Material Supply & Recycling perspective

Speaker

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Sustainability in Infrastructure

Materials Supply & Recycling

Materials Considerations in Infrastructure Projects

1. Materials selection
2. Transport of materials to site
3. Use/Implementation of materials on-site
4. Quality/life expectancy of materials

Materials Selection

- Emissions
  - Manufacture of materials
  - Re-cycling/re-processing
  - From point of origin to source of supply

- Other attributes that impact emissions
  - Density
  - Shape/Size
  - Quantity transported per load
  - On-site versus Off-site Assembly

Do Recycled Materials Always Make Sense ?

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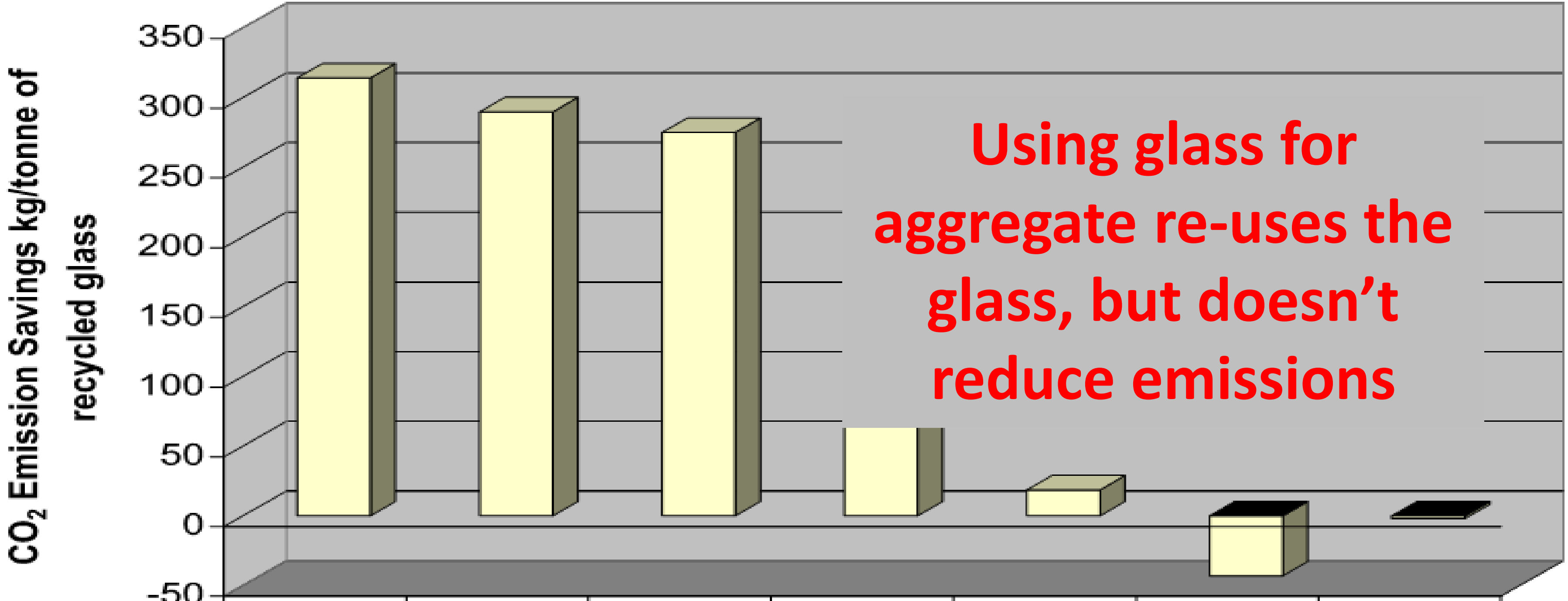

Using glass for aggregate re-uses the glass, but doesn't reduce emissions

	Glass containers	Glass containers (foreign	Glass Fibre	Bricks	Shot Blast	Filtration	Aggregates
kg CO2/tonne	314	290	275	66	19	-43	-2

Typical/Candidate Recycled Materials Used

- Concrete
  - as aggregate or re-polymerized
- Fly Ash
  - gypsum/wallboard
  - concrete
- Glass
  - road underlayment/aggregate
  - asphalt

- Wood (e.g. lumber, land clearing debris)
- Metals: steel, aluminum
- Other: carpet, shredded tires

Emissions of Construction Materials

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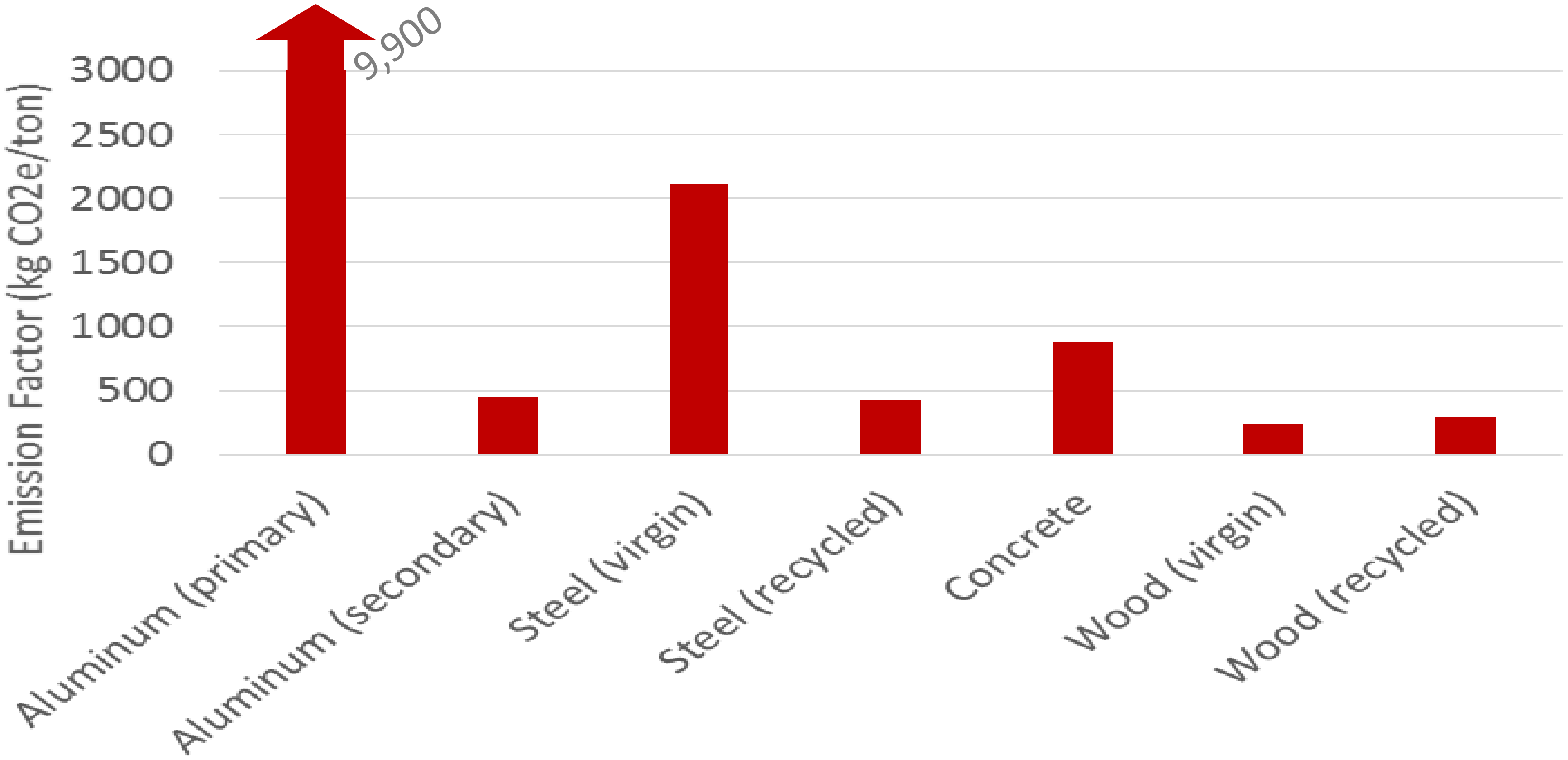

Avoided Emissions By Recycling/Reuse *(tons CO_2e)*

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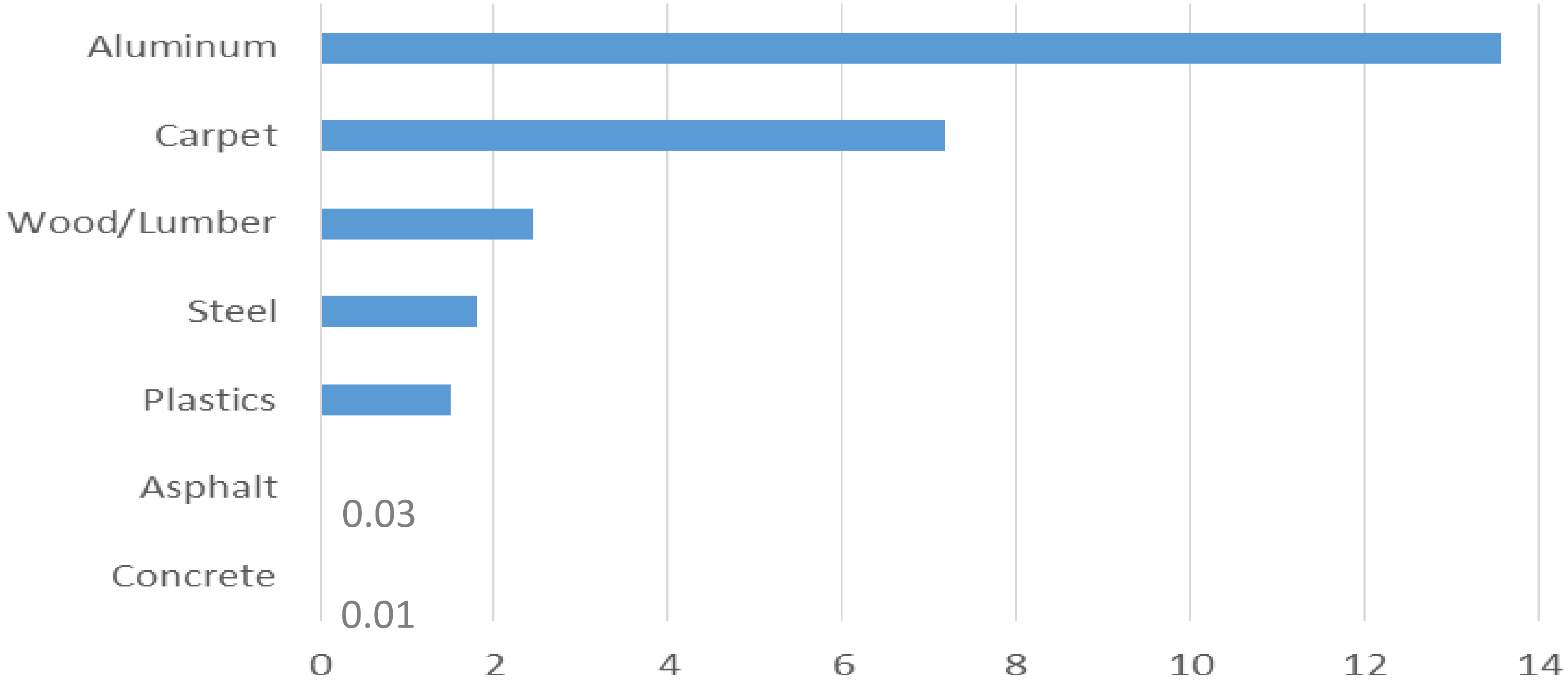

Source: US EPA

Material Transport

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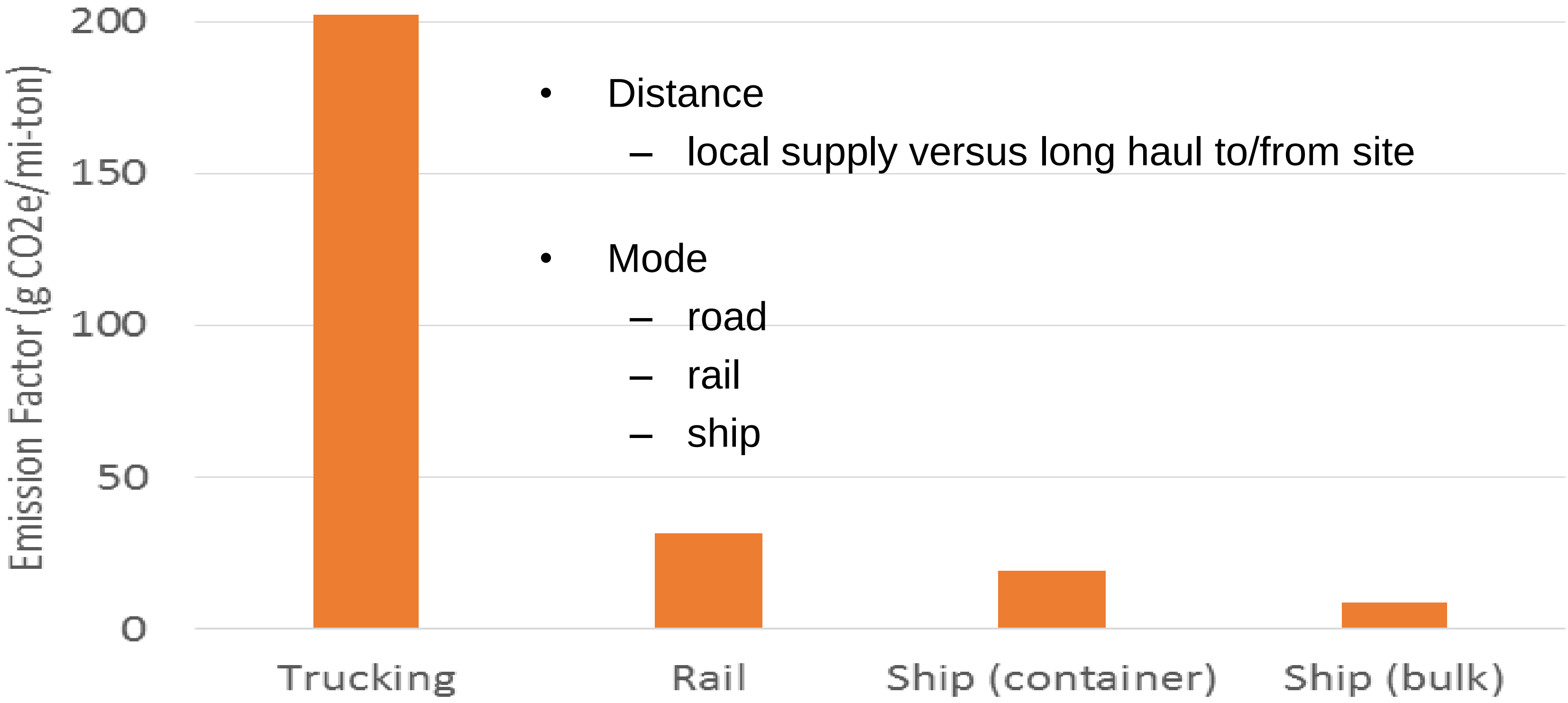
- Distance
  - local supply versus long haul to/from site
- Mode
  - road
  - rail
  - ship



Source: www.cn.ca

Emissions from Materials Implementation

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- Complexity of installation
  - More difficult = less efficient → higher emissions
  - Examples:
    - Extensive grading
    - Specialty contractors
    - Ancillary supplies
- Equipment needed
  - Type
  - Number
  - Time in operation
- Deconstruction/demolition considerations

Emissions Based on Material Implementation

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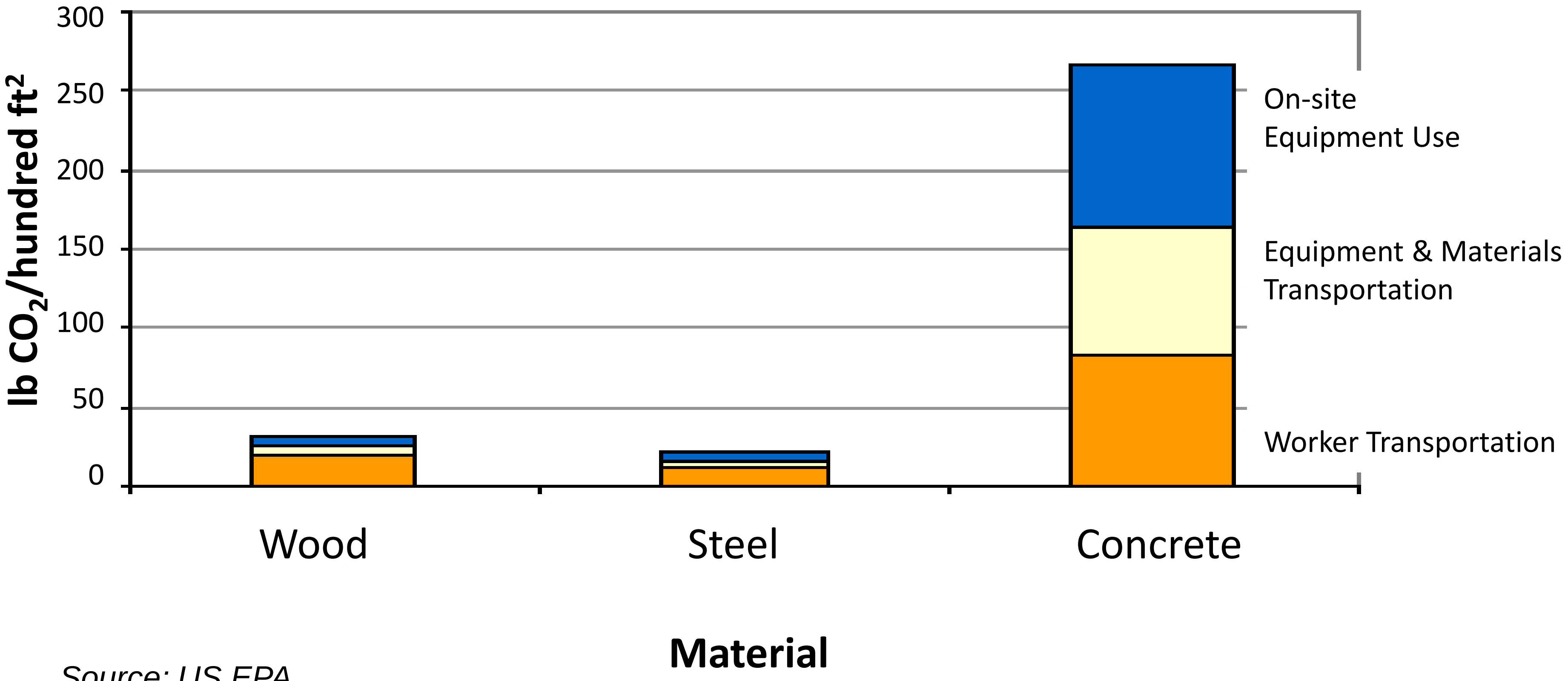

Source: US EPA

Material Longevity

- Consider total life cycle when selecting materials

- Life expectancy of materials
  - How often is repair/replacement required?
  - More frequent replacement = higher emissions

- Work Quality
  - Poor grading/sloping
  - Inadequate compaction
  - Erosion/Stormwater management

Complexity of Computing Emissions

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- Assume 200 tons materials to a project in Las Vegas, NV

- Material options:
  - Wood
    - Virgin
    - Sourced from Eugene, Oregon
  - Steel
    - Recycled
    - Sourced from Shanghai, China

Complexity of Computing Emissions

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- Wood

Production Emissions	Distance	Mode of Transport	Transport Emissions	Total Tons CO_2
47.2 tons CO_2	871 mi.	Truck	35.2 tons CO_2	**82.4**

But if 50% of wood is replaced over lifetime of facility, total emissions equal that of steel.

- Recycled Steel

Production Emissions	Distance	Mode of Transport	Transport Emissions	Total Tons CO_2
84.6 tons CO_2	6,487 mi.	Ship (China to LA)	11.5 tons CO_2	
	270 mi.	Truck (LA to Vegas)	10.9 tons CO_2	**107.0**

What Does the Future Hold?

- Considerations/data shared are not static

- Models used to estimate emissions are becoming more sophisticated
  - Greater accuracy
  - Allow for site specific optimization of emissions & cost

- Innovation can/will drive increased use of recycled materials
  - Likely better emissions reductions when used

What Does the Future Hold?

- Interdependency on multiple industries will impact evolution of materials & practices
  - Example: Fly ash production will decrease substantially over the next 2 decades

- Reduced emissions from on and off-road equipment are a substantial factor

- Development of local/regional markets for recycled materials could play a large role

Contact Information

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