The Southwest BC Bioregion Food System Design Project

Lillooet Agriculture and Food Society
Food Sustainability Workshop

October 25, 2017

KPU | Institute for Sustainable Food Systems

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Langley Environmental Partners Society
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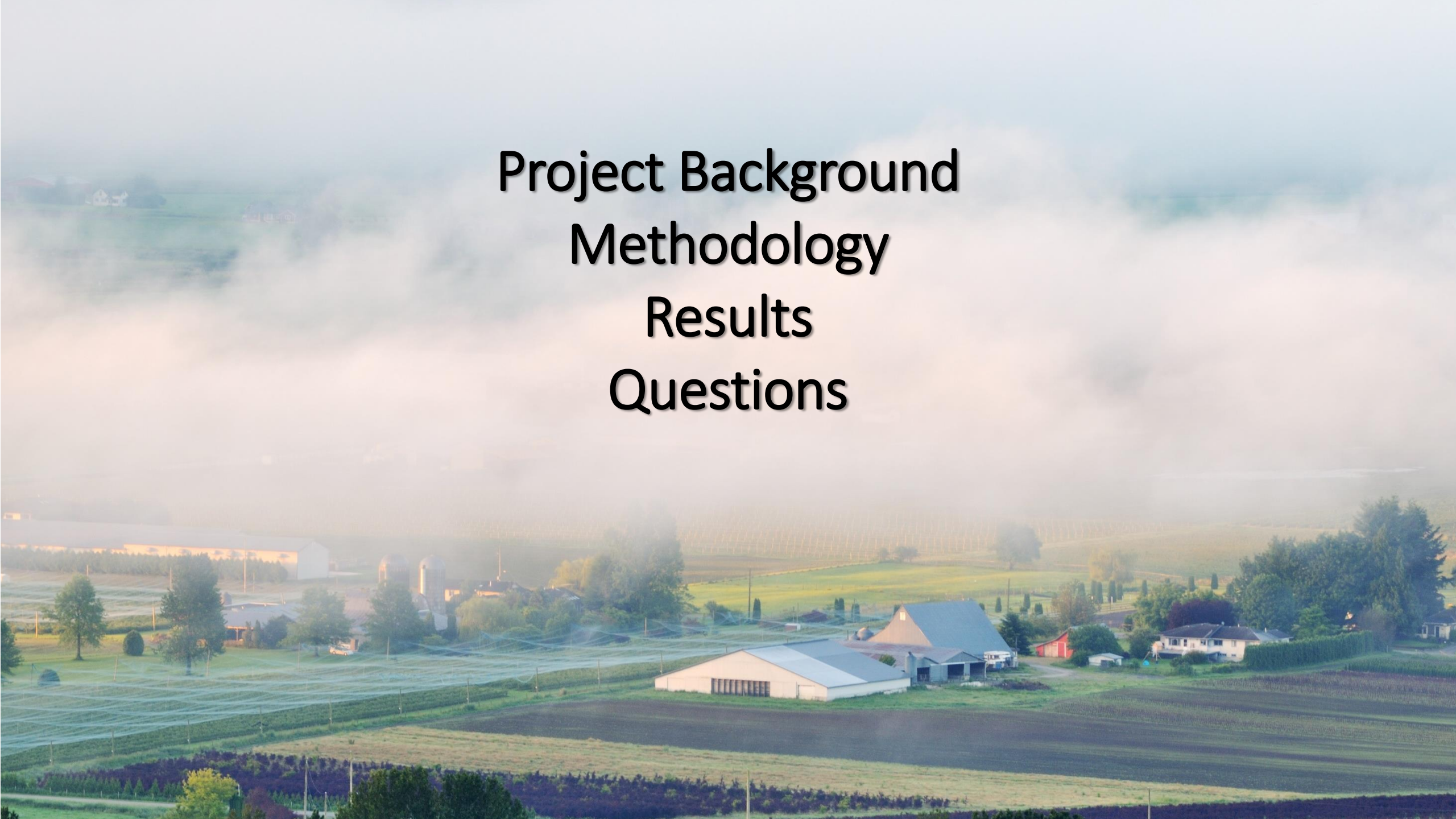
Vancouver Food Policy Council
Whistler Centre for Sustainability
White Rock and Surrey Naturalists Society



Project Background
Methodology
Results
Questions

A Sustainable Future Requires a Sustainable Food System

Current food systems:

- Overly dependent on oil;
- Diminishing supplies fresh water;
- Global warming;
- Loss of local capacity
- Agriculture not financially viable.

Food system localization:

- Growing interest in localization as a solution;
- Little information about how or to what degree it can address concerns.

Project Goals:

- Bring accurate information to the discourse and debate around local food systems.
- Bring environment, economy, and food self-reliance into the same discussion.

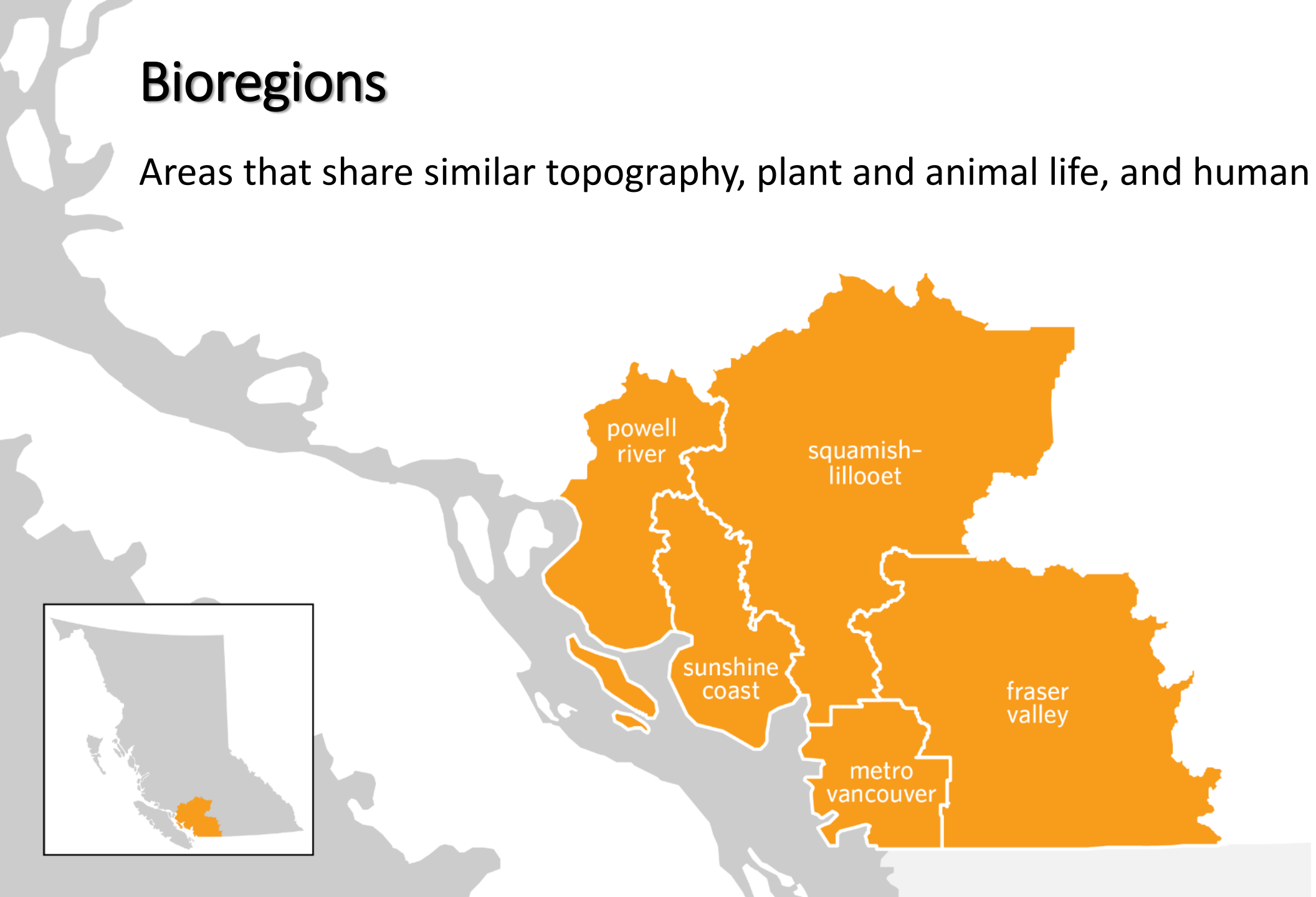
Project Objectives

1. **Develop a method for assessing the potential of regionalized food systems.**

2. **Apply this methods to the Southwest BC Bioregion to provide data-driven information about:**
   - The potential to increase SWBC food production for local markets
   - Whether and to what extent doing so could improve food self-reliance, benefit the economy, and create jobs
   - The environmental impacts of food production in SWBC and strategies to reduce them

Bioregions

Areas that share similar topography, plant and animal life, and human culture.




Project Background
Methodology
Results
Break
Questions & Reflections

Food System Modeling

Two Models:

1. **Optimization model:**
   Agricultural land use and associated food self-reliance and environmental impact.

   ] Developed by ISFS

2. **Input-Output model:**
   Impact of SWBC food system on BC's economy

   ] Developed by BC Stats

Models are exploratory, not predictive.

Scenarios Modeled

Dozens of scenarios modeled; five reveal the story:

1. Our Current Baseline

Year 2011

2. Business as Usual Food Production
3. Increase Food Self-Reliance
4. Mitigate Environmental Impacts from Ag
5. Expand Ag Land in Production

Year 2050

14 Indicators Measured in Each Scenario

Selected based on stakeholder input, expert opinion, and data availability.

Food Self-Reliance:

Portion of population's food need that could be satisfied with food produced locally.

Diet follows Canada's Food Guide and Canadian food preferences (124 fresh and minimally processed foods).

Ecological Footprint:

Global area required to meet population's food need and absorb associated carbon emissions.

Greenhouse Gas Emissions:

Quantity of GHGs produced from food production within SWBC.

Carbon Stocks:

Amount of CO_2e stored in aboveground woody parts of trees and shrubs on agricultural land.

Wildlife Habitat Capacity:

Value of agricultural land as habitat for regional species.

Habitat Connectivity:

Distance wildlife can travel via non-production perennial vegetation through the agricultural landscape.

Nutrient Surplus (Nitrogen and Phosphorous):

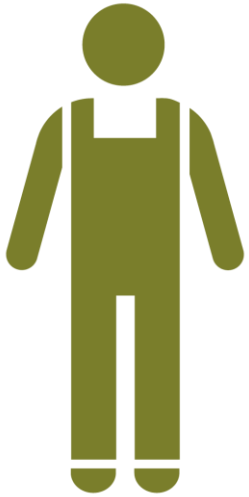
Quantity of N & P in livestock manure in SWBC relative to the quantity needed for crop production in SWBC.

Food Production:

Commodity weight of food produced in SWBC.

Food Imports:

Commodity weight and monetary value of food imported to meet food need not satisfied by local production.



Total Employment:

Number of full time equivalent jobs in the food sector.

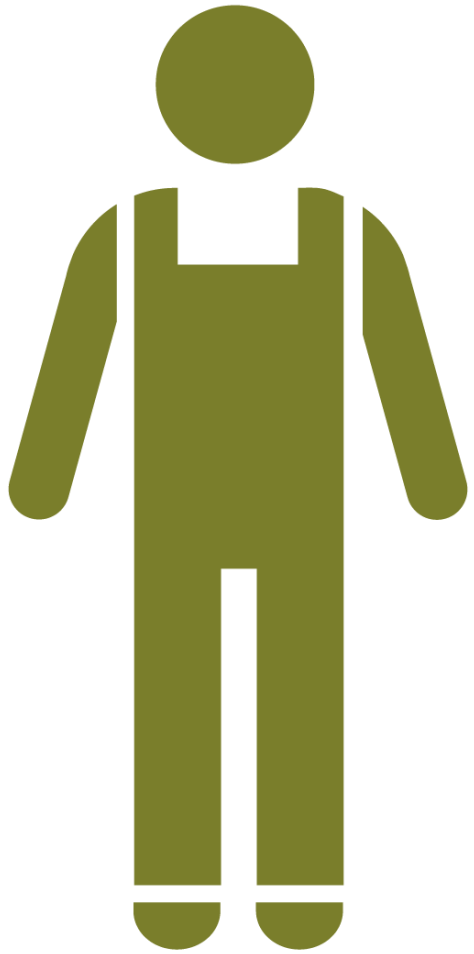
Total Output:
Monetary value of raw and processed food produced in SWBC and goods and services from all industries associated with food production in SWBC.

Total Gross Domestic Product:
Unduplicated monetary value gained for all goods and services associated with primary agriculture, food processing, and other related industries.

Total Employment Income:
Gross income earned by employees in primary agriculture, food processing, and other related industries.

Total Tax Revenue:
Value of federal, provincial, and municipal tax revenue collected from individuals and businesses involved in the SWBC food system.

Important Assumptions



Data

- Used best secondary sources available
- Many data gaps identified

Population

- 2011 population: 2.7 million (BC Stats)
- 2050 population: 4.3 million
  (Projected a 58% increase based on BC Stats projection to 2040)

Assumptions - Agricultural Land

- **Availability:** ALR and crown grazing land
- **Current use:** Matched spatial land availability & quality data to non-spatial Census land use data
- **Quality:** BC Land Capability for agriculture
  Class 1-4 (any crop), Class 5-6 (pasture only)

Assumptions –

Food Consumption & Self-Reliance

- Assumed food produced in SWBC first consumed in SWBC; surplus exported
- Accounted for seasonality of production
- Source of livestock feed greatly impacts outcome

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Research Brief

From the Southwest BC Bioregion Food System Design Project 2016

photo credit: LoweStock (Thinkstock)

Delineating the Southwest British Columbia Bioregion for Food System Study and Design

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The authors wish to acknowledge Denver Nixon

Abstract

Delineating our bioregion was the first task we undertook for the Southwest BC Bioregional Food System Design project. Bioregions represent an appropriate and consistently applicable scale and framework for sustainable food system analysis, design and planning, and bring to the forefront the interdependency between community, our economy and the environment. Bioregions are generally defined as areas that share similar topography, plant and animal life, and human culture. Though based largely on ecological parameters (e.g. watersheds and ecoregions) bioregion delineation is ultimately up to us and is therefore somewhat subjective. Southwest BC's landscape is complex and includes mountains, a major river system and delta, and a marine ecosystem. Its multicultural and mixed urban, suburban, and rural character, its proximity to Vancouver Island, as well as an international border with the United States all represented important considerations in the delineation of the bioregion.

In this Research Brief we present the method we used to determine the boundaries of the Southwest BC Bioregion. We also discuss important considerations and the basis for our bioregion boundary decisions. We believe the methodology presented has potential for application throughout British Columbia.

Note: This research brief draws largely from "Delineating the Southwest British Columbia Bioregion for Food System Design and Planning: A Practical Approach" (Harris et al, 2016), published in the Journal of Agriculture, Food Systems, and Community Development.

Expertise – Multidisciplinary Team

- Agriculture
- Food self-reliance, diet
- Greenhouse gases, Ecological Footprint
- Nutrient balance
- Economics
- Habitat
- Carbon stocks

Other Publications

Project Background

Methodology

Results

Questions

Results by Scenario

1. Current Baseline

Year 2011

2. Business as Usual Food Production
3. Increase Food Self-Reliance
4. Mitigate Environmental Impacts from Ag
5. Expand Ag Land in Production

Year 2050

Scenario:
2011 Baseline

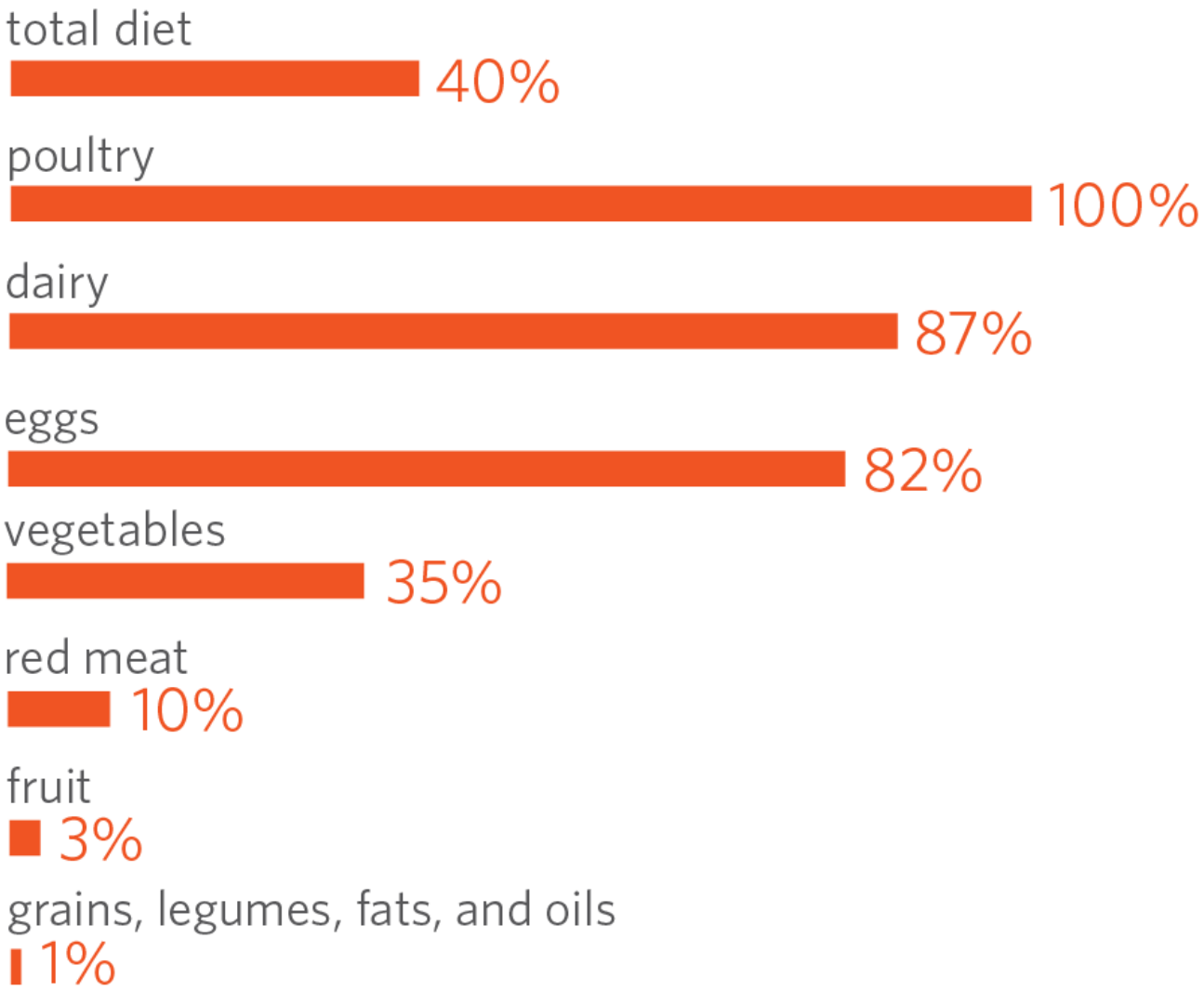
Year: 2011
Population: 2.7 million
Arable Land: 165,000 ha
Land in Production: 101,000 ha

Context:

- Prime agricultural land in close proximity to urban, peri-urban areas
- Major centre for dairy, eggs, poultry, and horticultural crops (cranberries, blueberries, greenhouse vegetables and potatoes)
- Much of the agricultural land protected by ALR

Food Self-Reliance

Percentage of diet that could be satisfied by locally produced foods



Ecological Footprint

Global hectares required to meet the food need of SWBC's population, in millions

SWBC crops for local consumption import crops

Greenhouse Gas Emissions

Tonnes of CO_2e emitted annually from SWBC agricultural production, in millions

enteric manure storage
fossil fuel use fertilizer application

Carbon Stocks

Tonnes of carbon stored in non-production perennial vegetation, in millions

- hedgerows
- riparian buffers
- small elements
- large stands

Habitat Capacity and Connectivity

Quality of land cover for wildlife

- habitat capacity (/100)
- habitat connectivity (m)

Nutrient Surplus

Surplus nitrogen and phosphorus from animal manure, in kilograms per hectare

nitrogen

16

phosphorus

14

Total Employment

Number of full-time equivalent positions in agriculture and related industries

16,580

Food Production

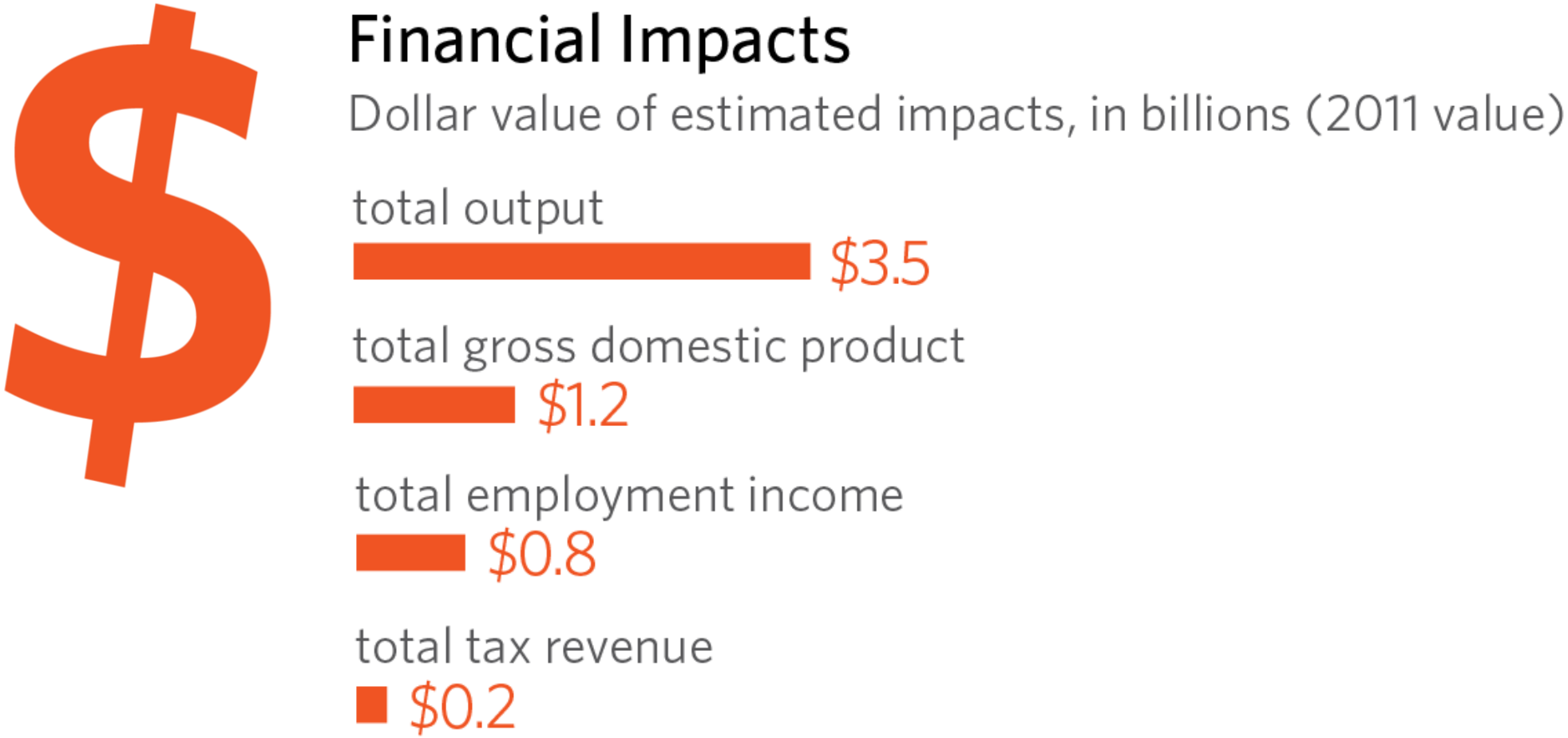
Tonnes of food produced in SWBC, in millions

Food Imports

Tonnes of food imported to meet outstanding food need in SWBC, in millions

Financial Impacts

Dollar value of estimated impacts, in billions (2011 value)



Scenario:
Business as Usual Food Production

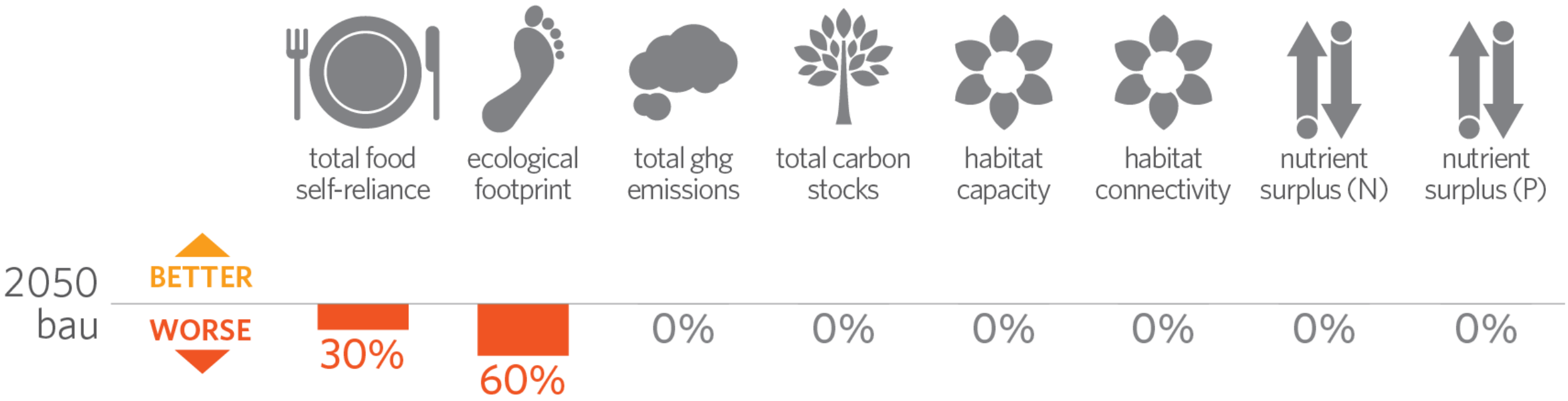
Year: 2050
Population: 4.3 million
Arable Land: 165,000 ha
Land modelled: 101,000 ha
Allocated to production: 101,000 ha

Context:

- No change in mix & quantity of crop and livestock products produced
- No change in land modeled
- No change in farming practices
- Increased population (~60%) and food need

Comparison of Performance

Percent change from 2011 conditions (better or worse)



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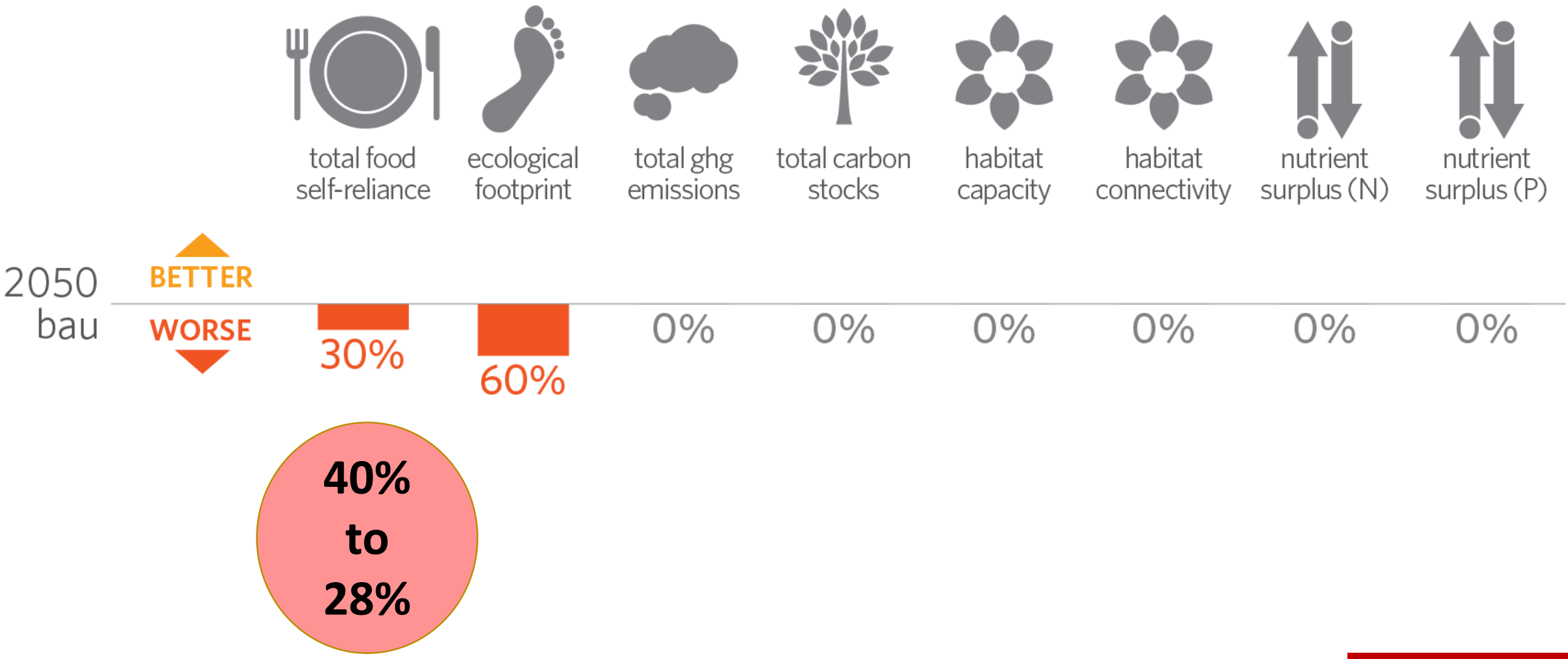

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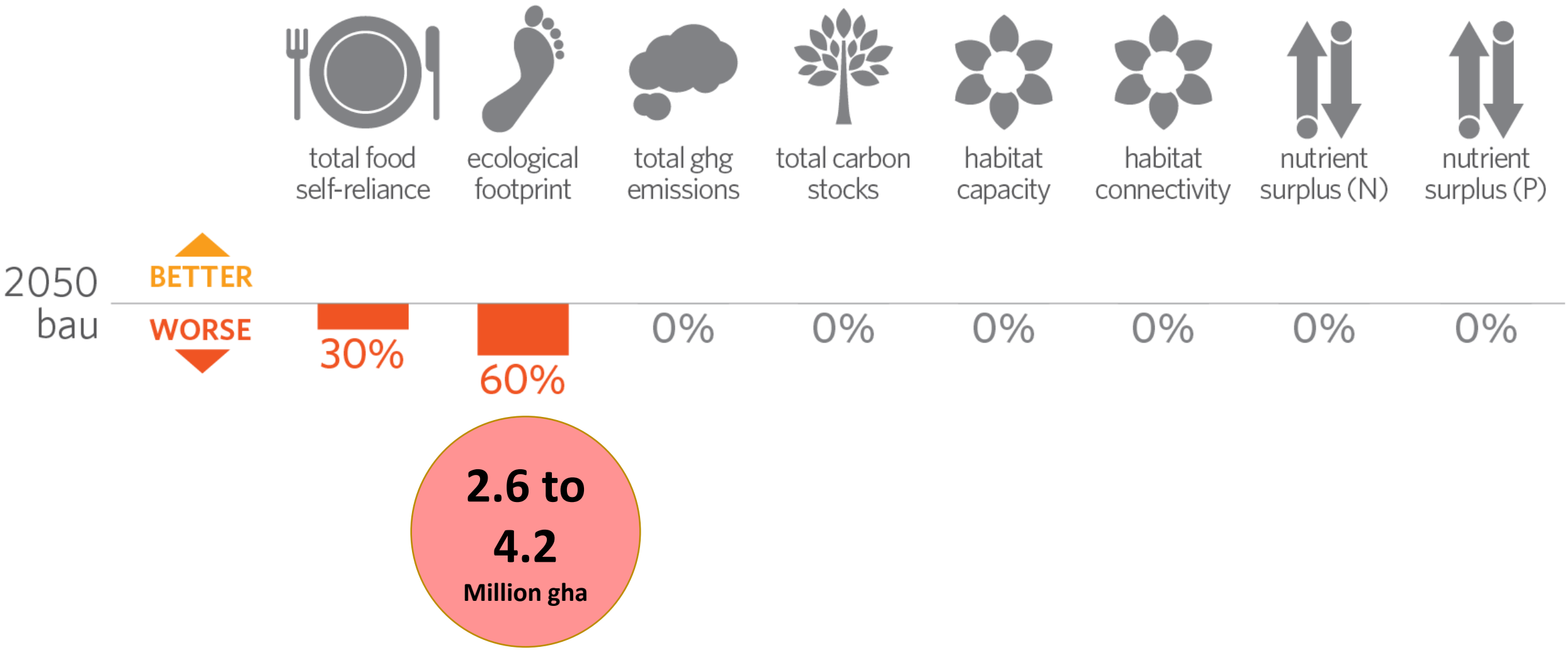

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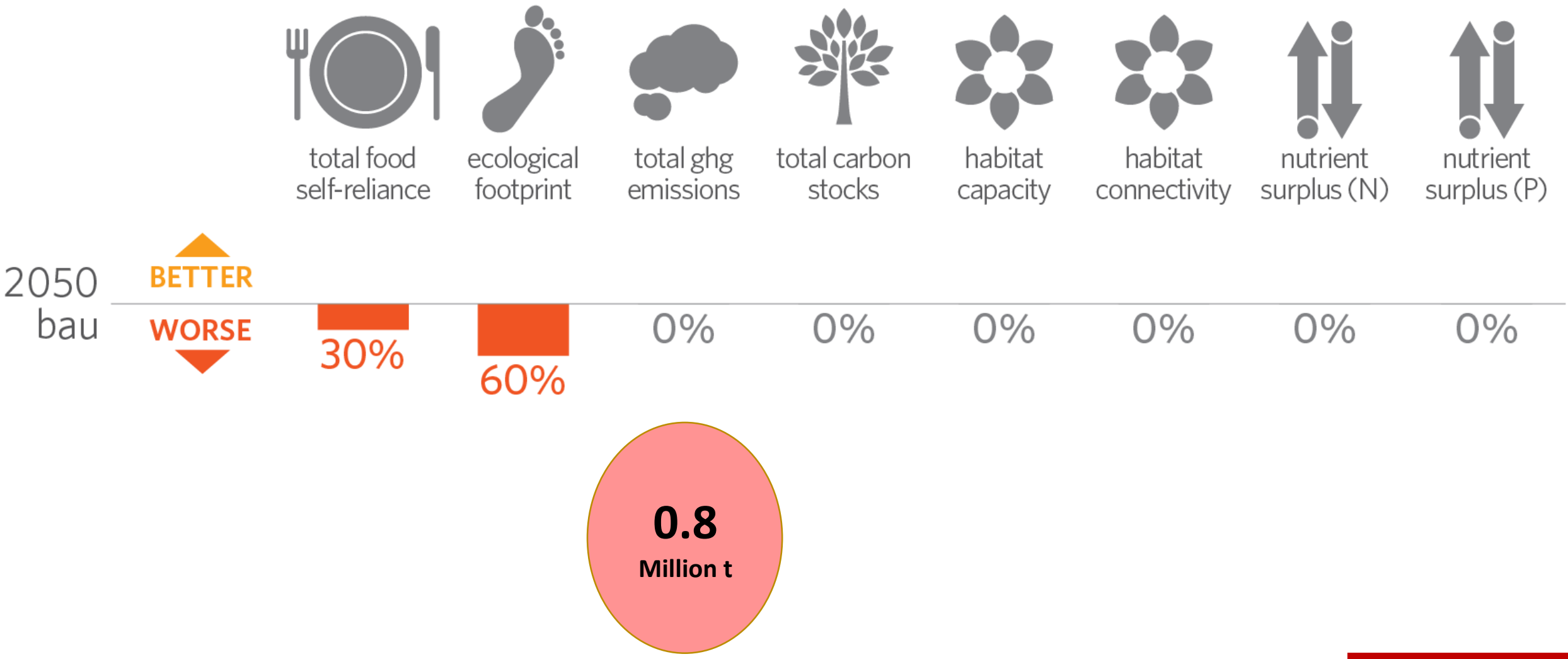

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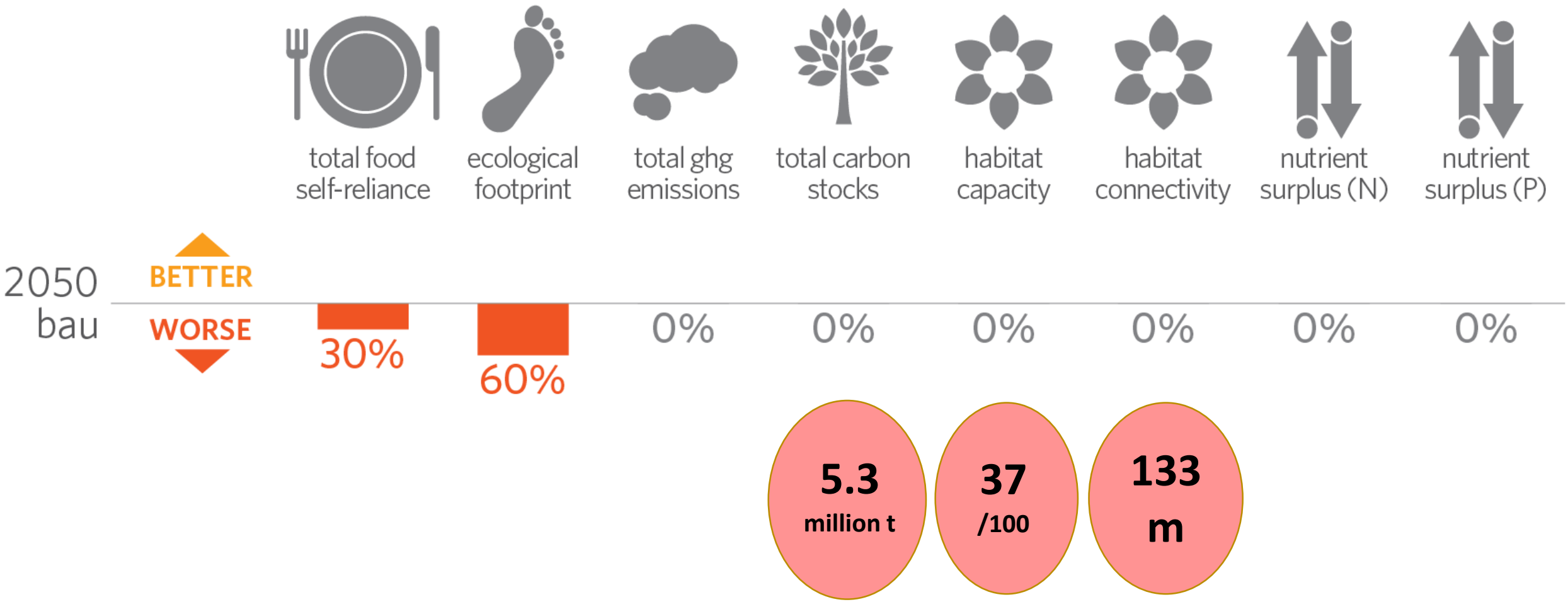

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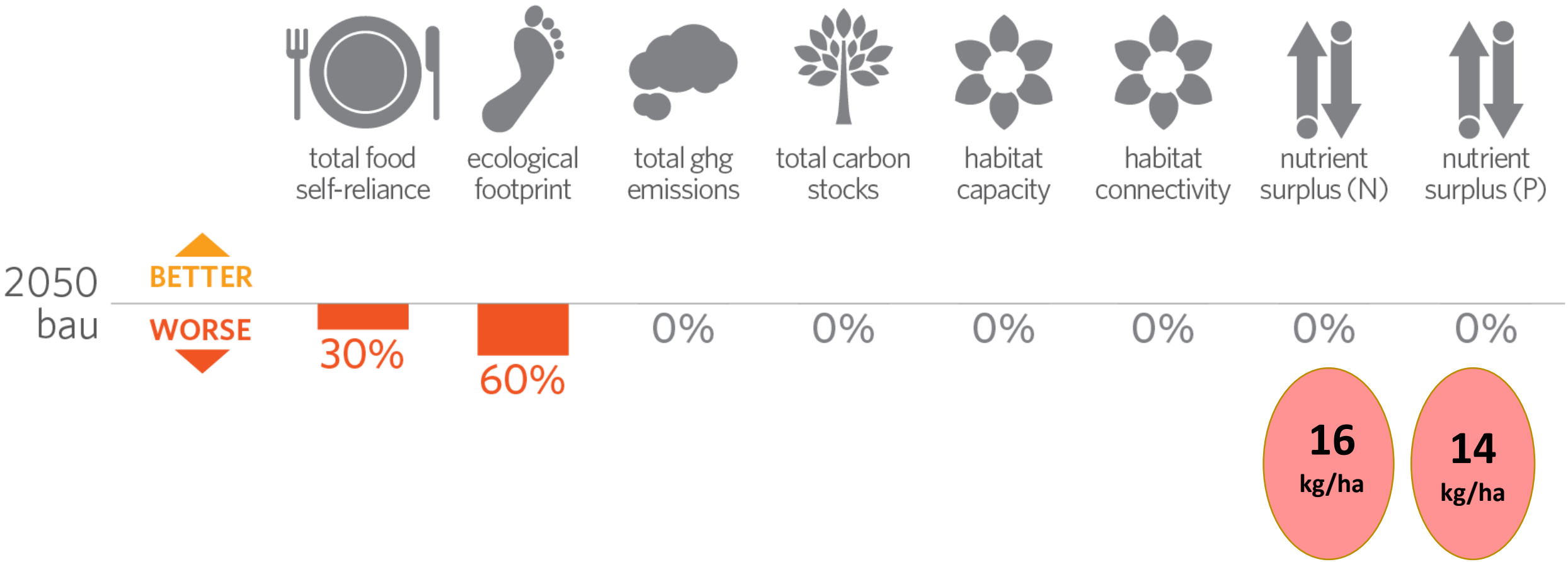

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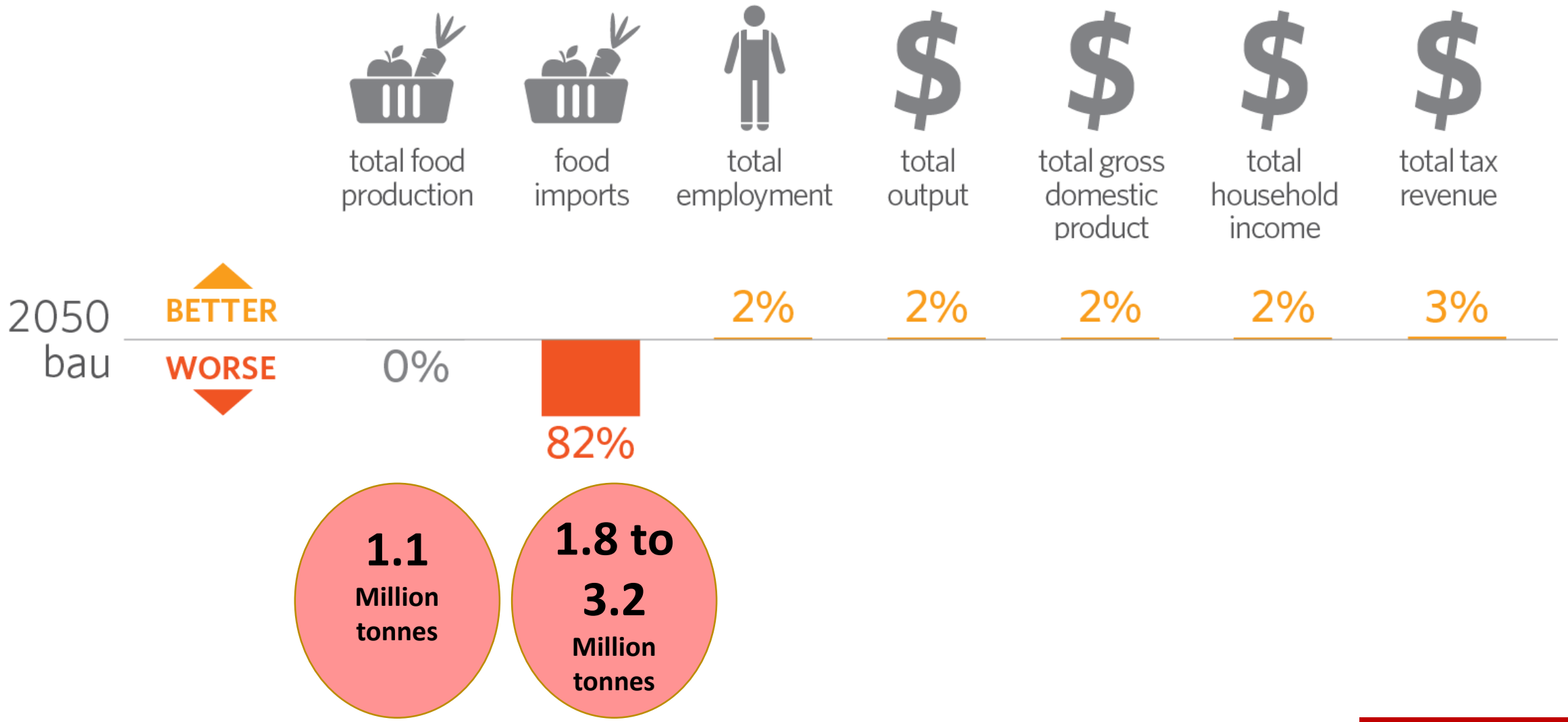

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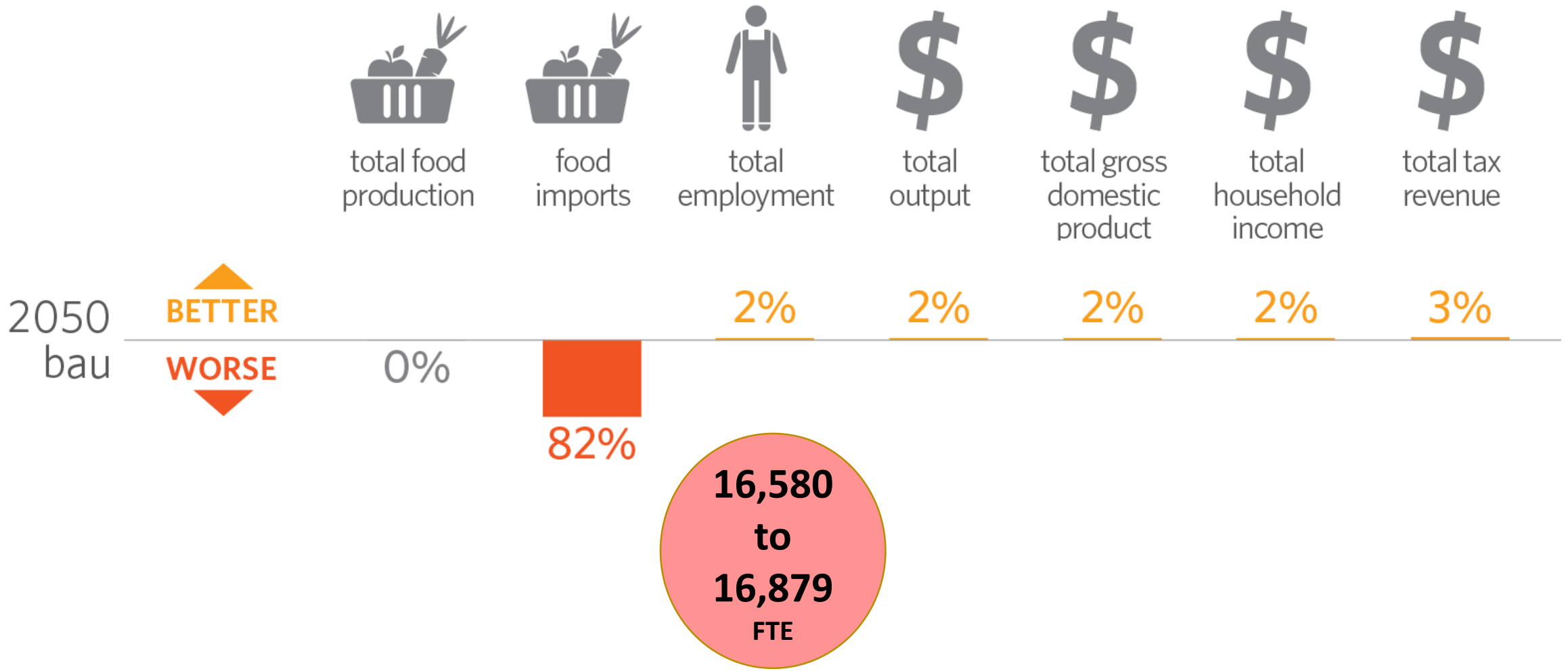

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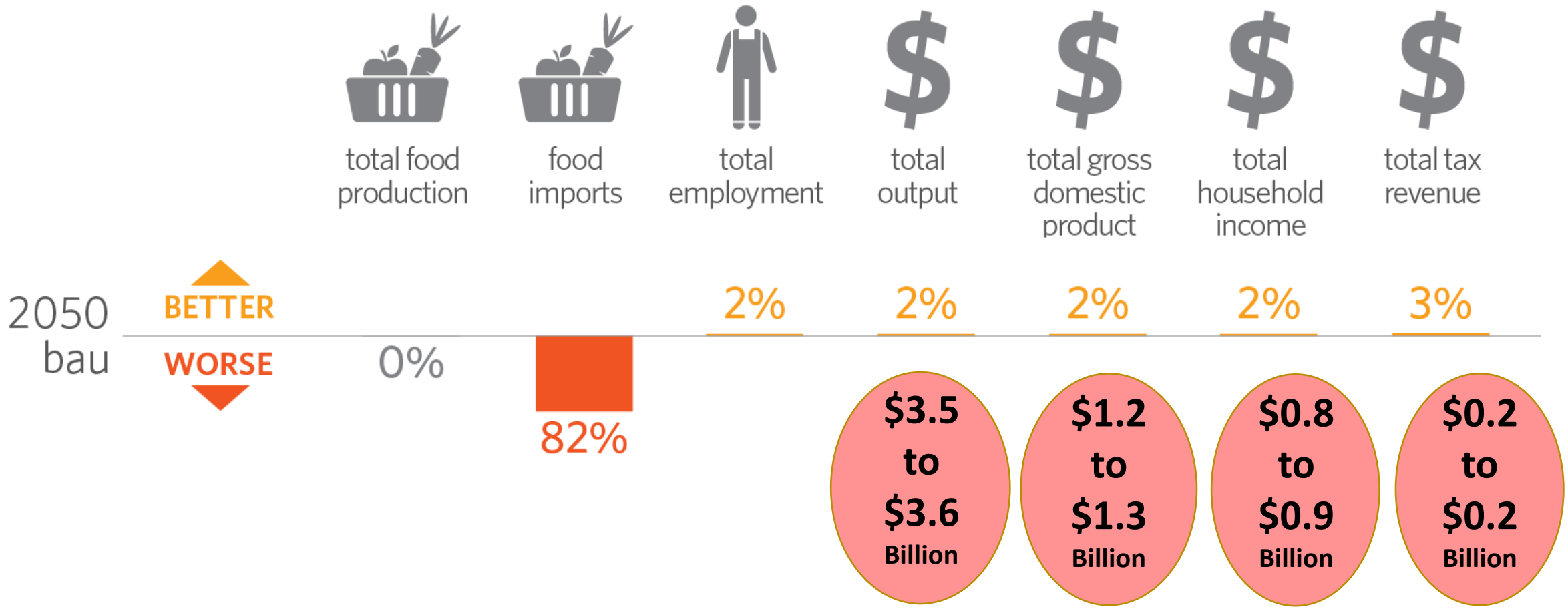


Scenario:
Increase Food Self-Reliance

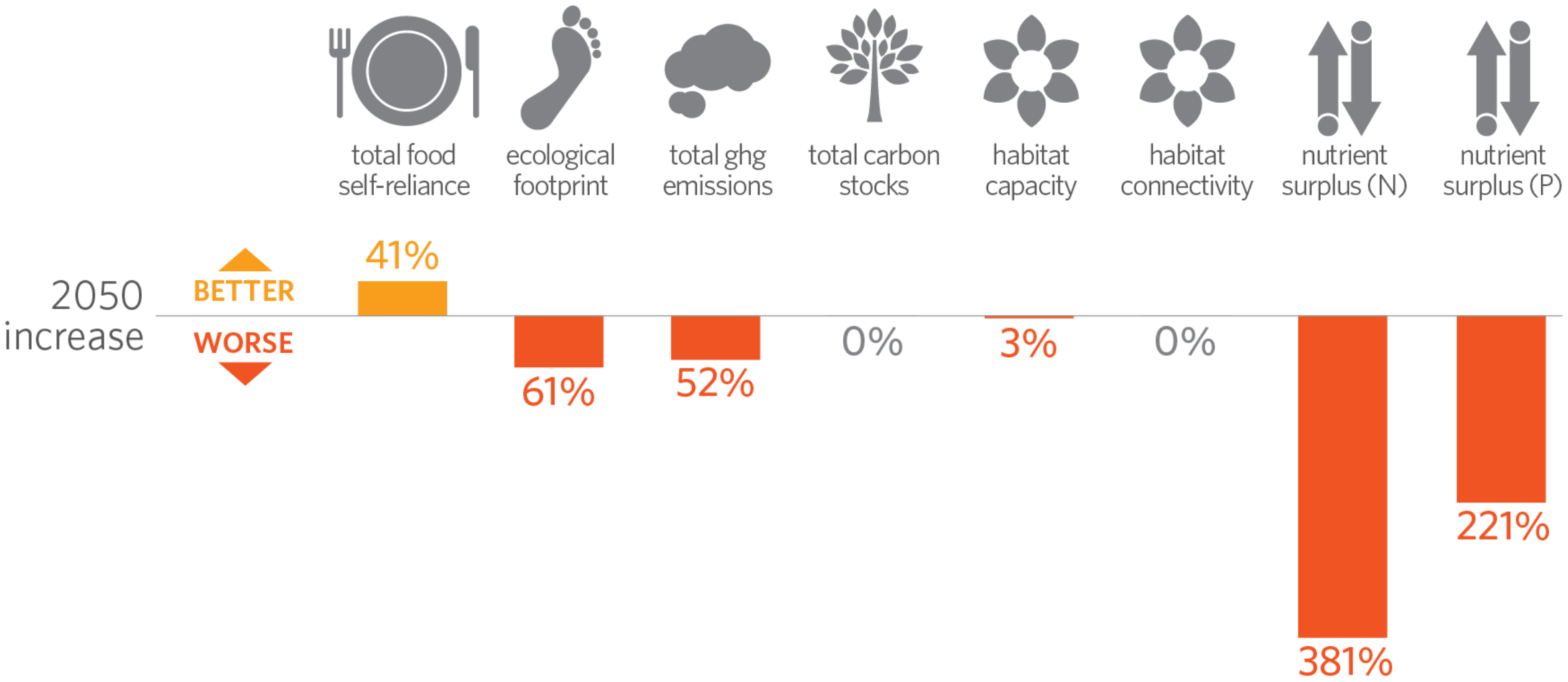
Year: 2050
Population: 4.3 million
Arable Land: 165,000 ha
Land modelled: 101,000 ha
Allocated to production: 87,000 ha

Context:

- No increase in land modelled
- No change in farming practices
- Increased population (60%) and food need
- Crop and livestock production reallocated to meet more of Southwest BC's food need

Comparison of Performance

Percent change from 2011 conditions (better or worse)



Comparison of Performance

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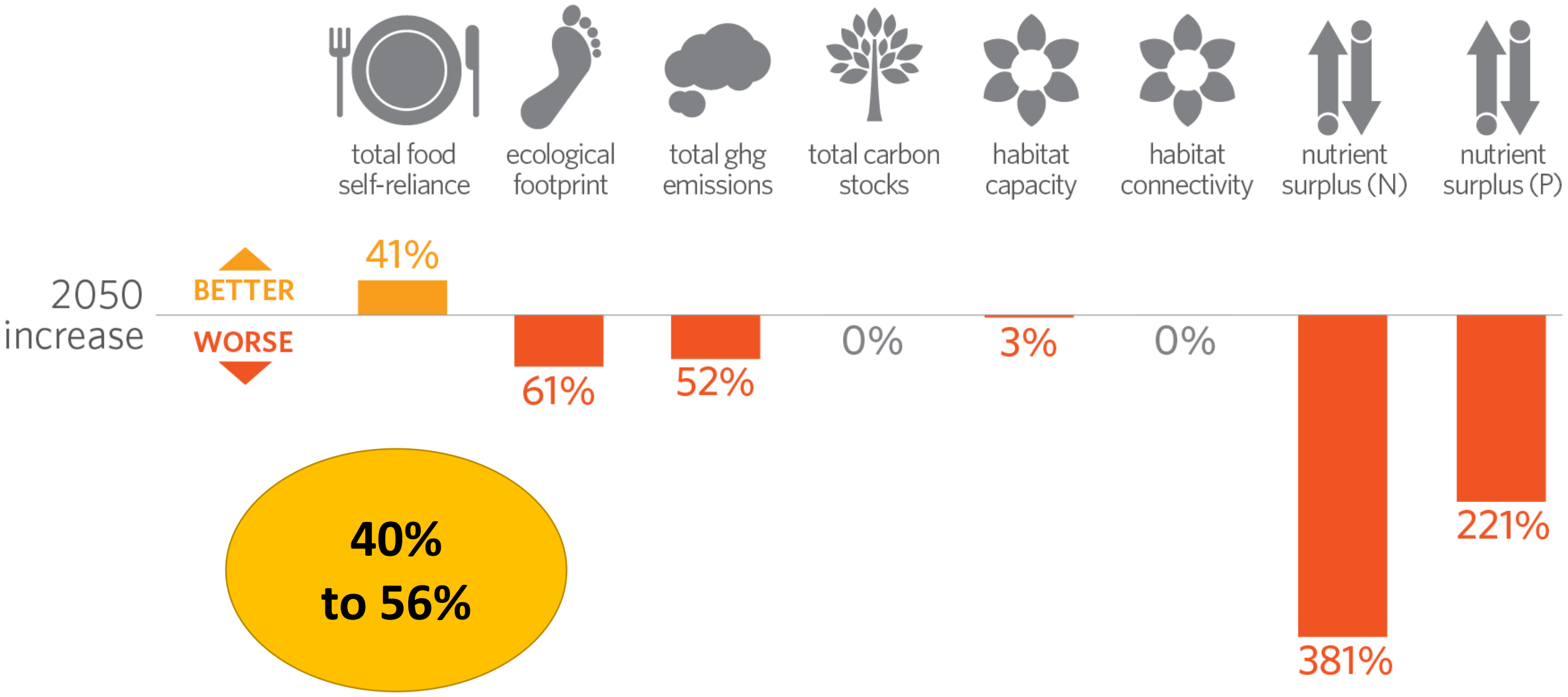

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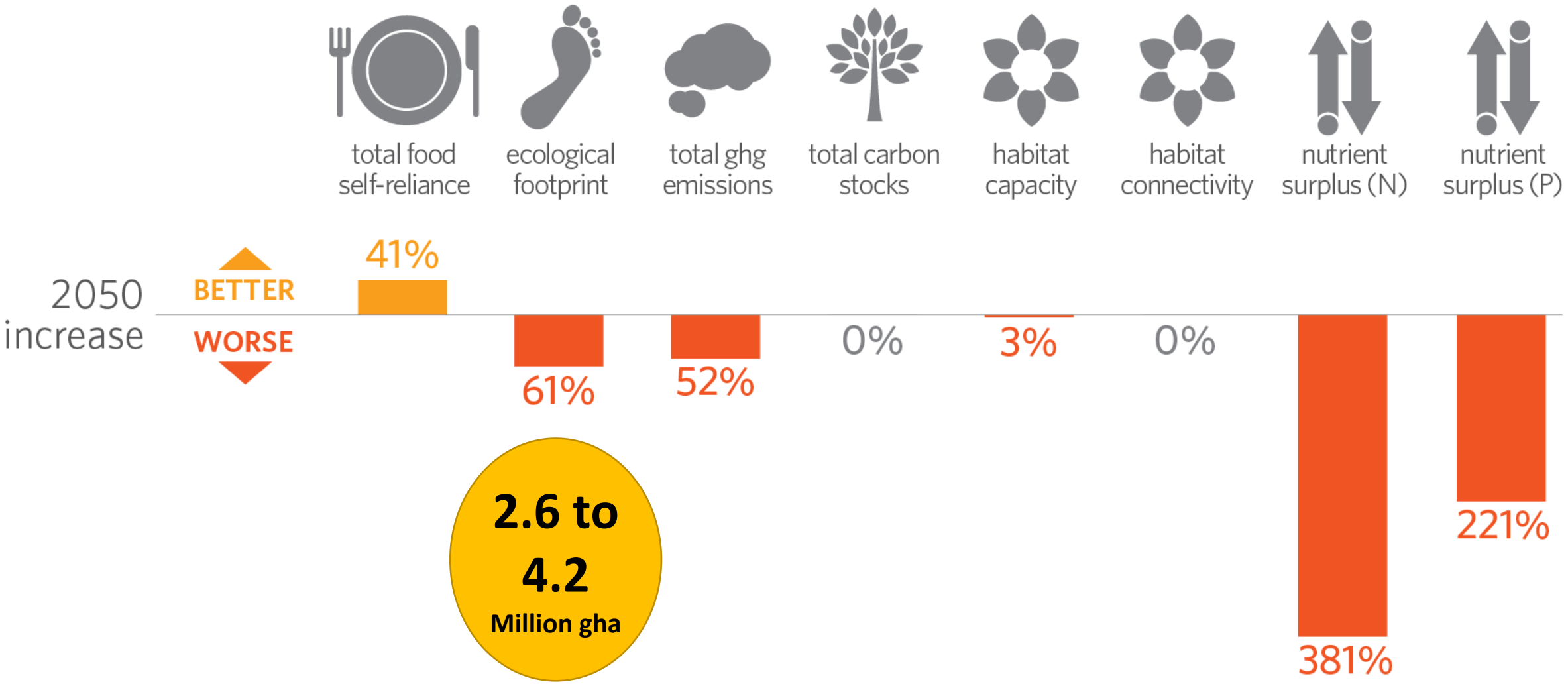

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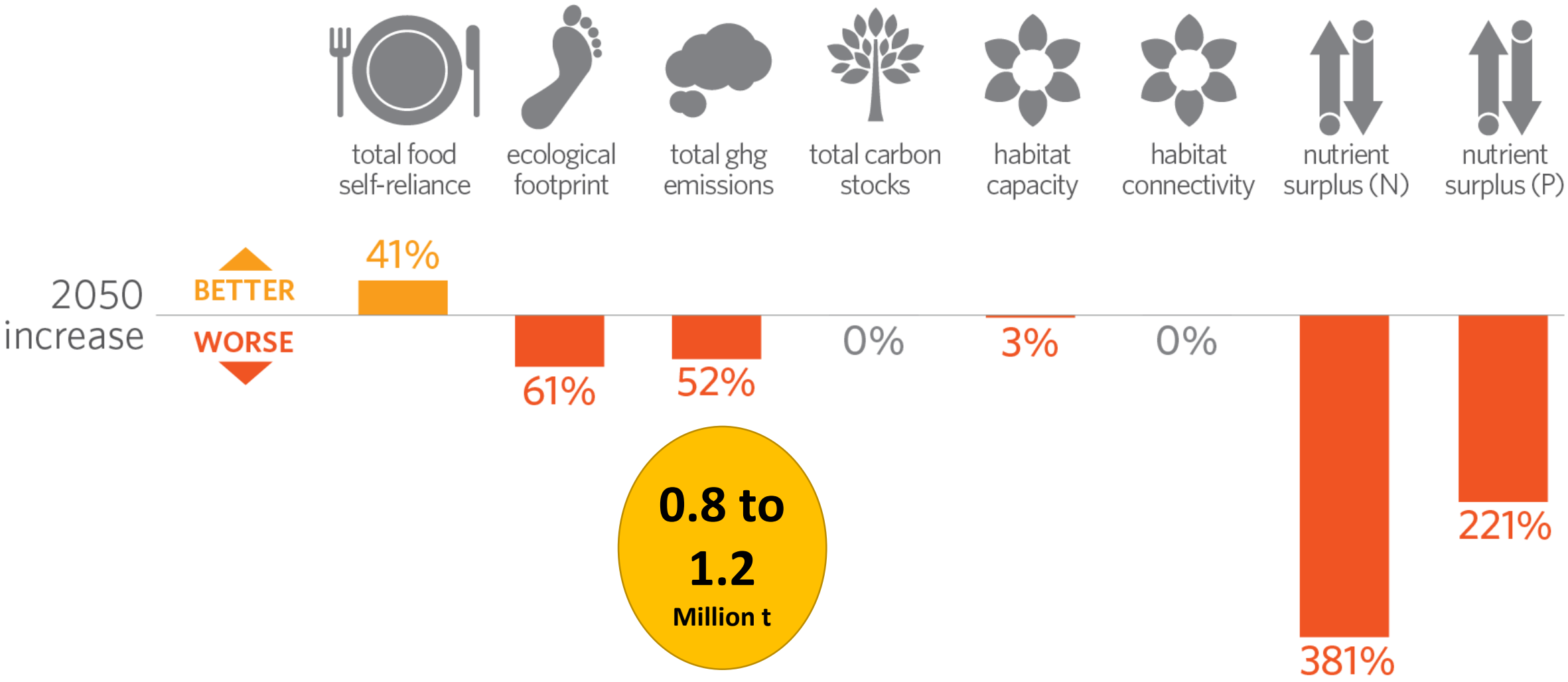

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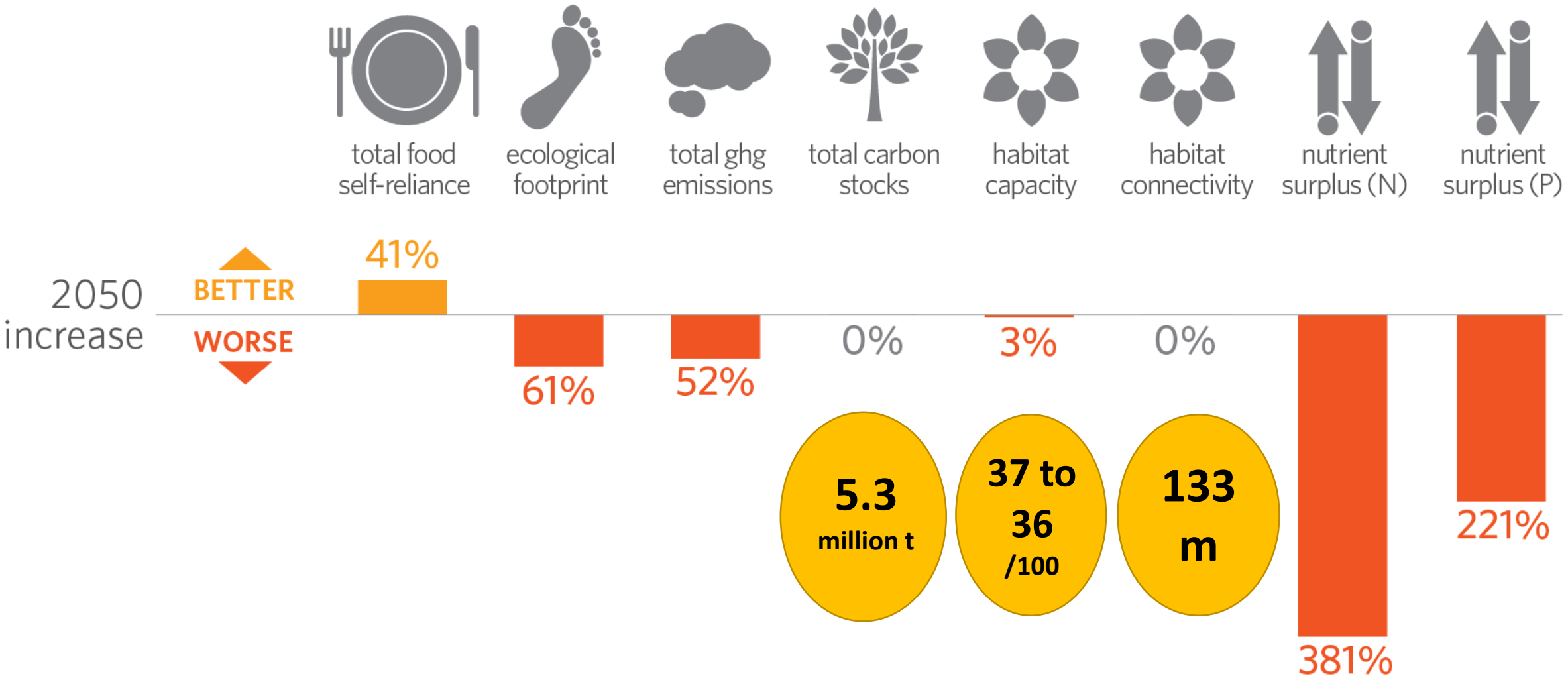

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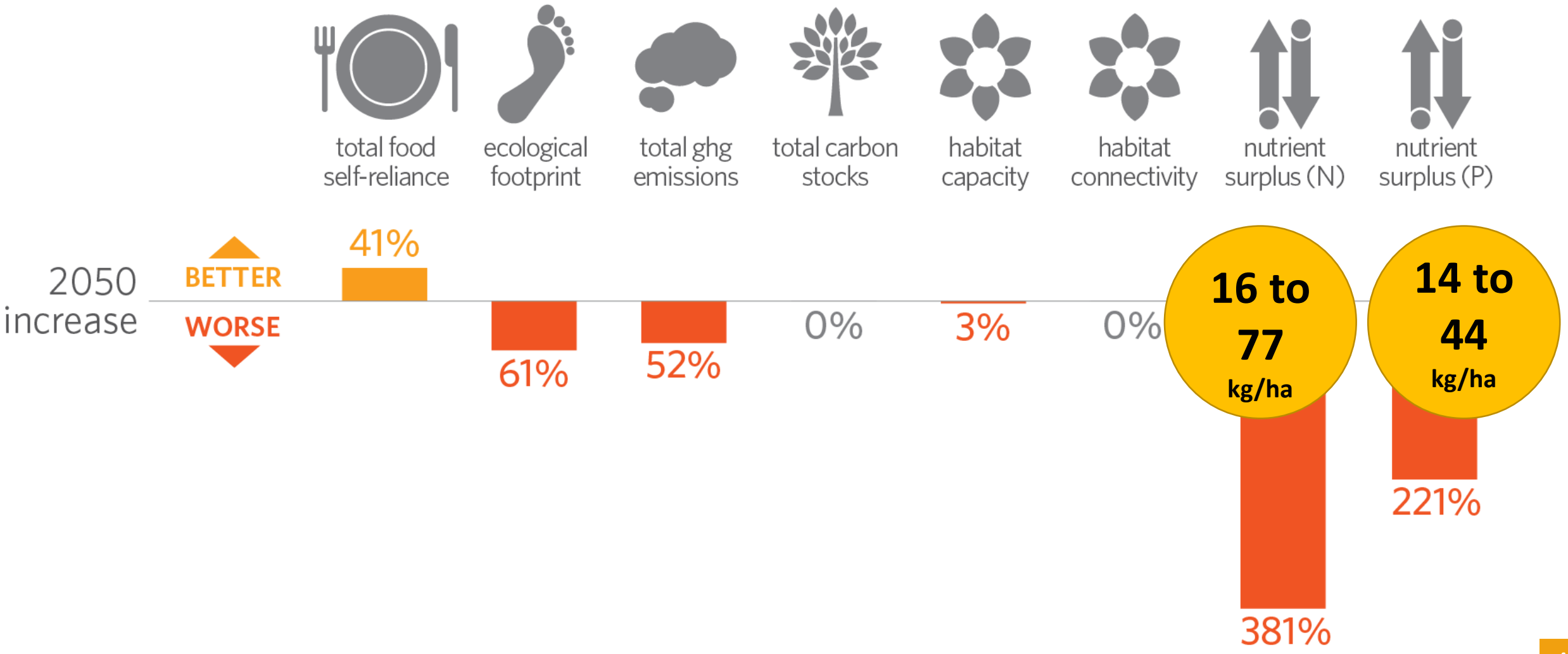

Comparison of Performance

Percent change from 2011 conditions (better or worse)

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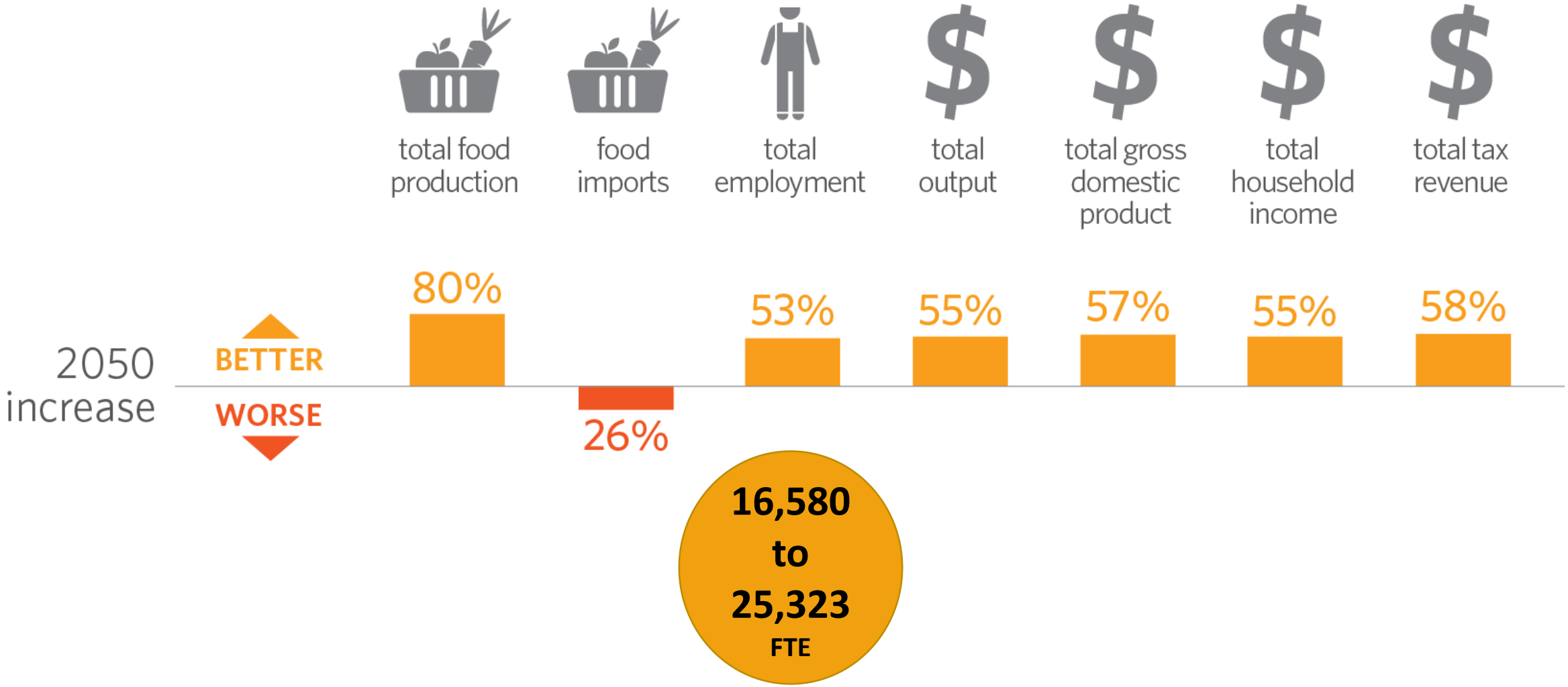
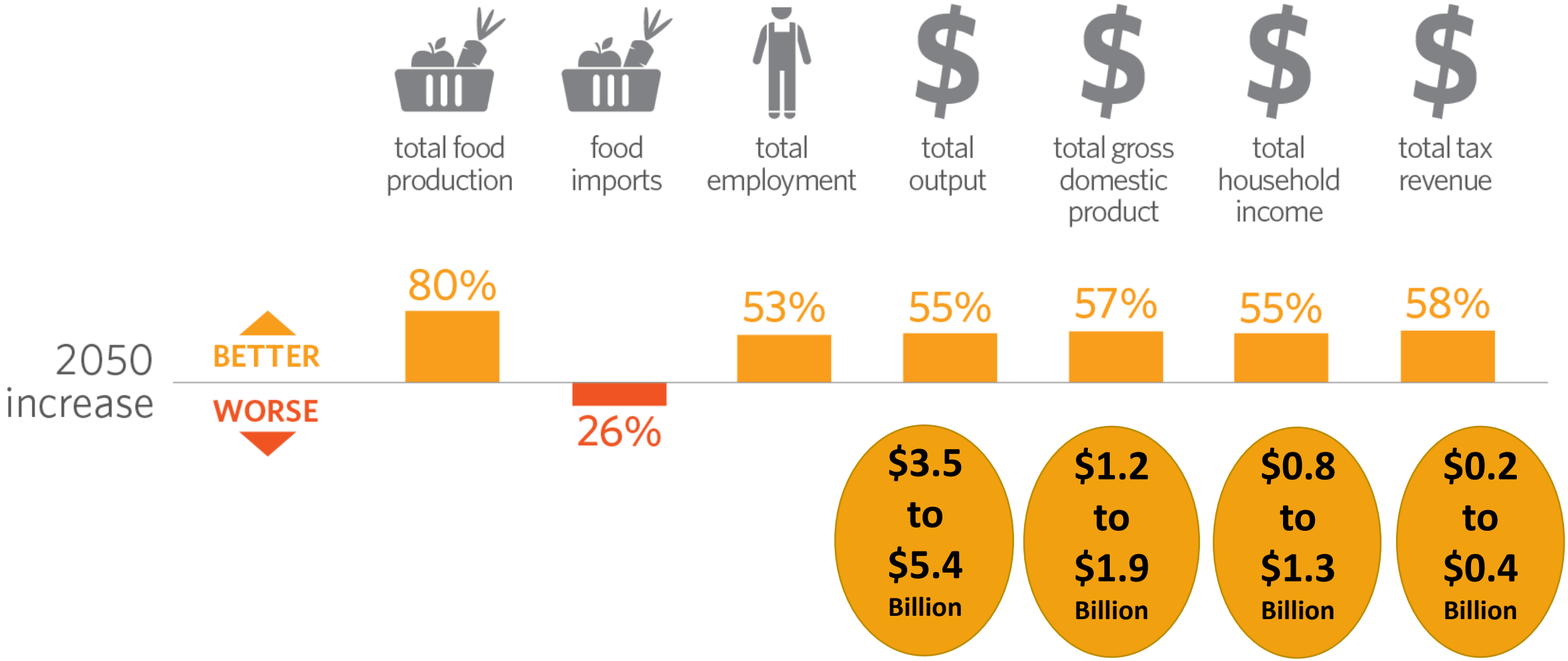


INCREASE - 51

Comparison of Performance

Percent change from 2011 conditions (better or worse)



INCREASE - 52

Scenario:
Mitigate Environmental Impacts

Year: 2050
Population: 4.3 million
Arable Land: 165,000 ha
Land modelled: 101,000 ha
Allocated to production: 79,000

Context:

- No increase in land modelled
- No change in farming practices
- Increased population (60%) and food need
- Crop and livestock production reallocated to meet more of Southwest BC's food need
- **Nitrogen balance and habitat enhancements implemented**

Habitat Enhancements:

Models the impact of planting

- riparian buffers (vegetation) along all waterways on farmland, and
- hedgerows (woody vegetation) along the boundaries of all farm parcels

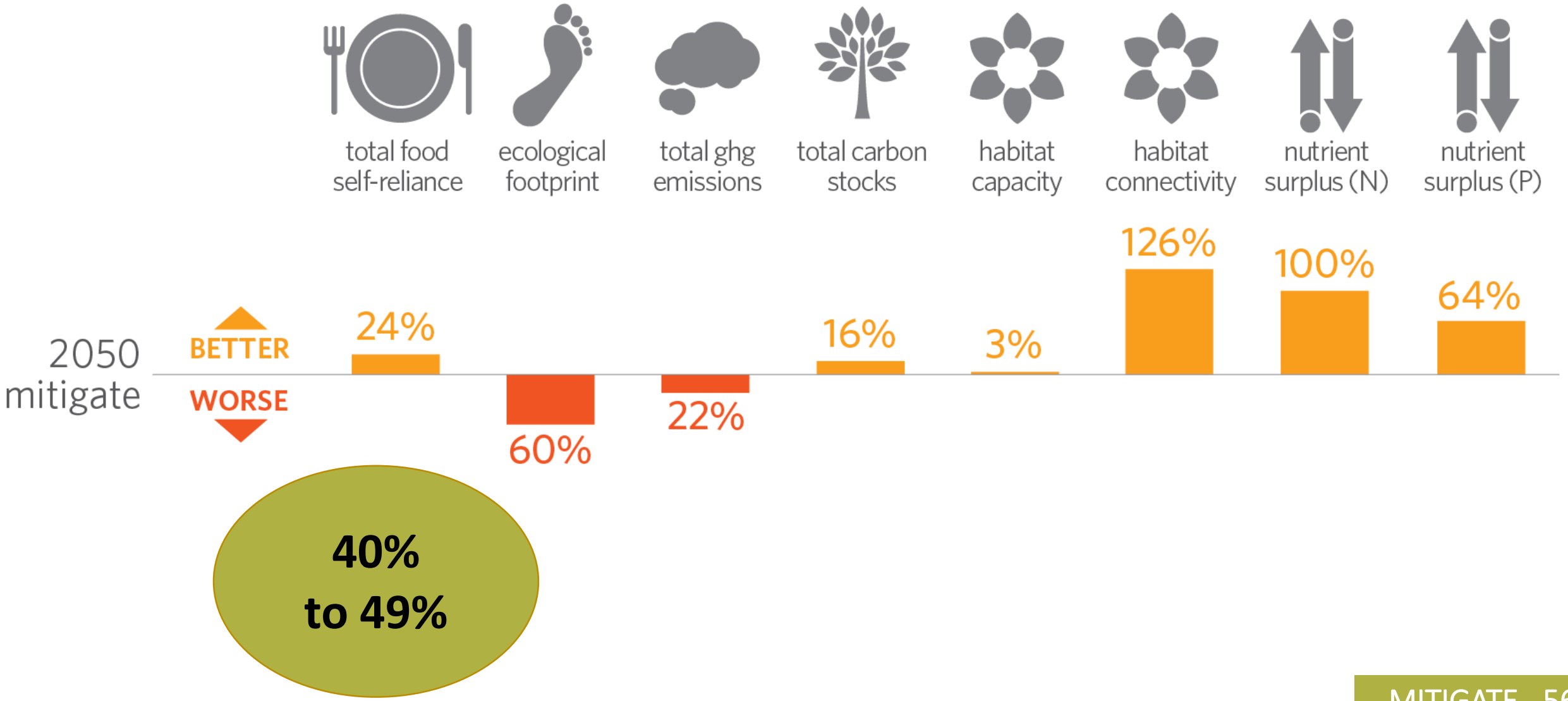
Nitrogen Balance:

Models the impact of matching livestock and crop production at levels such that the level of nitrogen produced (in manure) does not exceed the quantity required for crop nutrition requirements.

Sub-regional concentration of manure a confounding issue.

Comparison of Performance

Percent change from 2011 conditions (better or worse)



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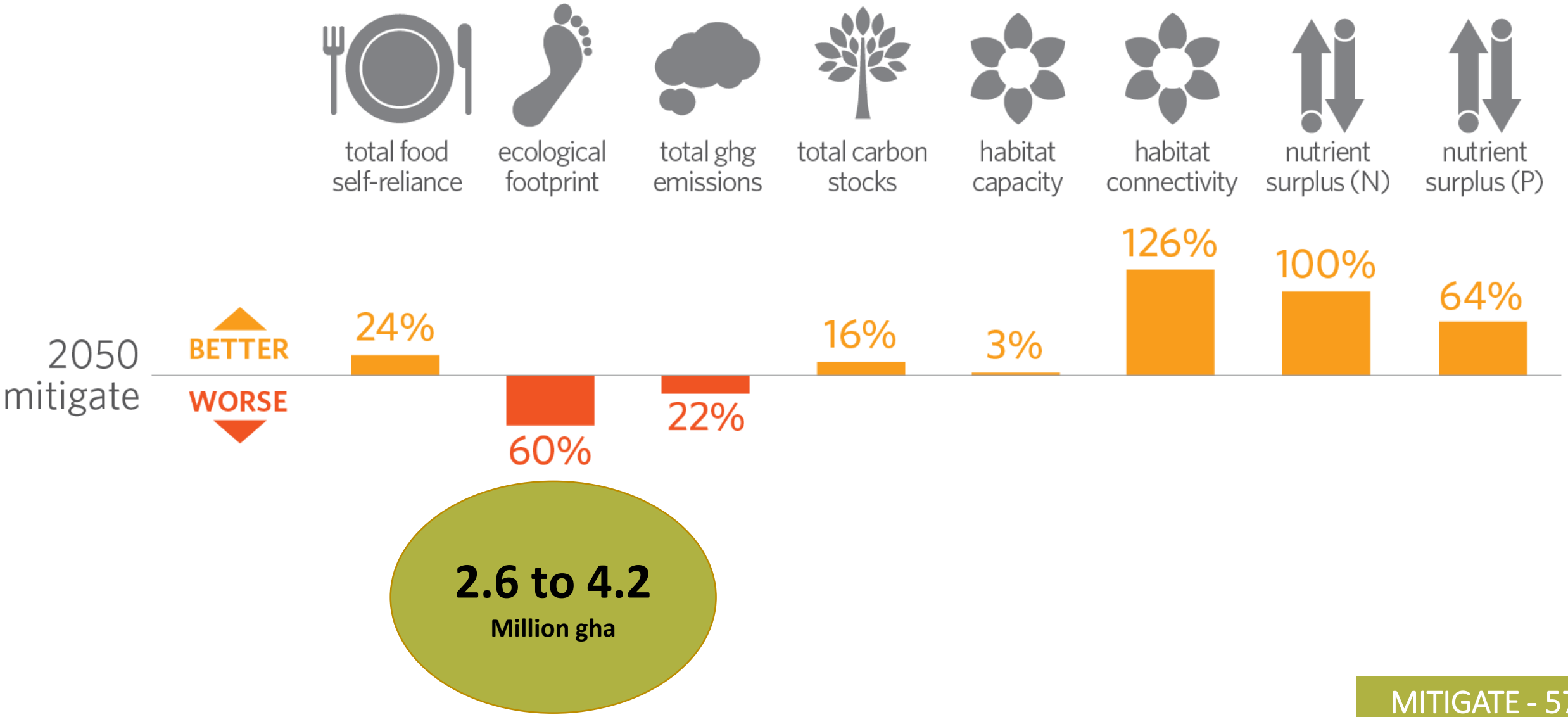

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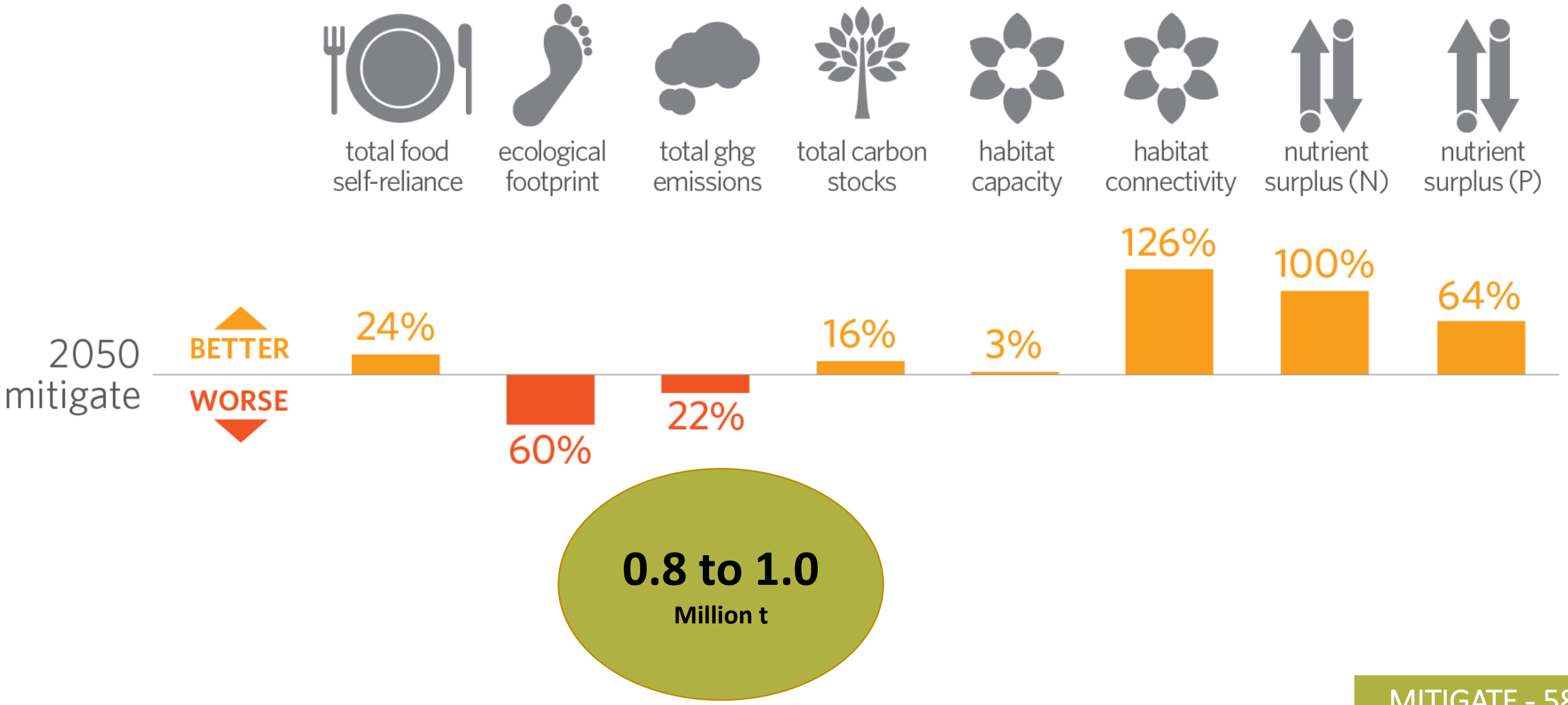

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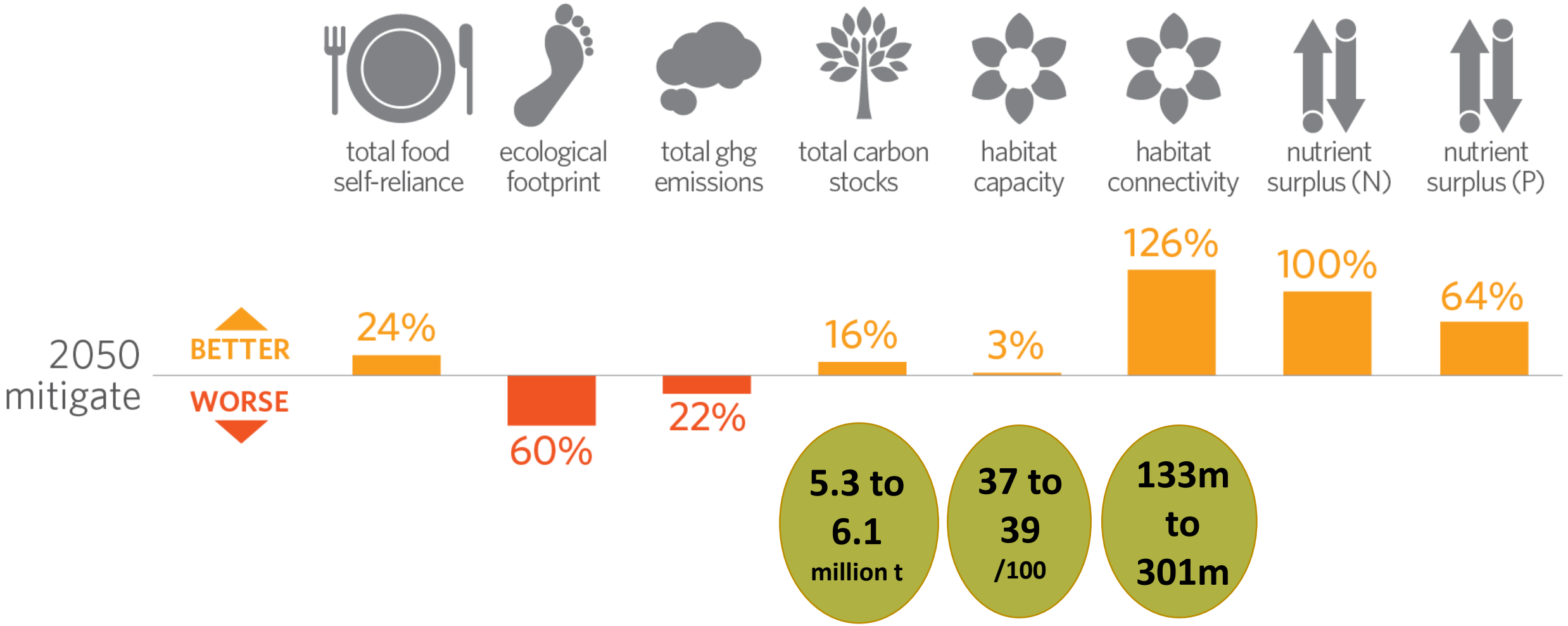
Percent change from 2011 conditions (better or worse)



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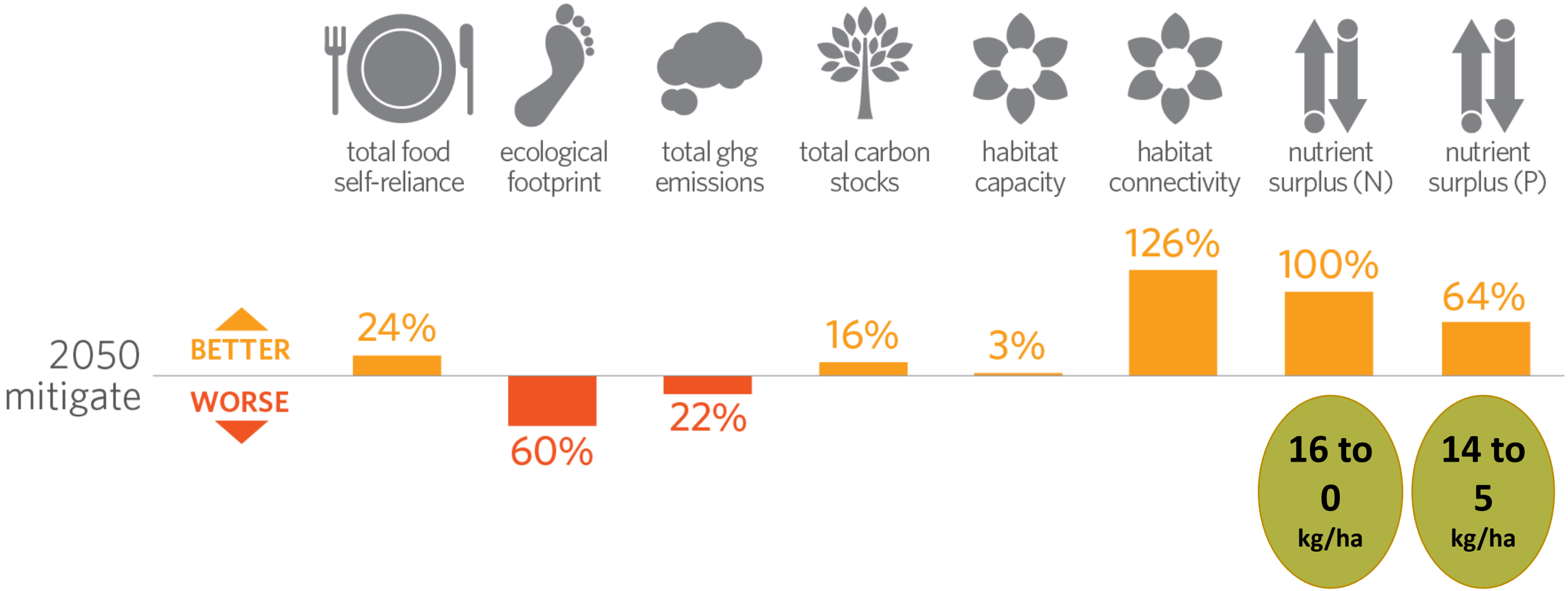

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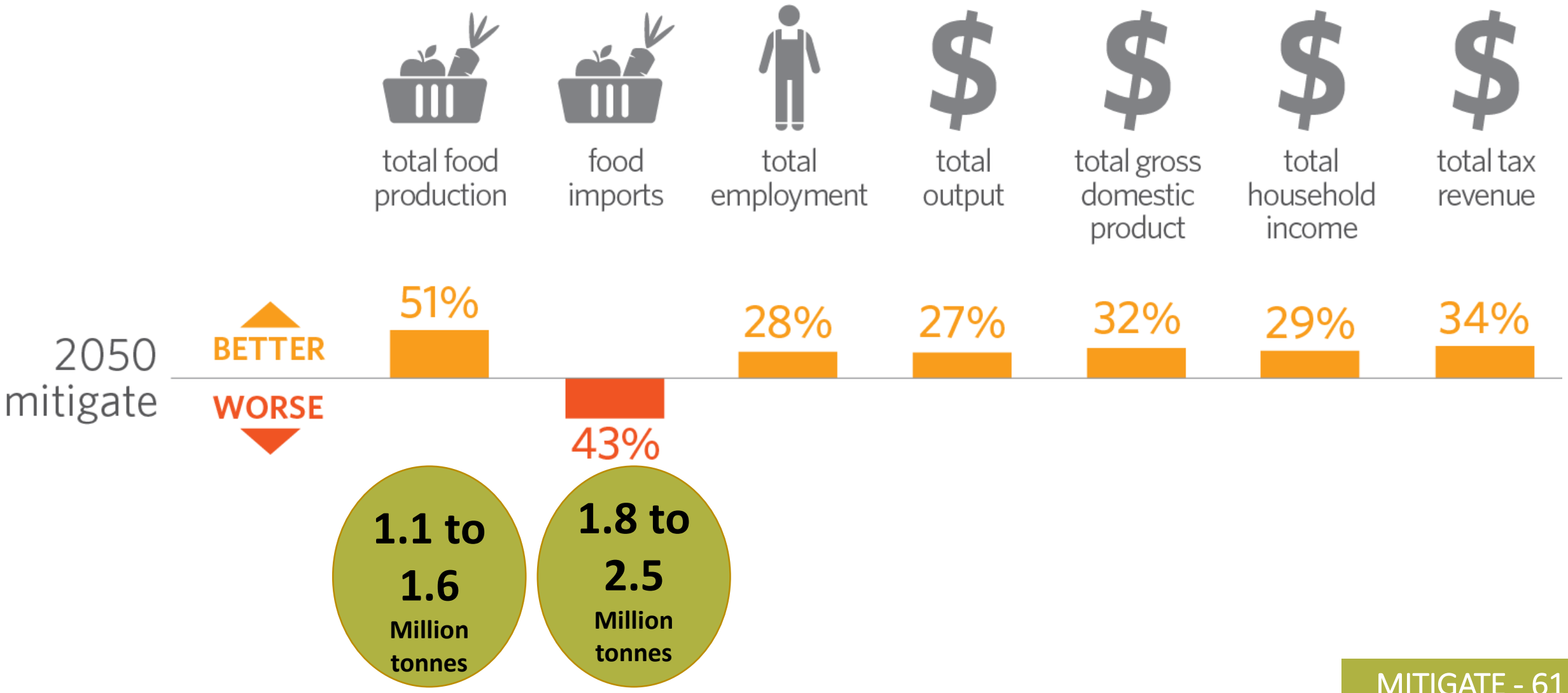

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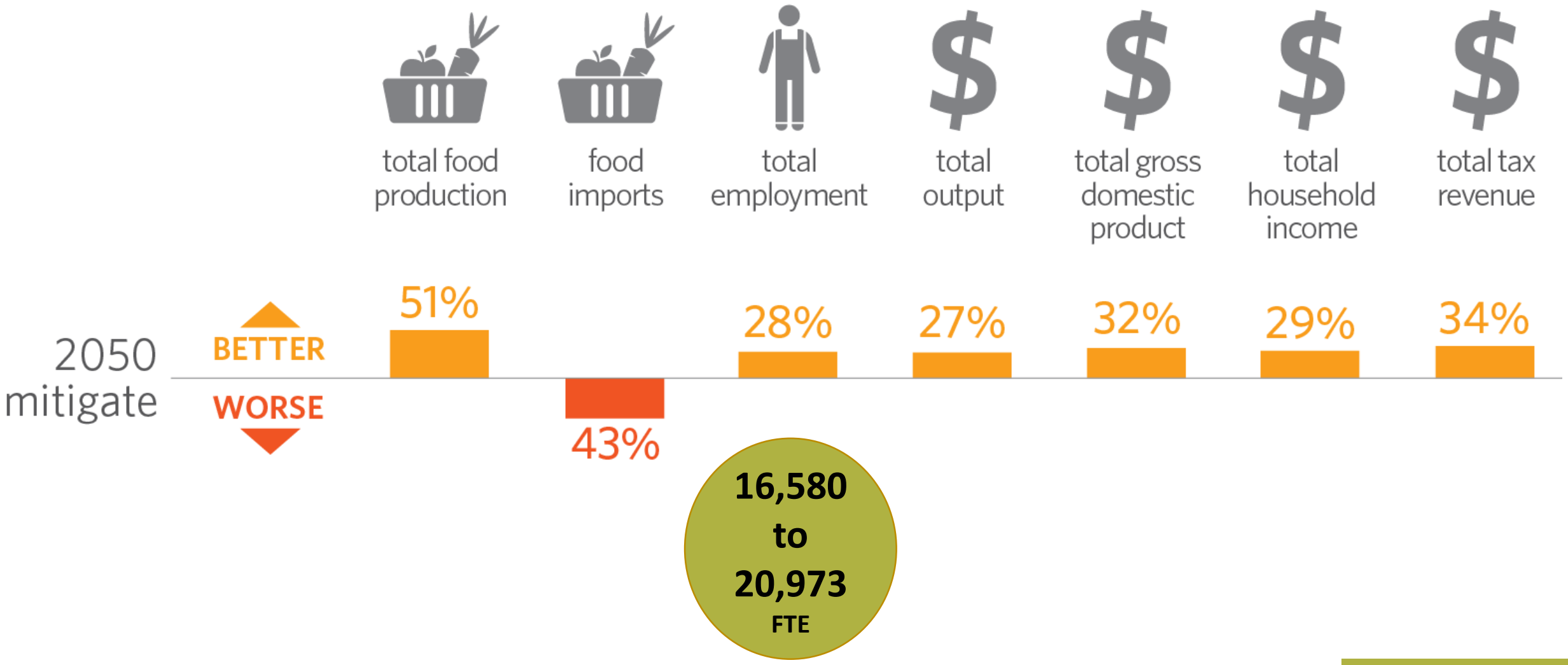

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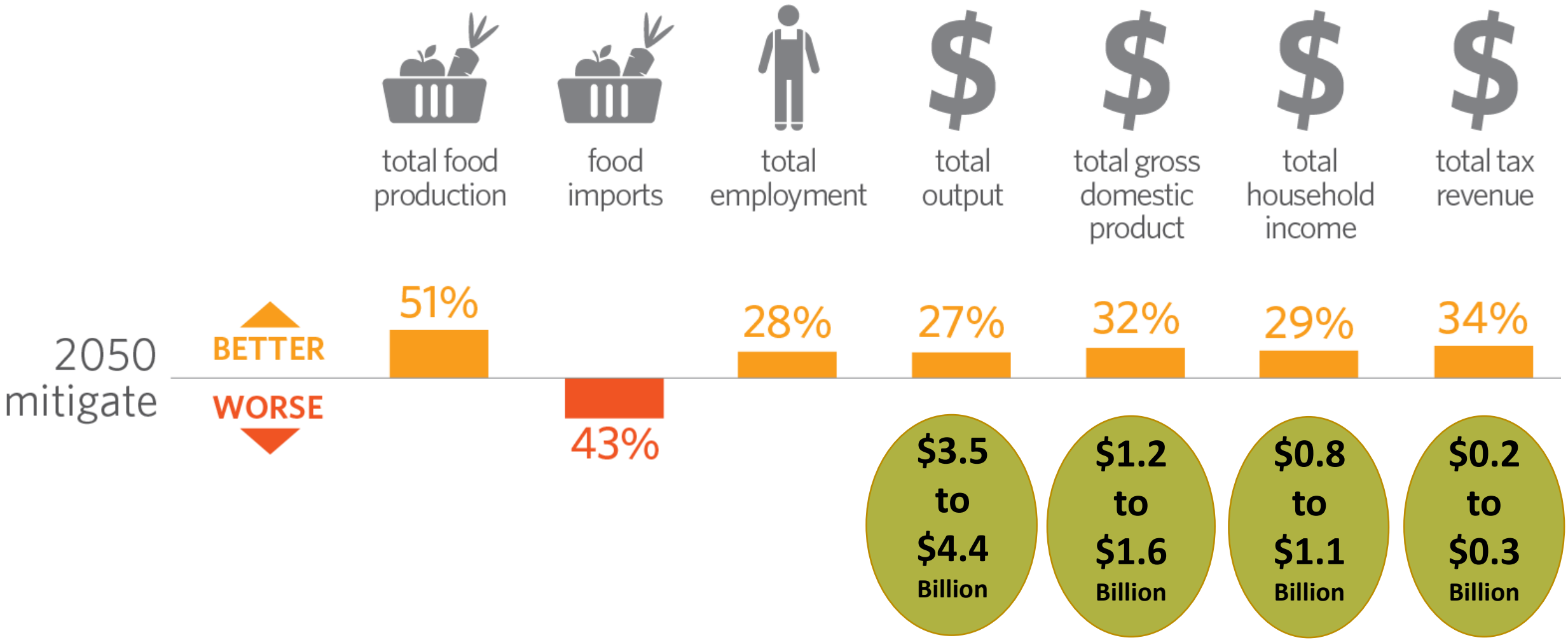


Scenario:
Expand Land in Production

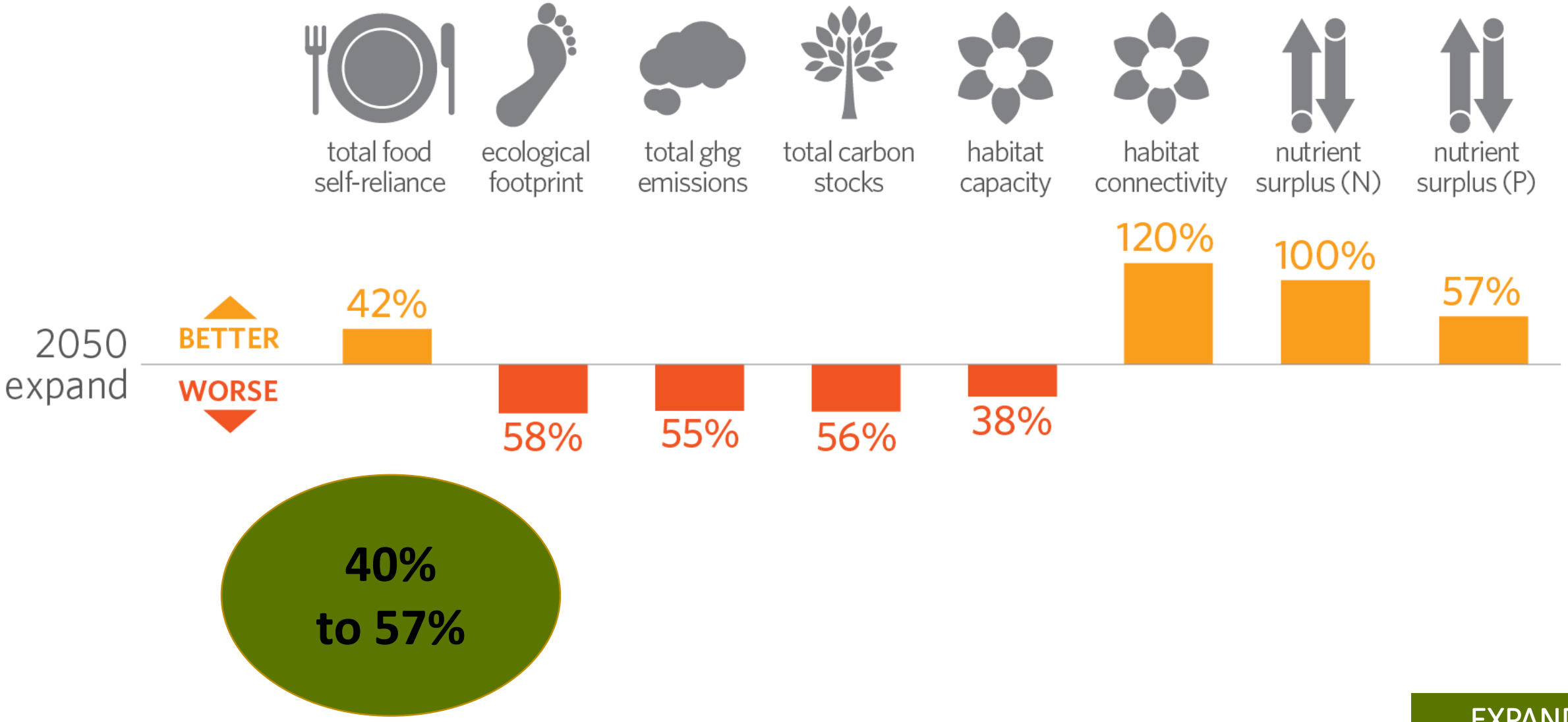
Year: 2050
Population: 4.3 million
Arable Land: 165,000 ha
Land modelled: 165,000 ha
Allocated to production: 125,000 ha

Context:

- No change in farming practices
- Increased population (60%) and food need
- Crop and livestock production reallocated to meet more of Southwest BC's food need
- Nitrogen balance and habitat enhancements maintained
- **Area in production expanded**

Comparison of Performance

Percent change from 2011 conditions (better or worse)



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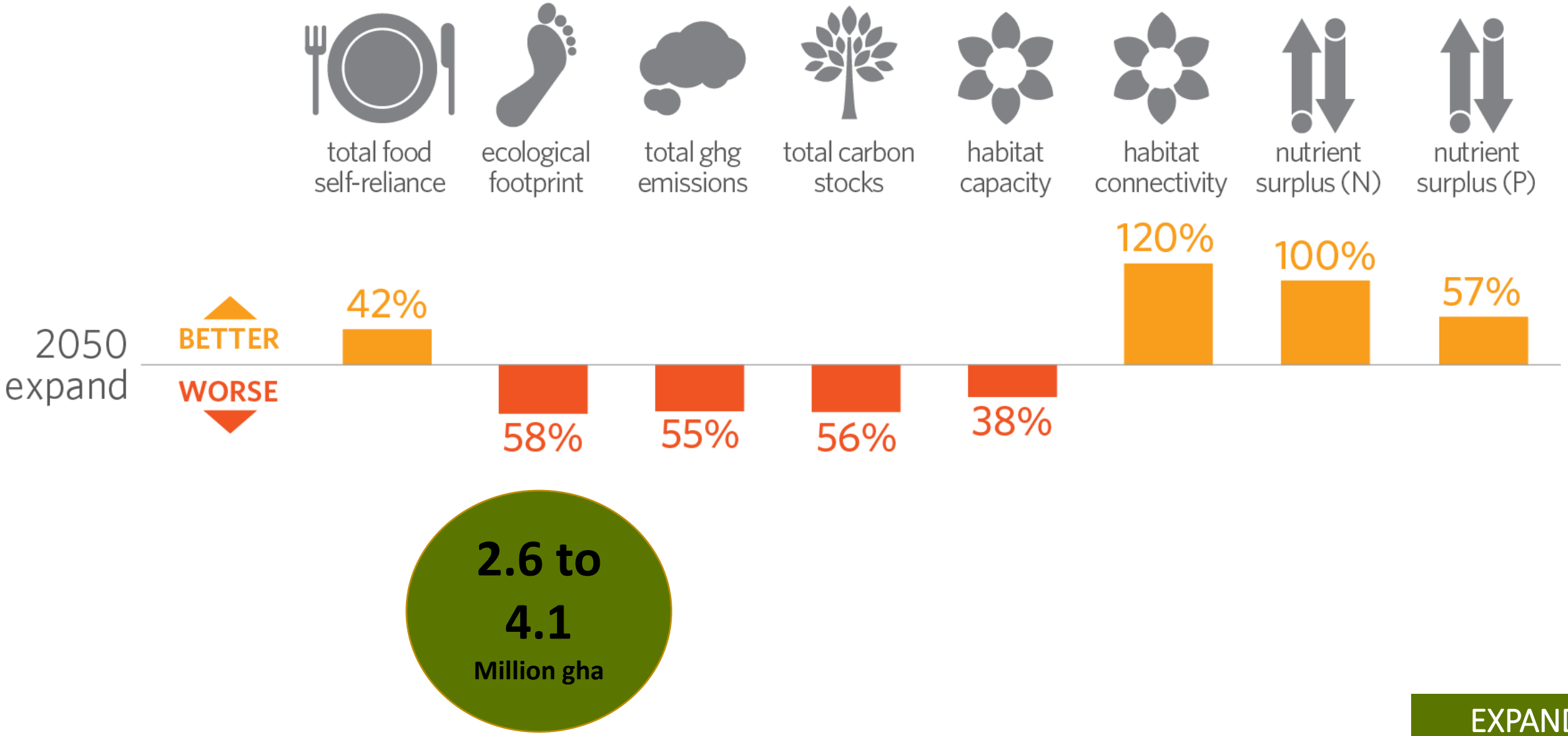

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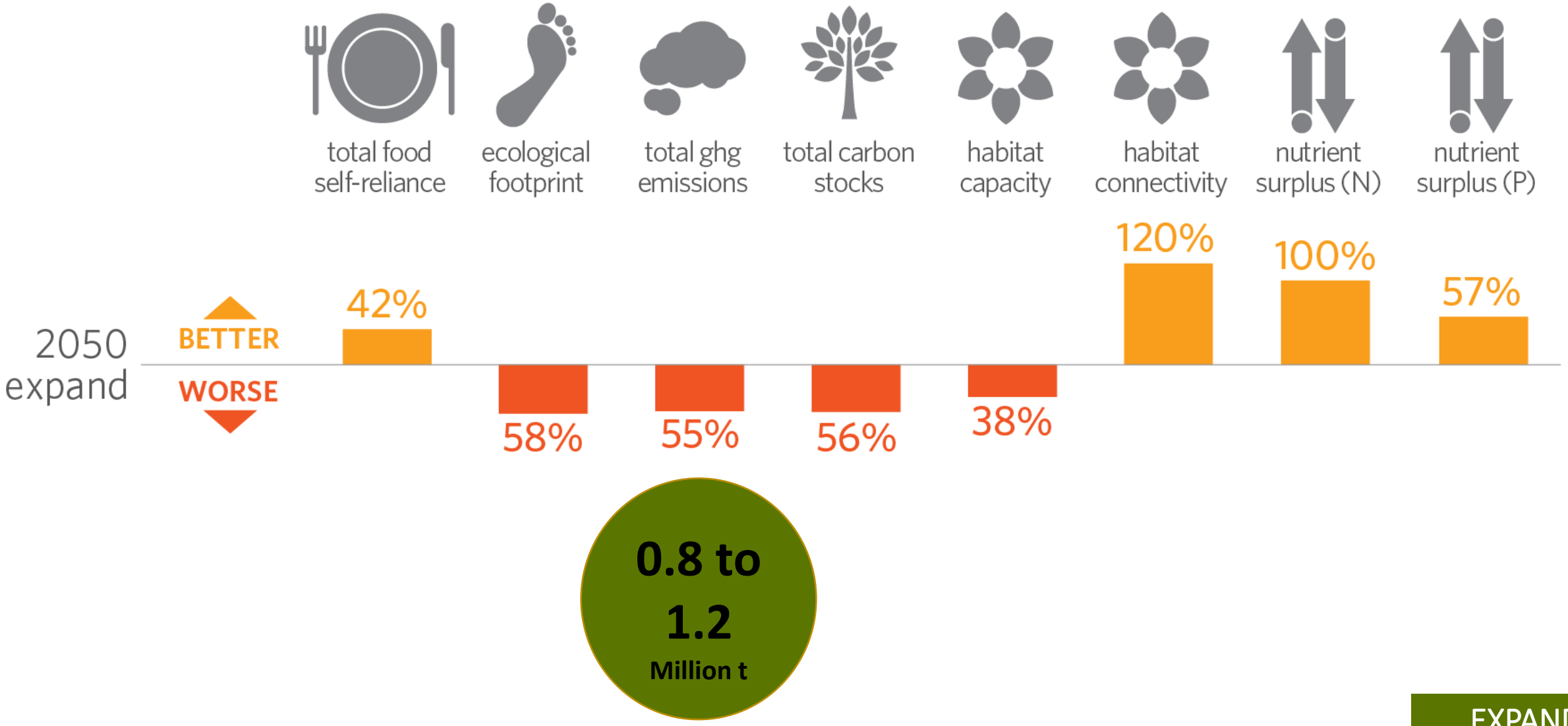

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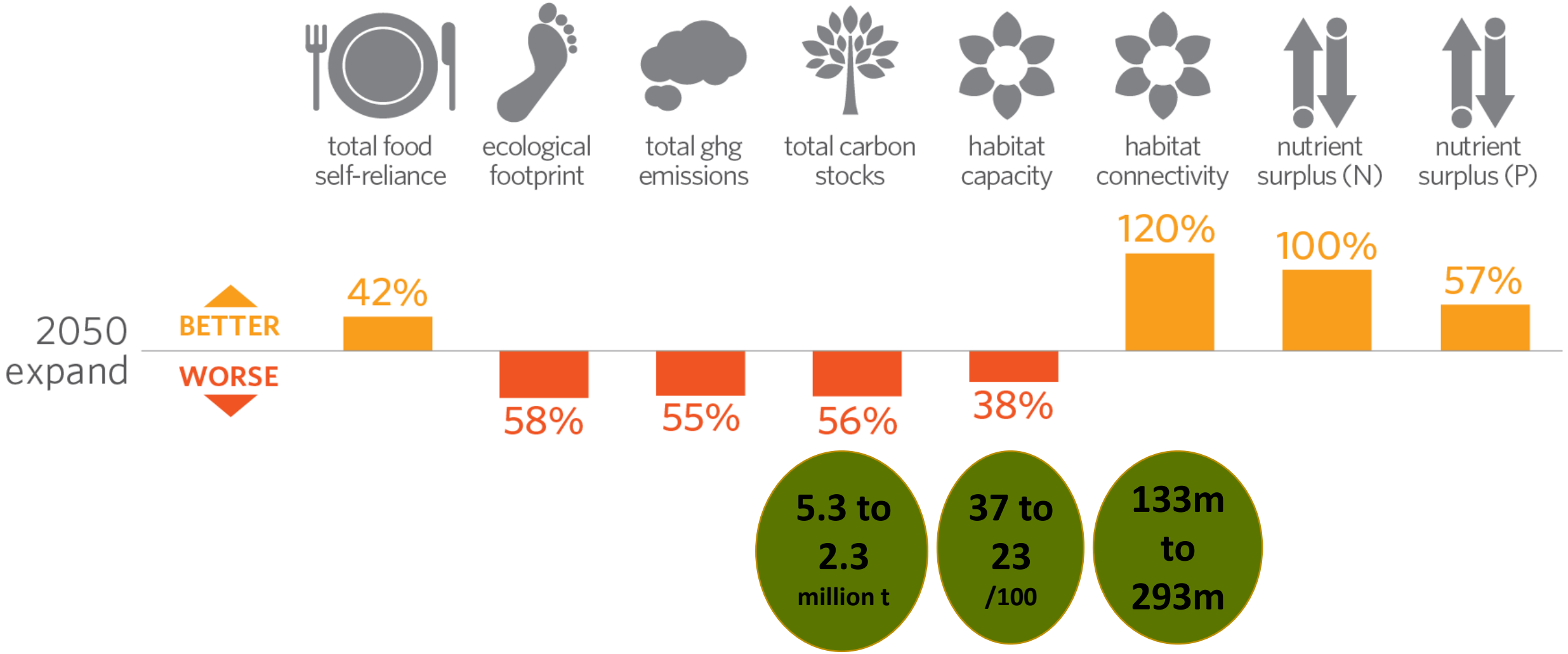
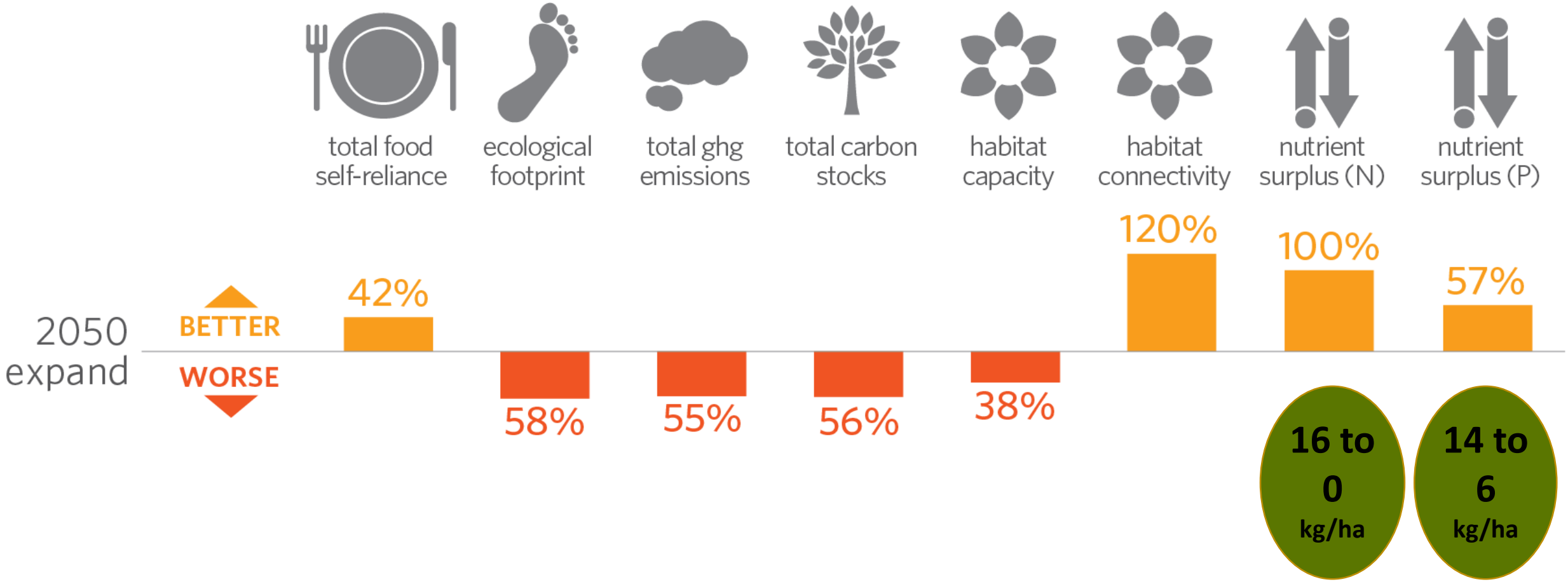


Comparison of Performance

Percent change from 2011 conditions (better or worse)



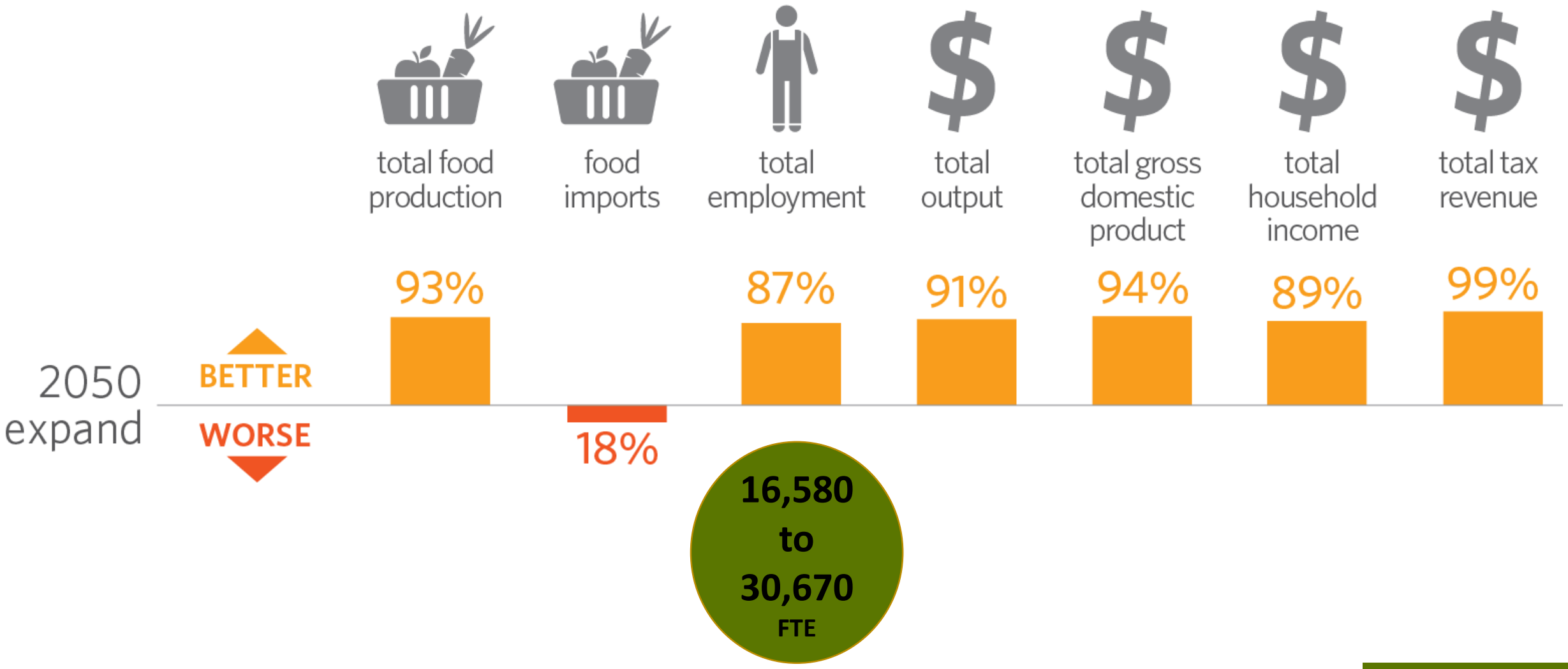
Comparison of Performance

Percent change from 2011 conditions (better or worse)

EXPAND - 70

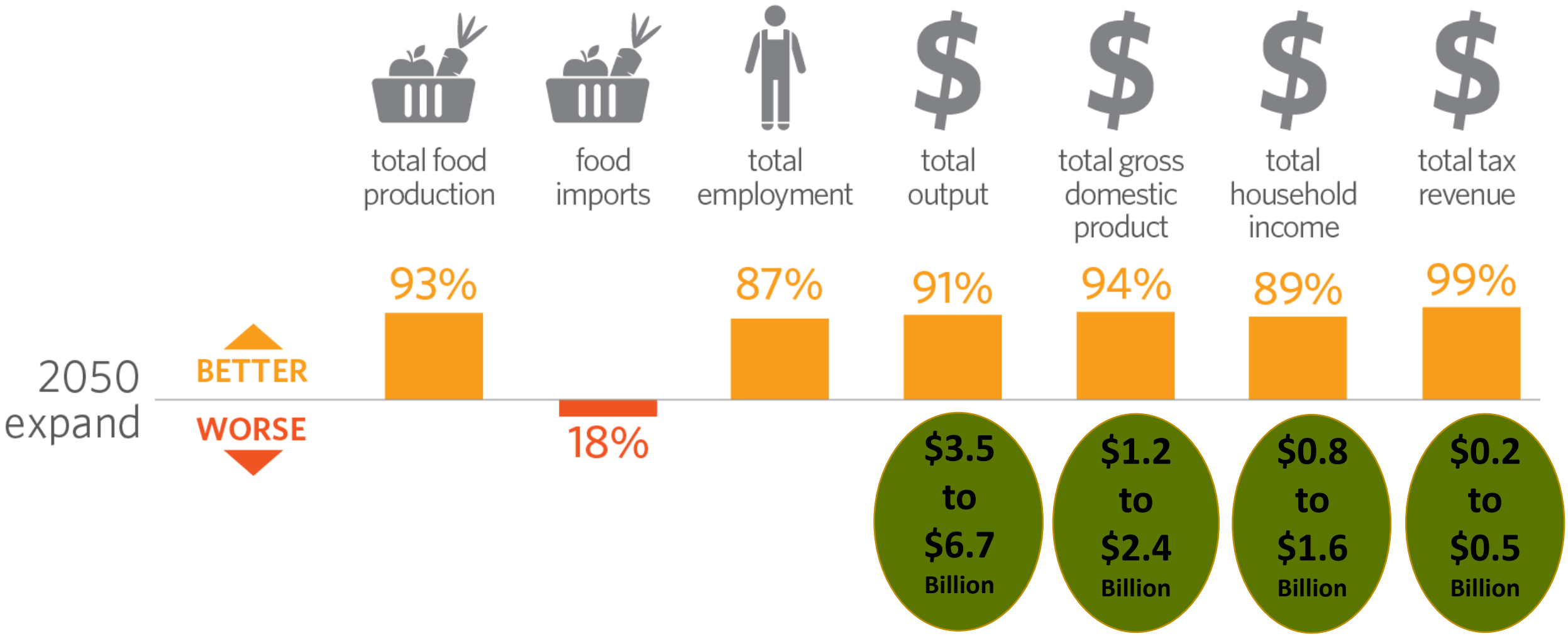
Comparison of Performance

Percent change from 2011 conditions (better or worse)



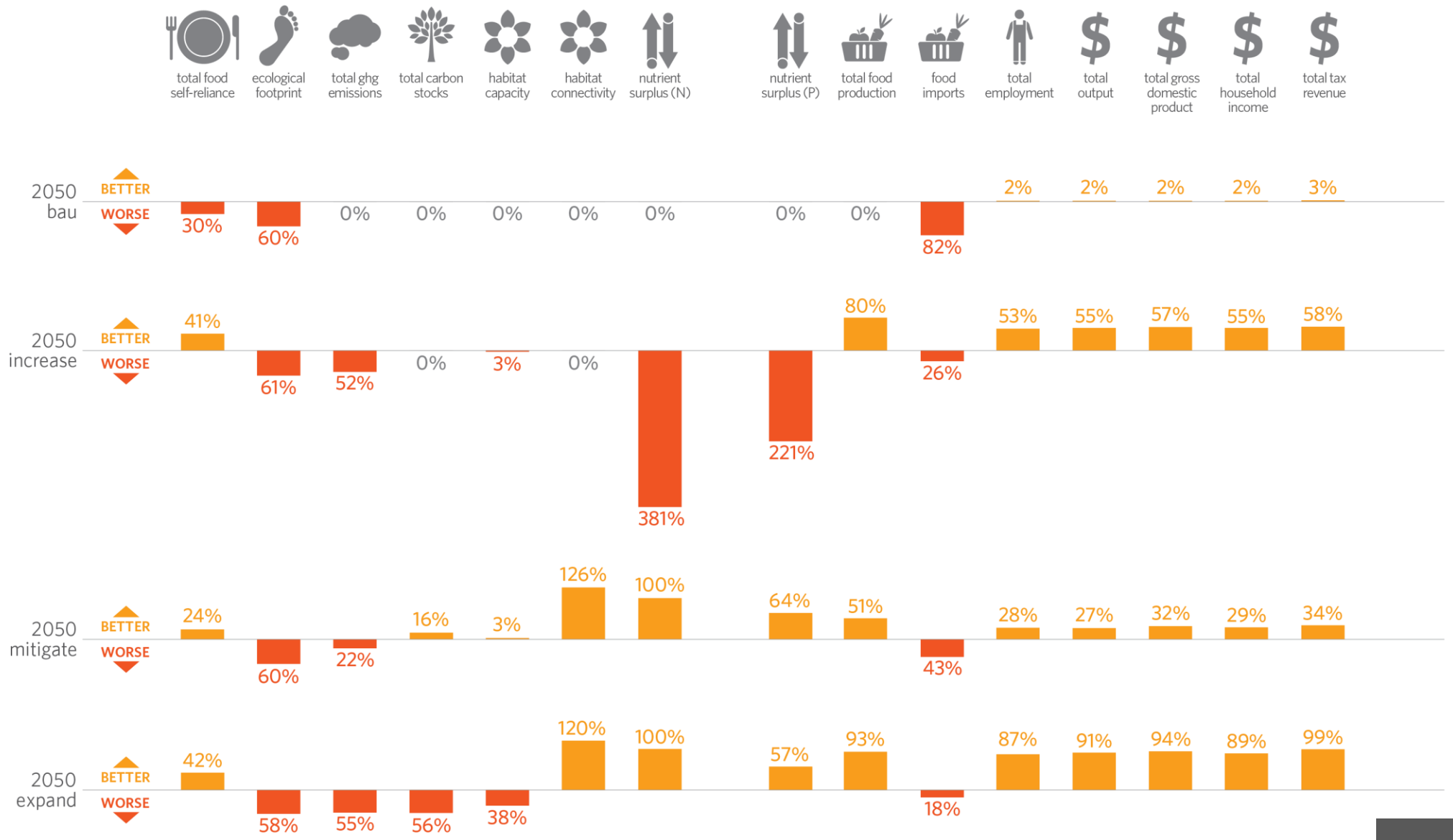
Comparison of Performance

Percent change from 2011 conditions (better or worse)



Comparison of Performance for All Scenarios

Percent change from 2011 conditions (better or worse)



Indicator Recommendations:
How to Advance Each for the Better

Food Self-Reliance:

Increase even with population growth by prioritizing production of crops needed in the local.

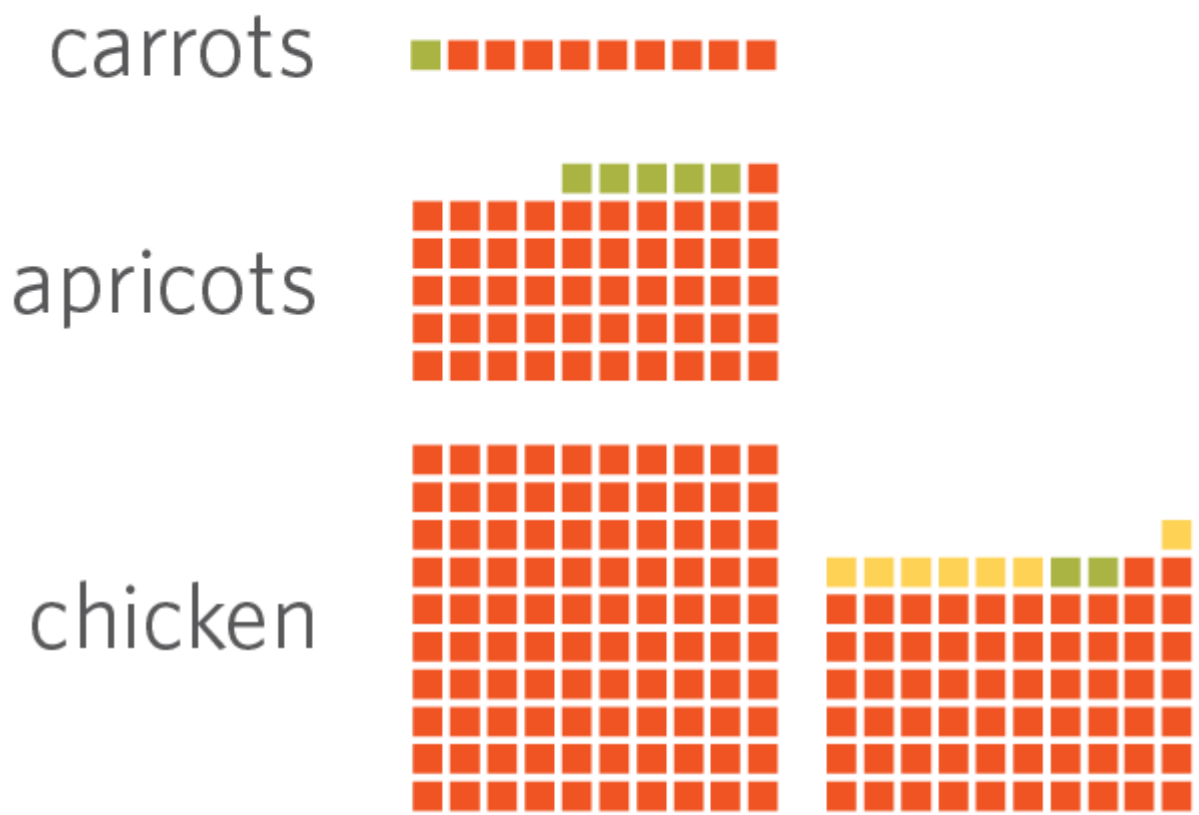
Ecological Footprint:

Regionalizing by increasing self-reliance will not reduce EF.

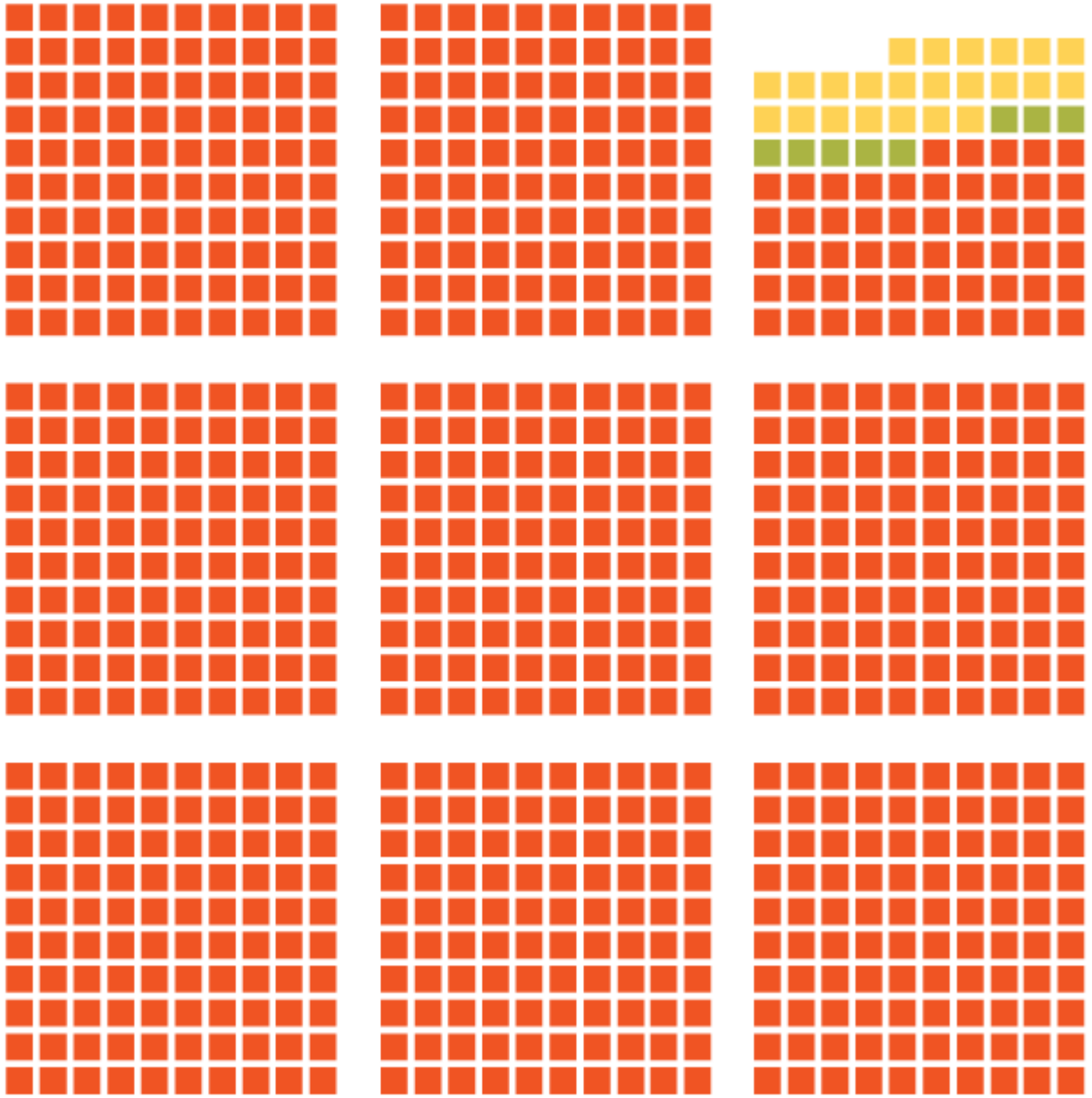
Diet change necessary.

Ecological Footprint Comparison

Global hectares (gha) required to produce one tonne (t) of a specified food commodity



beef



RECOMMENDATIONS - 76

Greenhouse Gas Emissions:

- Increasing food self-reliance causes increase in locally emitted GHGs.
- Opportunity to reduce through changing diet and farm practices.

Carbon Stocks:

Maintain existing stands or mitigate loss by:

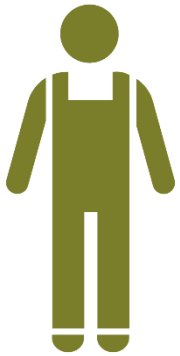
- Increasing soil organic matter
- Planting habitat enhancements
- Maintaining existing vegetation along parcel boundaries

Wildlife Habitat Capacity and Habitat Connectivity:

Plant extensive perennial hedgerows and riparian buffers to offset trade-off of habitat loss from increased food production and expanded land in production.

Nutrient Surplus (Nitrogen and Phosphorous):

- Increase crop and livestock production at levels that achieve a nutrient balance.
- Ensure distribution of livestock throughout the region and appropriate manure handling.
- Link crop fertility needs to manure sources.



Economic Impacts:

- Economic contribution of the Southwest BC food system to the provincial economy can be increased by:
  - Increasing food production in accordance with local food need
  - Increasing food processing capacity

- Processing sector is key to stimulating the regional food system economy.

Our Food System, Our Choice to Make

- Given how and what we eat, our land availability, the seasonality of production, and our population, we will never achieve 100% self-reliance in Southwest BC and our dependence on imported livestock feed is clear.

- By changing what we produce and/or increasing the area farmed, we can substantially improve self-reliance over 2011 levels – even with population growth.

- In doing so we can substantially contribute to the economy of Southwest BC and the province overall, and more so than would occur by only increasing food exports.

- There are trade-offs: increases in self-reliance and economic impact worsen our environmental impacts unless mitigation measures are taken and diets change.

Project Background

Methodology

Results

Questions


Thank You
Full Report and Research Briefs online
kpu.ca/isfs/southwestbcproject
KPU
Institute for Sustainable Food Systems