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Calculating the Campus Nitrogen Footprint

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Calculating the campus nitrogen footprint

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Presentation outline

1. The nitrogen dilemma

2. What is a nitrogen footprint?

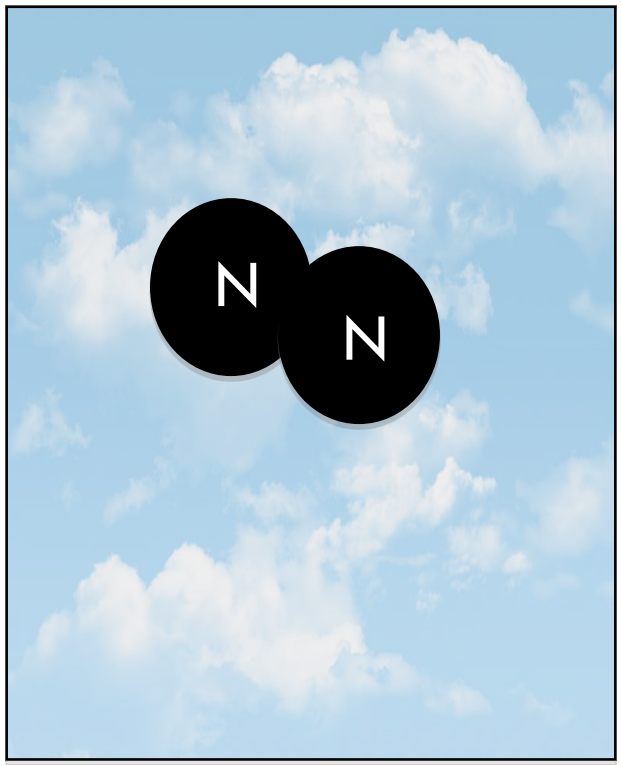
3. Calculating the nitrogen footprint of UVA and UNH

4. Combining the carbon and nitrogen footprint

1 The nitrogen dilemma

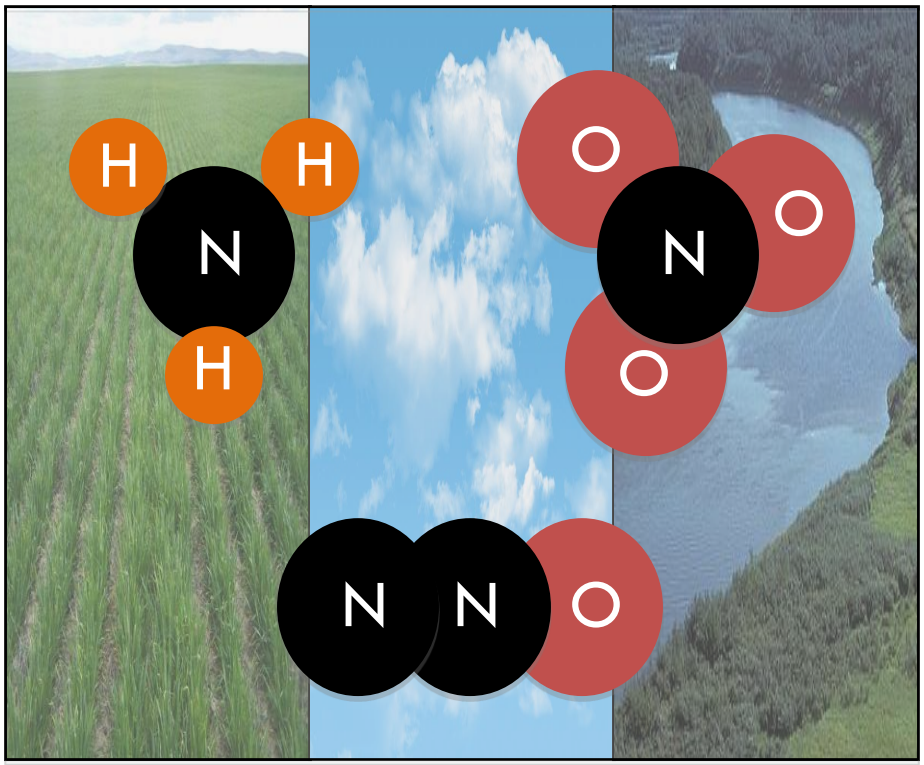
What is REACTIVE NITROGEN?

Unreactive Nitrogen



N_2

Reactive Nitrogen



All types of nitrogen except N_2

Reactive N is Created By:

Natural processes:

- Nitrogen fixation by microbes
- Also: lightning

Man-made processes:

- Fossil fuel combustion
- **Haber Bosch process**

Energy Production

N

ENVIRONMENT

Food Production

N

ENVIRONMENT

Too Much Nitrogen: In a Cascade

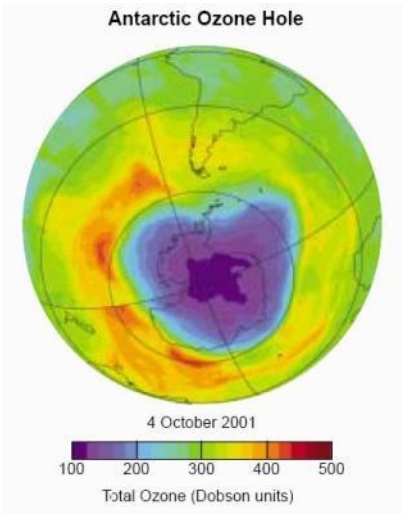
Smog, Haze

Forest Dieback

Acidification

Dead zones

Global Warming



Ozone Hole

The Nitrogen Dilemma

Benefits:

- Necessary for life
- Synthetic nitrogen fertilizer provides unlimited food supply

Drawbacks:

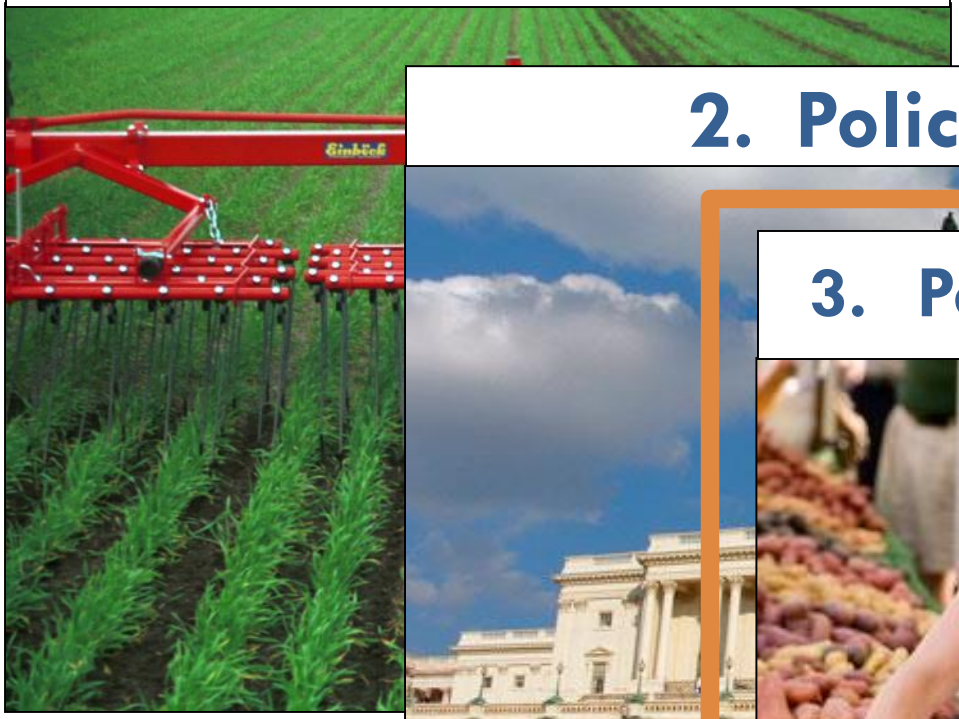
- Excess reactive nitrogen negatively affects environmental and human health

Challenge:

Optimizing the use of nitrogen,
while minimizing the negative impacts

Addressing the nitrogen challenge

1. Technology



2. Policy

3. Personal/institutional Action

2 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

Nitrogen footprints focus on 2 areas of resource consumption:

Food*

*Food consumption and production

Energy

Food N footprint: Definitions

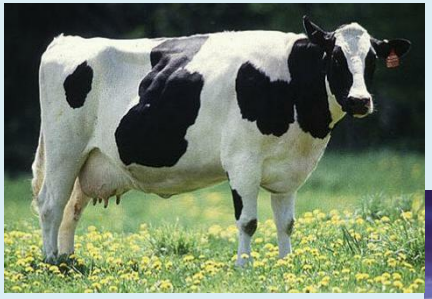
Food consumption

= N that enters human mouth

Virtual N

= **Food production N**

= N lost to the environment during the food production process



The impact of FOOD CHOICES on a nitrogen footprint

ENVIRONMENT

ENVIRONMENT

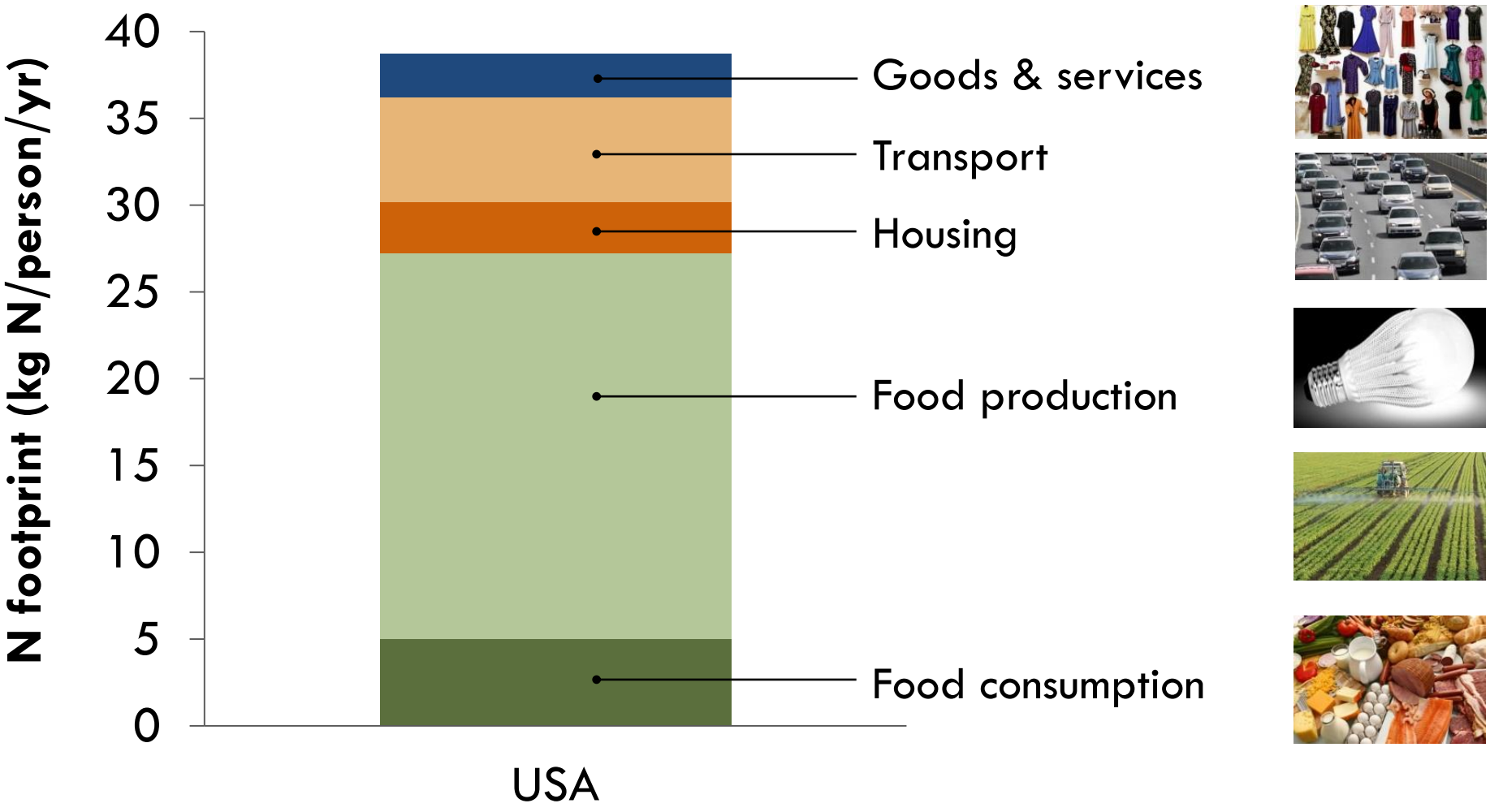
3 oz steak

15 g of protein

½ cup of beans

15 g of protein

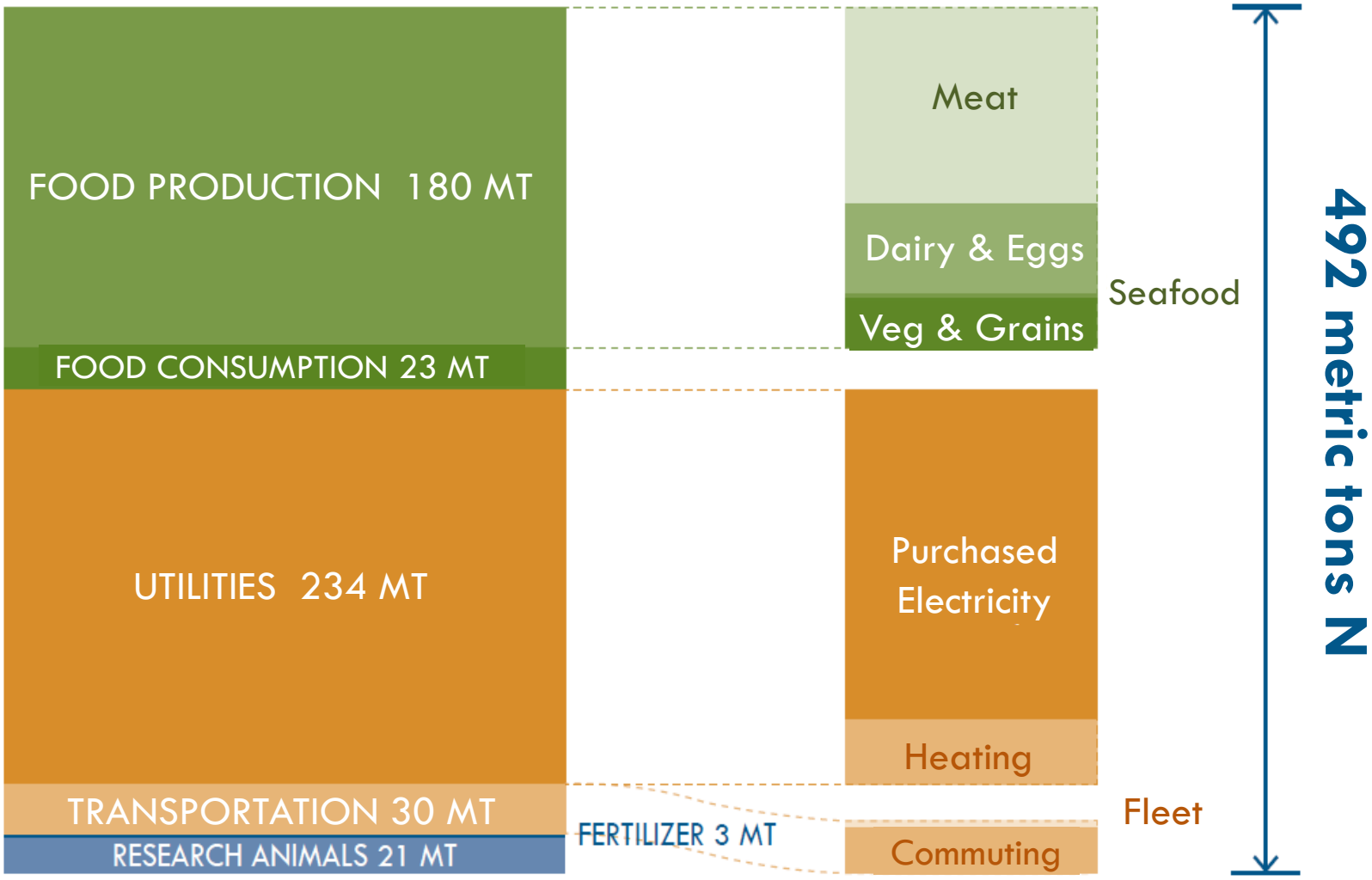
Personal N footprint in United States



N-Print

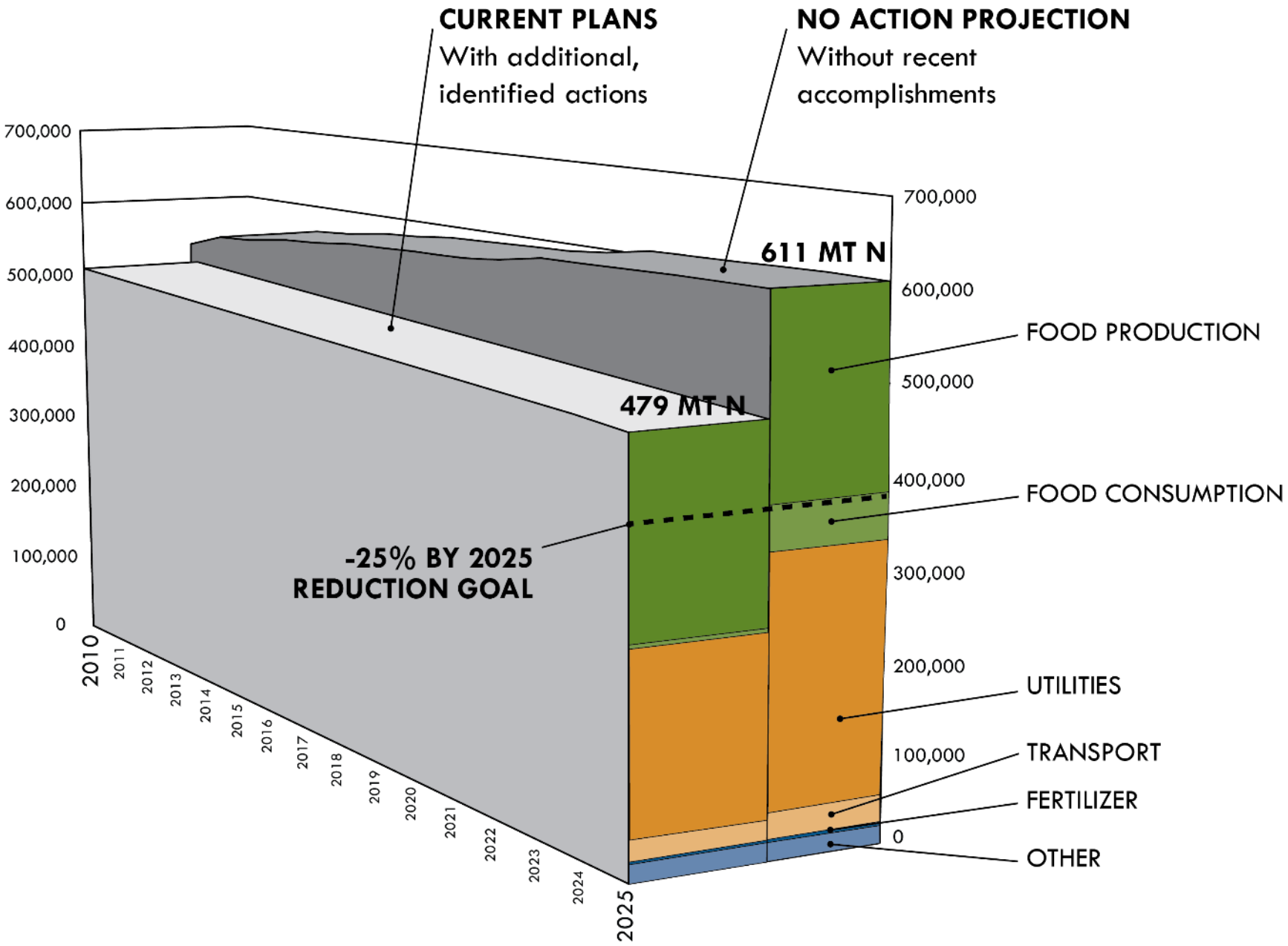
www.N-Print.org

3 Calculating the nitrogen footprint of UVA and UNH



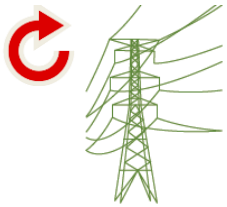
University of Virginia 2010 Nitrogen Footprint

How could UVA's N footprint change?



N REDUCTION STRATEGIES in place or in progress at UVA

ENERGY & OTHERS



Reduce Energy Consumption

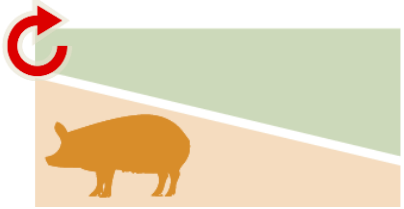
Transportation

Storm water

N offsets

FOOD

Improved Sewage Treatment



Sustainable Food

Expand Composting & Food "Recycling"

Reduce Food Waste

Organic Food

✓ COMPLETE

IN PROGRESS

Extending the nitrogen footprint to other institutions

- **Universities**: *UNH, Brown, Colorado State, Dickinson, MBL*
- **Secondary schools** *with EarthEcho*
- **Watersheds**: *Chesapeake Bay with CBF*
- **Cities:** *Baltimore*

Applying the model to UNH

Clean Air-Cool Planet
Campus Carbon Calculator

What will be new in the UNH nitrogen footprint?

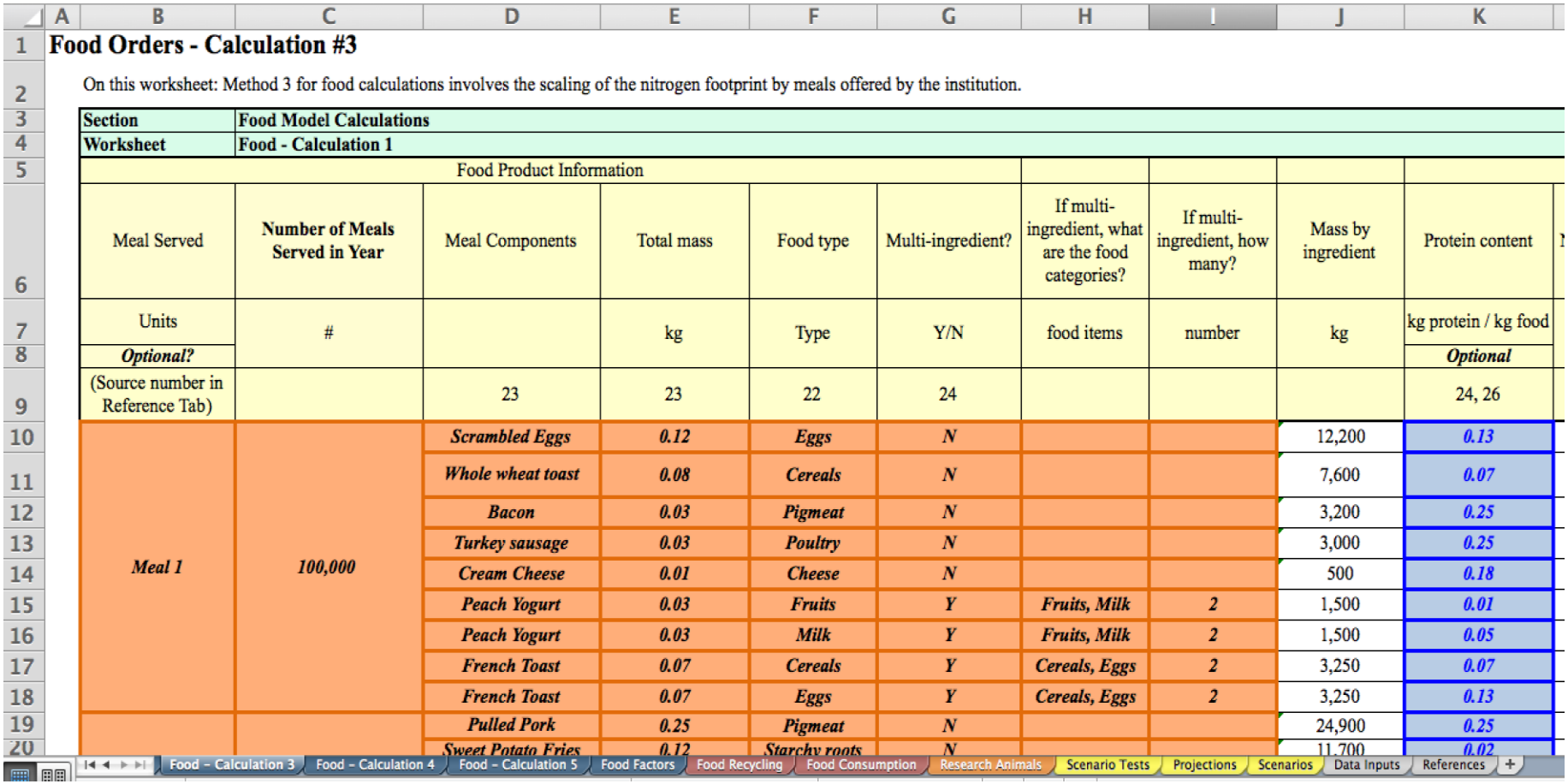
Research farms

Sustainability initiatives

- Cogeneration & EcoLine
- Carbon goal
- NE 50 by 60 goal
- Compost heat recovery
- …

Nitrogen footprint tools:

Data template and user's manual



Food Orders - Calculation #3

On this worksheet: Method 3 for food calculations involves the scaling of the nitrogen footprint by meals offered by the institution.

Section	Food Model Calculations									
Worksheet	Food - Calculation 1									
		Food Product Information								
Meal Served	Number of Meals Served in Year	Meal Components	Total mass	Food type	Multi-ingredient?	If multi-ingredient, what are the food categories?	If multi-ingredient, how many?	Mass by ingredient	Protein content	
Units	#		kg	Type	Y/N	food items	number	kg	kg protein / kg food	
Optional?									*Optional*	
(Source number in Reference Tab)		23	23	22	24				24, 26	
Meal 1	*100,000*	*Scrambled Eggs*	*0.12*	*Eggs*	*N*			12,200	*0.13*	
		Whole wheat toast	*0.08*	*Cereals*	*N*			7,600	*0.07*	
		Bacon	*0.03*	*Pigmeat*	*N*			3,200	*0.25*	
		Turkey sausage	*0.03*	*Poultry*	*N*			3,000	*0.25*	
		Cream Cheese	*0.01*	*Cheese*	*N*			500	*0.18*	
		Peach Yogurt	*0.03*	*Fruits*	*Y*	*Fruits, Milk*	*2*	1,500	*0.01*	
		Peach Yogurt	*0.03*	*Milk*	*Y*	*Fruits, Milk*	*2*	1,500	*0.05*	
		French Toast	*0.07*	*Cereals*	*Y*	*Cereals, Eggs*	*2*	3,250	*0.07*	
		French Toast	*0.07*	*Eggs*	*Y*	*Cereals, Eggs*	*2*	3,250	*0.13*	
		Pulled Pork	*0.25*	*Pigmeat*	*N*			24,900	*0.25*	
		Sweet Potato Fries	*0.12*	*Starchy roots*	*N*			11,700	*0.02*	

Food - Calculation 3 | Food - Calculation 4 | Food - Calculation 5 | Food Factors | Food Recycling | Food Consumption | Research Animals | Scenario Tests | Projections | Scenarios | Data Inputs | References

Calculating YOUR INSTITUTION'S N footprint

DATA REQUIRED:

Utilities	Transport	Food	Other
• Energy consumed	• Fuel consumed • Commuter miles	• Food purchases • Food waste	• Research farms • Fertilizer

N loss factors

How does this overlap with your carbon footprint?

4 Combining the carbon and nitrogen footprint

University of New Hampshire
The Sustainability Institute

DATA REQUIRED:

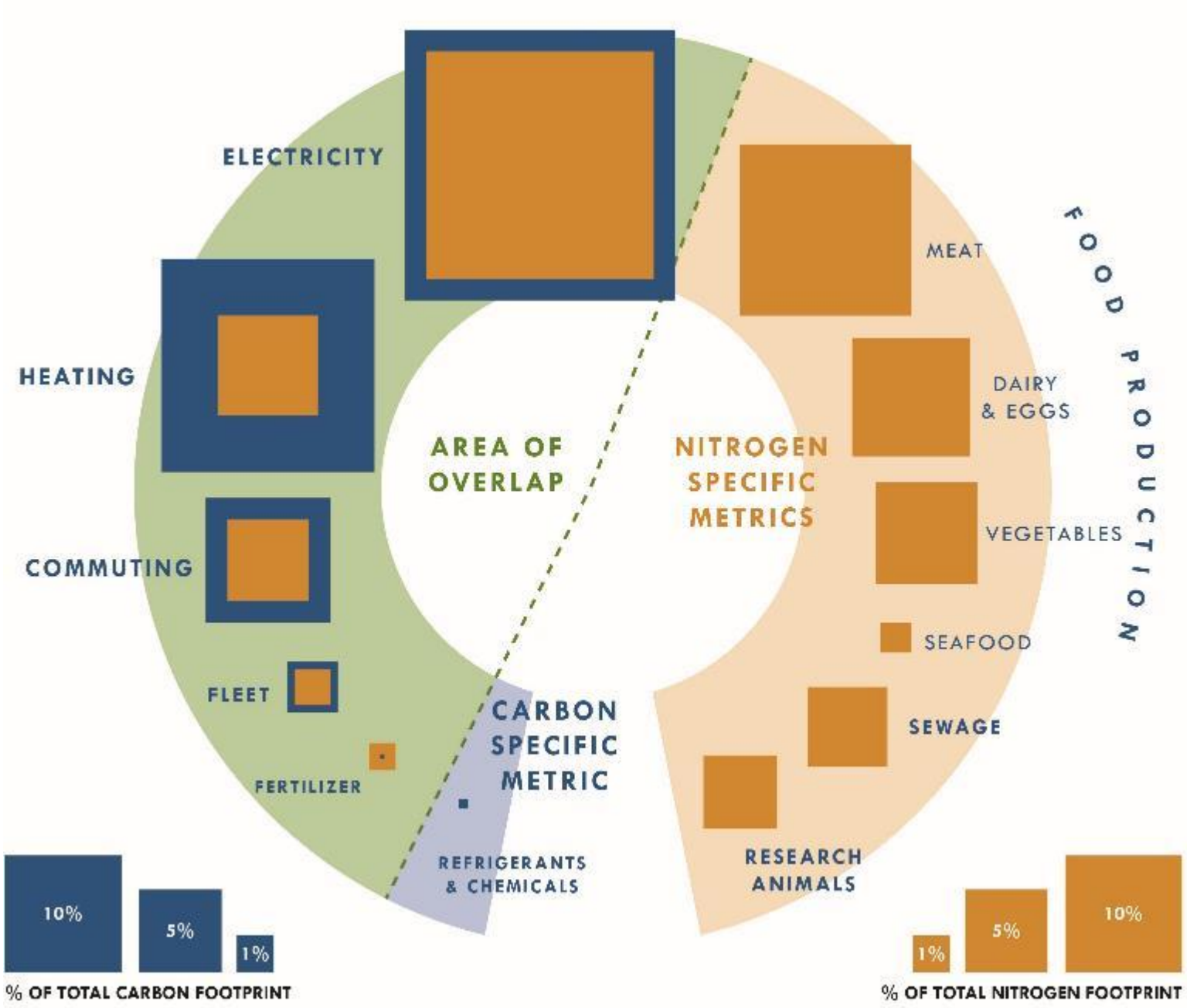
Utilities	Transport	Food	Other
• Energy consumed	• Fuel consumed • Commuter miles	• Food purchases • Food waste	• Research farms • Fertilizer

N loss factors

Carbon Footprint data

Food sustainability tracking data

Relationship to Carbon Footprint



A combined carbon and nitrogen campus tool?

A combined tool would provide:

- Broader picture of environmental impact
- Connections to local impacts
- Win-win for reduction strategies

We want your feedback!

- Would you use a combined tool?
- Do you want to calculate the C footprint of food?
- **We need universities to test the N footprint tool!**

Summary: University N Footprints

Nitrogen challenge

We must optimize nitrogen's benefits
while minimizing its negative consequences

Institutions:

Contact us to calculate
your institution's N footprint

info@n-print.org

Consumers:

Calculate YOUR
nitrogen footprint:

www.N-Print.org

N Print

Questions? Allison.Leach@unh.edu Jennifer.Andrews@unh.edu