



Operationalization of Sustainable Development Goals Using a Planetary Boundaries-Based LCA Framework

[Chanjief Chandrakumar](#)^{1,2} , Sarah McLaren^{1,3}

¹New Zealand Life Cycle Management Centre, Massey University, New Zealand

²School of Engineering and Advanced Technology, Massey University, New Zealand

³Institute of Agriculture and Environment, Massey University, New Zealand



Overview

- Introduction
 - Sustainable Development Goals
 - Planetary Boundaries
 - Life Cycle Assessment
- Absolute Sustainability
- Research Objectives and Questions
- Research Methodology
- Proposed Approach
- Case Study
- Conclusions



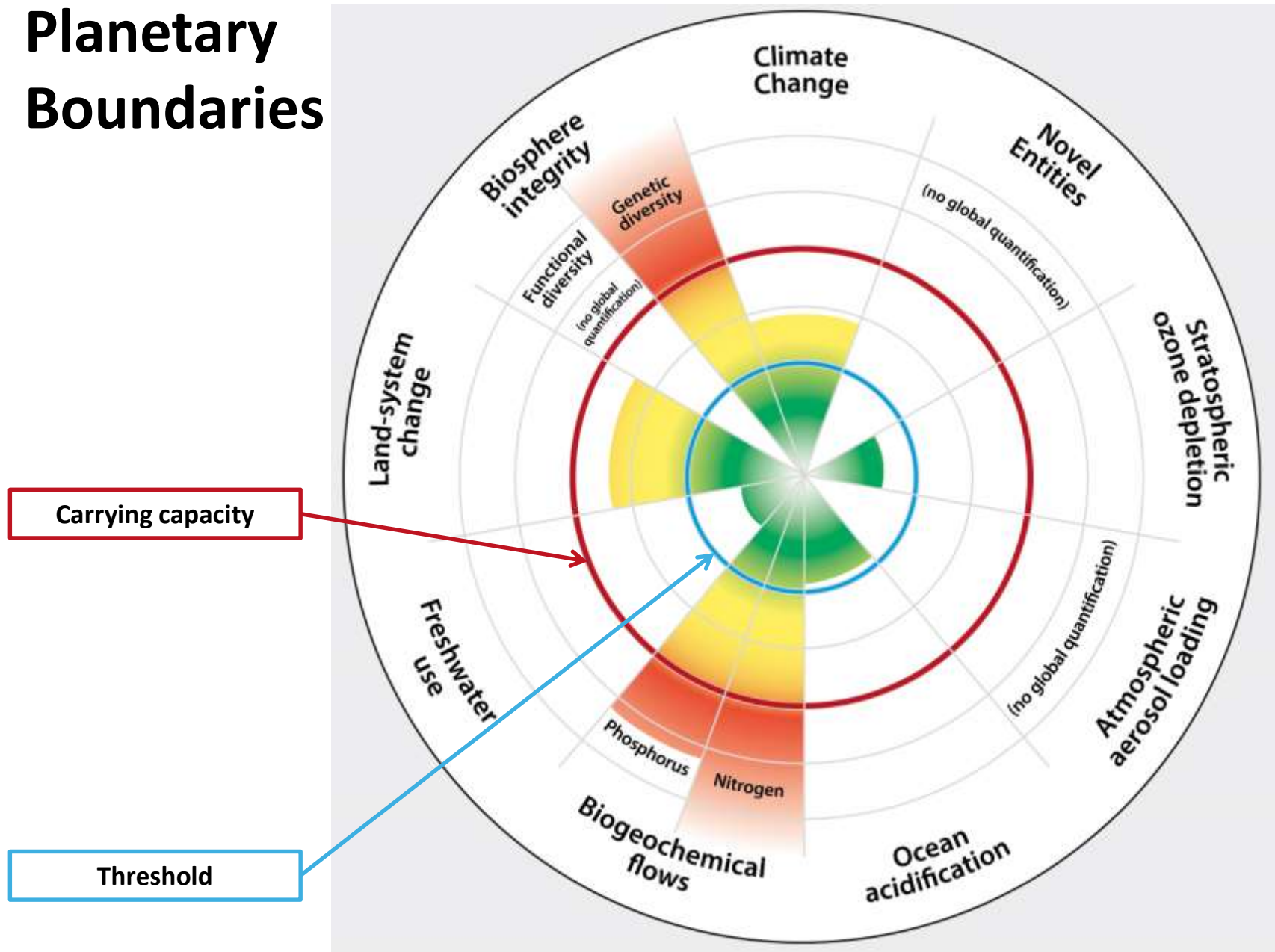
Sustainable Development Goals

- Positives:
 - A set of comprehensive goals
 - All sustainability dimensions
 - Good environmental impact coverage
- Negatives:
 - Too many goals, targets & indicators
 - Overlapping objectives
 - Less science-based targets
 - Focus on higher levels of the economy



(United Nations, 2015)

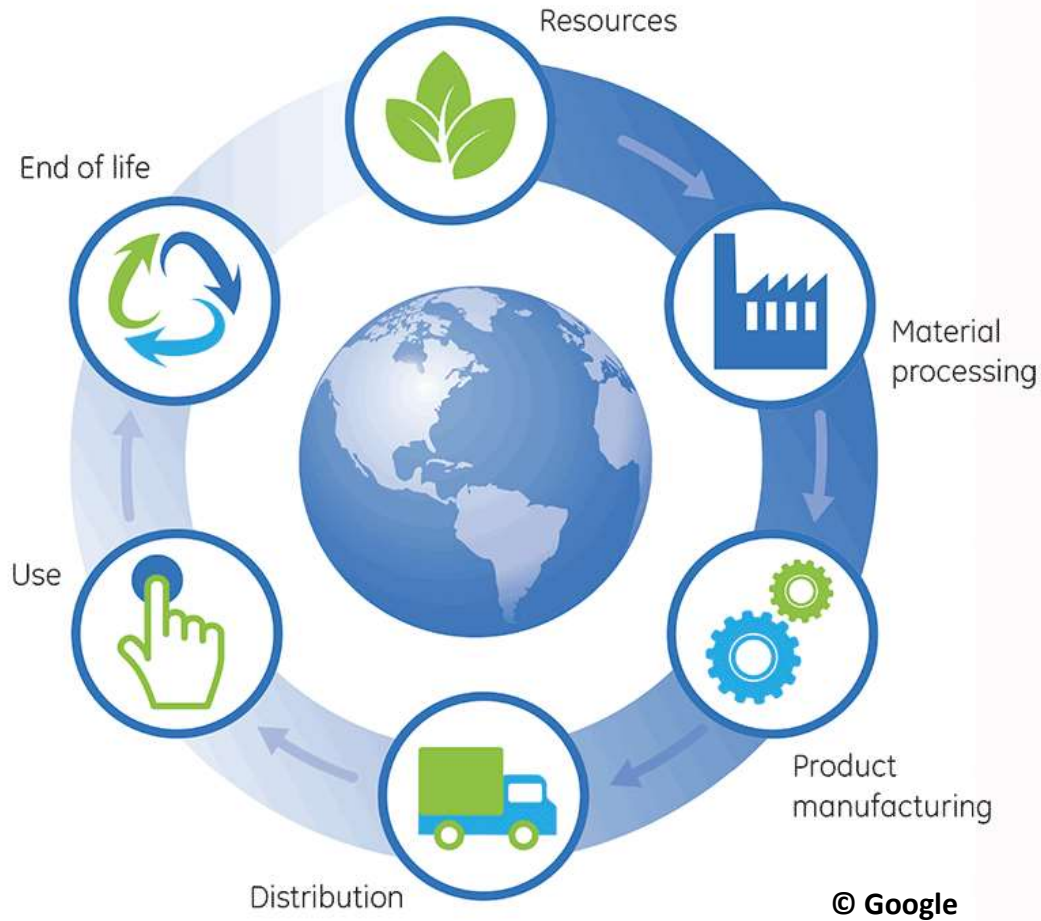
Planetary Boundaries



Adapted from Steffen et al., (2015). Science, vol. 347, p. 1259855



Life Cycle Thinking/ Life Cycle Assessment





Absolute Sustainability

- Human societies have to **operate within the carrying capacity** of the Earth^{1,2}.
- Studies attempting to propose tools that evaluate absolute sustainability are emerging.

**Absolute Sustainability Assessment Method (ASAM) =
Carrying Capacity References + LCT-based Tools ³**

- Few of the ASAMs:
 - Absolute LCA: CC-based LCA (e.g. PBs-based LCA)
 - Absolute footprint: CC-footprint (e.g. PBs-based footprints) ^{1,2}

¹Hauschild, M. Z. (2015). Better – But is it Good Enough? Procedia CIRP, vol. 29, pp. 1-7, 2015

²Bjørn, A., & Hauschild, M. Z. (2013). Absolute versus Relative Environmental Sustainability. J. Industrial Ecology, vol. 17, pp. 321-332, 2013



Research Objective

Develop an **absolute sustainability assessment method (ASAM)**:

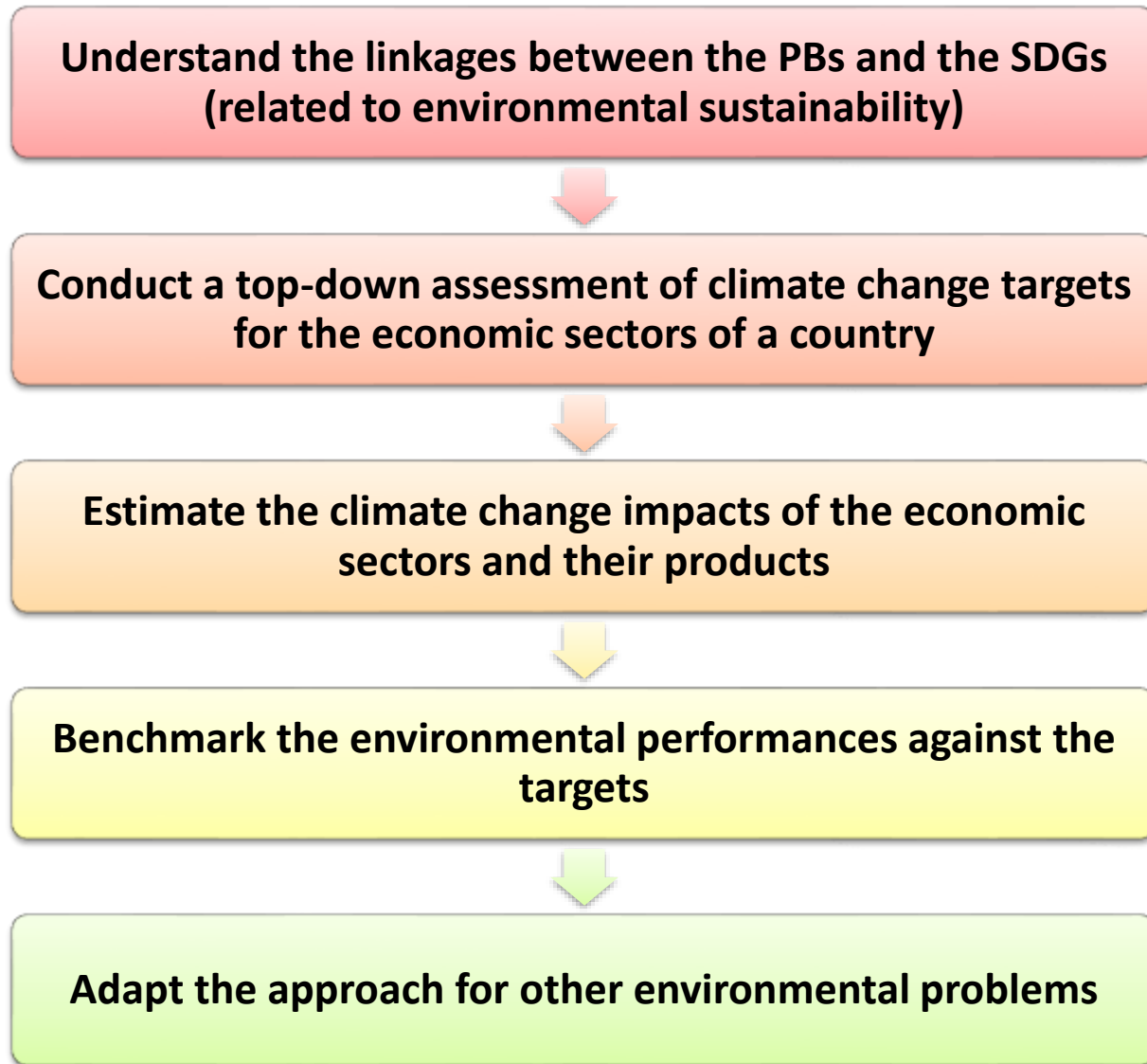
- to evaluate a large number environmental problems
- to operationalize the SDGs proposed for environmental sustainability
 - at all levels of the economy
 - using PBs and LCA

Research Questions

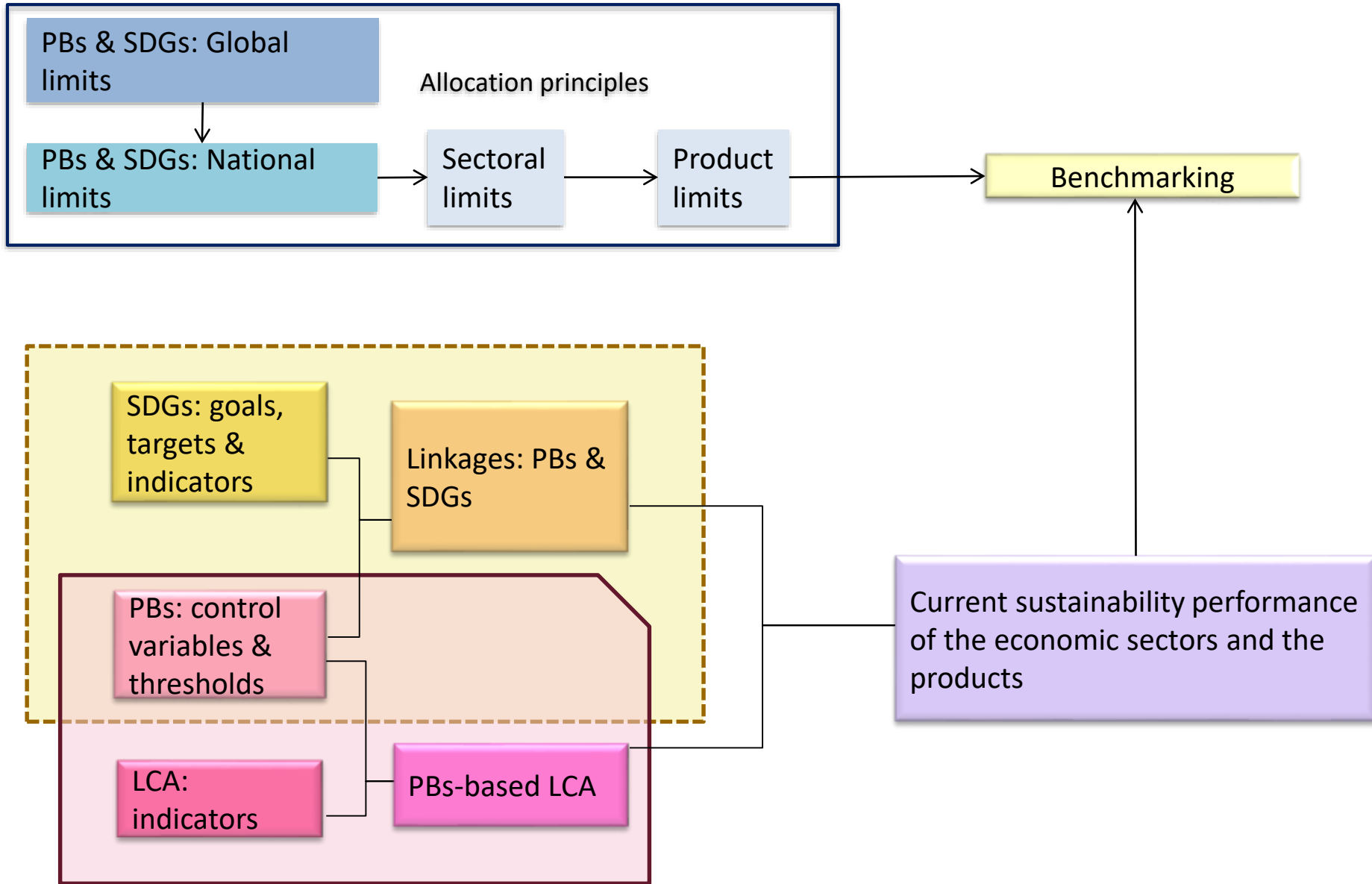
- i. What are the **interrelationships** between the **SDGs** and the **PBs**?
- ii. How can **LCA**, **SDGs** and **PBs** can be applied **complementarily** to develop an **ASAM**?
- iii. What are the **most appropriate economic levels** to test the proposed **ASAM**?

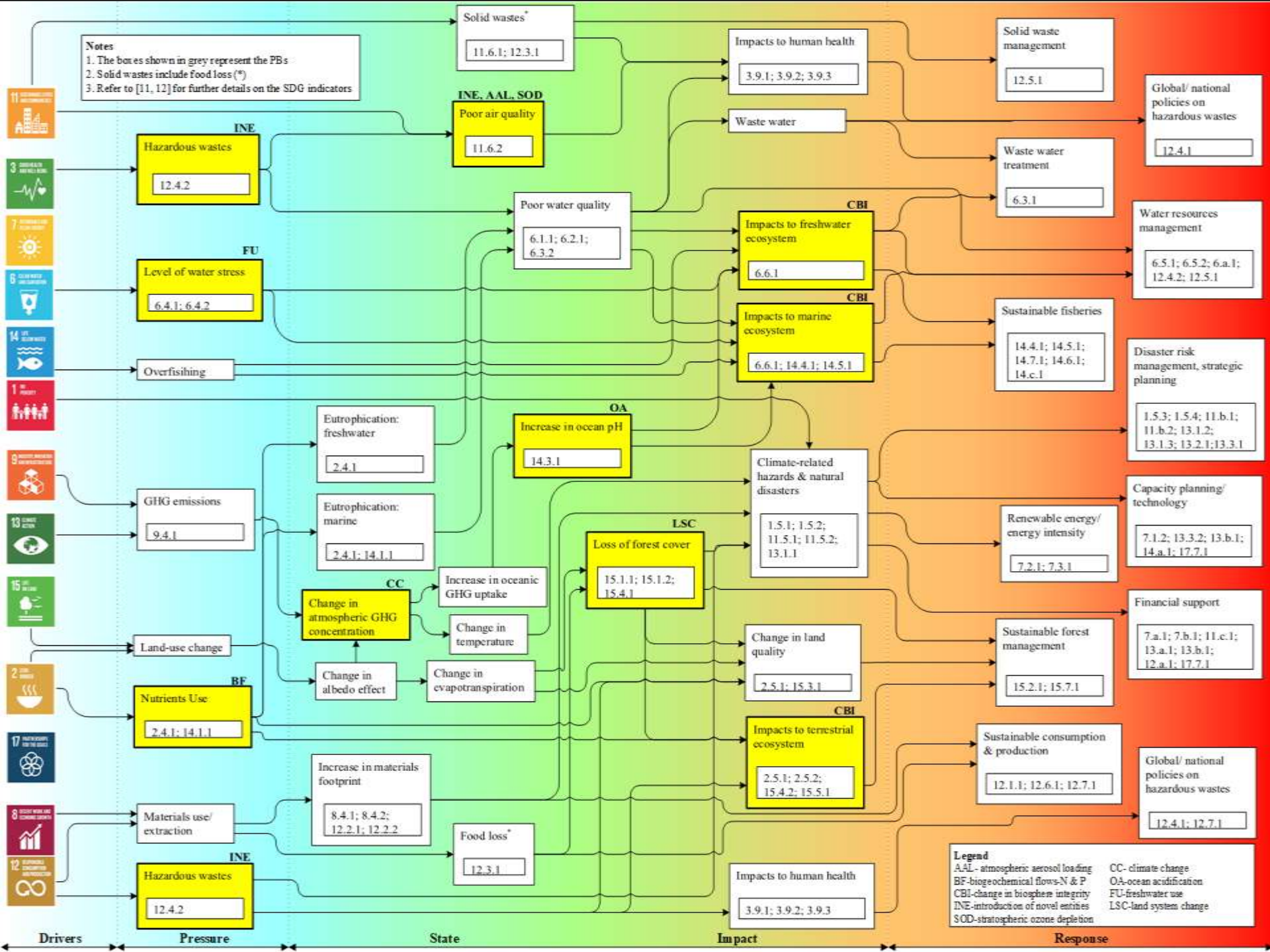


Research Methodology

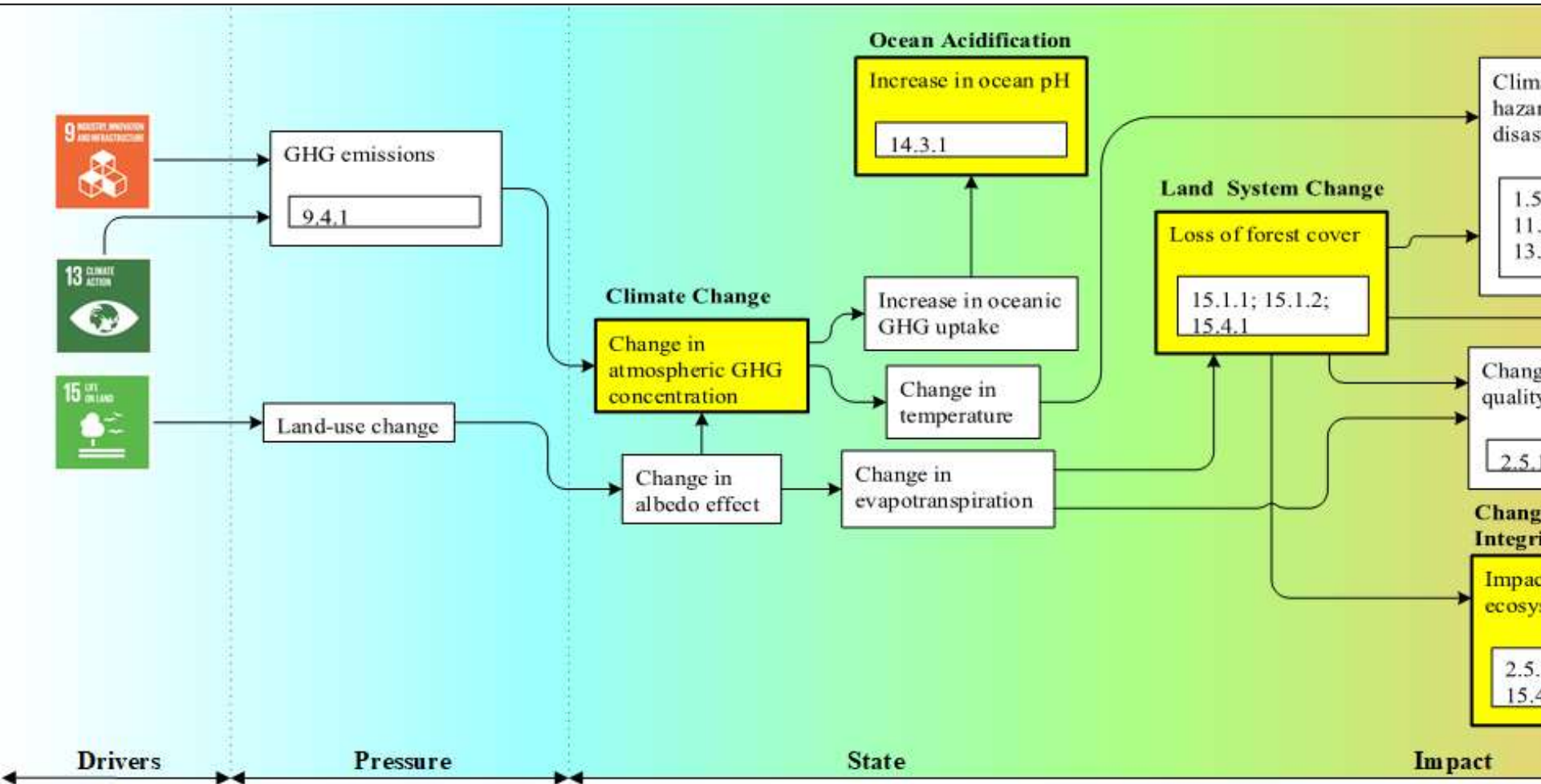


Proposed ASAM

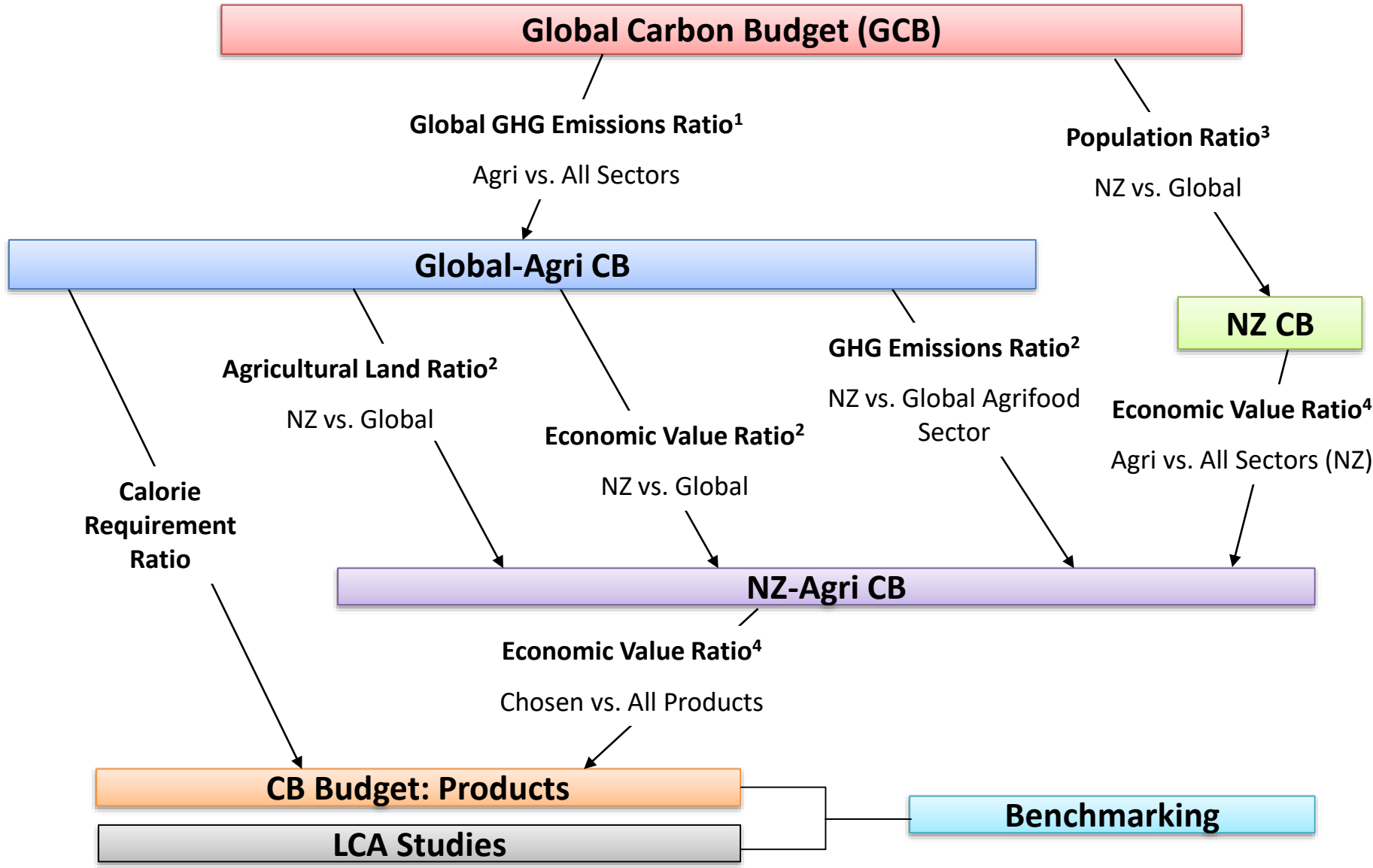




Climate Change-Related Environmental Problems

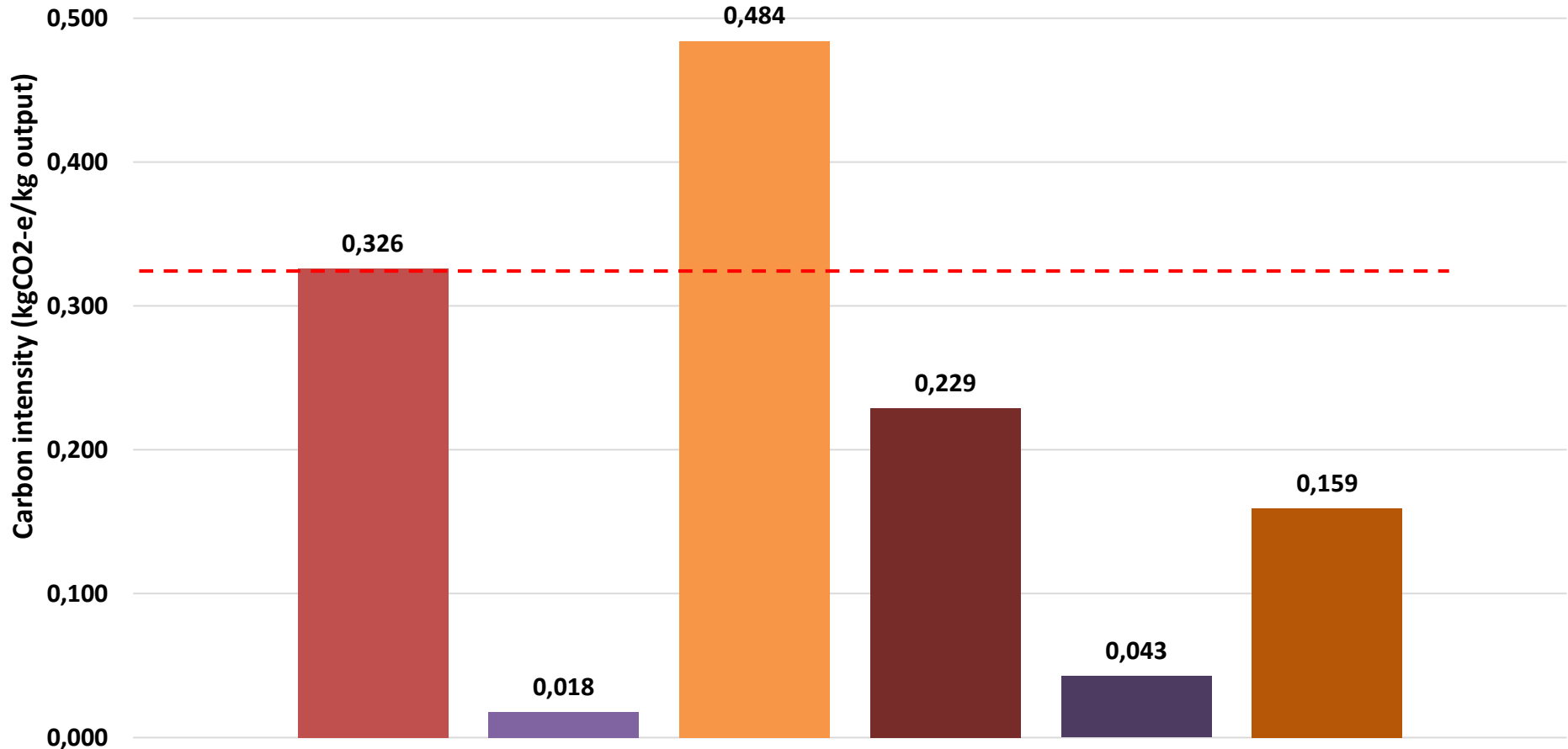
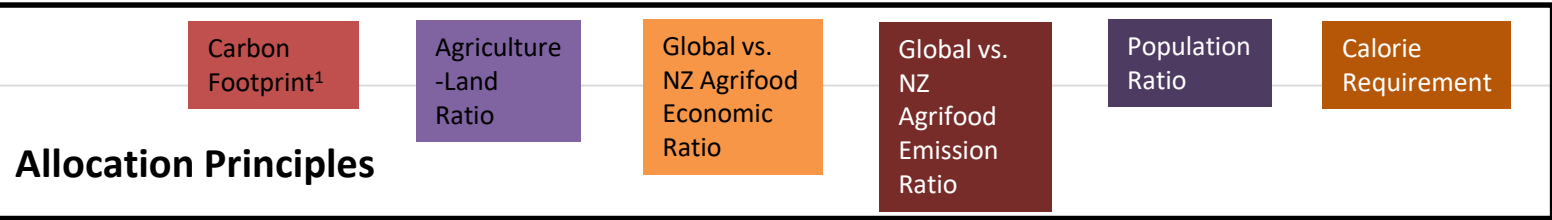


Case study: NZ Agrifood Sector & Climate Change



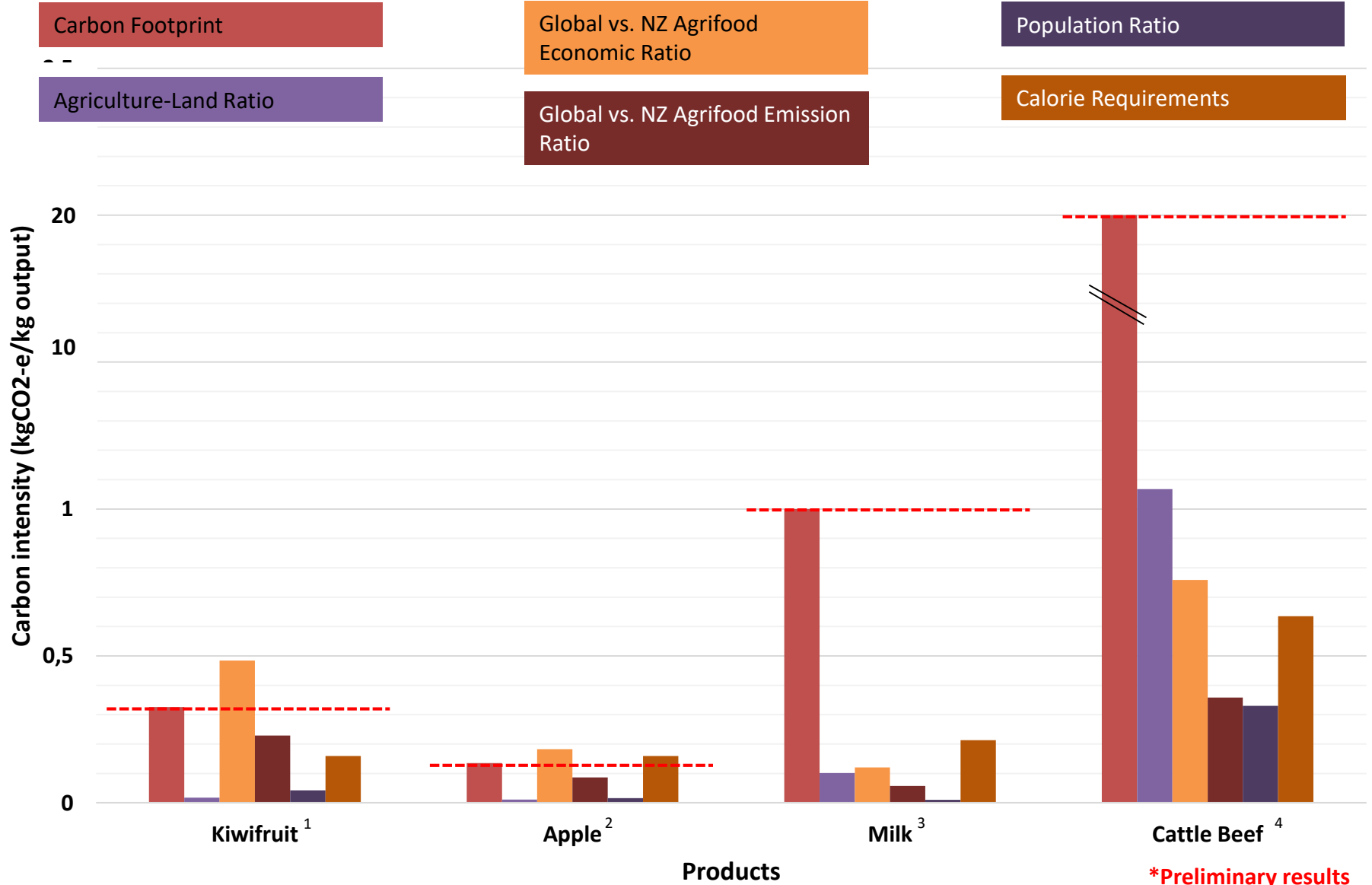
¹United States Environmental Protection Agency; ²FAOSTAT; ³The World Bank; ⁴National Accounts IO Tables Year Ended 2013

Results: Kiwifruit



***Preliminary results**

Results: Apple, Beef, Kiwifruit & Milk



¹Mithraratne et al. (2010), Landcare; ²McLaren et al. (2009), Landcare; ³Reisinger et al. (2017), Ecol. Ind.; ⁴Lieffering et al. (2012), AgResearch



Conclusions

- A need to develop an ASAM
- Key characteristics:
 - evaluate environmental problems
 - on an absolute scale
 - at multiple scales of the economy (product to global)
- Proposal: use existing approaches complementarily
 - SDGs, PBs and LCA
- Interrelationships between different approaches
 - PBs and SDGs
 - PBs, SDGs and LCA
- Applied the proposed ASAM:
 - NZ Agrifood sector
 - Climate change impact category
- Results:
 - Livestock-based food products are carbon intensive
 - Allocation principles influence the evaluation process



Thank you

