Projections and scenario analysis for climate and nitrogen action planning

SIMAP
SUSTAINABILITY INDICATOR MANAGEMENT & ANALYSIS PLATFORM

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Sustainability Institute

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University of New Hampshire
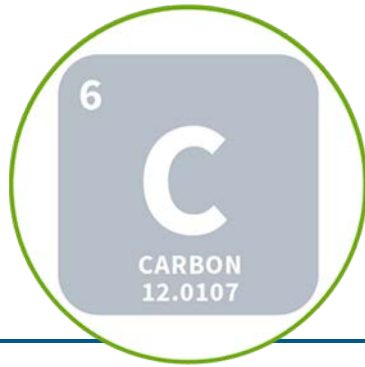
UNIVERSITY of VIRGINIA

Outline

Part 1: Projections & scenarios

- SIMAP background
- Projection & scenario results
- Excel templates

Part 2: Integrated planning

- Integrated planning strategies
- Case study 1: University of Virginia and nitrogen
- Case study 2: University of New Hampshire and climate

SIMAP integrates two tools

UNH Sustainability Institute

- Developed in 2001 at UNH
- Excel and web version
- Used by **thousands** of institutions

N Print

- Developed in 2009 at UVA
- Excel-based
- Used by 20 institutions
- **Completed pilot testing**

Why a new tool?

1 Broader picture of **environmental impacts**
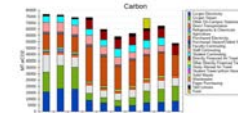

2 **Single tracking tool**

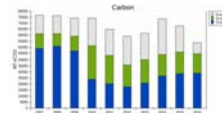**Carbon** Food Energy **Nitrogen**

3 Integrate with **other reporting platforms**

Second Nature   *Others in the future*

4 **Research about data trends**

5 **UNHSI's ability to support the tool**

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How did we get here?
Carbon
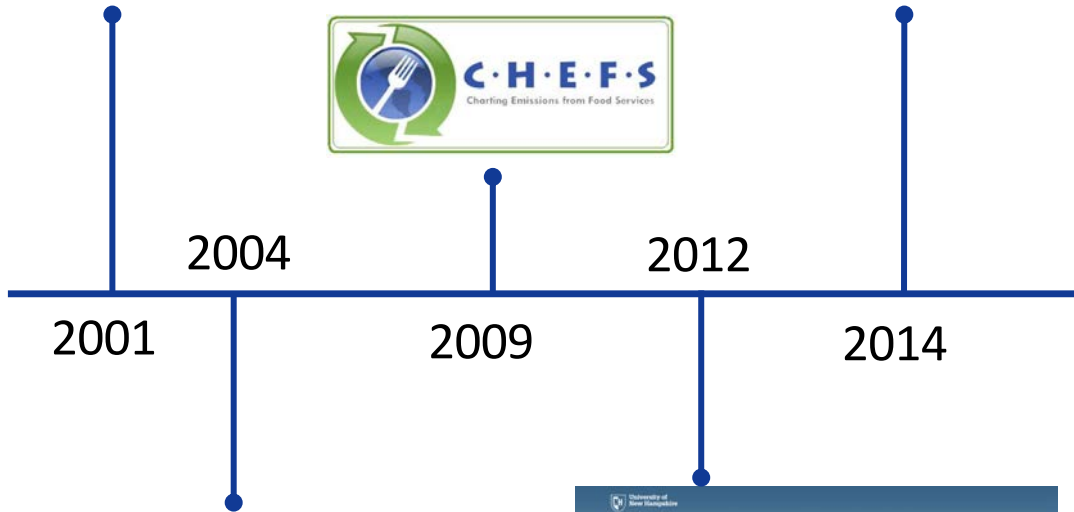
How did we get here?
Nitrogen

Leach senior thesis

EPA grant

NFT v1 launched

NFT Network

2013

2014-2017

2009

2014

2017

2017

UVA N reduction goal

Pilot testing by cohorts 1-3

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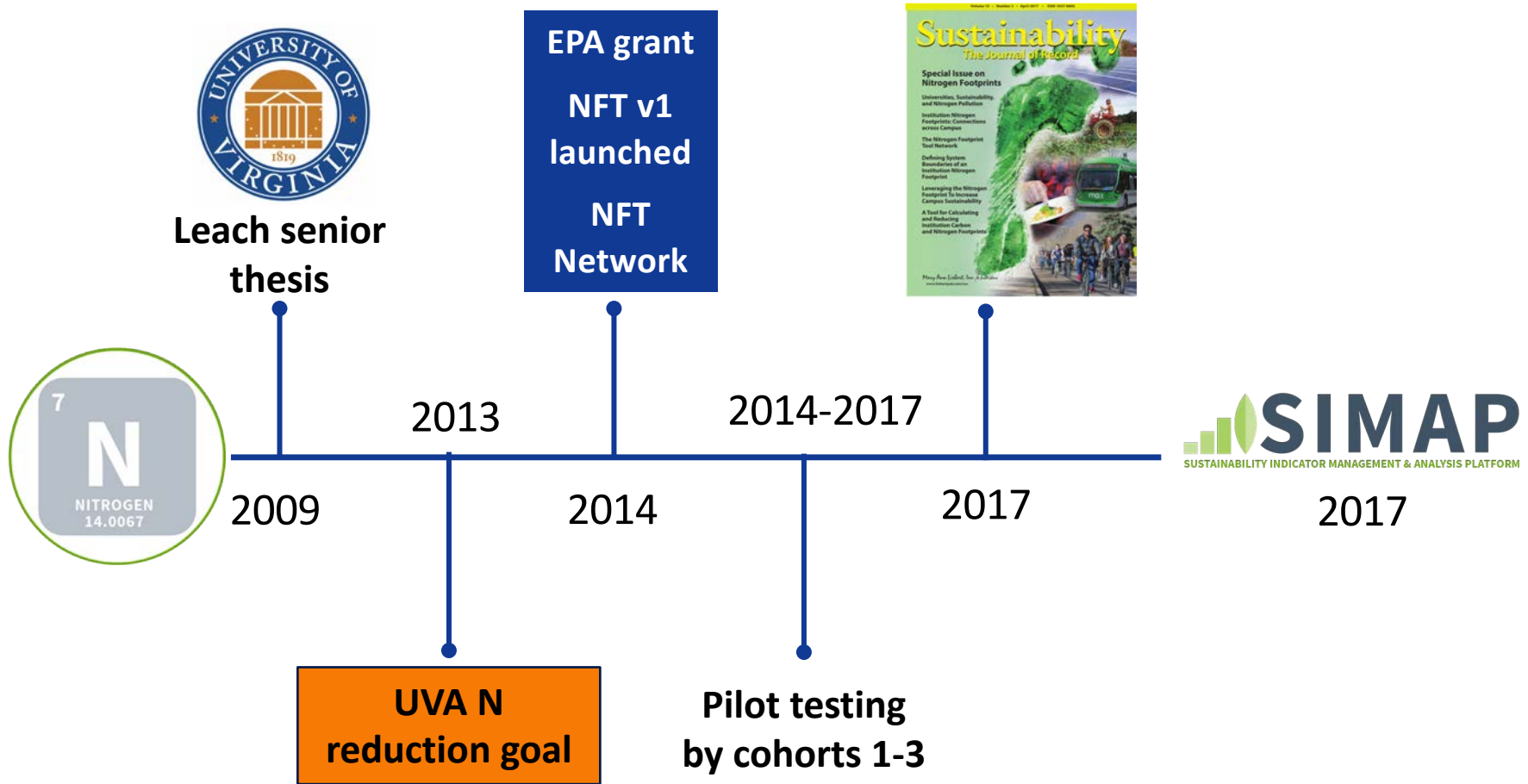
Why do we care about nitrogen?

Benefits

Necessary for life
Synthetic fertilizer provides unlimited N supply for food

Drawbacks

Negative impacts to environmental & human health

Challenge:

Optimize the use of nitrogen,
while minimizing the negative impacts

What is a nitrogen footprint?

A **nitrogen footprint** is the amount of reactive nitrogen released to the environment as a result of an entity's resource consumption

1 **Food***

*Food consumption and production

2 **Energy**

Carbon & nitrogen footprint of food

Crops

Meat & animal products

Legend: Carbon (kg CO_2-eq) — Nitrogen (g Nr)

Leach et al. 2016
Heller & Keoleian 2014
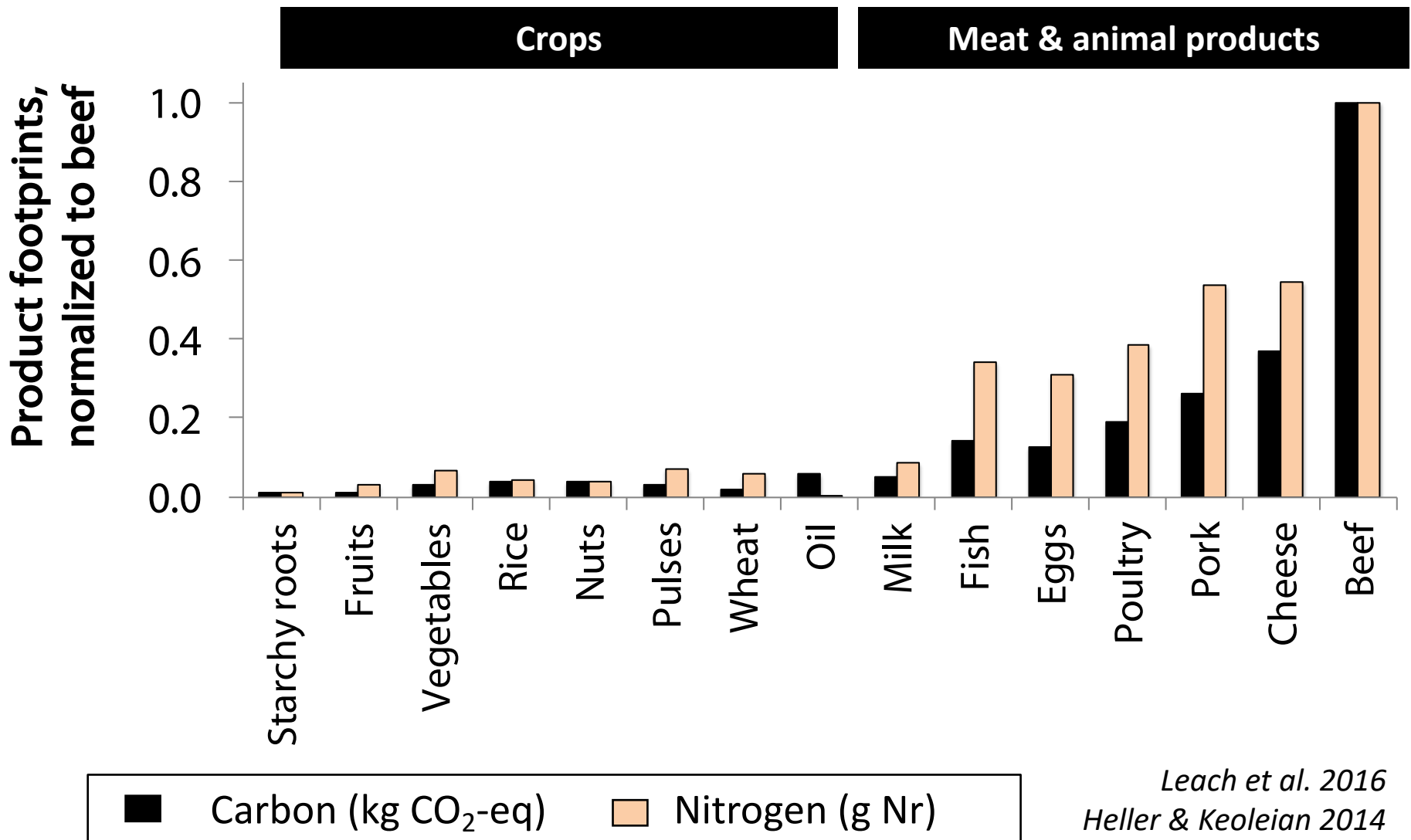
Consistent trends across C & N footprints

SIMAP

SUSTAINABILITY INDICATOR MANAGEMENT & ANALYSIS PLATFORM

SIMPLIFYING SUSTAINABILITY DECISIONS

SIMAP® is a carbon and nitrogen-accounting platform that can track, analyze, and improve your campus-wide sustainability. Our proven algorithms, based on nearly two decades of work supporting campus inventories with the Campus Carbon Calculator, CarbonMAP and Nitrogen Footprint Tool, will help you:

- **Create a baseline**
- **Benchmark your performance**
- **Create reports**
- **Set goals**
- **Analyze your progress year over year**

GET STARTED!

YOUR CAMPUS FOOTPRINT

CARBON

CO2 emissions from generating power, treating waste, daily commuting, and even the use of paper, contribute to a campus' carbon footprint. Reducing these greenhouse gas emissions will help slow the effects of climate change and global warming.

NITROGEN

Reactive nitrogen can result from everyday activities like food service, energy use, transportation, and ground fertilizer. Reducing your nitrogen footprint can provide benefits to air and water quality, while helping prevent climate change.

SUBSCRIPTION TIERS

While SIMAP offers basic functionality at no cost, we also offer two premium subscription levels that provide additional features at a nominal license fee. Our model allows UNH to cover the costs of continuing to offer and support this tool for the good of the entire campus-based sustainability community.

BASIC (FREE)   **TIER 1 ($350*):**   **TIER 2 (TBD):**

NEWSFEED

Graphs are now interactive! Check them out on the results tab and review the user guidance for how to use them.

SIMAP data review appointment request and data review document are on our Support page.

Thank you for taking the survey and for your feedback about what is working and what could be improved. We are analyzing the results now and will provide communications on what the development priorities will be and the timelines. We really appreciate your feedback!

"The Nitrogen Footprint Tool for Universities" webinar presented on 6/27/18

New and simpler data collection template now available!

Please read this new guidance on the updated Scope 2 market-based purchased electricity calculations with residual emissions factors.

Check out the FAQs and changes and updates.

Training Webinar Accounting for Renewable Energy in SIMAP: Recording posted on the training page.
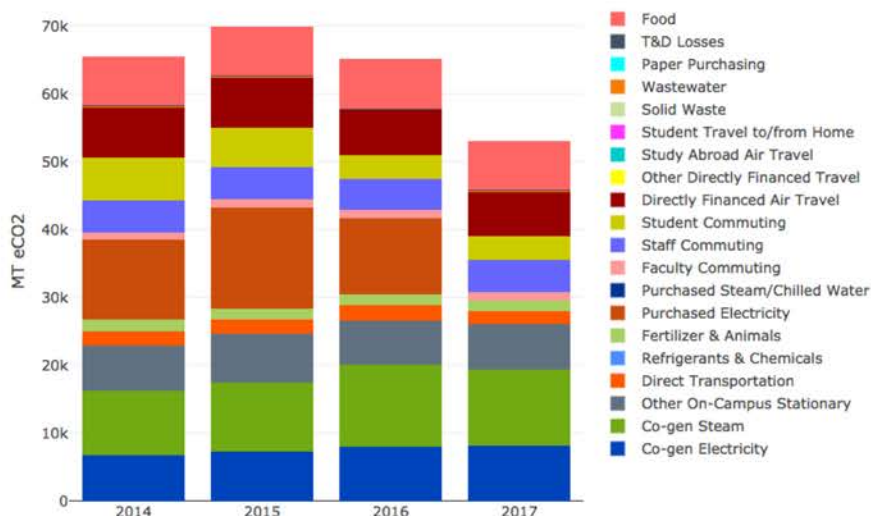
CarbonMAP users can still request your data HERE.

..ıll SIMAP

SUSTAINABILITY INDICATOR MANAGEMENT & ANALYSIS PLATFORM

| HOME | 1. ACCOUNT | 2. DATA ENTRY | 3. RESULTS | REPORTS | DATA MGMT | ABOUT | RESOURCES |

3. Results

Footprints *
☑ Carbon ☑ Nitrogen

Report Type *
○ Total footprint ○ Scopes ● Categories ○ Sources ○ Gas/pollutant

Scope 2 Method ❶ *
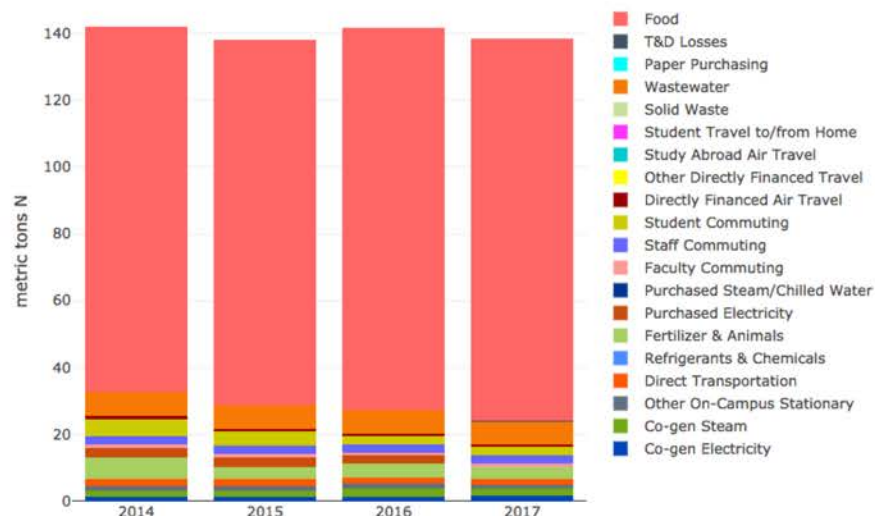● Market-Based ○ Location-Based ○ Custom Fuel Mix

Graph Type *
○ Line ● Bar

Fiscal Year Range *
2014 - 2017

Normalization
None

CALCULATE

❷ Get help with graphs

Carbon

Legend:
Food
T&D Losses
Paper Purchasing
Wastewater
Solid Waste
Student Travel to/from Home
Study Abroad Air Travel
Other Directly Financed Travel
Directly Financed Air Travel
Student Commuting
Staff Commuting
Faculty Commuting
Purchased Steam/Chilled Water
Purchased Electricity
Fertilizer & Animals
Refrigerants & Chemicals
Direct Transportation
Other On-Campus Stationary
Co-gen Steam
Co-gen Electricity

Nitrogen

Legend:
Food
T&D Losses
Paper Purchasing
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Student Travel to/from Home
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Other Directly Financed Travel
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Purchased Electricity
Fertilizer & Animals
Refrigerants & Chemicals
Direct Transportation
Other On-Campus Stationary
Co-gen Steam
Co-gen Electricity

Carbon

Fiscal Year	Scope	Source	CO2 (kg)	CO2 (MTCDE)	CH4 (kg)	CH4 (MTCDE)	N2O (kg)	N2O (MTCDE)	GHG MTCDE
2014	1	Co-gen Electricity	6,840,038	6,840.04	701	17.52	17	4.98	6,862.53
2014	1	Co-gen Steam	9,377,846	9,377.85	961	24.02	23	6.82	9,408.69

What are projections and scenarios?

Projections	Solutions/scenarios/projects

• **Estimate future emissions based on:**
   – Population growth
   – Planned construction
   – More!
	• **Estimate effects of management strategies on current or projected footprint:**
	   – Changes in emissions
	   – Cost of scenarios

Both are important for accurate and informed goal setting!

What methods have been used?

Projections	Solutions/scenarios/projects

• **Methods for projecting in the CCC:**
    – Linear
    – Normalized by students
    – Normalized by square feet
    – Custom trends
    – Variable trends
	• **Users entered detailed project* data in CCC**
	    – No "standard scenarios"
	• **Metrics to view results in the CCC:**
	    – Impact on C footprint
	    – Life-cycle cost of project
	    – Payback time of the project
	    – Net present value (life-cycle cost/savings per ton of C)

CCC = Campus Carbon Calculator

In the CCC: Projections
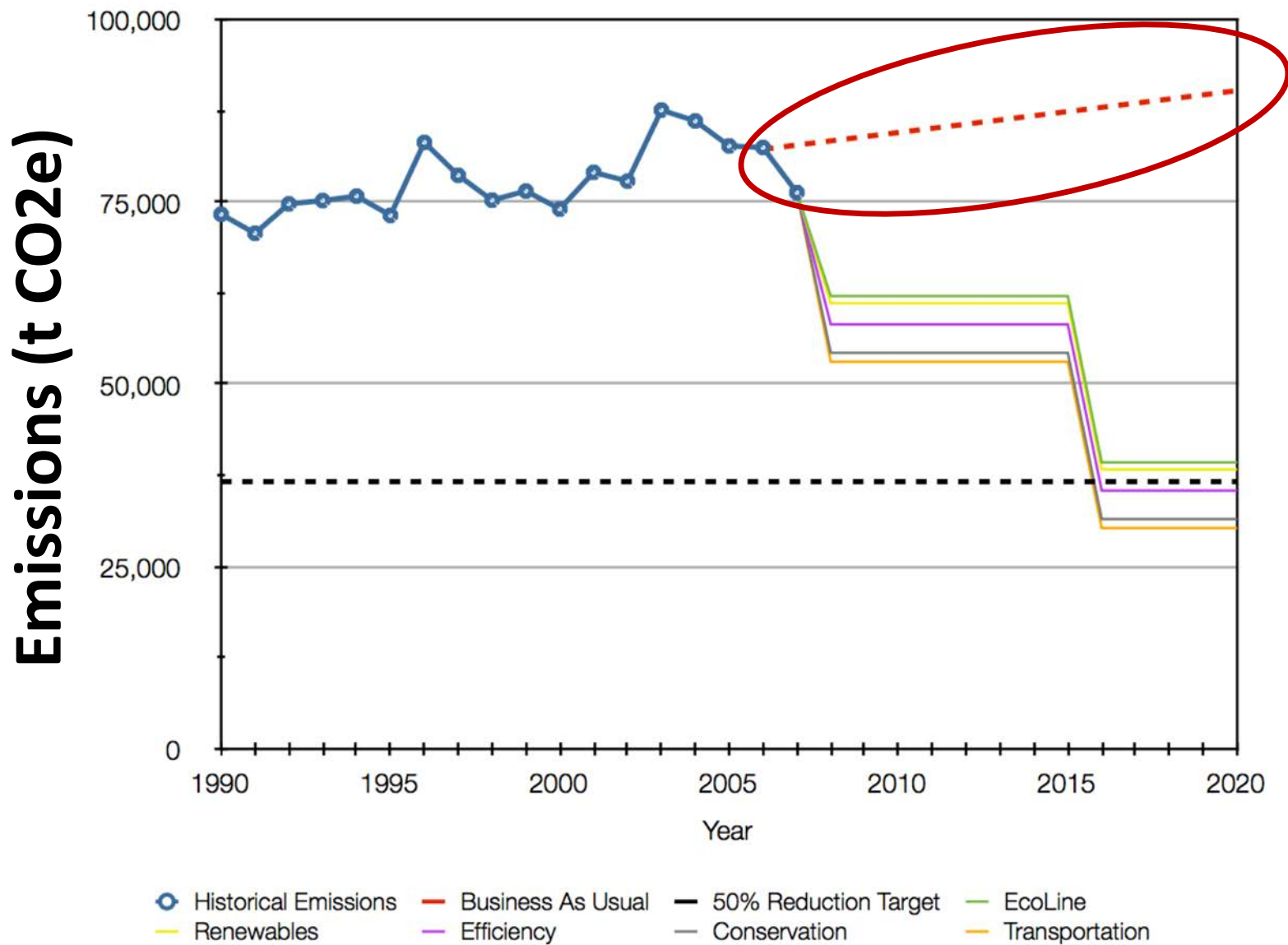
Projected Greenhouse Gas Reductions 1990–2020

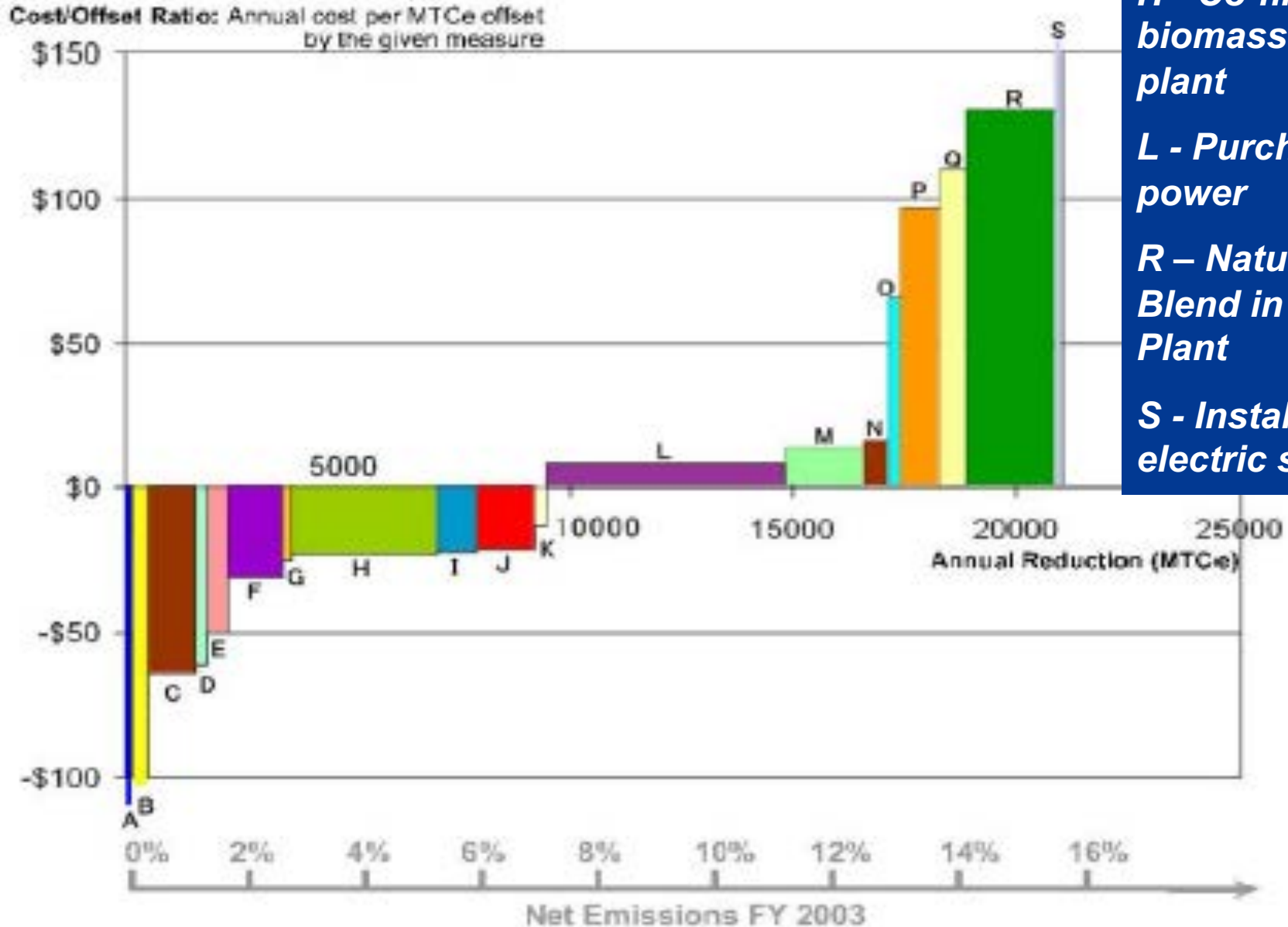# In the CCC: Weighing Solutions

A - Purchase high capacity buses
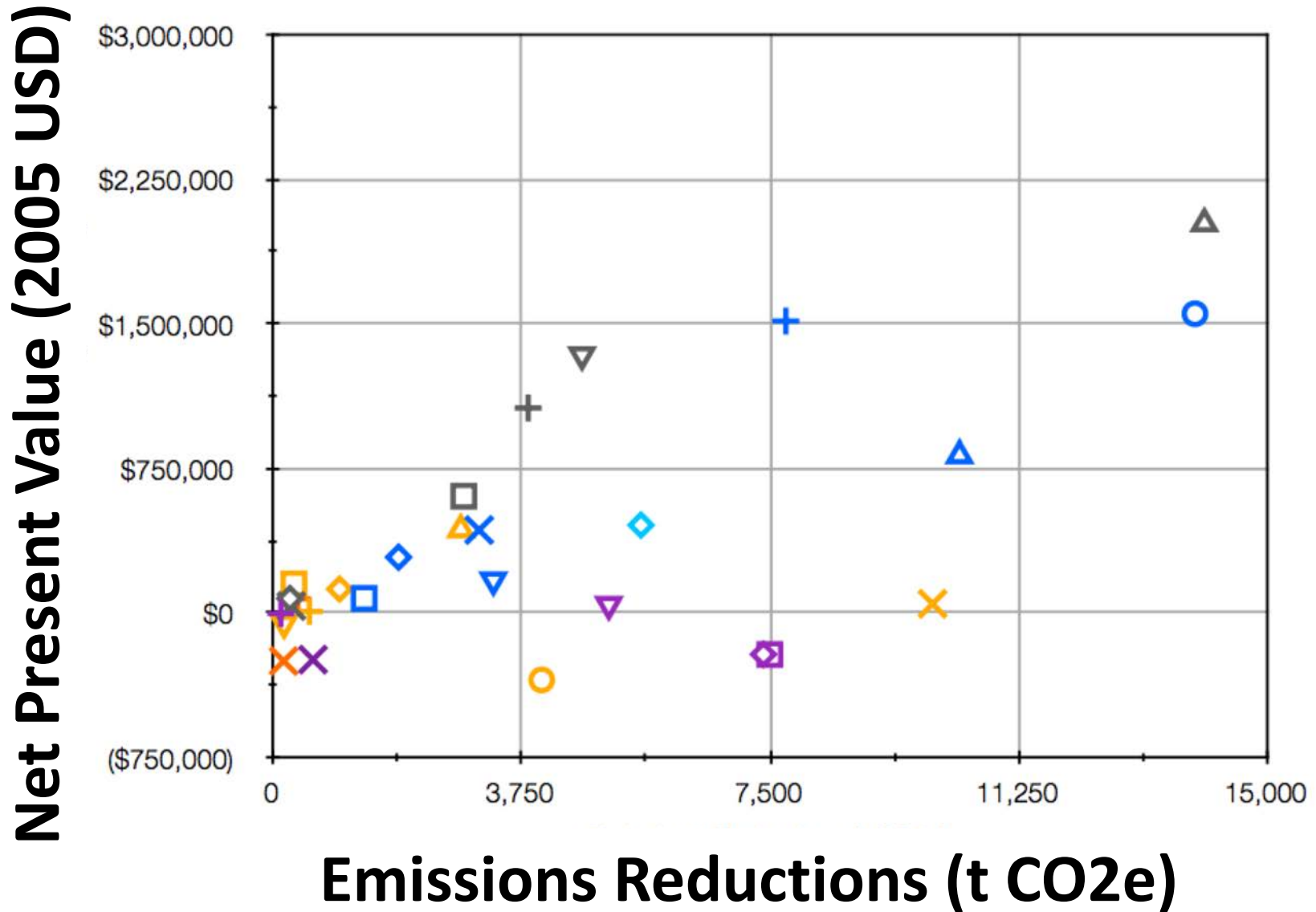
H - Co-fire biomass in steam plant

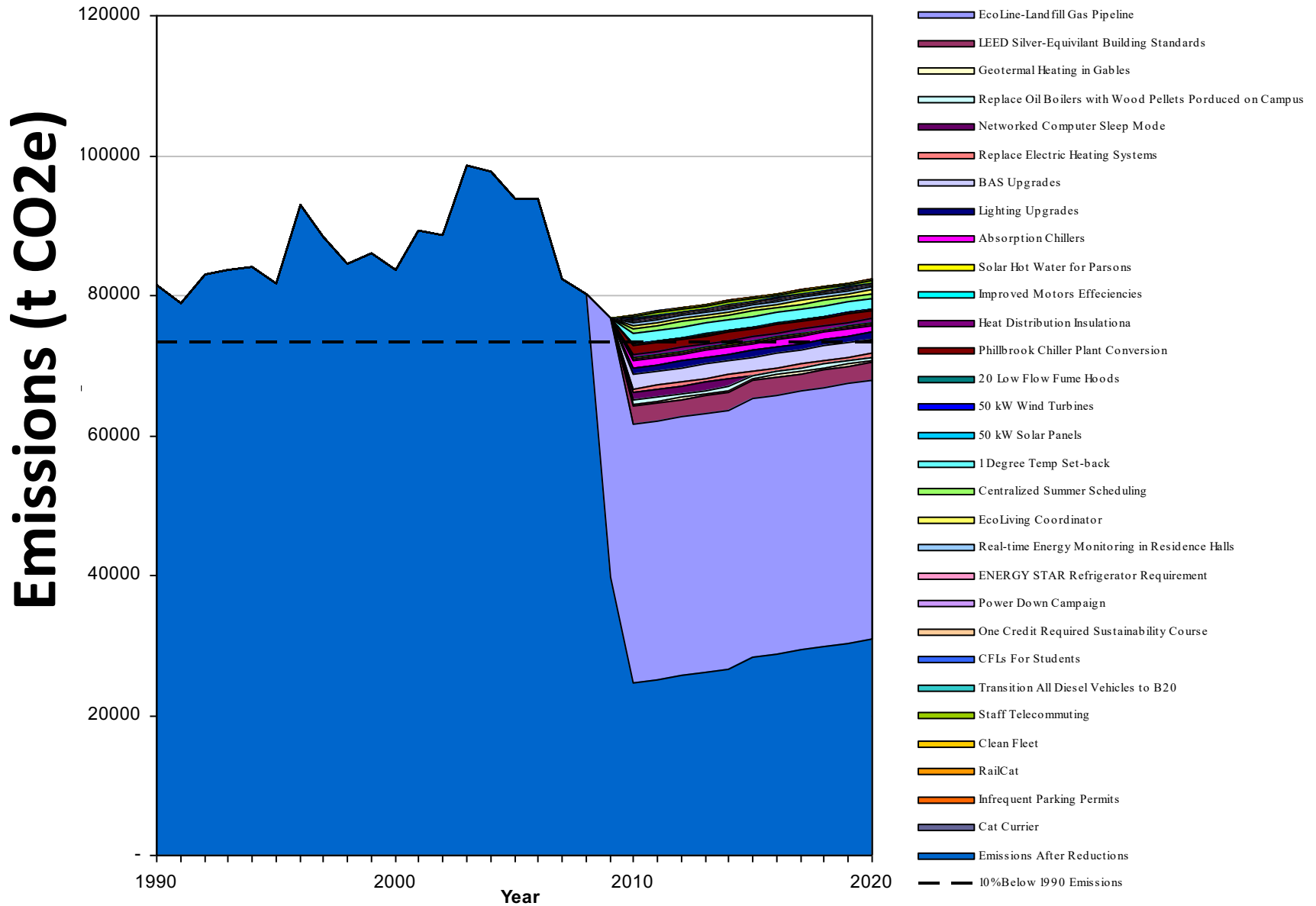L - Purchase wind power

R – Natural Gas Blend in Steam Plant

S - Install solar electric system
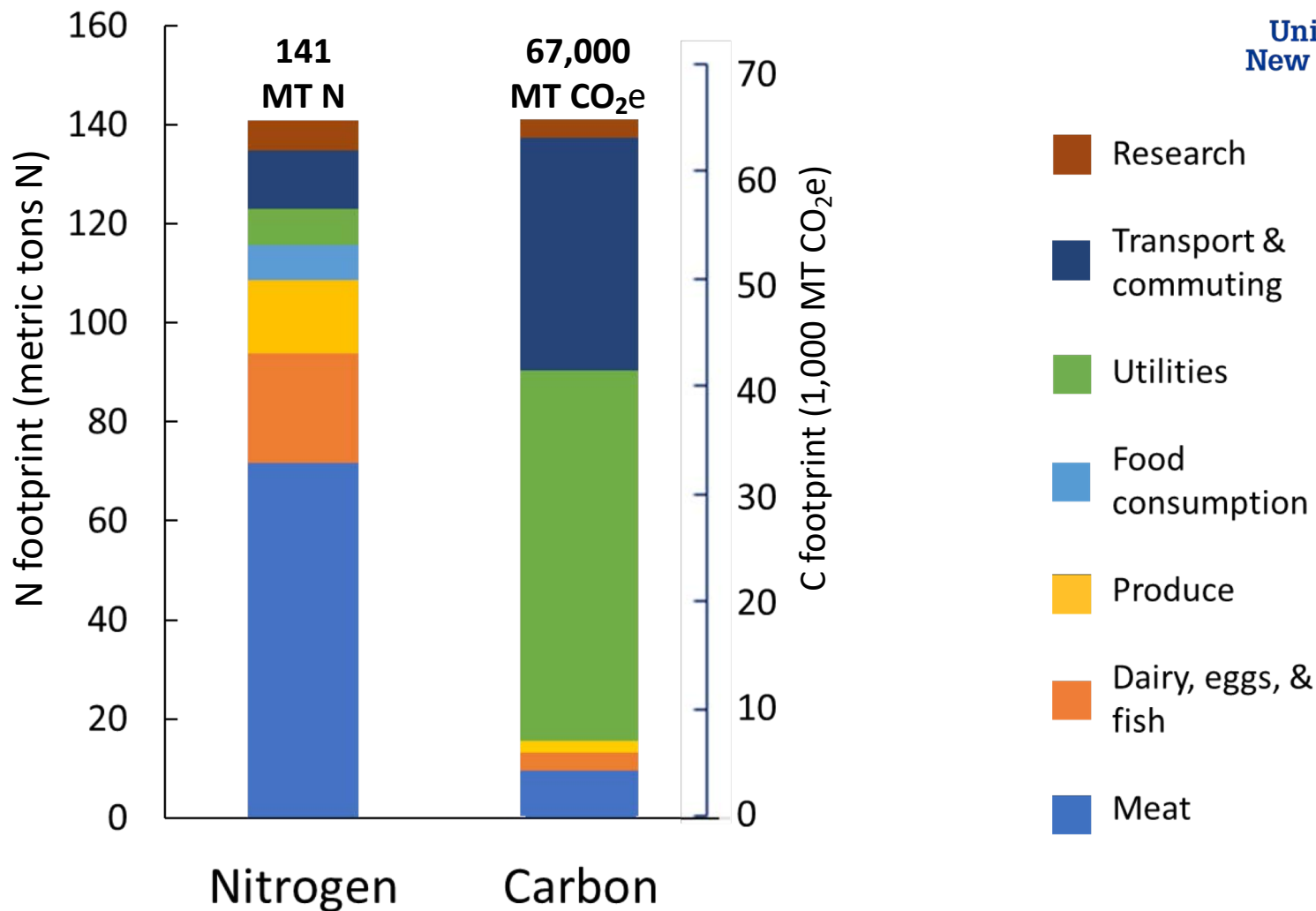
In the CCC: Weighing Solutions

In the CCC: Wedge diagram

Example at UNH

Food is key sector for nitrogen

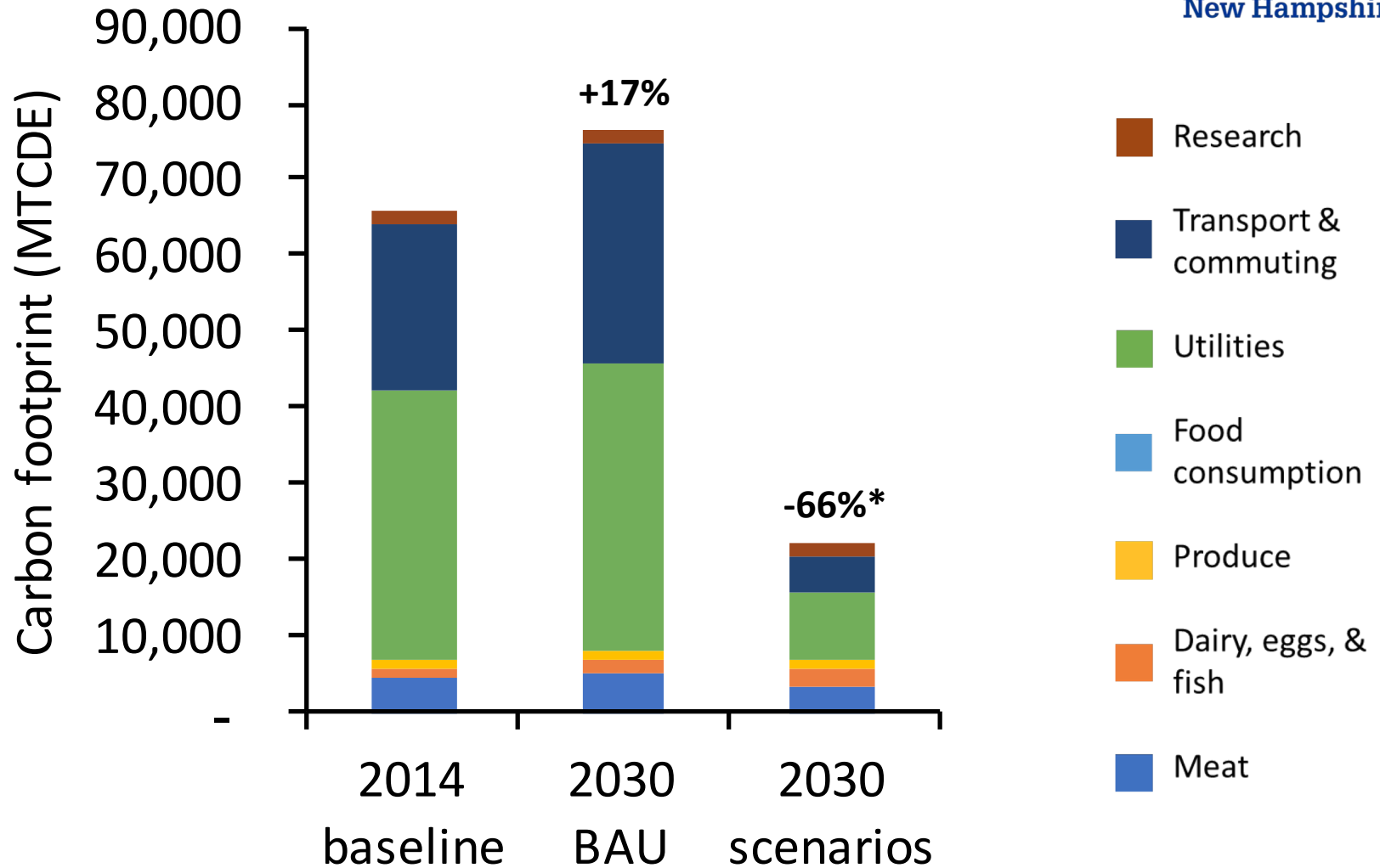**Energy sectors are key sector for carbon**

PROJECTIONS: UNH's C footprint in 2030

Assumes 2% growth rate for energy, linear population projection for food (0.7%)

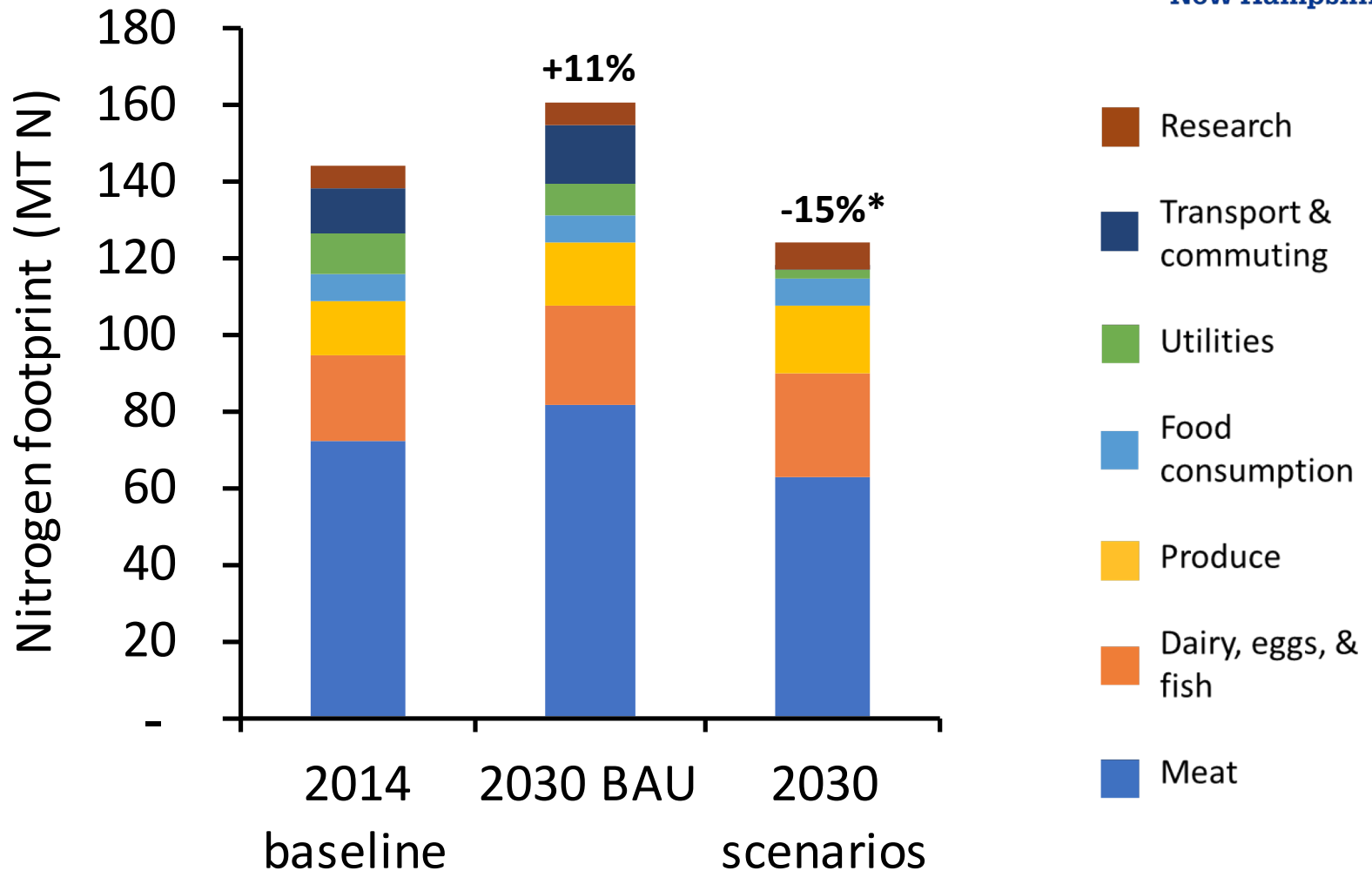*Relative to 2014 footprint
*When compared to 2001 C baseline, reduction is 71%

BAU = Business As Usual

PROJECTIONS: UNH's N footprint in 2030

Assumes 2% growth rate for energy, linear population projection for food (0.7%)

University of New Hampshire

*Relative to baseline (2014).
*C footprint goal + feasible food scenarios shown

BAU = Business As Usual

Next steps for projections and scenarios in SIMAP:

- Conducted survey in spring/summer
  - *More feedback welcome!*
- Beginning development
- Beta testing in early 2019

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What can you do in the meantime?
Use our Excel scenario templates!

Food scenarios template

Food Projections & Solutions Template

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NH | UNH Sustainability Institute

Updated: 8 June 2018

What this template provides

You can use this template to project your SIMAP carbon and nitrogen footprint results to a projection year. You can then run the following food scenarios: vegetarian meal replacement, up to 4 food category replacements, custom food replacement, and local food replacement, and diverting food waste.

How to use this template

Enter SIMAP data tab

Copy-paste your exported data from SIMAP. This will be used for your baseline C and N footprint and food calculations. See the tab for detailed instructions.

Select projections and scenarios tab

Select how you would like to project your data. There are different selections for non-food data and food data.

Select your scenario input data (e.g., % vegetarian meals, % replacement of food categories).

View projections and scenarios tab

Energy scenarios template

Energy Projections and Solutions Template

Prepared by:
Andrew Pettit, Libby Milo, Izzy Castner, Allison Leach, Jim Galloway, and the UVA Office for Sustainability
University of Virginia

Introduction

This template is intended to help users make decisions on energy reduction strategies to minimize both GHG and N losses to the environment.

This template provides:

1) Inventory your organization's Utility and Transportation reduction strategies.
2) Calculate the Nitrogen co-benefits from these reduction strategies.

Navigation

This color scheme is used throughout the template to indicate which cells to interact with.

	Do not enter data here
	Enter copy and pasted data here
	Enter customized data here

Instructions Overview

Downloads from SIMAP:

1. Annual Report Carbon: Go to SIMAP "Reports" tab -> Chose "annual report"," carbon"-> Type in baseline year

2. Annual Report Nitrogen: Go to SIMAP "Reports" tab -> Chose "

amp6cy@virginia.edu

Questions about projections and scenarios?

Part 2:

Integrated planning strategies

Alley Leach
University of New Hampshire
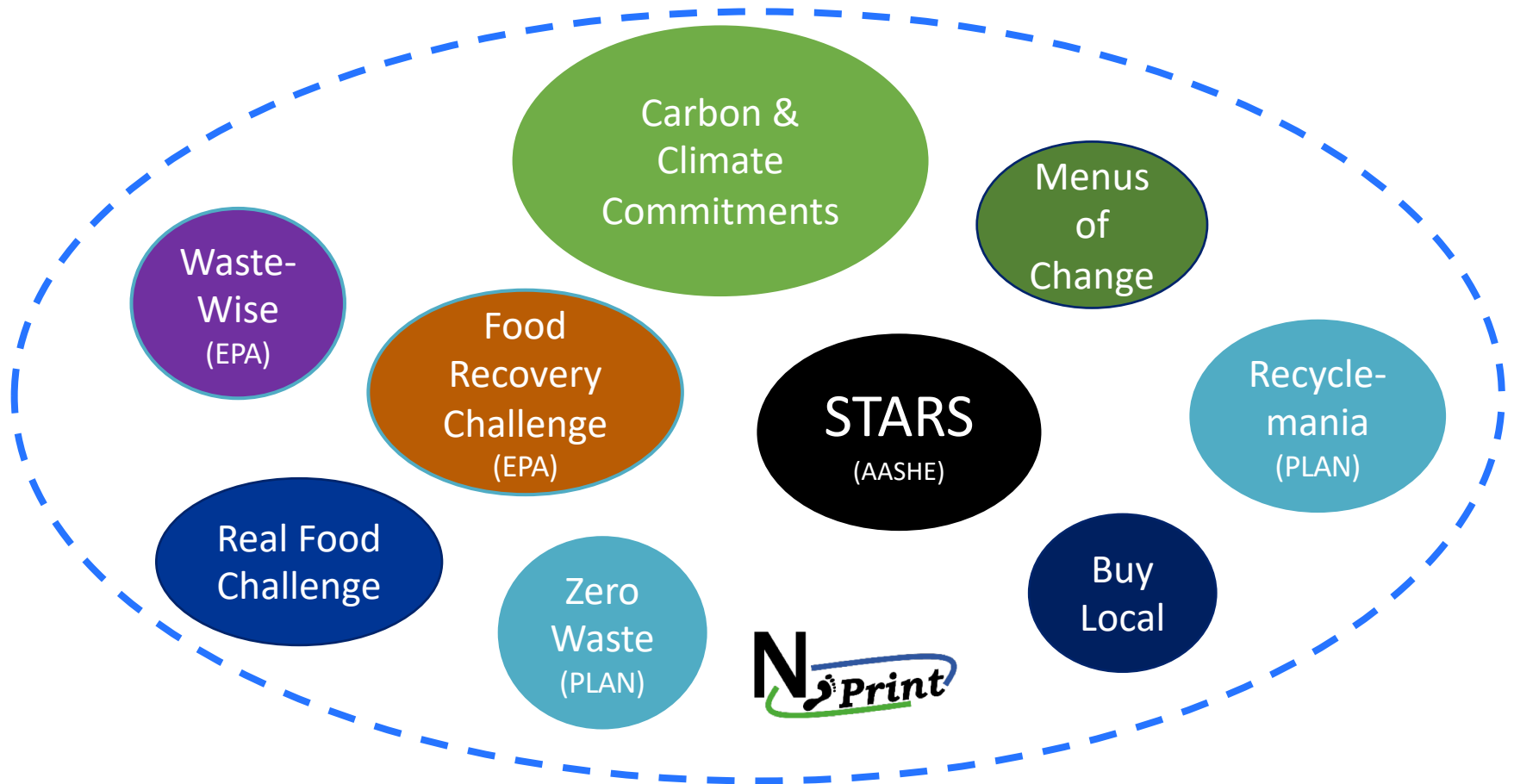Sustainability Institute

Questions for proposing C+N goal

1. What **other sustainability goals** are in place or planned?

2. At **what level** should the goal be approved (e.g., governing body, university)?

3. How should the goal be **framed** (e.g., overall, scopes)?

4. What should the **goal year** be?

5. What should the **% reduction** goal be?

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1. What other sustainability goals are in place or planned?

Carbon & Climate Commitments

Menus of Change

Waste-Wise (EPA)

Food Recovery Challenge (EPA)

STARS (AASHE)

Recycle-mania (PLAN)

Real Food Challenge

Zero Waste (PLAN)

Buy Local

N Print

Colorado College & University of New Hampshire

Barnes et al. 2017

2. At what level should the goal be approved?

NO GOAL

1. **Research exercise:** Internal stand-alone N footprint calculations and/or goal

2. **Grassroots action:** No goal, but working with stakeholders to push reduction strategies

3. **N benefits**: No goal, but N benefits mentioned in other plans

GOAL

4. **Goal based on existing plans**

5. **New goal approved by governing body**

Lower commitment

Higher commitment

3. How should the goal be framed?

- **Overall goal**
  - A single reduction goal for the overall N footprint

- **Per capita/normalized goal**
  - Reduction goal(s) normalized to campus users

- **Scope goals**
  - Separate reduction goals for scope 1+2 (local) and scope 3 (not local)

- **Sector goals**
  - Separate goals for energy, transit, food, etc.

Other questions to consider:

4. What should the **baseline year** and **goal year** be?

5. What should the **% reduction goal** be?

The University of Virginia's Nitrogen Action Plan
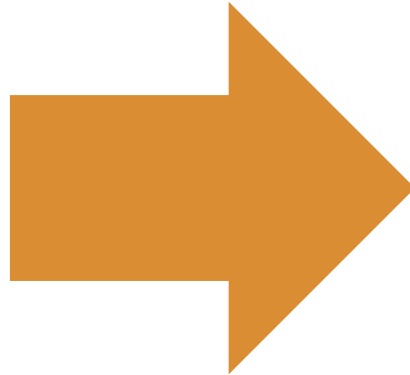
Elizabeth Dukes

From goal setting to action plans at UVA
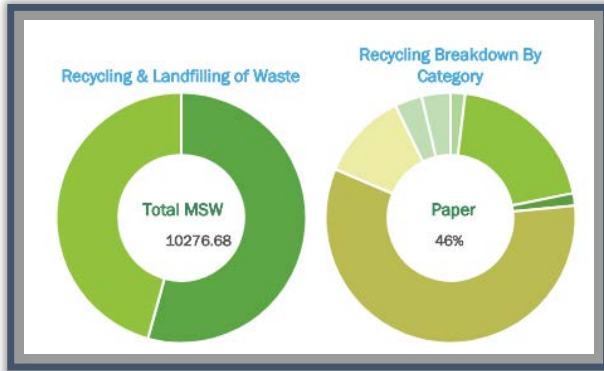
Goal setting

1. Carbon (2009)

2. Nitrogen (2010)

3. Water (2010)

4. Materials (2014)

5. And more!

Action plans

1. Greenhouse Gas (2017)

2. Nitrogen (2018)

3. Materials (2018)

4. Sustainable food (2018)

5. And more!

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Sustainability Goals and Action Plans at the University of Virginia



Materials Action Plan

Greenhouse Gas Action Plan

Sustainable Food Action Plan

Nitrogen (N) Action Plan

Reduce reactive nitrogen emissions 25% below 2010 levels by 2025.
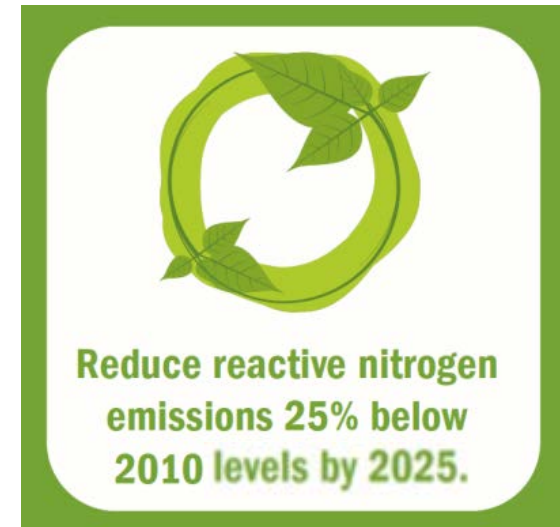
What's Included in the N Action Plan?

1. Reductions from GHG Action Plan
   a) Purchased Electricity
   b) On-site utilities
   c) Transportation
2. Reductions from Sustainable Food Action Plan
   a) Increase vegetarian meals
   b) Increase local purchasing
   c) Opening plant-based café
3. Reductions from Materials Action Plan
   a) Composting waste
4. Other specific N scenarios
   a) Higher reductions in utilities sectors
   b) More stringent meat reduction strategies in food sectors
   c) Offsets for N

Reduce reactive nitrogen emissions 25% below 2010 levels by 2025.

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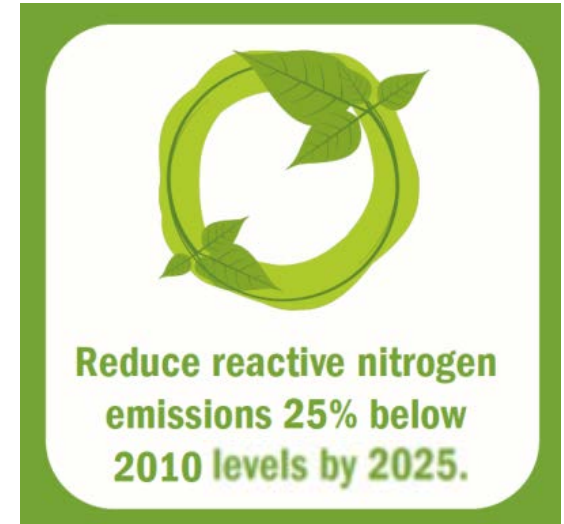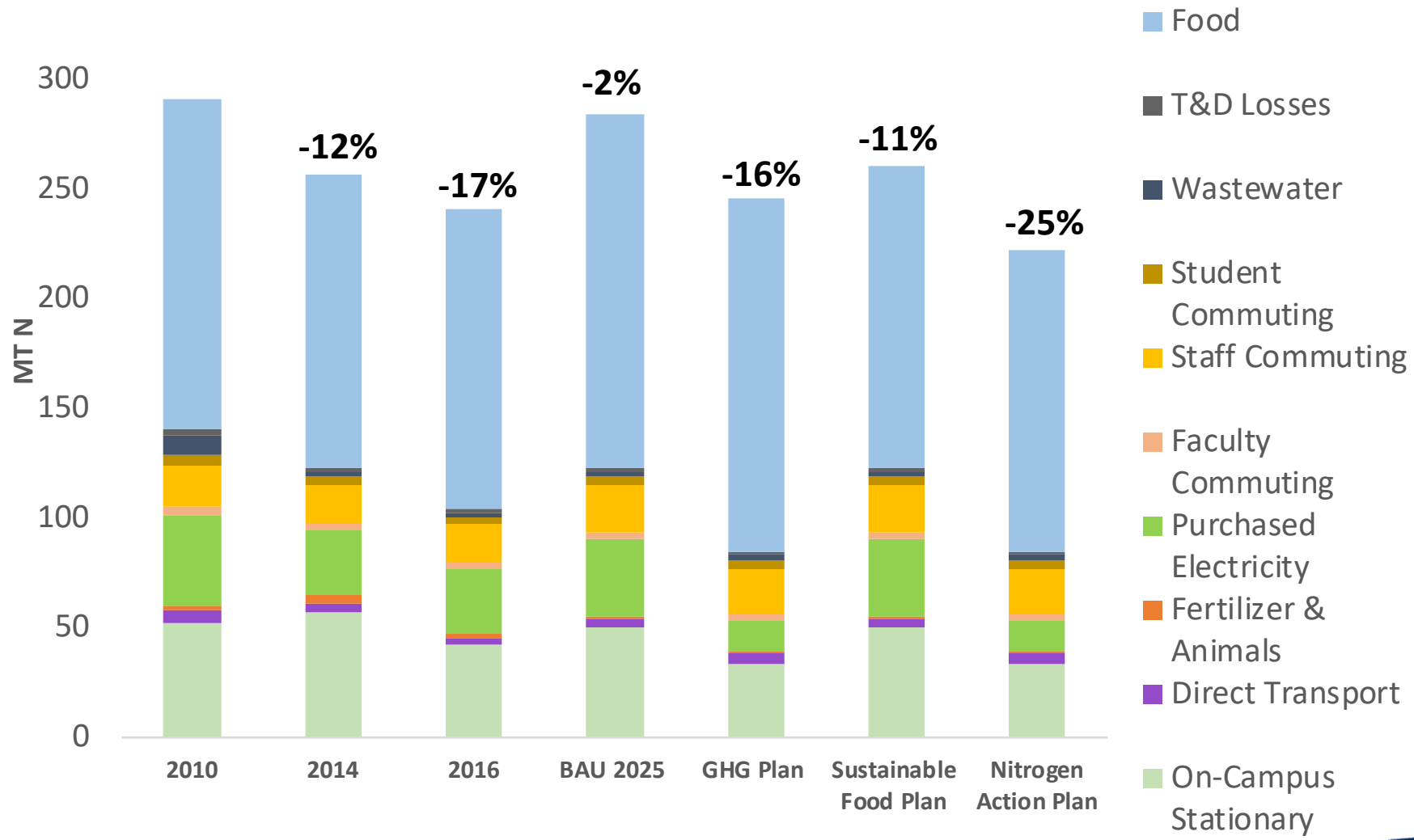
Take-aways for UVA's Nitrogen Action Plan

1. Current action plans strategies will allow UVA to reach 25% reduction goal.

2. Collaboration with multiple sectors at the university (dining, facilities, health system, etc.) will reduce N footprint and meet other goals!

Framing Resilience: "Five Capitals" Model

- plays an important role in our economy, enabling the other types of Capital to be owned and traded. Unlike the other types, it has no real value itself but is representative of natural, human, social or manufactured capital.

- is any stock or flow of energy and material that produces goods and services. It includes:
- Resources - renewable and non-renewable materials
- Sinks - that absorb, neutralize or recycle wastes
- Processes - such as climate regulation

- comprises material goods or fixed assets which contribute to the production process rather than being the output itself.

- consists of people's health, knowledge, skills and motivation. All these things are needed for productive work.

- concerns the institutions that help us maintain and develop human capital in partnership with others; e.g. Institutes, task forces, student orgs., committees.

Natural **Physical** **Financial** **Human** **Social**

Source: https://www.forumforthefuture.org/project/five-capitals/overview

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Findings: Priority Opportunities

- Use improved understanding of needs to improve social capital/systems to drive change in other capitals, primarily by working to break down silos and ensure collaborative, inclusive, transparent and effective processes
- **Better communication and outreach**
- **Continue/enhance student engagement**
- Add community representatives to Task Forces
- Water conservation – demand/summer, $
- **Promote active transportation**
- **Update WildCAP to meet/exceed GHG reduction goals**
- Land conservation policies in light of development pressure
- **Updated and implement Landscape Master Plan**
- **Accelerate sustainable food initiatives**
- Provide more interpersonal resilience skills training for students, staff, faculty
- Research: groundwater mapping
- **Research: supply chains**
- **Focus on indicator data collection**

UNH Sustainability

The Five Capitals:
Connected to Every Aspect of Sustainability

Physical

- Energy and GHG planning
- Buildings, deferred maintenance, and codes and zoning;
- Greening of fleets, streets (i.e. storm water) and TDM;
- Supply chains for food, water, waste disposal

Human

- "Healthy UNH"—including Menus of Change
- Learning outcomes
- Research and engaged scholarship
- "Campus climate"
- Sustainable food systems
- Inclusion and diversity

Natural/Ecological

- Landscape master plan update
- Nitrogen footprint reduction
- Land policy committee: zoning, land use planning

Social

- Coordination and planning
- Social justice and racial equity

Financial

- Move to life-cycle cost accounting in planning
- Housing affordability
- Living wages
- Staffing and employment
- Corporate social responsibility, social innovation
- Sustainable investment

UNH Sustainability

Summary

Projections and scenarios

- **Important for informed and accurate goal setting**

- **Excel templates available now**

- **Beta testing in early 2019**

Goal setting

- **Lots of options for integrated carbon and nitrogen goals**

- **Integrated goal setting is win-win for sustainability initiatives**

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