

Uma plataforma de cidades portuguesas para a **neutralidade climática**

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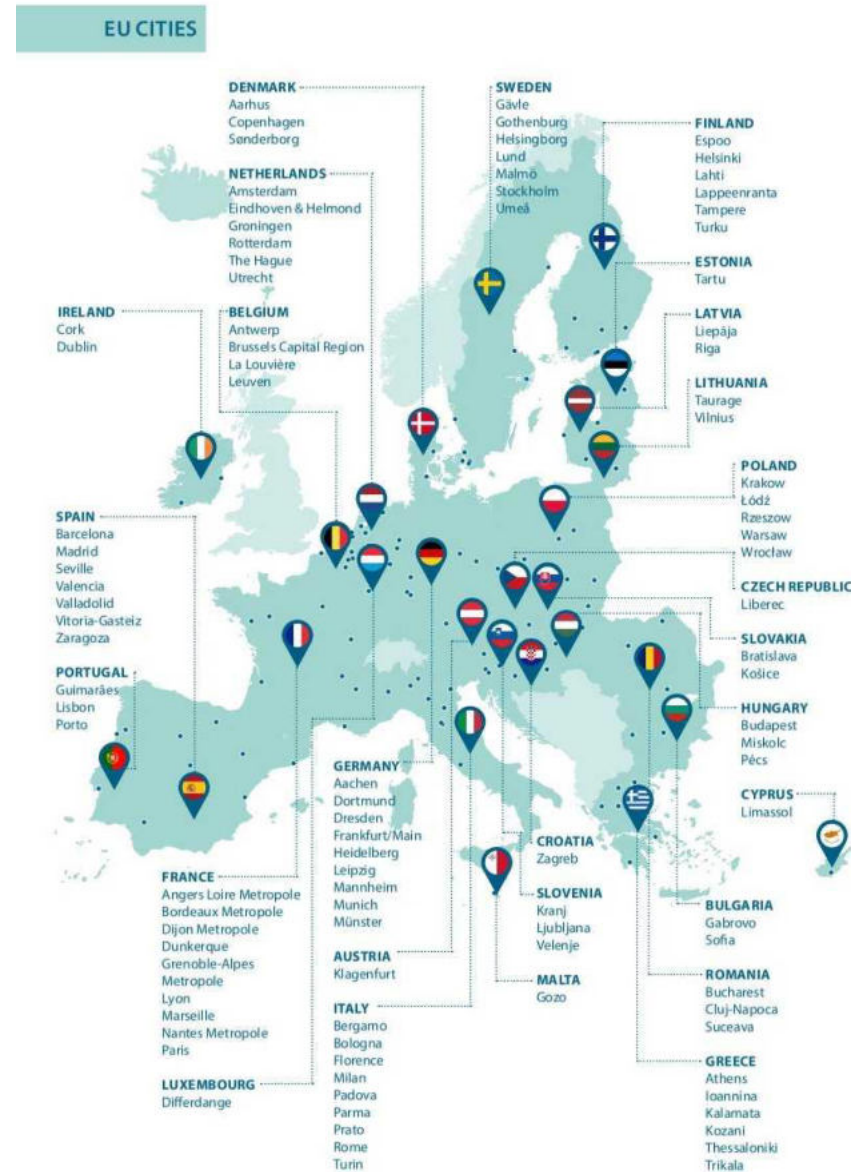
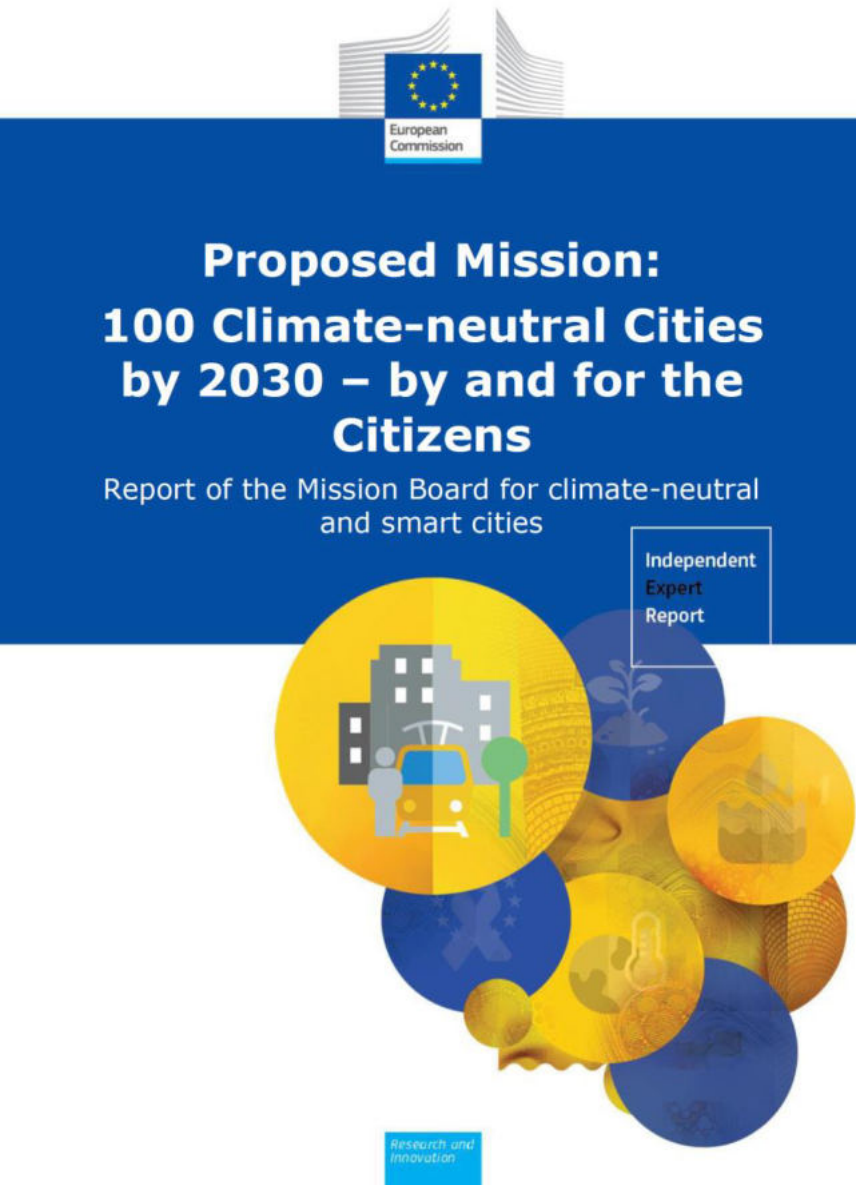


Climate Neutral and Smart Cities

"The new battlefield - Europe"

- **Mitigating climate change** at a global scale is a huge challenge and the time for the necessary societal transformation is short.
- Cities cover about 3% of the land on Earth, yet **they produce about 72% of all global greenhouse gas emissions.**
- On top of that, cities are growing fast; in Europe, it is estimated that **by 2050 almost 85% of Europeans will be living in cities.**
- Therefore, the **climate emergency must be tackled by cities – and by citizens.**

Smart cities – with a purpose – citizens and sustainability!





Climate Neutral and Smart Cities

Mission objectives

- Support and promote 100 European cities towards climate neutrality **by 2030** and turn them into models for all cities in the run to 2050;
- Build a multi-level, co-creative process, formalised through a **Climate City Contract**, to turn key barriers into drivers;
- Help delivering the SDG by improving air quality, **creating jobs, promoting healthier lifestyles**, and reducing the negative effects of mobility;
- **Capitalise on existing European climate initiatives** and stakeholders (CoM, EIT KICs,...);
- Collaborate with **European businesses** in order to contribute to innovation and improve their global competitiveness.



Climate Neutral and Smart Cities Mission board

- The mission board is committed to continue to support and steer the implementation of the missions, namely by **promoting networks of engaged cities, so that no one might be left behind**. These networks of ambitious cities are aimed at **addressing and discussing common issues related to accelerating climate-neutral solutions** and rely on the continued **support of the Commission to breaking silos and foster local cross-sectoral solutions to accelerate the climate neutrality**.
- This requires leveraging investments in EU programmes and in Member States, with continued support from the Commission, by guiding national authorities to not only to **streamline national, regional, European funds and create incentives for private investors** as a strategy to promote effective and concerted action.



Climate Neutral and Smart Cities Funding

- It will be critical for **cities** to have facilitated access to EU and national funding, as a **privileged mechanism mobilize private sector investment**, fostering their pivotal role in disseminating the solutions adopted across other cities ambitious in Europe.
- Two funding streams that deserve particular attention are **structural funds (Cohesion Policy) and the Innovation Fund**. The outreach to managing authorities could be strengthened with political support from the commission. Regarding the **Innovation Fund**, it will provide around **EUR 38 billion of support from 2020 to 2030** for the commercial demonstration of innovative low-carbon technologies, aiming to bring to the market industrial solutions to decarbonise Europe and support its transition to climate neutrality.



Climate Neutral and Smart Cities

Data platforms and digital twins

Smart technologies, data platforms and urban system modelling:

- **Smart and digital technologies** and data use can improve the efficient use of resources and better decision making, including by making use of **urban systems modelling**;
- Need to incentivize private investments, promote **voluntary data sharing**, establish **digital twins**, ensure **open platforms** and put in place a **harmonised approach to public procurement on the supply-side**.

- The constitution of this platform aims to promote an inclusive perspective, offering to all the cities engaged with the objective of carbon neutrality, the opportunity to **partner** with Lisbon, Guimarães and Porto, guaranteeing that no Portuguese city is left behind (21 cities applied to the mission and others).
- It is intended to **coordinate efforts of all network cities, all interested parties, and with the Central State Administration** to achieve common climate objectives, as:
 - Develop a “Climate Contract for the City”, aiming at climate neutrality by 2030,
 - Develop and implement projects with capacity to transform the cities,
 - Develop projects and actions that aim at an inclusive energy transition and the fight against energy poverty;
 - Betting on decarbonization, on the alteration of consumption and mobility patterns, and on promoting the **resource efficiency**.

National networks are developing well in many countries.






- Spain - **Spanish Cities platform**, here very well represented today.
- Sweden - “**Viable Cities**” network, Climate Neutral Cities 2030 , 23 Swedish municipalities - together accounting for 40% of Sweden's population - are working with Viable Cities and six authorities to achieve the mission. The central tool for this is Climate Contract 2030.
- Greece – the government is making a EUR 10 million “Green Fund” and an additional EUR 500.000 for each CCC available to its six Mission Cities.
- Finland - is formalising its support network for the Cities Mission, including a new national “Decarbonised Cities” funding programme

Digital Twins –Building Archetypes



BIM

Building Information Modeling

R4_MF_C													
GENERAL	1	Location	I1V2										
	2	Main Use	Residential										
	3	Prd Construction	1961-1990										
GEOMETRY	4	Bld Size-Class	Multi-Family										
	5	Neighboring	Contiguous										
	6	Nr. Dwellings	20										
	7	Nr. Rooms	2-3										
	8	Nr. Floor	5										
	9	Length	23,0 m										
	10	Width (depth)	12,5 m										
	11	Footprint Area (Avg)	241 m2										
	12	Constructed Area (Avg)	1422 m2										
	13	Floor-to-floor	2,72 m										
	14	Floor-to-ceiling	2,5 m										
	15	Volume (Avg)	4269 m3										
	16	Façade (Surface) Area (Avg)	1202 m2										
	17	Shape-Factor (S/V)	0,31										
	18	WWR (main façade)	21%										
	19	Angle	102 °										
													
	CONSTRUCTION	Façade (U-value)											
		20		1,1	Layer	Thick (m)	R (m2.K/W)	k (W/mK)	ρ_v (J/kg.K)	ρ (kg/m3)	Therm. ϵ	Solar α	Visual α
					Finishing - cement coating	0.02	0.025	0.8	1.040	1600	0.87	0.4	-
				Hollow Brick Wall	0.15	0.366	0.41	920-1000	1000-1200	0.93	-	-	
				Air Gap - cavity/no insulation	0.03	0.18	0.025	1000	1.23	-	-	-	
				Hollow Brick Wall	0.11	0.268	0.41	920-1000	1000-1200	0.93	-	-	
				Finishing - plaster	0.02	0.025	0.8	<1600	-	0.87	-	-	
Roof (U-value) - Sloped													
21			2,4	Layer	Thick (m)	R (m2.K/W)	k (W/mK)	ρ_v (J/kg.K)	ρ (kg/m3)	Therm. ϵ	Solar α	Visual α	
				Concrete paving flag	0.03	0.018	1.85	840-1040	2000-2300	0.92-0.97	-	-	
				Tar (waterproof)	0.008	0.007	1.15	820	<2100	-	-	-	
				Poor Concrete	0.04	0.024	1.85	840-1040	2000-2300	0.92-0.97	-	-	
				Reinforced Concrete slab	0.06	0.026	2	840-1040	2300-2400	0.92-0.97	-	-	
				Hollow Brick Blocks	0.06	0.146	0.41	920-1000	1000-1200	0.93	-	-	
				Finishing - plaster	0.03	0.038	0.8	<1600	-	0.87	-	-	
Interior Floor (U-value)													
22			1,8	Layer	Thick (m)	R (m2.K/W)	k (W/mK)	ρ_v (J/kg.K)	ρ (kg/m3)	Therm. ϵ	Solar α	Visual α	
				Ceramic tiles	0.02	0.015	1.3	745	2300	-	-	-	
				Reinforced Concrete slab	0.05	0.025	2	840-1040	2300-2400	0.92-0.97	-	-	
				Hollow Brick Blocks	0.06	0.146	0.41	920-1000	1000-1200	0.93	-	-	
			Finishing - plaster	0.03	0.038	0.8	<1600	-	0.87	-	-		
Ground Floor - R													
23		0,21	Layer	Thick (m)	R (m2.K/W)	k (W/mK)	ρ_v (J/kg.K)	ρ (kg/m3)	Therm. ϵ	Solar α	Visual α		
			Ceramic tiles	0.02	0.015	1.3	745	2300	-	-	-		
			Reinforced Concrete Slab	0.15	0.075	2	840-1040	2300-2400	0.92-0.97	-	-		
			Tar (waterproof)	0.008	0.007	1.15	820	<2100	-	-	-		
			Poor Concrete	0.1	0.061	1.85	840-1040	2000-2300	0.92-0.97	-	-		
			Gravel	0.1	0.060	2	-	1700-2200	-	-	-		
Partitions (U-value)													
24		1,5	Material Layer	Thick (m)	R (m2.K/W)	k (W/mK)	ρ_v (J/kg.K)	ρ (kg/m3)	Therm. ϵ	Solar α	Visual α		
			Finishing - plaster	0.02	0.025	0.8	<1600	-	0.87	-	-		
			Hollow Brick	0.15	0.366	0.41	920-1000	1000-1200	0.93	-	-		
			Finishing - plaster	0.02	0.025	0.8	<1600	-	0.87	-	-		
Windows (U-value)													
25		5,2	Glazing Type	Frame Type	Solar Factor*	Glass Transmittance*	Cobr	Break(Y/N)	Area Ratio (%)	Operable (Y/N)			
			Simple Glass (4mm)	Metallic Frame	0.88	0.9	no color	N	30	Y			
Shading		-	Shading Type	Window solar factor with shutters at 100%*				Position (SE)	Automated (Y/N)				
26	Shading	-	0.07				Exterior	N					
			0.46					Interior					

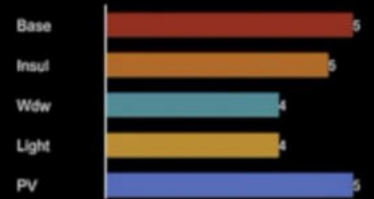
URBAN MODELING PLATFORM

Anjos, Lisbon

Heating (kWh/m²)



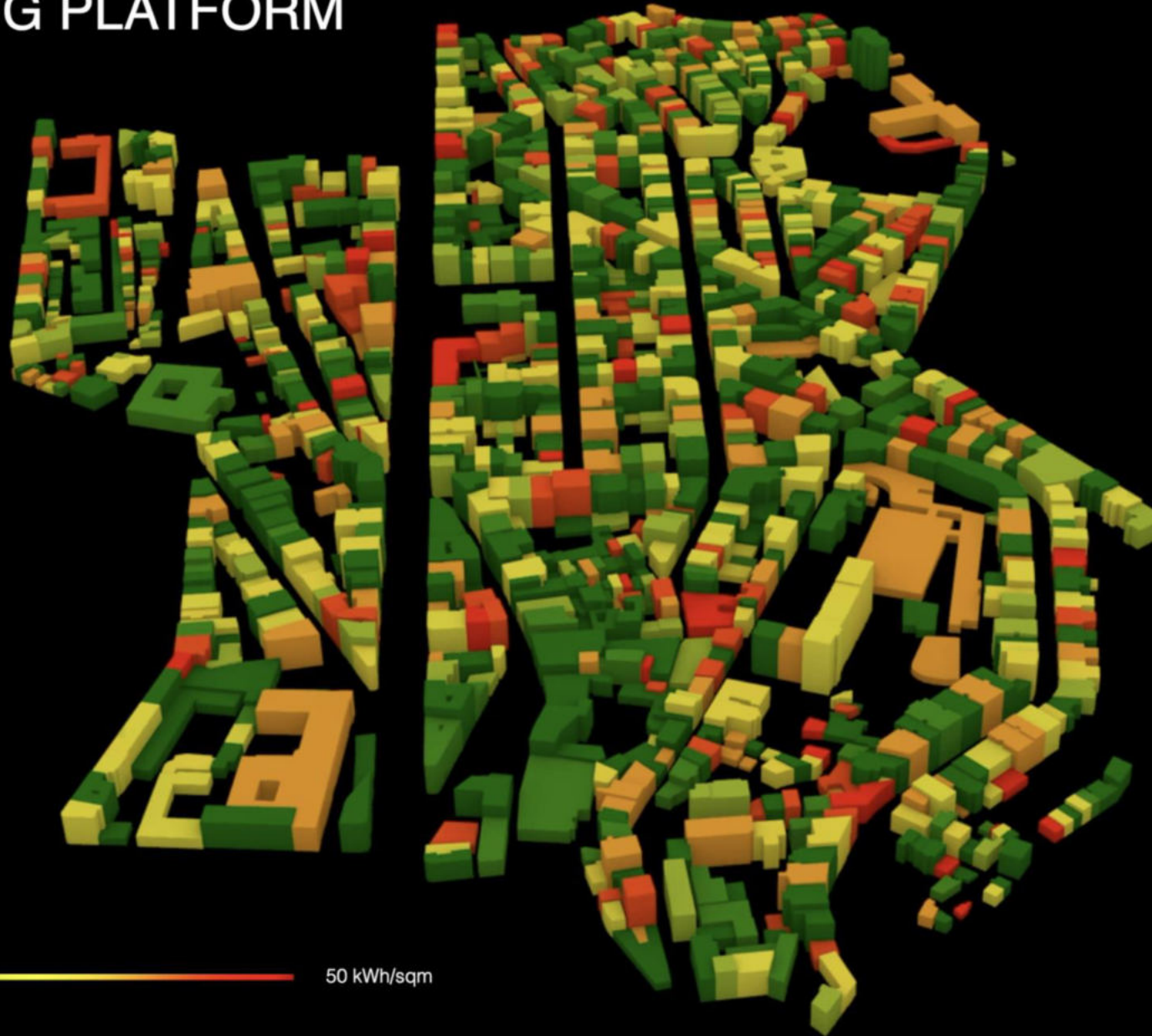
Cooling (kWh/m²)



Lighting and Equipment (kWh/m²)



30 kWh/sqm ————— 50 kWh/sqm



High temporal resolution
Building characterization
Occupant behaviour characterization

Building Retrofit Interventions

Envelope insulation enhancement

Level of implementation (%) 80

Windows replacement

Level of implementation (%) 60

LED lighting

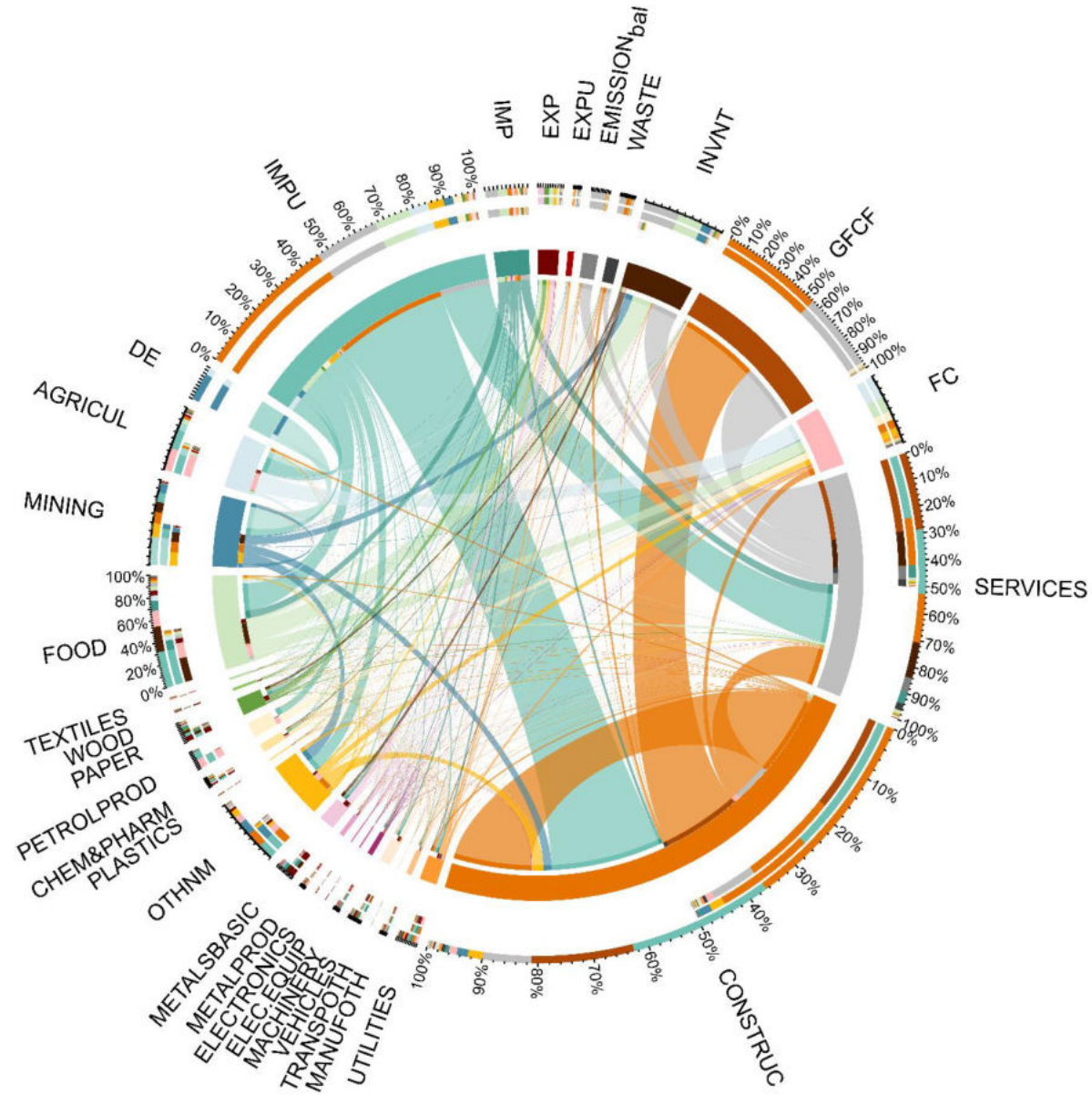
Level of implementation (%) 80

PV energy generation

Level of implementation (%) 100

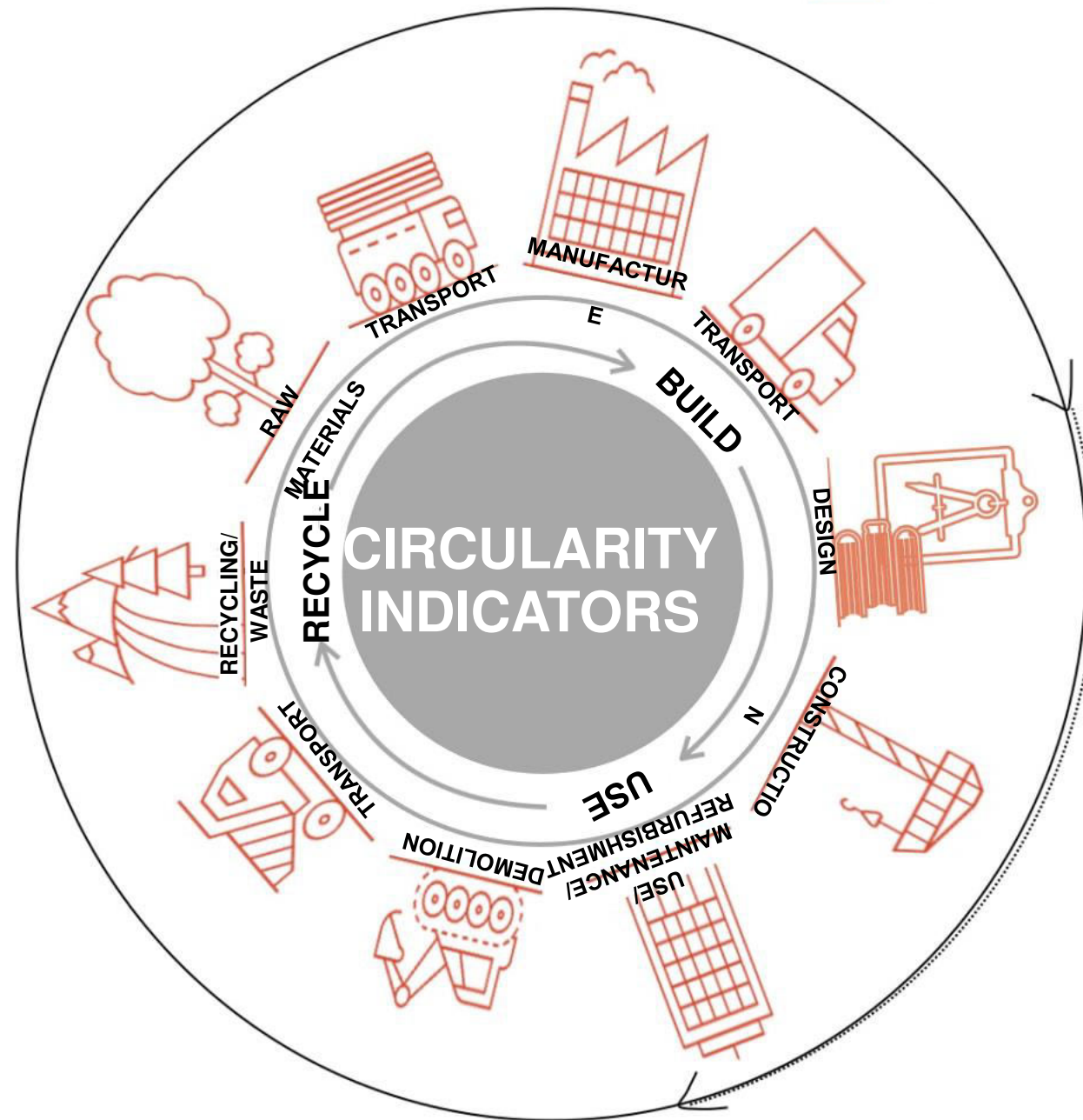
Understanding Urban metabolism to promote resource efficiency

- Lisbon Metabolism



Circular Economy

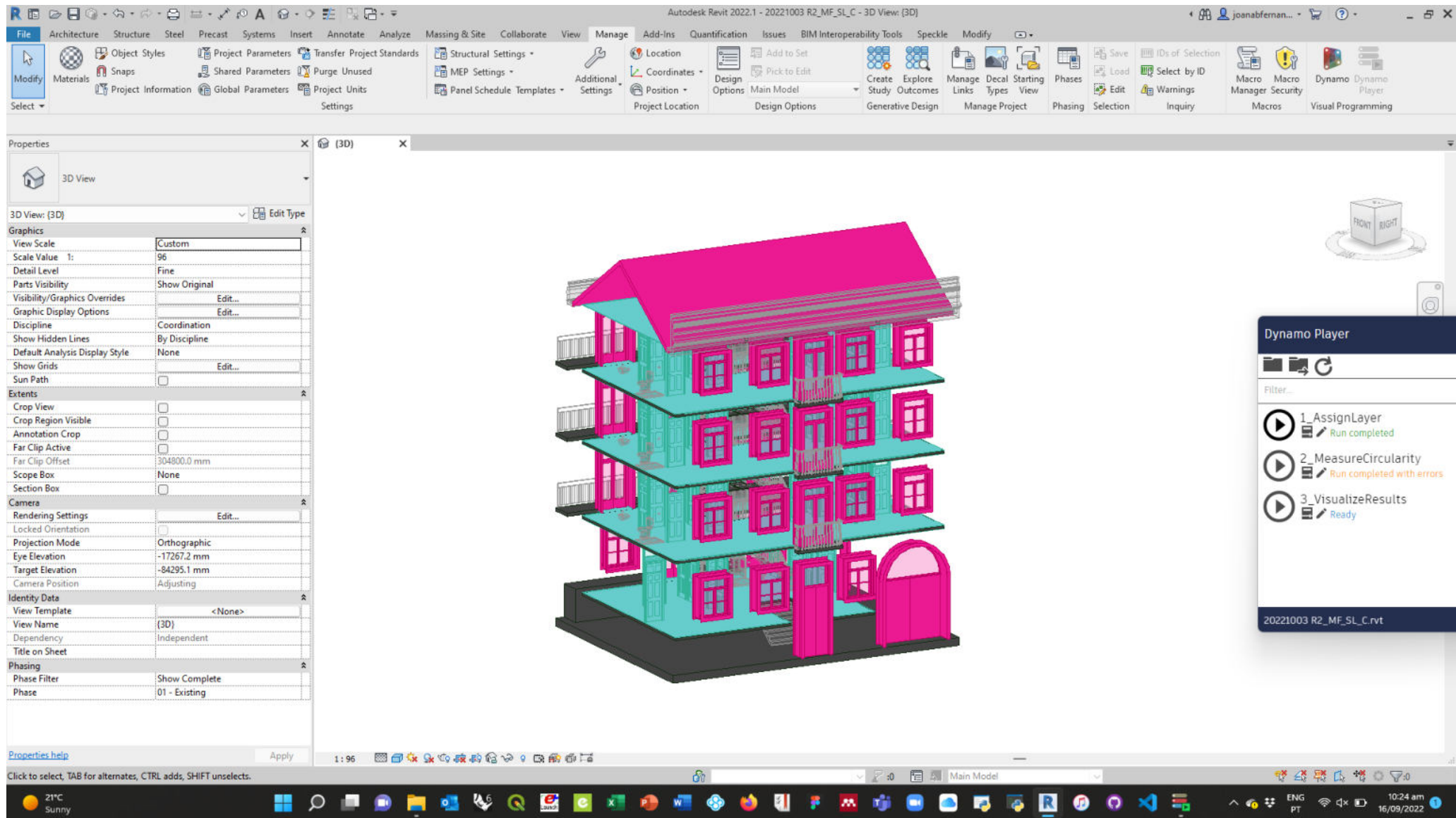
Circular economy is a restorative and regenerative model of production and consumption in which the **utility** of products, components and materials' is maximised and the **loops are closed** by reusing, recovering and recycling at end-of-life stage, with the aim of **minimising** the consumption of **virgin material** input and the production of **unrecoverable waste**.



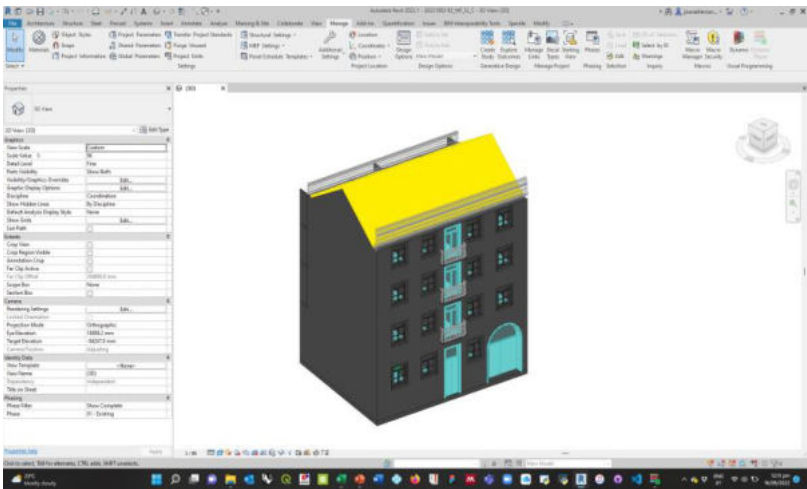
Science and Knowledge is the way forward to Circular Economy – example of Buildings



Circularity assessment in buildings | a new plugin(building layer)



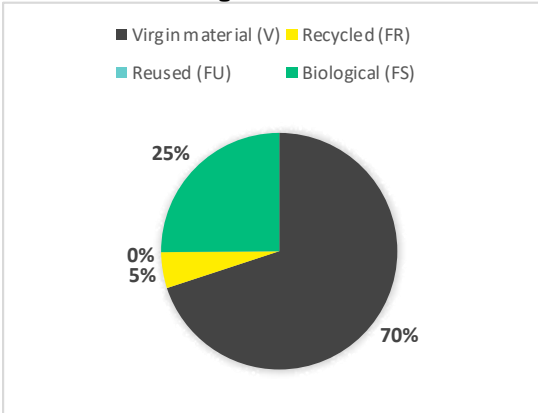
Sample Results



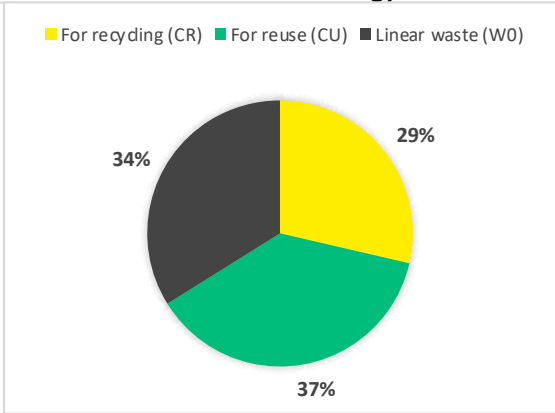
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Circular **EcoBIM**

Original material

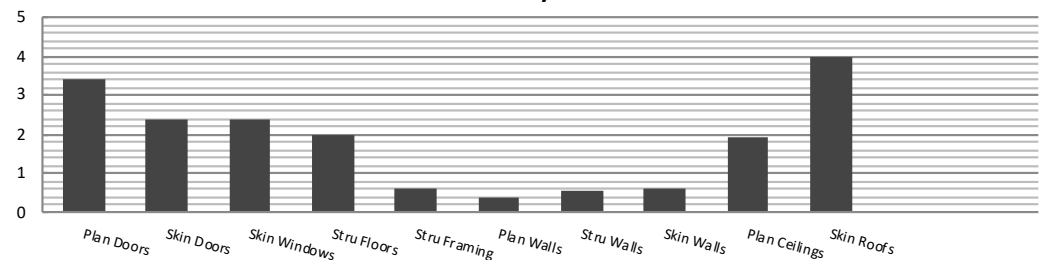


End of life strategy

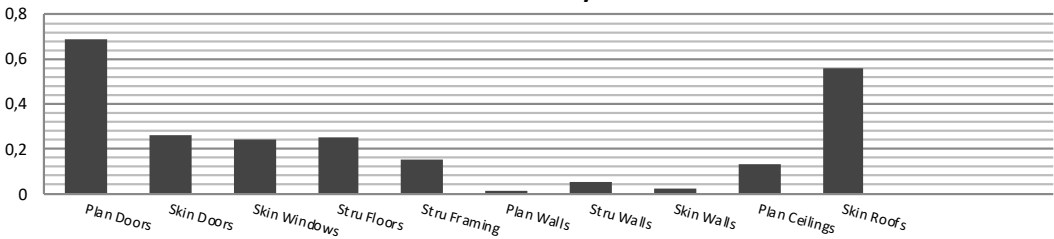


BCI	BCI	0,87
Average SCI	SCI	0,22
Average PCI	PCI	0,26
Average disassembly potential	DI	1,71
Highest disassembly potential (top 3)	DI _{MAX}	4, 3.8, 3.8
Lowest disassembly potential (top 3)	DI _{MIN}	0.4, 0.4, 0.4
Origin material: virgin material	V	96%
Origin material: recycled	F _R	7%
Origin material: reused	F _U	0%
Origin material: bio-based	F _S	34%
EoL strategy: recycle	C _R	27%
EoL strategy: reuse	C _U	36%
EoL unrecoverable waste	W ₀	32%

Disassembly indicators



Product Circularity Indicators



WORKSHOP

Dia da Europa, 9 maio 2023

O Desafio Europeu para a Neutralidade Climática
em 2030: o papel das cidades

Muito obrigado,
Thank you !

Paulo Ferrão

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