



الاسكوا
ESCWA

ENERGY END USE FOR ENERGY BALANCE

DECEMBER 2014

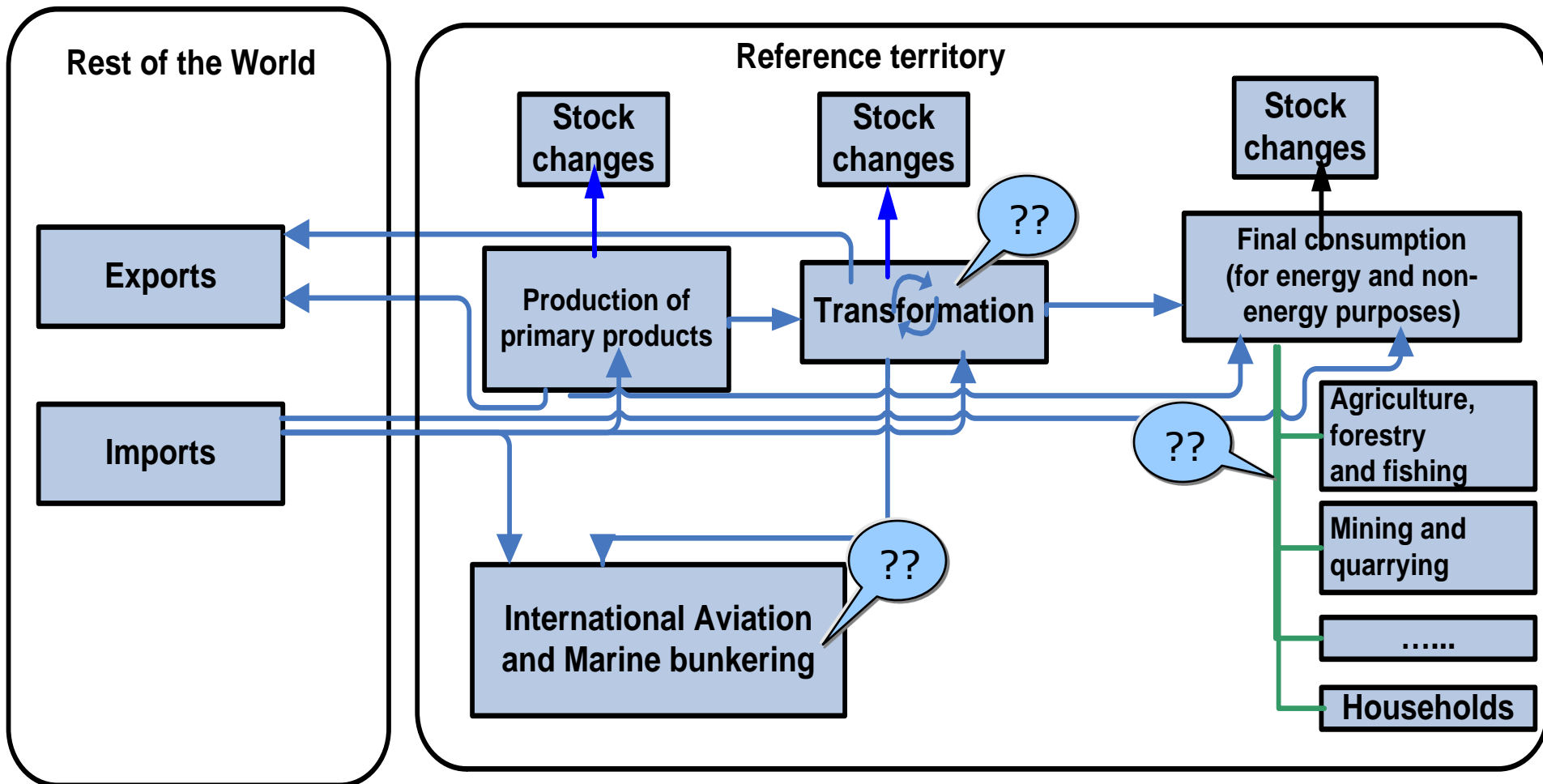
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Difficult Data in main energy flows



Energy consumers

مستهلكي الطاقة

3 major groups:

1. *Industry,*
2. *Transport ,*
3. *Other sectors.*

3 مجموعات:

1. الصناعة
2. النقل
3. القطاعات الأخرى

الصناعة Industry

الصناعة مقسمة الى:

- | | |
|---------------------------------|--------------------------------------|
| 1. Iron and steel | 1. الحديد والصلب |
| 2. Chemicals and petrochemicals | 2. المواد الكيميائية والبتروكيماويات |
| 3. Non-ferrous metals | 3. معادن لا حديدية |
| 4. Non-metallic minerals | 4. معادن لا فلزية |
| 5. Transport equipment | 5. معدات النقل |
| 6. Machinery | 6. الآلات |
| 7. Mining and quarrying | 7. التعدين واستغلال المحاجر |
| 8. Food, beverages and tobacco | 8. الأغذية والمشروبات والتبغ |
| 9. Pulp, paper and print | 9. عجينة ورقية وورق وصحيفة |
| 10. Wood and wood products | 10. الخشب ومنتجات الأخشاب |
| 11. Textiles and leather | 11. المنسوجات والجلود |
| 12. Construction | 12. التشييد |
| 13. Not elsewhere specified | 13. غير محدد في أماكن أخرى |

Transport النقل

- Domestic aviation
- Road
- Rail
- Domestic navigation
- Pipeline transport
- Transport not elsewhere specified



الطيران الداخلي
الطرق
السكك الحديدية
الملاحة الداخلية
نقل خطوط الأنابيب
النقل غير محدد
في مكان آخر

Other Sectors

القطاعات الأخرى

- Agriculture
- Commerce and public services
- Residential
- Other



- الزراعة
- التجارة والخدمات العامة
- المنازل
- أخرى

Purpose of Energy Surveys

To improve the quality of the energy consumption information, Energy consumption data should be collected as a part of the structural business statistics for manufacturing collected in a single survey.

“Without proper sampling, any statistic derived from a survey could be biased. Increasing the sample size may reduce sampling error but will not eliminate the bias. A large but biased sample will produce “precisely wrong statistics,” : statistics with an extremely small sampling error, but still reflecting biases.

WB Blog Revolutionizing Data Collection: From “Big Data” to “All Data”
Nobuo Yoshida's 12/11/2014



1. Administrative information

- 1.1 Name of Survey
- 1.2 Subject area
- 1.3 Responsible authority
- 1.4 Reference period
- 1.5 Frequency
- 1.6 Timeliness
- 1.7 Punctuality
- 1.8 Level
- 1.9 Legal authority
- 1.10 International reporting

Dag Spilde, Energy use in the manufacturing sector "Best practise"

Statistics Norway <http://www.ssb.no/emner/10/07/indenergi/>

2. Purpose and Users

2.1 Purpose

To provide information on energy consumption

Date of start of data collection ? Partners?

2.2 Users and applications

Public institutions (Energy, Industry, Economy, etc.),

Important input to the national accounts, the energy accounts and the energy balance

Emission statistics

In other analyses and research

3.1 Concepts and Definitions IRES

What does survey cover? Which Year?

- **Final Consumption of Energy Products:** all fuel and energy that is delivered to users for both their energy and non–energy uses.
- **Energy uses:** for heat raising, transportation and electrical services. Any fuel use for a Transformation Process should not be classified as Final Consumption.
- **Non-Energy Use:** Fuels used for chemical feedstocks and for non-energy purposes.

Cross classification of energy consumers and use by purpose

Use of energy: Activity (ISIC-based)	++ Transformation	Transport	Non-energy use	Energy use
Energy industries	a	b	c	d
Electricity plants				
Coal mines				
<Etc.>				
...				
Energy consumers				e
Iron and Steel				
<Etc.>				
<Etc.>				
...				
Households				



Standard International Energy Classification SIEC

SIEC HEADINGS SECTION, DIVISION, GROUP, CLASS, SUBCLASS

1 - Solid fossil fuels and derived products		2 - Natural gas and Oil		3 - Nuclear fuels	
1.1 - Coal and coal products		2.1 - Natural gas		3.1 - Uranium and plutonium	
1.1.1 - Hard coal		2.1.0 - Natural gas		3.1.0 - Uranium and plutonium	
1.1.1.1 – Anthracite		2.1.0.0 - Natural gas		3.1.0.0 - Uranium and plutonium	
<i>1.1.1.1.0 - Anthracite</i>		<i>2.1.0.0.0 - Natural gas</i>		<i>3.1.0.0.0 - Uranium and plutonium</i>	
1.1.1.2 - Bituminous coal		2.2 Oil		3.2 – Other nuclear fuels	
<i>1.1.1.2.1 - Coking coal</i>		2.2.1 - Conventional crude oil		3.2.0 – Other nuclear fuels	
<i>1.1.1.2.2 - Other bituminous coal</i>		2.2.1.0 - Conventional crude oil		3.2.0.0 – Other nuclear fuels	
1.1.2 - Brown coal		<i>2.2.1.0.0 - Conventional crude oil</i>		<i>3.2.0.0.0 – Other nuclear fuels</i>	
1.1.2.1 - Sub-bituminous coal		2.2.2 - Natural gas liquids (NGL)		4 - Biofuels and waste	
<i>1.1.2.1.0 - Sub-bituminous coal</i>		2.2.2.0 - Natural gas liquids (NGL)		4.1 - Biofuels	
1.1.2.2 - Lignite		<i>2.2.2.0.0 - Natural gas liquids (NGL)</i>		4.1.1 - Solid biofuels	
<i>1.1.2.2.0 - Lignite</i>		2.2.3 - Refinery feedstocks		4.1.1.1 - Fuelwood, wood by-products	
1.1.3 – Coal products		2.2.3.0 - Refinery feedstocks		<i>4.1.1.1.0 - Fuelwood, and by-products</i>	
1.1.3.1 - Coal coke		<i>2.2.3.0.0 - Refinery feedstocks</i>		4.1.1.2 - Agrofuels	
<i>1.1.3.1.1 - Coke oven coke</i>		2.2.4 – Additives and oxygenates		<i>4.1.1.2.1 - Bagasse</i>	
<i>1.1.3.1.2 - Gas coke</i>		2.2.4.0 - Additives and oxygenates		<i>4.1.1.2.2 - Animal wastes</i>	
<i>1.1.3.1.3 - Coke breeze</i>		<i>2.2.4.0.0 - Additives and oxygenates</i>		<i>4.1.1.2.3 - Other vegetable residues</i>	
<i>1.1.3.1.4 - Semi cokes</i>		2.2.5 - Other hydrocarbons		4.1.1.3 - Black liquor	
1.1.3.2 - Patent fuel		2.2.5.0 - Other hydrocarbons		<i>4.1.1.3.0 - Black liquor</i>	
<i>1.1.3.2.0 - Patent fuel</i>		2.2.6 –Oil products		4.1.1.4 - Charcoal	
1.1.3.3 - Brown coal briquettes (BKB)		<i>2.2.5.0.0 - Other hydrocarbons</i>		<i>4.1.1.4.0 - Charcoal</i>	
<i>1.1.3.3.0 - Brown coal briquettes (BKB)</i>		2.2.6.1- Refinery gas		4.1.2 - Liquid biofuels	
		<i>2.2.6.1.0 - Refinery gas</i>		4.1.2.1 - Biogasoline	
		2.2.6.2 - Ethane		<i>4.1.2.1.0 - Biogasoline</i>	
		<i>2.2.6.2.0 - Ethane</i>		4.1.2.2 - Biodiesels	
		2.2.6.3 - Liquefied petroleum gas		<i>4.1.2.2.0 - Biodiesels</i>	
				4.1.2.3 - Other liquid biofuels	
				<i>4.1.2.3.0 - Other liquid biofuels</i>	
				4.1.3 - Biogases	
				4.1.3.1 – Natural biogases	

5.2 – Electricity	
5.1.1 - Electricity	
5.1.1.1 – Electricity	
<i>5.1.1.1.0 - Electricity</i>	
6 - Heat	
6.1 – Heat	
6.1.1 - Heat	
6.1.1.1 – Heat	
<i>6.1.1.1.0 - Heat</i>	

Recommended units for dissemination

Fuels	Dimension	Unit
Solid fossil fuels	Mass	Thousand metric tons
Liquid fossil fuels	Mass	Thousand metric tons
(Liquid) Biofuels	Mass/Volume	Thousand metric tons/ Thousand cubic metres
Gases	Energy	Terajoules
Wastes	Energy	Terajoules
Fuelwood	Volume/Mass	Thousand cubic metres/ Terajoules
Charcoal	Mass	Thousand metric tons
Electricity	Energy (power x time)	GWh
Electricity installed capacity	Power	MW
Refinery capacity	Mass/time	Thousand metric tons/year
Heat	Energy	Terajoules
Common unit (e.g., balances)	Energy	Terajoules

Aggregate in major Groups

- Electricity: purchased and self-produced electricity
- Petroleum products: purchased light heating oils, heavy distillates, heavy fuel oils, waste oils,
- kerosene and auto diesel, non-taxable
- Gas: purchased and self-produced LPG, LNG, natural gas in gaseous, fuel gas and CO gas
- Coal products: purchased coal, coke and petrol coke
- Steam and district heating: purchased district heating and purchased and self-produced steam
- Solid biomass and wastes: purchased and self-produced waste of wood, black liquor and hazard.
- Waste petroleum products for transport: purchased gasoline, auto diesel taxable and marine gas oils.

Units

Ask for the consumption of different energy products in physical units

Convert all of the energy goods into the common unit MWh (million watts).

Based on information on average energy content for the individual energy goods.

Main Energy Consumers Industry (ISIC4)

Iron and steel
Chemicals and petrochemicals
Non-ferrous metals
Non-metallic minerals
Transport equipment
Machinery
Mining and quarrying
Food, beverages and tobacco
Pulp, paper and print
Wood and wood products
Textiles and leather
Construction
Not elsewhere specified

الحديد والصلب
المواد الكيميائية والبتروكيماويات
معادن لا حديدية
معادن لا فلزية
معدات النقل
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التعدين واستغلال المحاجر
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النقل

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- أخرى

*'households', includes *all* households in their capacity of final consumers and not only those engaged in economic activities (as covered by ISIC)

(** includes military consumption)

Example for Manufacturing and Mining and Quarrying in Norway

4. Statistics production

4.1 Population

4.2 Data sources

4.3 Sampling

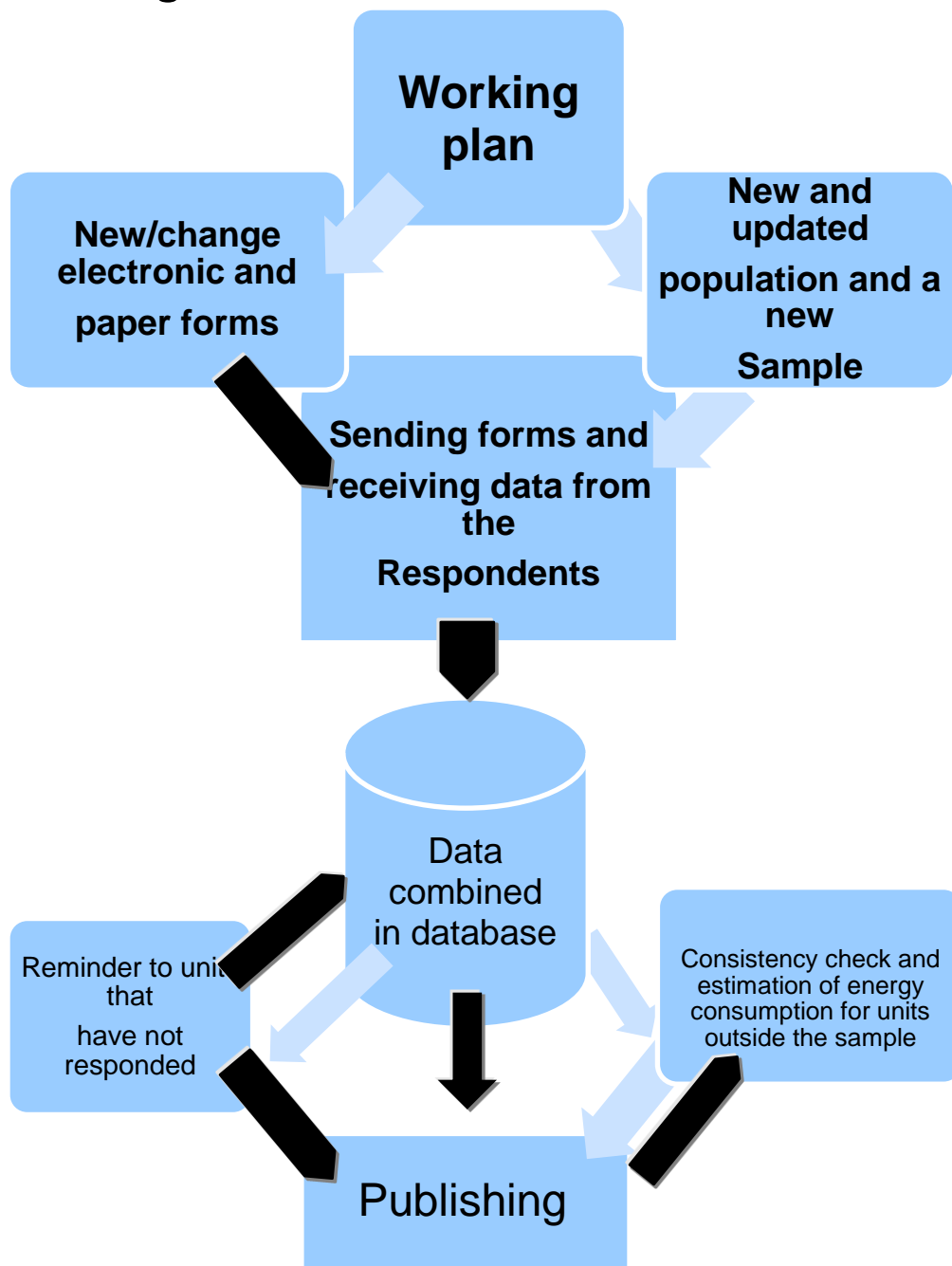
4.4 Collection of data

4.5 Editing and controls

4.6 Estimation

4.7 Use of resources

Diagram for Statistical Production



4.1 Population

- Business Register at National Statistics office to create a new population.
- The statistics cover all existing local units within the manufacturing, mining and quarrying units in the population. which corresponds to division 10, 12-37 in the Norwegian Standard Industrial
- Classification (22,000 units in the population).
- Enterprises excluded: (one-man enterprise were excluded before 1998)
- Reporting unit: Local Units
- Observational unit: Local Units
- Analytical unit: Energy consumption

4.2 Data sources

1. The Central Register of Establishments and Enterprises of Statistics Norway for the sample of local units in manufacturing, mining and quarrying and Information on activity codes, addresses and other information
2. Turnover data from the short-term turnover statistics (preliminary figures) and energy costs from the structural data for the manufacturing sector
3. Structural data for the manufacturing sector, concerning energy costs. These data are controlled against the energy costs in the statistics on energy consumption in manufacturing. The structural business statistics for manufacturing have a larger sample
4. Standard industry form that all enterprises in Norway have to report on income statement.

4.3 Sampling

Table 1: Status sample design 2006:

Sample design	Local KAUs	Employees	Local KAUs in %	Employees in %	Energy consump. in %
Population	21,194	243,502	100%	100%	100 %
Step 1	2,590	178,801	12.2%	73.4%	95.2%
Step 2	431	5,943	2.0%	2.4%	0.6%
Step 3	149	1,334	0.8%	0.6%	0.3%
Total sample	3,170	186,078	15.0%	76.4%	96.1%

all existing local
Units in mining
manufacturing,

>2% of
total emp.
In subgroup

1.Stratified sample
of small units
2.randomly choose
local units from
stratum

Add more local units
to industrial subgroups
<7 units

4.4 Collection of data

Questionnaires sent out in January, with a deadline in February.

2 reminders with a final deadline at the end of May.

Units that have not responded after the second reminder have to pay a fine. Even if the units pay the fine, they still have to respond.

No paper forms when are sent with reminders, only a letter with information on the duty to respond.

Respondents are better use the electronic form.

Passwords and user names are given in the letter.

4.5 Editing and controls

- Data from paper forms are read optically and transferred to database for revision.
- Electronic data are transferred automatically to the database.
- The database is created in Oracle and shows the energy consumption and energy costs for all local Units.
- It also shows the same data from the previous year and data from other relevant statistics. We use this data to carry out consistency checks.

4.6 Estimation

Model:

The common ratio model is used in the estimation.

This model assumes a linear connection between the dependent variable y and the independent variable x .

Predict energy costs from turn over data (preliminary figures).

Energy prices: a weighted average of observed prices in the sample

$$Price = \frac{1}{n} \sum_i price/unit \quad i = \frac{1}{n} \sum_i \frac{1000kr}{MWh}$$

Energy consumption (MWh) is then estimated from estimated or observed energy costs and prices

$$MWh = Costs/Price$$

5. Sources of error and uncertainty

5.1 Measurement and processing errors

5.2 Non-response errors

5.3 Sampling errors

5.4 Other sources of error

5.5 Errors and uncertainty

6. Comparability and coherence

6.1 Comparability over time and space

6.2. Coherence with other statistics

7. Availability

7.1 Publications and other links

7.2 Micro data

7.3 Documentation

7.4 Confidentiality

not to publish data if there are <3 enterprises in an industry,
data are confidential and aggregated up to a more
aggregated industry group before publishing



Policy Questions and Implications

What portion of the population can afford automobiles,

How much do services of transport sector provide in value added, labour employment etc.?

What negative effects do transportation modes increasing congestion, considerable air pollution, safety risk, and feelings of inequities in the society, etc.??

What are the options for multimodal system of walking, bicycle transportation, motorcycles, buses, and trains to support high-population density

The 40 percent slip in oil prices since June 2014 shifts 1.3 trillion USD from producers to consumers. What do governments, private sector, households want to do with this: Savings, Investments, Expenditures, etc..

Policy Implications Example

The transportation sectors use large amounts of energy, both in total and per dollar of output and on a per service basis

Use of benchmark input–output models permits assessment of not only the direct performance of the transportation service sectors but also the supply chain impacts required for operation of the transportation sectors.

Consideration of indirect impacts is critical for assessment of the overall costs and impacts of particular products or services.

Six transportation service sectors (air, rail, water, truck, transit, and pipeline) are examined. Economic impact, energy, greenhouse gas emissions, and toxic emissions are examined.

References: Transportation Sector and Supply Chain Performance and Sustainability in the USA. Chris Hendrickson, Gyorgyi Cicas, and H. Scott Matthews <http://www.cmu.edu/gdi/docs/transportation-sector.pdf>