

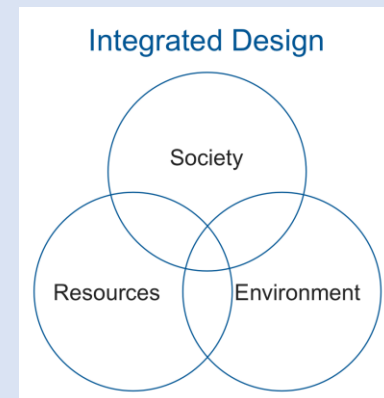
Future perspective of bioenergy in Japan's energy system

Workshop:

Future perspectives of bioenergy development in Asia

September 7, 2018

Toshihiko Nakata, Tohoku University



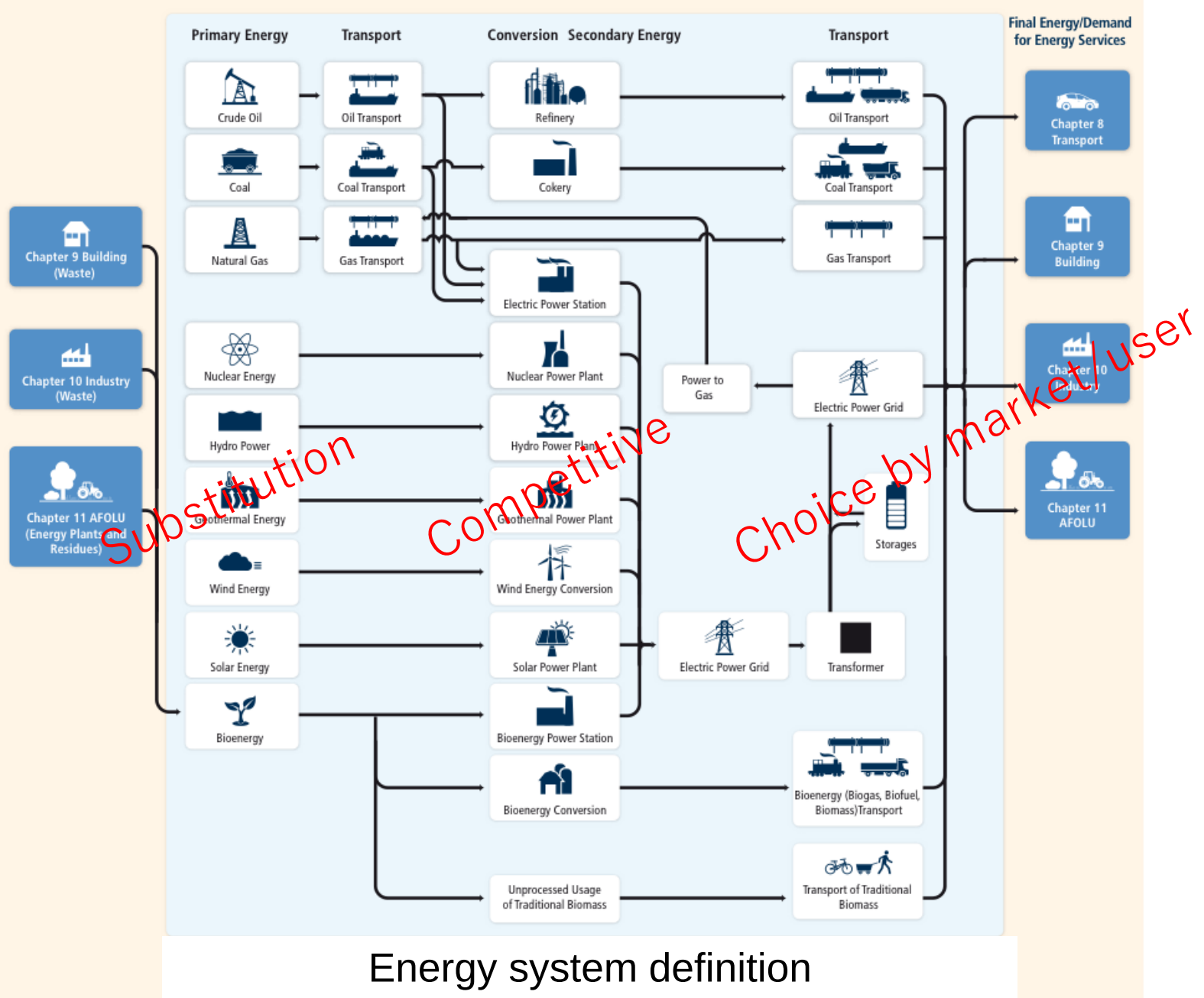
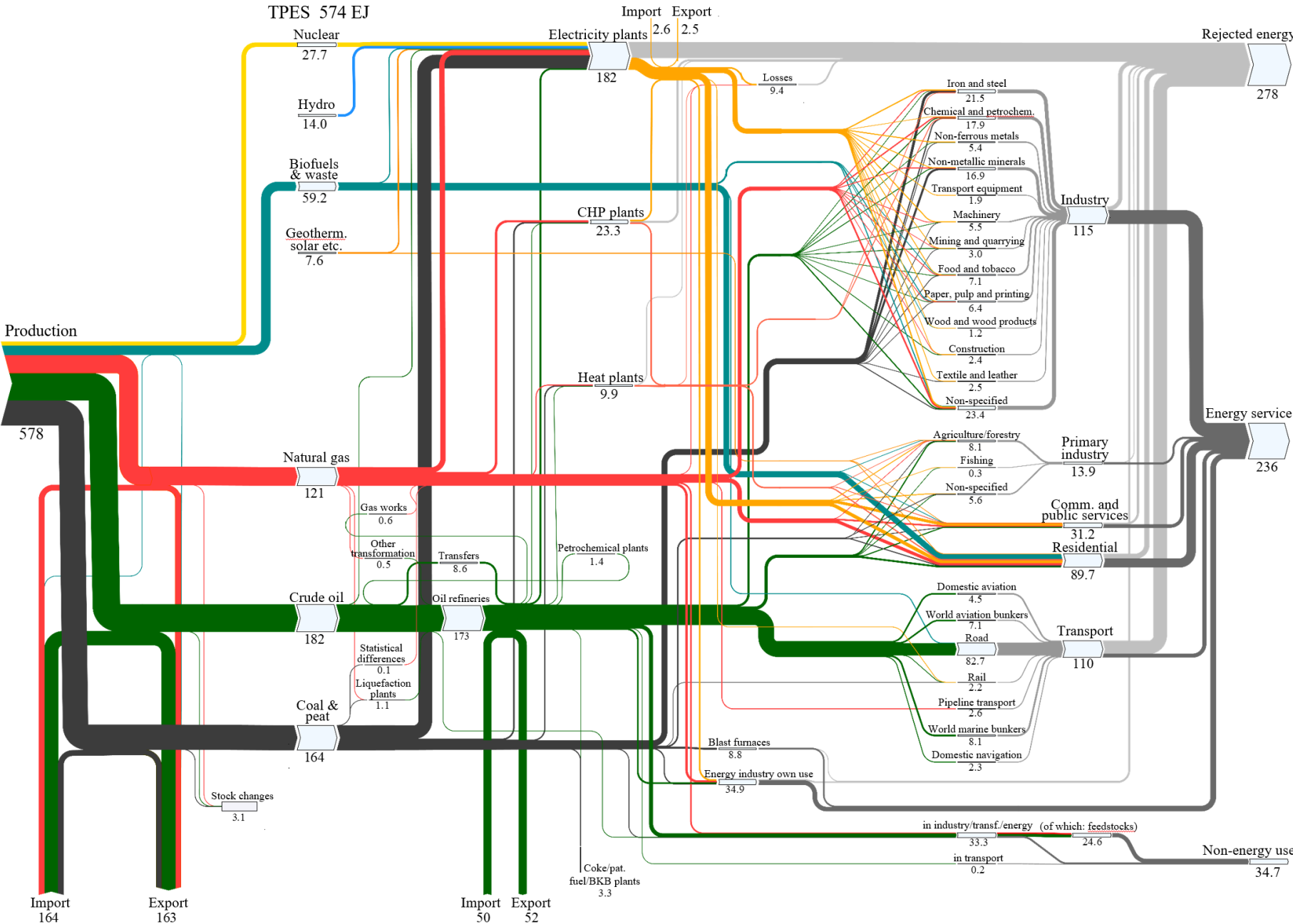
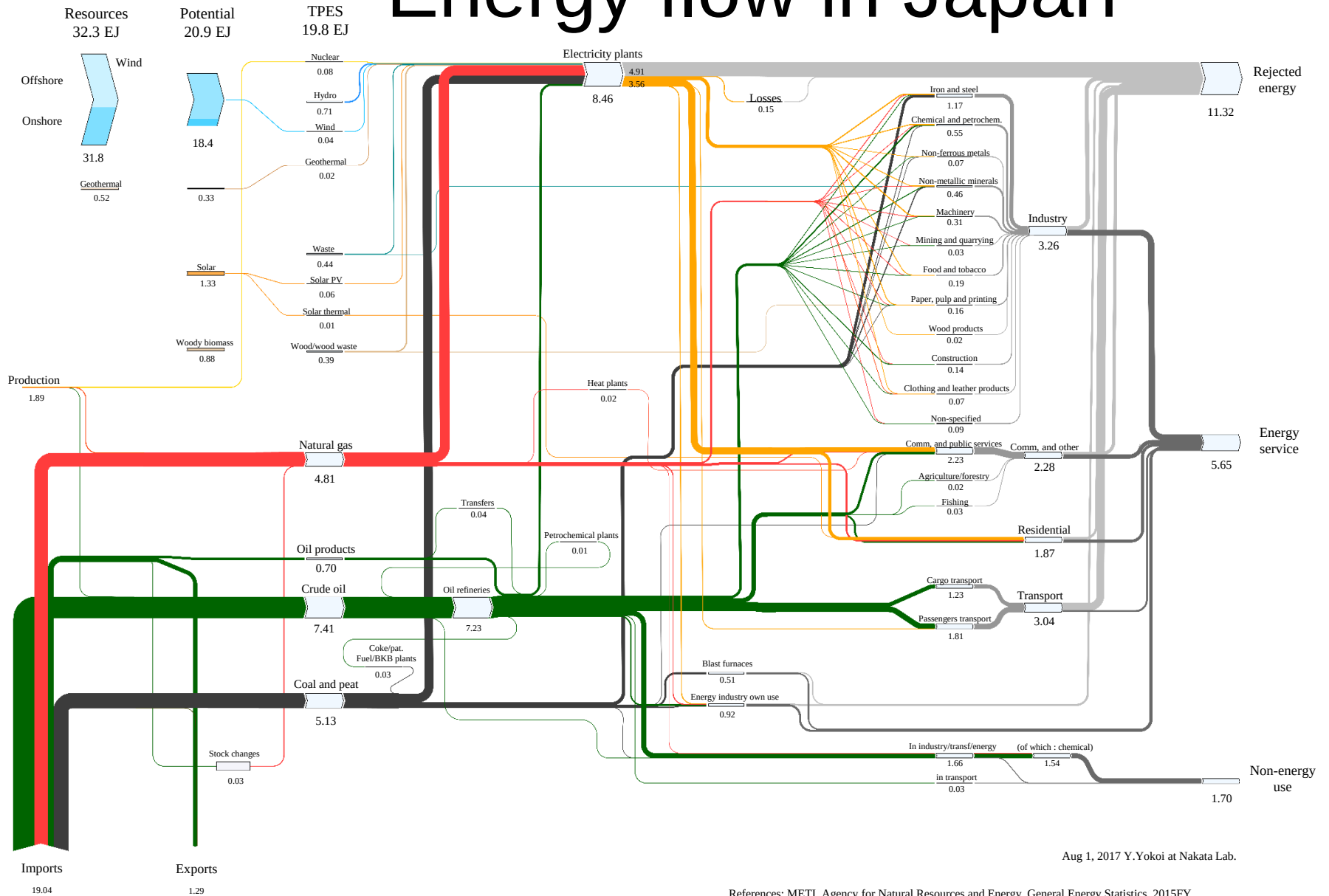


Figure 7.1 | Illustrative energy supply paths shown in order to illustrate the boundaries of the energy supply sector as defined in this report. The self-generation of heat and power in the end-use sectors (i.e., transport, buildings, industry, and Agriculture, Forestry, and Other Land Use (AFOLU)) is discussed in Chapters 8–11.

Energy flow in the world. 2014



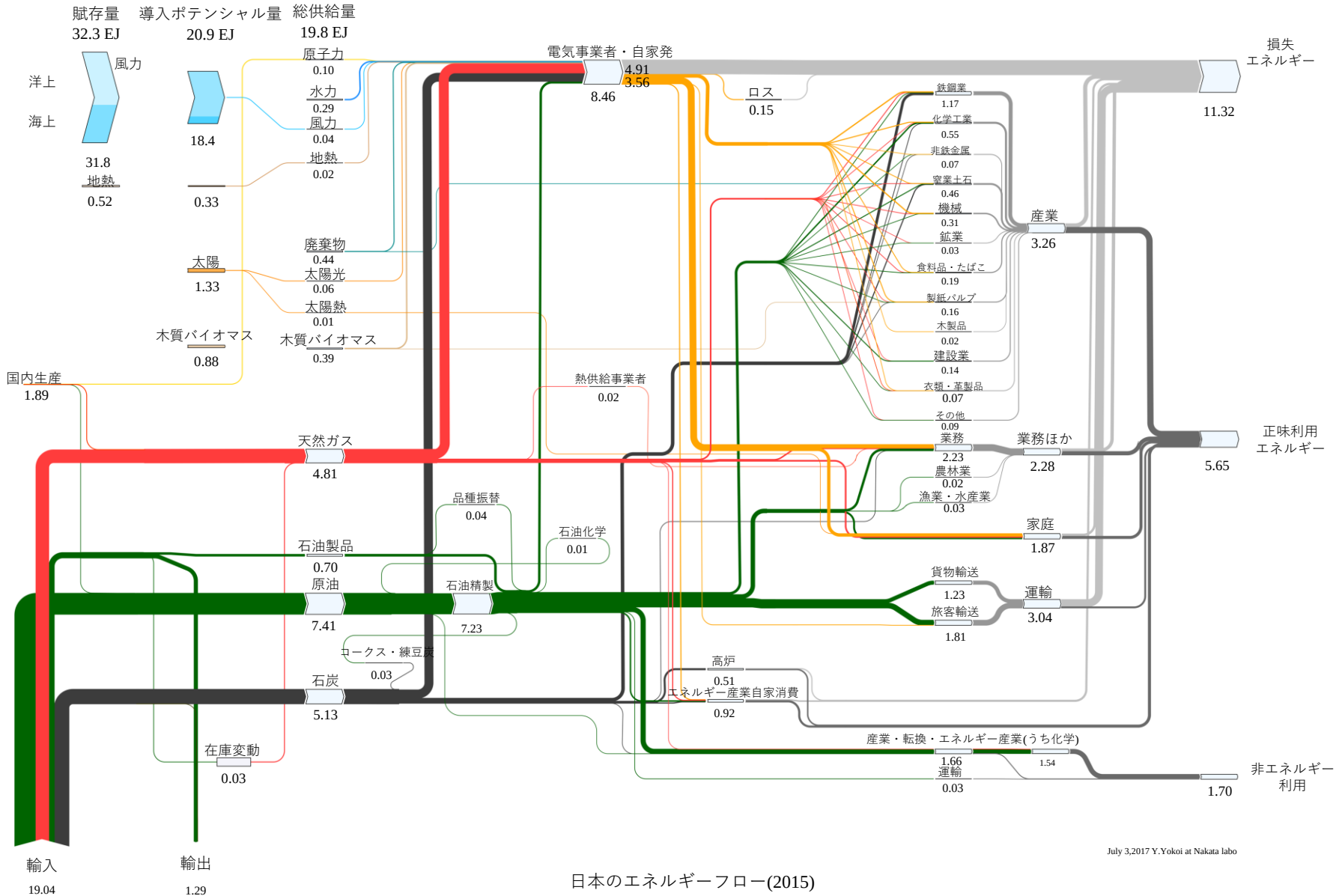
Energy flow in Japan



Aug 1, 2017 Y.Yokoi at Nakata Lab.

References: METI, Agency for Natural Resources and Energy, General Energy Statistics, 2015FY
Kondo, Energy and energy utilization efficiencies in the Japanese residential/commercial sectors, 2009 etc.

Energy flow in Japan



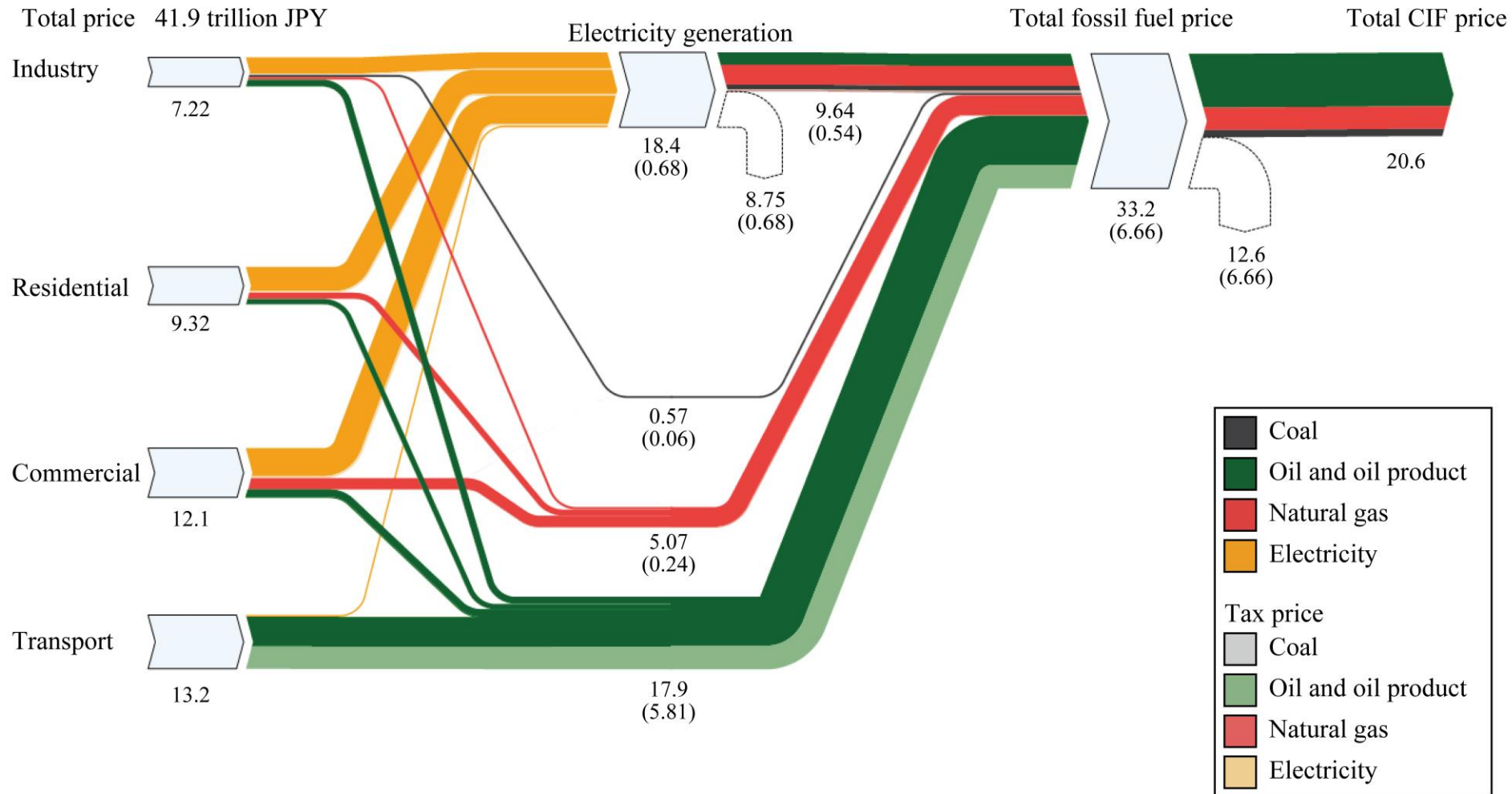
July 3, 2017 Y.Yokoi at Nakata labo

日本のエネルギーフロー(2015)

Reference: 資源エネルギー庁, 総合エネルギー統計, 2015年度
Kondo, Energy and energy utilization efficiencies in the Japanese residential/commercial sectors, 2009 etc

Energy cash in Japan

Japan fossil fuel cash flow (2012)

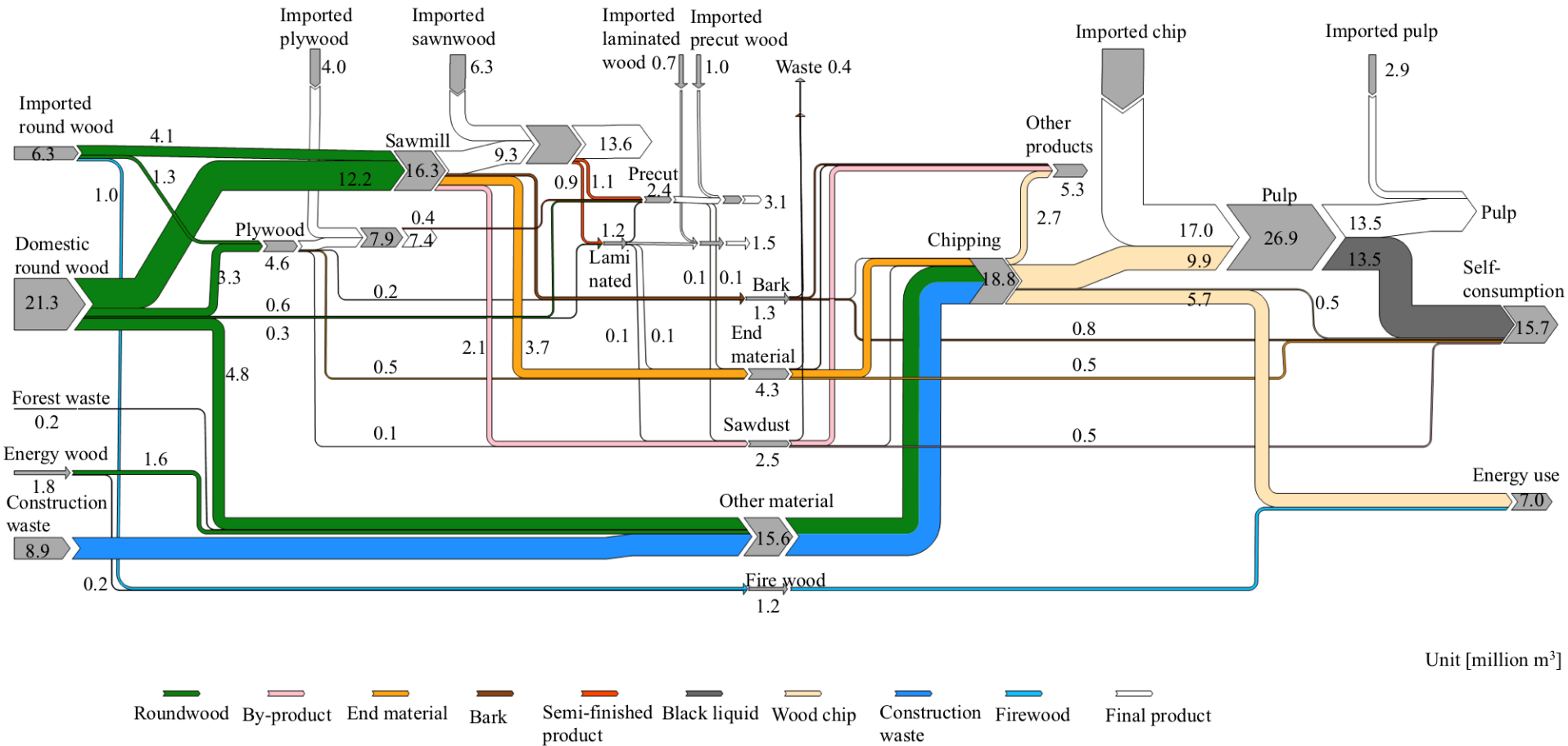


Reference: IEA, Energy Prices & Taxes 4th Quarter 2013.

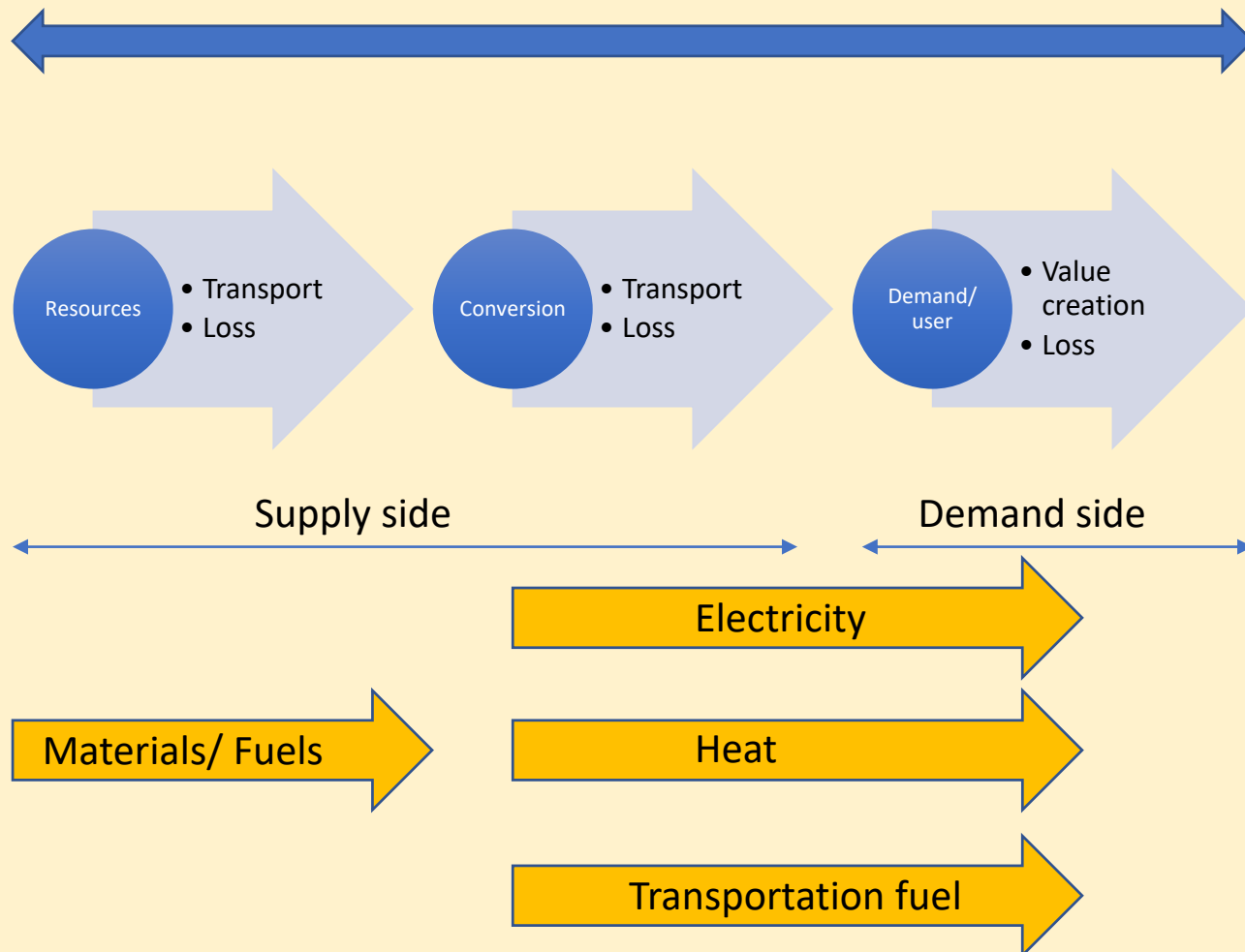
IEA, Energy Balances of OECD Countries 2014. IEA, Renewable Informations 2014.

BP, BP Statistical Review of World Energy June 2014

Wood flow in Japan



Energy system analysis & integration



Solution for energy system integration

- A) Spatial energy information based on scientific evidence
- B) Sector coupling
- C) Transition to zero carbon society



A) Spatial energy information

Final energy consumption by cities

<推計手法>

産業部門

製造品は製造品出荷額により按分

非製造業は就業者数で按分

家庭部門

世帯数で按分

業務部門

就業者数で按分

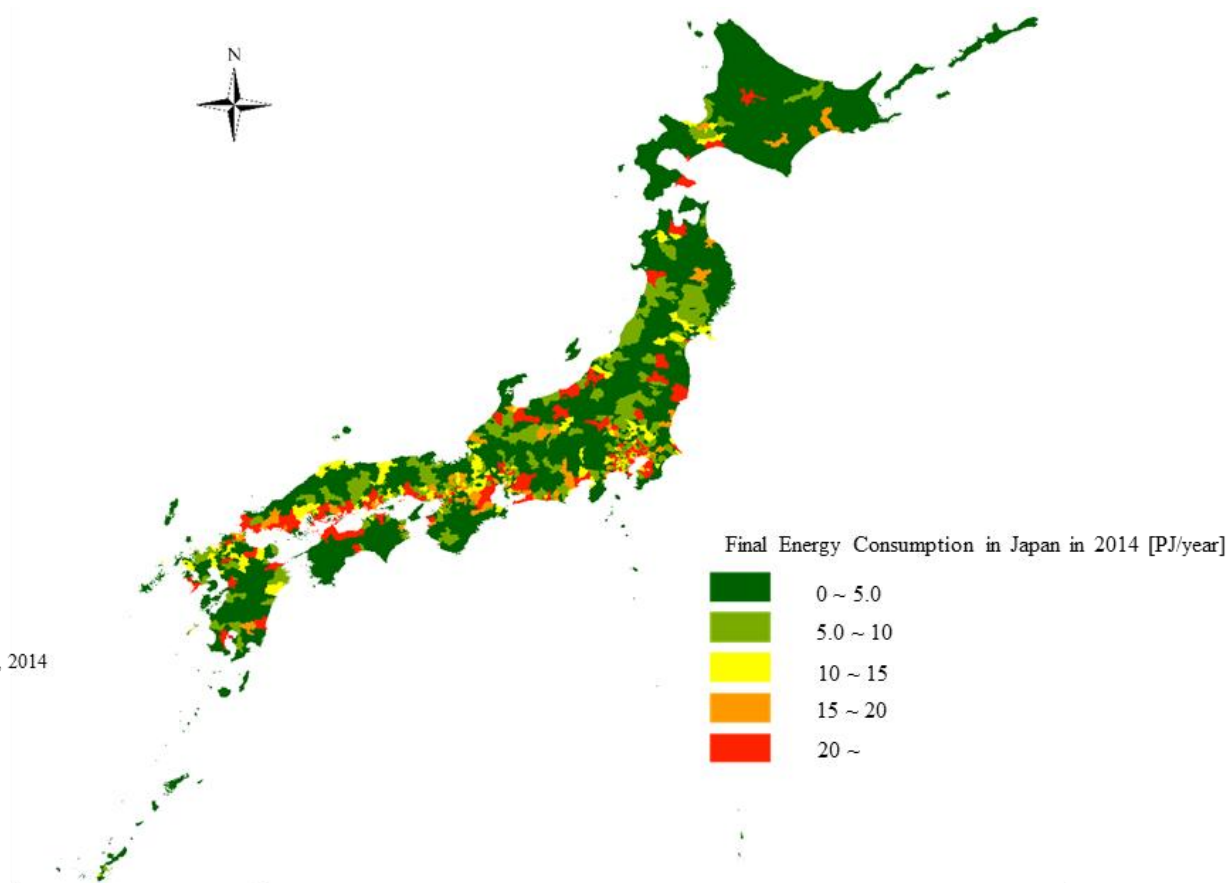
運輸部門

自動車保有台数で按分

Reference :

- ・経済産業省資源エネルギー庁, 都道府県別エネルギー消費統計, 2014
- ・総務省統計局, 国勢調査, 平成22年
 - > 家庭世帯数
 - 産業別就業者数
- ・経済産業省, 工業統計調査, 平成24年
 - > 産業別製造品出荷額及び付加価値額
- ・運輸局
 - > 自動車保有台数

など



日本の最終エネルギー消費量分布(2014)

A) Spatial energy information

Regional
condition A

- Life style
- Demand
- Density
- Biomass

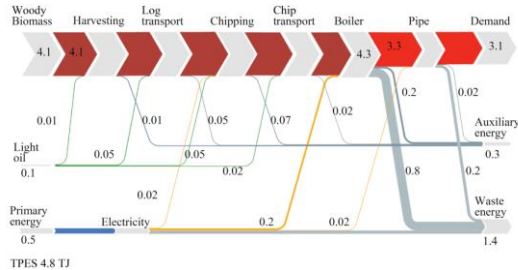
Regional
condition B

Regional
condition C

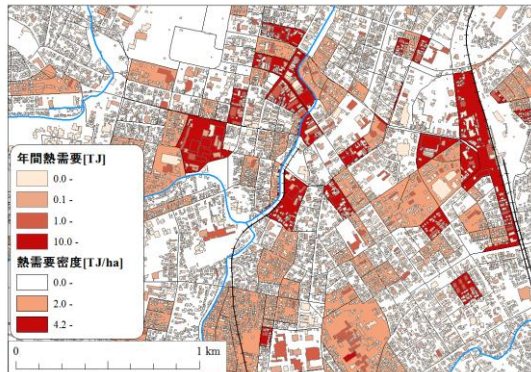
Common characteristics

- Conventional oil/gas/electricity infrastructure
- Changes in energy/utility business
- Carbon emission mitigation targets
- Imported fuel markets
- Stakeholders in energy planning

A) Spatial energy information for system integration

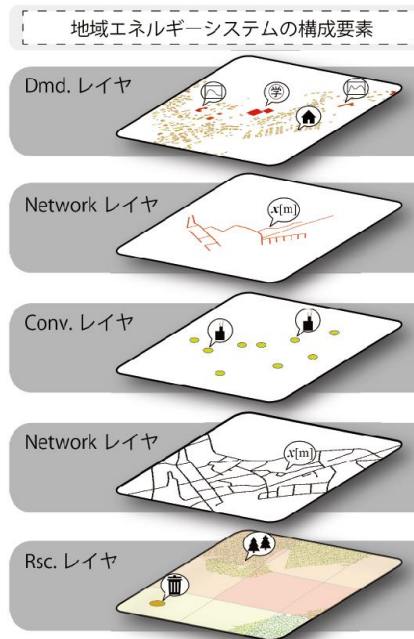


Input: Energy flow

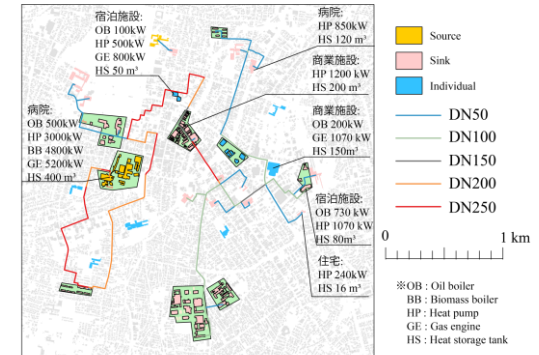


Input: Energy map

Demand/Supply matching



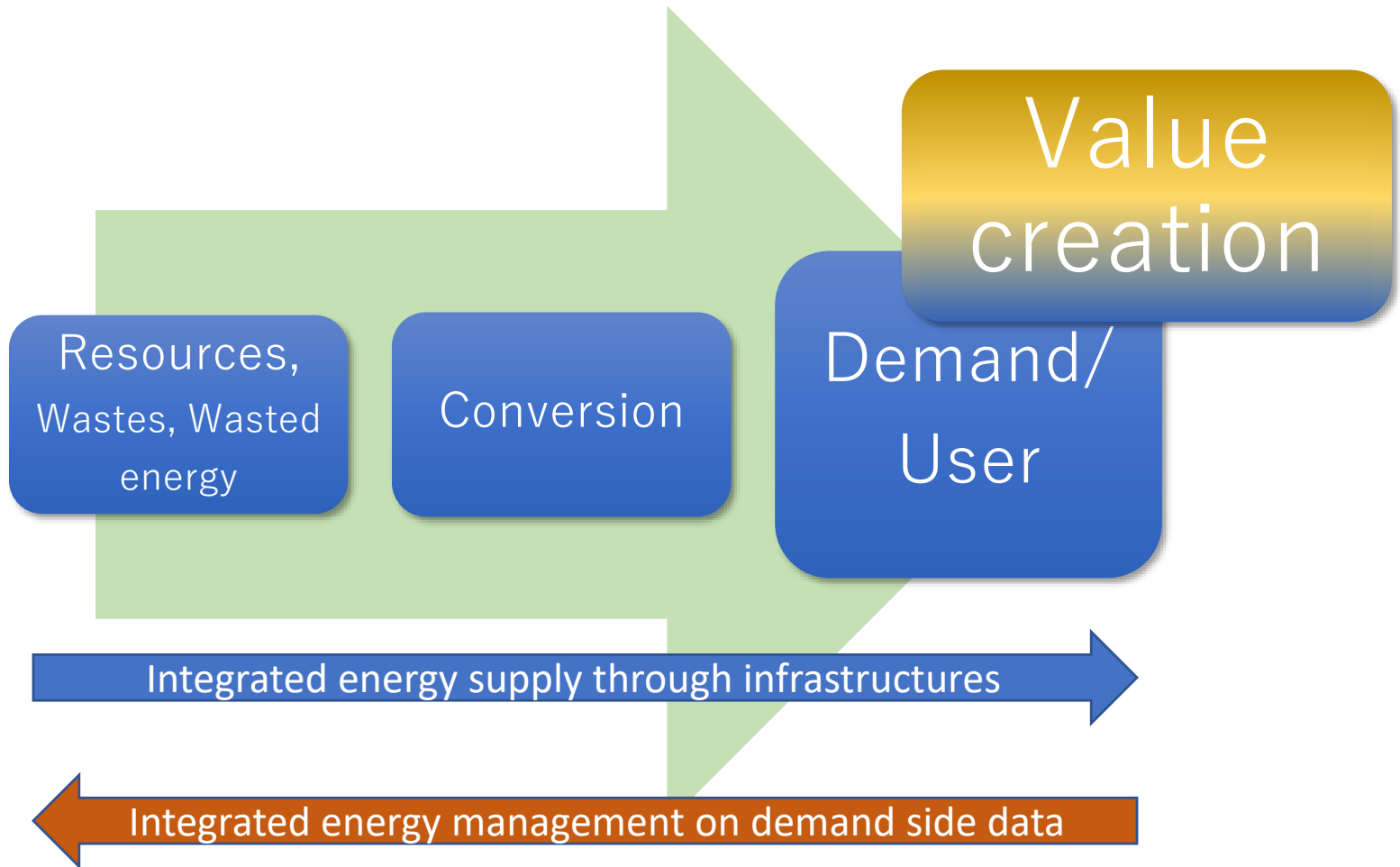
Spatial optimization



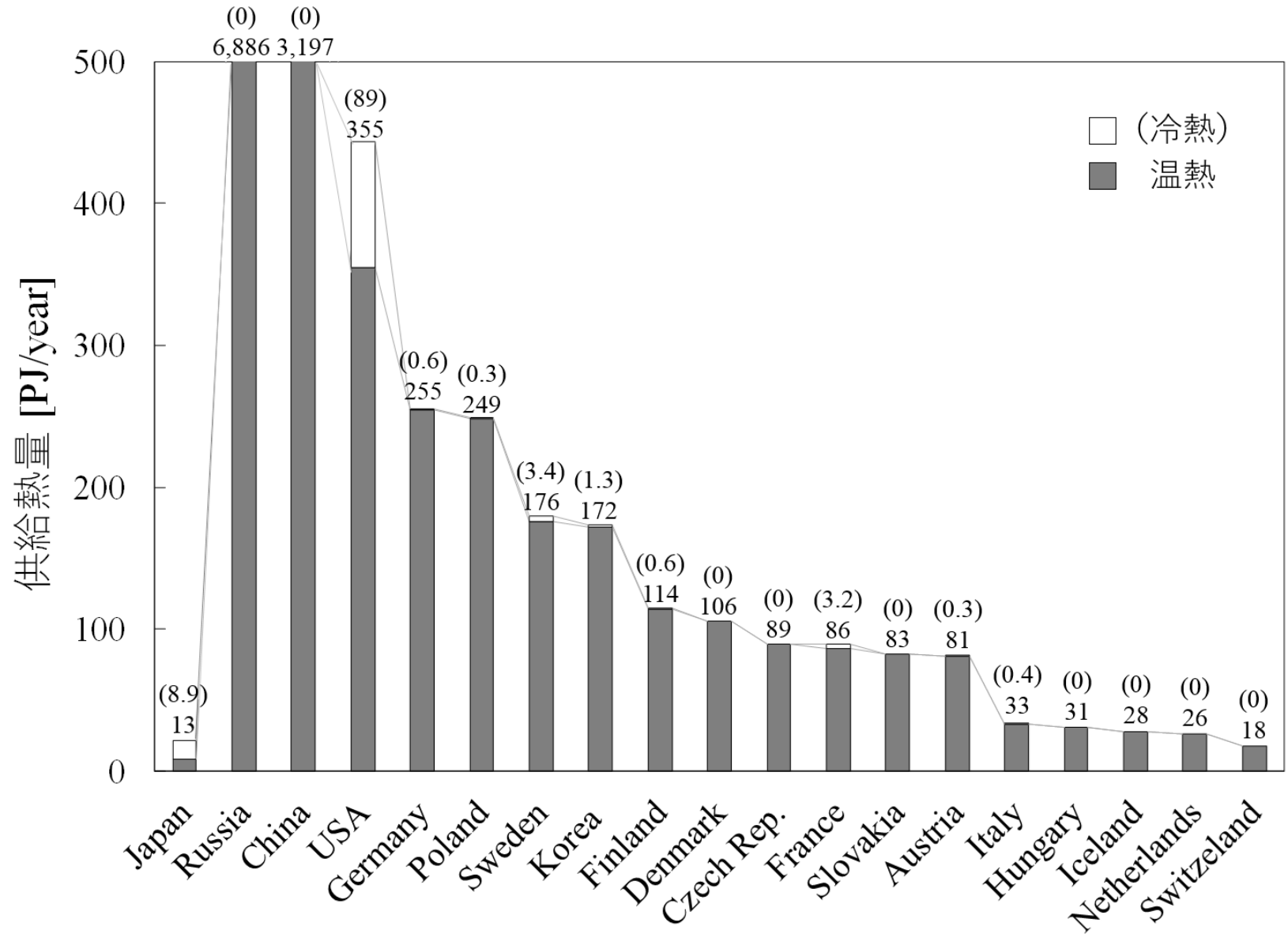
- CO₂ emissions
- Energy security
- Energy efficiency
- Sustainability
- Economic

Output: Infrastructure

B) Sector coupling



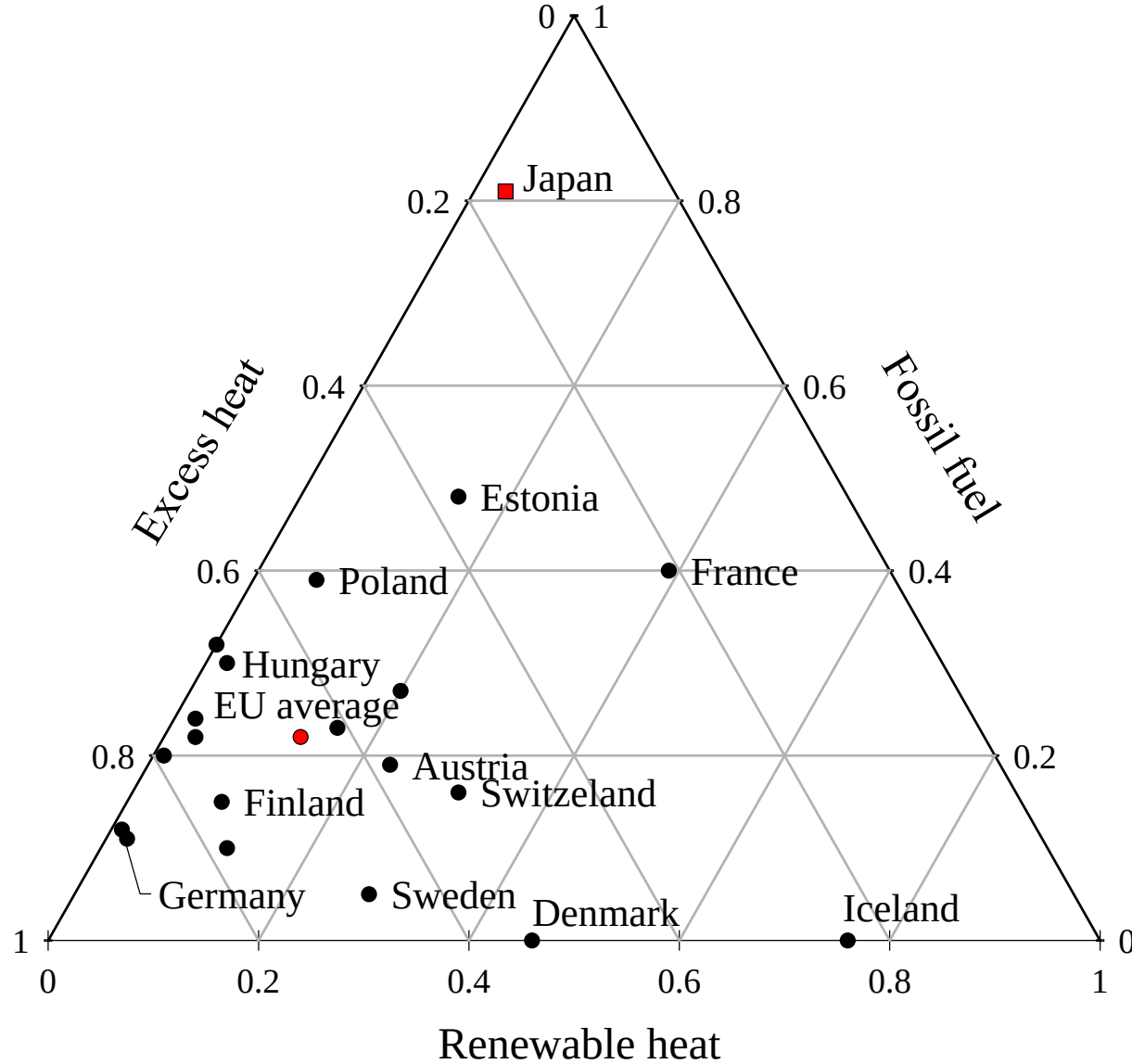
Heat supply by DHS



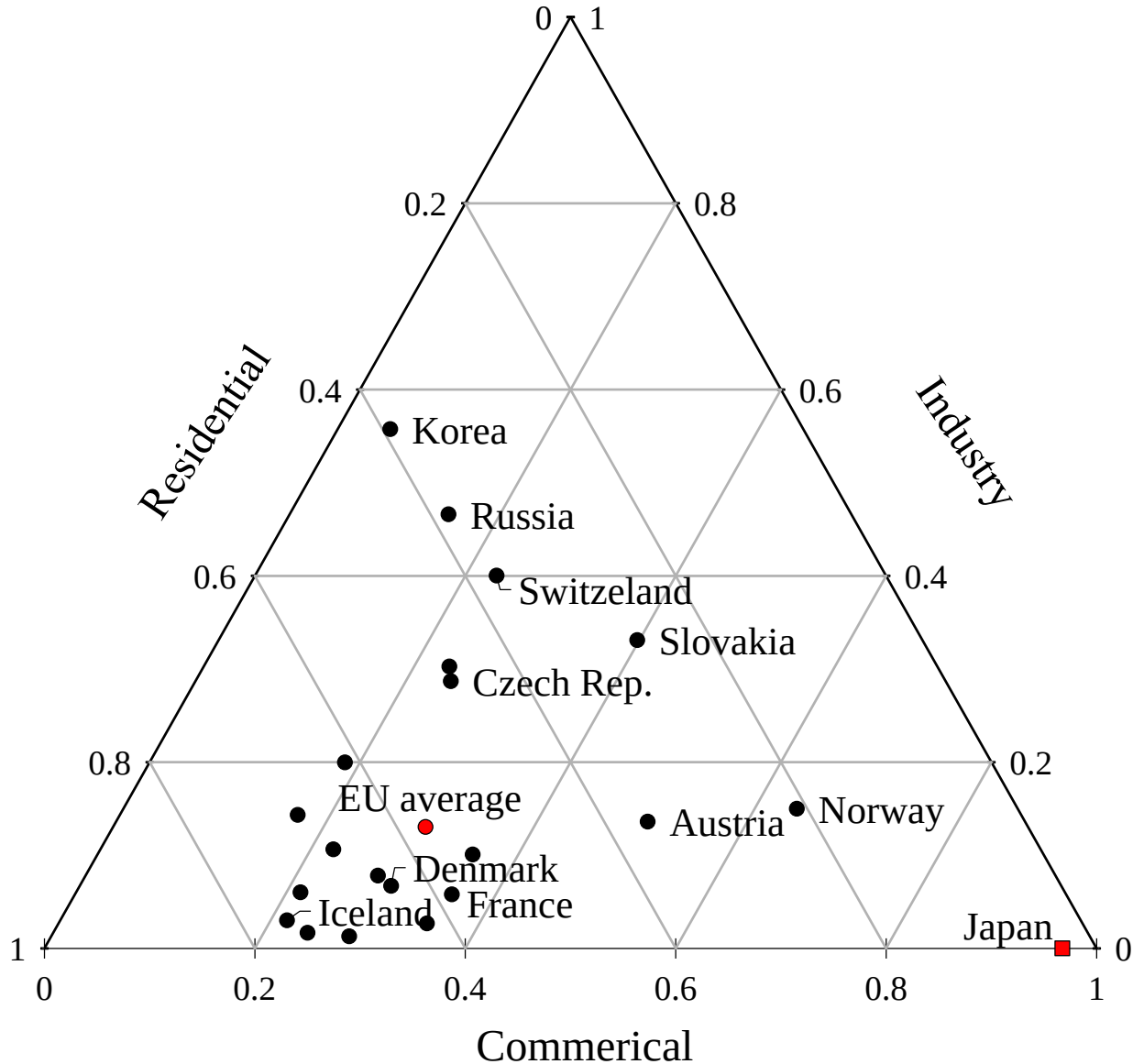
参考 EUROHEAT & POWER, 2015 Country by country – Statistics overview (2013 data)

熱供給事業便覧 平成28年度版, (社) 日本熱供給事業協会, 2017 等

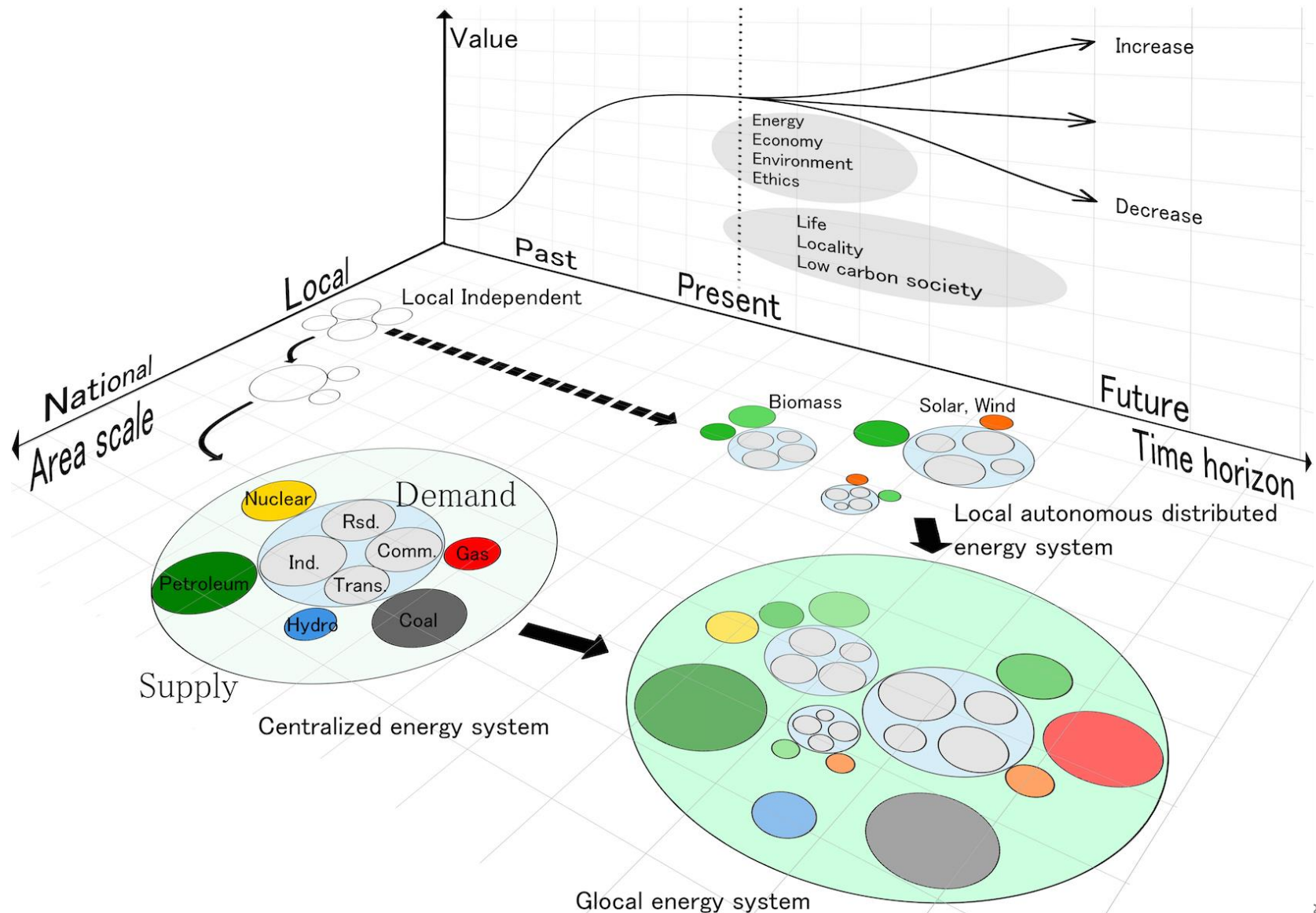
Share of fuel resources in DHS



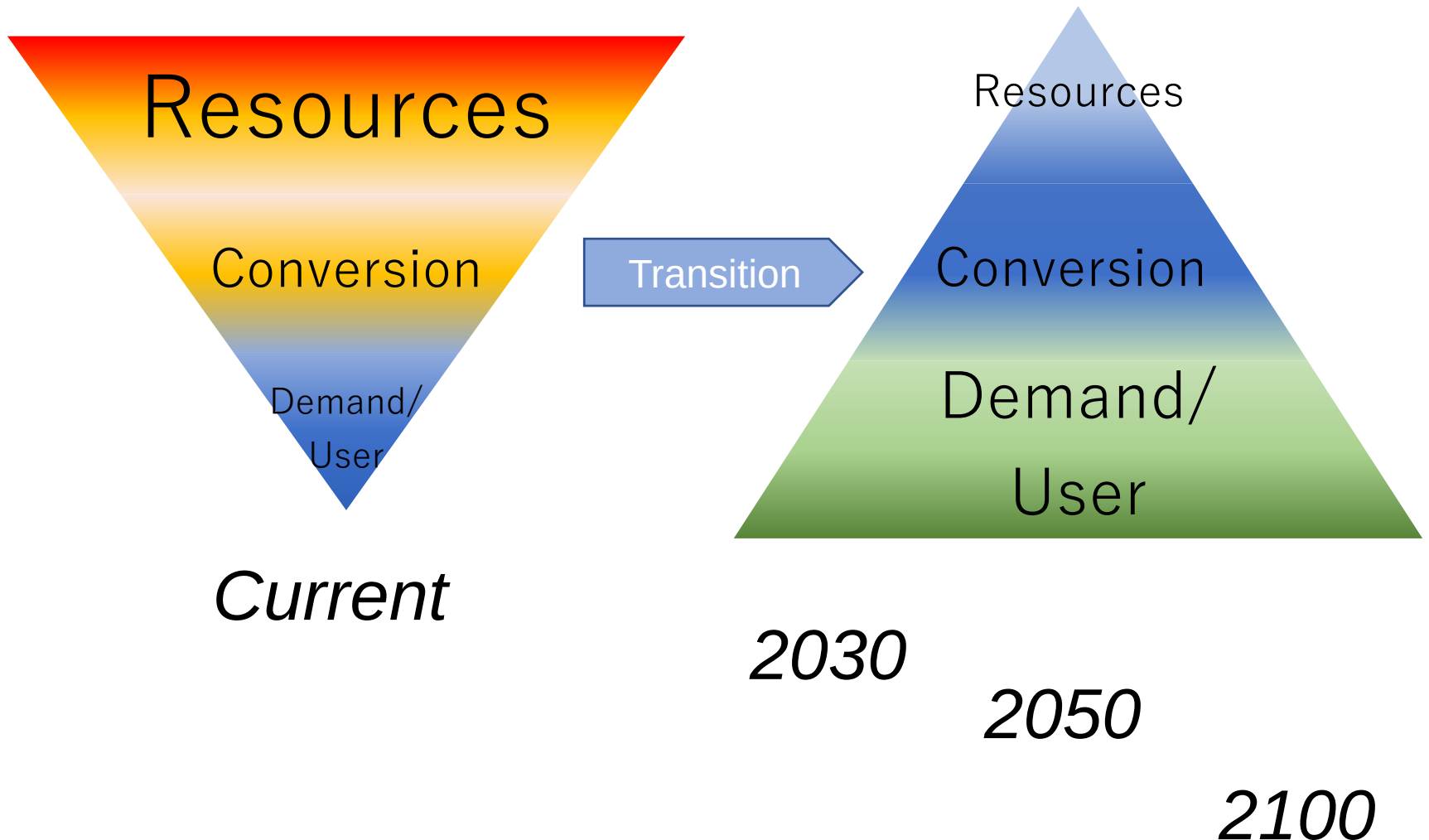
Share of demand sector in DHS



C) Transition to zero carbon society



C) Transition to zero carbon society



Integrated design & analysis for energy systems

A) Spatial integration w scientific evidence

Energy map, Logistics, Infrastructure

B) Sector coupling

Energy flow, Energy efficiency, Environment

C) Transition to zero carbon society

Regional energy planning

Regional carbon management





Welcome to the Laboratory