WELCOME TO THE 13th CONFERENCE ON SUSTAINABLE DEVELOPMENT OF ENERGY, WATER AND ENVIRONMENT SYSTEMS

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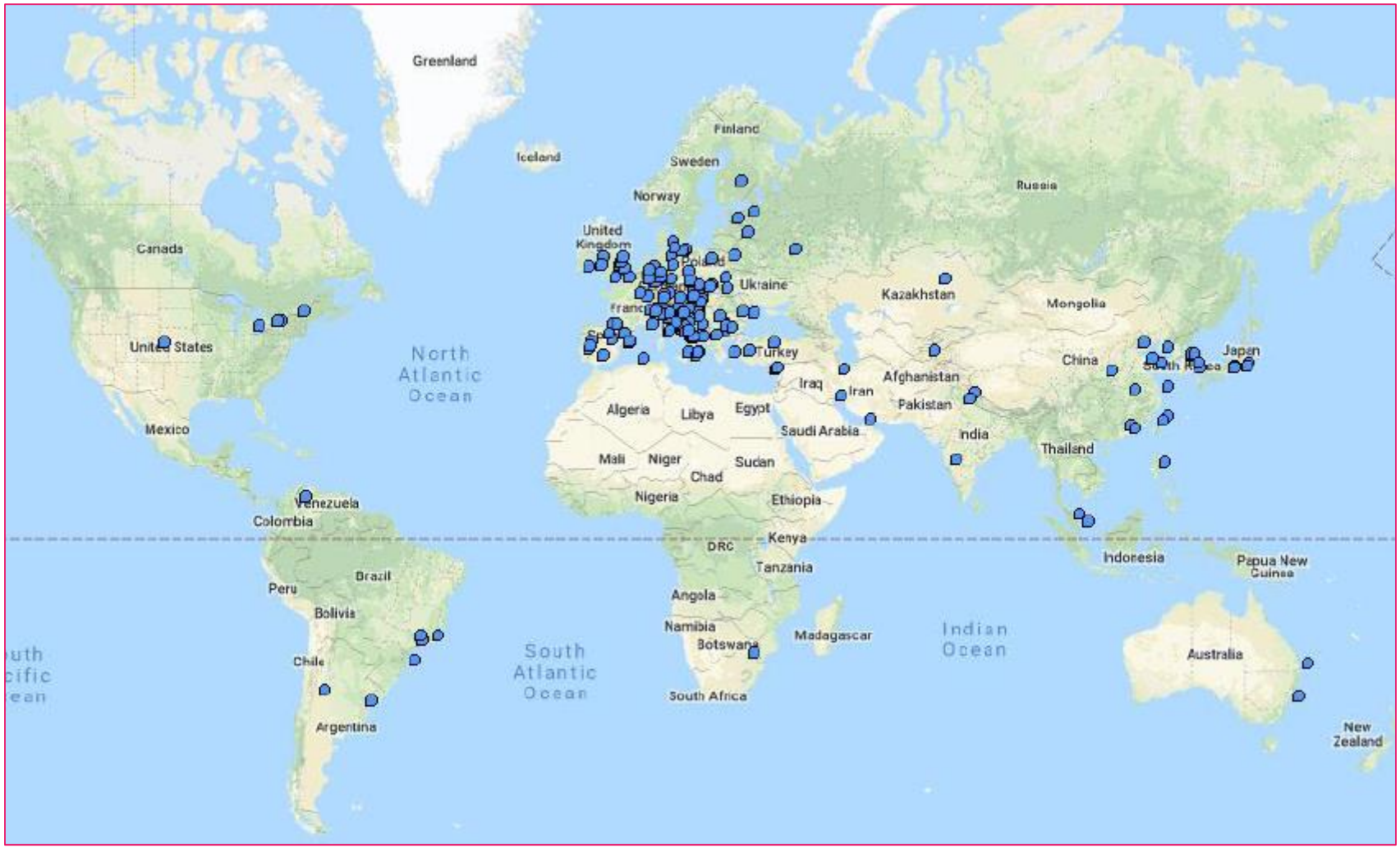


Around **400** participants coming from **49** countries, **215** universities, institutes and companies

OUR PARTICIPANTS

SDEWES Conference series

1st - 12th Conference on Sustainable Development of Energy, Water and Environment Systems

2002, 2003, 2005, 2007, 2009, 2011,
2012, 2013, 2014, 2015, 2016, 2017 …
SEE 2014, 2016, 2018 …
LA 2018…
University of Zagreb + Instituto Superior Técnico

SDEWES Conference series

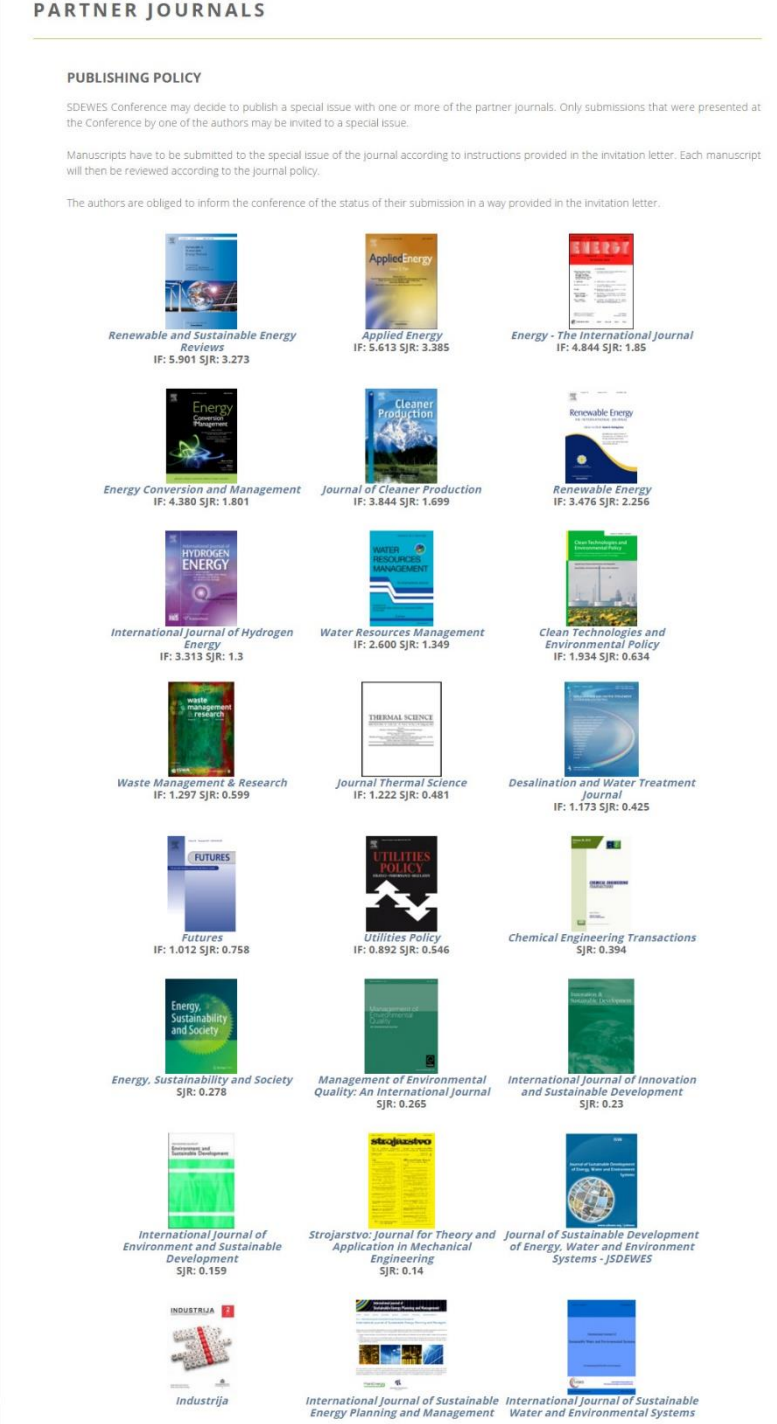
	2002	2003	2005	2007	2009	2011	2012	2013	2014	2015	2016	2017	2018
COUNTRIES	35	42	46	34	55	52	42	62	56	64	58	61	61
ATTENDED	140	83	134	132	329	418	211	559	320	534	490	563	**700+**
PRESENTED	98	96	158	230	349	398	231	601	326	532	535	602	**770?**
SUBMISSIONS	197	162	252	281	709	1029	607	1120	869	1204	1033	1036	**1276**
Sub/attended	1.4	2.0	1.9	2.1	2.2	2.5	2.9	2.0	2.7	2.3	2,1	1.84	1,82

13th sdewes Conference Palermo 2018

September 30 - October 4
Palermo, Italy

Published – over 1294 papers

- Renewable & Sustainable Energy Reviews
- Applied Energy
- Journal of Cleaner Production
- Energy Conversion and Management
- Energy
- Journal of Environmental Management
- International Journal of Hydrogen Energy
- Clean Technologies and Env. Policy
- Energies
- Waste Management & Research
- Thermal Science
- JSDEWES
- IJSEPM, EES, CET, IJISD, IJESD, MEQ
- http://www.sdewes.org/journals.php



JSDEWES Journal

- Editor-In-Chief: Neven Duić
- Online, open access, from 2013
  http://www.sdewes.org/jsdewes/
- Publisher: SDEWES Centre
- Indexed: SCOPUS, INSPEC, Hrcak, DOAJ, Google Scholar, Croatian Web Archive, National and University Library in Zagreb
- CiteScore 1.1 (Scopus)
- Web of Science Core Collection - Emerging Sources Citation index since 2016

- Use **#SDEWES** on Twitter and Facebook
- Tag yourself on **@sdewes.centre** pictures from the conference
- Papers must be presented by the presenting author
- AWARD session, Group Photo session, Poster session, Invited lecture …

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Sustainable or un-sustainable, that is the question

Neven Duić

University of Zagreb, Croatia

Editor: Energy Conversion and Management
Subject Editor: Energy
Editor-in-Chief: JSDEWES

SDEWES 2018 Palermo, October 1, 2018

Fear of Change

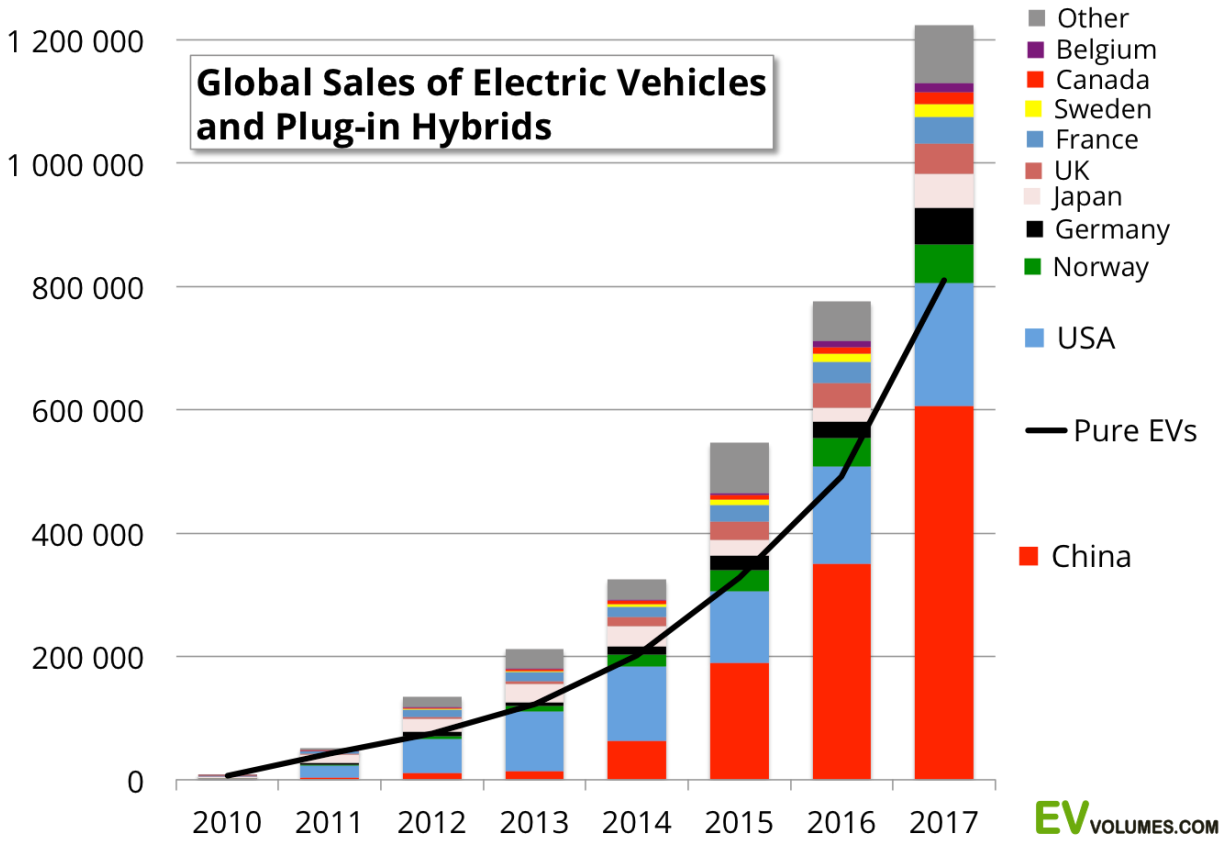
Ingo Stadler

http://www.rio2018.sdewes.org/lectures.php#IL1

How the Empire fights back …

Former SEC chair says Musk could be removed as CEO in civil case, go to jail if criminally charged

Transport electrification has started

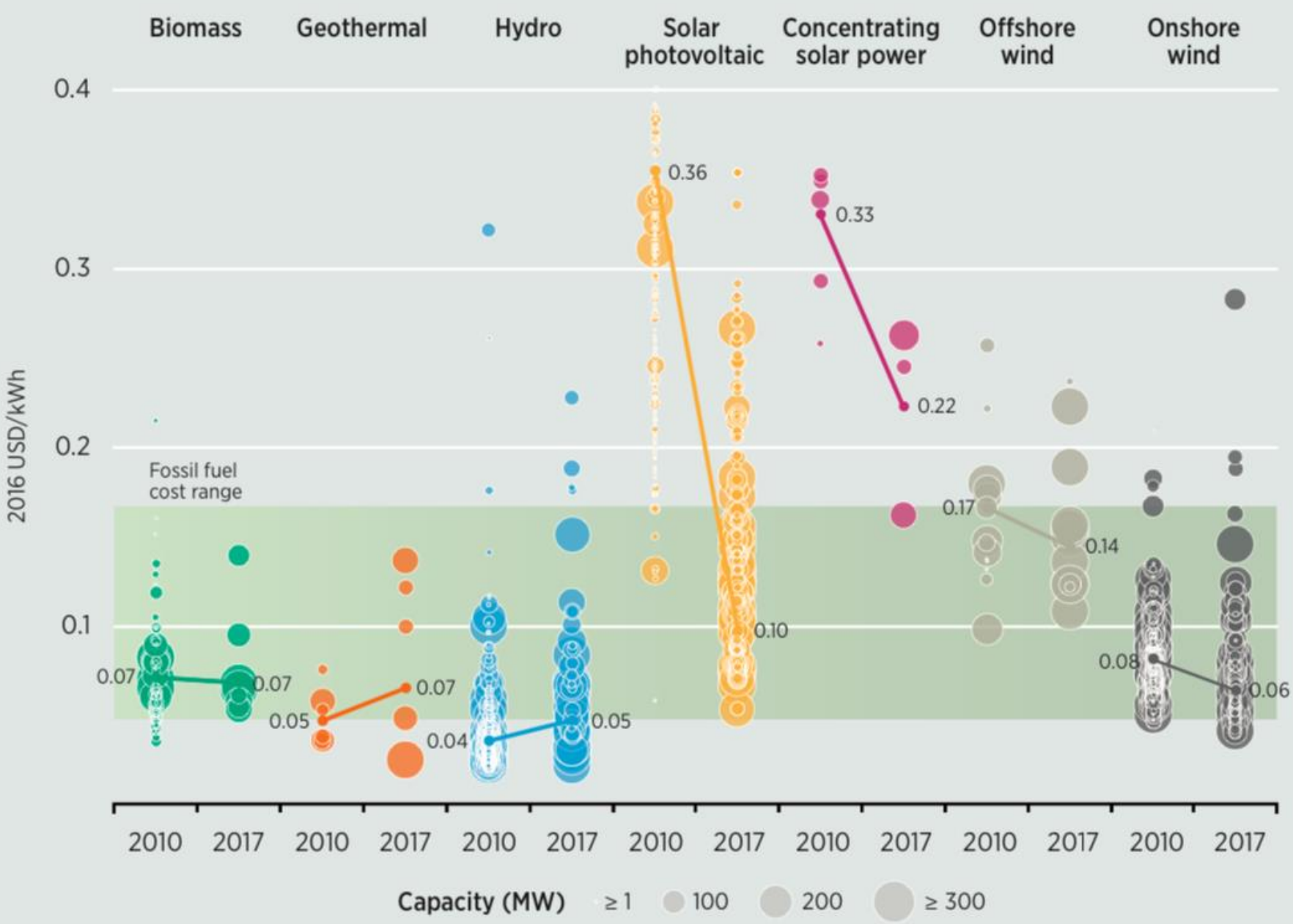


Global light vehicles sales in 2017

- 1.224 mln PHEV and BEV
- 94.5 mln total
- 1.3% global sales
- 57% PHEV and BEV sales growth
- 2.4% cars sales growth

Forecast for 2018:

- 2.1 mln PHEV and BEV

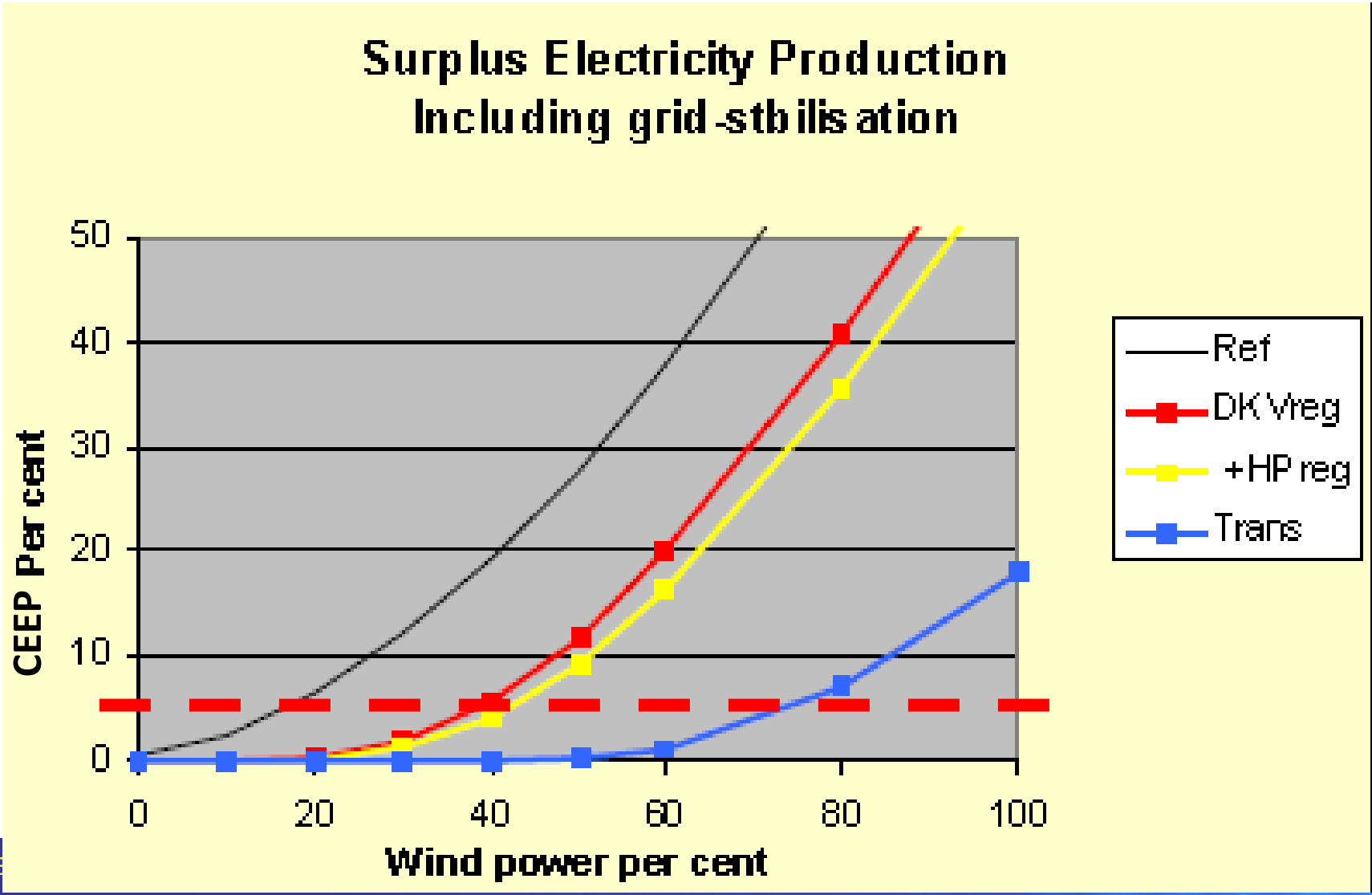

Biomass
Geothermal
Hydro
Solar photovoltaic
Concentrating solar power
Offshore wind
Onshore wind
0.4
0.3
0.2
0.1
2016 USD/kWh
Fossil fuel cost range
0.07
0.07
0.05
0.07
0.04
0.05
0.36
0.10
0.33
0.22
0.17
0.14
0.08
0.06
2010
2017
Capacity (MW)
≥ 1
100
200
≥ 300

How to solve renewables variability/intermittency problem?

- More grid interconnection
- Flexibilisation of thermal power plants
- Wholesale markets
- Demand response and integration of power, heating, cooling, transport and water systems – smart energy systems
- Energy storage

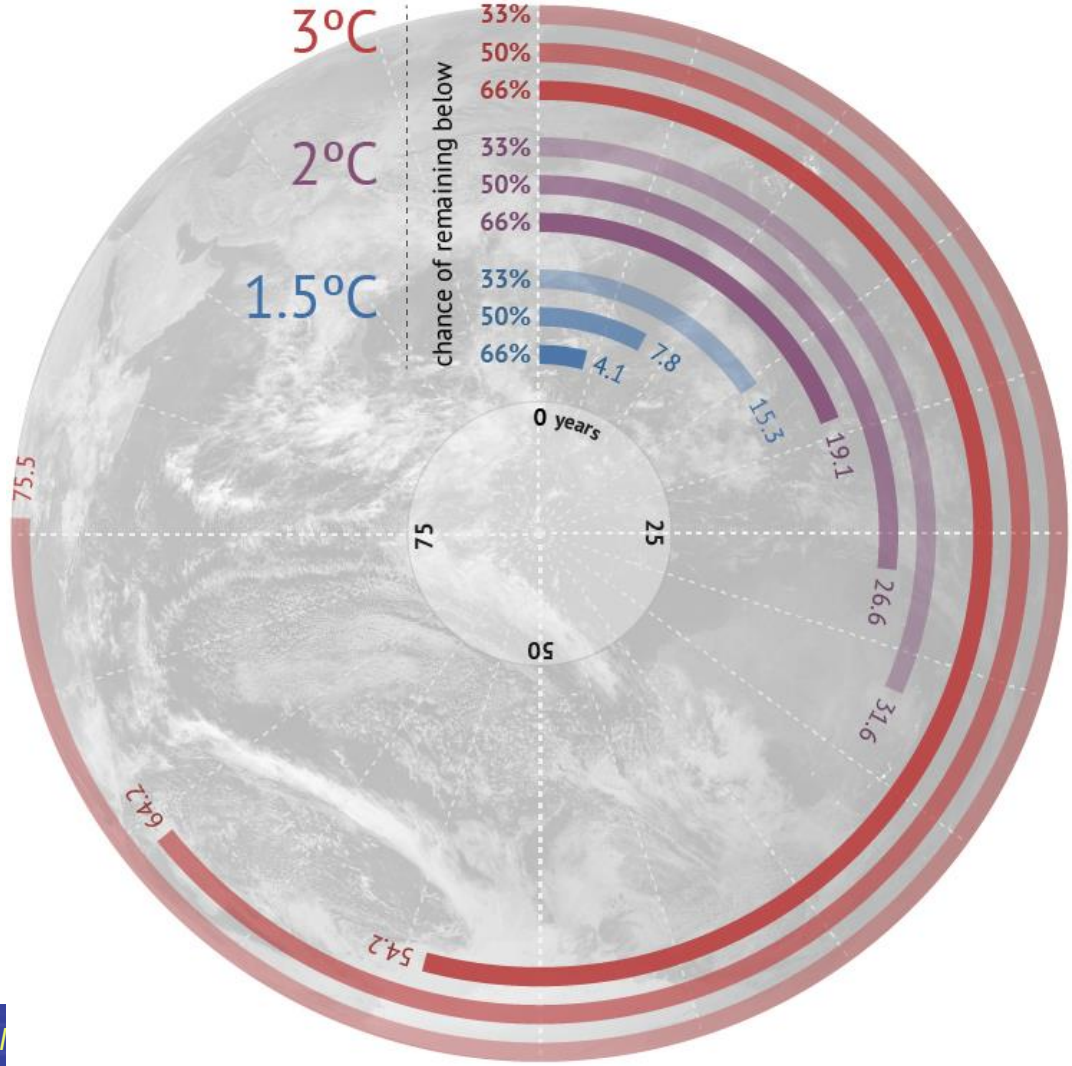
Demand response

- 20th century energy systems: supply follows demand
- 21st century energy systems: demand follows supply -> smart energy systems


Surplus Electricity Production
Including grid-stbilisation
CEEP Per cent
50
40
30
20
10
0
0
20
40
60
80
100
Wind power per cent
Ref
DK Vreg
+HP reg
Trans

1.5 C carbon budget

We are out of carbon budget by 2021 … with reasonable probability …



Questions

- Barriers to change are much higher than change needed! How to smoothly remove barriers to change?
- Technology is ready! How to roll it much faster?
- Transition is economically better than business as usual, for most! How to make decisions viable for all?
- Integration of power, heating, cooling, water and transport system necessary! How to make it work?

Let us help solve the conundrum!

Role of Cities in Addressing Climate Change and Perspectives from the SDEWES Index

Şiir KILKIŞ
SDEWES International Scientific Committee Member
TÜBİTAK Senior Researcher and Associate Professor
IPCC AR6-WGIII Lead Author

IPCC Sixth Assessment Report Cycle

Establishment: 1988

Intergovernmental Panel on Climate Change (IPCC) Assessment Reports

+

ar6

WGIII Contributions:

- Chapter 1 Introduction and Framing
- Chapter 2: Emissions trends and drivers
- Chapter 3: Mitigation pathways compatible with long-term goals
- Chapter 4: Mitigation and development pathways in the near- to mid-term
- Chapter 5: Demand, services and social aspects of mitigation

Sectoral Chapters

- Chapter 6: Energy systems
- Chapter 7: Agriculture, Forestry, and Other Land Uses (AFOLU)
- **Chapter 8: Urban systems and other settlements**
- Chapter 9: Buildings
- Chapter 10: Transport
- Chapter 11: Industry

Cross-Sectoral Chapters

- Chapter 12: Cross sectoral perspectives
- Chapter 13: National and sub-national policies and institutions
- Chapter 14: International cooperation
- Chapter 15: Investment and finance
- Chapter 16: Innovation, technology development and transfer
- Chapter 17: Accelerating the transition in the context of sustainable development

Acceptance by the IPCC: **2021**

Enhanced Importance Attributed to Cities by the IPCC

WG III Chapter 8 "Urban Systems and Other Settlements"

- Demographic perspectives, migration, and **urbanisation trends**
- Consumption, lifestyle, and linkages between urban and rural areas
- **Urbanisation wedge** in future emissions and mitigation at global and national levels
- **City emissions** and drivers analysis, city typologies
- Urban emissions and infrastructure lock-in
- **Urban mitigation options and strategies**
- **Low-carbon city scenarios, options and costs**
- Urban form, design, and role of spatial planning
- **Urban technologies**, including disruptive technologies, the use of information and communication technologies, involving use of data
- **Waste and waste water management, material recycling**
- Innovative strategies and climate actions, **urban experimentation**, city networks andcoalitions
- Urban mitigation governance – levels, barriers, and opportunities
- Policy instruments and infrastructure investments

Source: Decision IPCC/XLVI-4, Chapter outline of the Working Group III contribution to the Sixth Assessment Report (AR6)

Chapter 8: Urban Systems and Other Settlements

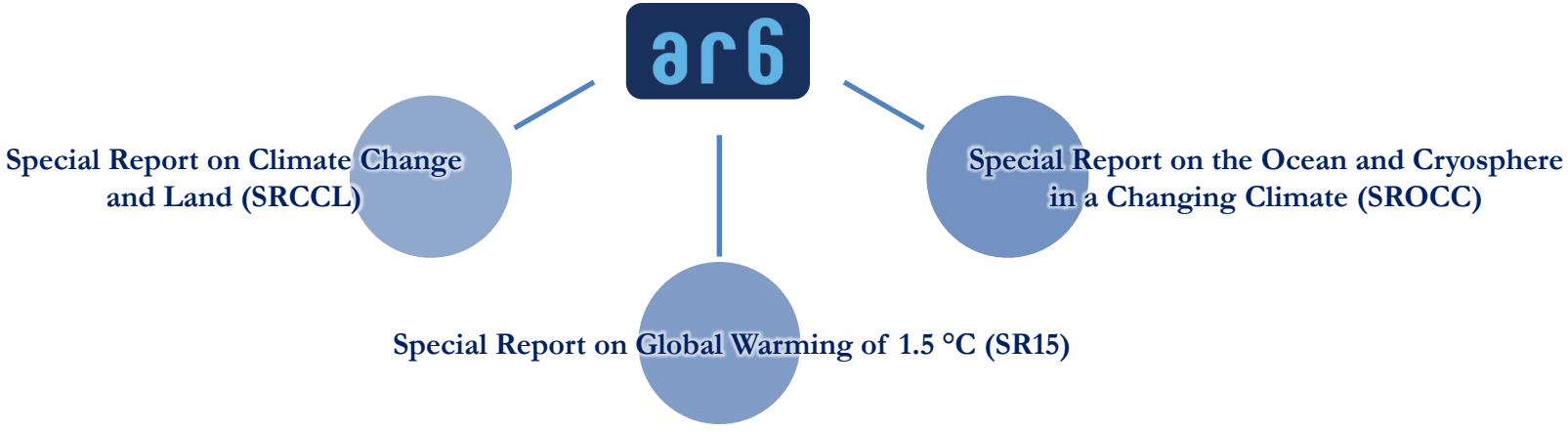
Chapter 8: Urban systems and other settlements

	Last Name	First Name	Role	Gender	Country	Citizenship	Current Affiliation
1	LWASA	Shuaib	CLA	M	Uganda	Uganda	Makerere University
2	SETO	Karen	CLA	F	USA	USA	Yale University
3	BAI	Xuemei	LA	F	Australia	Australia	Australian National University
4	BLANCO	Hilda	LA	F	USA	USA	University of Southern California
5	GURNEY	Kevin	LA	M	USA	USA	Arizona State University
6	KILKIŞ	Şiir	LA	F	Turkey	Turkey	The Scientific and Technological Research Council of Turkey (TÜBİTAK)
7	LUCON	Oswaldo	LA	M	Brazil	Brazil	SÃO PAULO STATE ENVIRONMENT SECRETARIAT
8	MURAKAMI	Jin	LA	M	China	Japan	City University of Hong Kong
9	PAN	Jiahua	LA	M	China	China	Institute for Urban & Environmental Studies, Chinese Academy of Social Sciences
10	SHARIFI	Ayyoob	LA	M	Japan	Iran	National Institute for Environmental Studies
11	YAMAGATA	Yoshiki	LA	M	Japan	Japan	National Institute for Environmental Studies
12	DUBEUX	Carolina	RE	F	Brazil	Brazil	Federal University of Rio de Janeiro (COPPE/UFRJ)
13	URGE-VORSATZ	Diana	RE	F	Hungary	Hungary	Center for Climate Change and Sustainable Energy Policy (3CSEP)

Source: https://www.ipcc.ch/report/authors/report.authors.php?q=37&p=

Cities have a crucial role in addressing urban challenges for a more sustainable Planet!

Special Reports of the Sixth Assessment Cycle



*"An IPCC special report on the **impacts of global warming of 1.5 °C above pre-industrial levels and related global greenhouse gas emission pathways**, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty"*

SR15 released in one week!

ipcc
INTERGOVERNMENTAL PANEL ON climate change

2018/16/MA

IPCC MEDIA ADVISORY

6 August 2018

Save the Date: IPCC Special Report *Global Warming of 1.5ºC*

GENEVA, Aug 6 – The Intergovernmental Panel on Climate Change (IPCC) will meet in Incheon, Republic of Korea, on 1-5 October 2018, to consider the Special Report *Global Warming of 1.5ºC*. Subject to approval, the Summary for Policymakers will be released on **Monday 8 October** with a live-streamed press conference.

Source: https://www.ipcc.ch/news_and_events/ma-p48.shtml

Role of Cities in Addressing Climate Change

Systems approach is crucial for cities while inadequate tools for decision-support are one of the barriers in its realisation

Bai et al. (2016) *Curr Opin Environ Sustain*;23:69–78.

Source: Bai et al. (2018) *Nature* 2018;555:23–5

Increasing role of cities in addressing climate change with need for scientific support

Priorities for supporting cities involve expanding observations based on **urban data** and supporting transformation towards low-carbon cities

Bai et al. (2016) *Curr Opin Environ Sustain*;23:69–78.

Shortcomings remain in supporting a coherent **urban science for global sustainability**

Acuto et al. (2018) *Nature Sustainability* 2018;1:2–4.

Role of Cities in Addressing Climate Change

Projected Emission Reductions from Baseline Years in 2020

49 % — Buildings

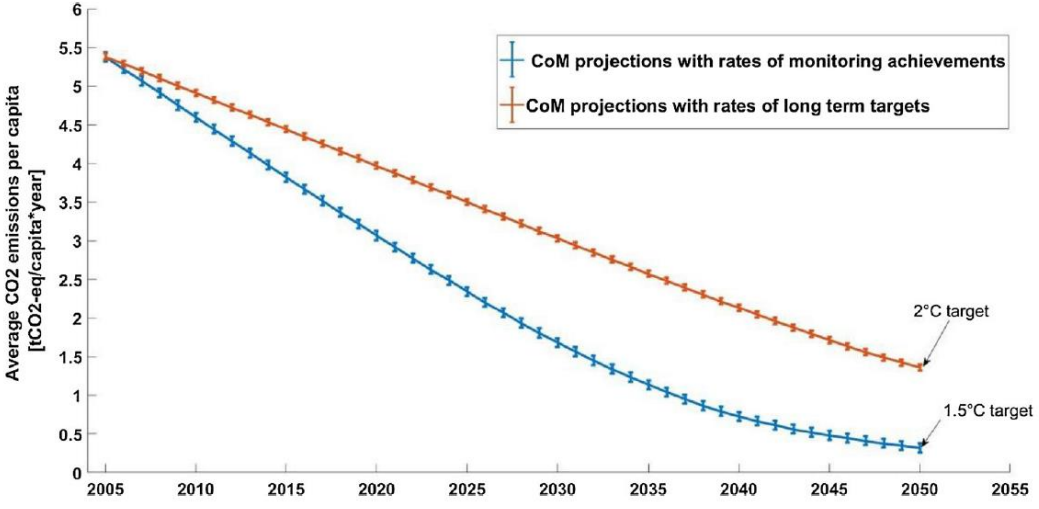
23 % — Transport

Measures
- Improved efficiency
- More efficient networks
- Increased share of renewable sources
- Shift to public transport and electric mobility

Contribution of Emissions Reduction from Local Energy Generation 20 %

Source: Kona. A. et al. (2017) Covenant of Mayors in Figures: 8-Year Assessment, JRC Reports

Covenant of Mayors
Committed to local sustainable energy



Source: Kona et al. (2018) *Sustainable Cities and Society* 41 (2018) 568–575

Co-benefits from energy savings and improvements in air quality in CoM signatories

- Over 65,000 years of life saved due to better air quality

Source: Monforti-Ferrario et al. (2018)

Pursuits to Support Transformative Solutions in Cities

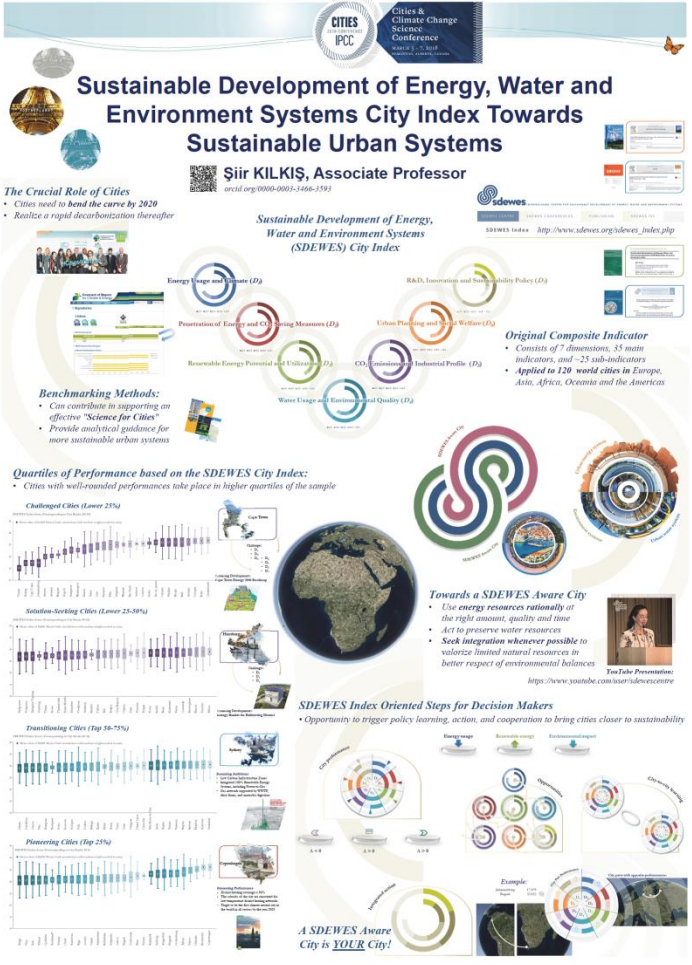
IPCC Cities and Climate Change Conference

Photo Credits: IPCC

Knowledge needs for cities and key research gaps:

- Systemic knowledge base for transformative solutions
- Greater understanding of systemic linkages between urban sectors

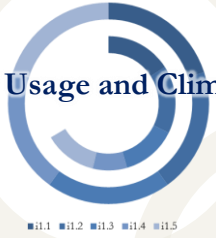
Source: https://citiesipcc.org/news/participant-posters-and-presentations/



SDEWES Index

The Sustainable Development of Energy, Water and Environment Systems (SDEWES) City Index

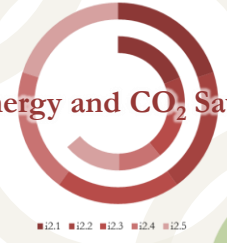
Energy Usage and Climate (D_1)



35 Main Indicators in 7 Dimensions

R&D, Innovation and Sustainability Policy (D_7)

Penetration of Energy and CO_2 Saving Measures (D_2)



Urban Planning and Social Welfare (D_6)

Renewable Energy Potential and Utilization (D_3)

CO_2 Emissions and Industrial Profile (D_5)

Water Usage and Environmental Quality (D_4)

Benchmarking Studies with the SDEWES Index

1st SEE SDEWES Conference Ohrid

10th SDEWES Conference Dubrovnik

11th SDEWES Conference Lisbon

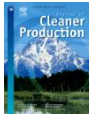
9th SDEWES Conference Mediterranean

2nd SEE SDEWES Conference Piran

12th SDEWES Conference Dubrovnik

SDEWES Index

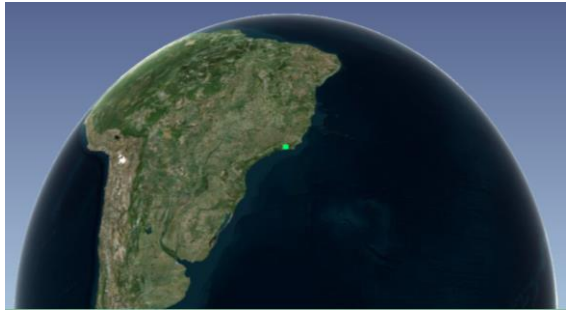
Geographical Focus [a]	Benchmarked Cities	Top 3 Cities	Related Analyses
• SEE cities	12	Zagreb Bucharest Ohrid	• Ranking of cities based on index results • Comparison of best practices and options [b]
• Mediterranean Sea basin port cities	22	Nice Venice Dubrovnik	• Application of three energy scenarios • SDEWES Index Energy Scenario Tool
• World cities	25	Stockholm Espoo Seville	• City pairs for policy learning • **SDEWES Index Benchmarking Tool**
• SEE cities	18	Klagenfurt Velenje Pécs	• Quartiles of city performance • City pairs for policy learning • **Four step process to support decision-making** • SDEWES Index Future City Network
• World cities	26	Copenhagen Helsinki Gothenburg	• Quartiles of city performance • Normative scenario for Rio de Janeiro [c]
• World cities	18	Aalborg Reykjavík Riga	• **SDEWES Index Atlas** • City collaboration pairs • Scenario based on Peta 4.2



[a] Corresponds to the geographical focus of the SDEWES Conference series in chronological order from the 1st SEE SDEWES Conference in Ohrid, Macedonia to the 12th SDEWES Conference in Dubrovnik.
[b] City rankings and comparison of best practices is a common element of analysis for each new sample after the first sample. Additional analyses for other samples are indicated on a cumulative basis.
[c] The normative scenario including targets based on Vision Rio 500 is developed after the benchmarking of the city for the 11th SDEWES Conference in Lisbon.

Benchmarking Studies with the SDEWES Index

1st LA SDEWES Conference Rio de Janeiro



3rd SDEWES Conference Novi Sad

13th SDEWES Conference Palermo

GREENING THE ISLANDS

1st Latin American sdewes Conference RIO DE JANEIRO 2018

3rd SEE sdewes Conference Novi Sad 2018

13th sdewes Conference Palermo 2018

Taking Cities as Data Sources for Benchmarking - 1

D_1: Energy Usage and Climate

City (C_j) →	Energy usage of buildings (MWh)	Energy usage of transport (MWh)	Energy usage per capita (MWh/capita)	Total degree days (Days °C) [a]	Final to primary energy ratio (%)

- Residential buildings
- Tertiary buildings
- Municipal buildings

- Private transport
- Public transport
- Municipal vehicle fleet

- Buildings
- Transport
- Industry (Non-ETS)
- Public lighting

- Heating degree days
- Cooling degree days

- Energy production
- Transmission and distribution
- Storage/end-usage

Taking Cities as Data Sources for Benchmarking - 2

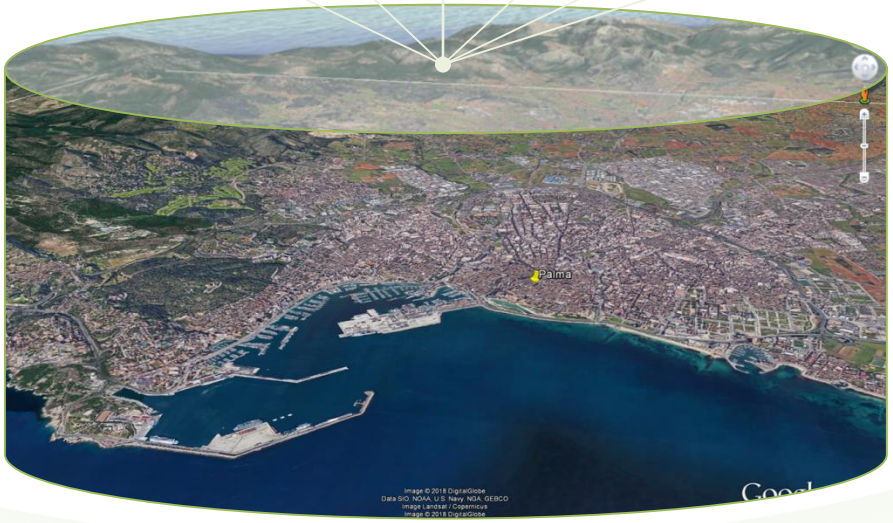
D_2: Penetration of Energy and CO_2 Saving Measures

City (C_j) →	Action Plan for Energy and CO_2 Emissions	Combined heat and power based DH/C	Energy savings in end-usage (buildings)	Density of public transport network	Efficient public lighting armatures
	• SEAP/SECAP • Equivalent strategy	• District heating/cooling (DH/C) • Combined heat and power • Integration of multiple sources • Low temperature DH/C network • Renewable power to hydrogen (P2G)	• Refurfishment of buildings • Net-zero energy buildings/districts	• Total urban rail per km^2 • Daily usership per km • Bicycle sharing stations	• Solid-state lighting • Solar energy based armatures

Taking Cities as Data Sources for Benchmarking - 3

D_3: Renewable Energy Potential and Utilization

City (C_j) →	Solar energy potential ($Wh/m^2/day$) [a]	Wind energy potential (m/s) [a]	Geothermal energy potential (mW/m^2) [b]	Renewable energy in electricity production (%) [c]	Green energy in transport (%) [d]
	• Irradiation on optimally inclined plane	• Average wind speed at 50 m height	• Mean heat-flow density	• Solar, wind, geothermal, bioenergy, hydropower, wave	• Biofuel blends • Electricity (with > 45% RE share)



Taking Cities as Data Sources for Benchmarking - 4

D_4: Water Usage and Environmental Quality

City (C_j) →	Domestic water consumption per capita (m^3)	Water quality index (/100)	Annual mean PM_{10} concentration ($\mu g/m^3$)	Ecological footprint per capita (gha)	Biocapacity per capita (gha)

- Water footprint of domestic blue water consumption
- Dissolved oxygen
- pH level
- Conductivity
- Nitrogen
- Phosphorous
- Urban monitoring stations
- Demand for land across six categories
- Natural regenerative capacity

Taking Cities as Data Sources for Benchmarking - 5

D_5: CO_2 Emissions and Industrial Profile

City (C_j) →	CO_2 emissions of buildings (t CO_2)	CO_2 emissions of transport (t CO_2)	Average CO_2 intensity (t CO_2/MWh)	Number of CO_2 intense industries	Airport ACA level and measures
	• Residential buildings • Tertiary buildings • Municipal buildings	• Private transport • Public transport • Municipal vehicle fleet	• Energy related CO_2 emissions • Waste and wastewater treatment	• Energy intense industries included in EU ETS	• Airport Carbon Accreditation (ACA) • Mapping CO_2 emissions • Mitigation/optimization • Renewable energy measures • Landside/ground handling/airside • Airports < 150,000 PAX

Taking Cities as Data Sources for Benchmarking - 6

D_6: Urban Planning and Social Welfare

City (C_i)	Waste and wastewater management	Compact urban form and green spaces	GDP per capita (PPP$)	Inequality adjusted well-being (/10)	Tertiary education rate (%)

- Recycling and compositing share
- Waste generated per capita (kg)
- WWTD compliance (BOD, COD, TSS)
- Coverage of wastewater treatment

- Population living in core area(s)
- Urban sprawl index (%)
- Share of green area in urban area / share of impermeable surface area
- Number and area of protected reserves, RAMSAR, national parks

- Citizen satisfaction with daily experience

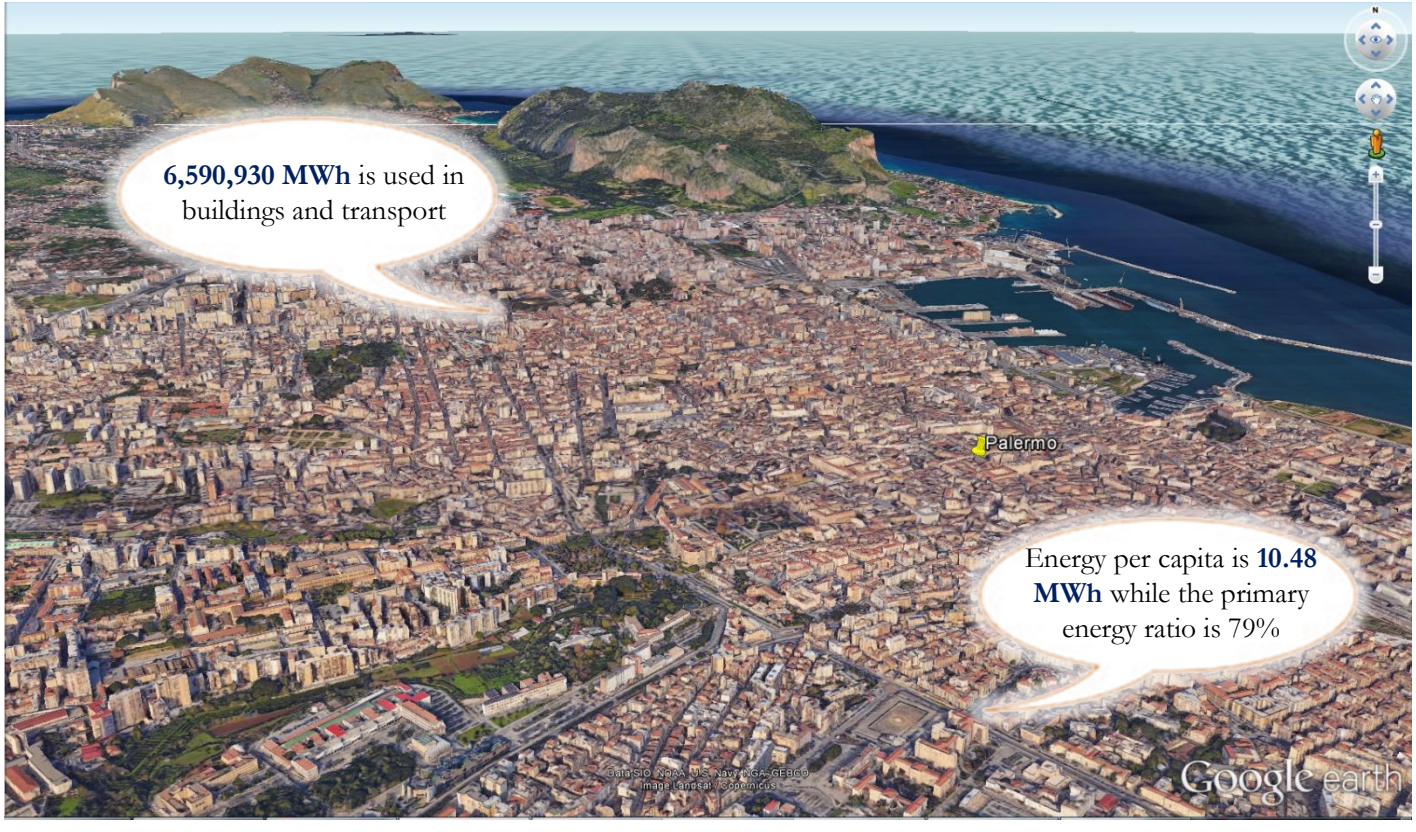
- Attainment of ISCED 5 and 6

Taking Cities as Data Sources for Benchmarking - 7

D_7: R&D, Innovation and Sustainability Policy

City (C_j) →	R&D and innovation policy orientation	National patents in clean technologies	Universities/ institutes in the local ecosystem	National h-index	Reduction Target for CO_2 Emissions
	• R&D and innovation priorities • Relation to SEAP/SECAP/SUMP • Gross expenditure on research and development (GERD)/ GDP	• Y02 and Y04 coded patents (Building technologies, energy generation, transport, smart grid, carbon capture and storage) • Share in total national patents	• Public/private universities/institutions • Scimago top 1000 institutions • Concentration in the city (%)	• Knowledge production including sustainability	• 2020 CO_2 reduction target • 2030, 2040 and 2050 targets annualized to 2020

From Greater Knowledge to Strengthened Action



Data sources: Palermo Piano di Azione per l'Energia Sostenibile; Regione Siciliana, Rapporto di Monitoraggio Ambientale; Noussan et al. (2018)

From Greater Knowledge to Strengthened Action

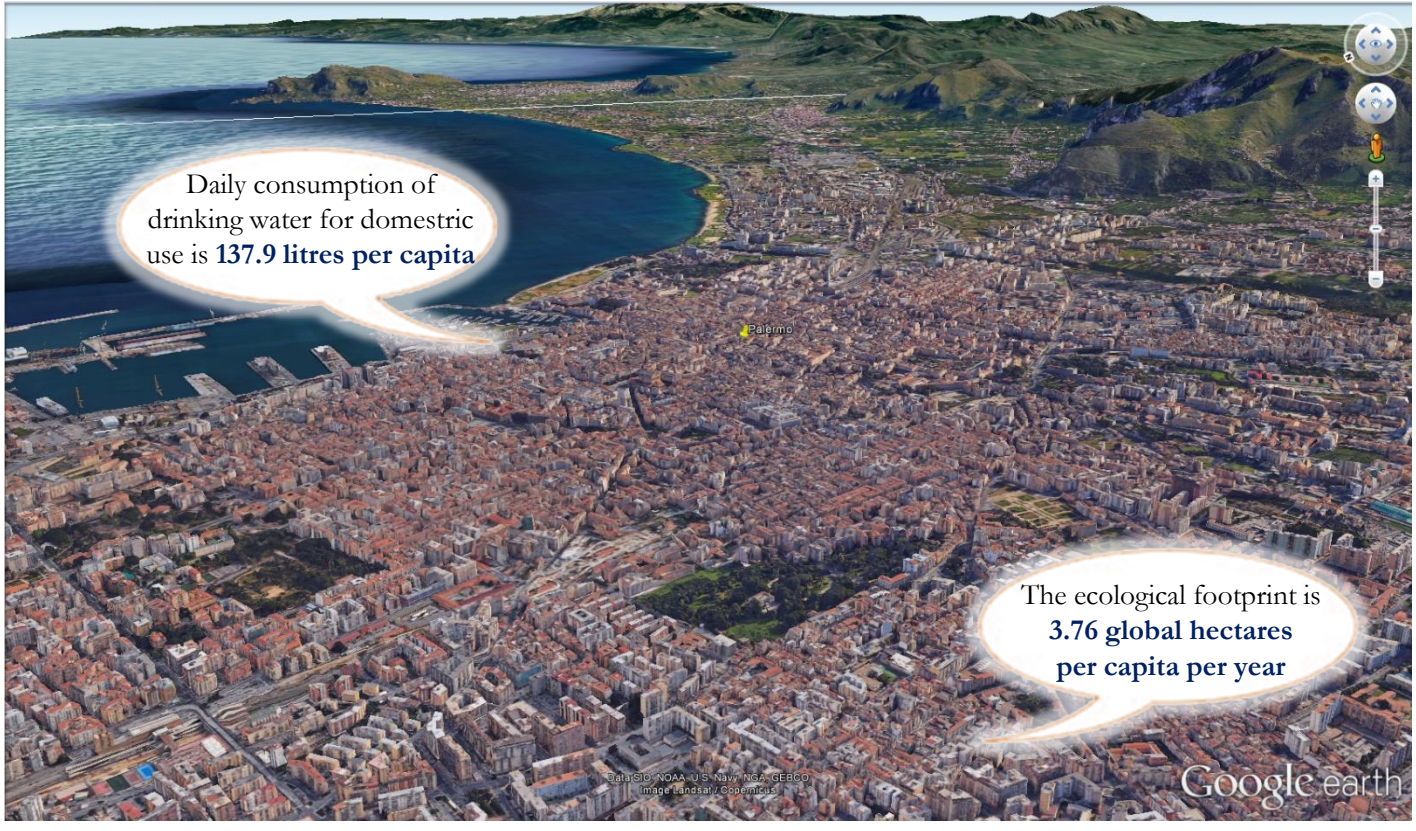
From Greater Knowledge to Strengthened Action

Data sources: Ecosistema Urbano: Rapporto sulle performance ambientali delle cittá 2017; Data excludes a 53 kW concentrated solar power plant

From Greater Knowledge to Strengthened Action

Data sources: Ecosistema Urbano: Rapporto sulle performance ambientali delle cittá 2017; Urban Waste Water Treatment Directive Monitoring

From Greater Knowledge to Strengthened Action



Data sources: Ecosistema Urbano: Rapporto sulle performance ambientali delle cittá 2017; Baabou et al. (2017) *Env. Sci Policy* Vol. 69, p.94-104

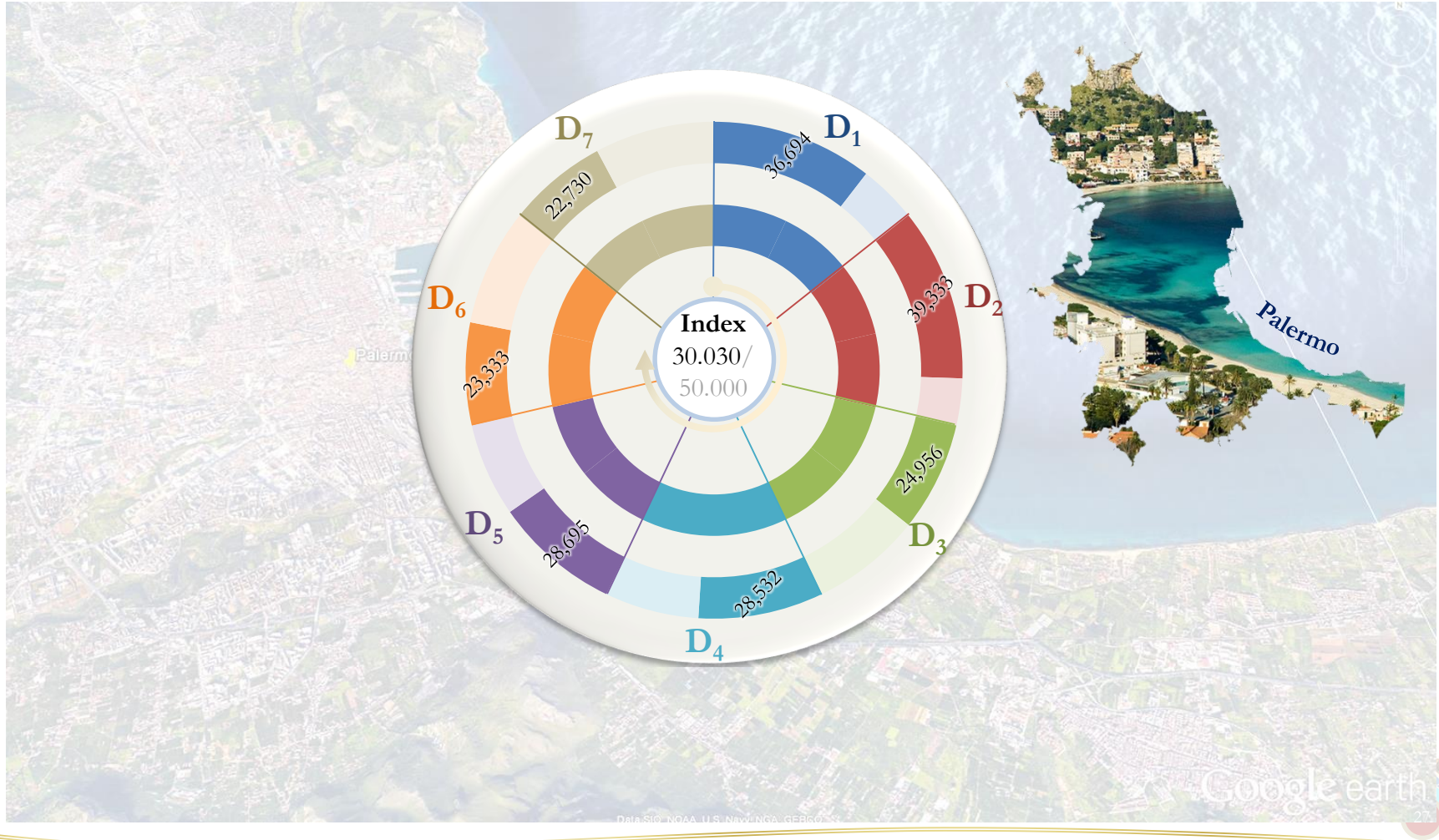
From Greater Knowledge to Strengthened Action

Data sources: OECD Metropolitan Areas Database

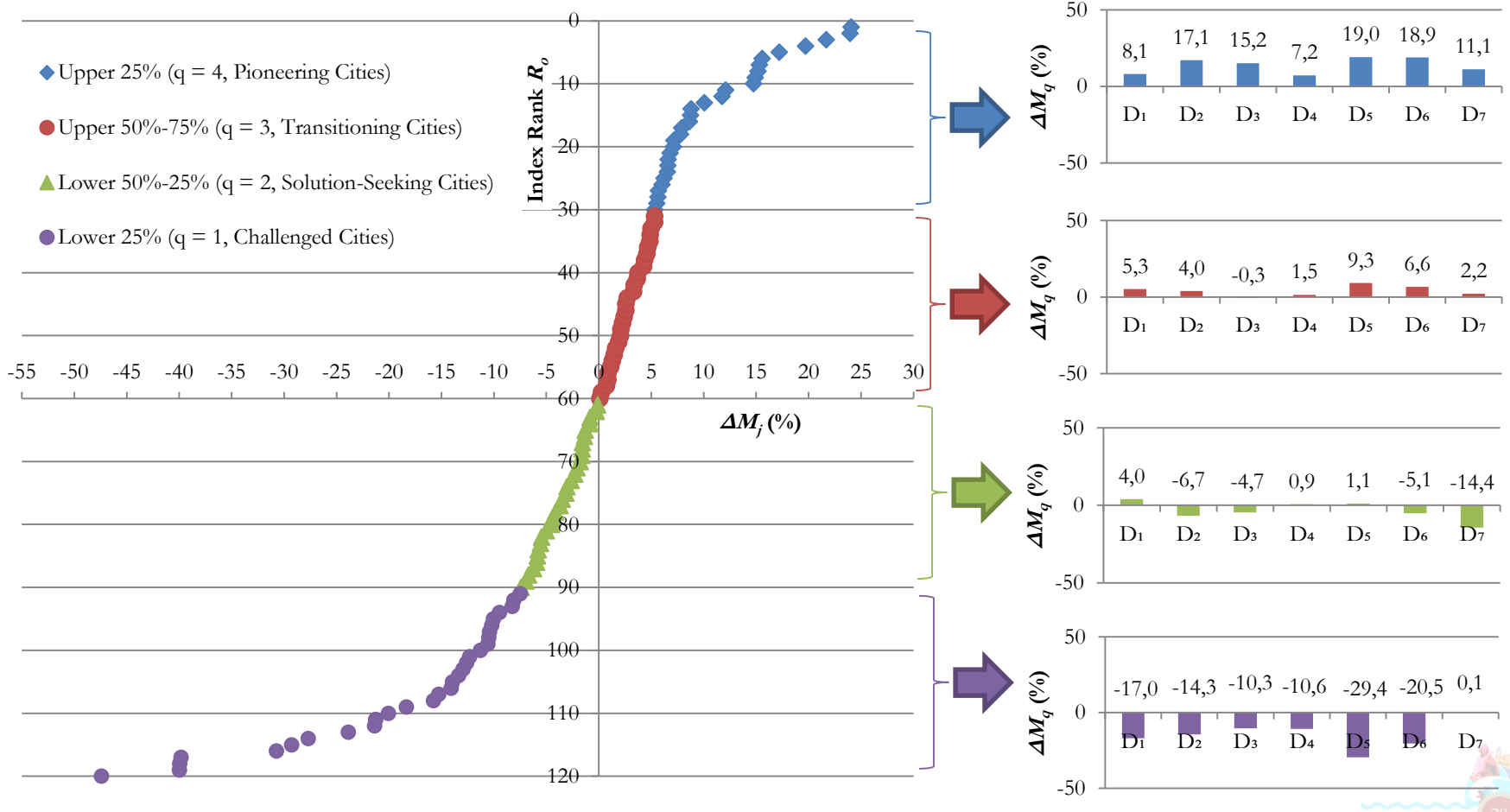
From Greater Knowledge to Strengthened Action

Data sources: OECD Metropolitan Areas Database; European Climate Adaptation Platform

Palermo: Transitioning Cities of the Sample



Exceling Coherent Above Average Performances



Integrated Urban Transitions: SDEWES Aware City

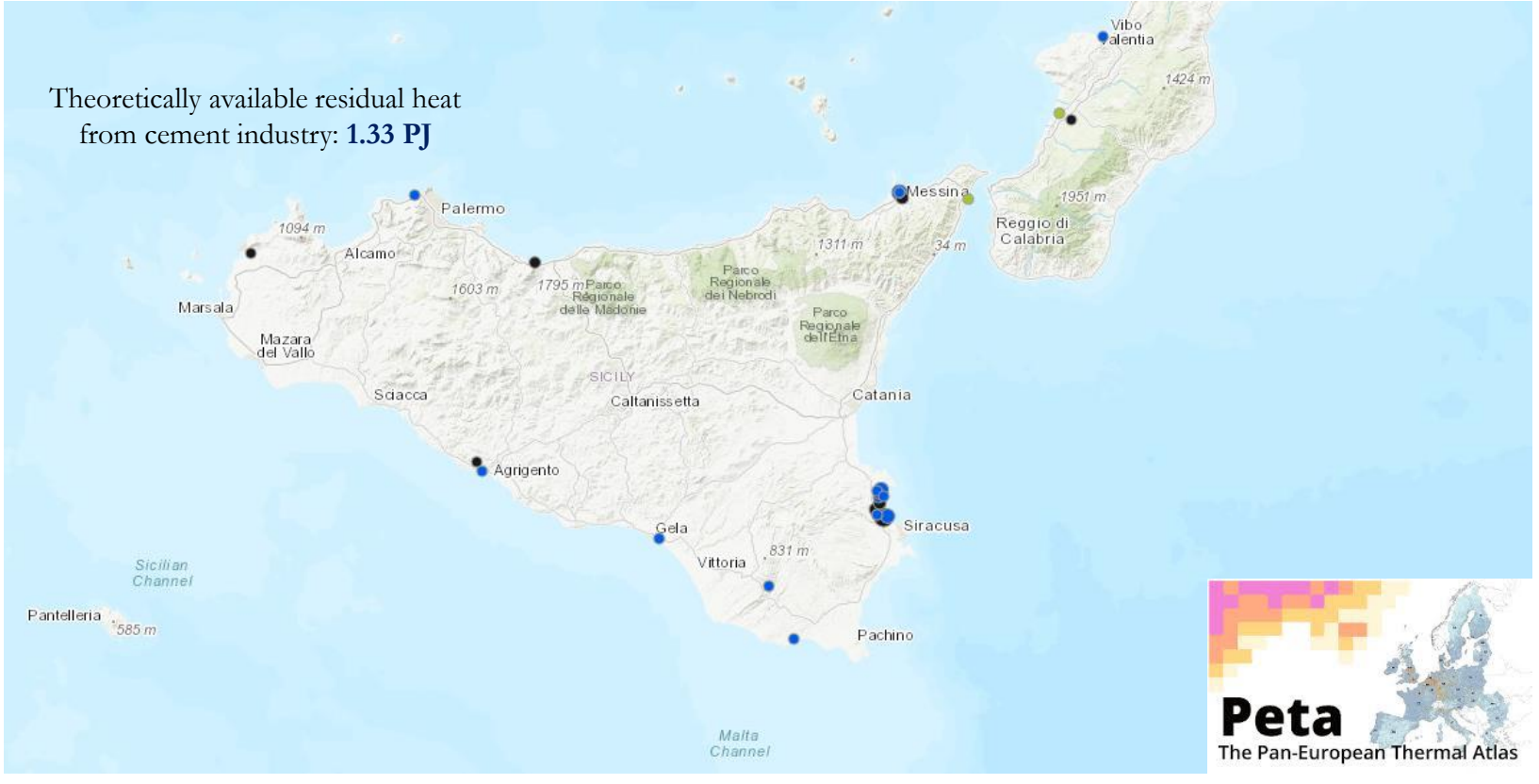
Perspectives	Urban Energy Systems	Urban Water Systems	Urban Environment Systems
Specific system scope / focus [a]	Provision of energy resources to meet **energy services in urban areas**	Provision of water services to **produce, distribute, collect and treat water resources**	Provision of services to **minimize, recycle and collect waste**, reduce emissions and pollutants, and increase **environmental quality**
Urban concepts in the literature	• Energy efficient city • Renewable energy city	• Water Sensitive city • Water Wise City • Zero Wastewater city	• Climate Neutral City • Zero Waste Municipality
Related urban transitions	**Urban energy transition**	**Urban water transition**	**Urban circular economy** **Urban symbiosis**
Examples of integrated, cross-sectoral perspectives	• Use of residual heat from industry in the building sector • Use of energy from the wastewater sector (residual heat and biogas)	• Renewable energy for water pumping demands • Demand response in the wastewater sector • Co-location of energy and water infrastructure	• Reduction of CO_2 emissions from energy, water and waste sectors in urban areas • Urban planning to reduce energy and water usage and increase water permeability
Proposed vision for urban systems	← **"SDEWES" Aware City** →		



Possible Synergy with Energy Foresight for Palermo

Source: EU Roadmaps for Energy (R4E) Project: Ambition, Vision and Roadmap Smart Buildings and Smart Mobility Palermo

Energy Sharing and Cross-Sectoral Strategies



Source: Pan-European Thermal Atlas <https://hre.aau.dk/resource-center/peta4/>

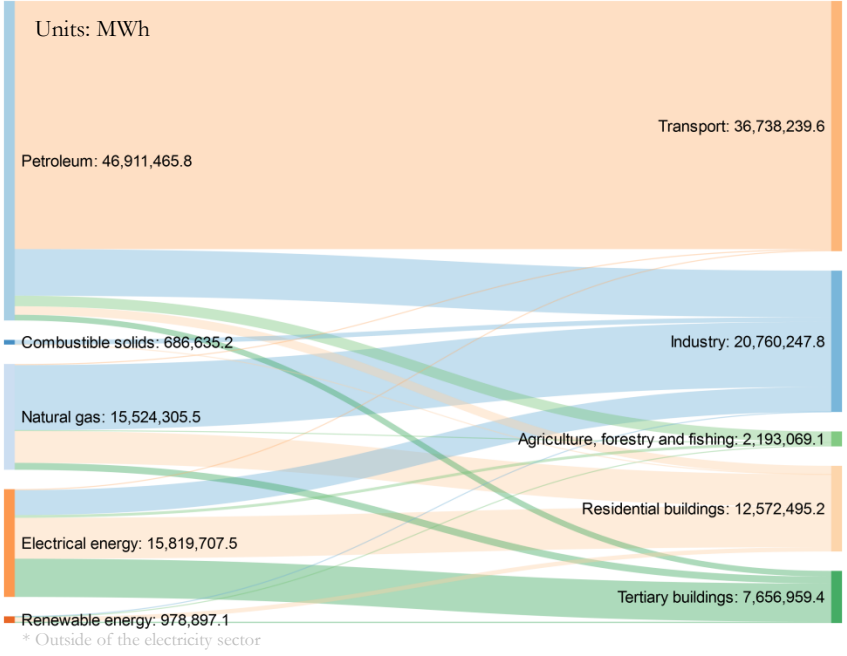
Integrated Penetration of Renewables Across Sectors

Increasing the share of electricity in transport

Time is of the essence

Greater pace is required to mobilize renewable energy and energy efficiency solutions

Increasing the share of renewables in the electricity mix



Sankey Based On: Regione Siciliana, Rapporto di Monitoraggio Ambientale

Reducing the energy demand and increasing flexibility, including in the wastewater sector

Substituting the combustion of natural gas for low exergy demands

Urban transitions in energy, water and environment systems towards SDEWES-Aware cities can further accelerate progress closer to the 1.5°C target

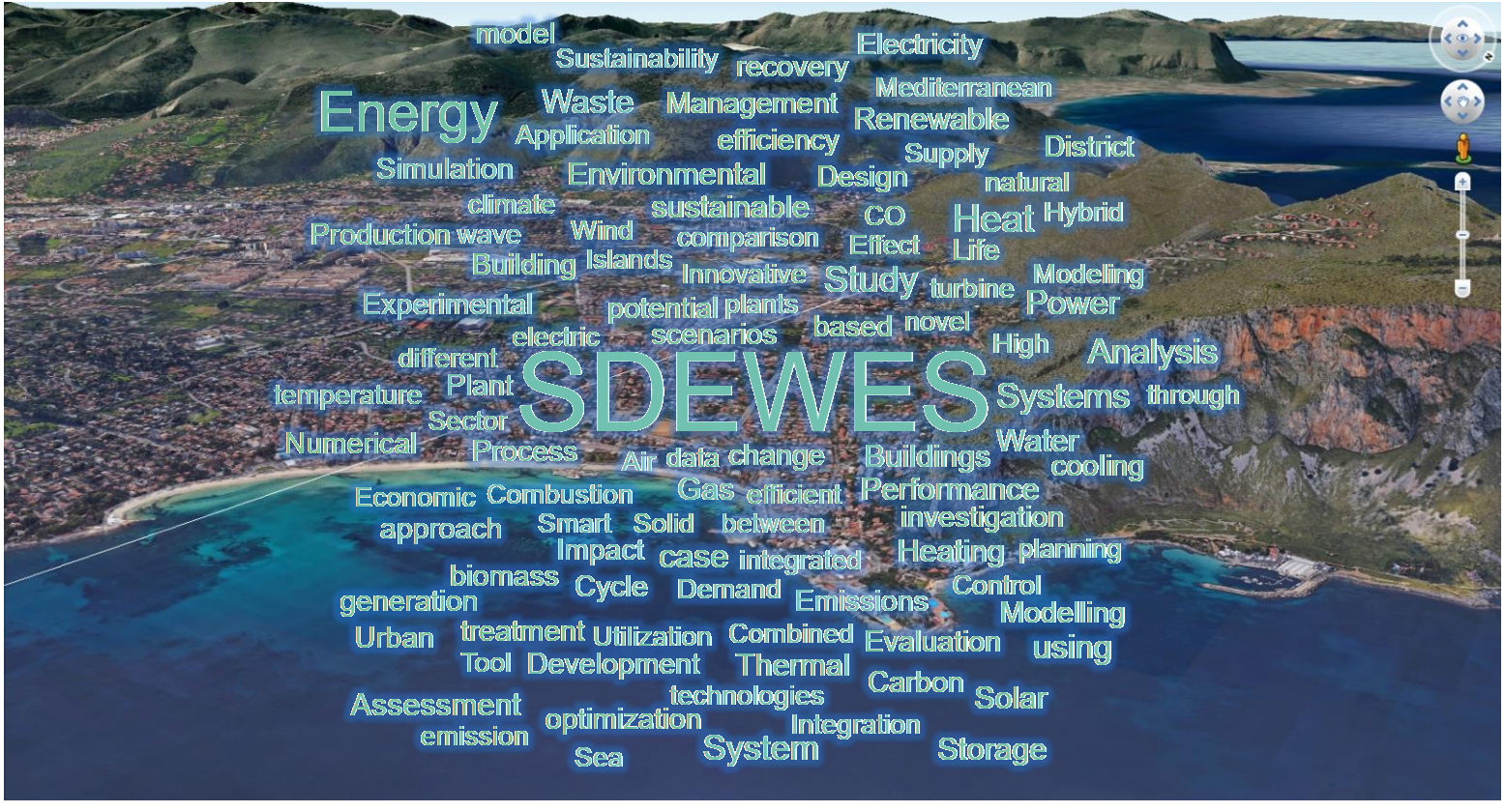
Towards SDEWES Aware Cities

Use **energy** resources rationally at the right amount, quality, and time

Act to preserve **water** resources

And seek integration whenever possible to valorize limited natural resources in better respect of **environmental** balances

Dare to Challenge and Envision Sustainable Cities



Word cloud based on the Scientific Programme of the 13th SDEWES Conference

Introductory address

Undergoing transitions while staying in the middle of …

Prof. Antonio Piacentino

University of Palermo

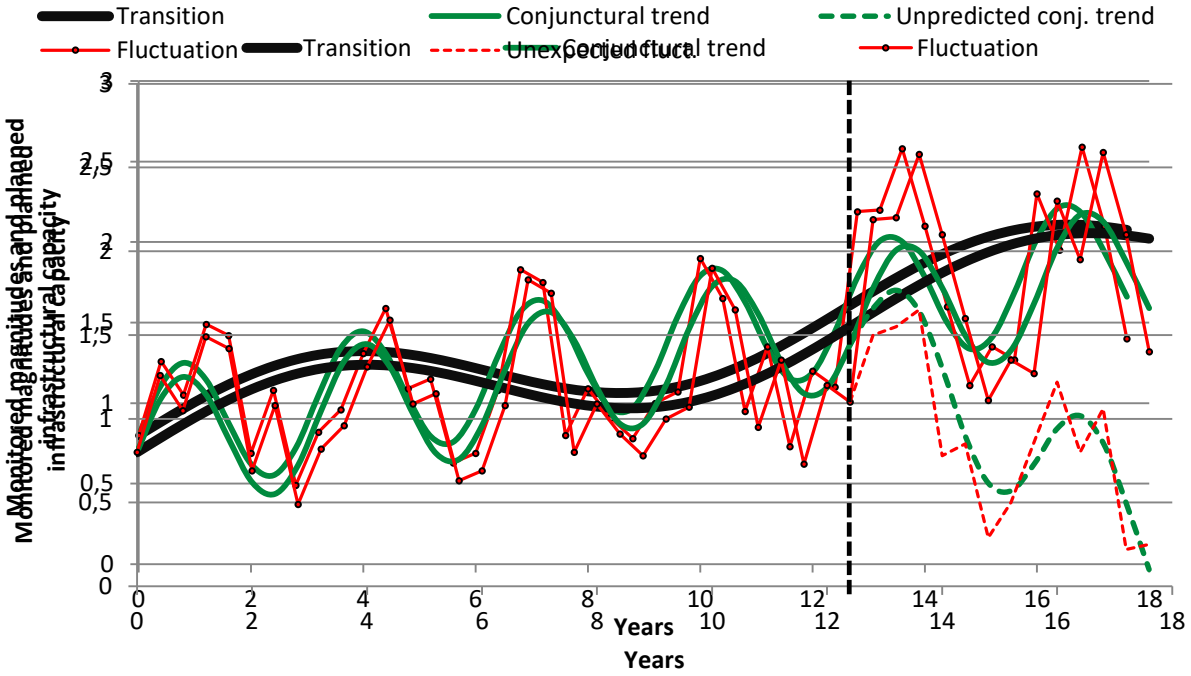
UNIVERSITÀ DEGLI STUDI DI PALERMO

Transitions

Transitions imply deep modifications in the societal framework needed to open new opportunities and solving new problems

They usually involve **simultaneously** several spheres of human existence …

In the last two decades we have been observing that transitions, which are intrinsically slow processes, have faced more and more rapid and less predictable conjunctural trends and fluctuations



Together with opportunities, transitions imply serious risks ….

Sicily as a best example of how, staying in the middle of … can exacerbate risks and make planning more critical

In the middle of … the sea

Coinciding with the growth of "Greening the Islands" initiative, this Conference is the first one to be held on an island.

Most of islands, like Sicily, share in common:

- A delicate equilibrium between **terrestrial and marine ecosystems**

- A **deep interrelation between environmental and economic sustainability**, due to the strong naturalistic touristic vocation

San Vito Lo Capo

Parco dell'Alcantara

Scopello

In the middle of … the mediterranean people and cultures (1)

Due to its strategic position in the middle of Mediterranean Sea, Sicily has been playing, in the last few years, a relevant role in facing some of the **highest human challenges related to political instabilities and wealth inequalities**, with the consequent migration processes …

At meantime, this strategic position has favoured, over the centuries, a number of dominations, such as:

Classical age

- Greek period
- Phoenician period
- Roman period

Middle age

- Germanic and Byzantine period
- Arab muslim period
- Viking age
- Norman period
- Swabian period
- Angevins period
- Aragonese period

Pre-modern era

- Spanish period
- Austrian period
- Bourbon period

In the middle of … the mediterranean people and cultures (2)

All these cultures have left a cultural heritage of enormous value …

The Valley of the Temples –UNESCO World Heritage Site

Ancient Theatre - Taormina

Zisa Castle and Gardens – UNESCO Wolrd Heritage Site

Palatine Chapel –UNESCO World Heritage Site

Casa Professa – Baroque period

Preservation of these beauties is obviously a priority for any planning action…

… but what is the relationship with sustainable transition issues?

In the middle of … the mediterranean people and cultures (3)

- Pressure exerted, in terms of antropic impact, by almost 5 millions tourists (approximately the same number of inhabitants), with presences mostly concentrated in summer

- Frequent need for accurate evaluation of feasibility of new renewable installation in compliance with archaelogical and landscaping constraints.

The problem of architectural integration of PV solar and buildings cannot be addressed looking for solutions like:

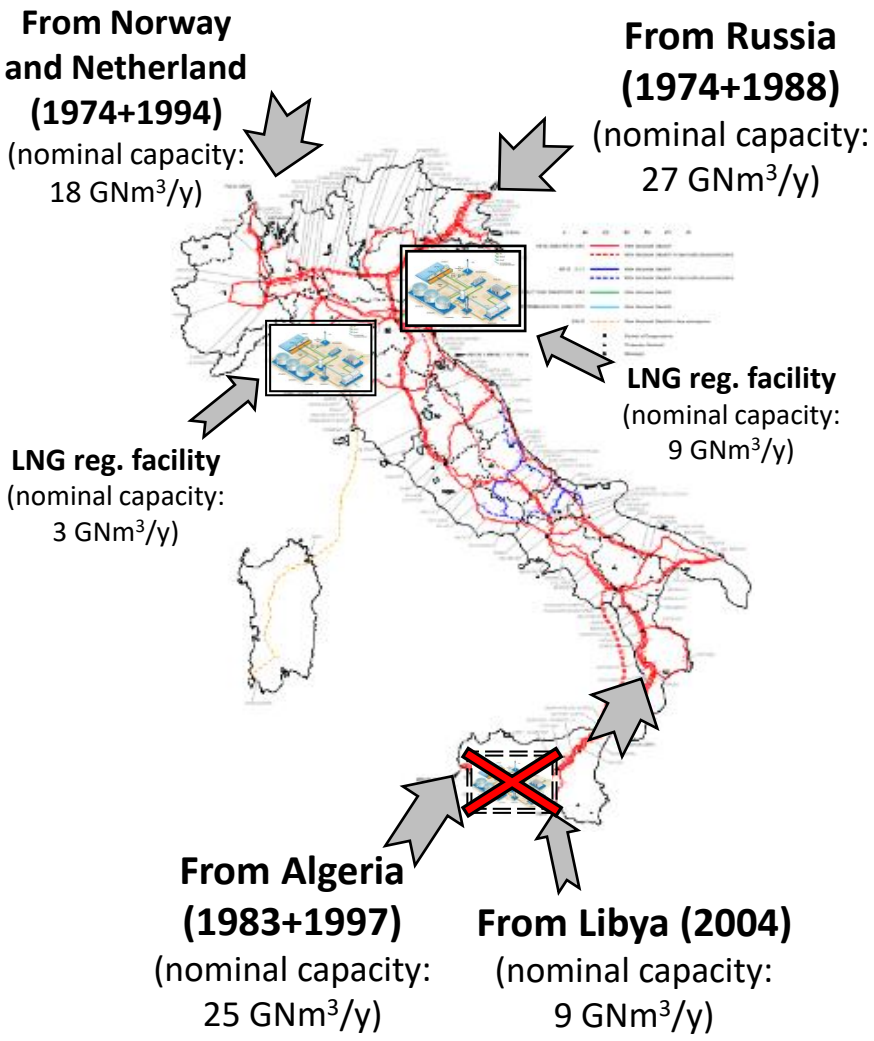
but trying to find original and case-by-case solution to answer to the question:

What (if anything) can be integrated here???

This "sweet" problem is obviously shared with several other cities in Italy, where new infrastructures (especially for mobility issues or distribution pipes) often encounter archaelogical obstacles.

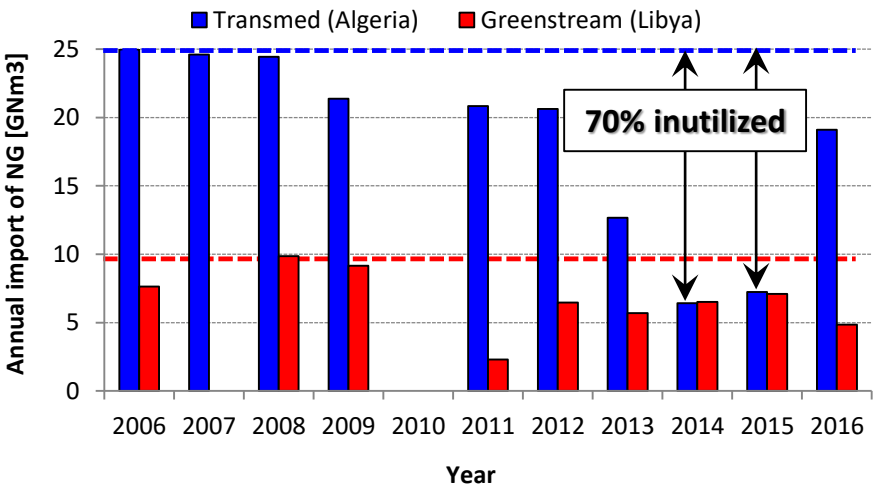
In the middle of … the mediterranean countries (1)

Again due to its position, being the Italian region closest to the countries of southern rim of the Mediterranean, Sicily has been representing an **energy hub** for Italy.



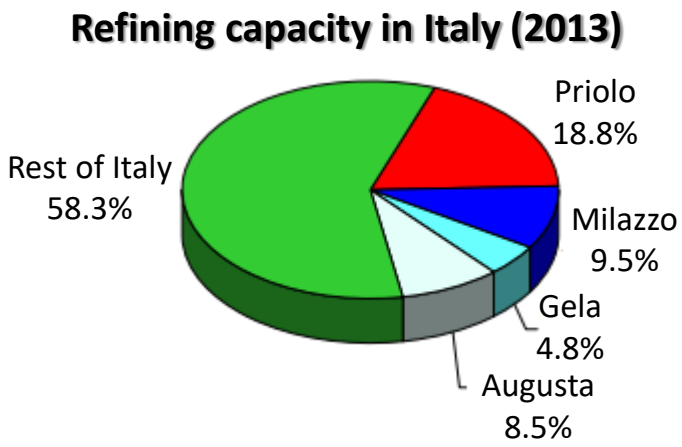
Sicily consumes approximately 4 GNm^3 of NG per year, thus being the 33 GNm^3 import capacity mainly designed **to move gas toward the rest of Italy via pipes**.

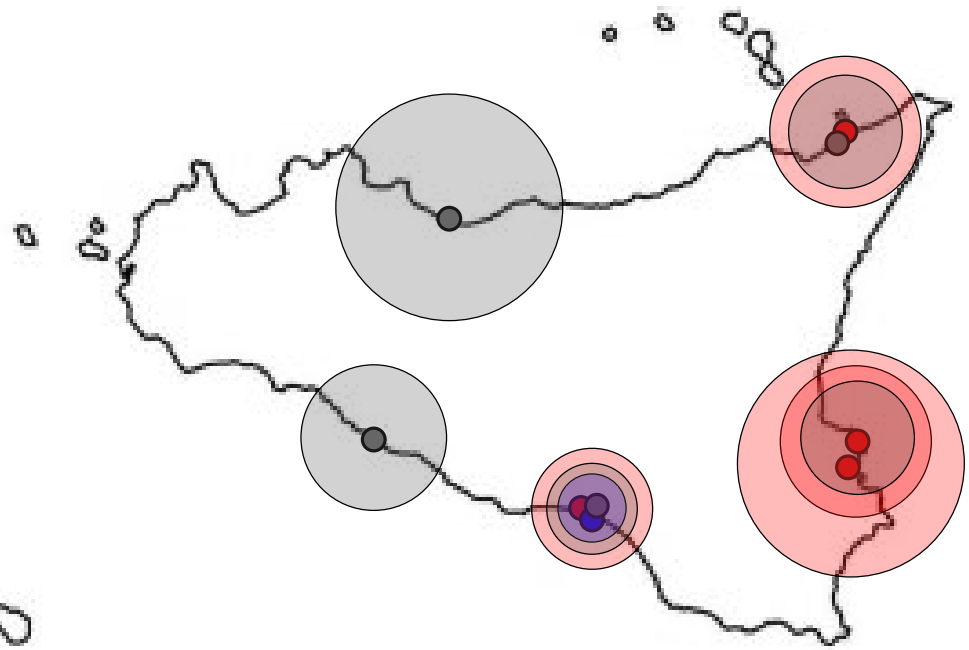
Also, there was a serious possibility to have this import capacity increased by a **new LNG regasification facility** with 8 GNm^3 capacity, but investors recently renounced to this project.



In the middle of … the mediterranean countries and routes (2)

Again due to its favourable position, in ’50s and ‘60s large investments were made in the creation of refineries, petrochemical plants, mostly integrated with CHP power plants and, in some case, with thermal desalination plants.





Could Sicily leave with less polluting plants …

… in the short and medium term there would be a serious problem of **social sustainability**!

Obviously, environmental impact of such large industrial areas has been somewhere dramatic, but conversions are being implemented to less polluting technologies.

In the middle of … expectations of future generations

Better integration between naturalistic and cultural potential of the island and more sustainable productive sectors may be probably achieved through … **CULTURE**!

Academic institutions are playing a driving role, creating open minded and skilled economists and engineers …

… also giving examples through good practices and innovative projects:

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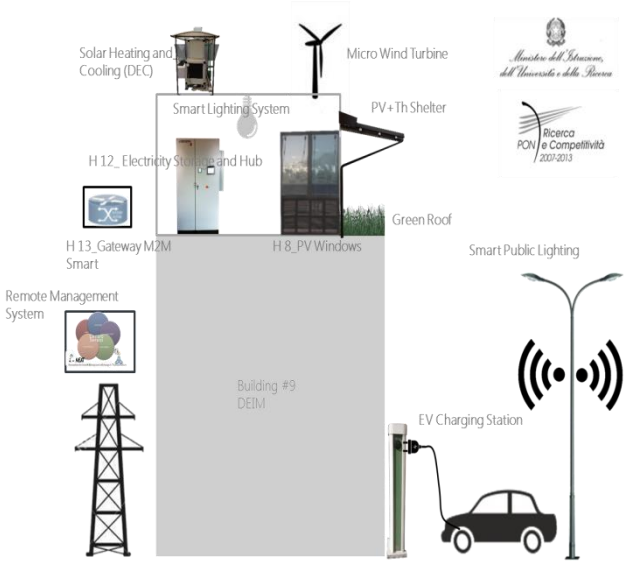
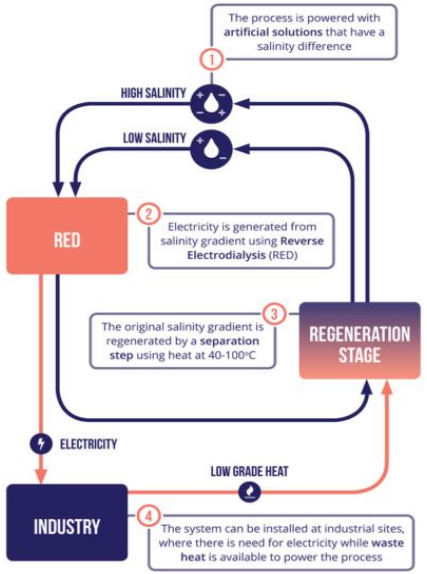


Sustainable Campus

Parabolic Solar Dish-Stirling



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Integrating industrial waste heat recovery into sustainable Smart Energy Systems

Patrizia Simeoni*, Gellio Ciotti, Mattia Cottes, Antonella Meneghetti, Gioacchino Nardin

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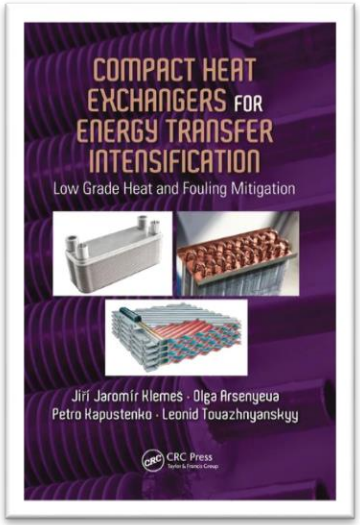

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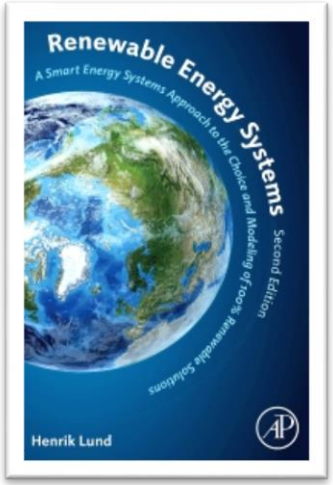

Giovanni Barone

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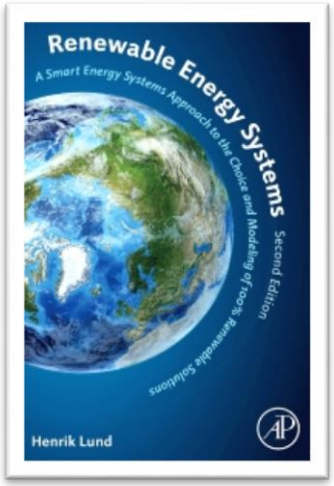

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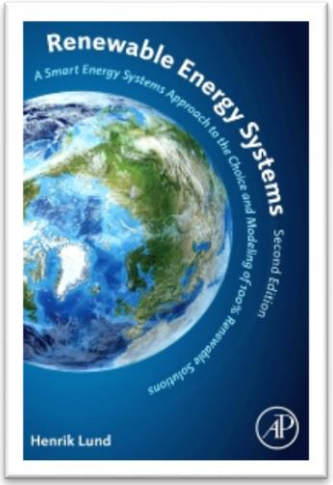

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