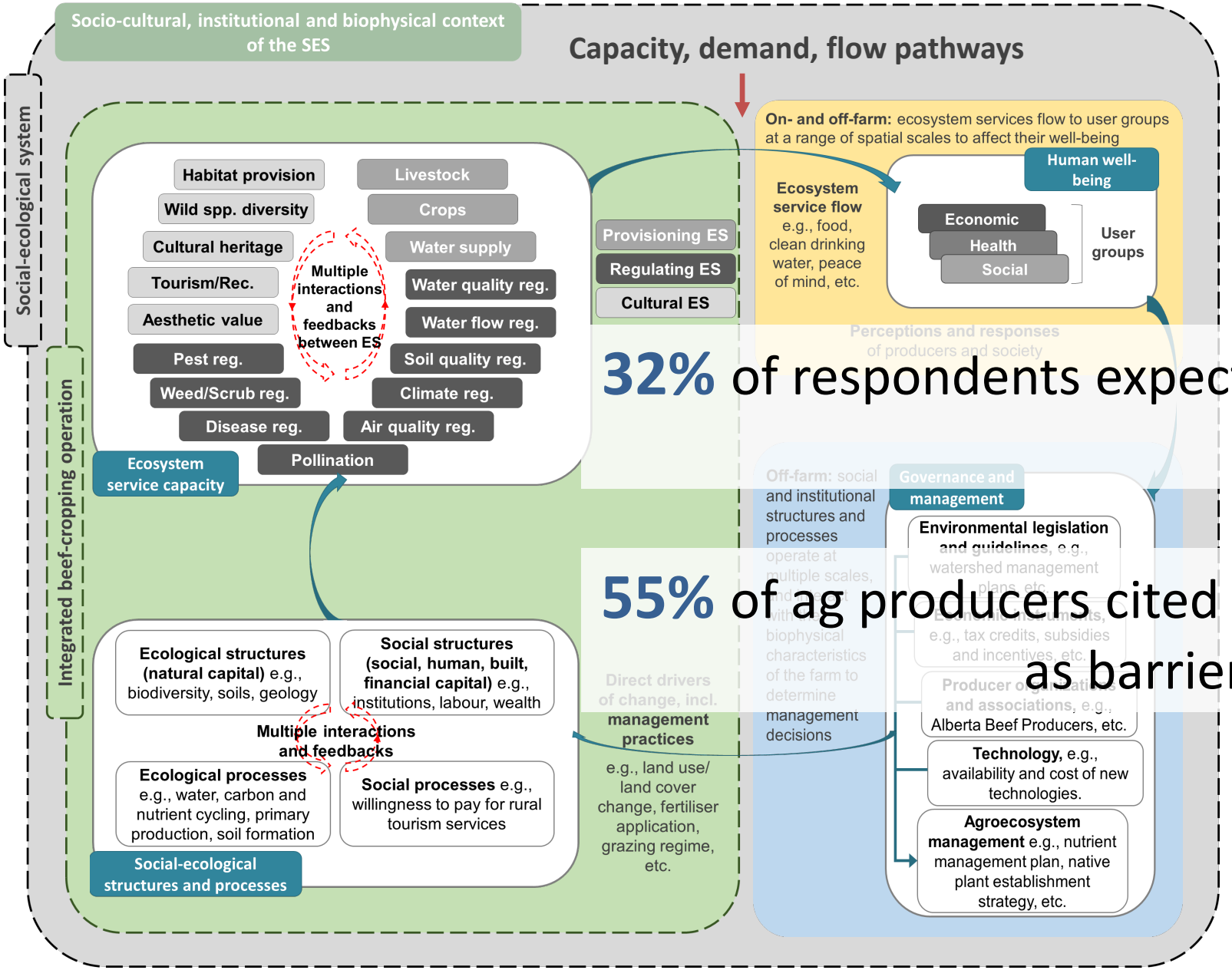
Individual visitation rates from previous year

Human well-being

Visitors: perceived/self-reported improvements in physical and psychological well-being

Producer: income from rural tourism activities ($)





32% of respondents expect to eat less beef in the next five years

55% of ag producers cited economic pressure as barrier to adopting BMPs

Trade-offs within stages of production

Cultural services
Ranching tradition and rural tourism

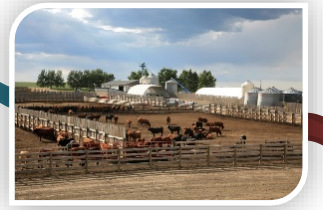
Water quality regulation
Low risk of contamination

Air quality regulation
Positive impact on air quality

Cattle on pasture

Climate regulation*

Climate regulation

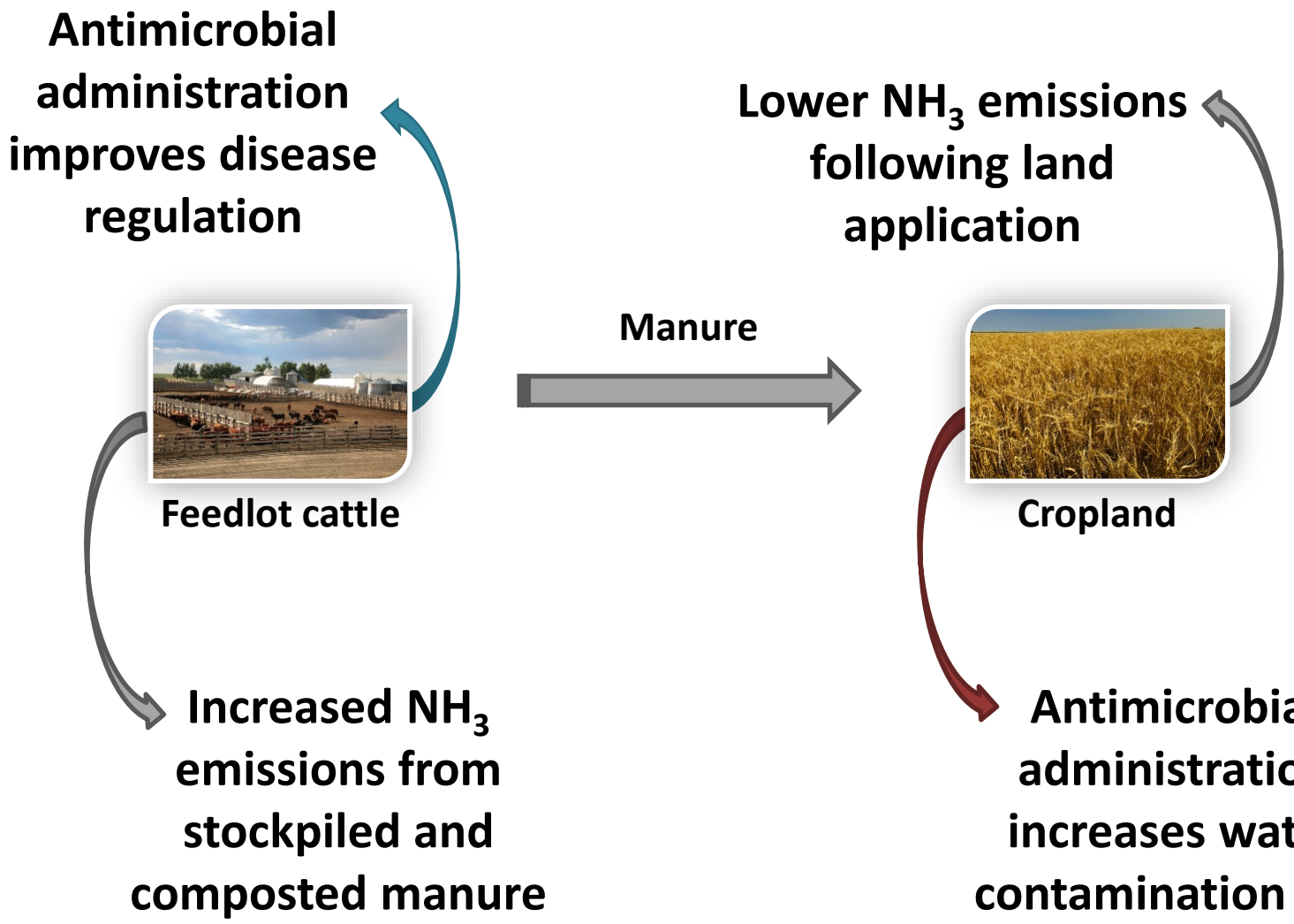


Feedlot cattle

Air quality regulation
39% - 72% of ingested N emitted as NH_3

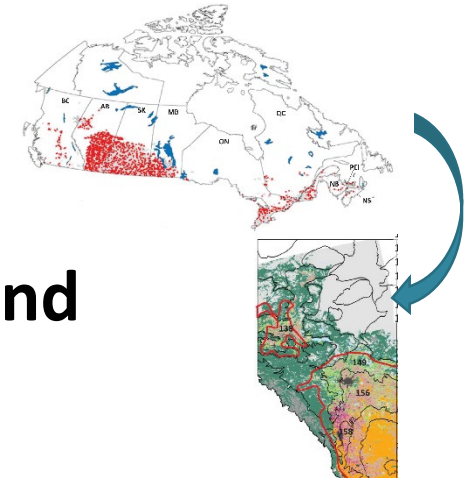
Water quality regulation
Runoff greatest risk

Trade-offs across stages of production



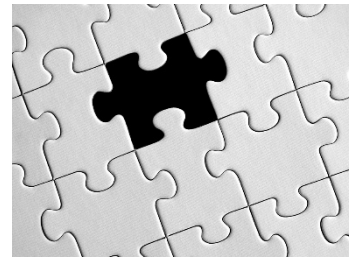
Next steps

- Going from **general to specific** – combine assessment framework and evidence base and apply to ecoregion-specific beef farms



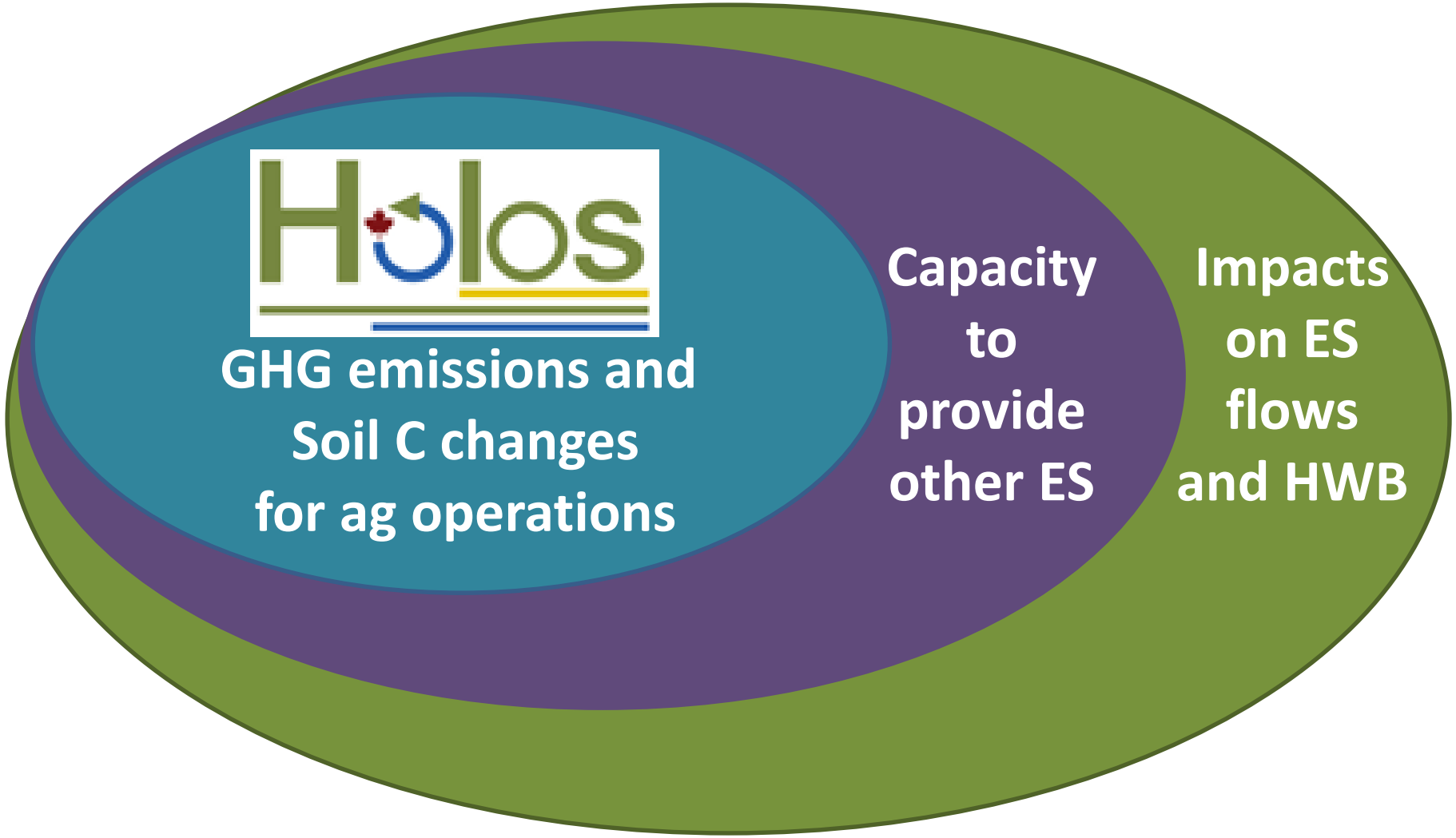
- **Expand our knowledge** base to health and social sciences

- **Identify knowledge/data gaps** for different ecoregions and propose solutions or strategies



- **Communicate** to interested parties

Expanding Holos



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Thank you for your attention

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