HOKKAIDO UNIVERSITY

Title	Application of the UNI metrics to two universities: Hokkaido University and Politecnico di Torino
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Description	大学改革シンポジウム　サステイナブルキャンパス国際シンポジウム2013 : 地域と連携したサステイナブルキャンパスの構築. 2013年11月6日(水). 北海道大学学術交流会館講堂. 札幌.
Issue Date	2013-11-06
Doc URL	https://hdl.handle.net/2115/53987
Type	conference presentation
File Information	05_Fujii_131106_SW2013.pdf, 発表スライド

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Application of the UNI metrics to two universities: Hokkaido University and Politecnico di Torino (サステナビリティに関する大学評価指標の適用: 北大とトリノ工科大の場合)

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Oct. 6, 2013 International symposium on sustainable campus creation

1. Introduction
(はじめに)

2. Application of the UNI metrics
(サステナビリティに関する大学評価指標の適用)

2.1. to the entire campus
(大学全体への適用)

2.2. to specific faculties
(特定部局への適用)

3. Suggestion for better metrics
(評価指標の改善に向けた提言)

Sustainable campus activities
(サステナブルキャンパス活動)

- University's corporate social responsibility to reduce environmental burdens
  (大学の社会的責任としてのキャンパス内の環境負荷削減)

- Self-education and enlightenment to students and staffs on campus who engage in such activities
  (キャンパス構成員(学生・教職員)の自己啓発)

- Testing bench for new technology and policy for sustainability
  (サステナビリティに関する新しい技術や政策の試験的導入)

Hokkaido University Sapporo Campus as a "miniature town" ("社会の縮図"北大札幌キャンパス)

- Large daytime population of ca. 22,000, consisting of students and staffs (昼間人口約22,000人)
- Wide farms as well as many facilities such as cafeterias, supermarkets, book stores, barbers, hospitals etc. (農場、食堂、売店、書店、床屋、病院など多様な施設)
- Trial experiments and measures for reducing environmental burdens can be applied to the campus (教育研究目的のパイロット実験の実施に最適)



Fact (事実)

- Hokkaido University is one of the largest business institutions in Hokkaido Prefecture
  (北大は道内最大の一般事業所)
- 0.1% of Hokkaido's greenhouse gas emission from Hokkaido University (Yamada et al., 2011)
  (道内のCO_2排出量の0.1%は北大から)
- The current CO_2 emission from Hokkaido University has been doubling since 1990
  (cf. the Japan's emission reduction target under the Kyoto Protocol is 6% of the 1990 level)
  (キャンパス内のCO_2排出量は1990年から倍増)

→ The CO_2 reduction on campus is socially required
(キャンパス内のCO_2削減が社会的に求められる)

UNI-METRICS






In collaboration with:

enter the site to read more about UNI-METRICS project

UNI-metrics stands for **Value Metrics and Policies for a Sustainable University Campus.** It is a EU project financed by the European Commission under the 7th Framework Program within the Marie Curie Actions IRSES-International Research Staff Exchange Scheme (Grant agreement number PIRSES-GA-2010-269161) and coordinated by the Politecnico di Torino, Italy.
The primary goal of the project is to strengthen research partnerships among the four partner organizations (in Italy, United Kingdom, The Netherlands and Japan) who share a similar concept of sustainable development and an interdisciplinary research approach. The project is also closely linked to practical activities in the participating institutions The mission of UNIMETRICS is to increase the environmental sustainability of University Campuses as complex areas insisting on the urban space and to promote the quality of universities services and utilities.

UNIMETRICS is coordinated by the Politecnico di Torino. The Consortium is composed by the following partners: Cambridge University (UK), Free University of Amsterdam (NL) and Hokkaido University (JP).

UNI-metrics is a multi-disciplinary project which is based on a working hypothesis that "value-based metrics" can be found and interoperated in the intersection between actors, buildings and cities, and be integrated in policy-making. Based on the expertise of each partner and links to a number of ongoing projects and previous research on sustainability metrics and policies, the project aims at elevating their scientific competence, research quality and education in the field of sustainable university campuses, metrics and policies.

The overall goal of this initiative is to foster collaboration between like-minded scientists on a problem that ranks high in societal importance. More specifically, the goals to be achieved during the exchange program are:

UNI metrics
(サステナビリティに関する大学評価指標)

Four clusters (4つのクラスター)

1. Integration with the surrounding & land use (周囲の環境と土地利用)

2. Quality & efficiency of the built environment (建物の質と効率)

3. Quality of education & utilities (教育と設備の質)

4. Research & third mission (研究と"第3のミッション")

Quality & Efficiency of the built environment
(建物の質と効率)

Indicator (評価指標)	Indicator (評価指標)
Certified built environment	Waste production
Pith of outdoor areas	Food sovereignty
Sewage management level	Percentage of population less than 300 m away from services
Water resource management level	Accessibility to the public transport
Water consumption level	Average distance between intersections
Rate of wastewater collection and treatment	Contiguity of bicycle and car routes
Wastewater sent out of the zone to municipal treatment plants	Fuel efficiency of university vehicles
Energy consumption level	Low emissions university vehicles
Energy sustainability	Faculty/staff modal split
Climate change mitigation	Bicycle sharing
CO_2 balance	Carpool matching

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(大学全体への適用)

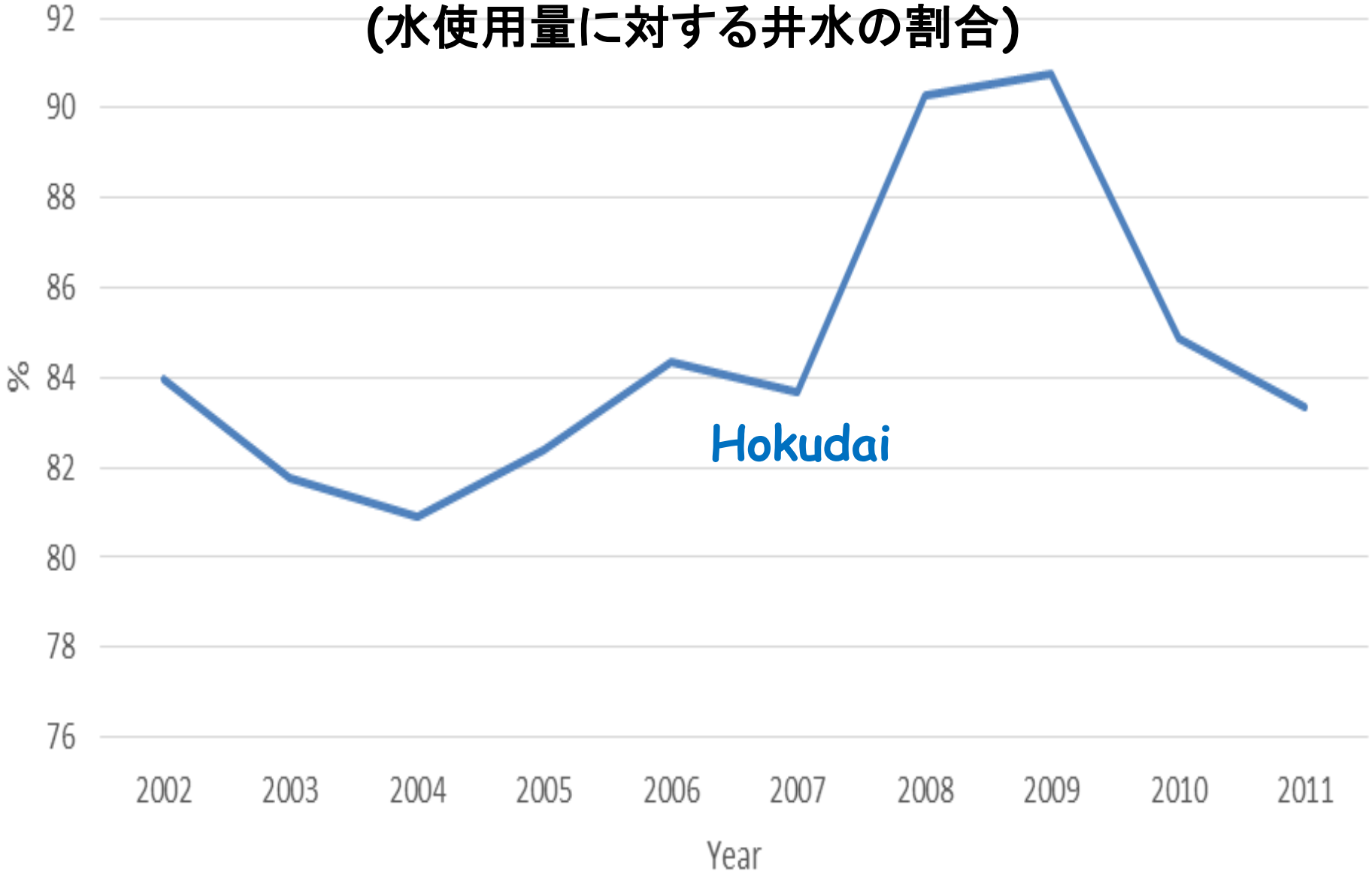
2.2. to specific faculties
(特定部局への適用)

3. Suggestion for better metrics
(評価指標の改善に向けた提言)

Water resource management level

(Water supplied from inside plant/ Consumed water)

(水使用量に対する井水の割合)



Water consumption level

(Water supplied from the town water system)

(水道水消費量)

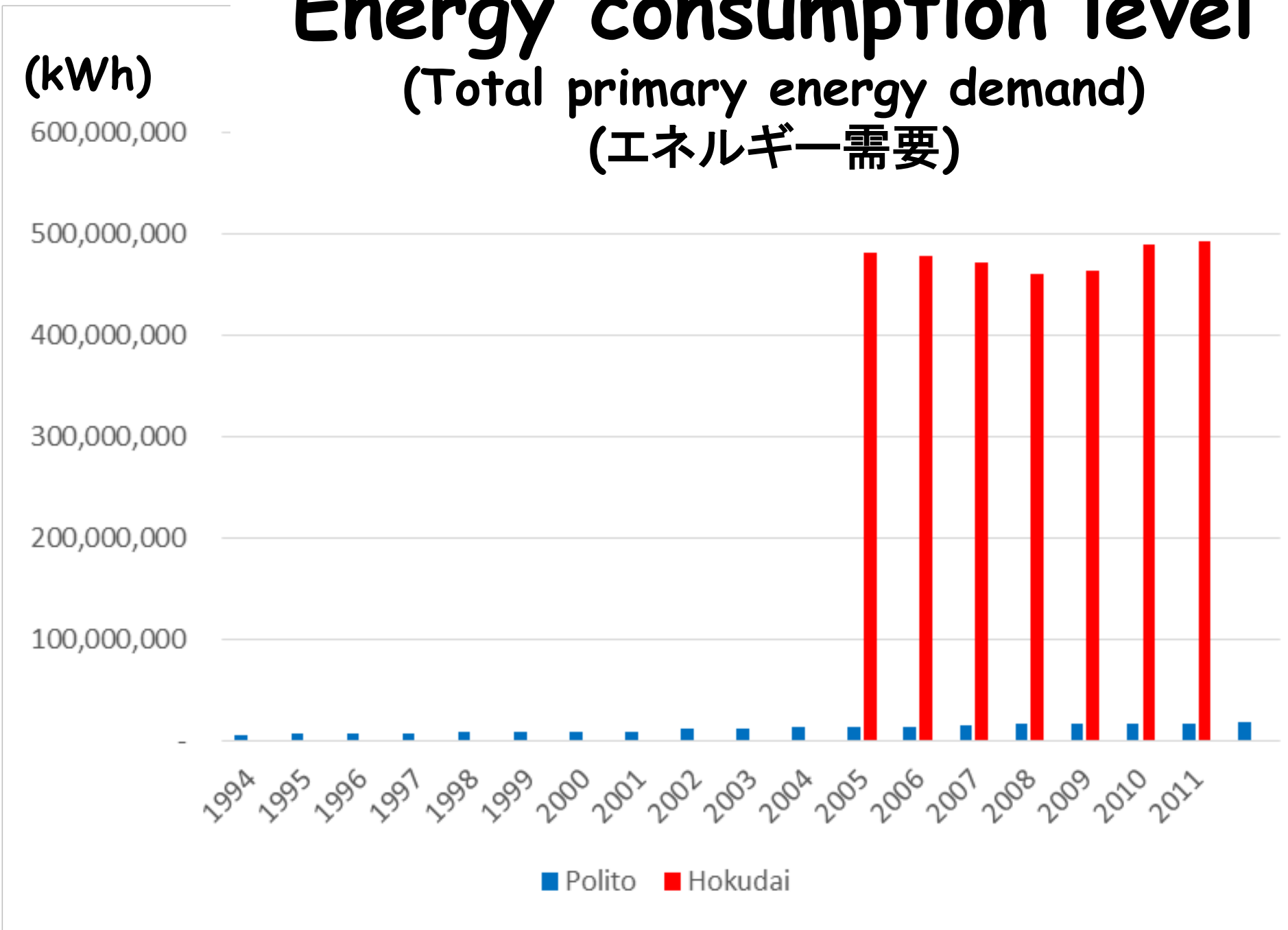


Start of implementation of automatic taps with sensors at Hokudai (2007/2008)
(北大、2007/2008年自動水栓導入開始)

Energy consumption level

(Total primary energy demand)

(エネルギー需要)



Energy sustainability

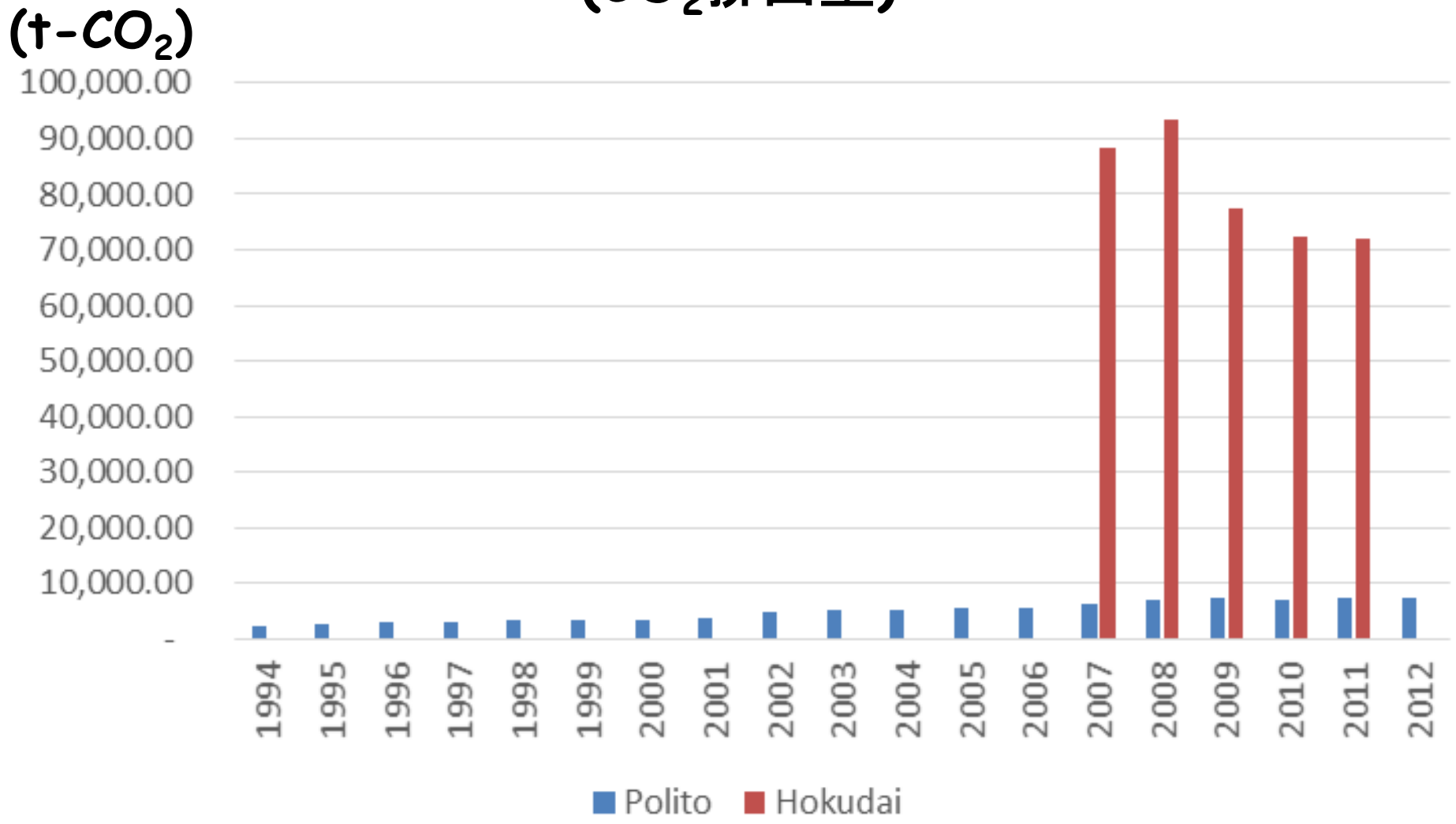
(Renewable energy produced / Total primary energy demand inside the campus)
(エネルギーの持続可能性)

Hokudai	Polito
0.08% (2011) 96% by cogeneration (熱電併給) 3% by photovoltaic (太陽光発電) 1% by geothermal heat pump (地中熱ヒートポンプ)	0.12% (2012) by photovoltaic (太陽光発電)

Climate change mitigation

(Tons of CO_2 produced)

(CO_2排出量)



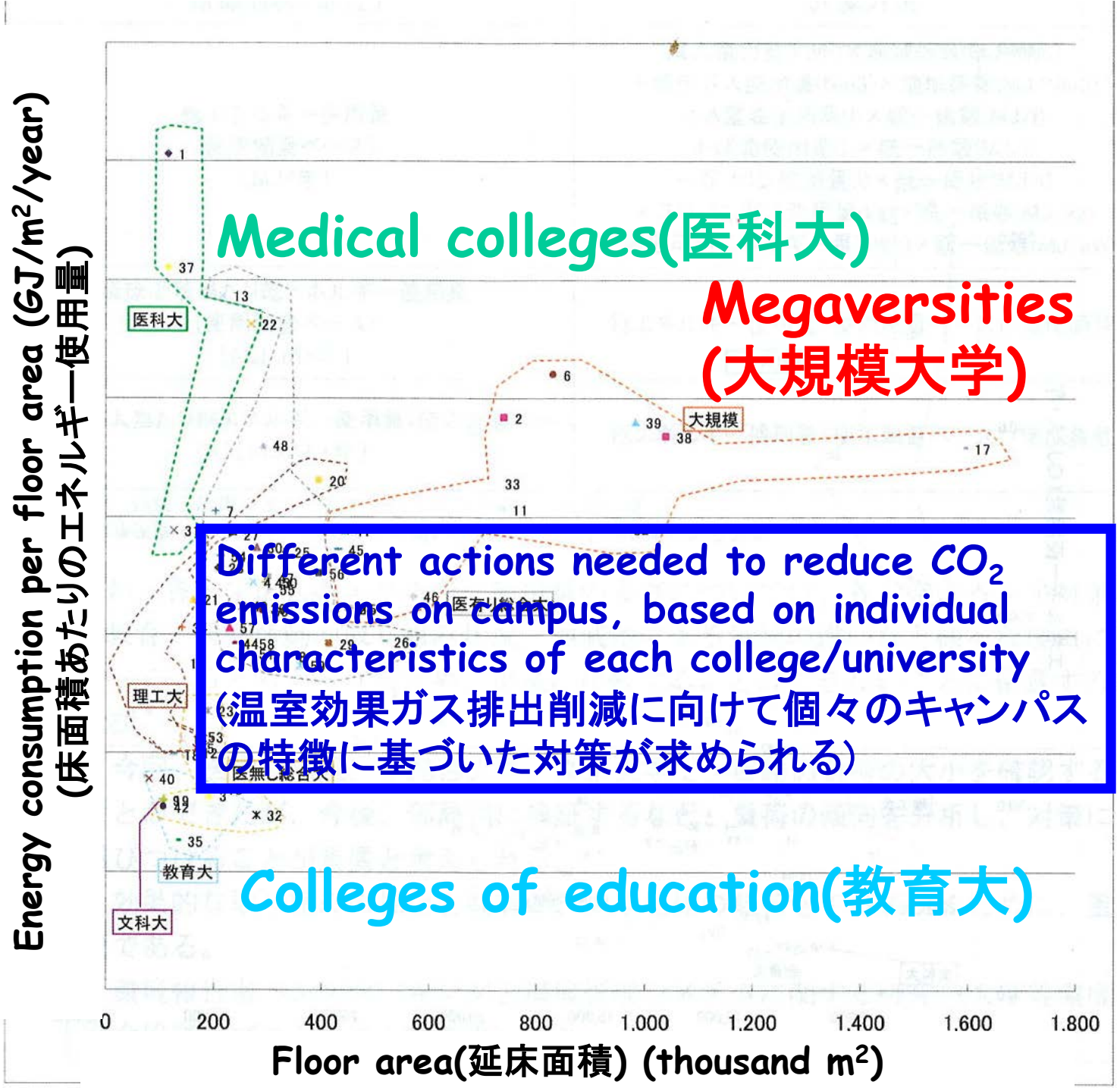
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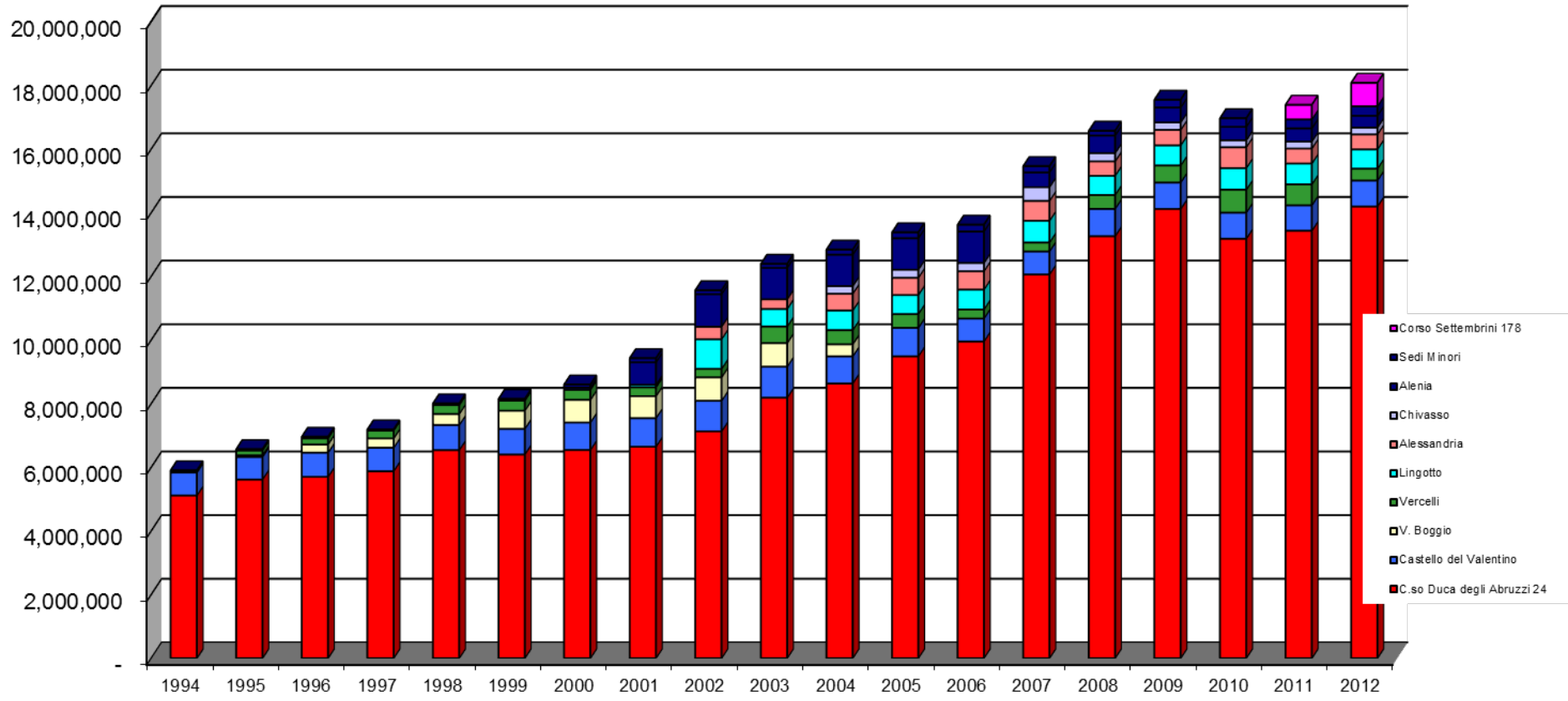
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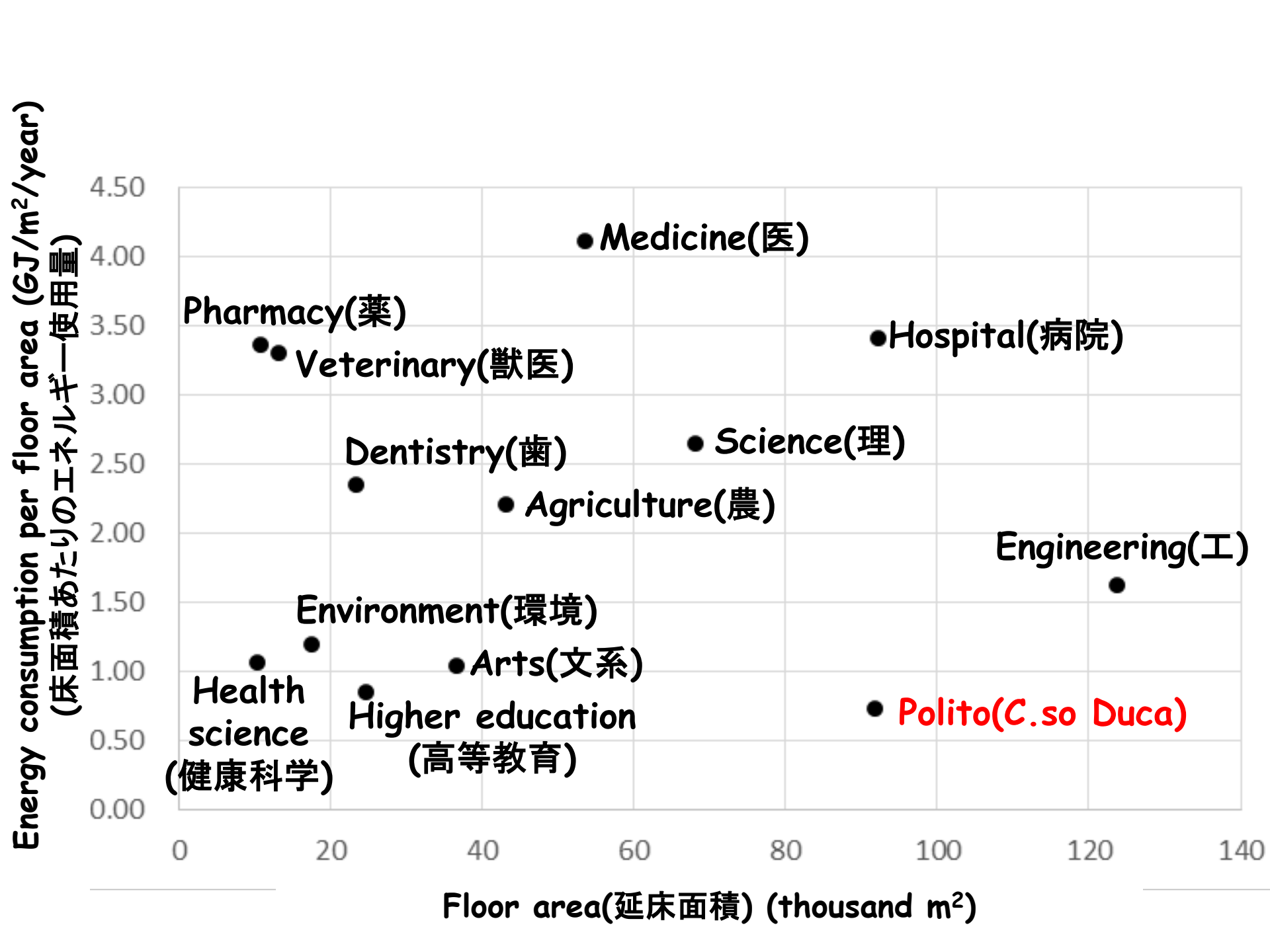
(文部科学省（2010）：施設マネジメントに関するベンチマーク手法
－国立大学法人等における良好なストックの形成を目指して－.)

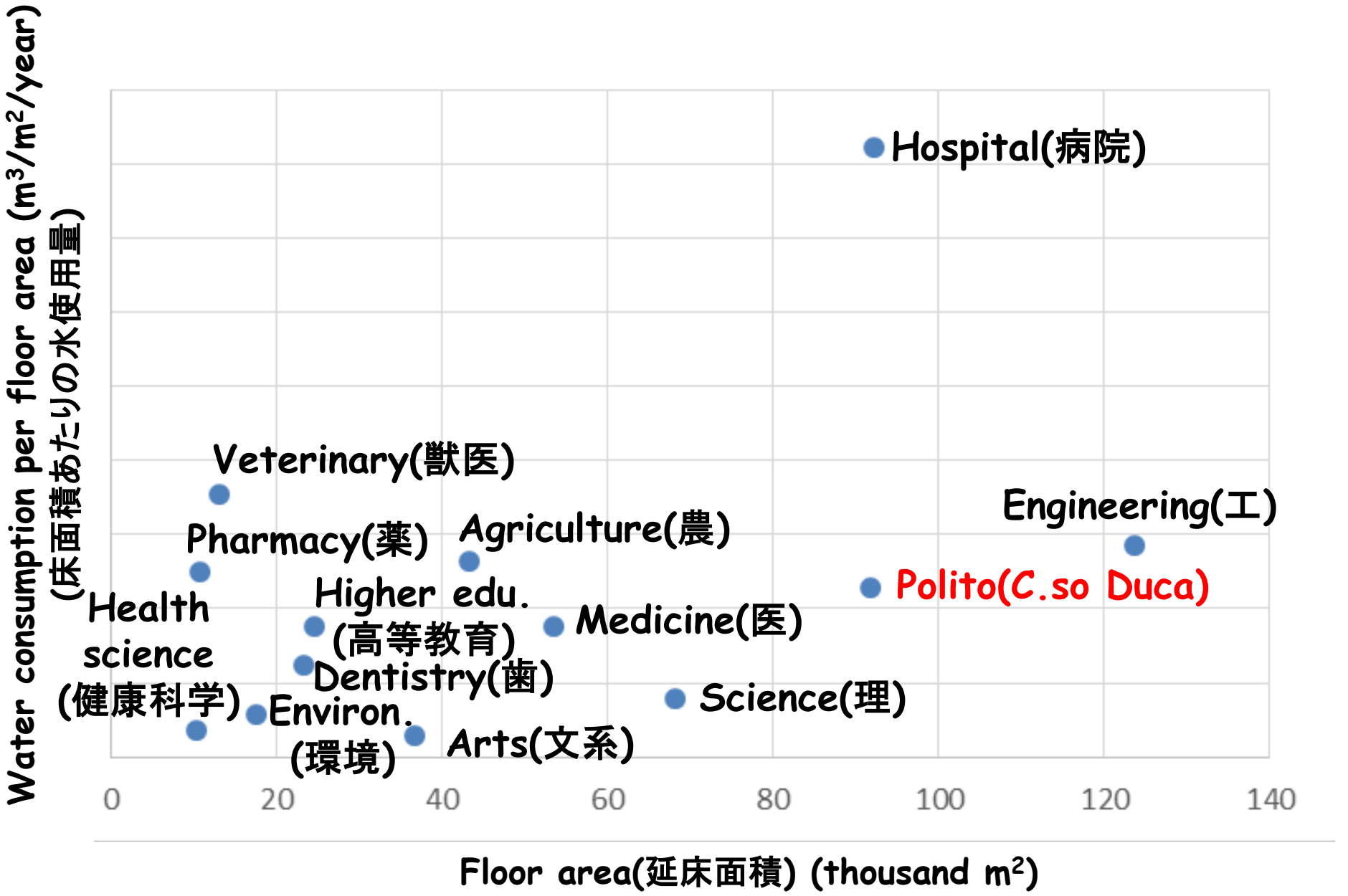
Electric power consumption at Polito
(トリノ工科大学の電力使用量)

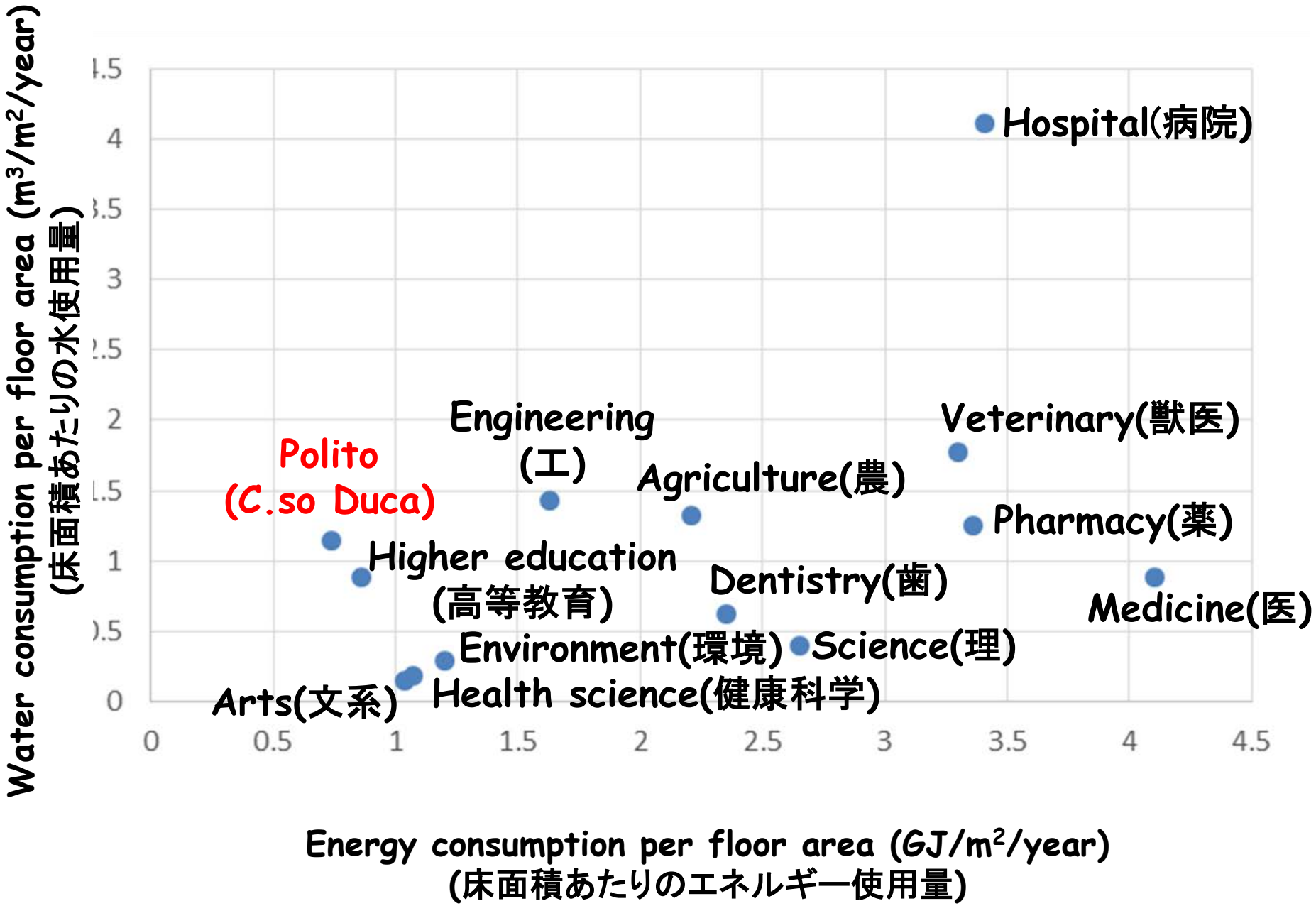
(kWh)



Ufficio Energia


Energy consumption per floor area (GJ/m²/year)
(床面積あたりのエネルギー使用量)
4.50
4.00
3.50
3.00
2.50
2.00
1.50
1.00
0.50
0.00
0
20
40
60
80
100
120
140
Floor area(延床面積) (thousand m²)
Medicine(医)
Pharmacy(薬)
Veterinary(獣医)
Hospital(病院)
Science(理)
Dentistry(歯)
Agriculture(農)
Engineering(工)
Environment(環境)
Arts(文系)
Health science (健康科学)
Higher education (高等教育)
Polito(C.so Duca)


Water consumption per floor area (m³/m²/year)
(床面積あたりの水使用量)
Hospital(病院)
Veterinary(獣医)
Engineering(工)
Pharmacy(薬)
Agriculture(農)
Polito(C.so Duca)
Higher edu.
(高等教育)
Health
science
(健康科学)
Medicine(医)
Dentistry(歯)
Science(理)
Environ.
(環境)
Arts(文系)
0
20
40
60
80
100
120
140
Floor area(延床面積) (thousand m²)


Water consumption per floor area (m³/m²/year)
(床面積あたりの水使用量)
Energy consumption per floor area (GJ/m²/year)
(床面積あたりのエネルギー使用量)
Hospital(病院)
Veterinary(獣医)
Engineering
(工)
Agriculture(農)
Polito
(C.so Duca)
Pharmacy(薬)
Higher education
(高等教育)
Dentistry(歯)
Medicine(医)
Environment(環境)
Science(理)
Arts(文系)
Health science(健康科学)
0
0.5
1
1.5
2
2.5
3
3.5
4
4.5

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(1) Quantity and quality of data (データの充実)

- Some metrics could not be evaluated because of lack of data (データ欠損のため評価できない指標の存在)

- Many metrics are expressed by per capita

→Exact data for the number of population on campus are necessary
("1人当たり"で定義される評価指標の見積もりには
キャンパス人口の精確な把握が必要)

- Uncertainty arising from different data source: smart metering vs. bills (データ源の違いによって生じる不確実性)

(2) Clarifying spatiotemporal scales (時空間規模の明確な定義化)

- Unclear definition of spatiotemporal scales in applying the metrics (評価指標を適用すべき時空間規模が不明瞭)

- Definition of locality (for energy and CO_2 absorption by trees) (エネルギーの地産地消などを評価する際の領域の定義づけ)

- Definition of a base year for evaluation (基準年の設定)
  - Time scale of climate change: tens of years (気候変化は数十年規模)
  - Different CO_2 emissions intensity with year (CO_2排出原単位は年によって異なる)

(3) New metrics for new good practice (新たな試みを後押しする評価指標の導入)

Good practice such as:

- Renewable energy certificates (already introduced in Polito!!) (グリーン電力購入)
- Visualiation (見える化)

Acknowledgements (謝辞)

- Office for a sustainable campus, Hokudai (北大サステナブルキャンパス推進本部の皆様)

- Prof. Patrizia Lombardi, Ms. Giulia Sonetti, Dr. Koki Kikuta and other Polito members

- Prof. Shinichi Arai and Hokudai Sustainable Low-carbon Society Project (荒井眞一教授並びに北大持続可能な低炭素社会プロジェクトの皆様)

- My students (指導学生の皆様)