

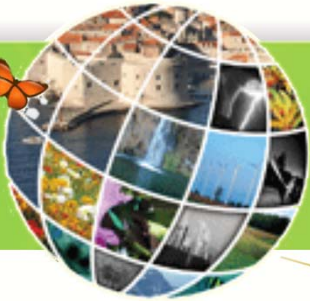


SDEWES Index - Benchmarking the Performance of Cities Across Energy, Water and Environment Systems

Şiir KILKIŞ, PhD
SDEWES Center Member



10th Conference on Sustainable Development
of Energy, Water and Environment Systems



Towards Integration

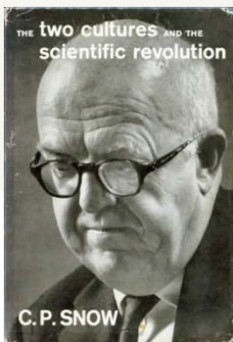


Evolution of approaches:



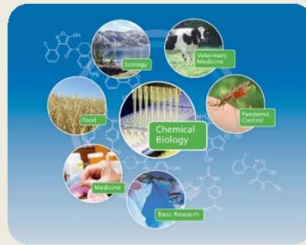
Dichotomy of disciplines

- The «Two Cultures»



Convergence of disciplines

- Inter/Multi-disciplinarity



Integrated approach

- «Sustainability Science»



Sustainable Society...?



Sustainable development of

Water

Energy

Environment
Systems

RAISE YOUR VOICE
NOT THE SEA LEVEL



Challenge: Sustainable development of energy, water, and environment systems

Tools and approaches



Present pressures on the Earth system

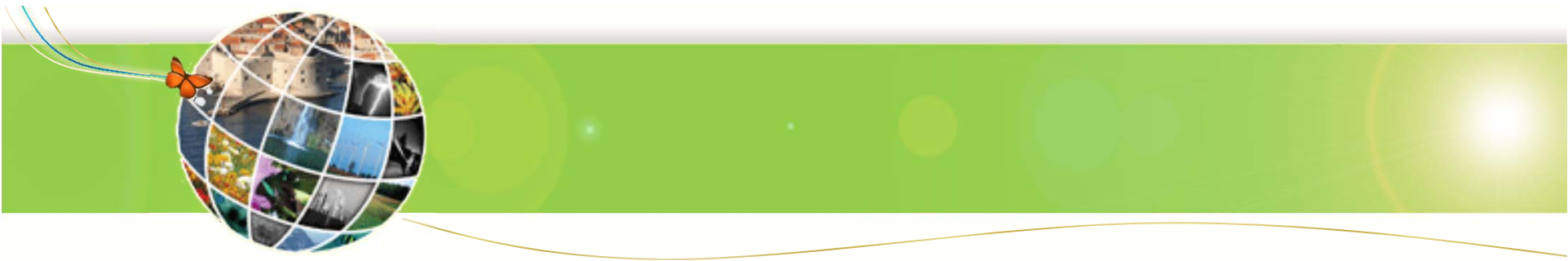
*How can **cities** learn from each other towards addressing the challenge of SDEWES?*



SDEWES



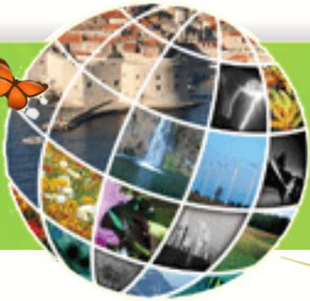
Index



SDEWES

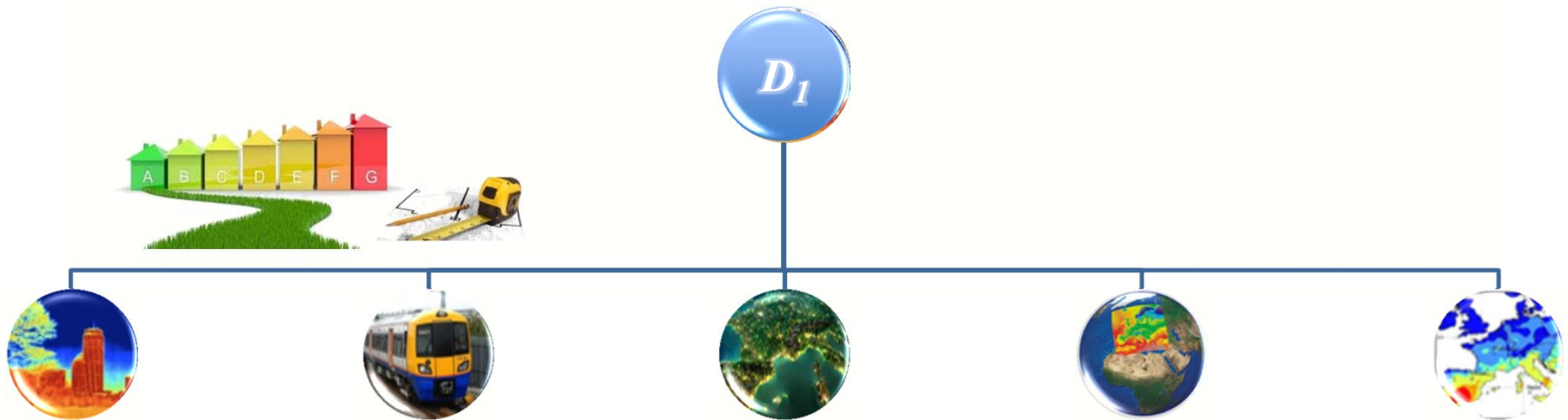
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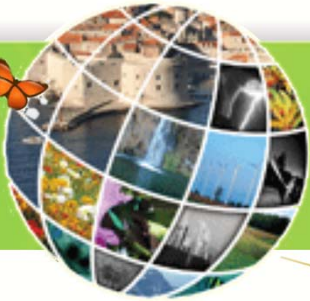




Dimensions

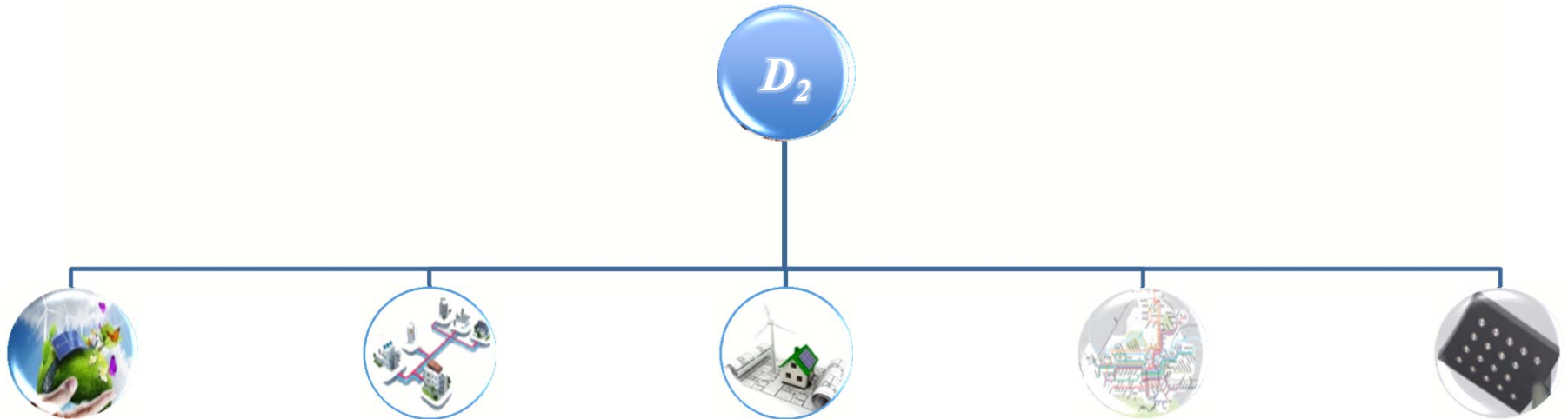
Energy Consumption and Climate





Dimensions

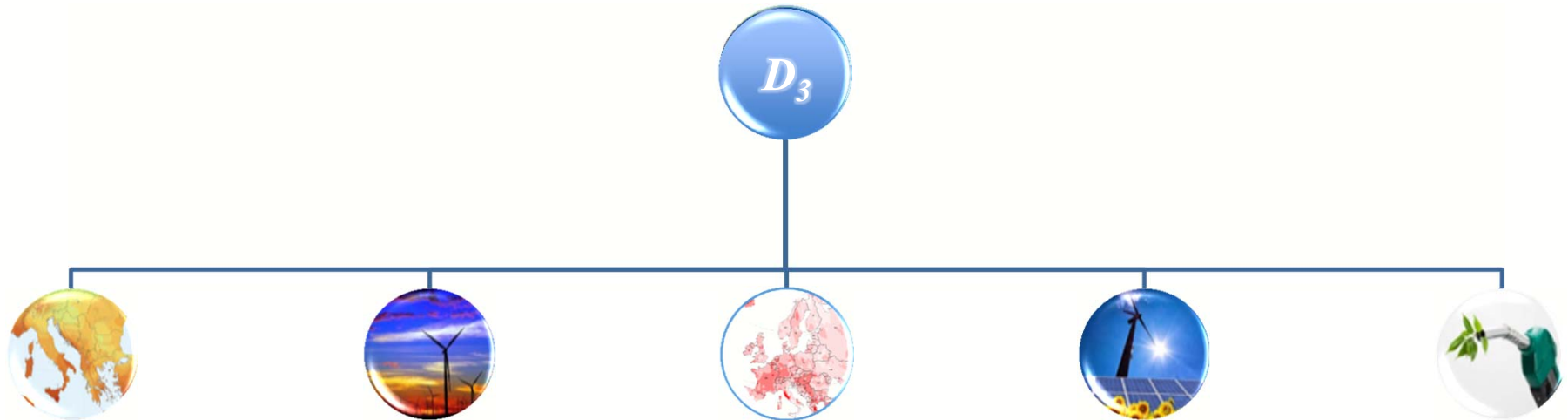
Penetration of Energy and CO₂ Saving Measures

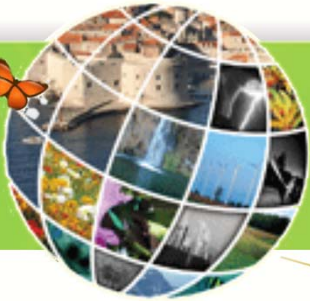




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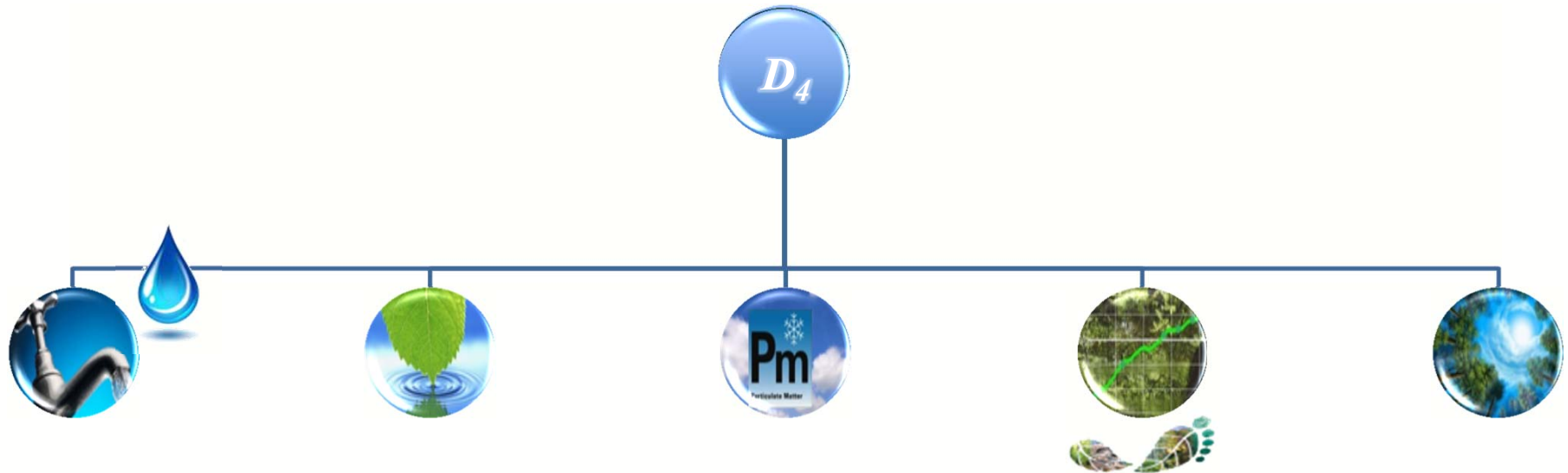
Renewable Energy Potential and Utilization





Dimensions

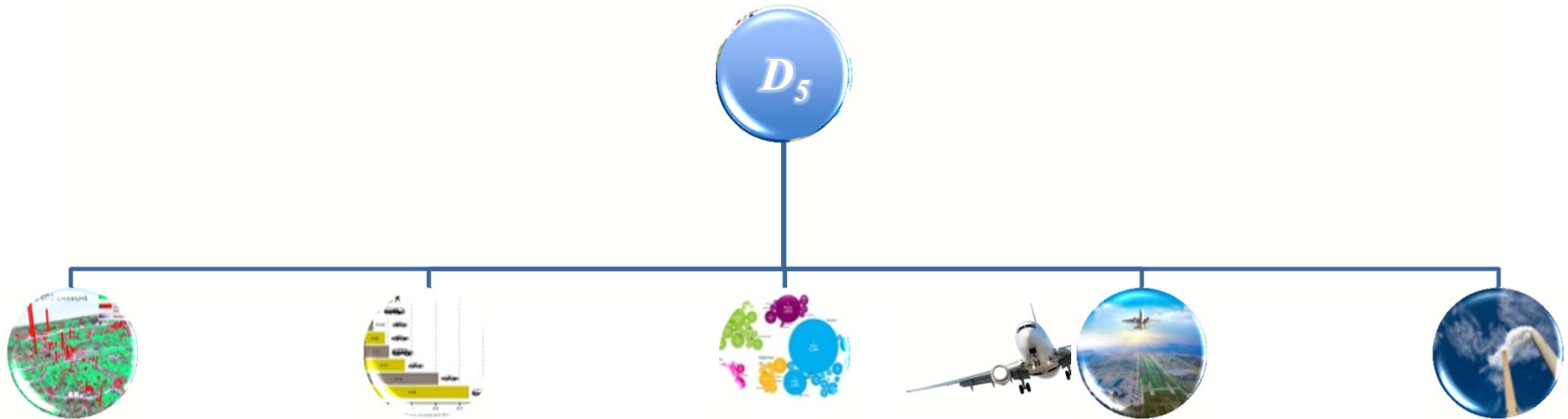
Water and Environmental Quality

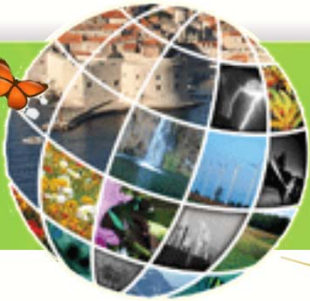




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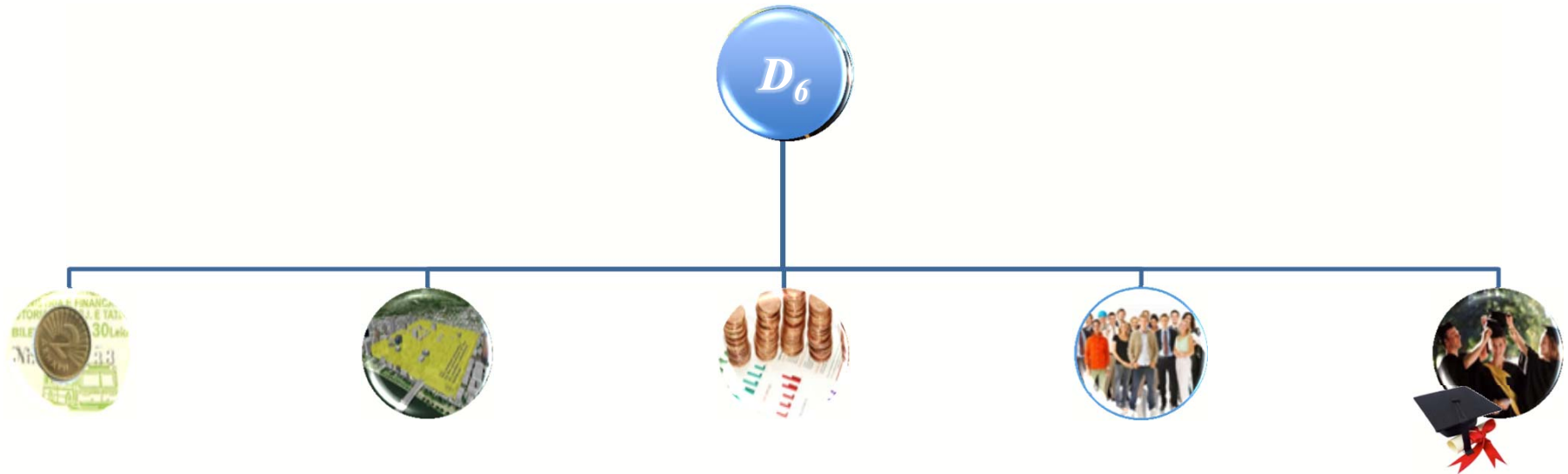
CO₂ Emissions and Industrial Profile





Dimensions

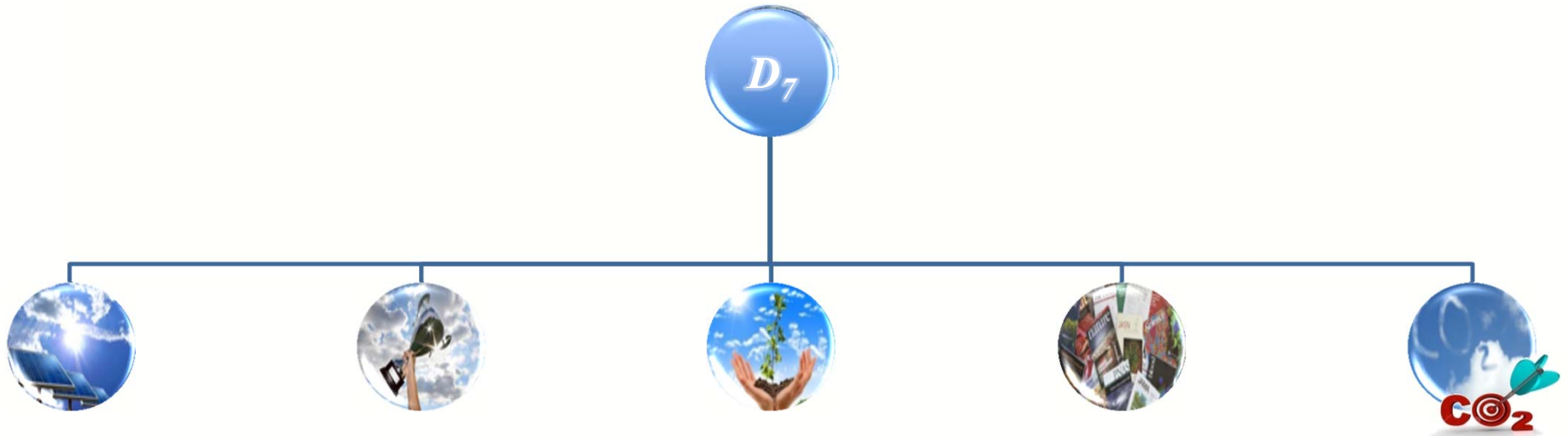
City Planning and Social Welfare

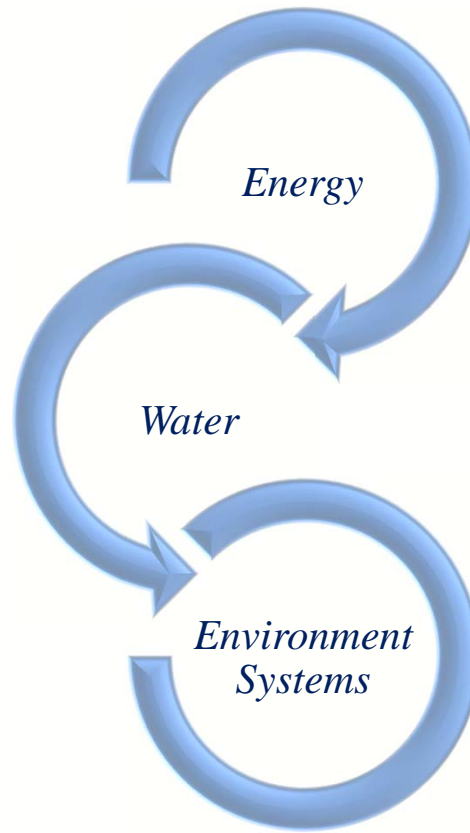
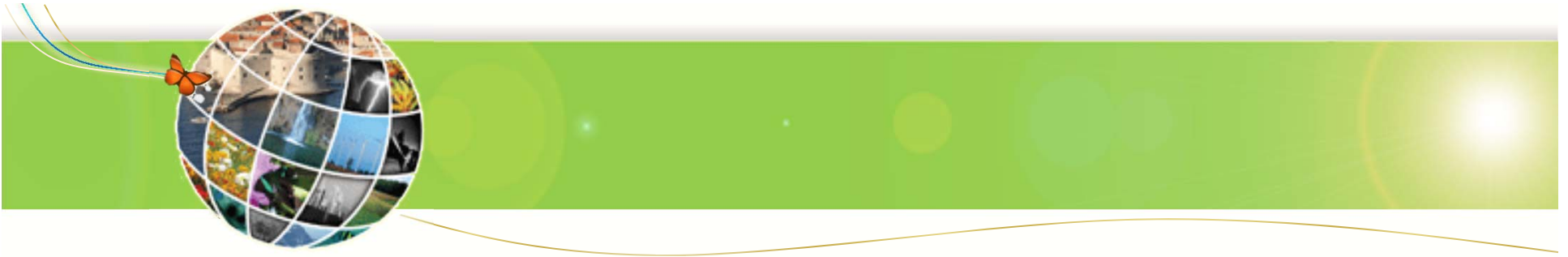




Dimensions

R&D, Innovation and Sustainability Policy





(C) SDEWES 2015



Southeast European Cities

Athens



Belgrade



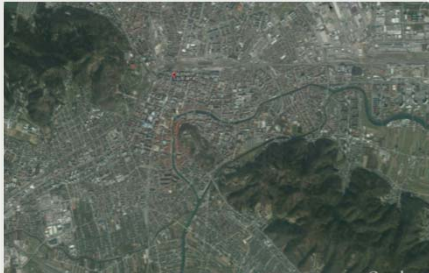
Bucharest^a



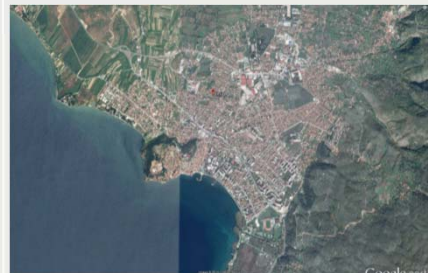
Istanbul^b



Ljubljana



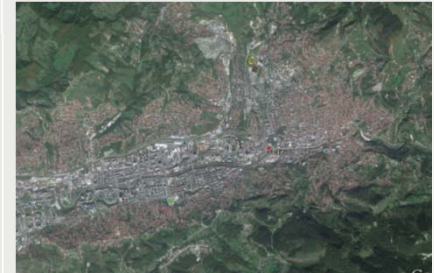
Ohrid



Podgorica



Sarajevo



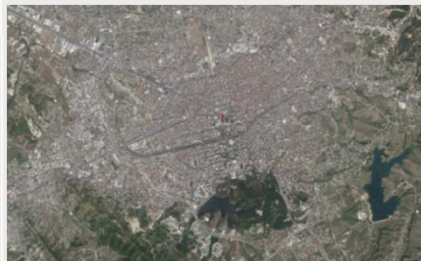
Skopje



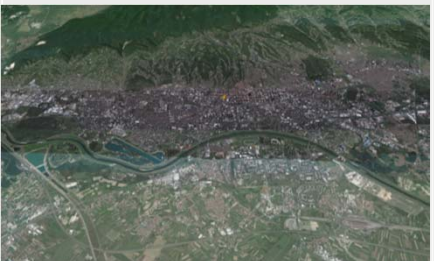
Sofia



Tirana



Zagreb

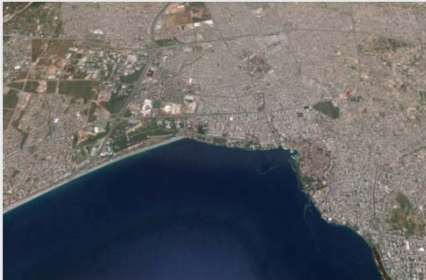


^a District 1 with SEAP; ^b 12 districts on the Thrace side



Mediterranean Port Cities

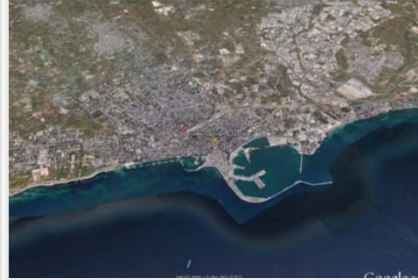
Antalya



Barcelona



Bari



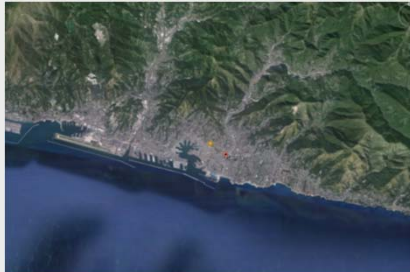
Bornova



Dubrovnik



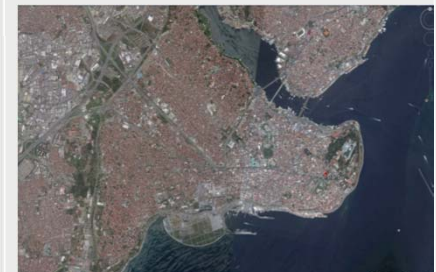
Genoa



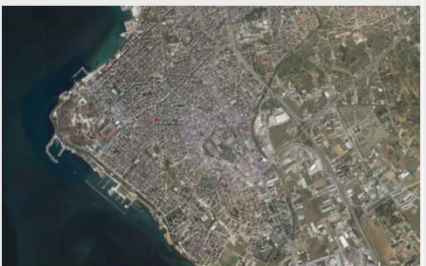
Heraklion



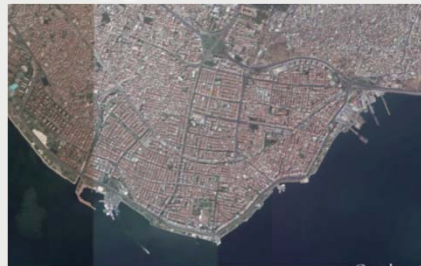
Istanbul^b



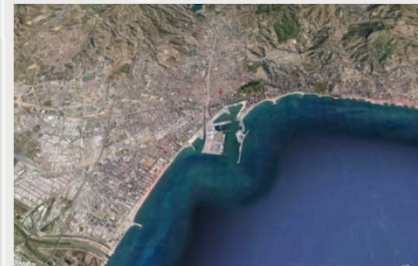
Kalamariá



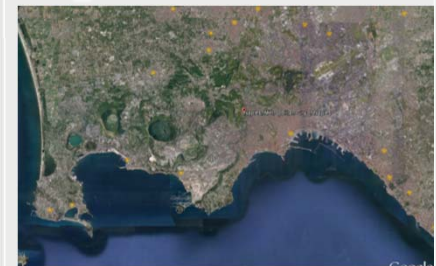
Karşıyaka



Málaga



Naples



^b 12 districts on the Thrace side

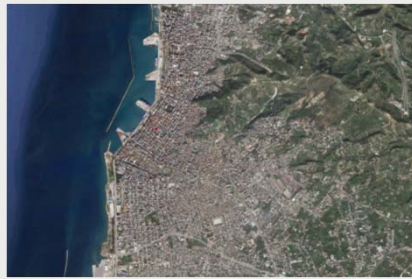


Mediterranean Port Cities

Nice



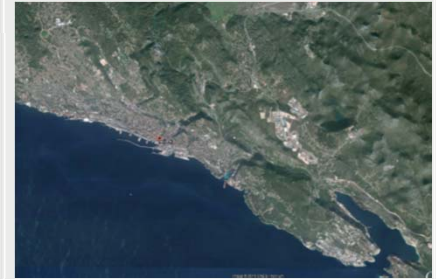
Patras



Pula



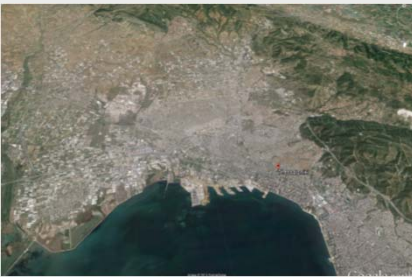
Rijeka



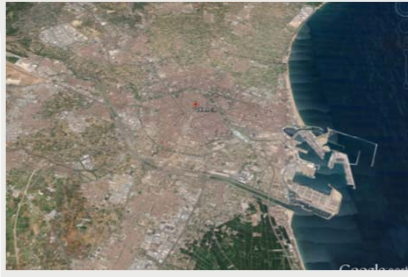
Seferihisar



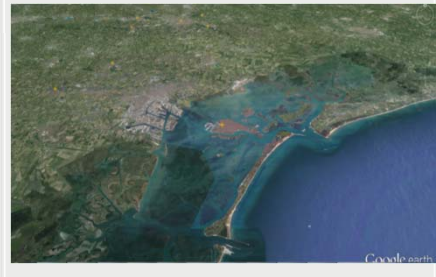
Thessaloniki



Valencia



Venice



Volos

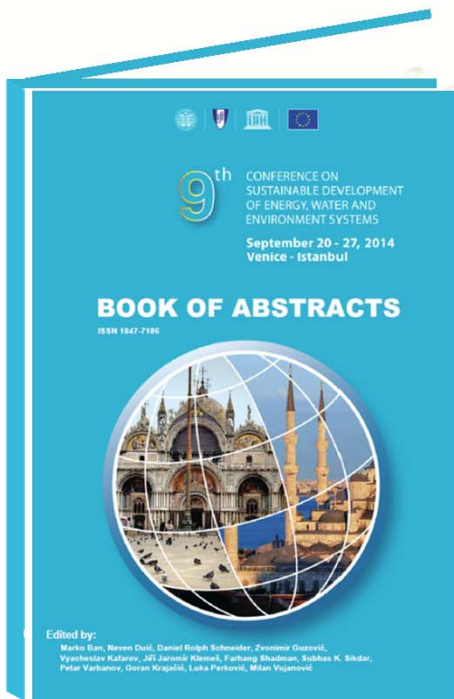


Zadar





Cities of the participating authors





Selected World Cities

Århus



Bogotá



Cluj-Napoca



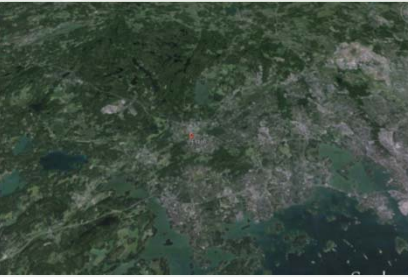
Cologne



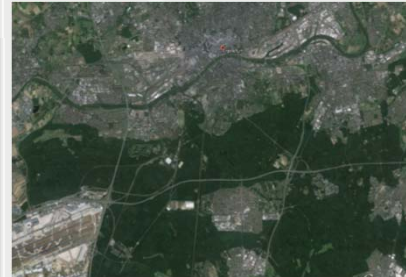
Eskişehir Tepebaşı



Espoo



Frankfurt



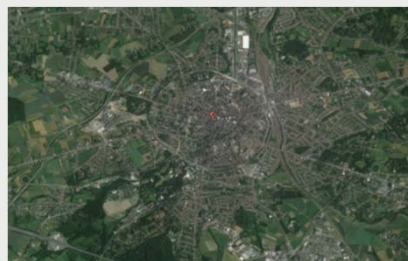
Grenoble



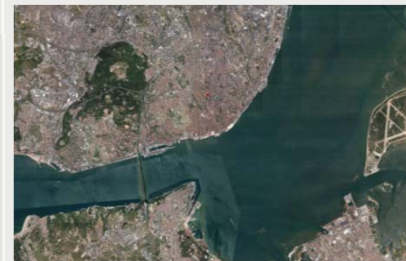
Incheon



Leuven



Lisbon



Maribor





Selected World Cities

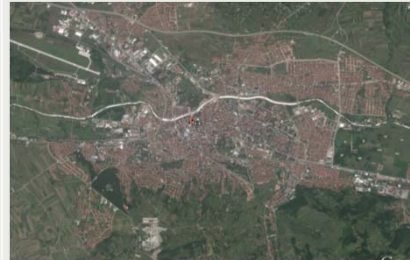
Milan



Nagoya



Niš



Ostrava



Paris



Pisa



Sevilla



Stockholm



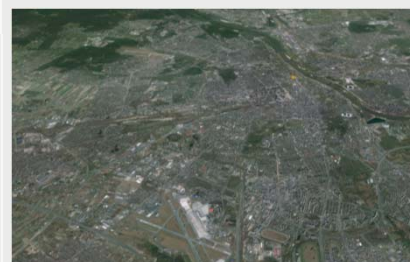
Timișoara



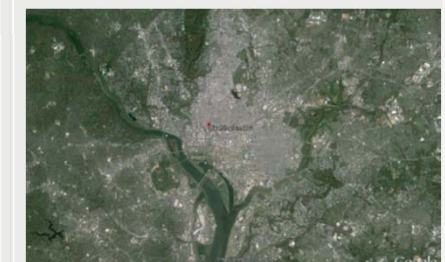
Vienna

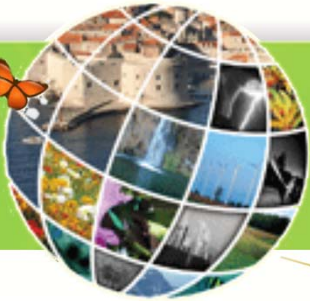


Warsaw



Washington D.C.





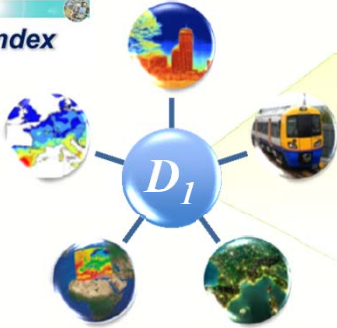
Selected World Cities

Zaragoza



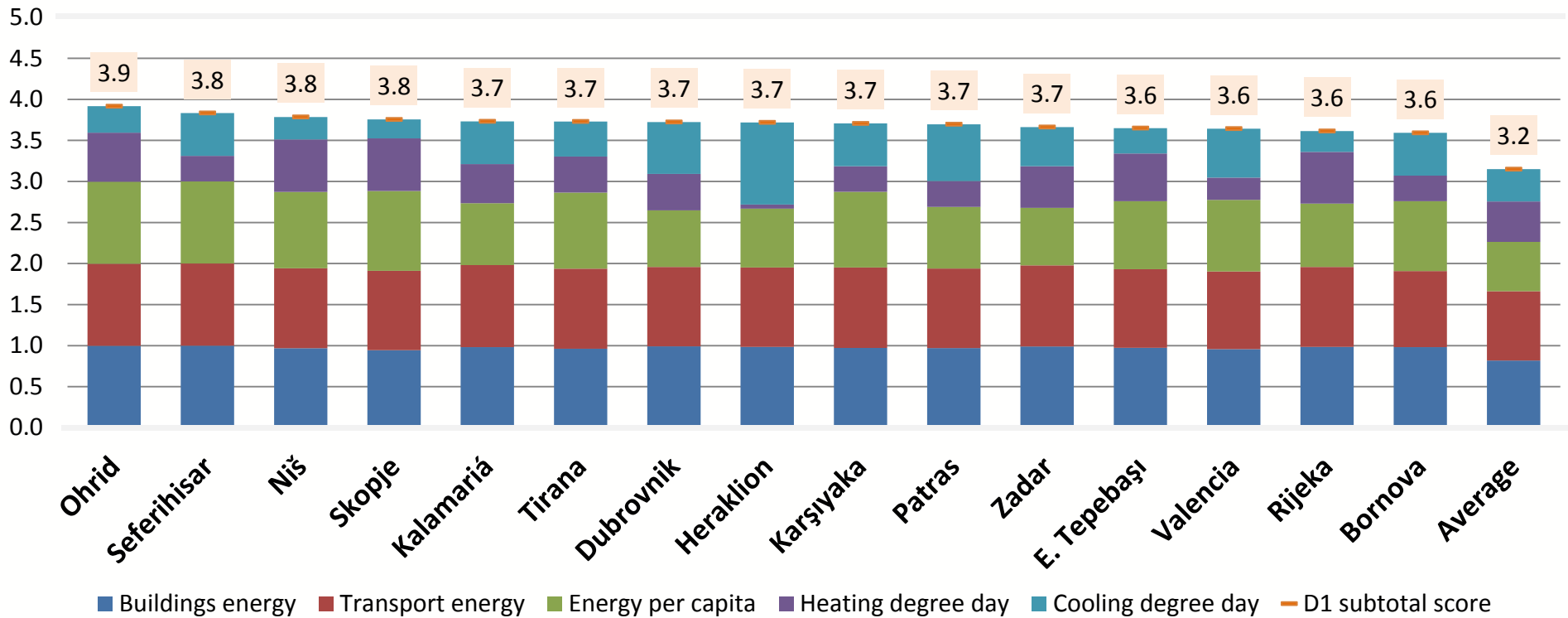
Sample of 58 cities

Best Practices



Energy Consumption and Climate

- Minimizing energy usage in buildings and transport relative to population and climate

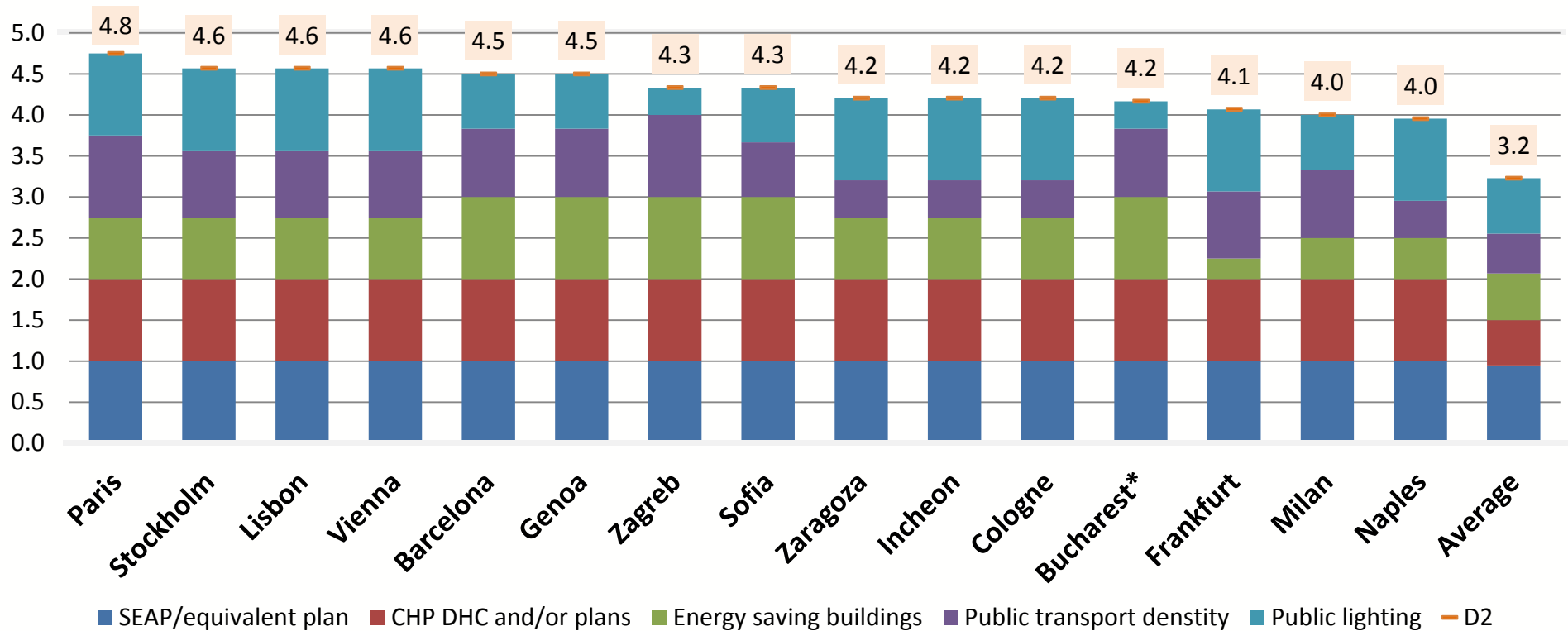


Best Practices



Penetration of Energy and CO₂ Saving Measures

- Diffusing CHP based DH/C networks
- Implementing pilot nZEB projects
- Connecting multiple modes of public transport

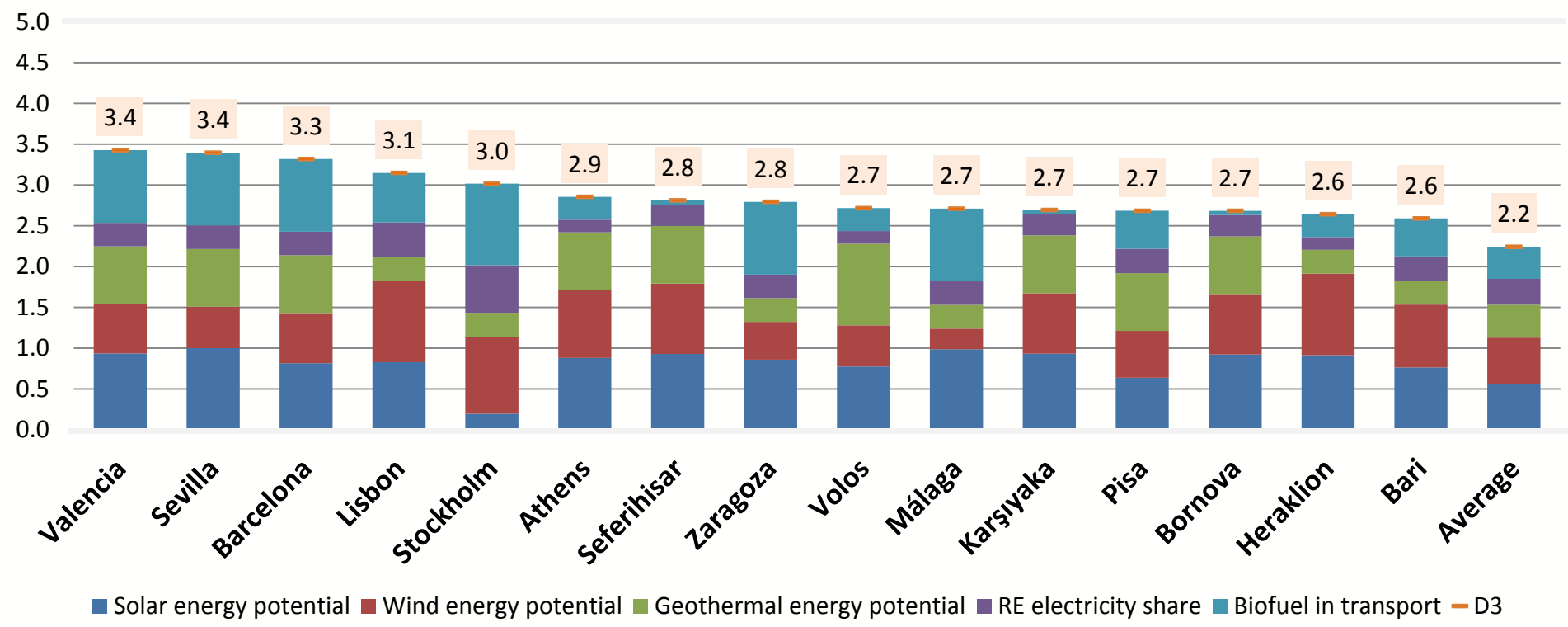


Best Practices



Renewable Energy Potential and Utilization

- Putting into use RE to replace high exergy resources
- Integrating RE into thermal energy networks

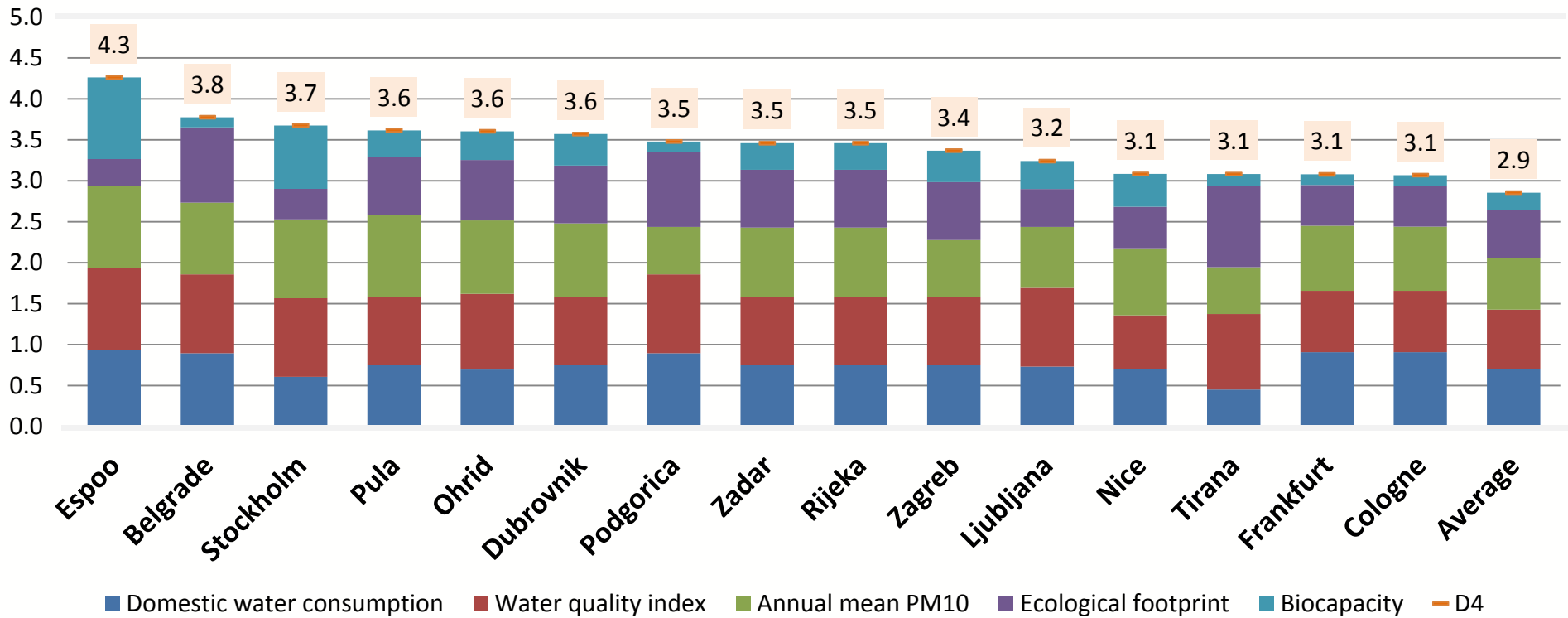


Best Practices



Water and Environmental Quality

- Increasing water quality and minimizing air pollution

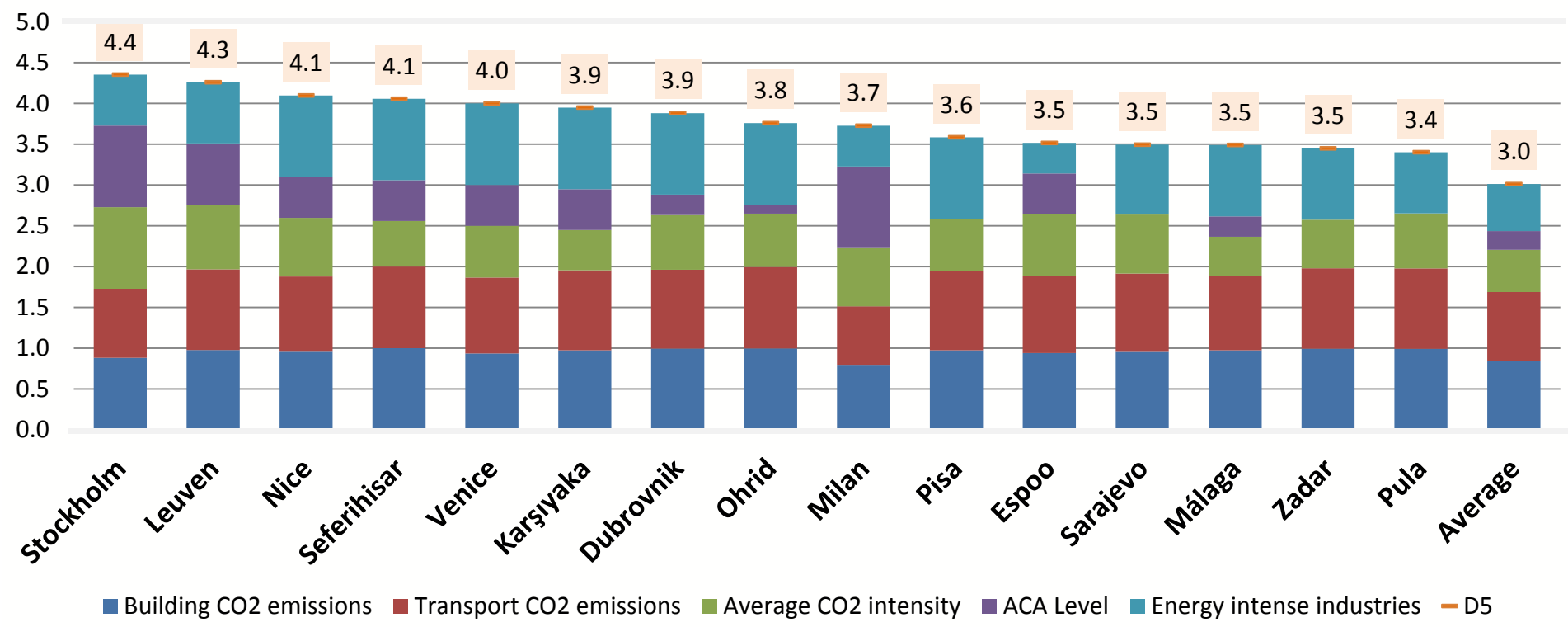


Best Practices



CO₂ Emissions and Industrial Profile

- Reducing CO₂ emissions relative to energy usage
- Minimizing energy intense industry and airport CO₂ impact

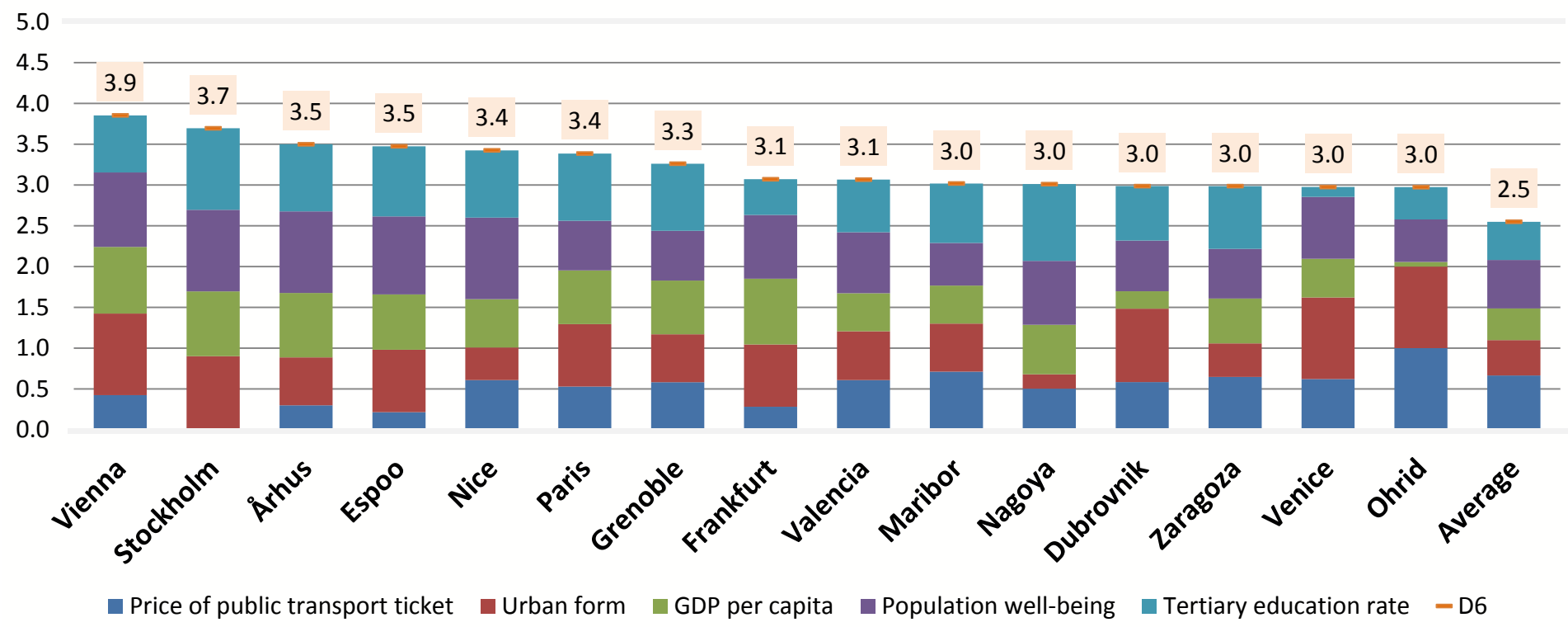


Best Practices



City Planning and Social Welfare

- Compact urban form and protecting green corridors
- Increasing economic and social well-being

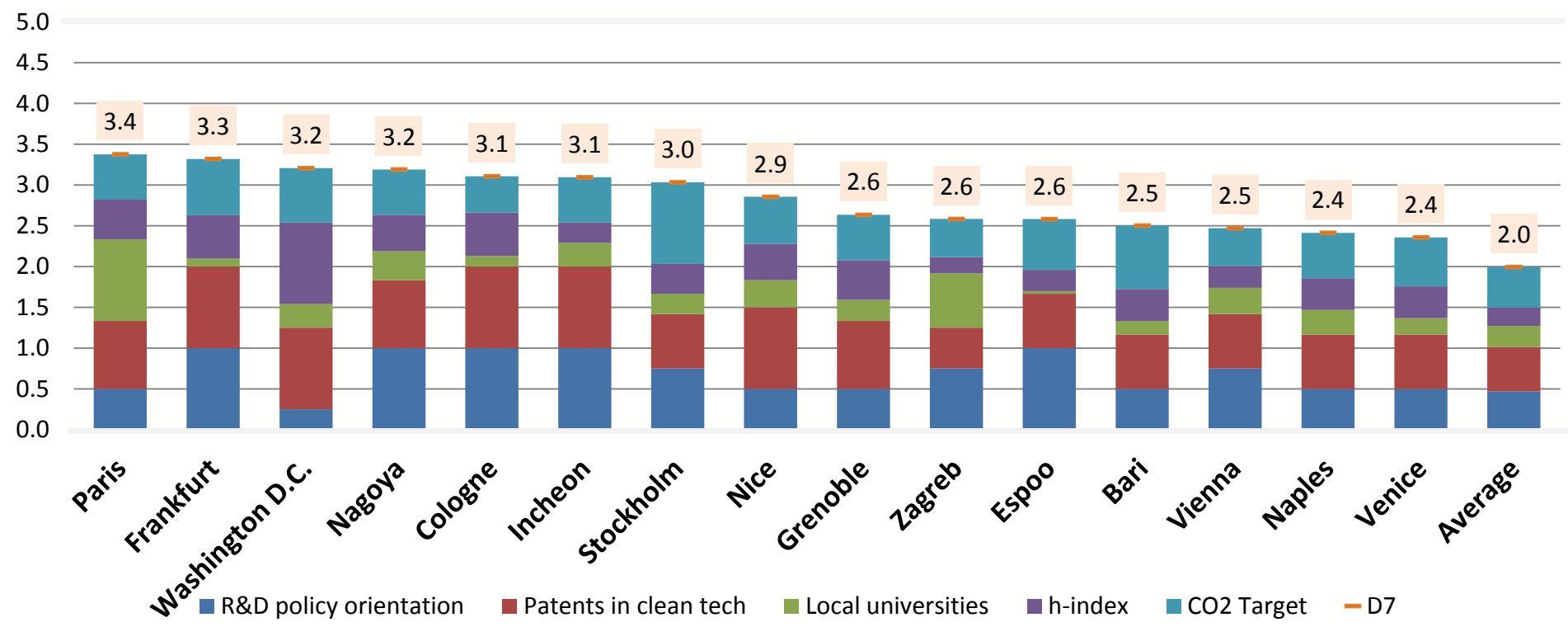


Best Practices



R&D, Innovation and Sustainability Policy

- Strengthening R&D and innovation capacity
- Mobilizing knowledge base for clean technology





SDEWES Index



D₁



D₂



D₃



D₄



D₅

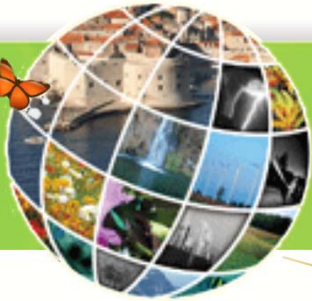


D₆



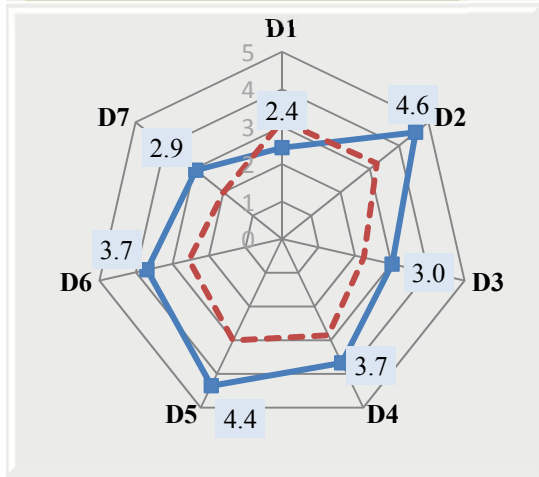
D₇



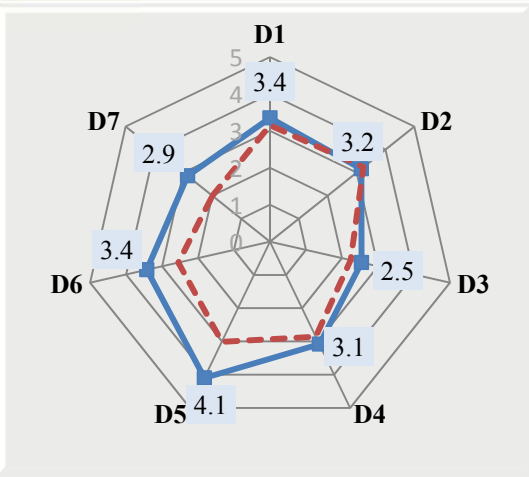


Top 15 Cities

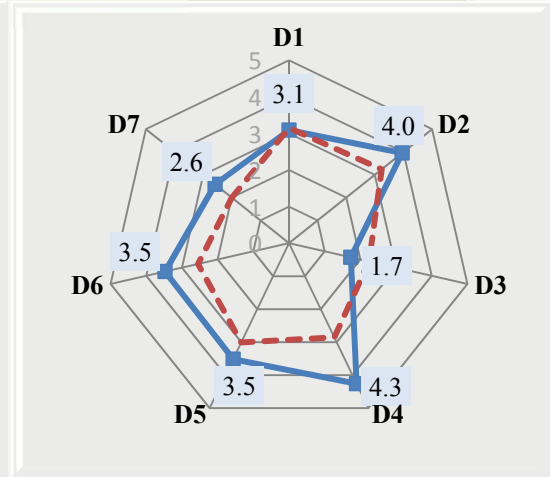
Stockholm



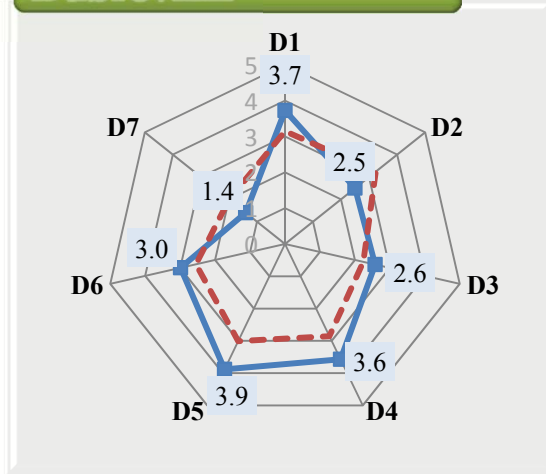
Nice



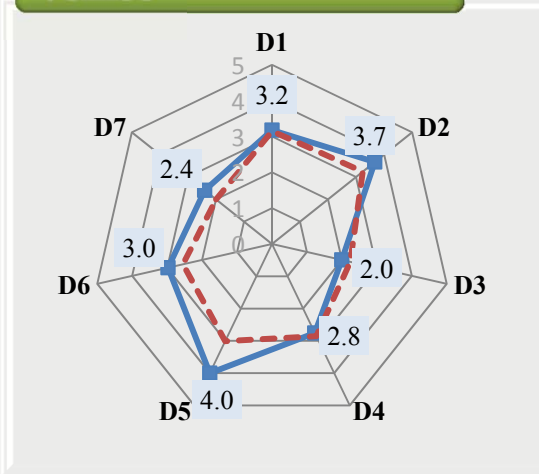
Espoo



Dubrovnik



Venice



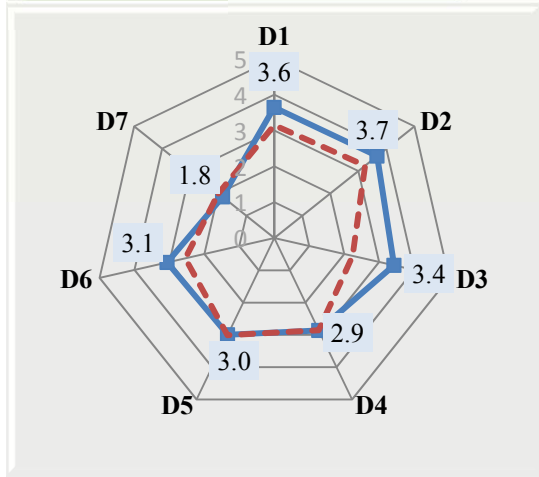
- 1
- 2
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- 6
- 7



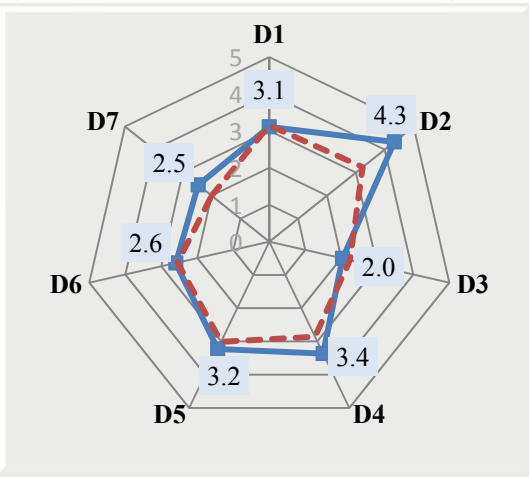


Top 15 Cities

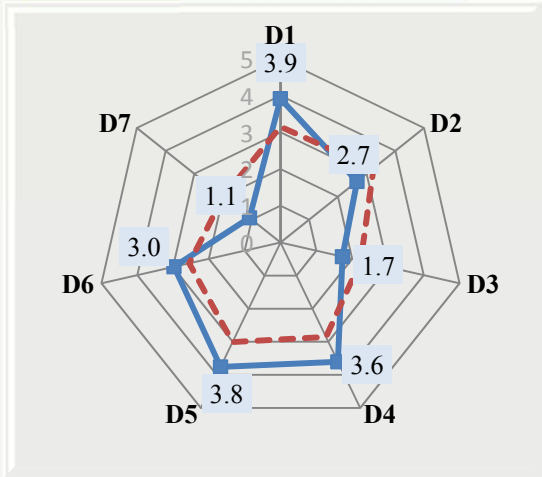
Valencia



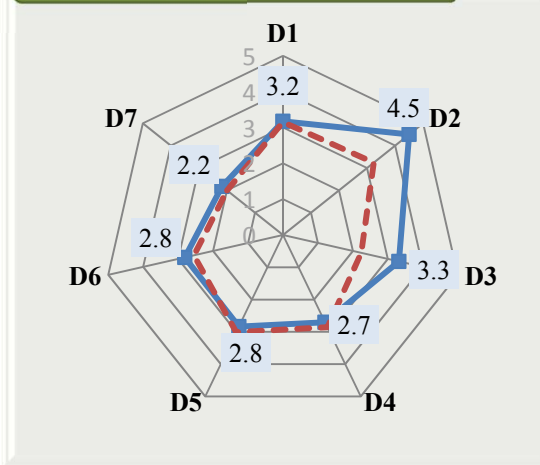
Zagreb



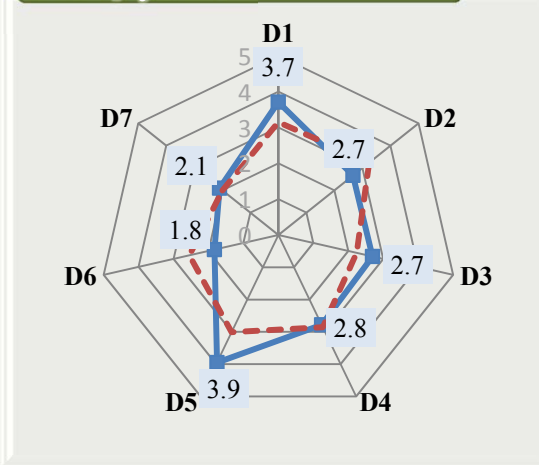
Ohrid



Barcelona



Karşıyaka

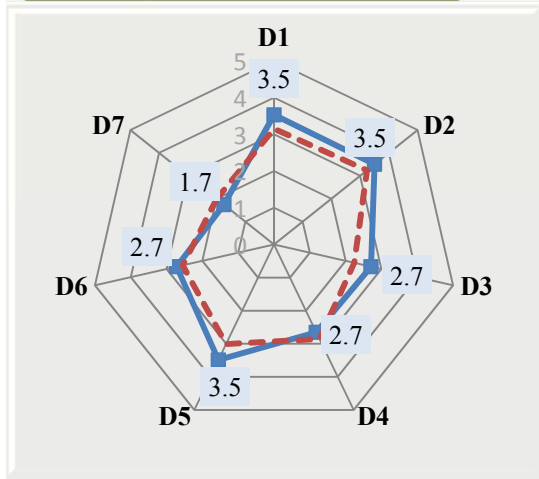


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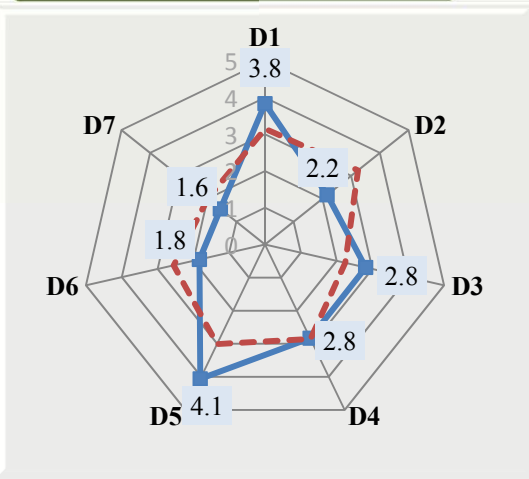


Top 15 Cities

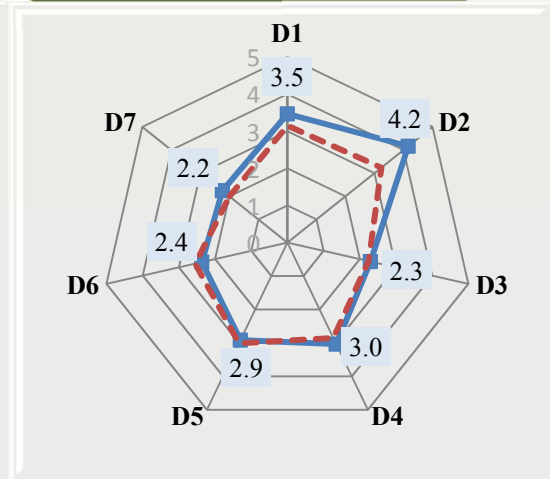
Málaga



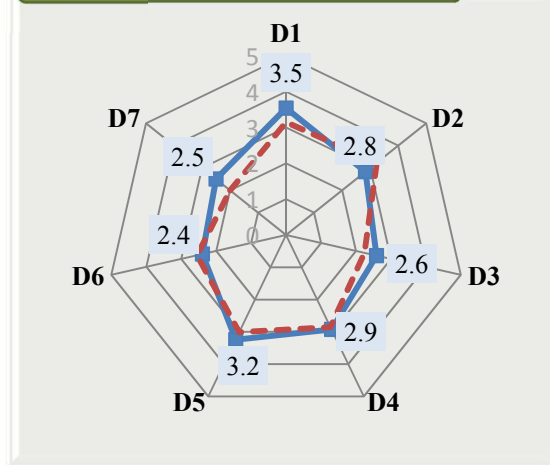
Seferihisar



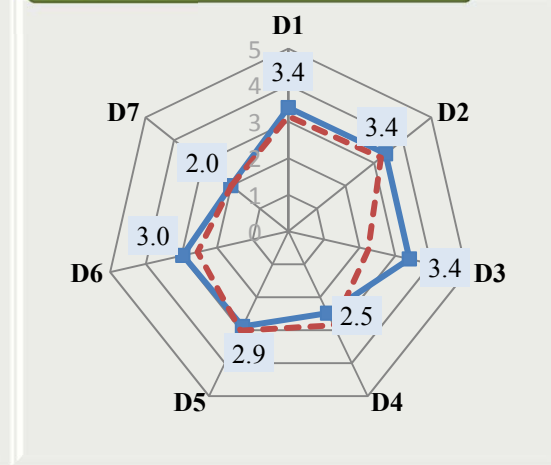
Bucharest*



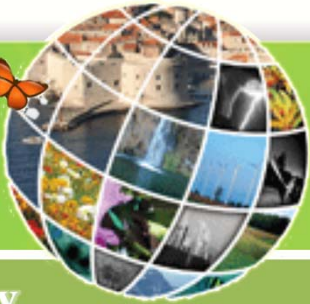
Bari



Sevilla

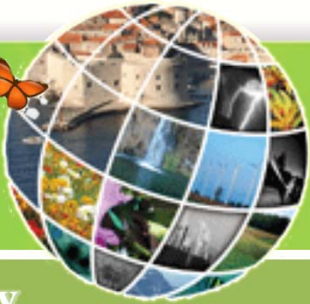


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- 5
- 6
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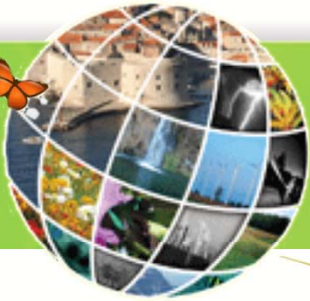
Complete Results

| City | Rank | SDEWES | City | Rank | SDEWES |
|---------------|------|--------|-------------|------|--------|
| • Stockholm | 1 | 3.49 | • Zaragoza | 16 | 2.97 |
| • Nice | 2 | 3.33 | • Grenoble | 17 | 2.94 |
| • Espoo | 3 | 3.25 | • Lisbon | 18 | 2.94 |
| • Dubrovnik | 4 | 3.14 | • Zadar | 19 | 2.93 |
| • Venice | 5 | 3.13 | • Naples | 20 | 2.93 |
| • Valencia | 6 | 3.12 | • Vienna | 21 | 2.93 |
| • Zagreb | 7 | 3.07 | • Paris | 22 | 2.92 |
| • Ohrid | 8 | 3.06 | • Århus | 23 | 2.92 |
| • Barcelona | 9 | 3.06 | • Genoa | 24 | 2.92 |
| • Karşıyaka | 10 | 3.05 | • Pula | 25 | 2.91 |
| • Málaga | 11 | 3.05 | • Bornova | 26 | 2.88 |
| • Seferihisar | 12 | 3.01 | • Frankfurt | 27 | 2.87 |
| • Bucharest | 13 | 2.99 | • Leuven | 28 | 2.87 |
| • Bari | 14 | 2.98 | • Pisa | 29 | 2.86 |
| • Sevilla | 15 | 2.98 | • Sofia | 30 | 2.86 |



Complete Results

| City | Rank | SDEWES | City | Rank | SDEWES |
|---------------|------|--------|-----------------|------|--------|
| • Milan | 31 | 2.85 | • Thessaloniki | 46 | 2.64 |
| • Heraklion | 32 | 2.84 | • Skopje | 47 | 2.58 |
| • Rijeka | 33 | 2.82 | • Incheon | 48 | 2.58 |
| • Belgrade | 34 | 2.81 | • Podgorica | 49 | 2.57 |
| • Kalamariá | 35 | 2.78 | • Cologne | 50 | 2.56 |
| • Patras | 36 | 2.74 | • Tirana | 51 | 2.56 |
| • Ljubljana | 37 | 2.74 | • Ostrava | 52 | 2.51 |
| • Maribor | 38 | 2.72 | • Warsaw | 53 | 2.42 |
| • Timișoara | 39 | 2.70 | • Athens | 54 | 2.30 |
| • Niš | 40 | 2.67 | • Washington DC | 55 | 2.30 |
| • E. Tepebaşı | 41 | 2.67 | • Istanbul | 56 | 2.24 |
| • Antalya | 42 | 2.66 | • Bogotá | 57 | 2.17 |
| • Cluj-Napoca | 43 | 2.65 | • Nagoya | 58 | 1.99 |
| • Volos | 44 | 2.65 | | | |
| • Sarajevo | 45 | 2.65 | | | |



Conclusion

