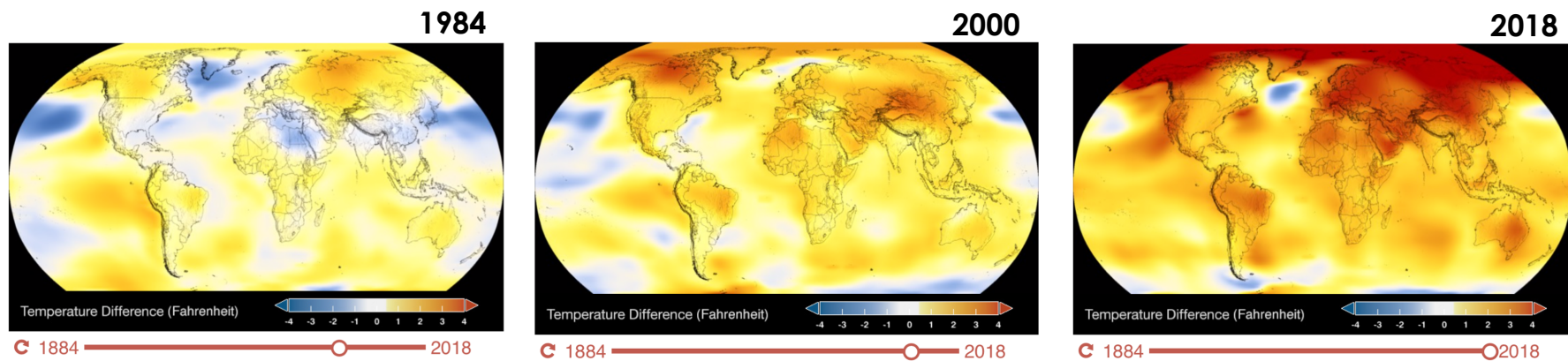


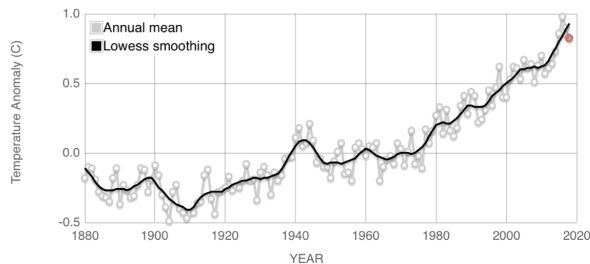
Sustainability: Connecting Stakeholders Across the Supply Chain in Sustainability Initiatives

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Global warming



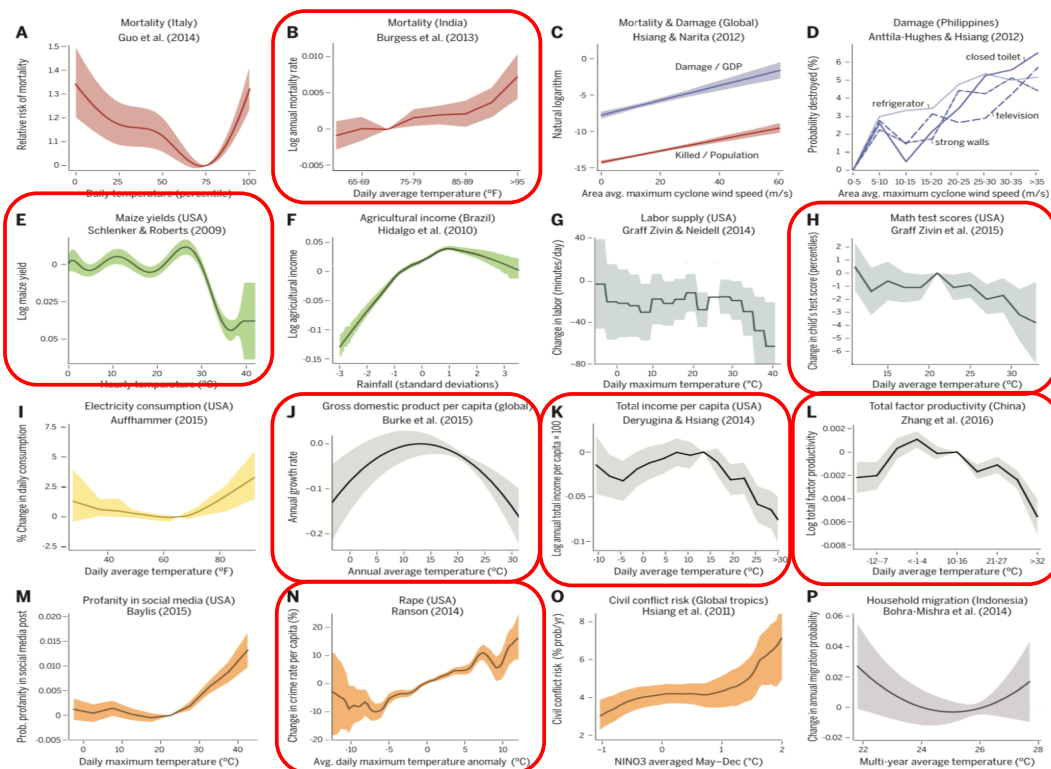
Global Land-Ocean Temperature Index



- ✓ Dark blue indicates areas cooler than average. Dark red indicates areas warmer than average.
- ✓ 18 of the 19 warmest years all have occurred since 2001.
- ✓ The year 2016 ranks as the warmest on record.

Effects of climate on societies

- ✓ Empirical studies demonstrate that climate variables influence social and economic outcomes in many sectors and contexts



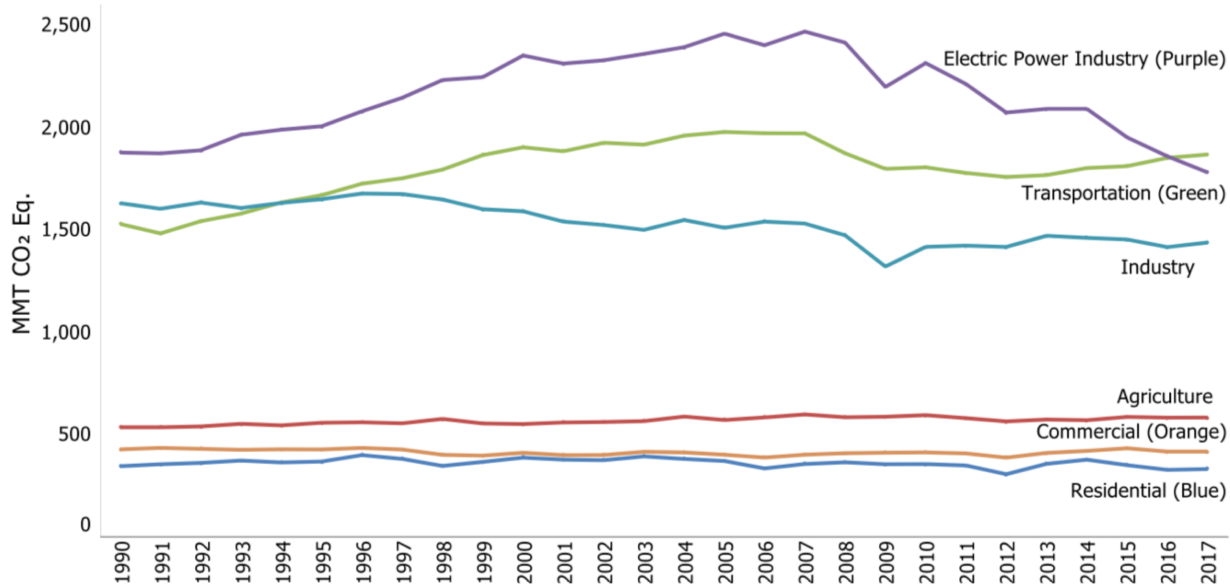
Carleton & Hsiang, 2016

Importance of transportation to economy

- ✓ At the macroeconomic level (the importance of transportation for a whole economy):
 - ❑ Transportation and the mobility it confers are linked to a level of output, employment and income within a national economy
 - ❑ In many developed countries, transportation accounts between 6% and 12% of the GDP
 - ❑ The value of all transportation assets, including infrastructures and vehicles, can easily account for half the GDP of an advanced economy
- ✓ At the microeconomic level (the importance of transportation for specific parts of the economy):
 - ❑ Transportation is linked to producer, consumer and production costs
 - ❑ Transportation accounts on average between 10% and 15% of household expenditures, while it accounts around 4% of the costs of each unit of output in manufacturing

Environmental impact of transportation

U.S. Greenhouse Gas Emissions Allocated to Economic Sectors



- ✓ The transportation sector accounted for the largest portion (29%) of total U.S. greenhouse gas (GHG) emissions in 2017.
- ✓ Between 1990 and 2017, GHG emissions in the transportation sector increased more in absolute terms than any other sector.

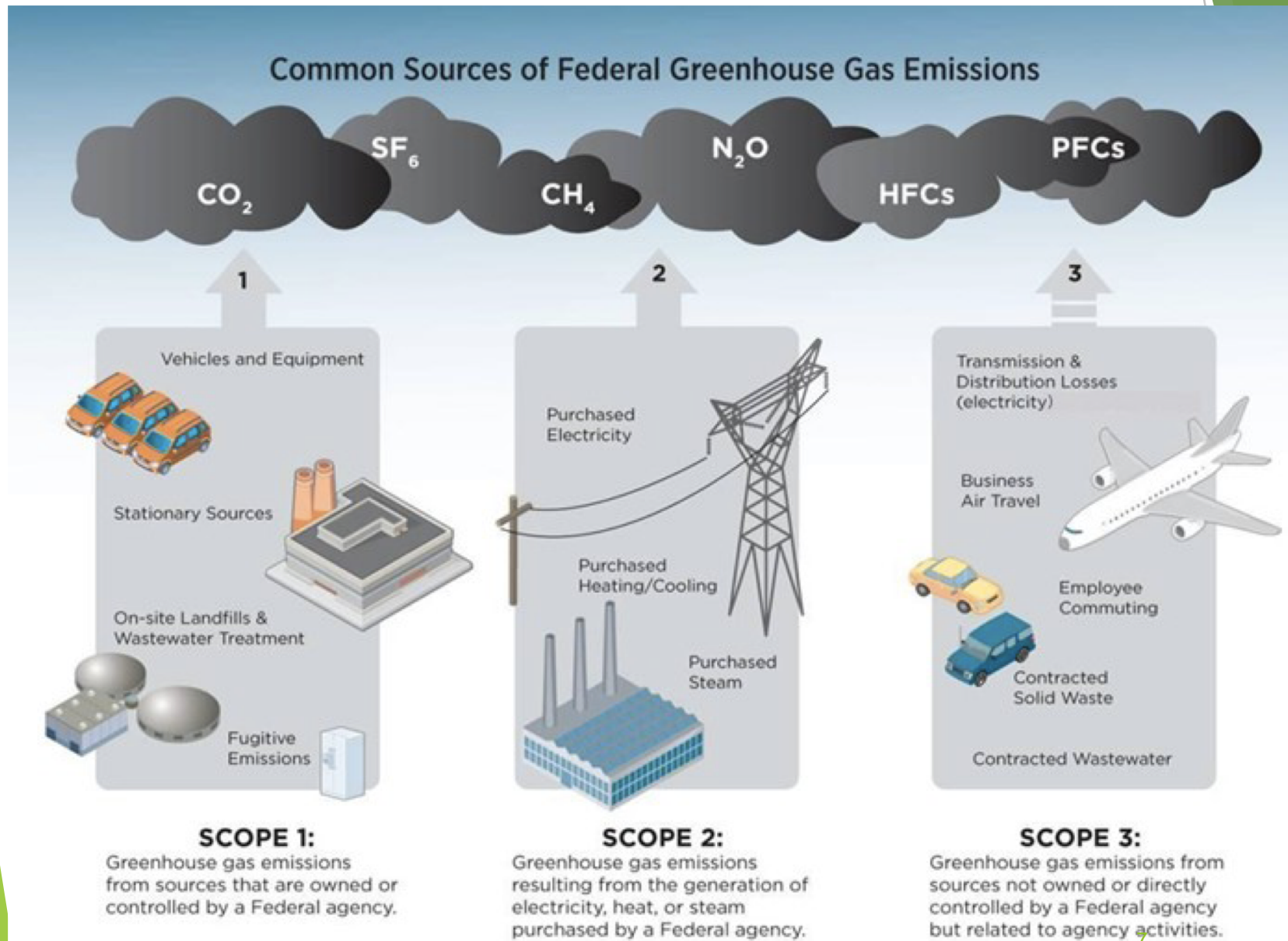
Table 1 – Greenhouse Gas Emissions Comparison by Mode

North American Freight Emissions Factor			GHG Emissions Calculation = $D \cdot W \cdot EF$		
Mode	Functional Unit	Emissions Factor	Distance (mile)	Weight (short ton)	Total Emissions (metric ton)
Air	grams of CO2 per short ton-mile	1459.2	1,000	200	291.8
Ocean	grams of CO2 per short ton-mile	24.3	1,000	200	4.9
Rail	grams of CO2 per short ton-mile	22.9	1,000	200	4.6
Trucks	grams of CO2 per short ton-mile	161.2	1,000	200	32.2

Note: Adapted from *The Green Freight Handbook* (2019) by EDF (Environmental Defense Fund)

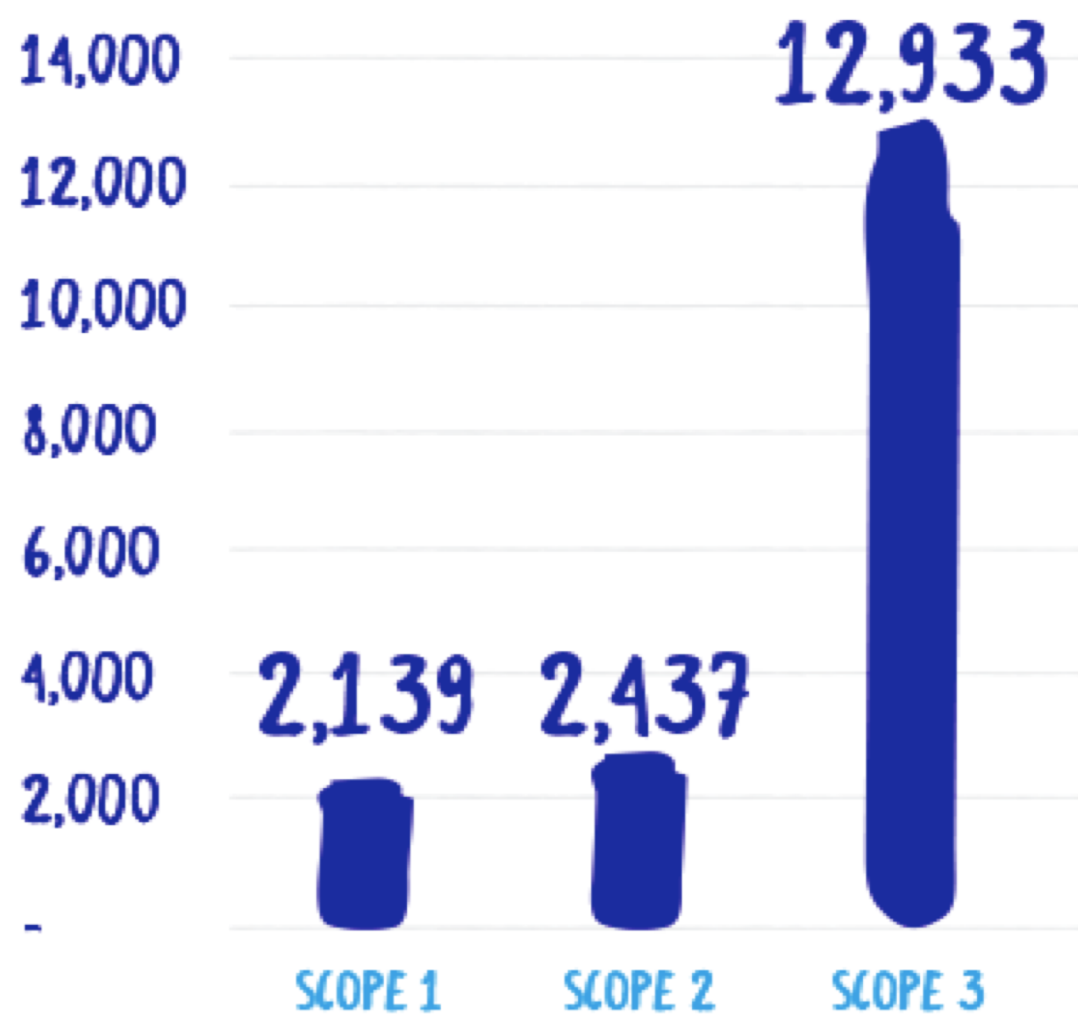
1. Emissions factor for each mode is the average of all categories. For example, emissions factor of Air is the average of that of longer flights (>3,700 km/2,300 miles) and shorter flights (<3,700 km/2,300 miles). And emissions factor of Ocean is the average of all shipping categories (i.e. North America to Africa and Asia to North America (east coast)) under dry goods and refrigerated goods.
2. The functional unit of all modes is by weight, namely, grams of CO2 per short ton-mile, and conversion is made to adopt the same functional unit for the sake of apple-to-apple comparison.
3. Only carbon dioxide is factored into greenhouse gas emissions.

Emissions Scope(s)



KIMBERLY-CLARK 2017 SCOPE 3 INVENTORY

CO₂-EQ (THOUSAND T/YR)



Economic and environmental sustainability

- ▶ Not all environmental practices provide cost savings, particularly in the short term (Gattiker, Tate, & Carter, 2008)
- ▶ Environmental investments may actually increase costs and take many years to yield a return on investment (Trumpp & Guenther, 2017)
- ▶ Sustainability strategy: how to balance short-term profitability and long-term environmental sustainability
- ▶ Overwhelming focus on economic actors' influence on company's sustainability strategy

Sustainability in supply chains



Patagonia Inc. built an \$800 million outdoor apparel empire selling heavy-duty jackets, backpacks and long underwear at premium prices, winning a loyal customer base with vows to “build the best product” and “cause no unnecessary harm.” But as Patagonia’s growth has taken off, the company is finding those two promises coming into conflict.



“When you’re trying to clean up your supply chain, you can’t believe how deep you have to go”

– Yvon Chouinard, Founder of Patagonia

- In 2012, Patagonia discovered brokers were charging migrant workers thousands of dollars for job placement at the company’s factories in Taiwan—a practice human-rights groups say is a form of slavery.
- And last summer, People for the Ethical Treatment of Animals posted a video online depicting grisly abuse of sheep at South American ranches that sold wool to Patagonia.

– WSJ 8/17/2016

Focal firms managing sustainable initiatives at the network level

- ▶ Apple reacted to a local NGO in Taiwan and China with regard to addressing labor issues and ethical sourcing in their supply networks
 - ▶ These stakeholders influenced Apple to such an extent that they began closely monitoring their supply network with 633 audits (up from 39 in 2007) in 19 countries during 2014
 - ▶ This included multiple tiers of sub-suppliers in places such as the Democratic Republic of the Congo (Apple 2015)
- ▶ Conflict mineral legislation in the US has forced companies to engage stakeholders multiple tiers down supply chain
- ▶ Apparel industry under major reconstruction with “watch dogs” such as GreenPeace and ProjectJust. Brands like NIKE are being highly criticized.

Supplier Maze

Companies that identified the most potential suppliers of “conflict minerals.”

COMPANY	NO. OF SUPPLIERS*
Caterpillar	38,700
ABB	30,000
General Dynamics	13,000
Pentair	11,500
TE Connectivity	11,000

What are we trying to understand?

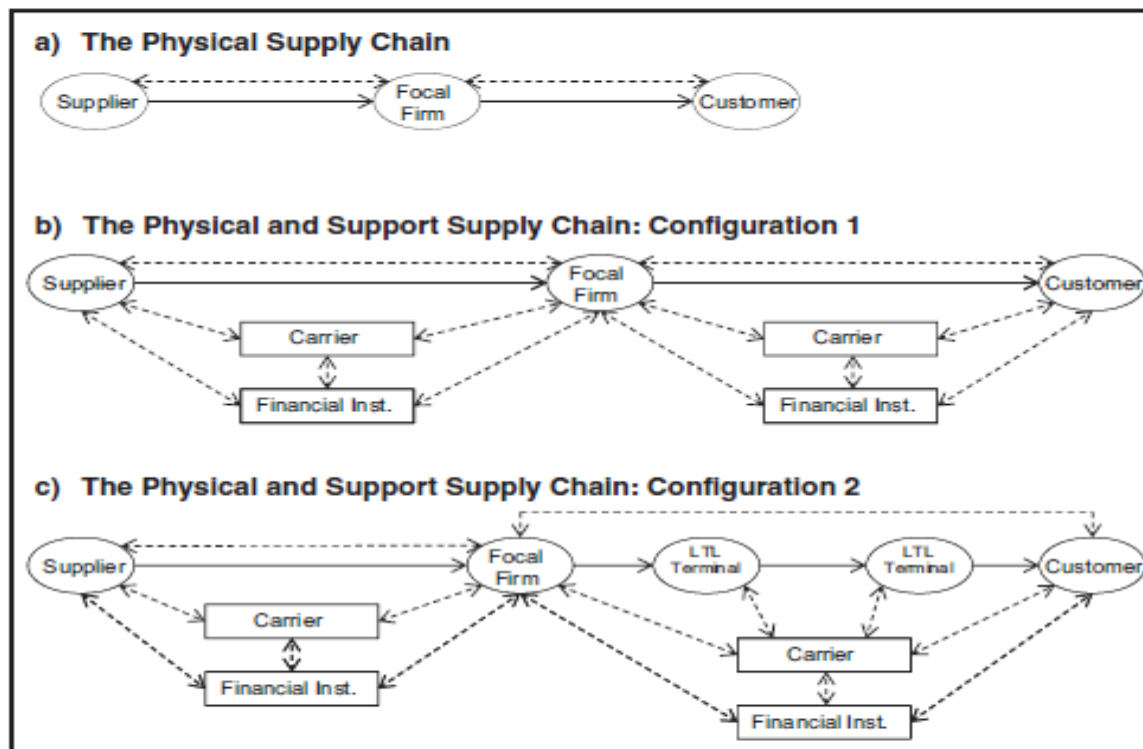
- How do connections to other stakeholders in a network affect its ability to develop, diffuse, and drive the adoption of sustainability initiatives in its supply network?



Broadening the design elements: physical and support chains

Theory of the Supply Chain (Carter, Rogers and Choi, 2015)

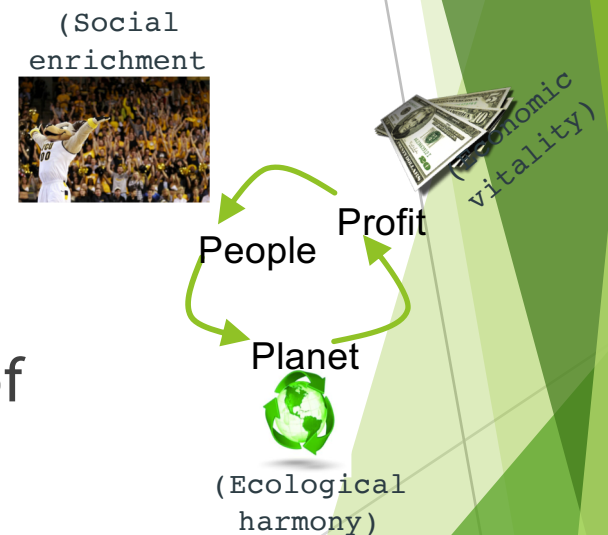
FIGURE 1
The Physical and Support Supply Chain



Note: Ovals represent physical supply chain nodes and rectangles represent support supply chain nodes. Solid lines represent the flow of product between physical nodes; dashed lines represent the flow of information and/or finance between physical and/or support nodes.

The impact of sustainability on these concepts

- ▶ The traditional flows and stakeholders we discuss in relation to supply chains generally come from an economic viewpoint, are linear, & often dyadic
- ▶ Many focal firms now consider the triple bottom line (TBL) when measuring supply chain performance
 - ▶ People, planet, profit
 - ▶ Research has found that managing the TBL line necessitates a network view of the supply chain (Choi & Kim, 2008)
 - ▶ Businesses can not do it alone



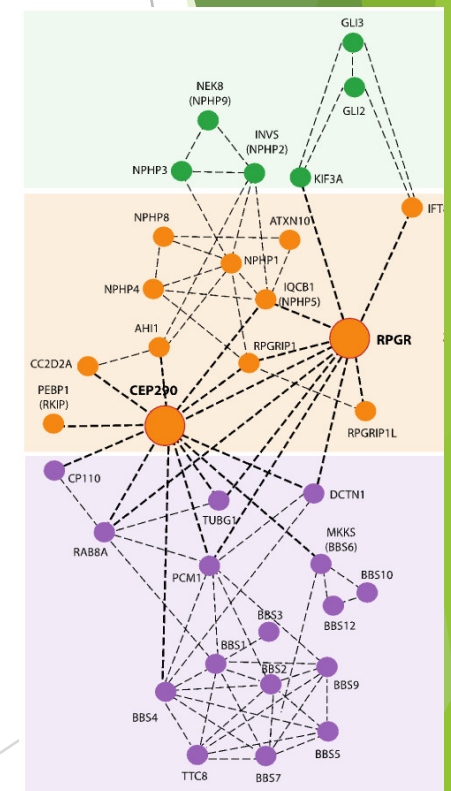
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Gölgeci 2013)

The implementation of sustainable initiatives in a network

- ▶ The implementation of sustainable initiatives, like other business processes, goes through distinct stages of development to diffusion to relevant stakeholders with the ultimate goal of adoption (Bansal 2005)
- ▶ Firms must rely on those they are directly connected to enable the development, diffusion, and adoption of sustainable initiatives at the network level (Carter & Rogers 2008)
- ▶ Understanding how a focal firm is embedded in its network defines its access to resources in the network and makes those stakeholders that “broker” relationships with indirectly connected stakeholders critical



Implications

- Helps organizations better focus on the relationships that connect them to indirectly linked stakeholders at the boundary of their network whose voice is important but might otherwise not be considered (Clark et al. 2011)
 - Make better sustainable and ethical decisions that are more inclusive of network stakeholders
 - Ability to manipulate network in a way that strengthens or weakens ties to ensure the appropriate sustainable and ethical outcomes
 - Analyze if the best/most effective stakeholders are acting as brokers to indirectly connected actors in the network
- Dynamic nature of networks in the implementation of a sustainability initiative

Thank you very much for your attention!
Any Questions or Suggestions?



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