ISLA SOSTENIBLE 'MENORCA' ROADSHOW

CITY-zen
New urban energy

Monday 24th April to Friday 28th April 2017

Hosted by IME – Institut Menorquí d'Estudis

Dr Craig Martin, TU Delft NL.

SEVENTH FRAMEWORK PROGRAMME

IME Institut Menorquí d'Estudis

MENORCA RESERVA DE BIOSFERA

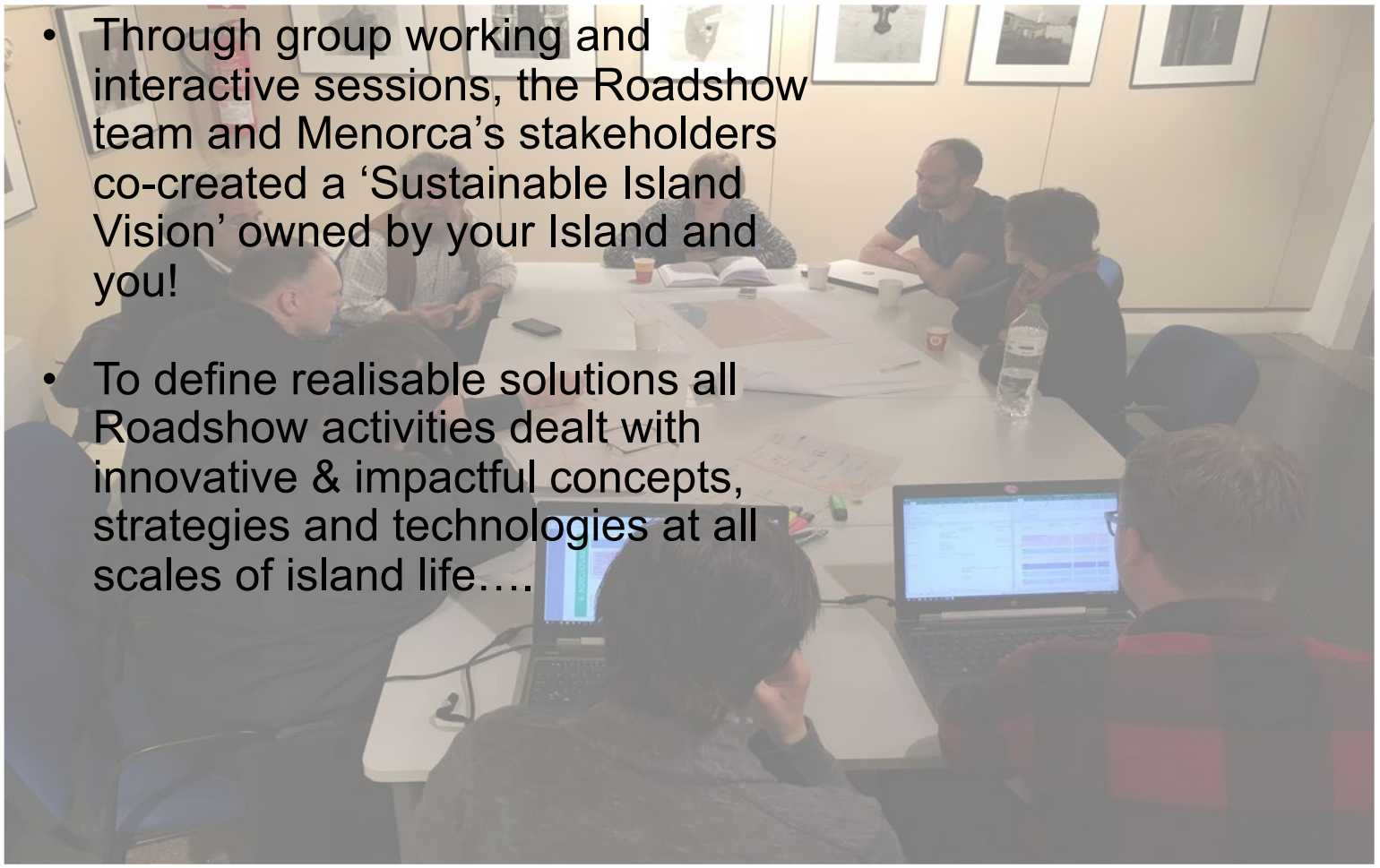
MENORCA TALAIÒTI Candidata Patrimoni Mundial Única al món!

CONSELL INSULAR DE MENORCA

DEM directrius estratègiques de menorca

COL·LEGI OFICIAL D'ARQUITECTES ILLES BALEARS

THE AIM



- Through group working and interactive sessions, the Roadshow team and Menorca's stakeholders co-created a 'Sustainable Island Vision' owned by your Island and you!

- To define realisable solutions all Roadshow activities dealt with innovative & impactful concepts, strategies and technologies at all scales of island life….

MENORCA ‘SWAT’ Studio (Feb 2017)

22 | MENORCA • Es Diari | SÁBADO, 11 DE MARZO DE 2017 |

Mira Menorca

El Maó més autosuficient

▶ Alumnes de la Delft University of Technology han plantejat propostes per fer que la ciutat sigui més sostenible

S.W.A.T STUDIO

3 MONTHS

Port. Els alumnes hi proposen un canvi d'aspecte radical, per tal que sigui molt més diàfan i pensat per al passeig. El trànsit rodat no s'elimina però sí que queda totalment dissimulat i, aprofitant el canvi d'ubicació del trànsit marítim a s'Altra Banda, proposen fer un centre wellness a l'antiga Estació Marítima, amb restaurant, spa exterior i una plataforma elevada connectant amb les escales que pugen al centre. Tot el projecte contempla la implantació d'energies netes i el reaprofitament, per exemple, de les aigües calentes de la central tèrmica.

Plaça Conquesta. Aquest punt quasi en total desús en l'actualitat, es podria convertir en una espècie de mercat agrari, totalment desmuntable, reconfigurable i ple de vegetació, que es destinaria també a l'oci, amb espais per a la lectura. Comptaria amb panells solars per fer-lo totalment autosuficient.

Rubió Tudurí. El parc perdria les barreres que el delimiten per obrir-se al barri i convertir-se en un autèntic pulmó verd, des de l'avinguda Vives Llull fins a la pista d'atletisme del poliesportiu. L'espai per al trànsit quedaria molt reduït i es connectaria l'entorn amb els camins rurals propers (de ses Rodees). Els edificis tindrien plaques solars.

Idees

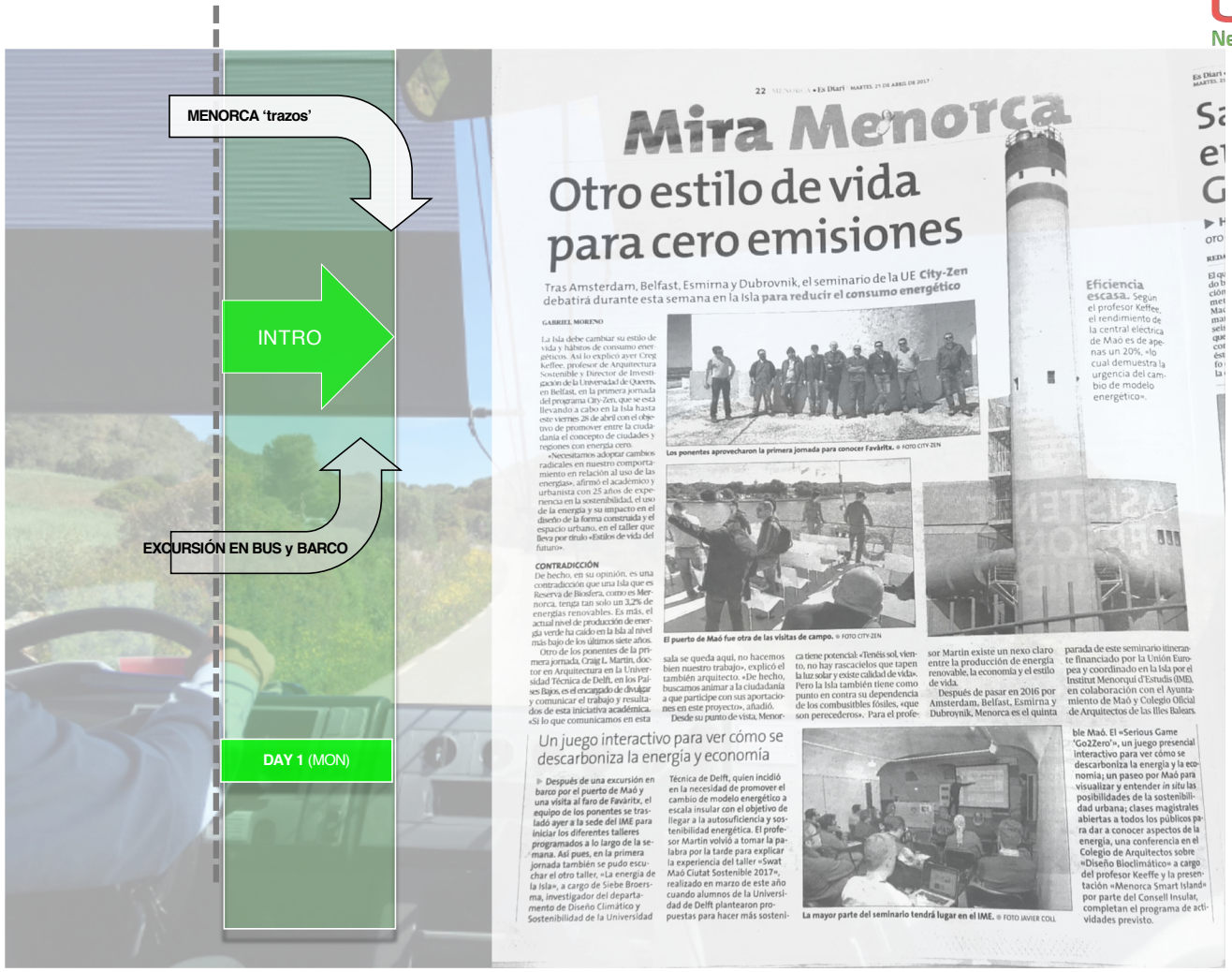
Els alumnes holandesos han aportat solucions per tenir una ciutat molt més eficient

Dues setmanes de treball a l'Illa per presentar els seus projectes

▶ Els estudiants han estat a Menorca durant dues setmanes, temps durant el qual han estat analitzant les característiques de la ciutat. Han estudiat la situació climàtica, les emissions i la petjada de carboni, la cultura, l'economia, la morfologia urbana i també la tipologia dels edificis. A partir d'aquesta anàlisi han proposat les seves idees per convertir els diferents punts de la ciutat que se'ls ha adjudicat, per tal d'aplicar-hi les millors mesures en matèria d'eficiència energètica i autosuficiència, així com també d'atorgar-los un major valor mediambiental. Els treballs finals es van presentar ahir de matí a la seu de l'Institut Menorquí d'Estudis. Van assistir a l'acte el conseller insular de Mobilitat, Miquel Preto, la regidora de Medi Ambient de Maó, Isabel López, i David Carreras, de l'OBSAM.

La presentació dels projectes va ser a Can Victori. FOTO JAVIER COLL

Día 1



22 MENORCA • Es Diari MARTES, 25 DE ABRIL DE 2017

Mira Menorca

Otro estilo de vida para cero emisiones

Tras Amsterdam, Belfast, Esmirna y Dubrovnik, el seminario de la UE City-Zen debatirá durante esta semana en la Isla para reducir el consumo energético

GABRIEL MORENO

La Isla debe cambiar su estilo de vida y hábitos de consumo energéticos. Así lo explicó ayer Creg Keffee, profesor de Arquitectura Sostenible y Director de Investigación de la Universidad de Queens, en Belfast, en la primera jornada del programa City-Zen, que se está llevando a cabo en la Isla hasta este viernes 28 de abril con el objetivo de promover entre la ciudadanía el concepto de ciudades y regiones con energía cero.

«Necesitamos adoptar cambios radicales en nuestro comportamiento en relación al uso de las energías», afirmó el académico y urbanista con 25 años de experiencia en la sostenibilidad, el uso de la energía y su impacto en el diseño de la forma construida y el espacio urbano, en el taller que lleva por título «Estilos de vida del futuro».

CONTRADICCIÓN

De hecho, en su opinión, es una contradicción que una Isla que es Reserva de Biosfera, como es Menorca, tenga tan solo un 3,2% de energías renovables. Es más, el actual nivel de producción de energía verde ha caído en la Isla al nivel más bajo de los últimos siete años.

Otro de los ponentes de la primera jornada, Craig L. Martin, doctor en Arquitectura en la Universidad Técnica de Delft, en los Países Bajos, es el encargado de divulgar y comunicar el trabajo y resultados de esta iniciativa académica. «Si lo que comunicamos en esta sala se queda aquí, no hacemos bien nuestro trabajo», explicó el también arquitecto. «De hecho, buscamos animar a la ciudadanía a que participe con sus aportaciones en este proyecto», añadió.

Desde su punto de vista, Menorca tiene potencial: «Tenés sol, viento, no hay rascacielos que tapen la luz solar y existe calidad de vida». Pero la Isla también tiene como punto en contra su dependencia de los combustibles fósiles, «que son perecederos». Para el profesor Martin existe un nexo claro entre la producción de energía renovable, la economía y el estilo de vida.

Después de pasar en 2016 por Amsterdam, Belfast, Esmirna y Dubrovnik, Menorca es el quinta parada de este seminario itinerante financiado por la Unión Europea y coordinado en la Isla por el Institut Menorquí d'Estudis (IME), en colaboración con el Ayuntamiento de Maó y Colegio Oficial de Arquitectos de las Illes Balears.

Los ponentes aprovecharon la primera jornada para conocer Favàritx. • FOTO CITY-ZEN

El puerto de Maó fue otra de las visitas de campo. • FOTO CITY-ZEN

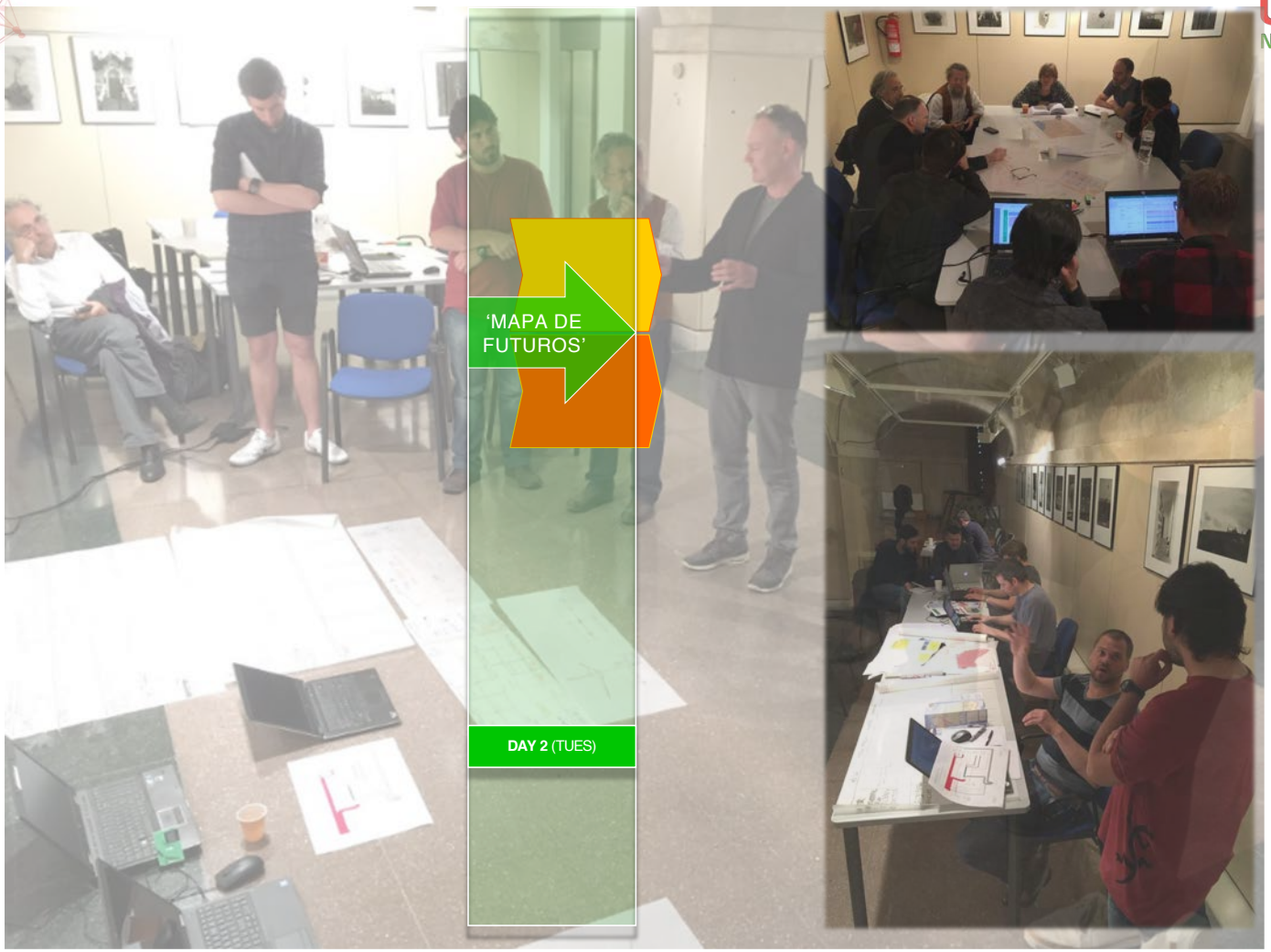
Eficiencia escasa. Según el profesor Keffee, el rendimiento de la central electrica de Maó es de apenas un 20%, «lo cual demuestra la urgencia del cambio de modelo energético».

Un juego interactivo para ver cómo se descarboniza la energía y economía

*Después de una excursión en barco por el puerto de Maó y una visita al faro de Favàritx, el equipo de los ponentes se trasladó ayer a la sede del IME para iniciar los diferentes talleres programados a lo largo de la semana. Así pues, en la primera jornada también se pudo escuchar el otro taller, «La energía de la Isla», a cargo de Siebe Broersma, investigador del departamento de Diseño Climático y Sostenibilidad de la Universidad Técnica de Delft, quien incidió en la necesidad de promover el cambio de modelo energético a escala insular con el objetivo de llegar a la autosuficiencia y sostenibilidad energética. El profesor Martin volvió a tomar la palabra por la tarde para explicar la experiencia del taller «Swat Maó Ciutat Sostenible 2017», realizado en marzo de este año cuando alumnos de la Universidad de Delft plantearon propuestas para hacer más sostenible Maó. El «Serious Game 'Go2Zero'», un juego presencial interactivo para ver cómo se descarboniza la energía y la economía; un paseo por Maó para visualizar y entender *in situ* las posibilidades de la sostenibilidad urbana; clases magistrales abiertas a todos los públicos para dar a conocer aspectos de la energía, una conferencia en el Colegio de Arquitectos sobre «Diseño Bioclimático» a cargo del profesor Keeffe y la presentación «Menorca Smart Island» por parte del Consell Insular, completan el programa de actividades previsto.*

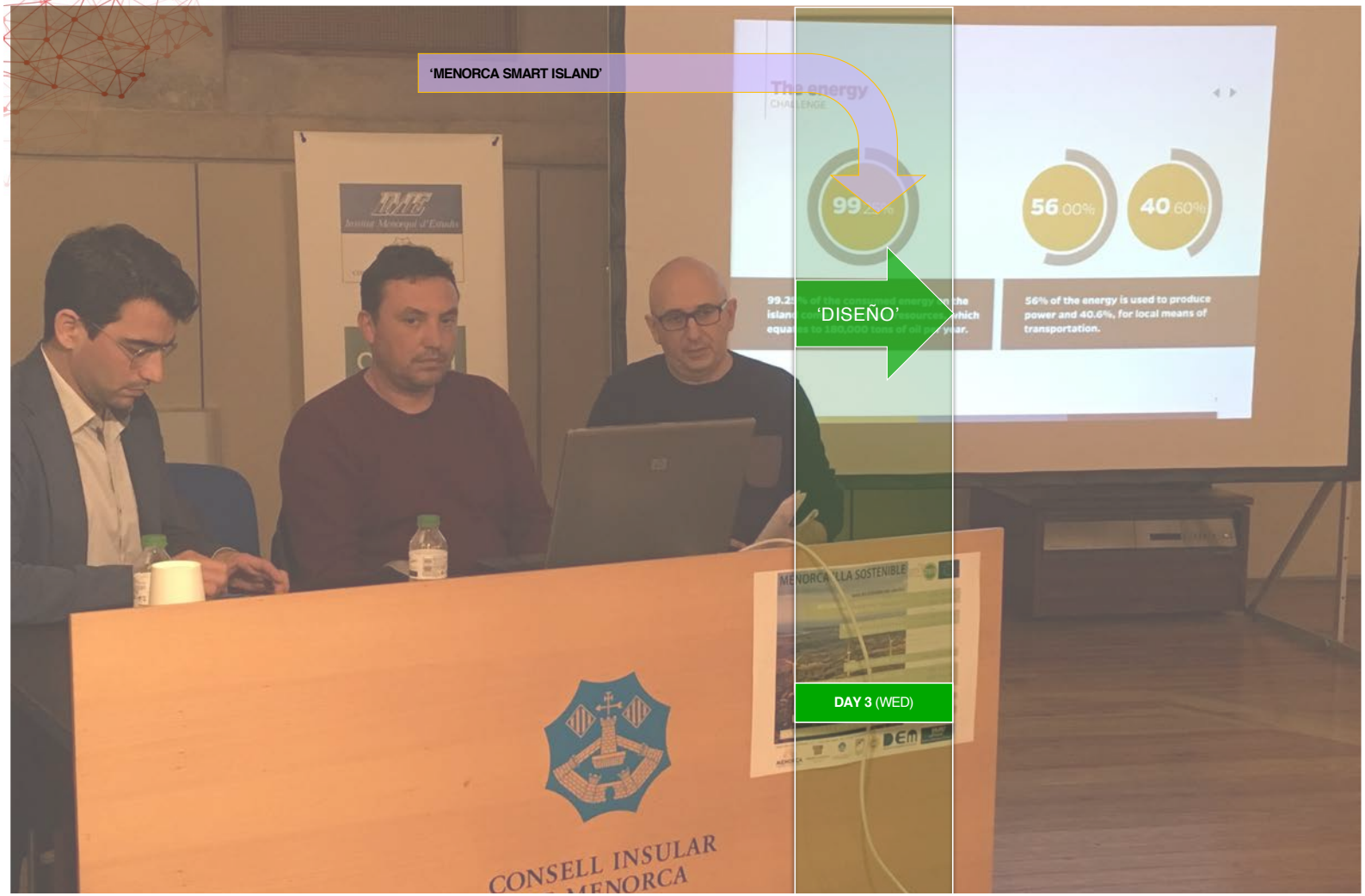
La mayor parte del seminario tendrá lugar en el IME. • FOTO JAVIER COLL

Día 2: ‘MAPA DE FUTUROS’ TALLERES PARALELOS COMENZAN



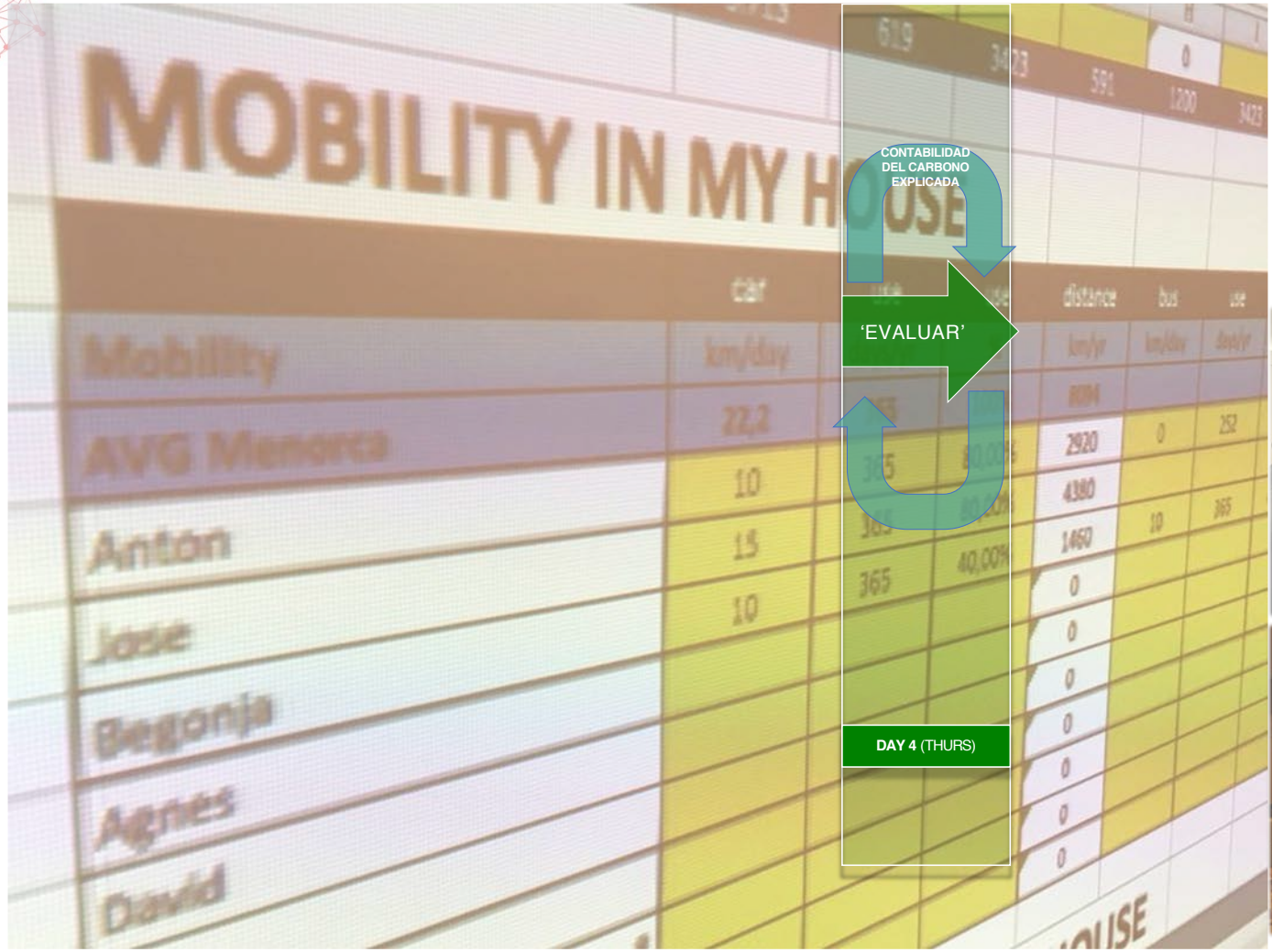
Día 3: SERIOUS GAME

Día 3: MENORCA SMART ISLAND



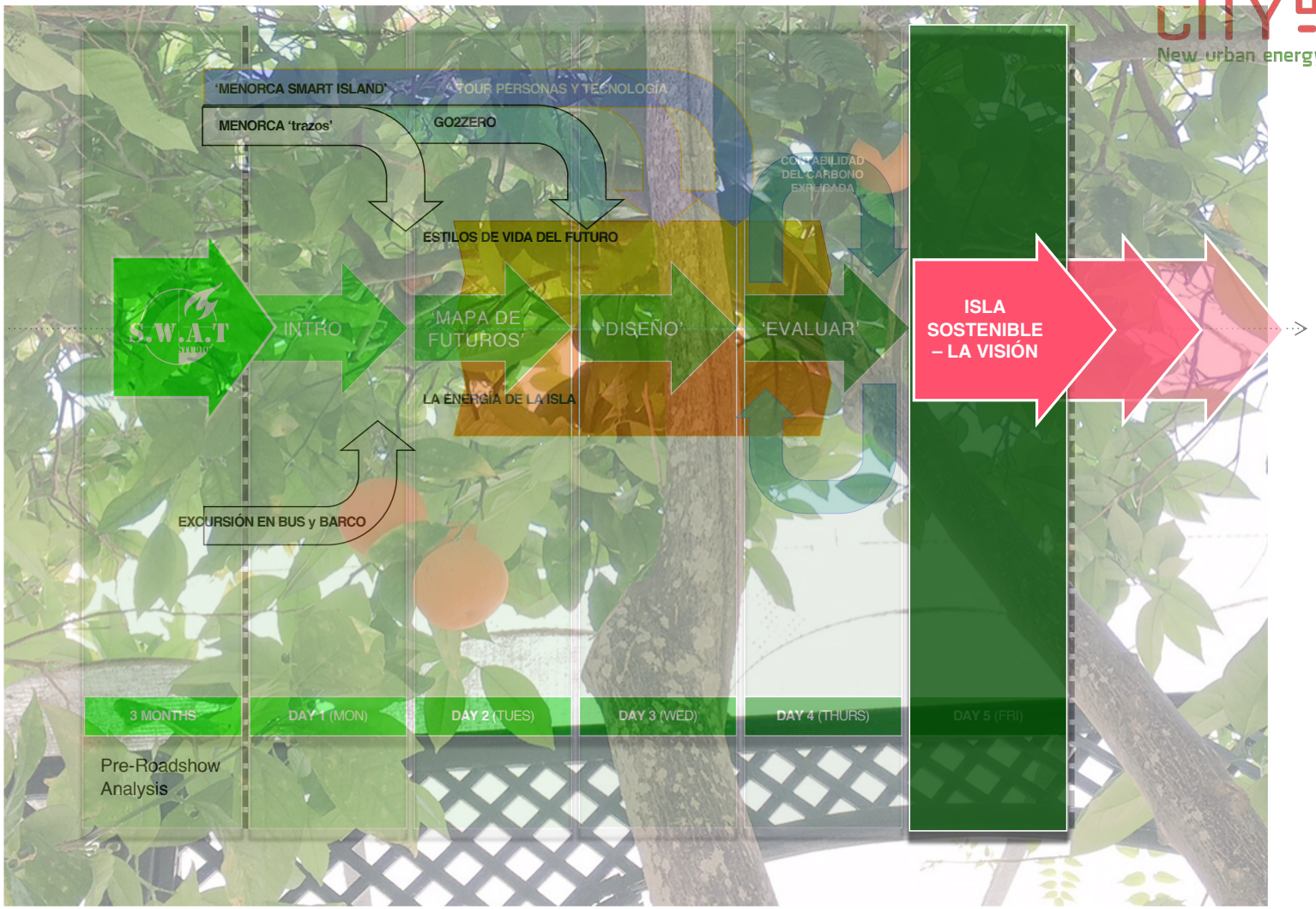
Día 3: TOUR PERSONAS Y TECNOLOGÍA

Día 4: ‘EVALUAR’ - CONTABILIDAD DEL CARBONO EXPLICADA



Día 5: ‘VIE’ - ISLA SOSTENIBLE – LA VISIÓN

Día 5: ‘VIE’ - ISLA SOSTENIBLE – LA VISIÓN



Ricardo Pulselli, University of Siena

Ecological Footprint of Menorca is roughly 7 times its area.

Most of this is comprised of

Food

Generally sourced from elsewhere.
High levels of waste/foodmiles

Materials

Poor recycling and re-use
Non local sources.

Energy

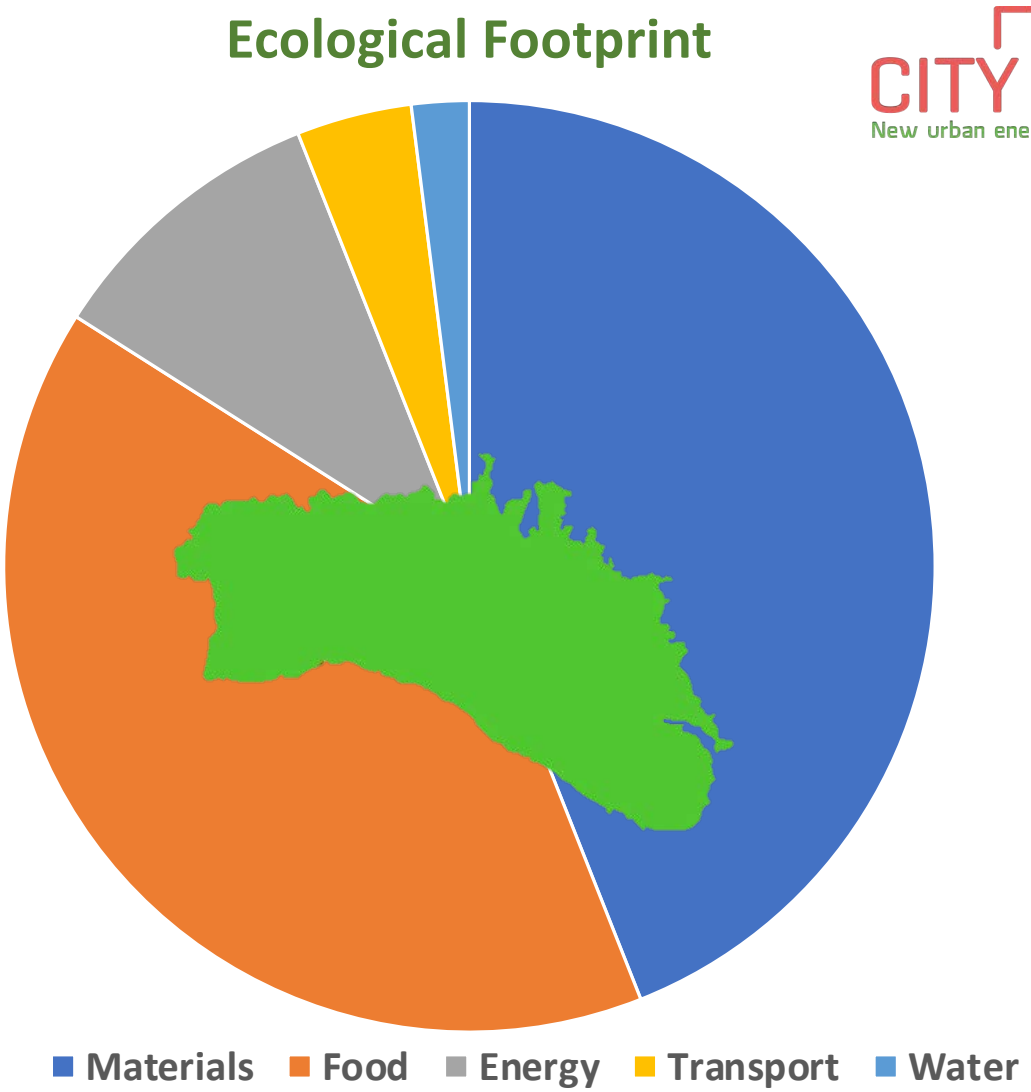
Mainly Fossil fuels

Transport

Low public transport
Little cycling/walking
High car use

Water

Limited local supply



ELECTRICITY EMISSION FACTOR

CARBON ACCOUNTING

MENORCA ELECTRICAL GRID

Electricity demand **479 GWh**
Electricity production **411 GWh**

NET IMPORT (14.3%) 69 GWh
Coal (70%); Nat gas (14%); Oil (4%)

THERMO-ELECTRICITY (82.9%) 397 GWh
Oil (82.9%) **397 GWh/yr**

RENEWABLE (3%) 13 GWh
PV (1.6%) **8 GWh/yr**
Wind (1.1%) **5 GWh/yr**

CARBON FOOTPRINT OF MENORCA

CARBON ACCOUNTING

RESIDENTIAL ENERGY	**166,122**	**t CO_2eq/yr**	
Electricity	198,270	MWh/yr	
Petroleum	33,773	MWh/yr	
LGP	27,256	MWh/yr	
Biomass	7,670	MWh/yr	
SERVICES	**178,218**	**t CO_2eq/yr**	
Electricity	210,371	MWh/yr	
Petroleum	43,422	MWh/yr	
LGP	28,581	MWh/yr	
WASTE MANAGEMENT	**51,412**	**t CO_2eq/yr**	
Collected quantity	55,265	t/yr	
Recicled	10,944	t/yr	
Waste to landfill	44,320	t/yr	

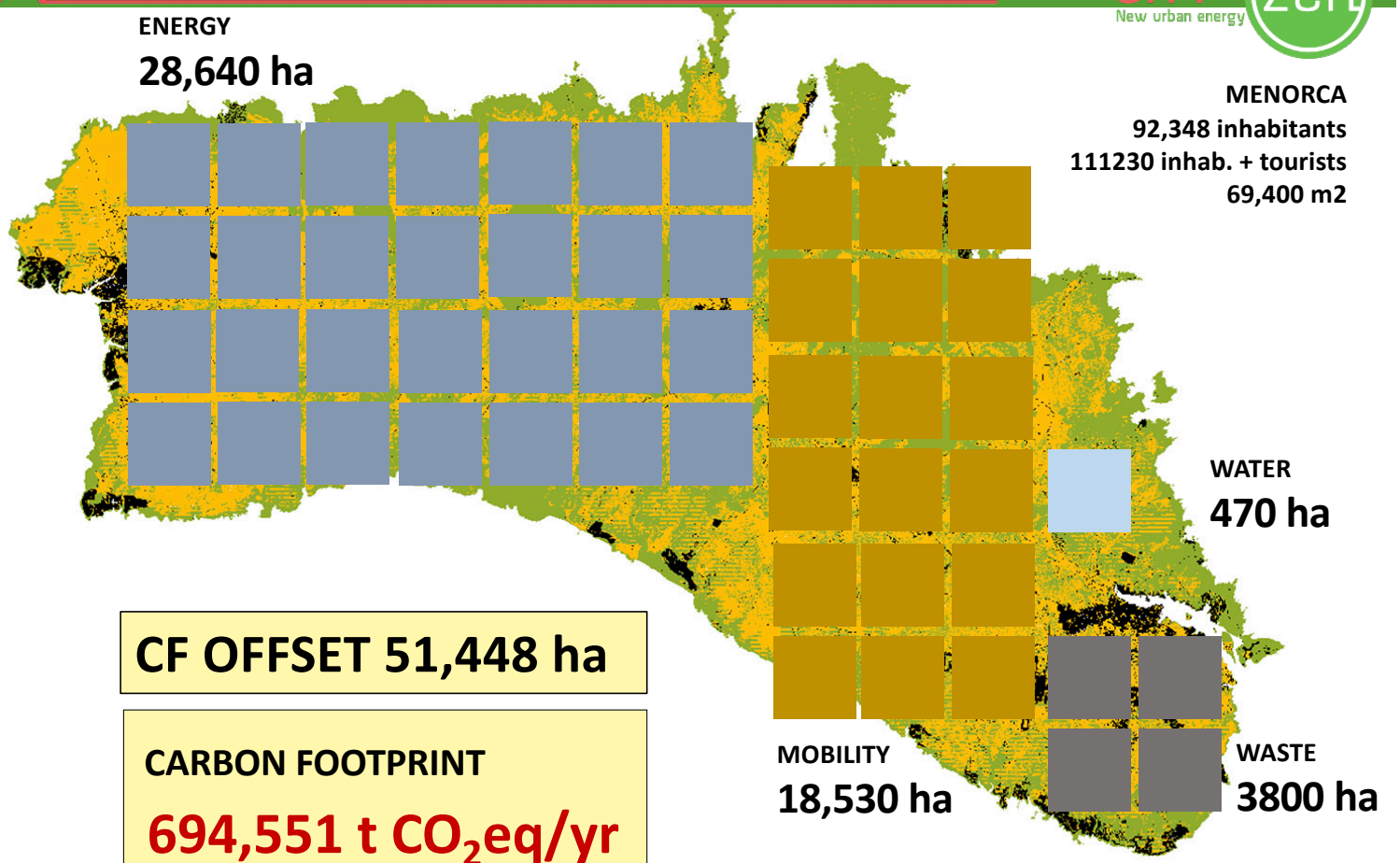
CARBON FOOTPRINT

694,551 t CO_2eq/yr

INDUSTRIAL ENERGY	**26,105**	**t CO_2eq/yr**	
Electricity	24,267	MWh/yr	
Petroleum	19,299	MWh/yr	
LGP	3519	MWh/yr	
Liquified Natural Gas	8250	MWh/yr	
AGRICOLTURE	**16,187**	**t CO_2eq/yr**	
Electricity	7692	MWh/yr	
Petroleum	38,556	MWh/yr	
Biomass	0.005	MWh/yr	
MOBILITY	**129,647**	**t CO_2eq/yr**	
Diesel	478,401	MWh/yr	
MARITIME & AIR TRANSPORT	**120,540**	**t CO_2eq/yr**	
Petroleum	444,798	MWh/yr	
WATER MANAGEMENT	**6319**	**t CO_2eq/yr**	
Water use	10,800,000	m^3/yr	

CARBON FOOTPRINT OF MENORCA

CARBON ACCOUNTING



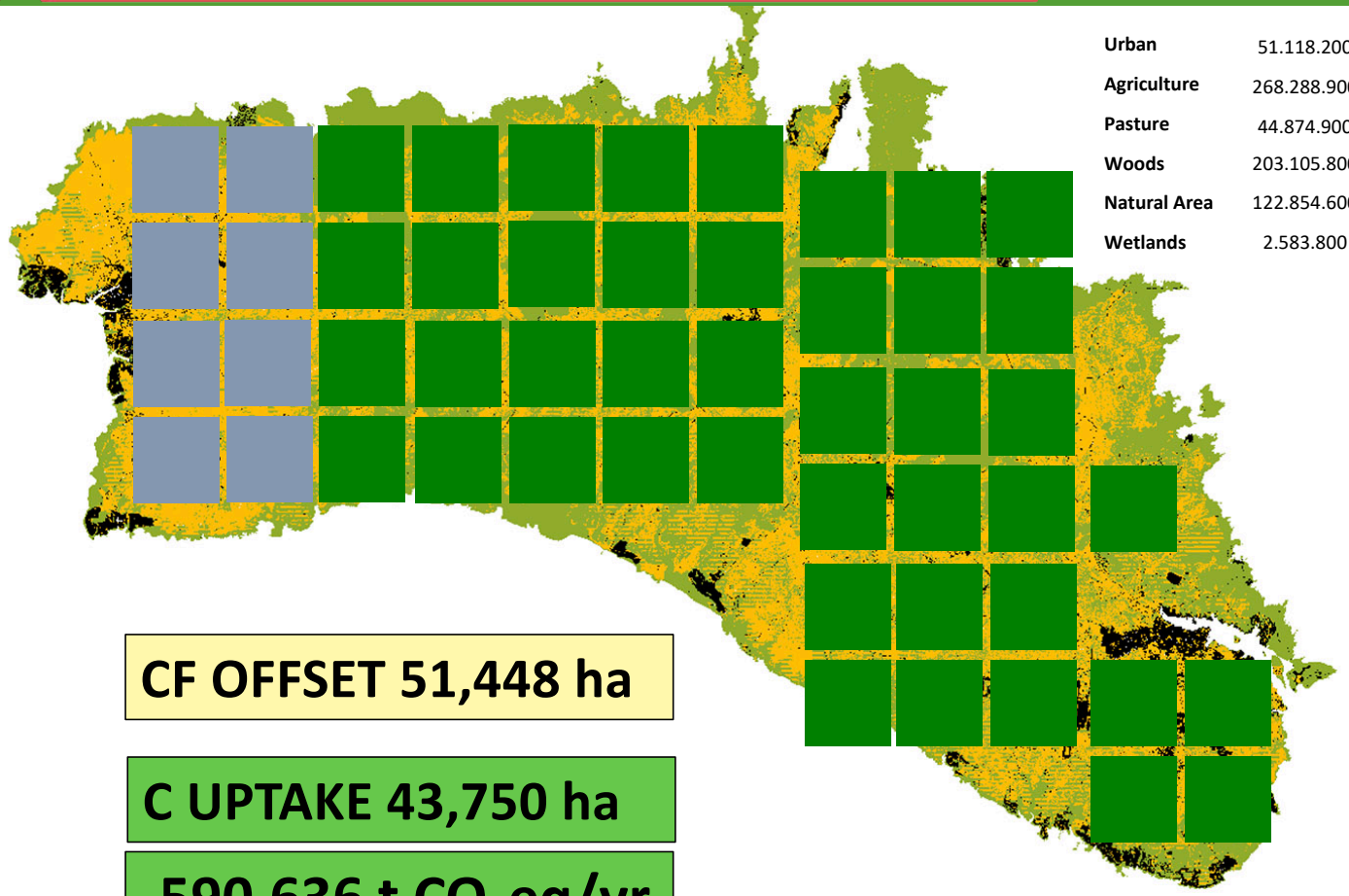
CF OFFSET 51,448 ha

CARBON FOOTPRINT

694,551 t CO_2eq/yr

CARBON FOOTPRINT OFFSET OF MENORCA

CARBON ACCOUNTING



Urban	51.118.200	m^2
Agriculture	268.288.900	m^2
Pasture	44.874.900	m^2
Woods	203.105.800	m^2
Natural Area	122.854.600	m^2
Wetlands	2.583.800	m^2

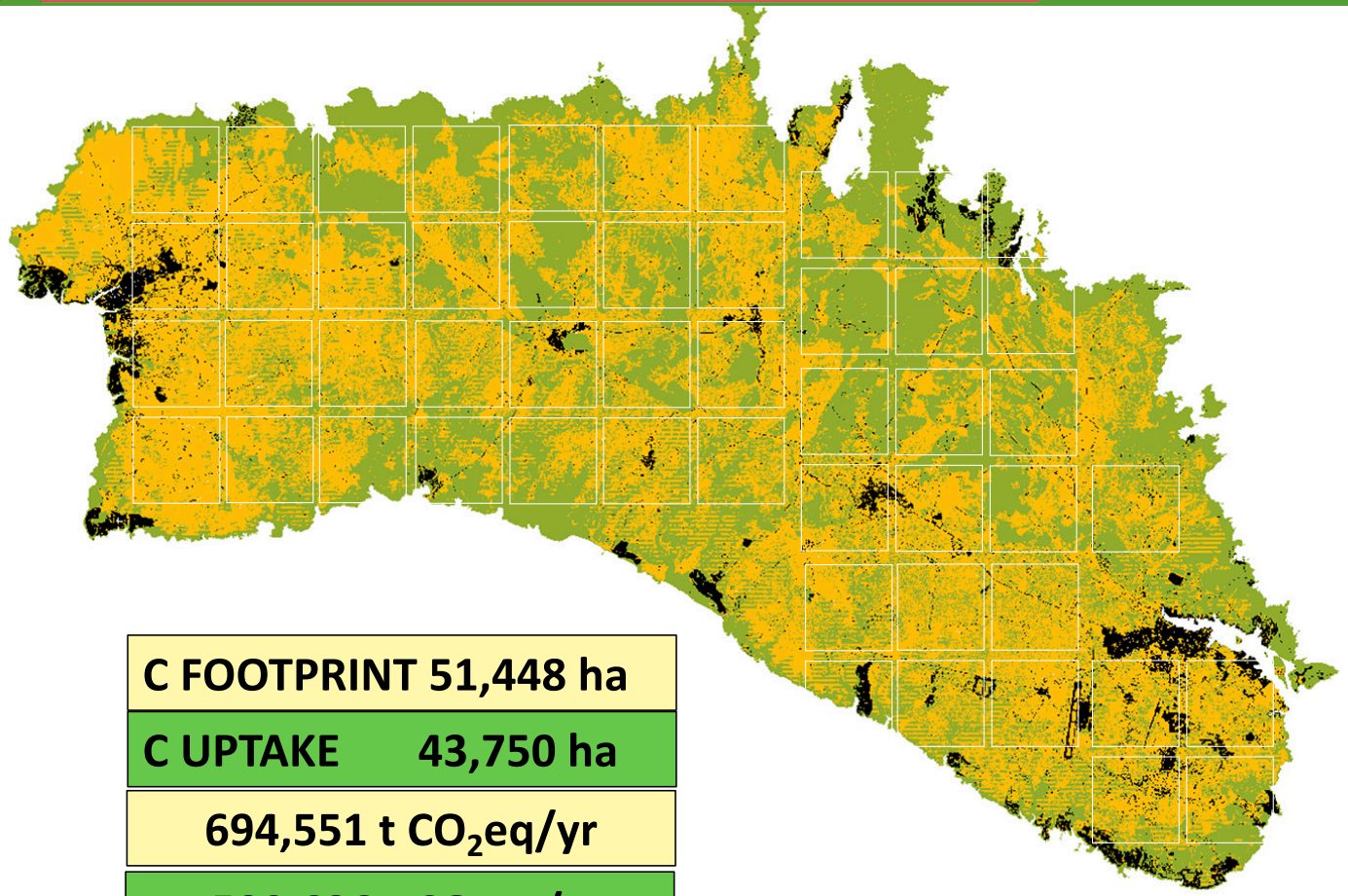
CF OFFSET 51,448 ha

C UPTAKE 43,750 ha

-590,636 t CO_2eq/yr

CARBON FOOTPRINT OFFSET OF MENORCA

CARBON ACCOUNTING



C FOOTPRINT	51,448 ha
C UPTAKE	43,750 ha
694,551 t CO_2eq/yr	
-590,636 t CO_2eq/yr	

CARBON FOOTPRINT per HOUSEHOLD

CARBON ACCOUNTING

MENORCA HOUSEHOLD PROFILING

ENERGY DEMAND	**5186**	**kg CO_2eq**	**55%**	
Cooling electricity	619	kWh_e/yr	}	
Lighting & appliances	3713	kWh_e/yr	} 6189kWe/yr	
Heating & DHW (electr)	1857	kWh_e/yr		
Heating & DHW (butane)	253	kWh_h/yr	}	
Cooking (butane)	591	kWh_h/yr	} 844kWh/yr	
Heating & DHW (oil)	1063	kWh_h/yr		
Heating (biomass)	250	kWh_h/yr		
MOBILITY	**2914**	**kg CO_2eq**	**31%**	
Distance by car	8094	km/yr		
WASTE MANAGEMENT	**1153**	**kg CO_2eq**	**12%**	
Collected quantity	496	kg/yr		
Recycled	20	%		
Waste to landfill	0.8	%		
WATER MANAGEMENT	**142**	**kg CO_2eq**	**2%**	
Water use per inhabitant	97.1	m^3/yr		

5.92 t CO_2eq/yr

5.04 t CO_2eq/yr

5.70 t CO_2eq/yr

5.60 t CO_2eq/yr

CARBON FOOTPRINT

9.40 t CO_2eq/yr

CARBON FOOTPRINT OFFSET

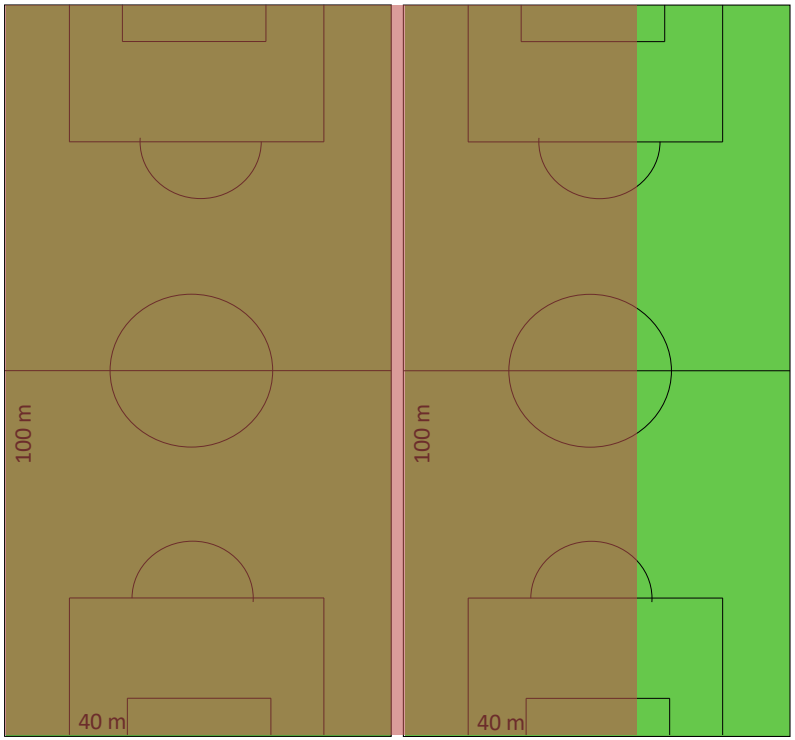
carbon uptake by urban forestry (i.e. 1.35 kg CO_2/m^2)

The carbon footprint of one household is eqivalent to

26,000 km driven by car

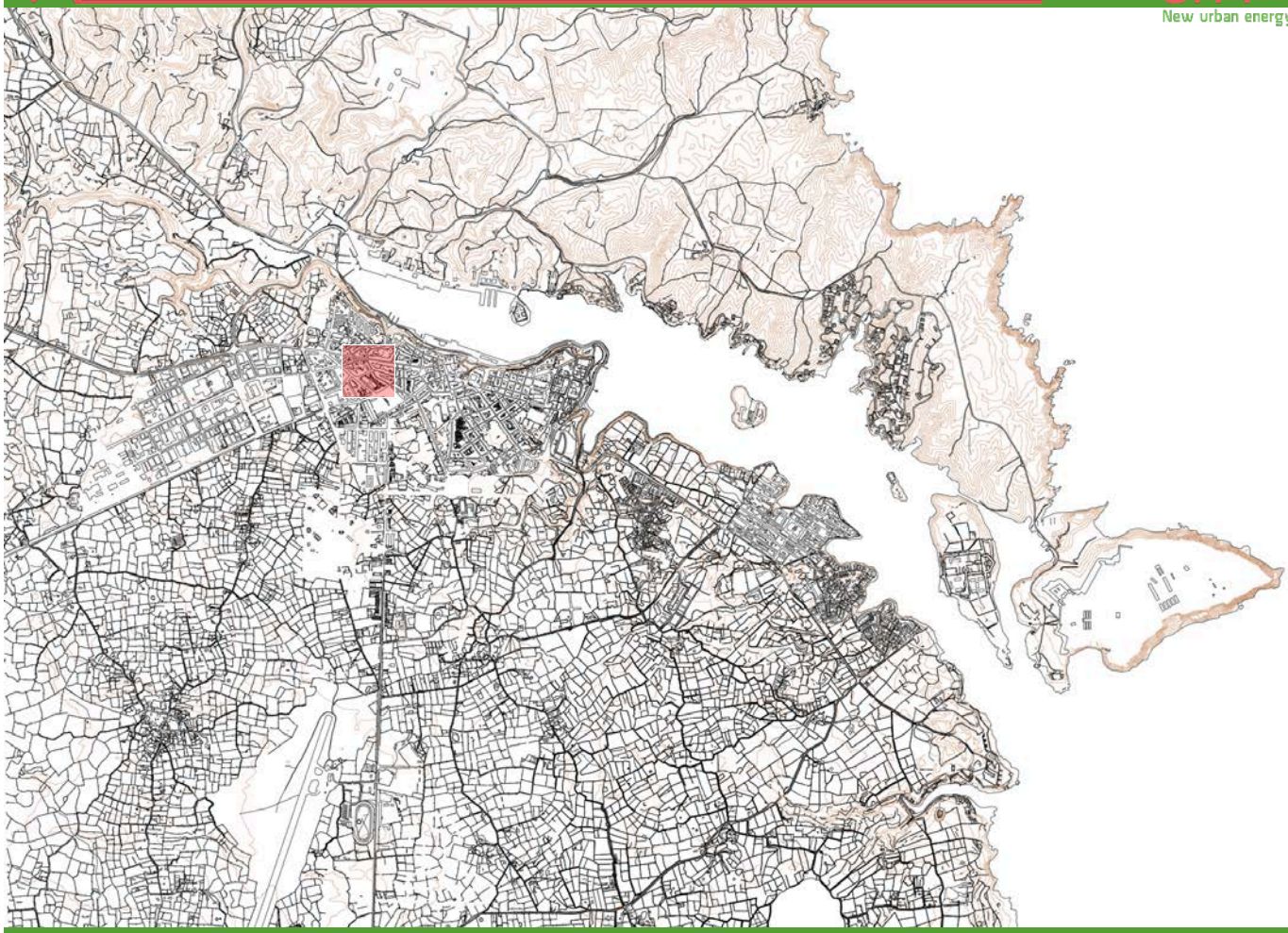
The carbon footprint offset of one household is eqivalent to

0.70 ha forestland



CARBON FOOTPRINT of the NEIGHBOURHOOD

CARBON ACCOUNTING

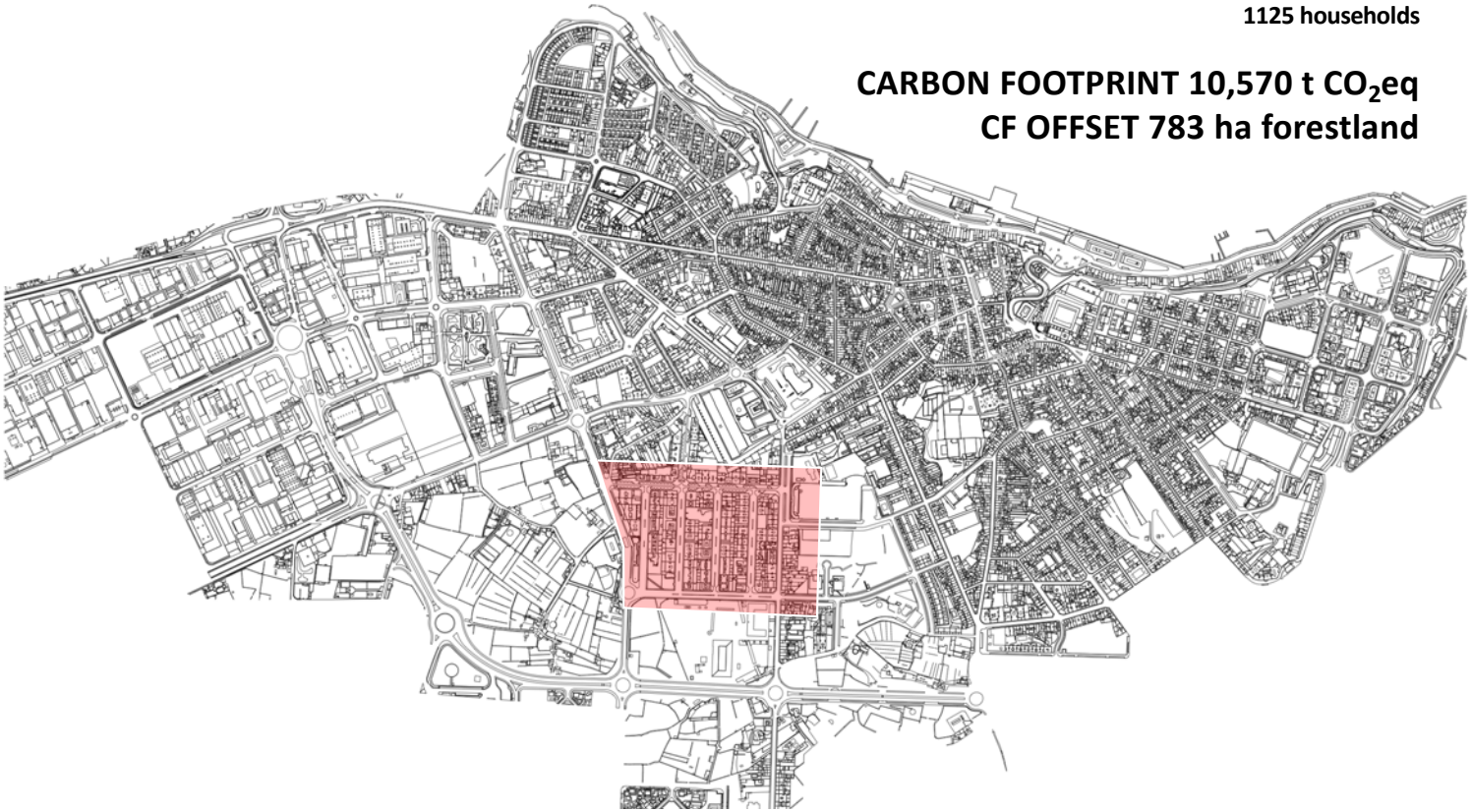


CARBON FOOTPRINT of the NEIGHBOURHOOD

CARBON ACCOUNTING

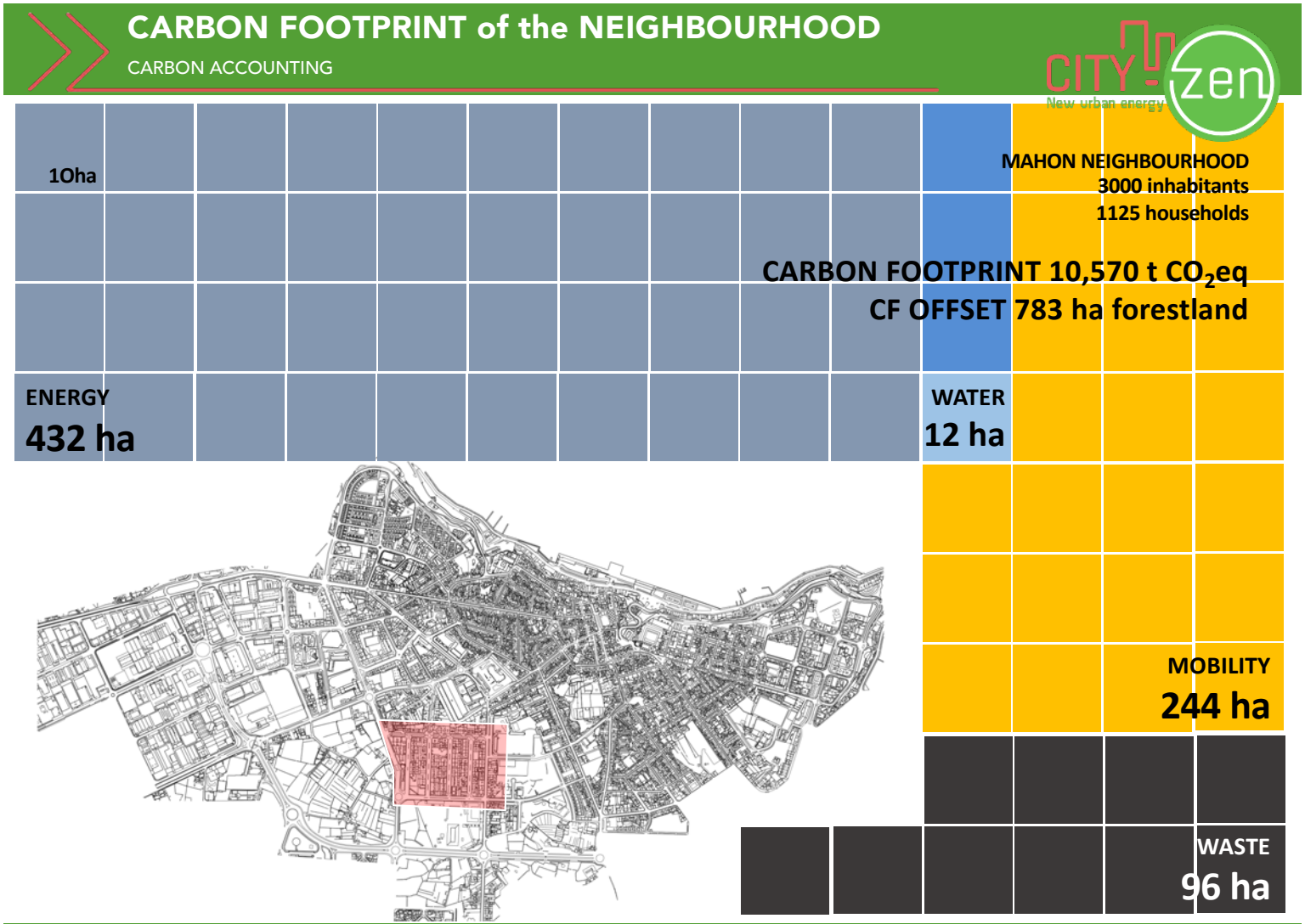
MAHON NEIGHBOURHOOD
3000 inhabitants
1125 households

CARBON FOOTPRINT 10,570 t CO_2eq
CF OFFSET 783 ha forestland



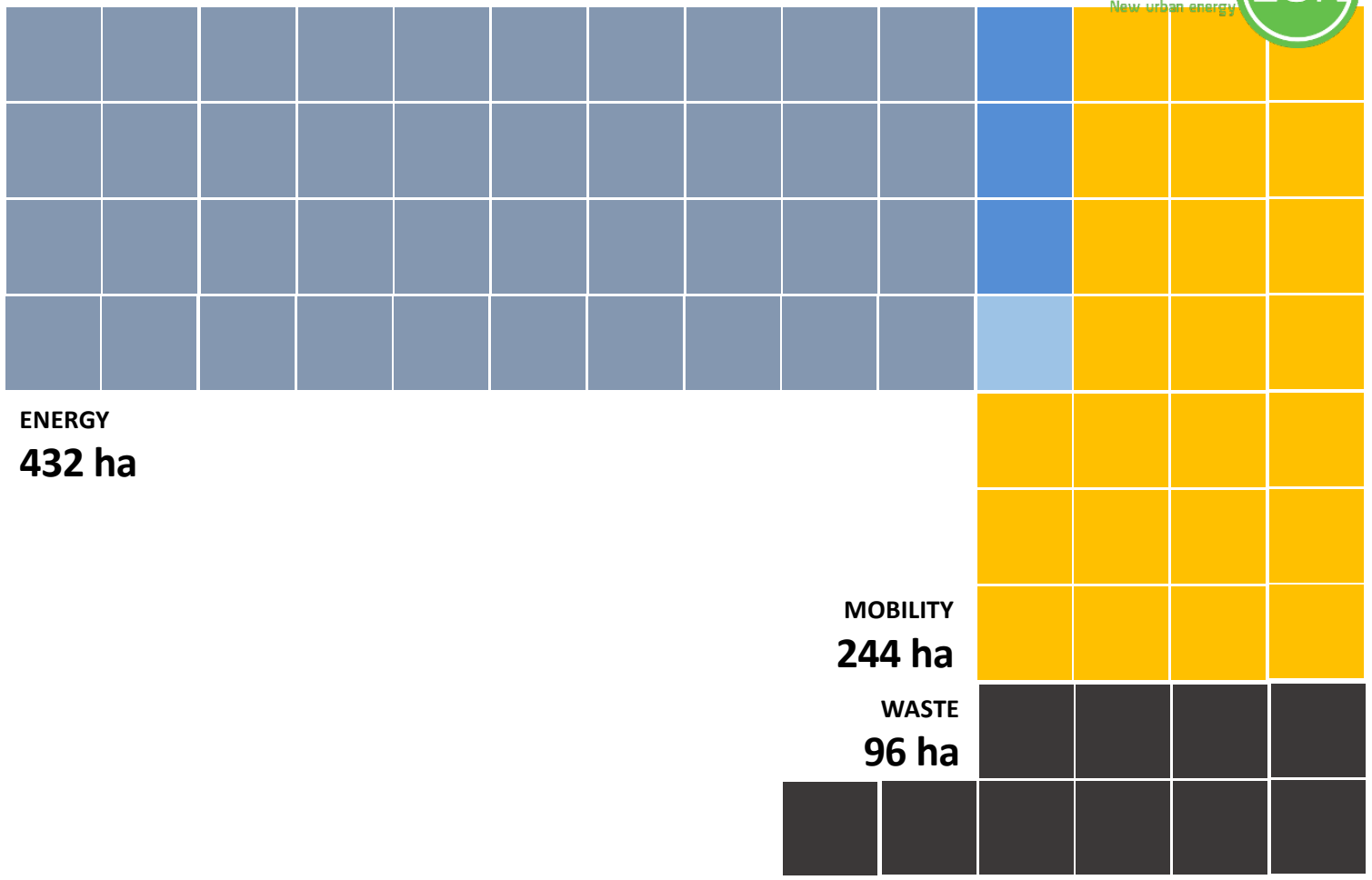
CARBON FOOTPRINT of the NEIGHBOURHOOD

CARBON ACCOUNTING



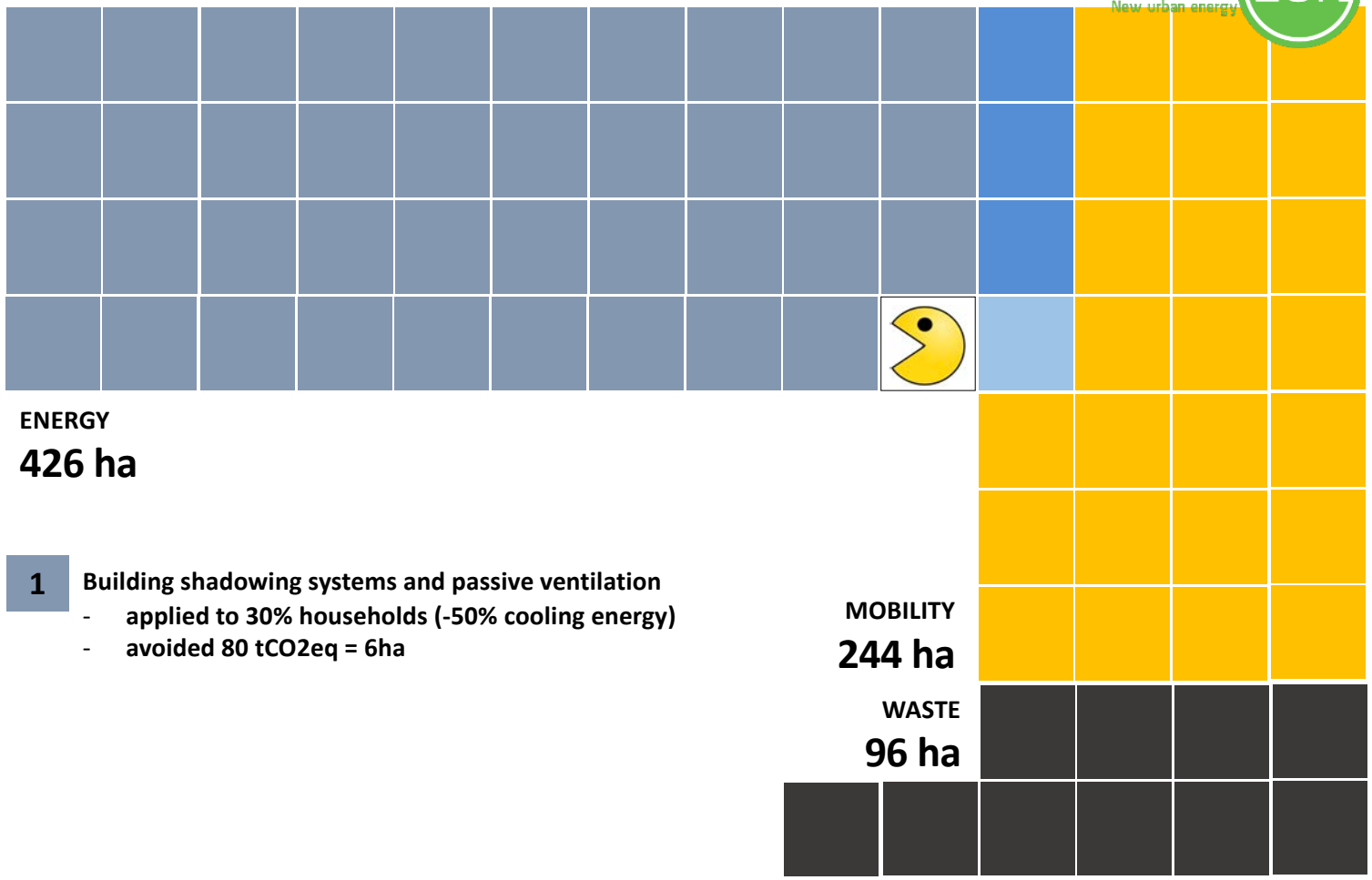
CARBON FOOTPRINT of the NEIGHBOURHOOD

CARBON ACCOUNTING



CARBON FOOTPRINT of the NEIGHBOURHOOD

CARBON ACCOUNTING



ENERGY

426 ha

1 **Building shadowing systems and passive ventilation**

- **applied to 30% households (-50% cooling energy)**
- **avoided 80 tCO2eq = 6ha**

MOBILITY

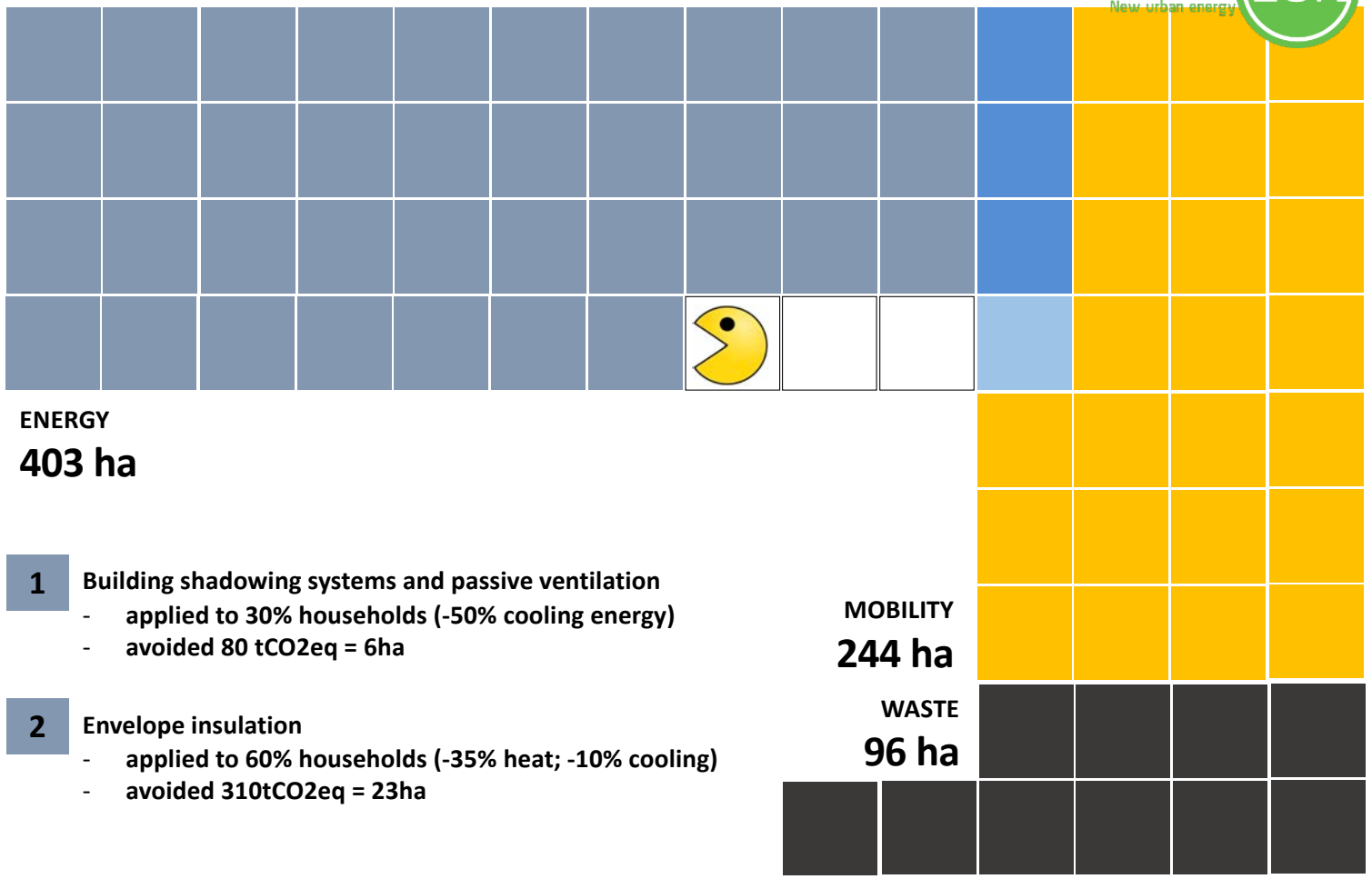
244 ha

WASTE

96 ha

CARBON FOOTPRINT of the NEIGHBOURHOOD

CARBON ACCOUNTING



ENERGY

403 ha

1 **Building shadowing systems and passive ventilation**

- **applied to 30% households (-50% cooling energy)**
- **avoided 80 tCO2eq = 6ha**

2 **Envelope insulation**

- **applied to 60% households (-35% heat; -10% cooling)**
- **avoided 310tCO2eq = 23ha**

MOBILITY

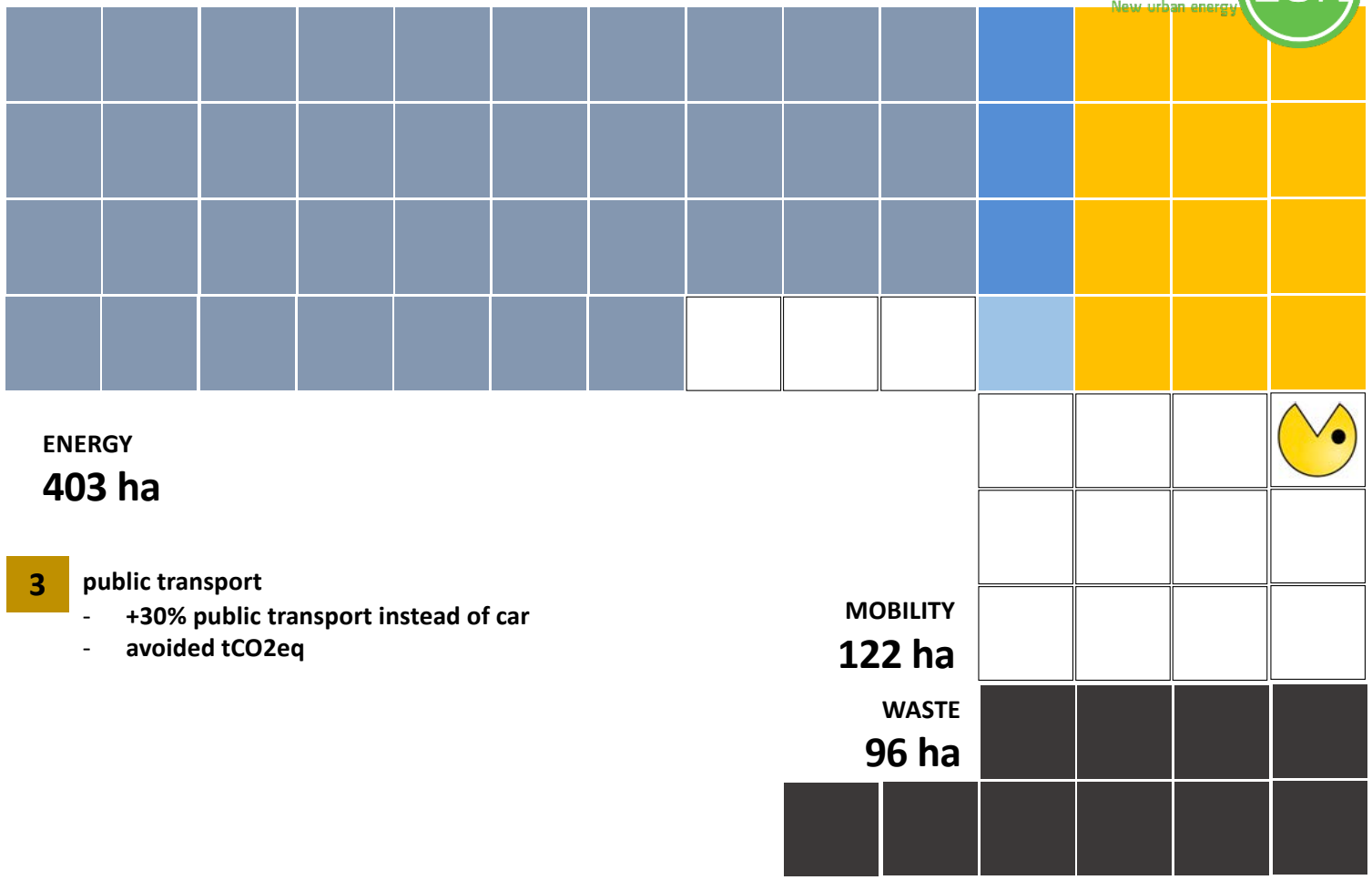
244 ha

WASTE

96 ha

CARBON FOOTPRINT of the NEIGHBOURHOOD

CARBON ACCOUNTING



ENERGY

403 ha

3 **public transport**

- **+30% public transport instead of car**
- **avoided tCO2eq**

MOBILITY

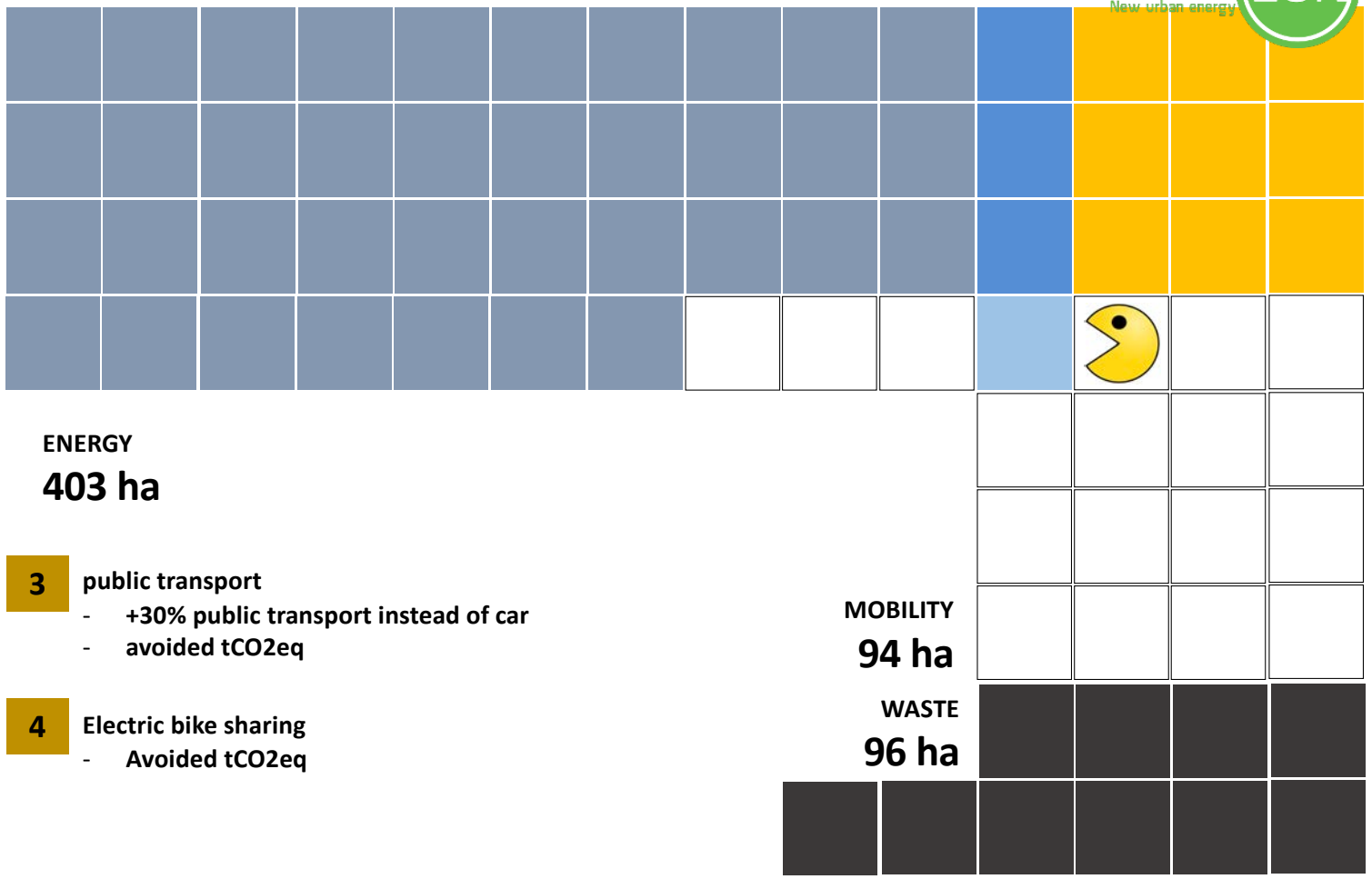
122 ha

WASTE

96 ha

CARBON FOOTPRINT of the NEIGHBOURHOOD

CARBON ACCOUNTING



ENERGY

403 ha

3 **public transport**

- **+30% public transport instead of car**
- **avoided tCO2eq**

4 **Electric bike sharing**

- **Avoided tCO2eq**

MOBILITY

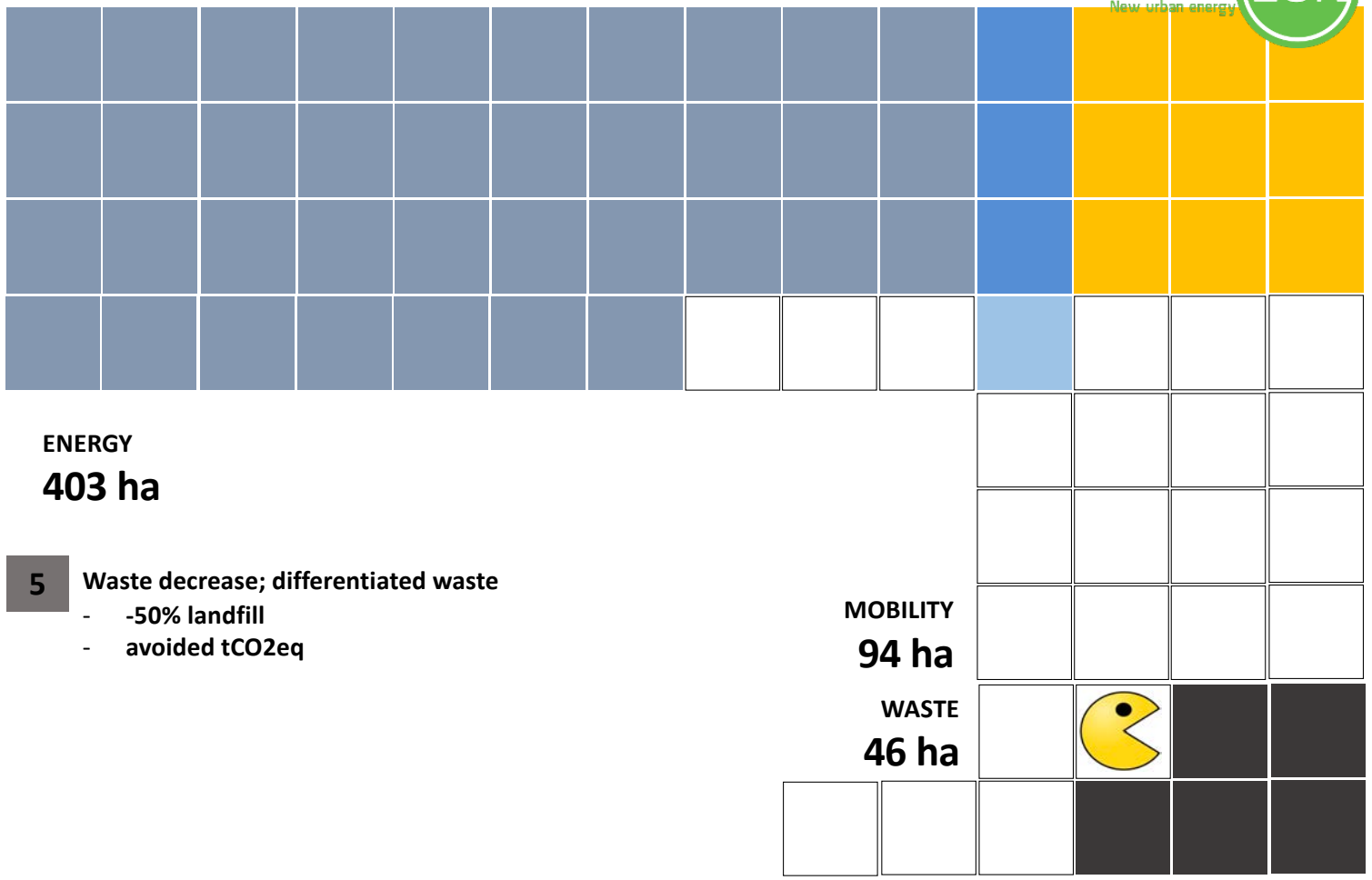
94 ha

WASTE

96 ha

CARBON FOOTPRINT of the NEIGHBOURHOOD

CARBON ACCOUNTING



ENERGY

403 ha

5 **Waste decrease; differentiated waste**

- **-50% landfill**
- **avoided tCO2eq**

MOBILITY

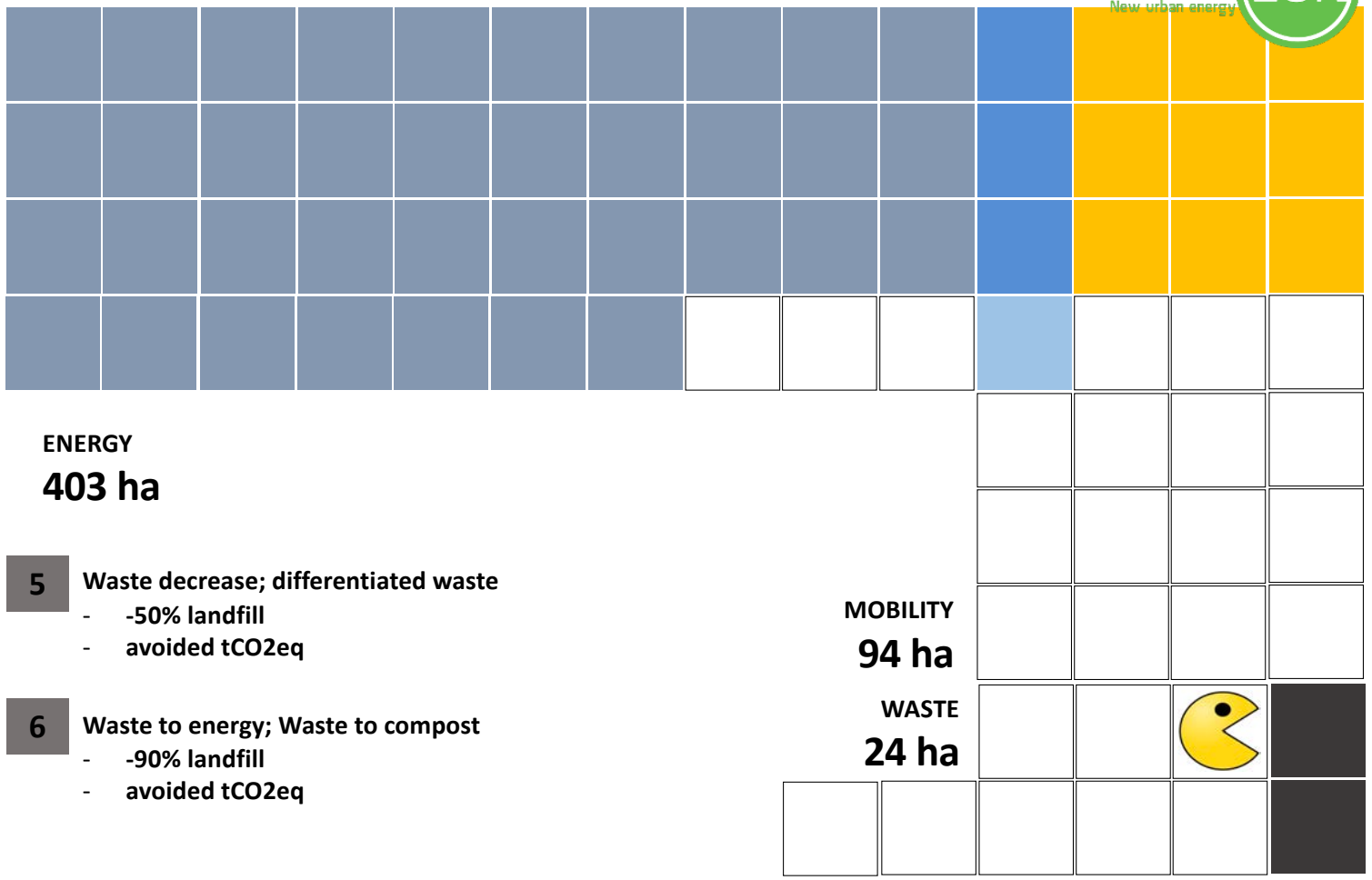
94 ha

WASTE

46 ha

CARBON FOOTPRINT of the NEIGHBOURHOOD

CARBON ACCOUNTING



ENERGY

403 ha

5 **Waste decrease; differentiated waste**
- **-50% landfill**
- **avoided tCO2eq**

6 **Waste to energy; Waste to compost**
- **-90% landfill**
- **avoided tCO2eq**

MOBILITY

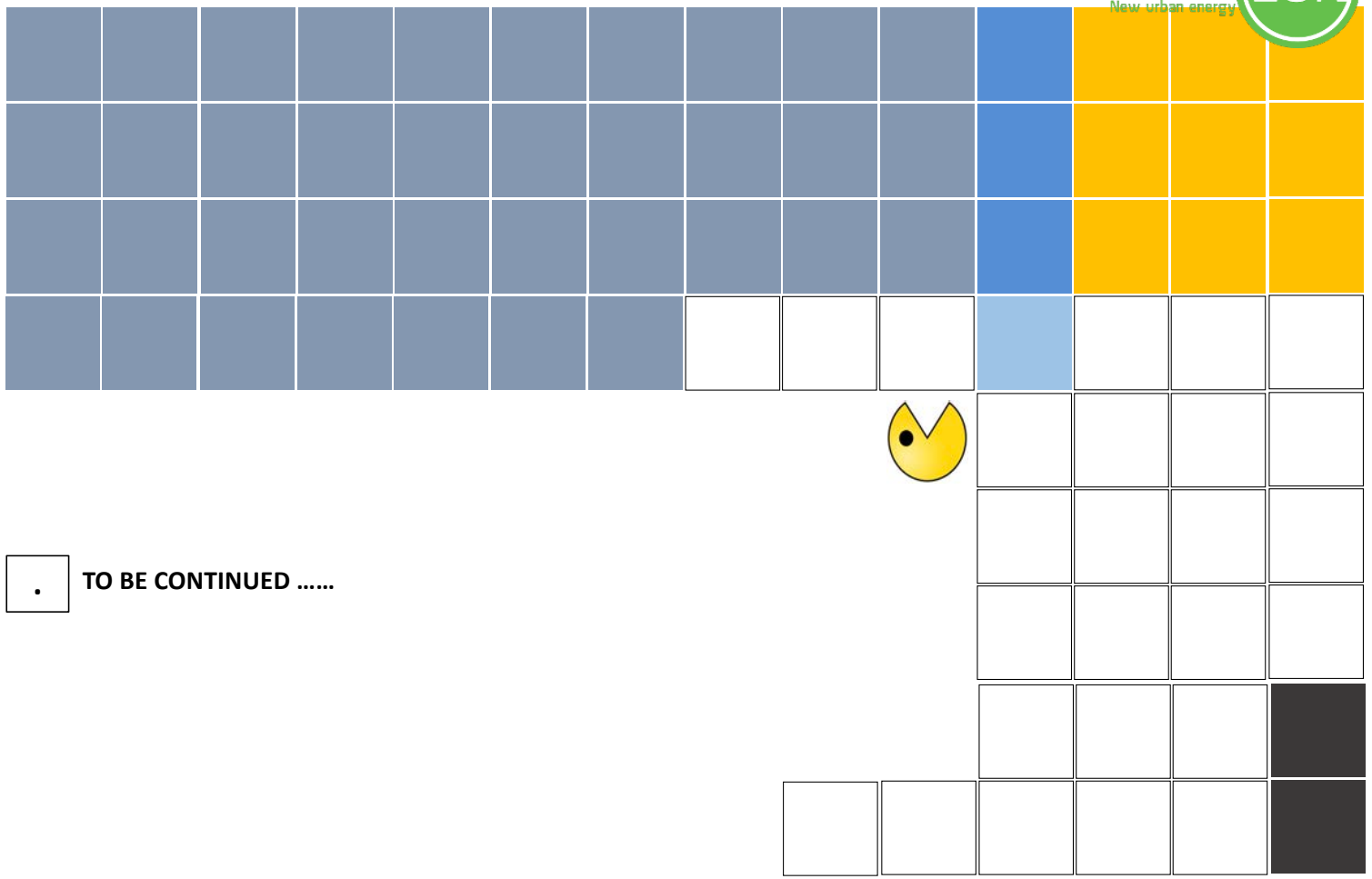
94 ha

WASTE

24 ha

CARBON FOOTPRINT of the NEIGHBOURHOOD

CARBON ACCOUNTING



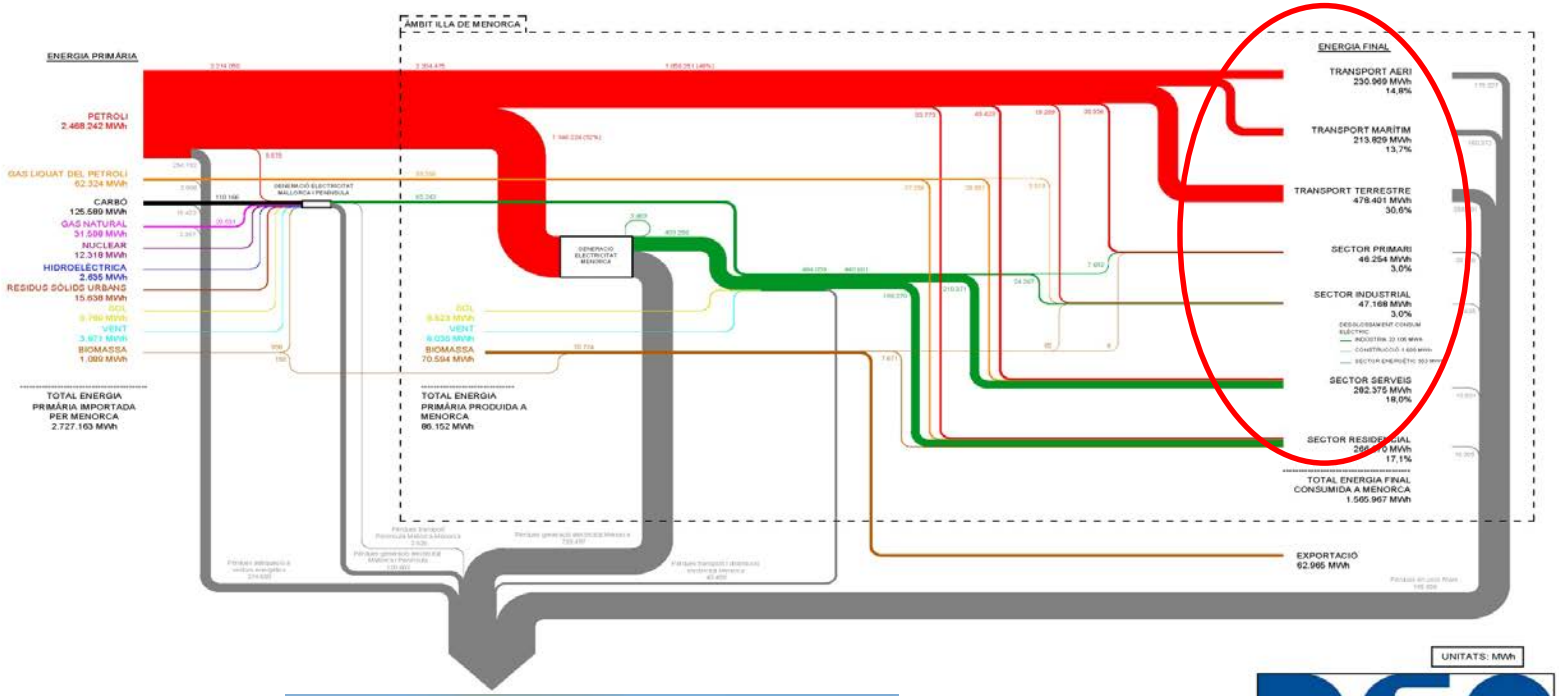
TO BE CONTINUED ……

Energy interventions

Siebe Broersma TU Delft

The current energy system, demand & potentials

The current energy system & energy use



directrius estratègiques de menorca

Defining the real energy demand

RESIDENTIAL energy use and demand

total RESIDENTIAL energy use	total (MWh)	per hh (kWh)	demand for
electricity	**198000**	6188	electric + cool + heat+ DHW
butan etc	**27000**	844	heating + DHW +cooking
Petroleum	**34000**	1063	heating +DHW
biomassa	**8000**	250	heating
total	**267000**	8344	total

avarage household **USE** for:

	electricity (appl)	cooling	heating	DHW	cooking
	3713	619	1238	619	
			169	84	591
			744	319	
			250		
total	**3713**	**619**	**2400**	**1022**	**591**

avarage household **DEMAND** for:

		electricity (appl)	cooling	heating	DHW	cooking
COP airco	2,5	3713	1547	2400	1022	591

TOTAL RESIDENTIAL ENERGY **DEMAND** for:

	electricity (appl)	cooling	heating	DHW	cooking	total
(MWh)	**118800**	**49500**	**76800**	**32700**	**18900**	**296700**
calculated:	40	17	26	11	6	100 %

consumption for demand type

educated guess:	RESIDENT	SERVICE
electricity for:		
electricity (appl)	60%	50%
el heating	20%	5%
el cooling	10%	40%
el DHW	10%	5%
butan for		
cooking	70%	
DHW	10%	
heating	20%	
petroleum for		
heating	70%	50%
DHW	30%	50%
biomassa for		
heating	100%	
LPG for		
heating		20%
cooking		30%
DHW		50%

energy use and demand SERVICES

SERVICES energy use	total (MWh)	demand for	ENERGY DEMAND from services for: electricity (appl)	cooling	heating	DHW	cooking	
electricity	210000	electric + cool + heat+ DHW	105000	84000	10500	10500		
Petroleum	43000	heating +DHW			21500	21500		
LPG	28000	heating +DHW+cooking			5600	14000	14000	total
total	281000	total	**105000**	**84000**	**37600**	**46000**	**14000**	**286600**
			37	29	13	16	5	100 %

INDUSTRIAL energy use and demand

INDUSTRIAL energy use	total (MWh)	demand for	electricity (appl)	cooling	heating	DHW	cooking	
electricity	24000	electricity	24000					
Petroleum	31000	processes with hot water				31000		total
		total	**24000**	**0**	**0**	**31000**	**0**	**55000**
			44	0	0	56	0	100 %

Energy use and demand for VEHICLES and ARGRICULTURE

demand by	fuel vehicles	electricity
airplains	231000	
boats	214000	
vehicles land	478000	
agricultural	38000	8000
total (MWh)	**961000**	**8000**
total (GWh)	**787**	**8**

1st step towards a zero energy island: proper energy accounting!

Know your energy demand!

Starting point: the current demand

Total current energy demand (GWh)						
SECTOR	electricity (appl)	cooling	heating	DHW	cooking	fuel
RESIDENTIAL	119	50	77	33	19	
SERVICES	105	84	38	46	14	
INDUSTRIAL + AGRIC	32			31		
VEHICLES LAND						516
BOATS						214
AIRPLAINES						231
TOTAL (GWh)	**256**	**134**	**114**	**110**	**33**	**961**

Energy potential analyses

How much – where – barriers - solutions

Sun

Wind

Underground

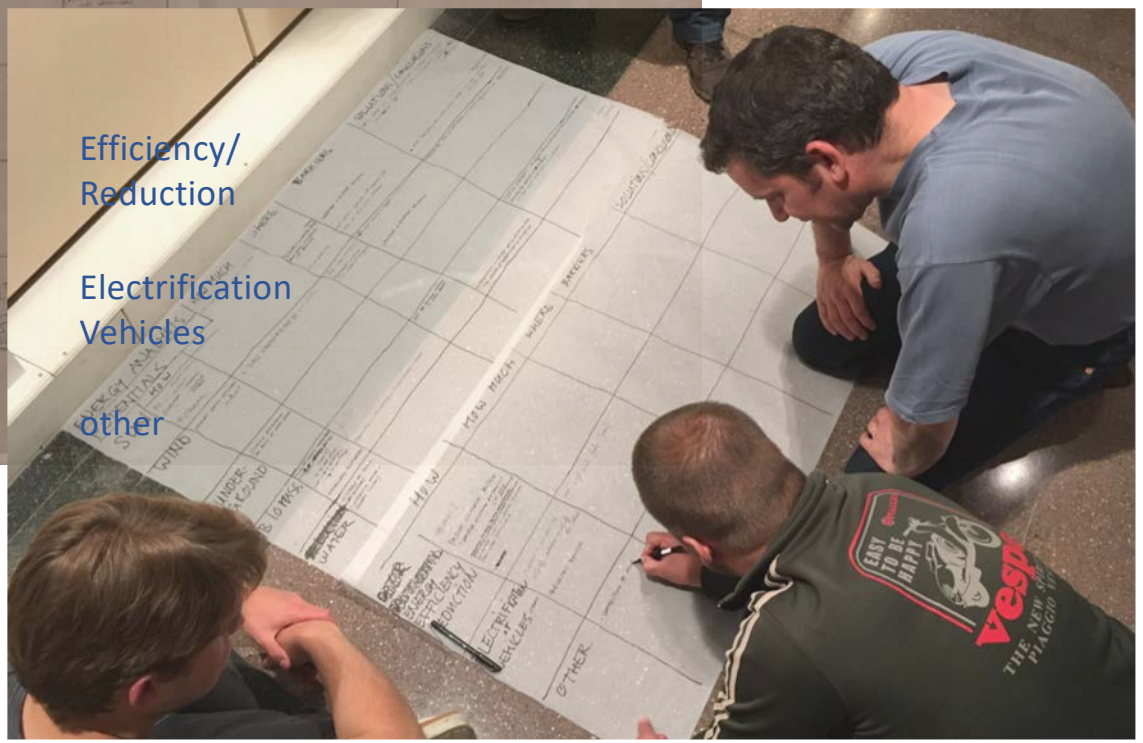
Biomass

water

Efficiency/
Reduction

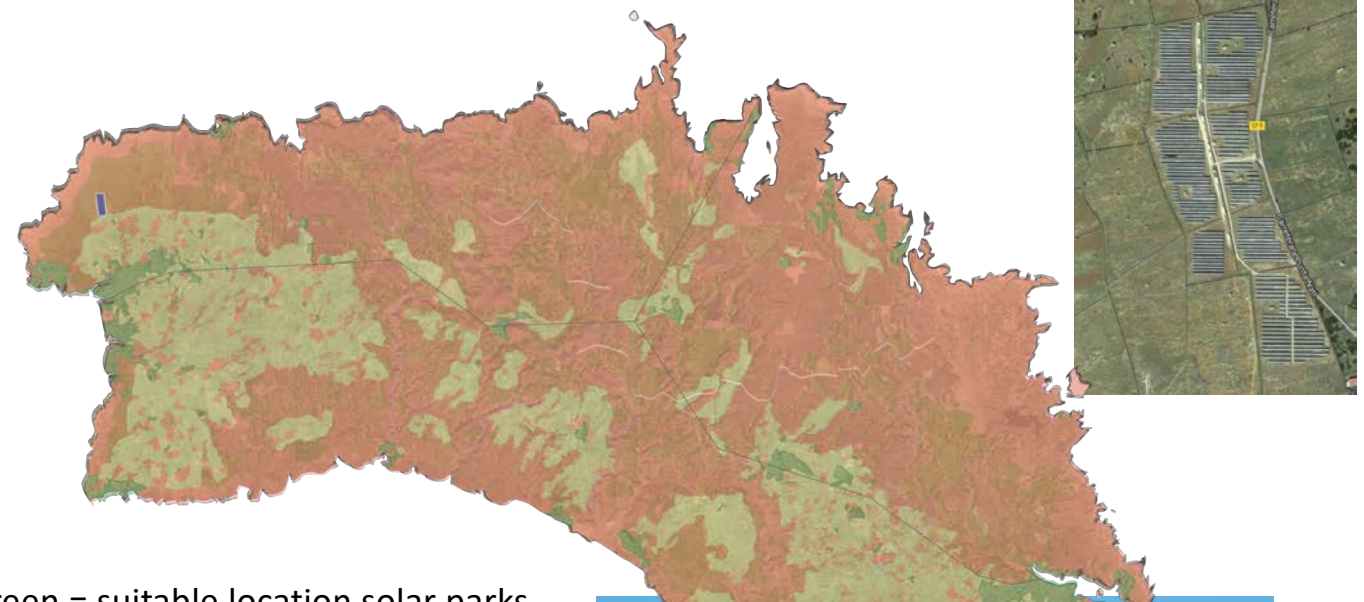
Electrification
Vehicles

other



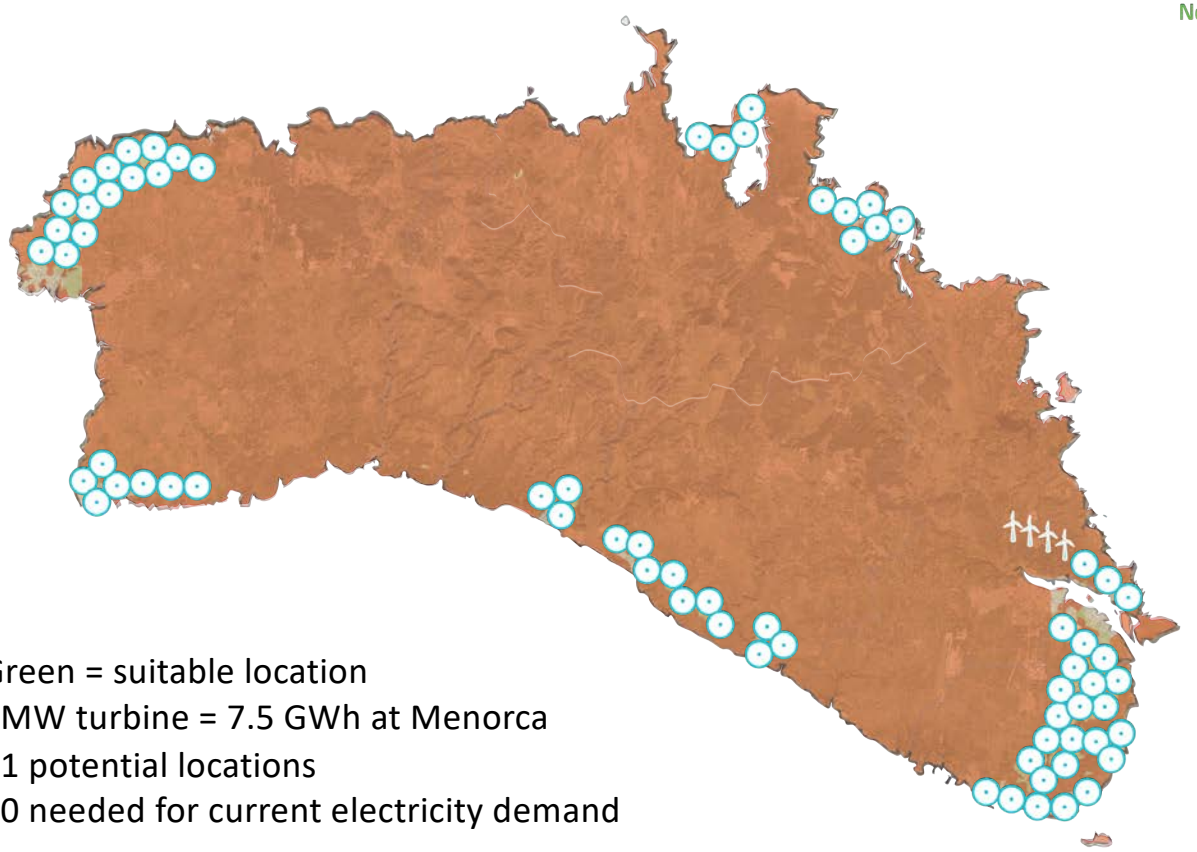
What are the local energy potentials…and barriers?

Solar power potential



- Green = suitable location solar parks
- Small blue = existing solar park
- 5 km2 for current electricity demand
- = 60x existing PV plant (west)
  for current electricity demand

Wind potential



- Green = suitable location
- 3MW turbine = 7.5 GWh at Menorca
- 71 potential locations
- 60 needed for current electricity demand

Taking energy measures in a smart way

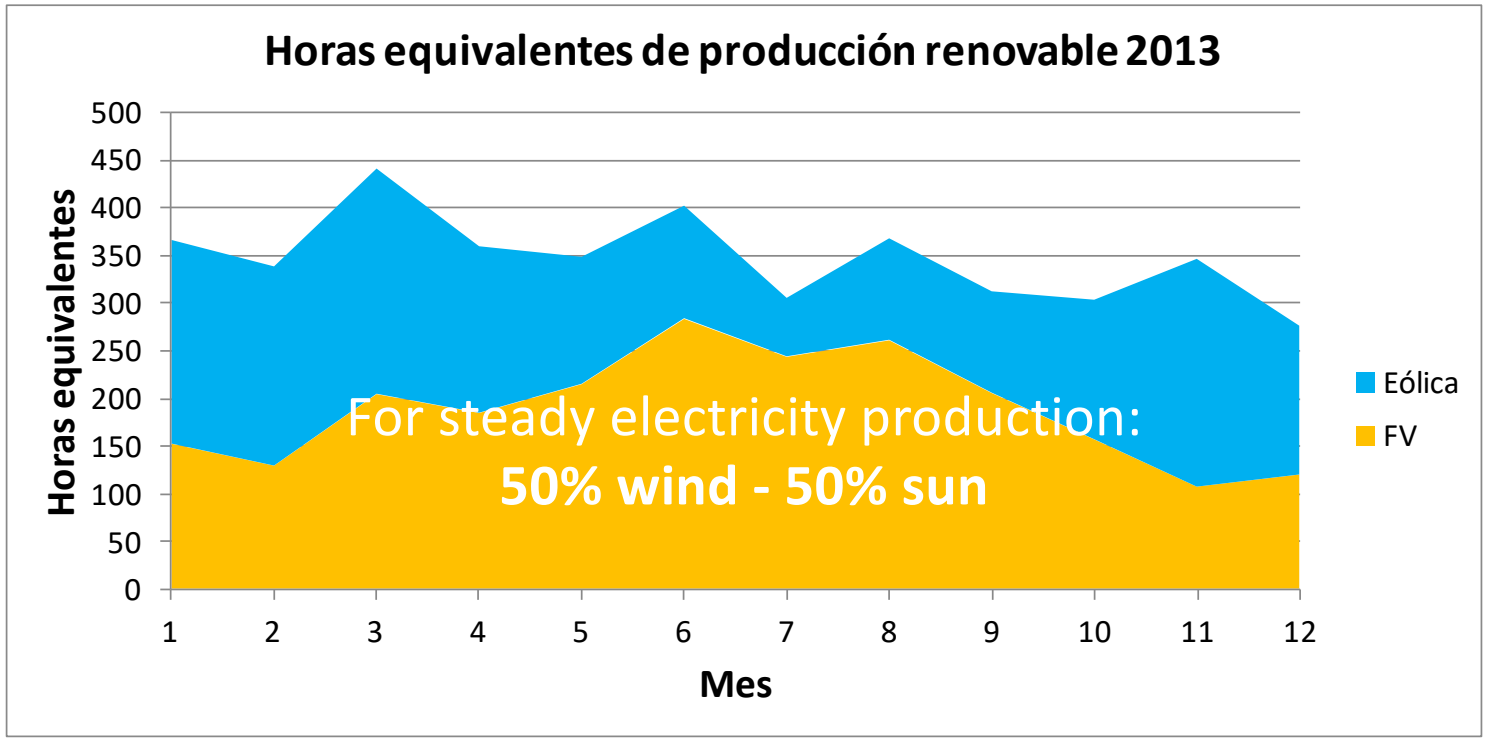
Our New Stepped Strategy (for different scale levels)

1. **Reduce** the energy demand
   - Urban planning & design
   - Architectural design
   - Passive, smart & bioclimatic design
   - Using local characteristics, vernacularity

2. **Reuse** waste energy
   - Attune supply and demand
   - Exchange surpluses with shortages
   - Cascade heat
   - Store energy

3. **Produce** renewable energy
   - Sun
   - Wind
   - Water
   - Air
   - Soil
   - Biomass

Solar and wind power



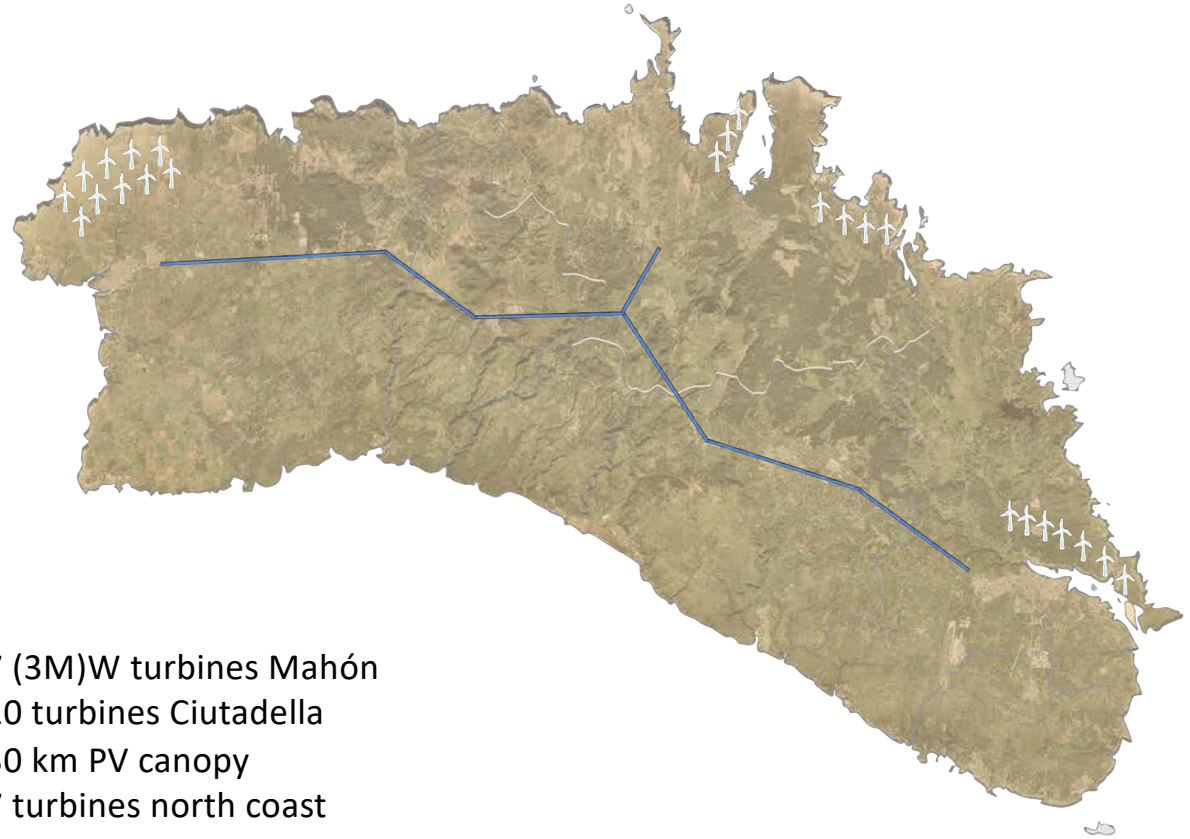
Energy efficiency & sustainable production

Total current energy demand (GWh)						
SECTOR	electricity (appl)	cooling	heating	DHW	cooking	fuel
RESIDENTIAL	119	50	77	33	19	
SERVICES	105	84	38	46	14	
INDUSTRIAL + AGRIC	32			31		
VEHICLES LAND						516
BOATS						214
AIRPLAINES						231
TOTAL (GWh)	256	134	114	110	33	961

Energy efficiency measures for Menorca (GWh)						
ENERGY MEASURE	electricity (appl)	cooling	heating	DHW	cooking	fuel
electricity reduction for appliances (-25%)	64					
modal shift (more public transport and bikes)						258
switch to 50% electric cars/busses/trucks	-43					129
switch to 50% electric bikes	-1,29					129
building retrofit measures ave. 43% red		57	49			
switch to electric boats 100%	-71,3					214
heat pump for heating (COP 4)	-13,8		55			
heat pumps for DHW (COP 2)	-10,5			21		
electric cooking (80%)	-26				26	
heat pump systems for cooling (COP 5)	-15,2	76				
remaining energy demand	373	0	10	89	7	231

Energy PRODUCTION measures for Menorca (GWh)						
ENERGY MEASURE	electricity (appl)	cooling	heating	DHW	cooking	fuel
Wind turbines Mahon (replace 4) (7x3MW)	50					
Wind turbines Ciutadella (7x3MW)	50					
PV-roof canopy 30 km (amorpheus, 15m)	67					
solar boilers 75% of DHW				82		
CHP on biomass for heating city centres + el.	10		10	6		
biogas from foodwaste					7	
PV on roofs (20% all roofs)	120					
10 3MW windturbines	76					
total energy balance with measures	0	0	0	0	0	231

Large scale energy production



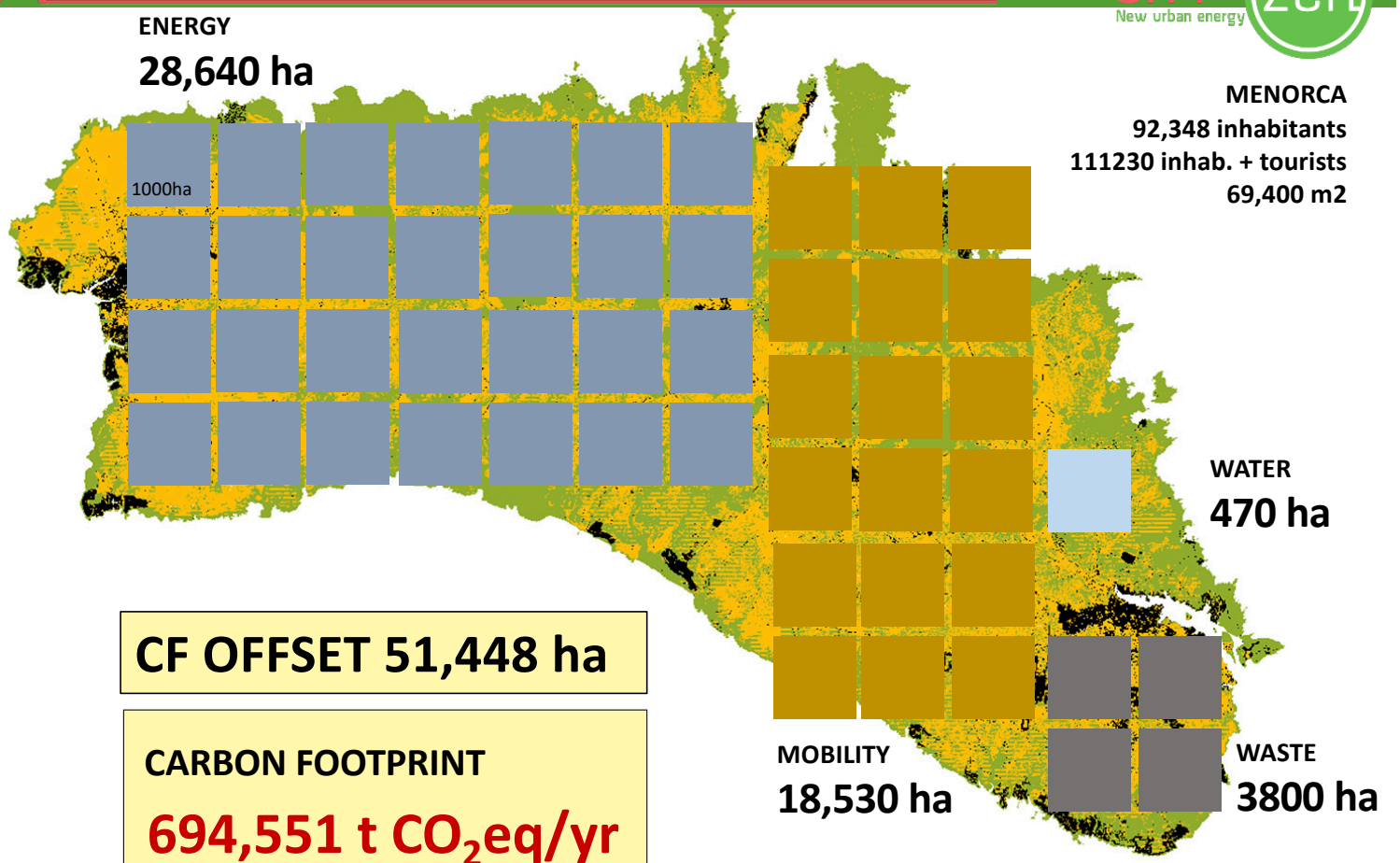
- 7 (3M)W turbines Mahón
- 10 turbines Ciutadella
- 30 km PV canopy
- 7 turbines north coast

CITY-zen
New urban energy

CITY-zen
New urban energy

CARBON FOOTPRINT OF MENORCA

CARBON ACCOUNTING



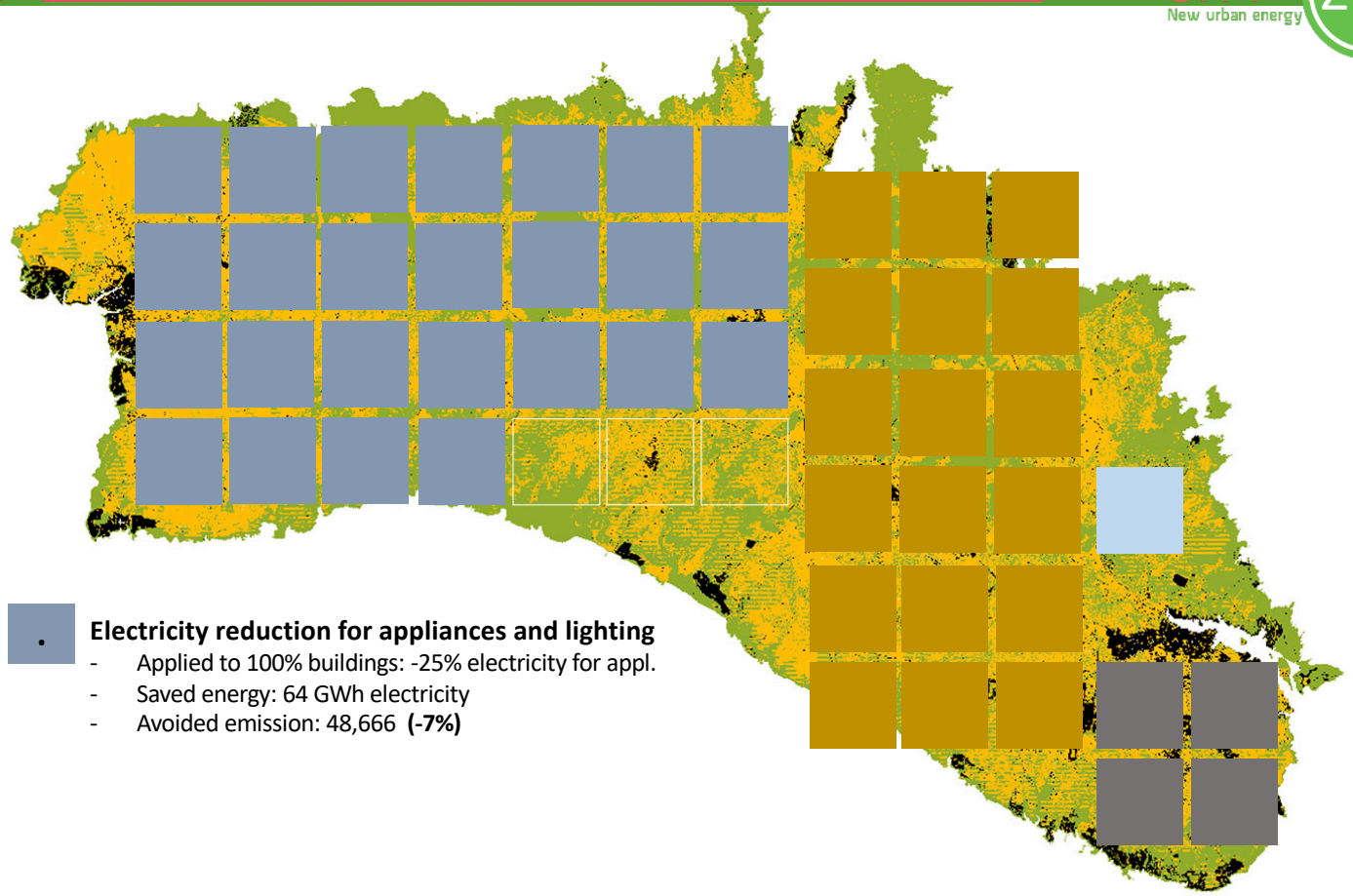
CF OFFSET 51,448 ha

CARBON FOOTPRINT

694,551 t CO_2eq/yr

CARBON FOOTPRINT OF MENORCA

CARBON ACCOUNTING

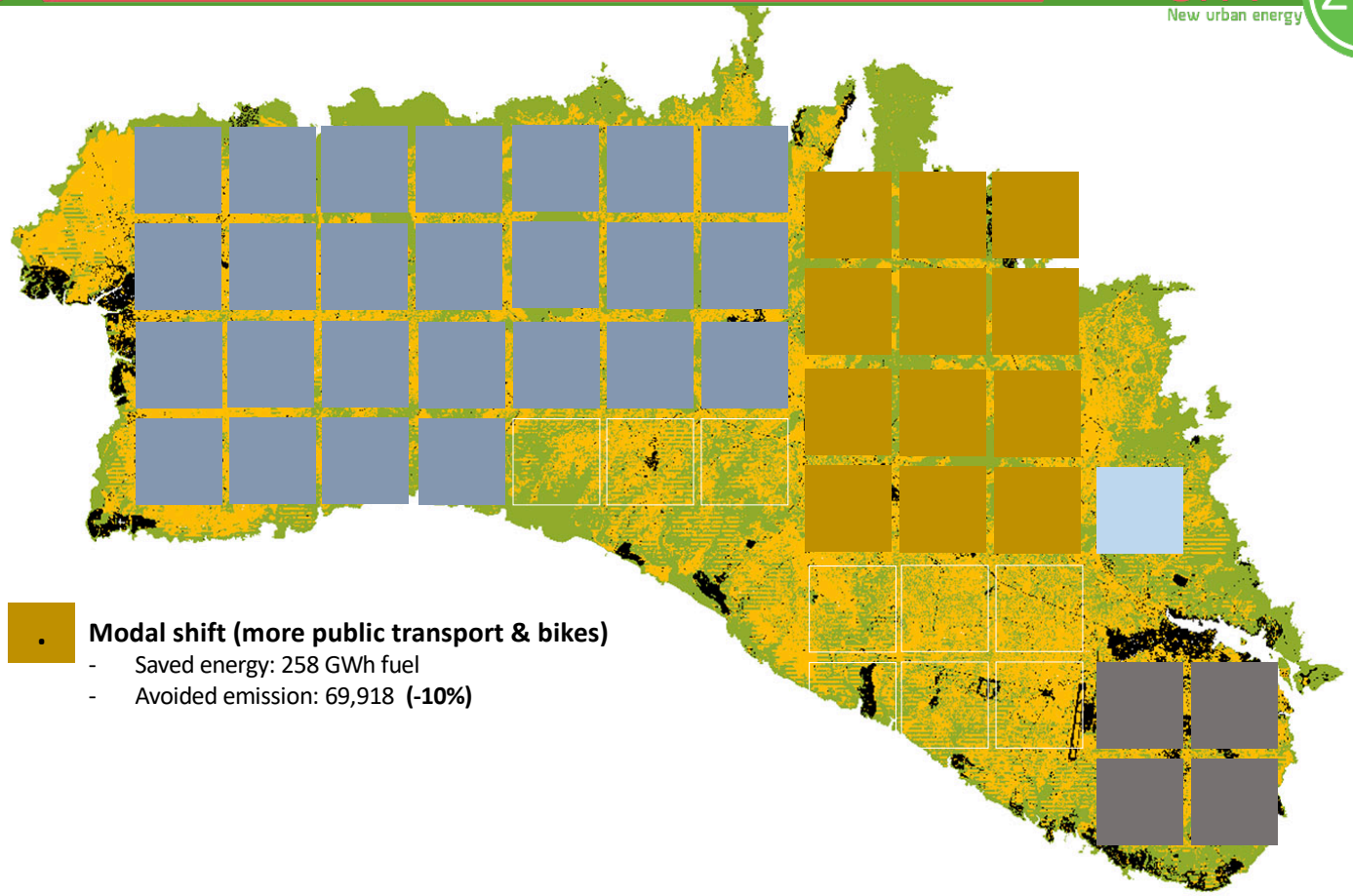


Electricity reduction for appliances and lighting

- Applied to 100% buildings: -25% electricity for appl.
- Saved energy: 64 GWh electricity
- Avoided emission: 48,666 **(-7%)**

CARBON FOOTPRINT OF MENORCA

CARBON ACCOUNTING

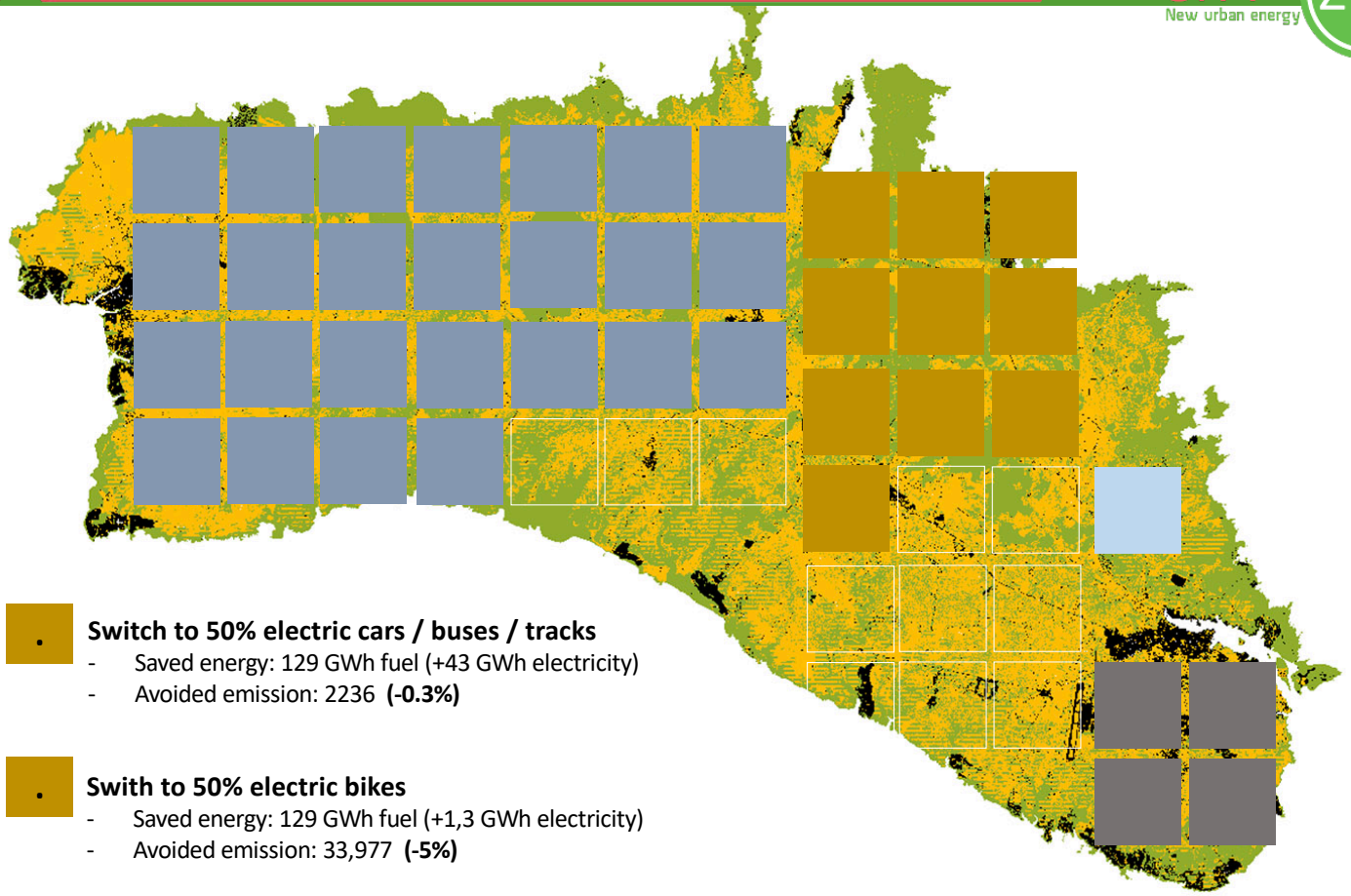


Modal shift (more public transport & bikes)

- Saved energy: 258 GWh fuel
- Avoided emission: 69,918 **(-10%)**

CARBON FOOTPRINT OF MENORCA

CARBON ACCOUNTING



Switch to 50% electric cars / buses / tracks

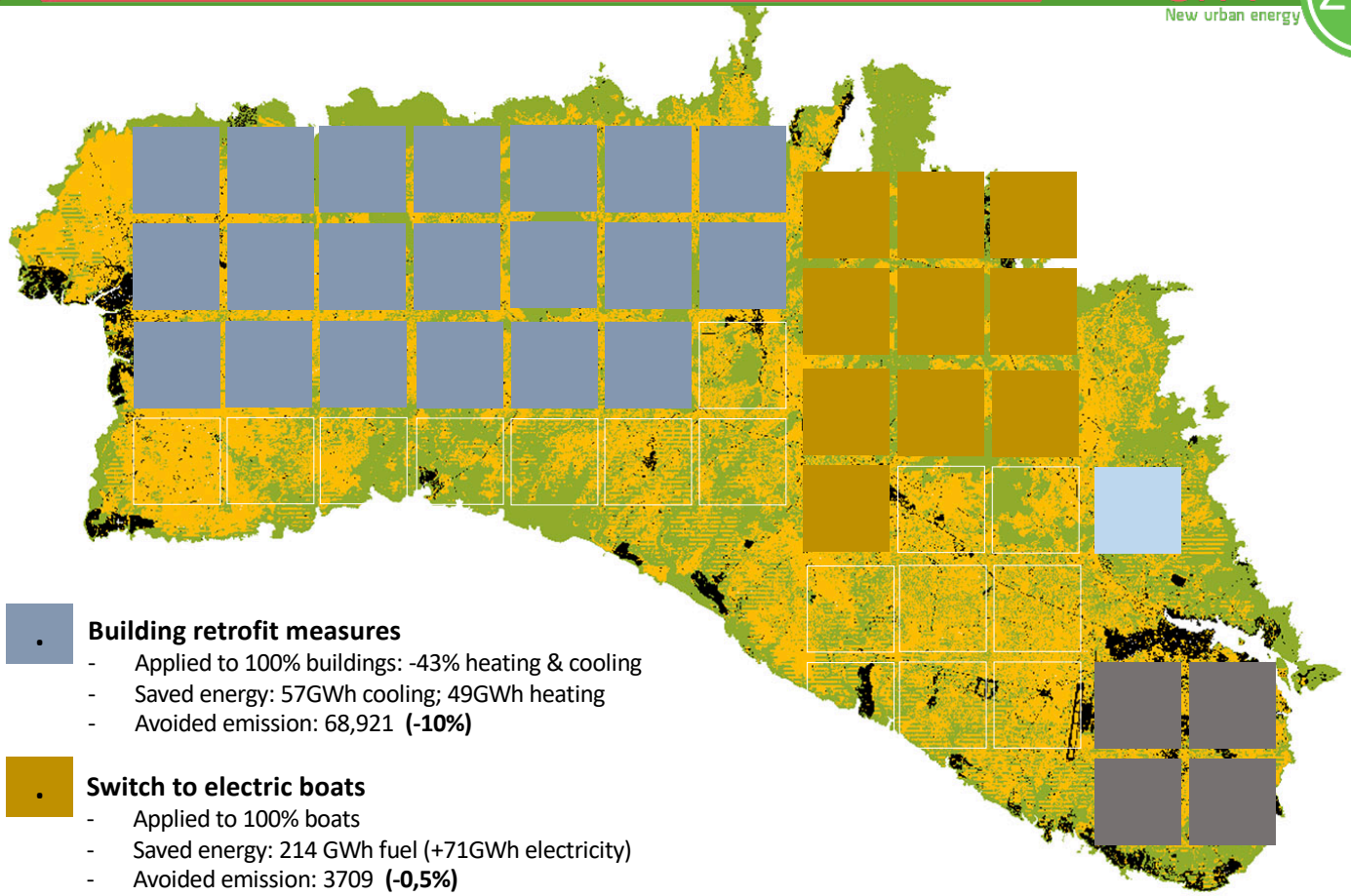
- Saved energy: 129 GWh fuel (+43 GWh electricity)
- Avoided emission: 2236 **(-0.3%)**

Swith to 50% electric bikes

- Saved energy: 129 GWh fuel (+1,3 GWh electricity)
- Avoided emission: 33,977 **(-5%)**

CARBON FOOTPRINT OF MENORCA

CARBON ACCOUNTING



Building retrofit measures

- Applied to 100% buildings: -43% heating & cooling
- Saved energy: 57GWh cooling; 49GWh heating
- Avoided emission: 68,921 **(-10%)**

Switch to electric boats

- Applied to 100% boats
- Saved energy: 214 GWh fuel (+71GWh electricity)
- Avoided emission: 3709 **(-0,5%)**

Cost of Retrofit – orders of magnitude.

Each household pays 1000 Euro per year for energy.

Energy retrofit operation on all permanent residential units in Menorca

In **historic centres**, allowing **20%** of reduction in energy use

In all other places **deeper retrofit** allowing **50%** reduction in energy use.

We estimate *average* retrofitting costs as follows:

10.000 Euro for an apartment;

25.000 Euro for a terraced house;

30.000 Euro for a freestanding house.

Total Cost for 600 million Euro

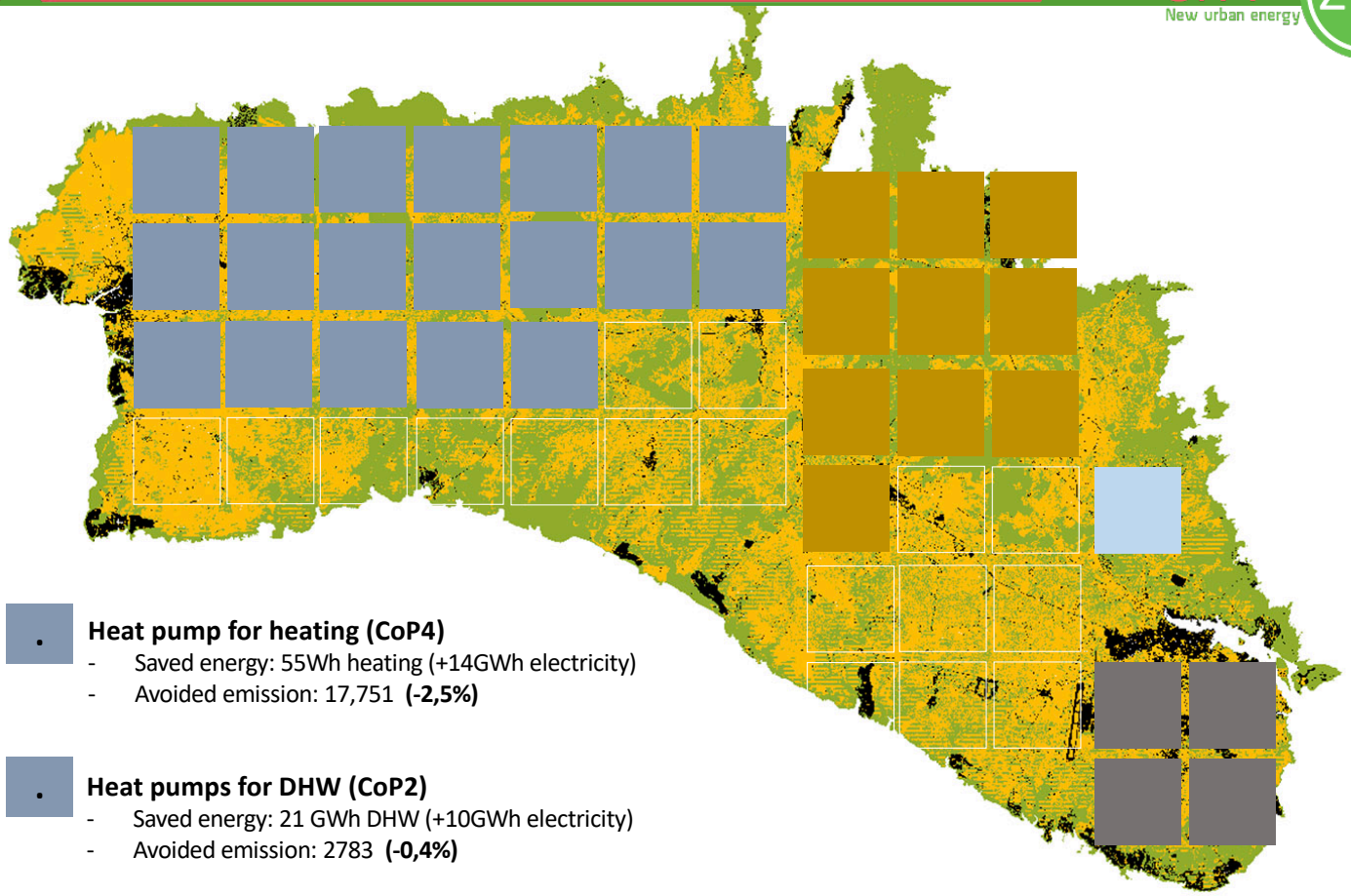
Saving each household €420 pa

Payback 27 years if 5% fuel inflation

The payback time is very **sensitive** to rising energy prices, behaviour of occupants and other factors influencing energy use & costs.

CARBON FOOTPRINT OF MENORCA

CARBON ACCOUNTING



Heat pump for heating (CoP4)

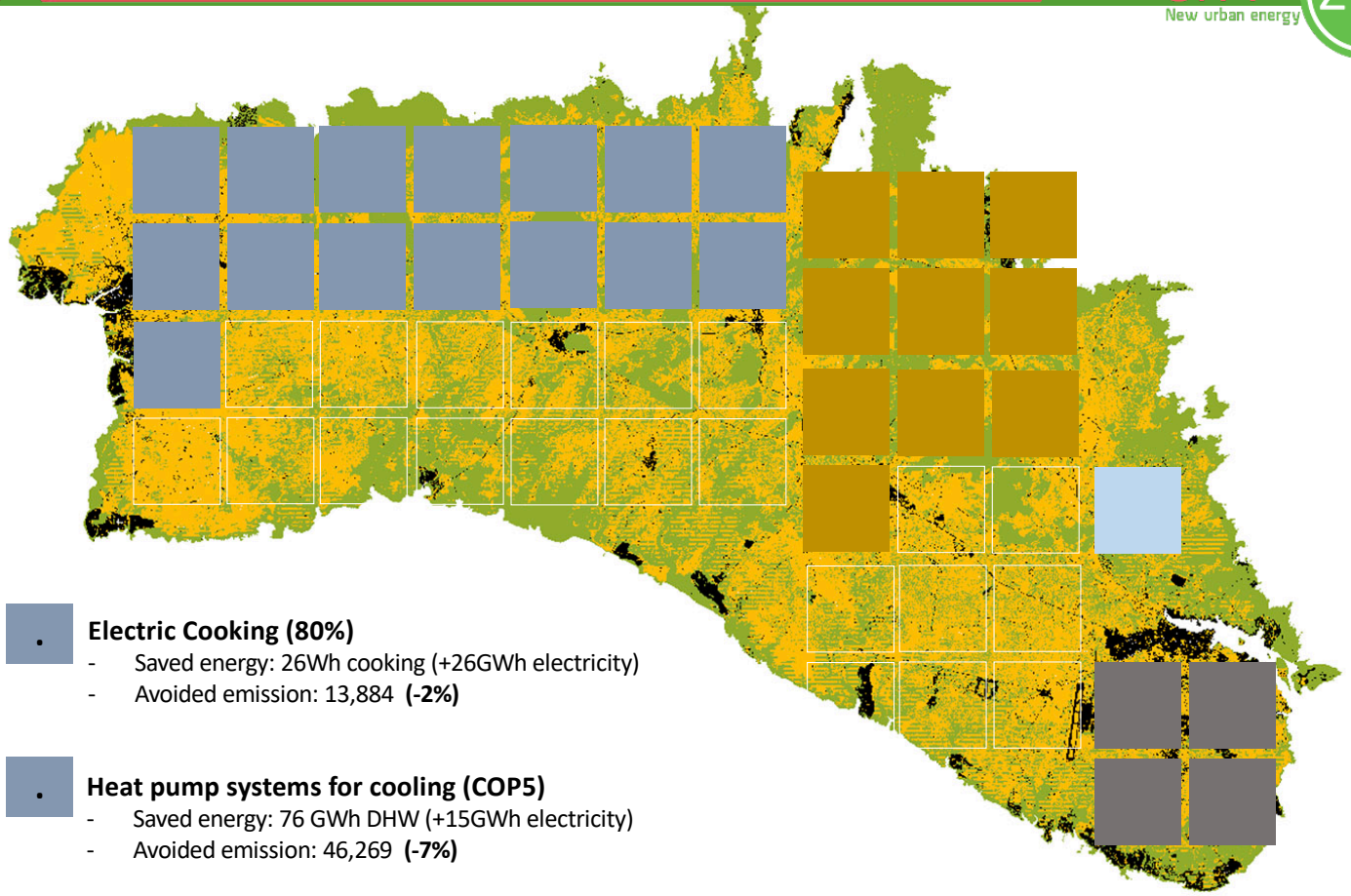
- Saved energy: 55Wh heating (+14GWh electricity)
- Avoided emission: 17,751 **(-2,5%)**

Heat pumps for DHW (CoP2)

- Saved energy: 21 GWh DHW (+10GWh electricity)
- Avoided emission: 2783 **(-0,4%)**

CARBON FOOTPRINT OF MENORCA

CARBON ACCOUNTING



Electric Cooking (80%)

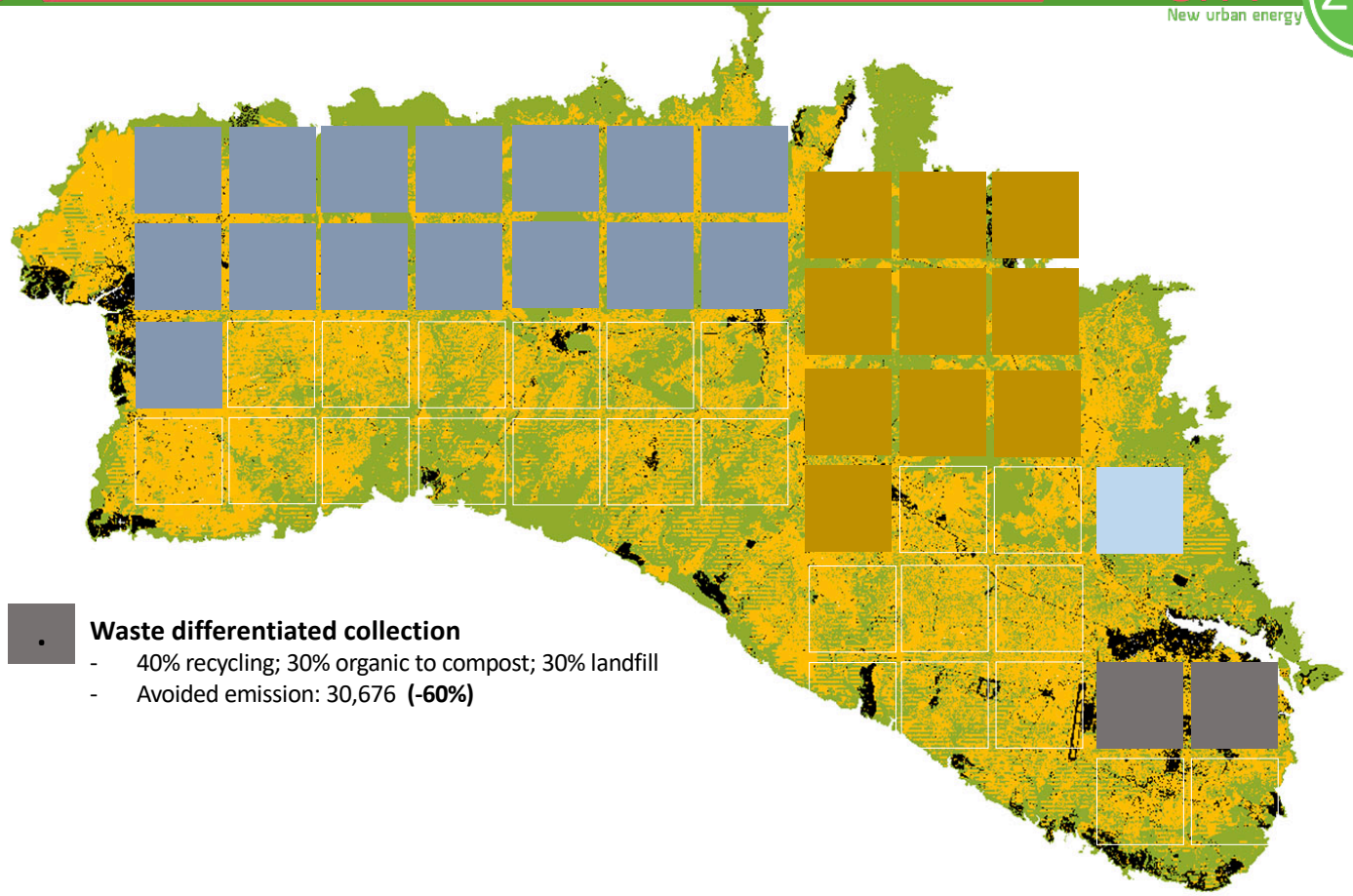
- Saved energy: 26Wh cooking (+26GWh electricity)
- Avoided emission: 13,884 **(-2%)**

Heat pump systems for cooling (COP5)

- Saved energy: 76 GWh DHW (+15GWh electricity)
- Avoided emission: 46,269 **(-7%)**

CARBON FOOTPRINT OF MENORCA

CARBON ACCOUNTING

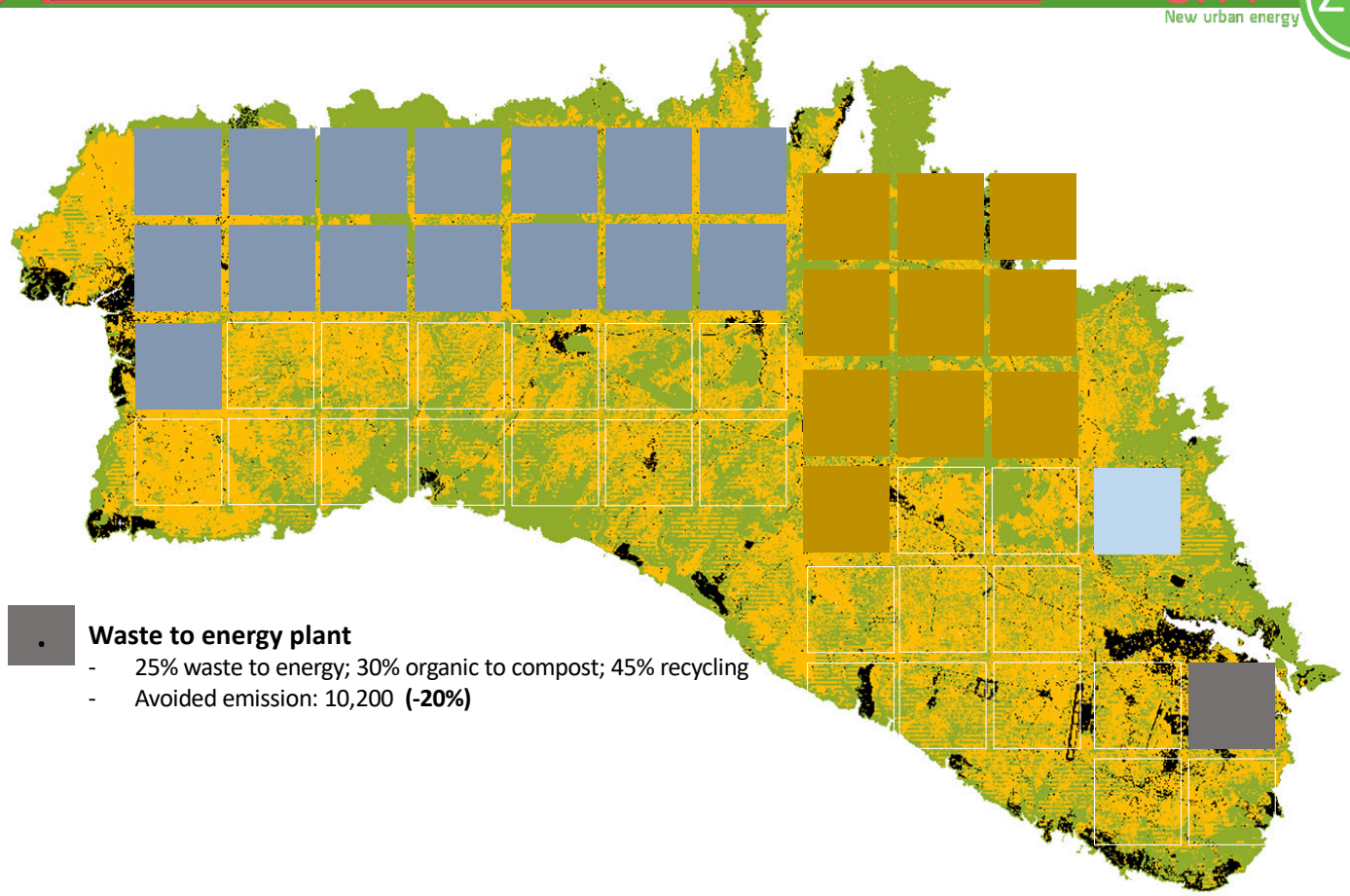


Waste differentiated collection

- 40% recycling; 30% organic to compost; 30% landfill
- Avoided emission: 30,676 **(-60%)**

CARBON FOOTPRINT OF MENORCA

CARBON ACCOUNTING

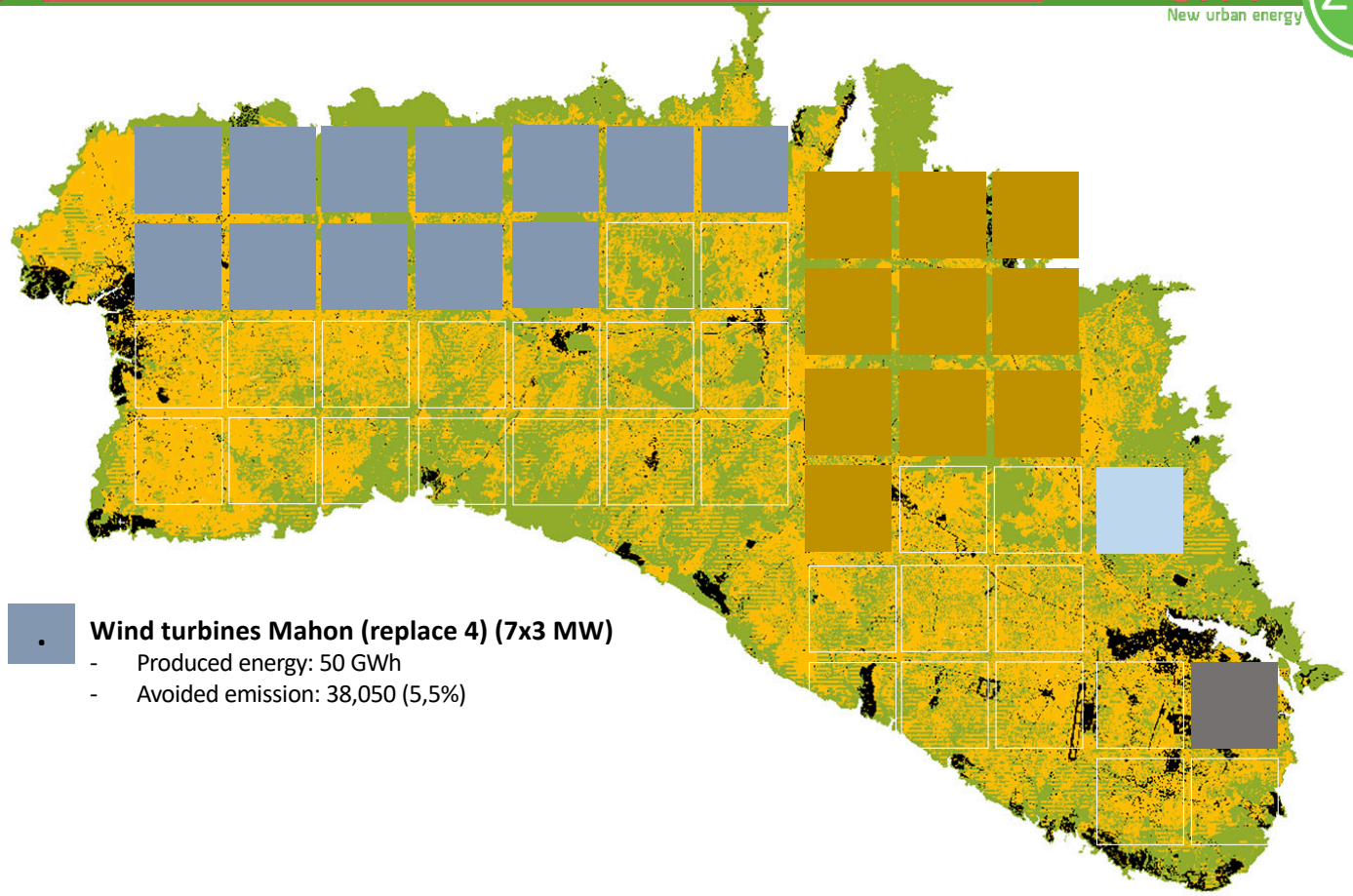


Waste to energy plant

- 25% waste to energy; 30% organic to compost; 45% recycling
- Avoided emission: 10,200 **(-20%)**

CARBON FOOTPRINT OF MENORCA

CARBON ACCOUNTING

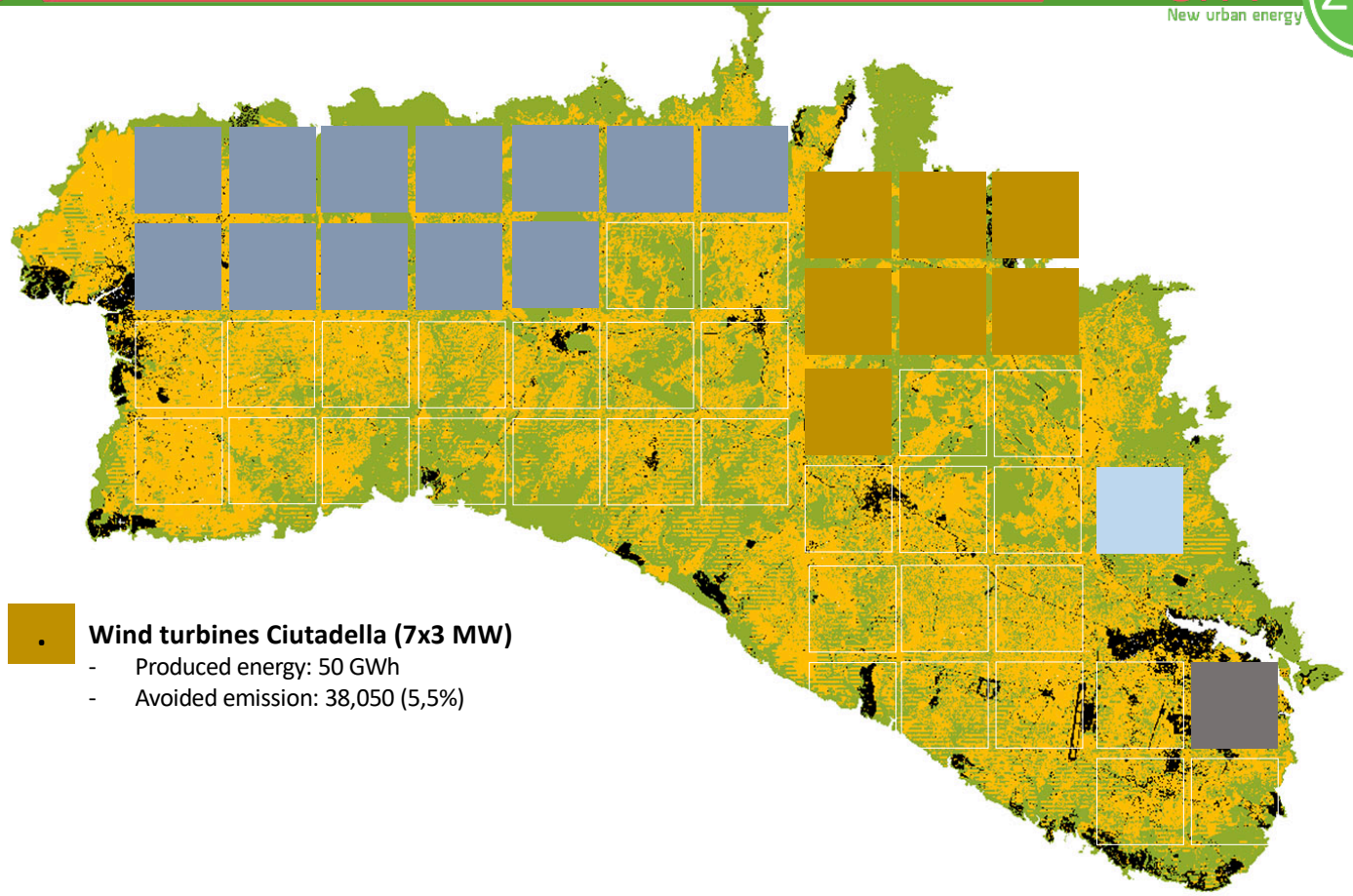


Wind turbines Mahon (replace 4) (7x3 MW)

- Produced energy: 50 GWh
- Avoided emission: 38,050 (5,5%)

CARBON FOOTPRINT OF MENORCA

CARBON ACCOUNTING

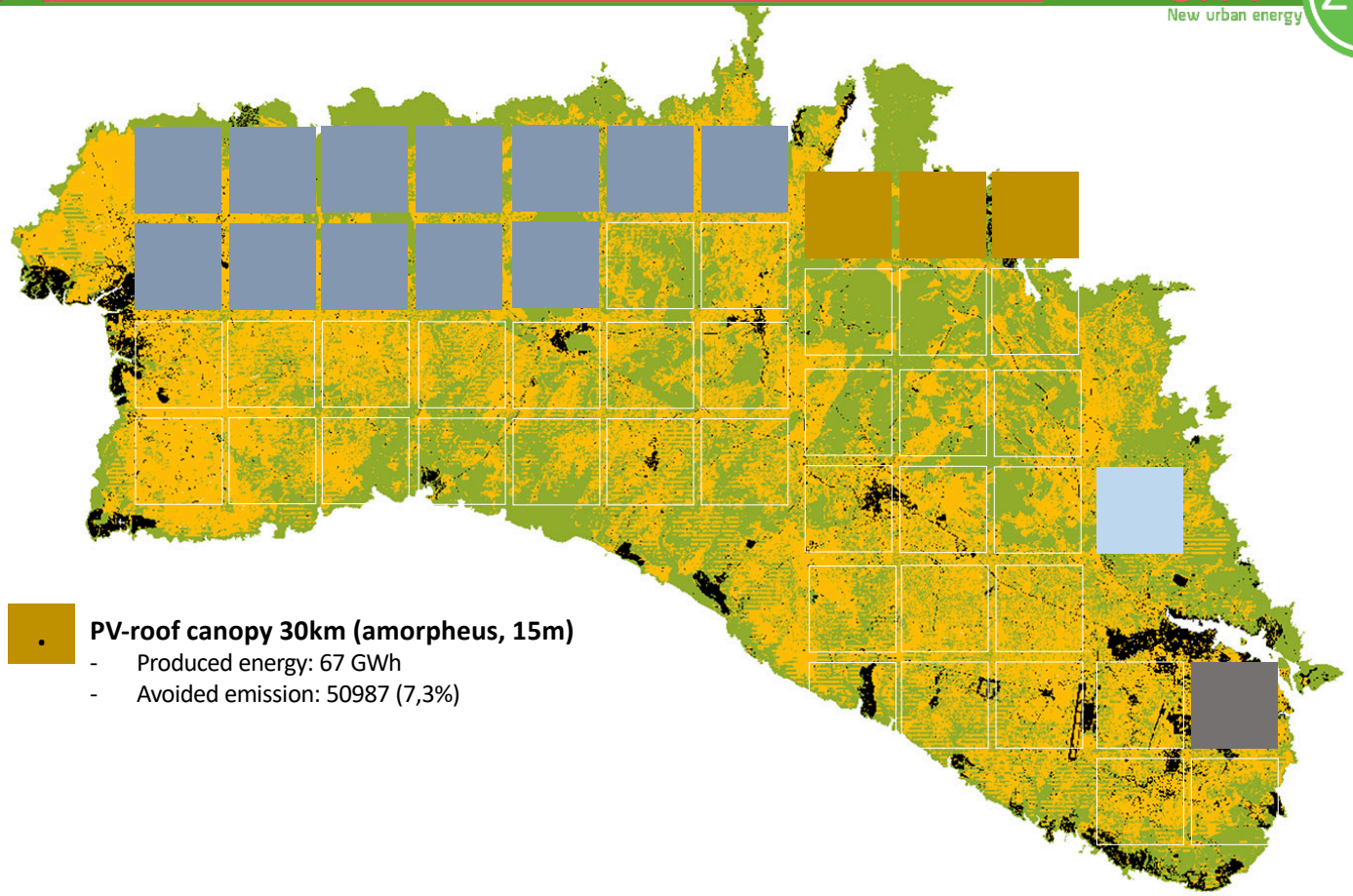


Wind turbines Ciutadella (7x3 MW)

- Produced energy: 50 GWh
- Avoided emission: 38,050 (5,5%)

CARBON FOOTPRINT OF MENORCA

CARBON ACCOUNTING

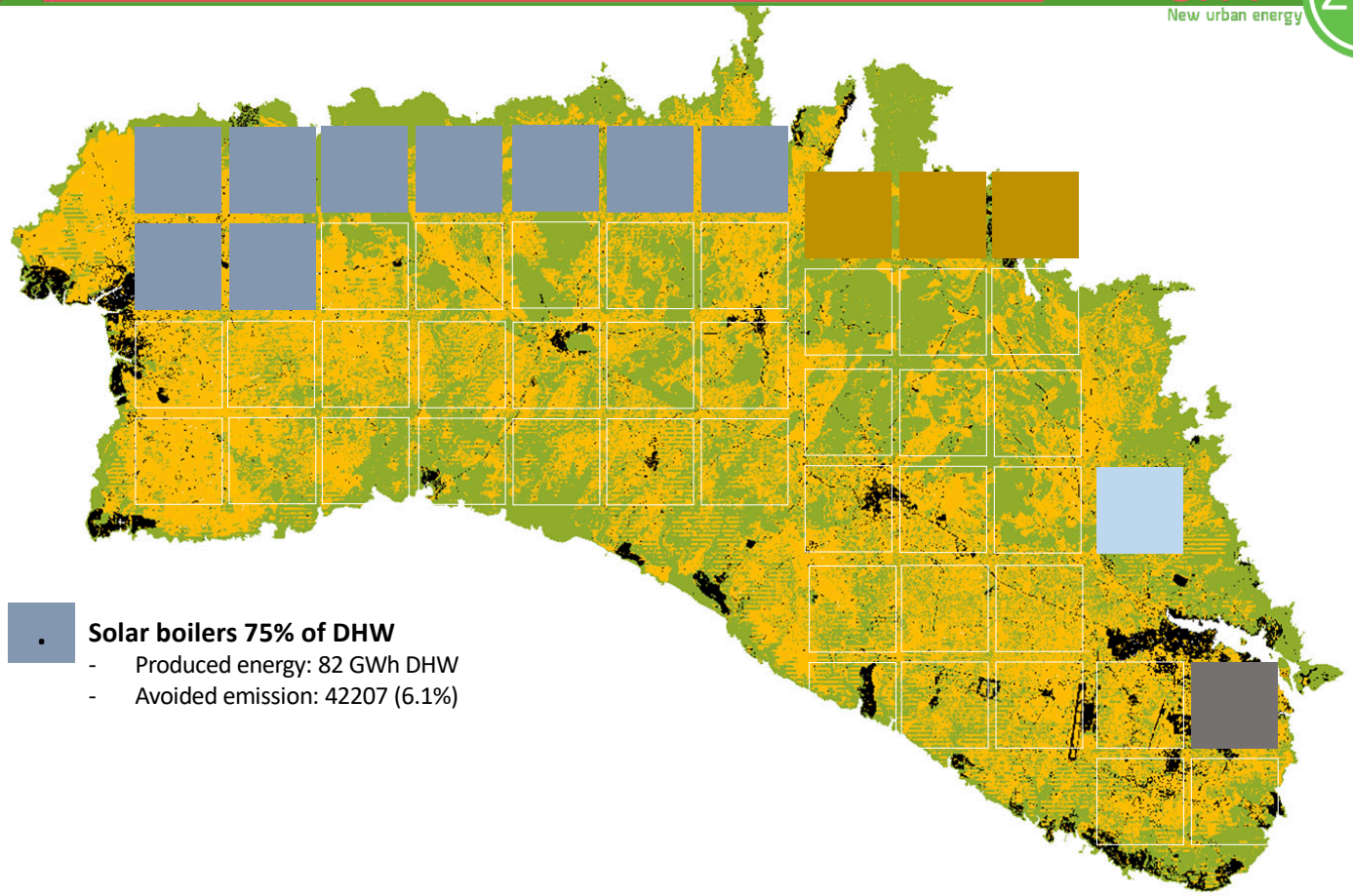


PV-roof canopy 30km (amorpheus, 15m)

- Produced energy: 67 GWh
- Avoided emission: 50987 (7,3%)

CARBON FOOTPRINT OF MENORCA

CARBON ACCOUNTING

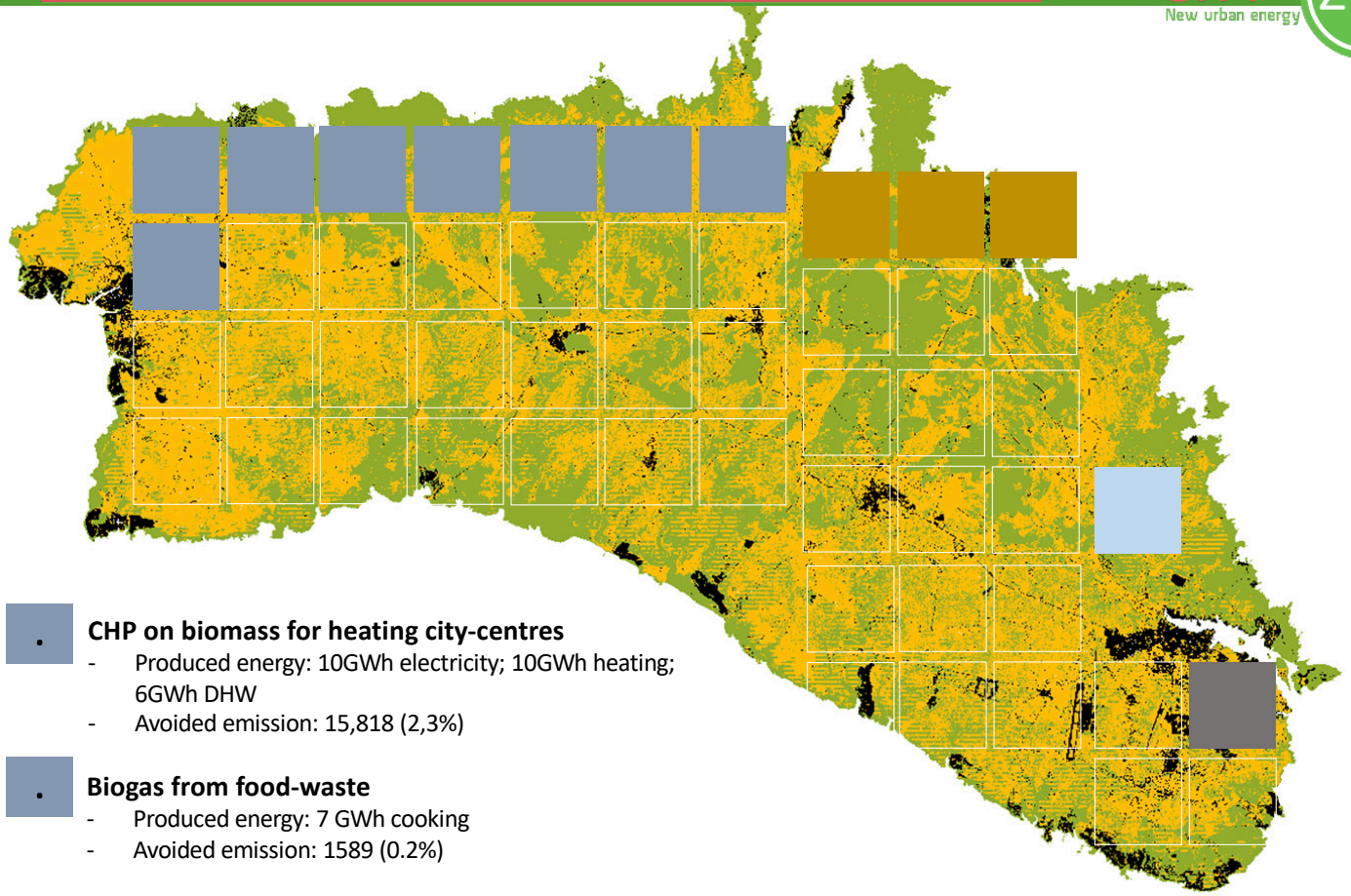


Solar boilers 75% of DHW

- Produced energy: 82 GWh DHW
- Avoided emission: 42207 (6.1%)

CARBON FOOTPRINT OF MENORCA

CARBON ACCOUNTING



CHP on biomass for heating city-centres

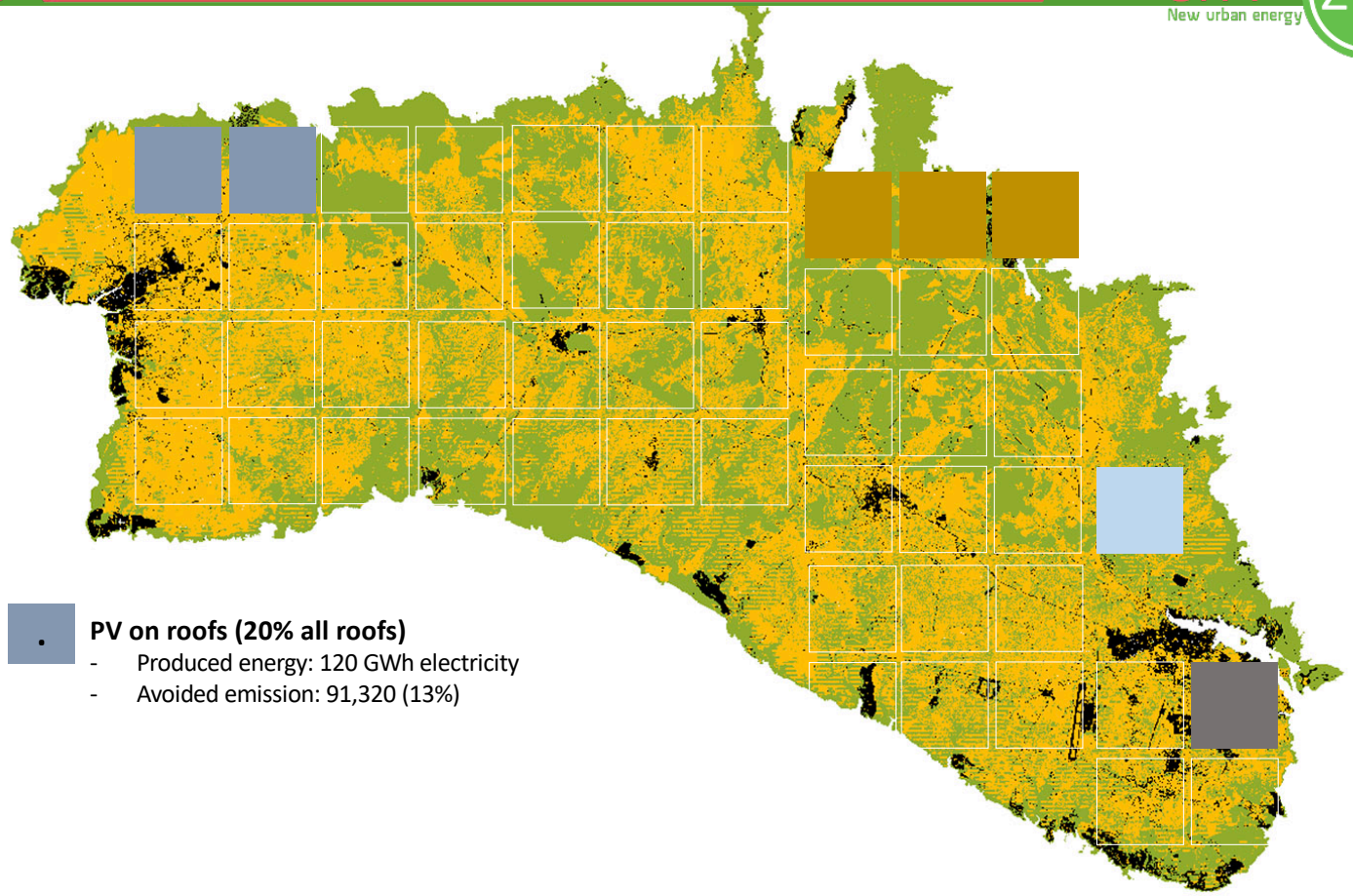
- Produced energy: 10GWh electricity; 10GWh heating; 6GWh DHW
- Avoided emission: 15,818 (2,3%)

Biogas from food-waste

- Produced energy: 7 GWh cooking
- Avoided emission: 1589 (0.2%)

CARBON FOOTPRINT OF MENORCA

CARBON ACCOUNTING

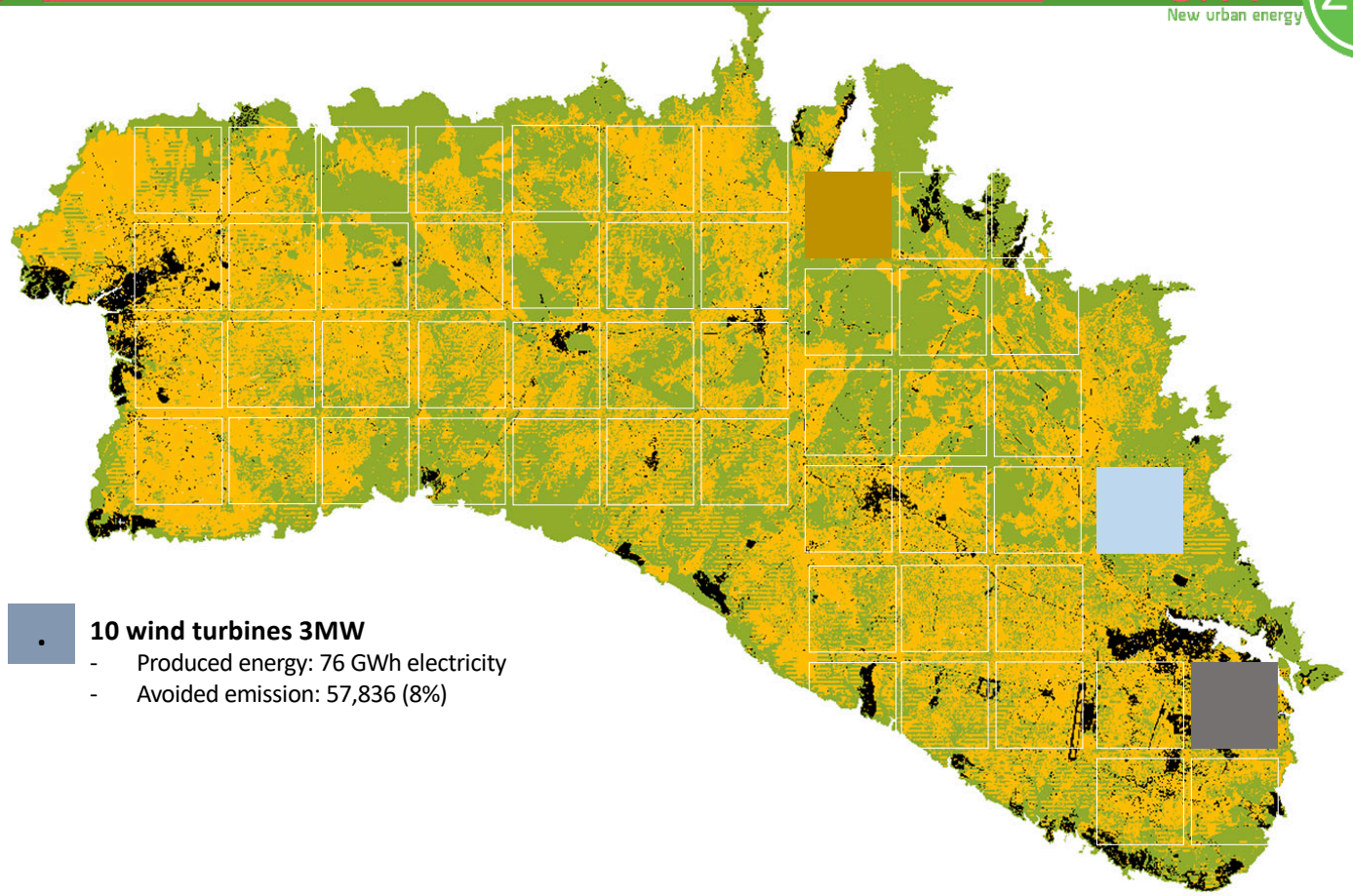


PV on roofs (20% all roofs)

- Produced energy: 120 GWh electricity
- Avoided emission: 91,320 (13%)

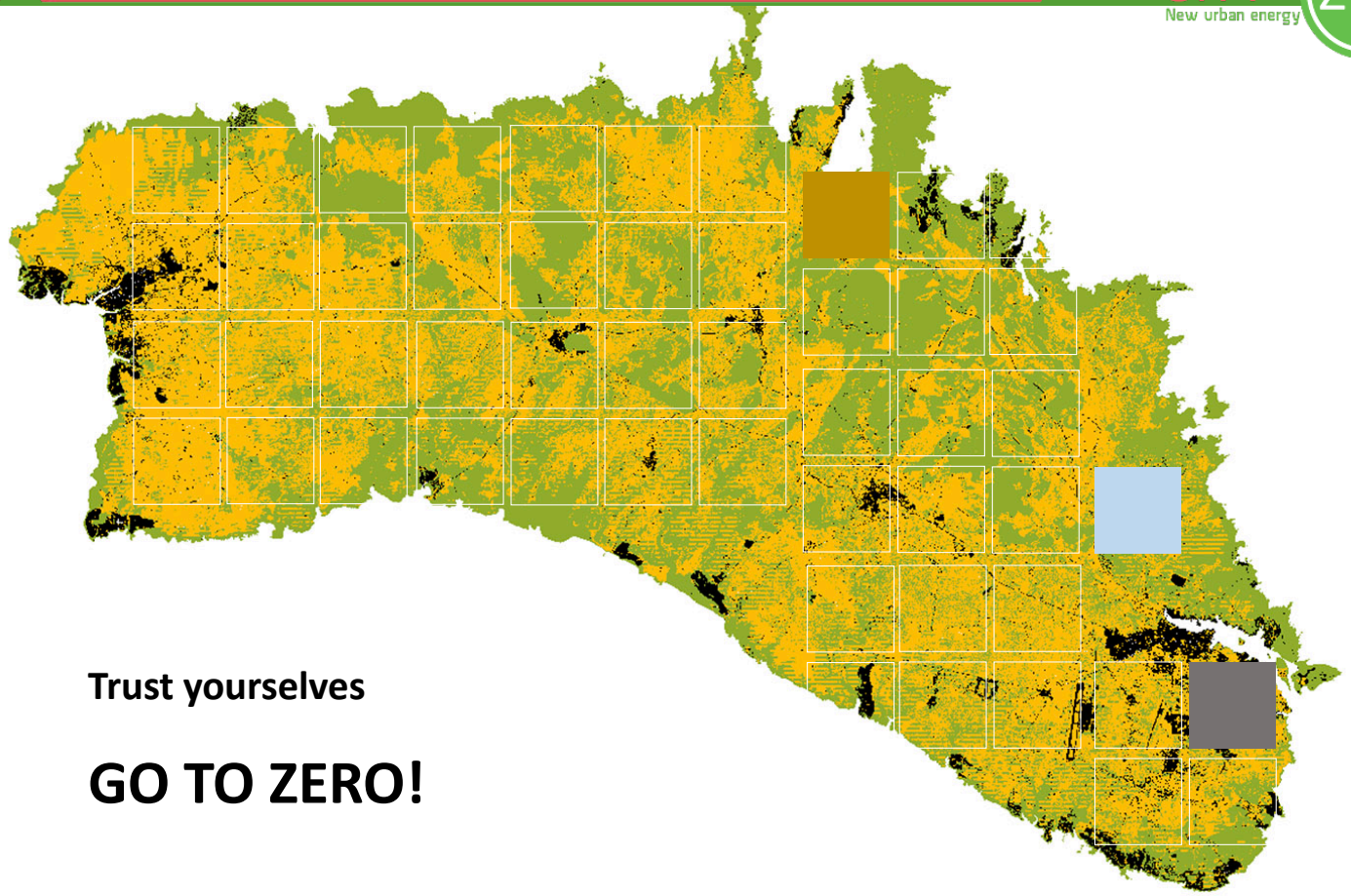
CARBON FOOTPRINT OF MENORCA

CARBON ACCOUNTING



10 wind turbines 3MW

- Produced energy: 76 GWh electricity
- Avoided emission: 57,836 (8%)



Trust yourselves

GO TO ZERO!

Urban Vision

Professor Greg Keeffe Queens University Belfast

The vision

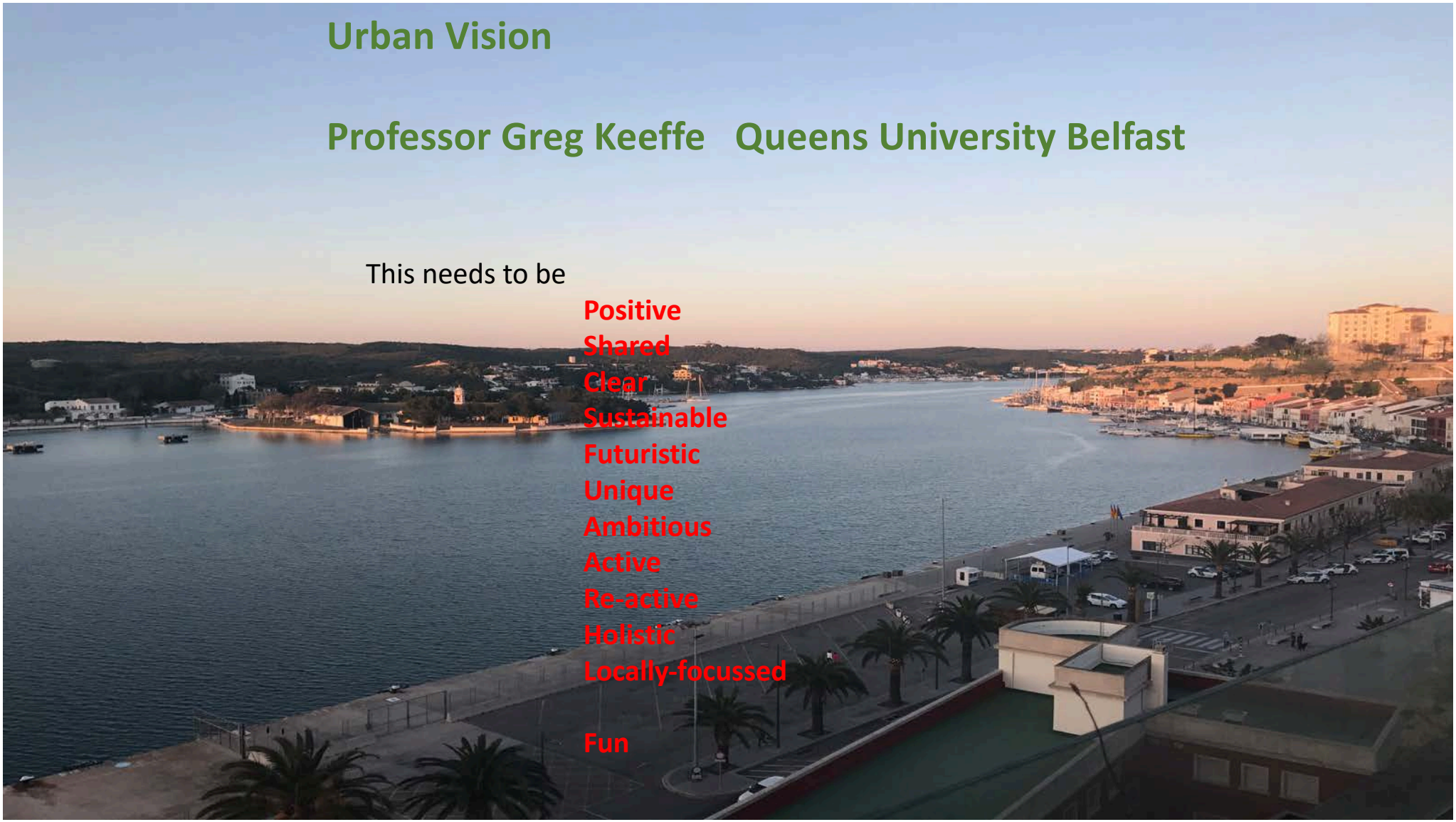
This needs to be

Positive
Shared
Clear
Sustainable
Futuristic
Unique
Ambitious
Active
Re-active
Holistic
Locally-focussed

Fun

Urban Vision

Professor Greg Keeffe Queens University Belfast

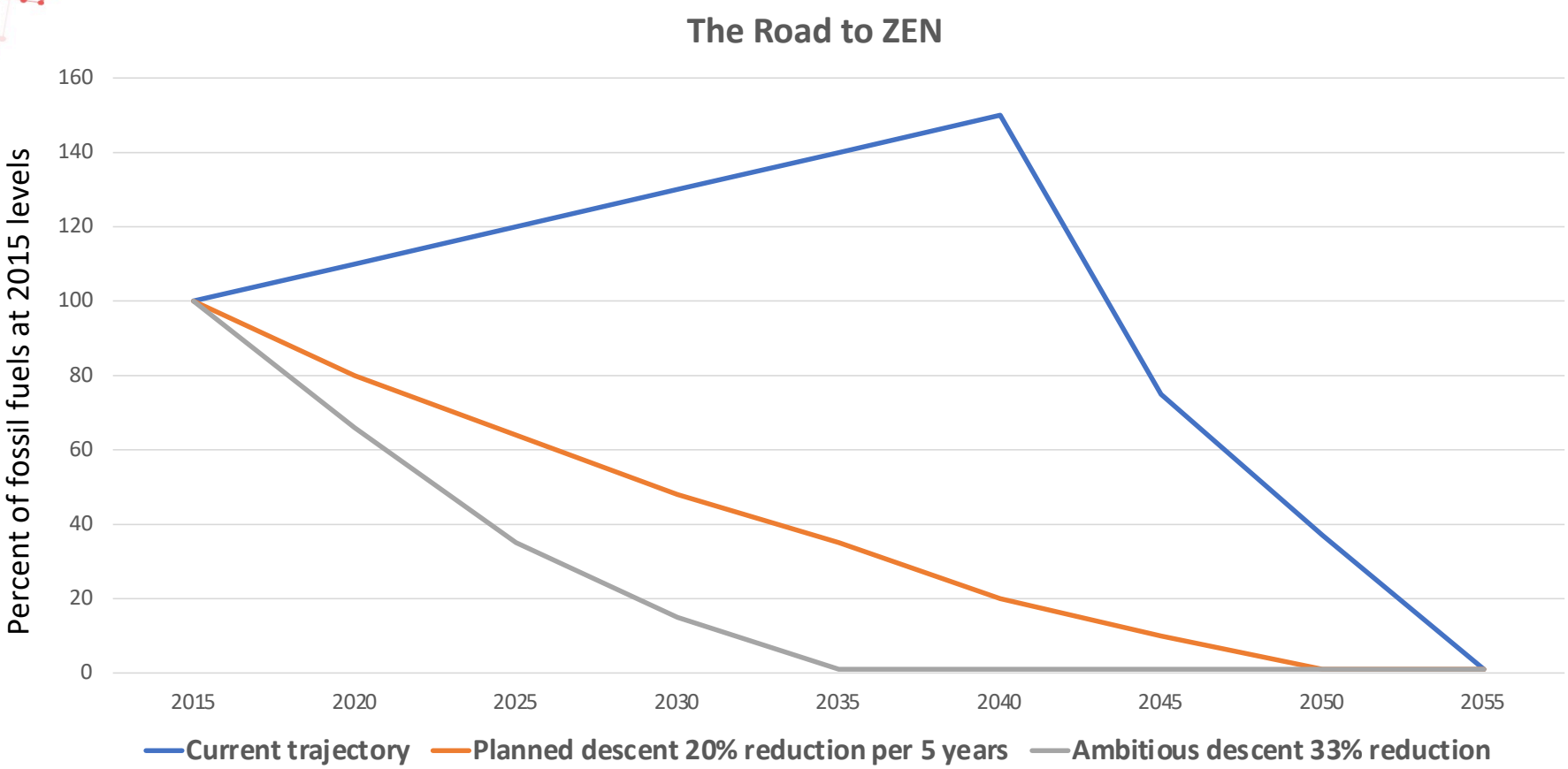


This needs to be

Positive
Shared
Clear
Sustainable
Futuristic
Unique
Ambitious
Active
Re-active
Holistic
Locally-focussed

Fun

Speed of Implementation



The city vision:

Mahon a slow city,

Confident in its future

Connected to its environment.

Car free

Sustainably powered

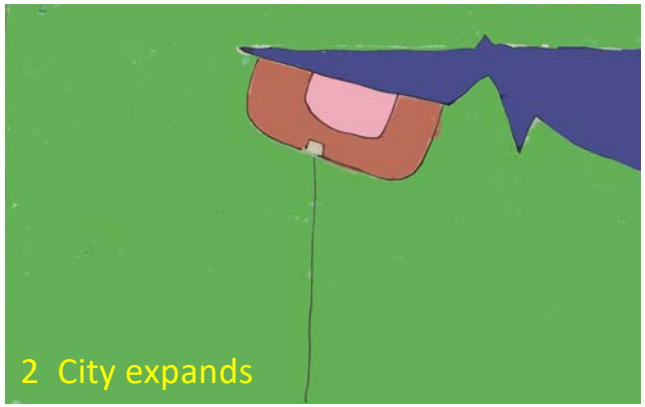
Locally focused

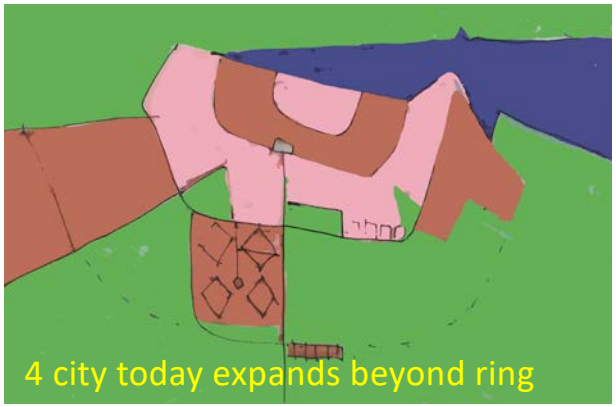
Child and older people-friendly

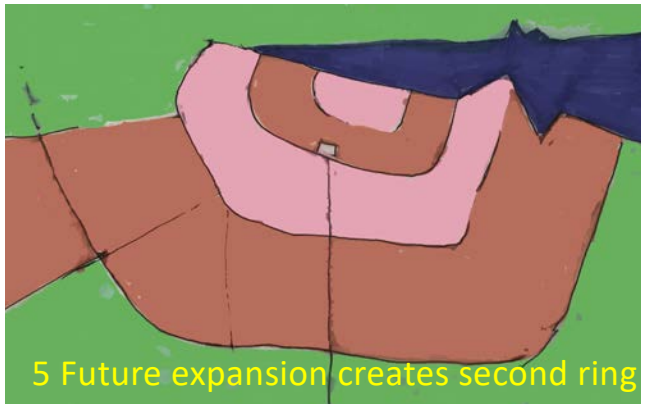
Biologically connected

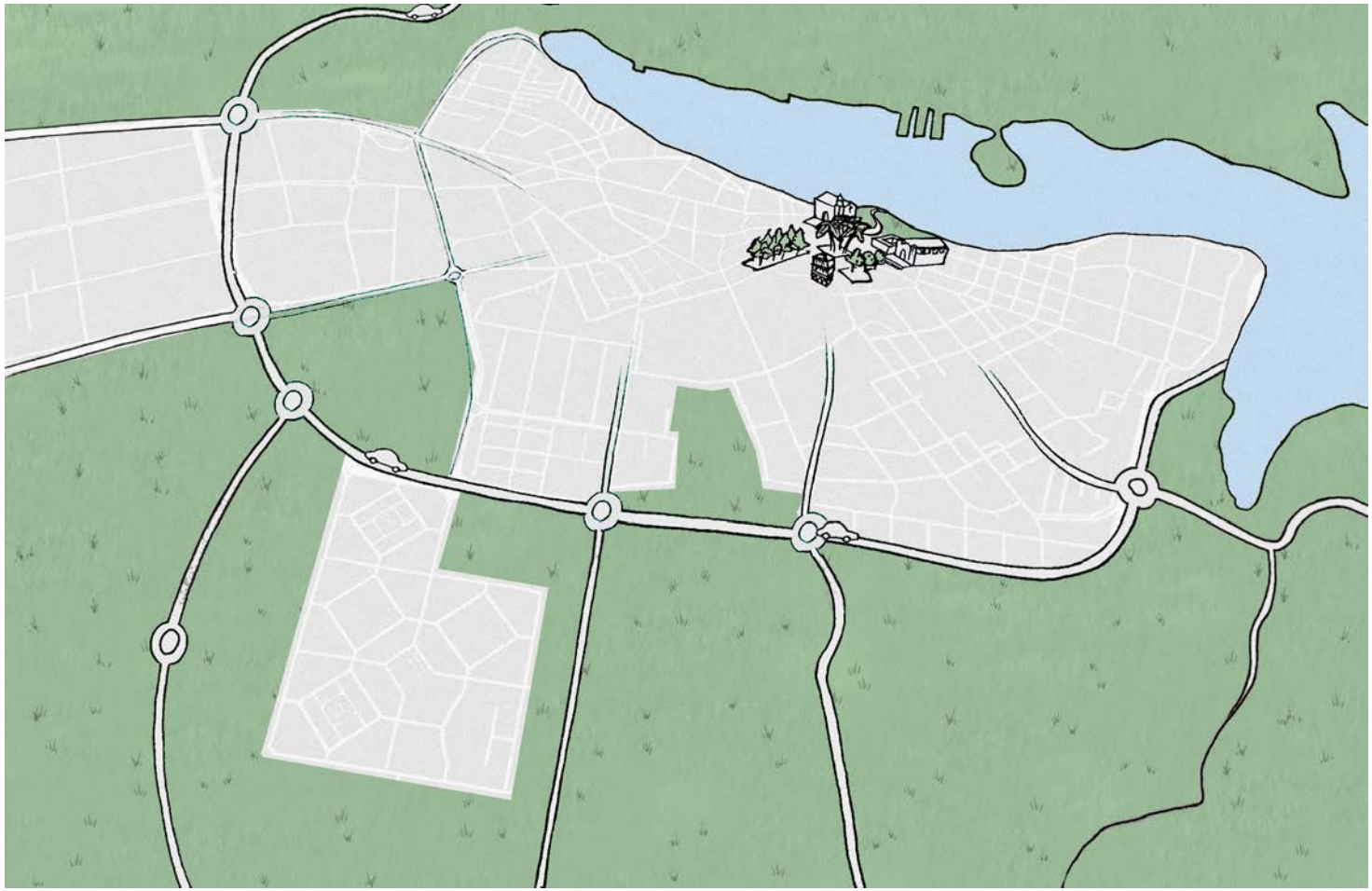
A destination for sustainable tourism

Mahon: Historic and projected city growth



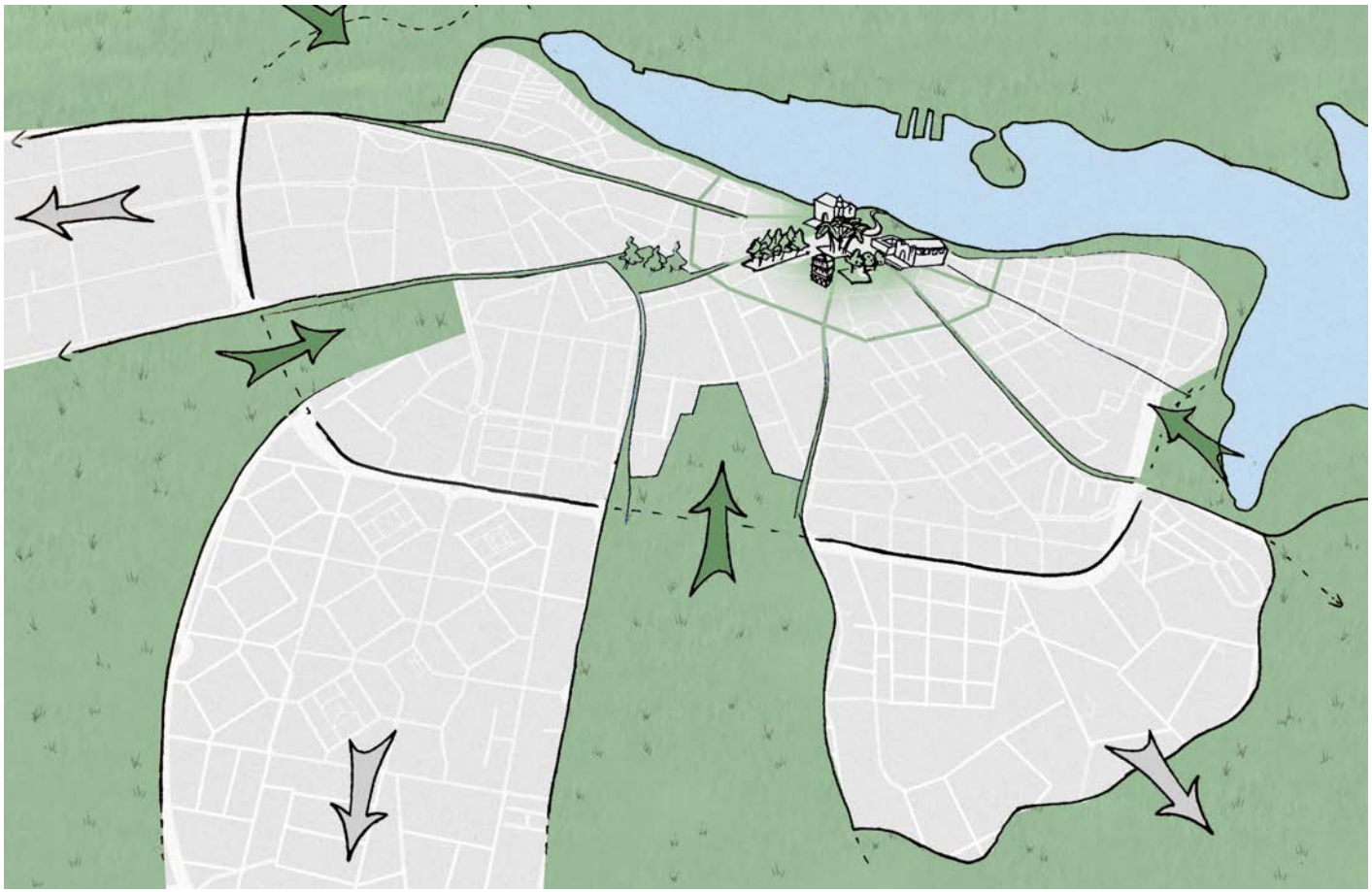






CITY-zen
New urban energy


YOU ARE HERE



Long term vision –city

(Re) Connect the city with the rural landscape

Create and Protect green corridors.

Remove cars from city centre

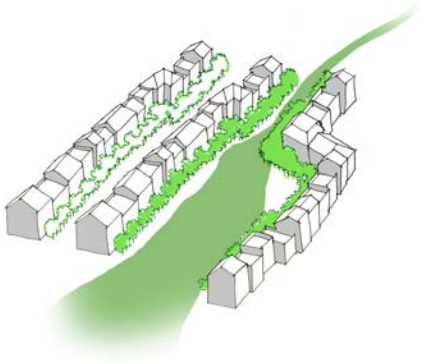
Create green and shaded routes inside the city for bicycles and pedestrians.

De-engineer the ring road

Allow city to grow in a structured way

new public spaces created with car parking under.

CITY-zen
New urban energy



Rural space directly accessed from the city

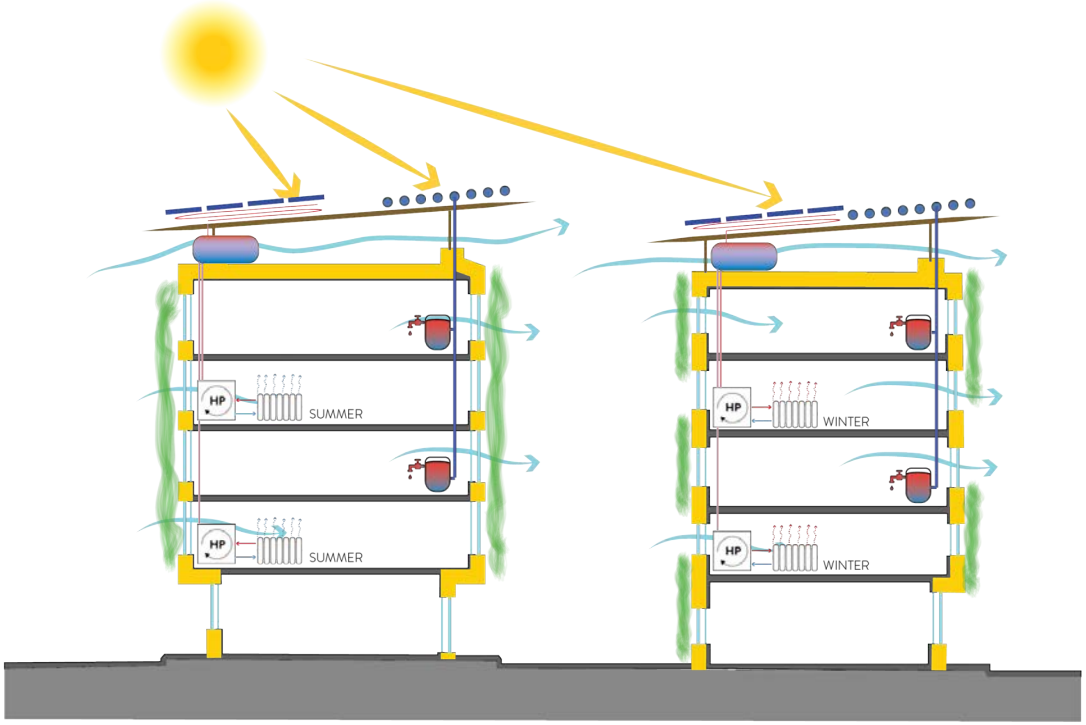
Car domination

CITY-zen
New urban energy

Bicycle routes for the city

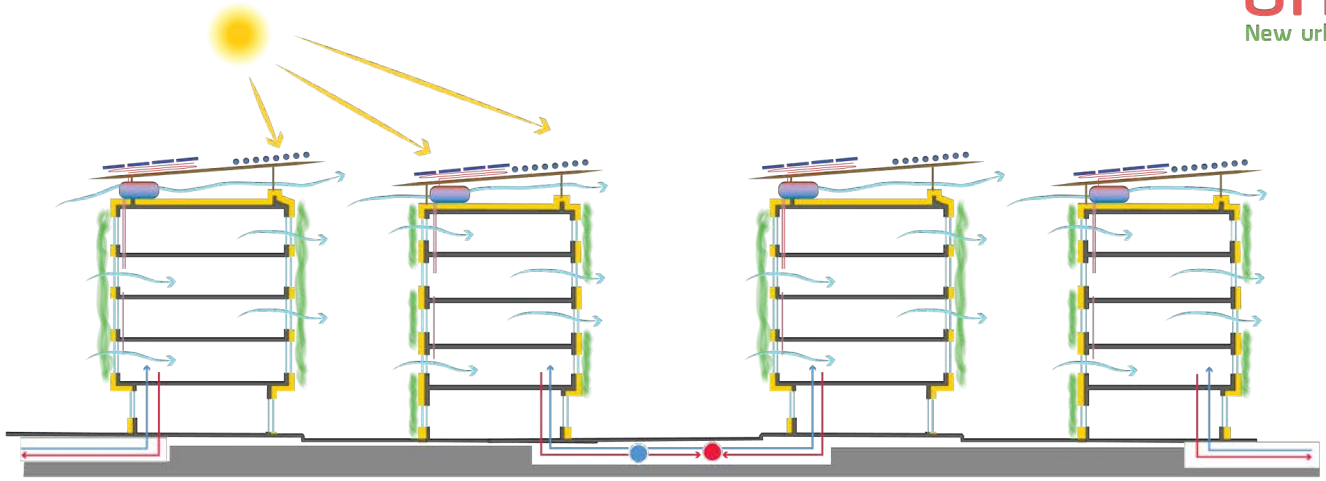
Energy strategy Mahón south

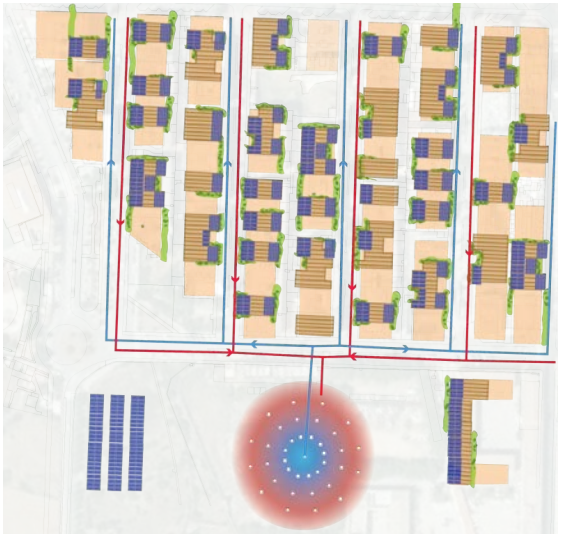
Energy measures Mahón south



- **Insulation of roofs/walls/glazing**
  - Reduction of heating demand: 50%
  - Reduction of cooling demand: 25%
- **Tropical roof & greening the building**
  - Reduction of cooling demand: 20%
- **Solar boilers for hot water**
  - Reduction of DHW: 80%
- **Installation of low-temperature radiators +heat pumps**
  - Reduction heating 75%
  - Reduction cooling 60%
- **PV-thermal roof**
  - Reduction electricity 35%
  - Reduction of heating 20%

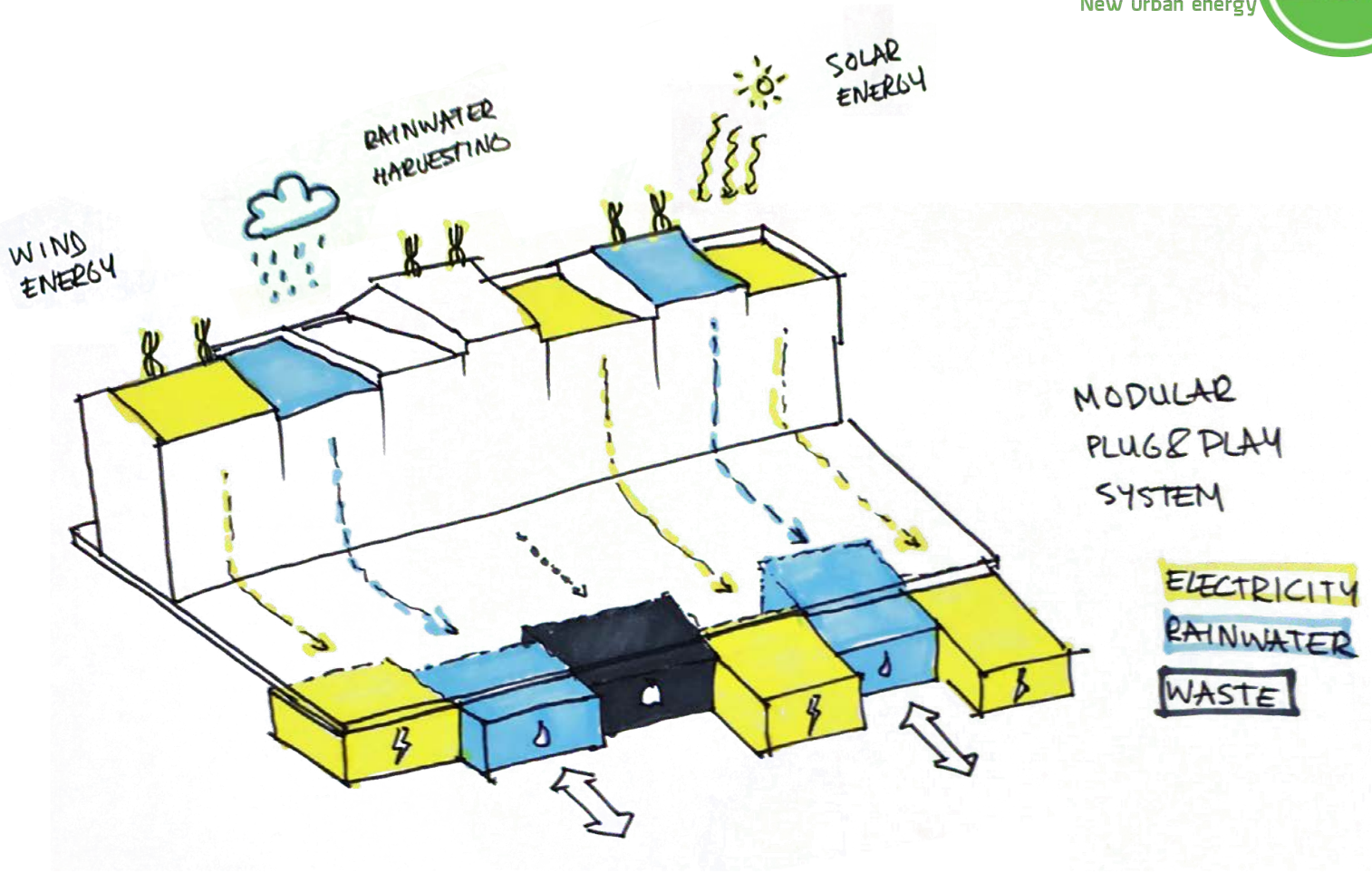
Energy measures

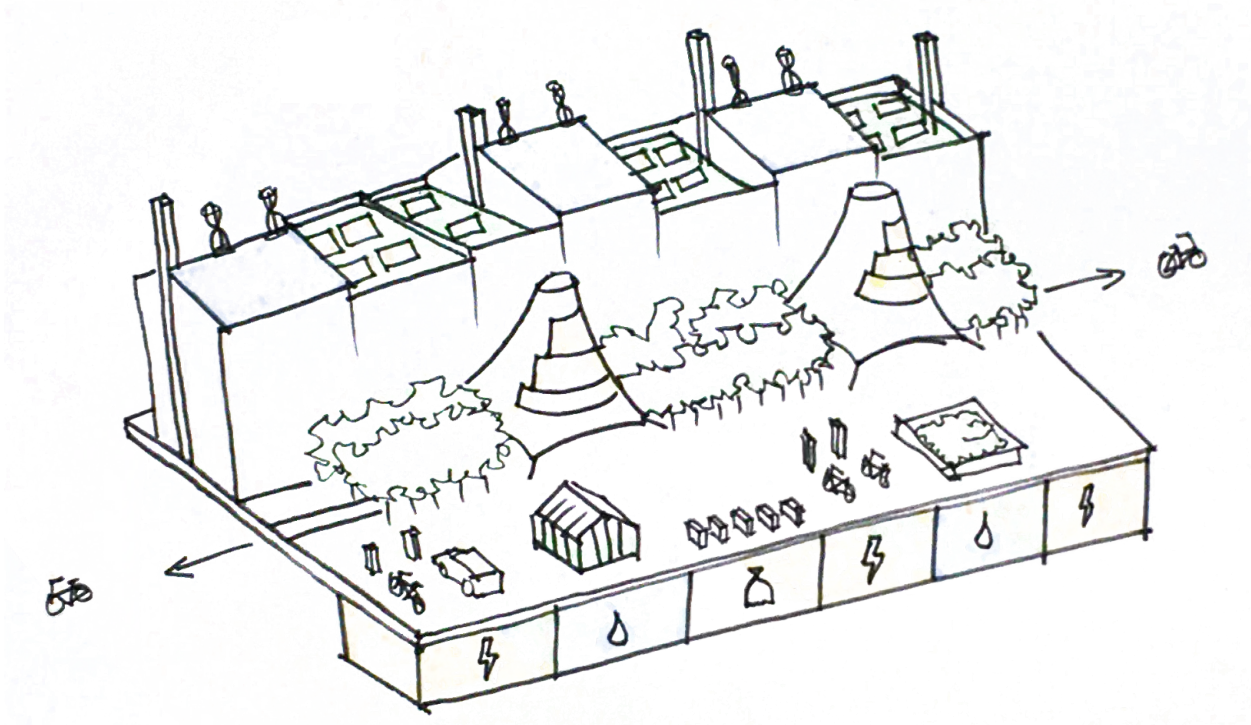


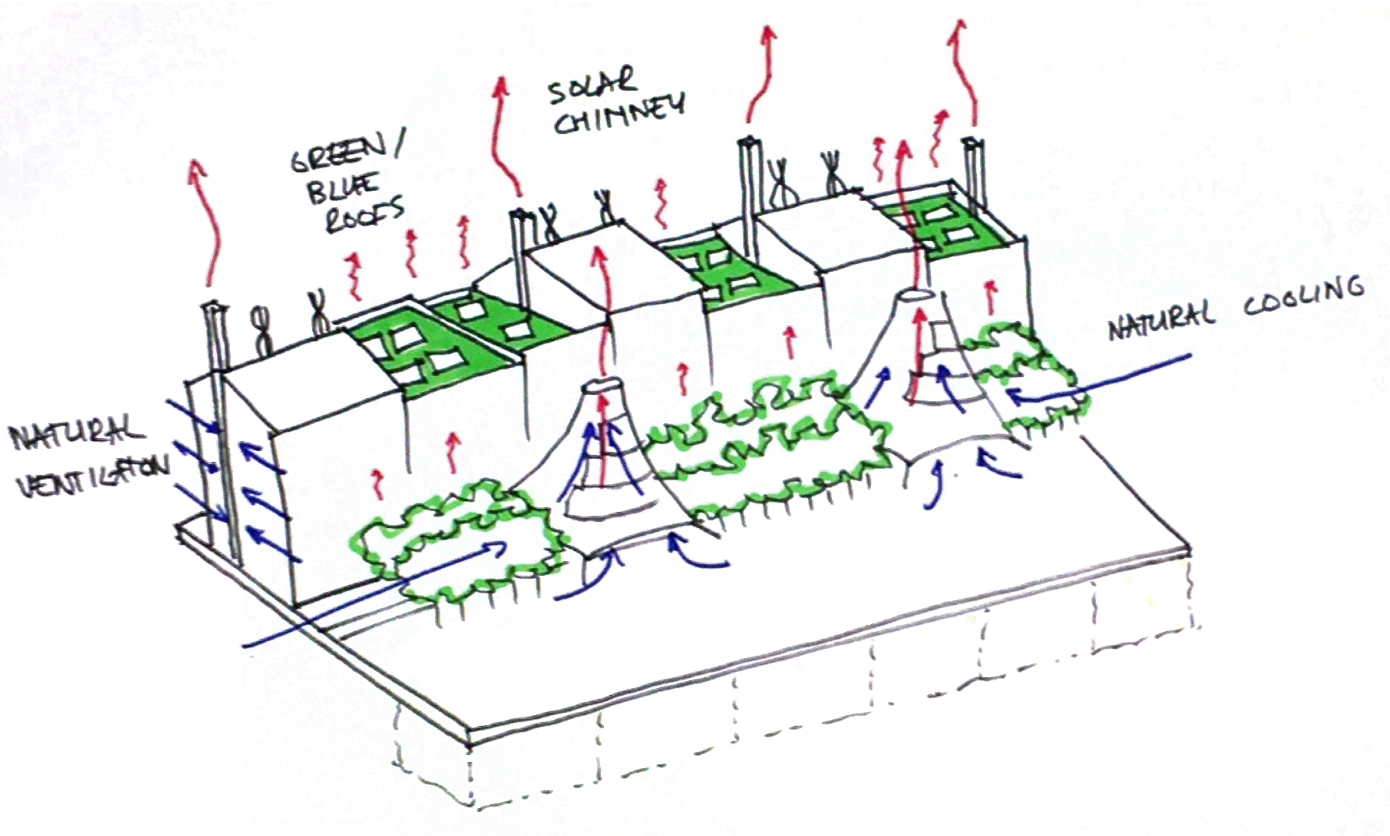


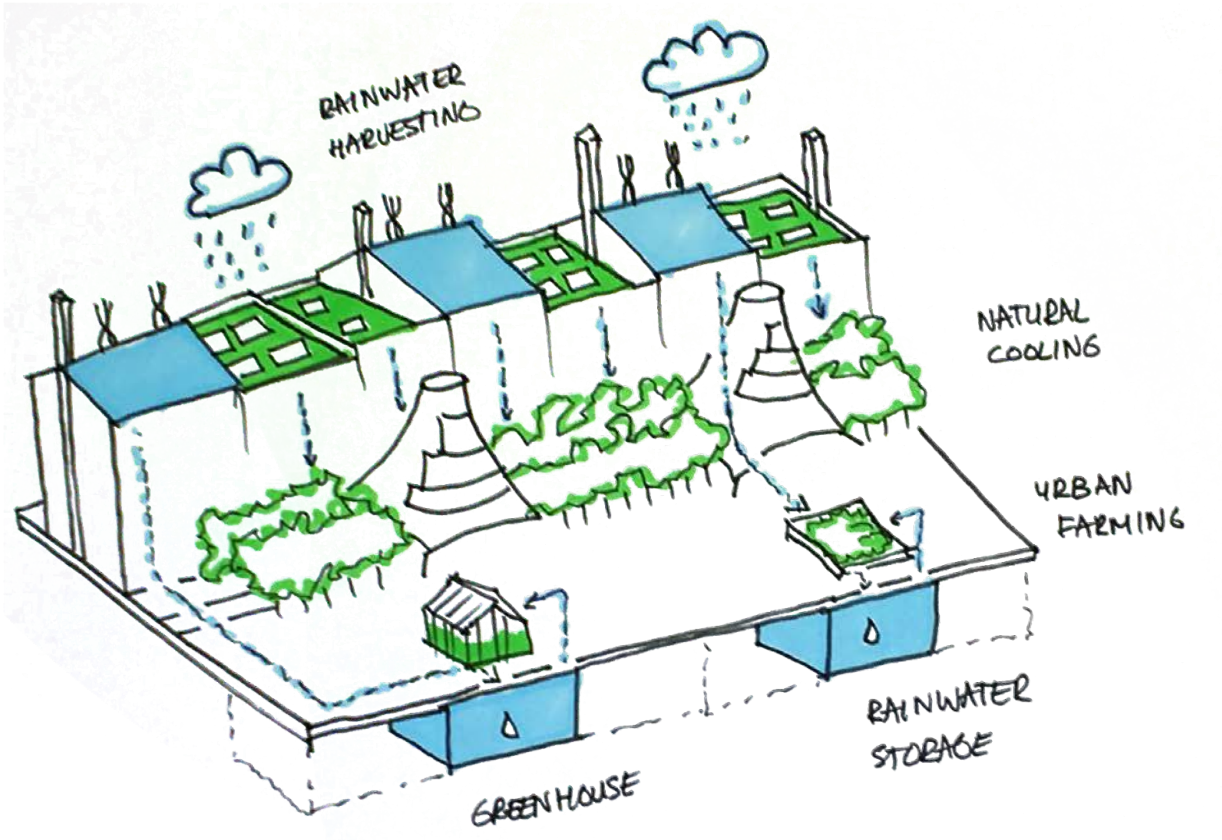
- **Connection to low temperature heat-cold grid with seasonal storage (boreholes)**
  - Reduction of heating demand: 35%
  - Reduction of cooling demand: 90%

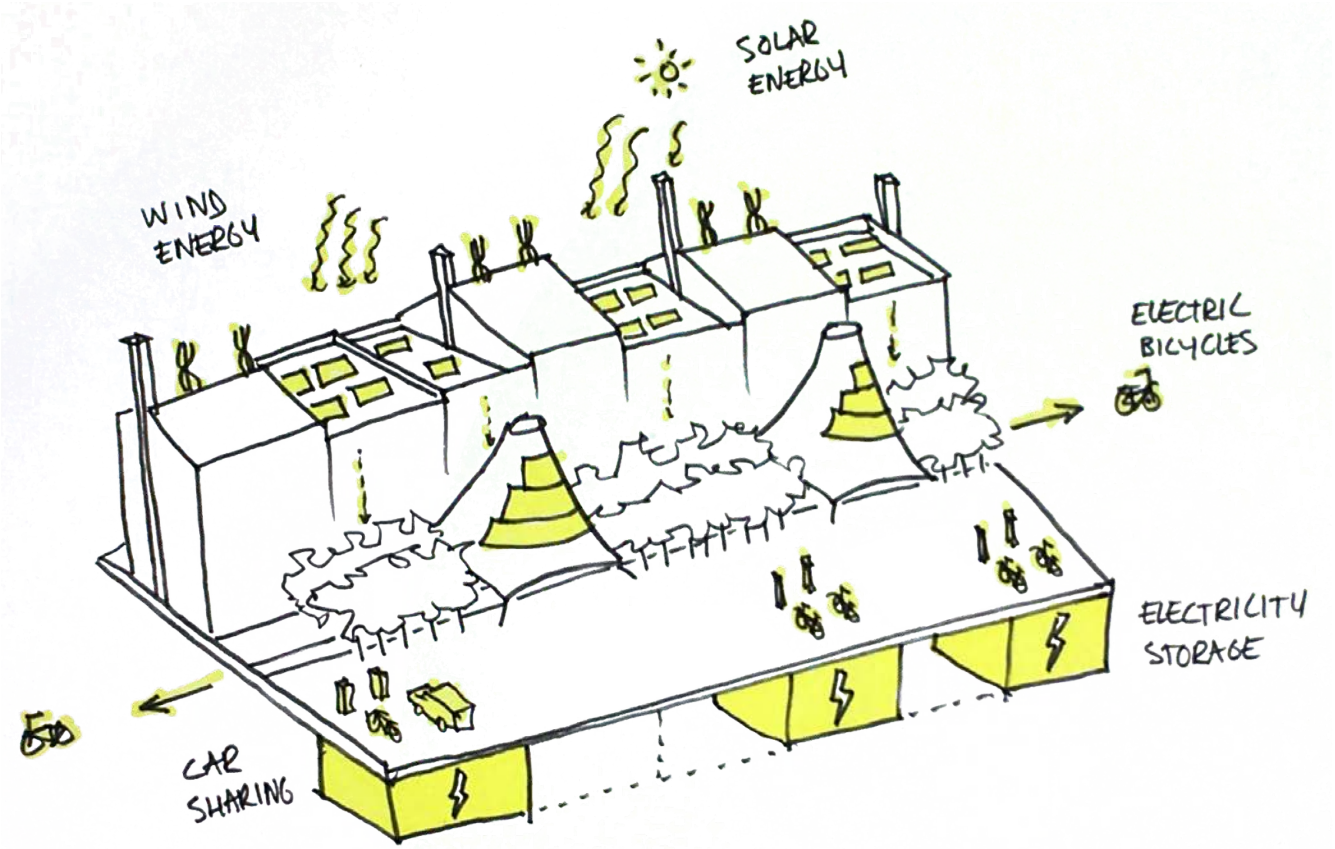
- **Total reduction energy consumption neighbourhood**
  - 70%

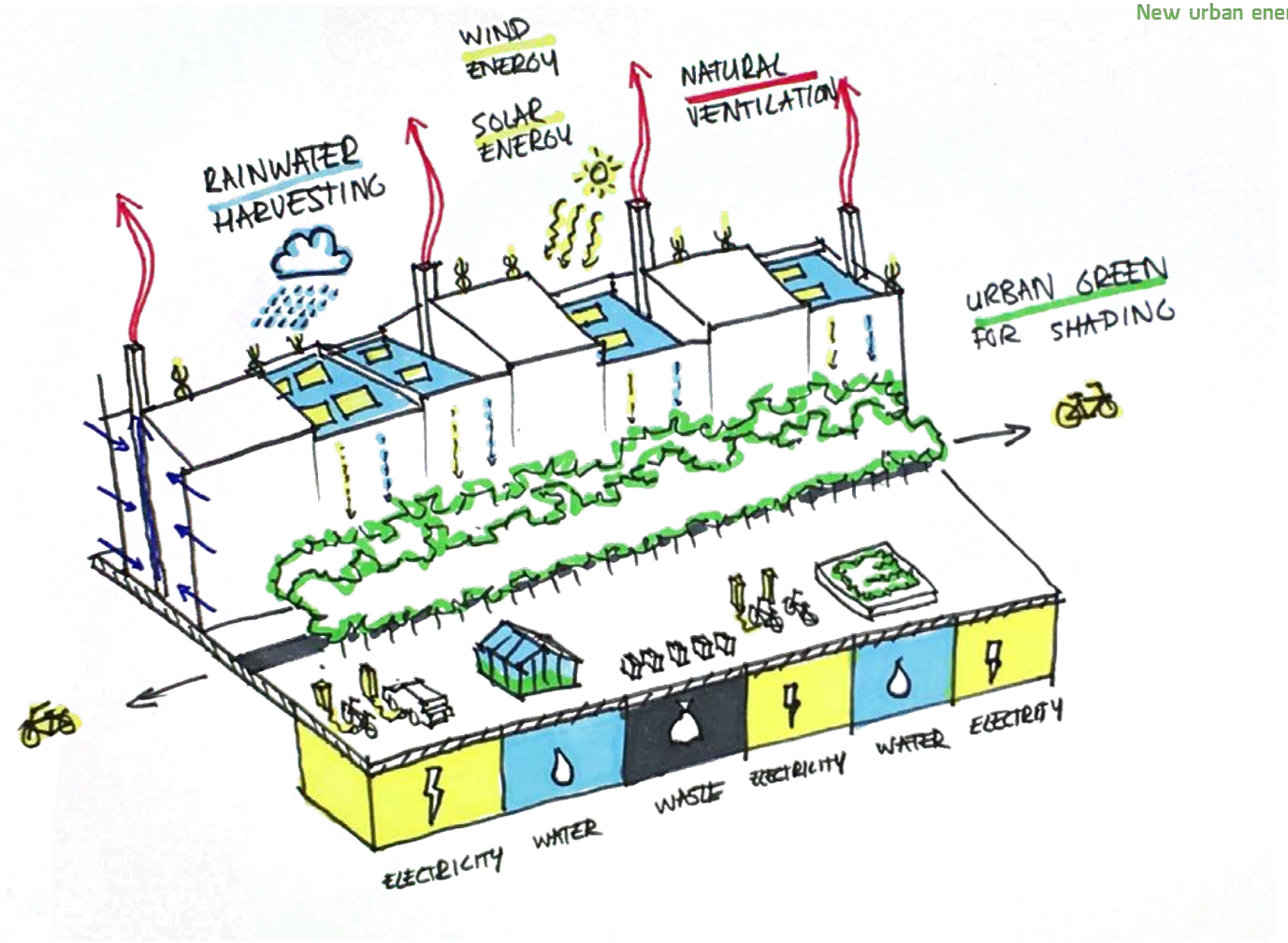

WIND ENERGY
RAINWATER HARVESTING
SOLAR ENERGY
MODULAR PLUG & PLAY SYSTEM
ELECTRICITY
RAINWATER
WASTE




SOLAR CHIMNEY
GREEN / BLUE ROOFS
NATURAL COOLING
NATURAL VENTILATION

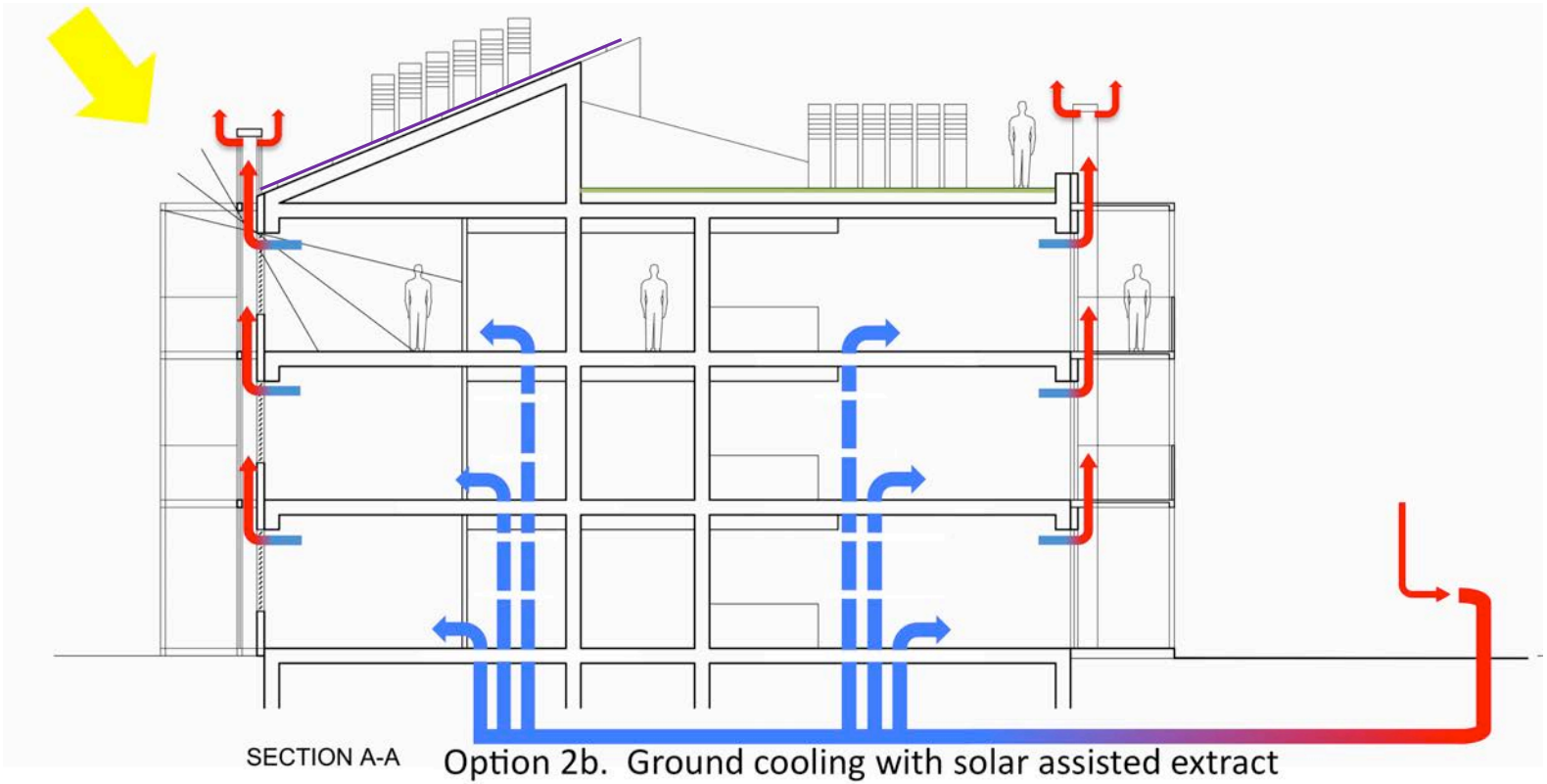

RAINWATER HARVESTING
NATURAL COOLING
URBAN FARMING
RAINWATER STORAGE
GREENHOUSE


SOLAR ENERGY
WIND ENERGY
ELECTRIC BICYCLES
ELECTRICITY STORAGE
CAR SHARING


WIND ENERGY
SOLAR ENERGY
NATURAL VENTILATION
RAINWATER HARVESTING
URBAN GREEN FOR SHADING
ELECTRICITY
WATER
WASTE
ELECTRICITY
WATER
ELECTRICITY

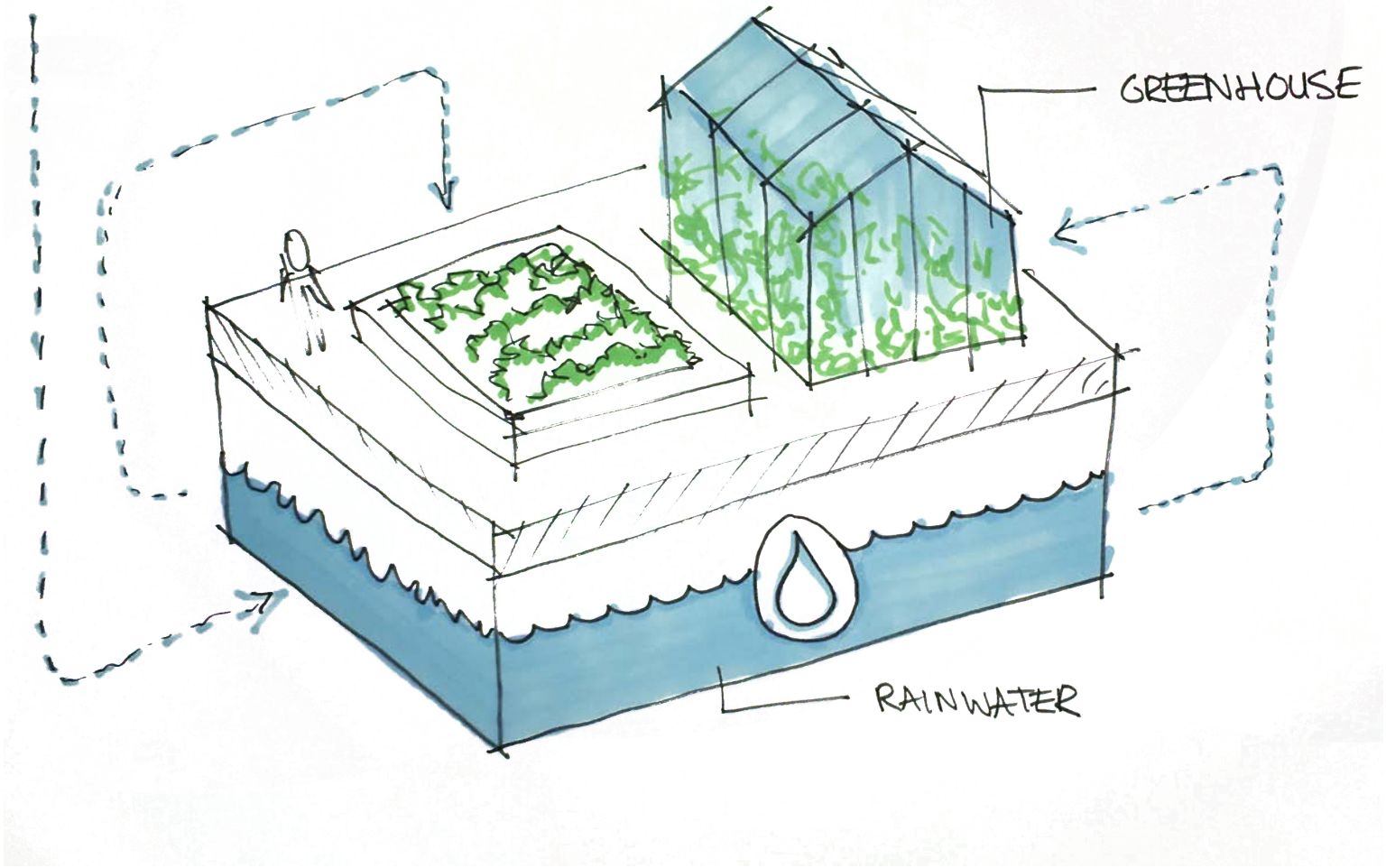
CITY-zen
New urban energy

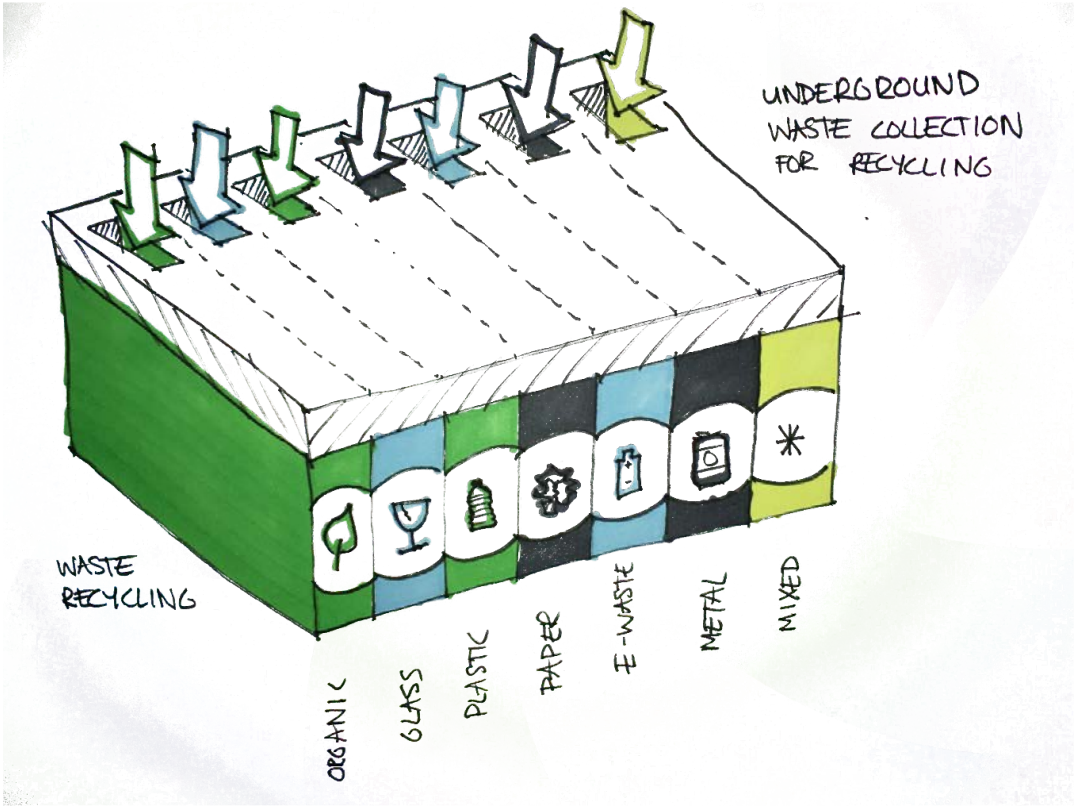
Passive cooling strategy for apartment blocks using ground cooling and solar chimneys

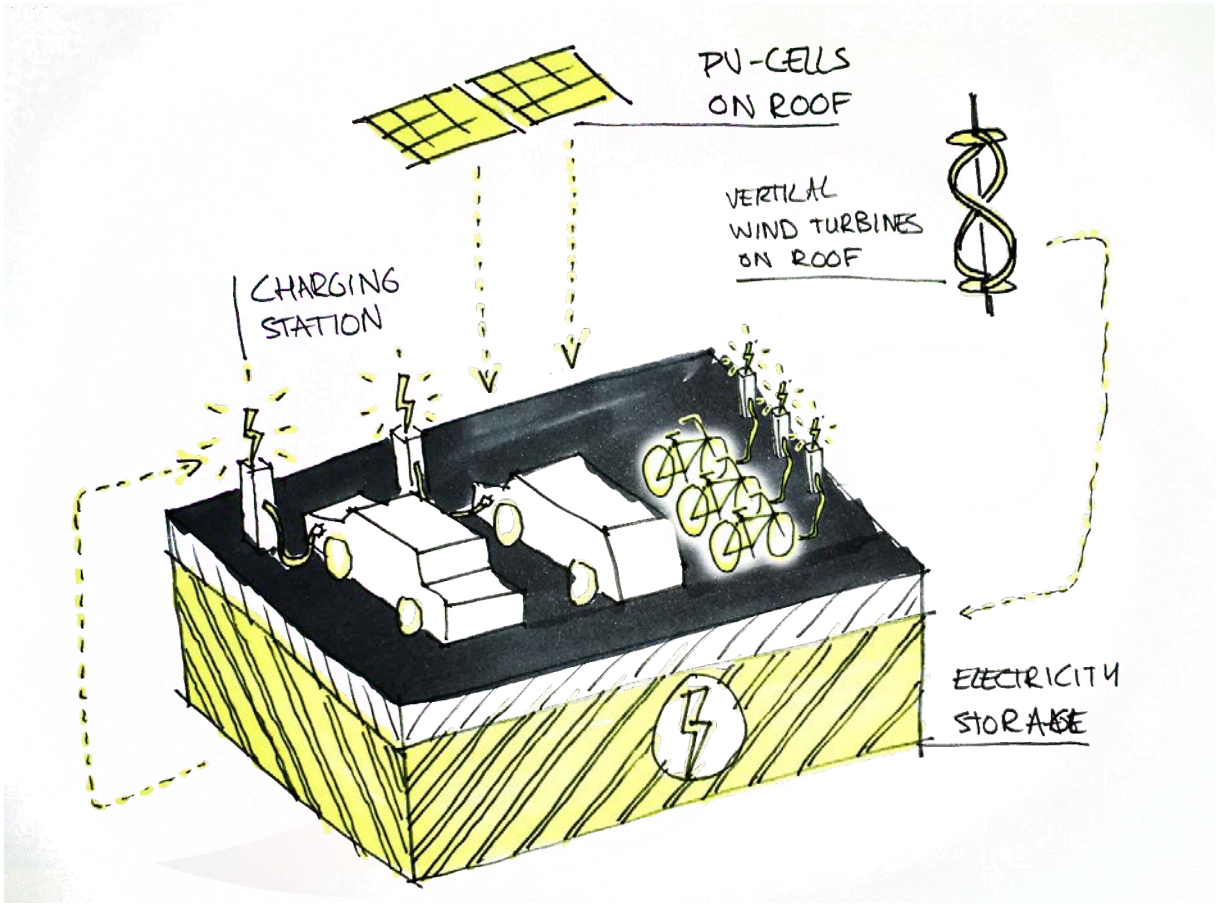


CITY-zen
New urban energy

RAINWATER HARVESTING ROOF




UNDERGROUND
WASTE COLLECTION
FOR RECYCLING
WASTE
RECYCLING
ORGANIC
GLASS
PLASTIC
PAPER
E-WASTE
METAL
MIXED


PV-CELLS
ON ROOF
VERTICAL
WIND TURBINES
ON ROOF
CHARGING
STATION
ELECTRICITY
STORAGE

Electric mobility

Not all vehicles are equal

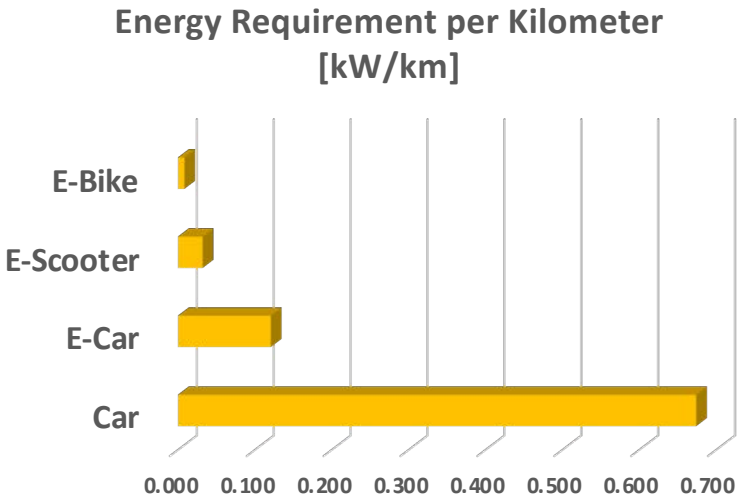
Issues & Solutions

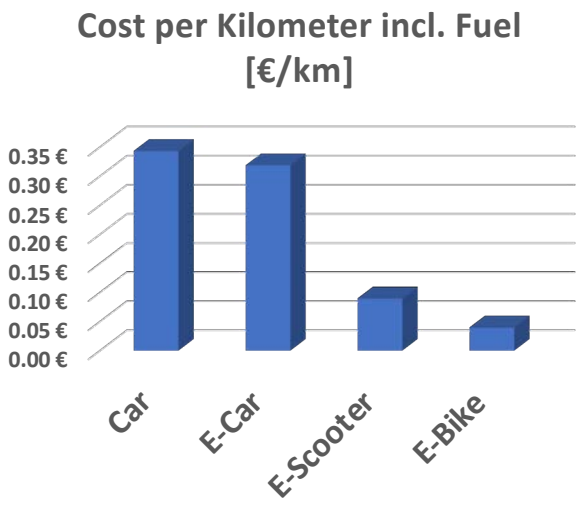
Cars are used for short distances

Use E-Bikes / E-Scooters

High EV Investment cost

Use Leasing (incl. fuel)

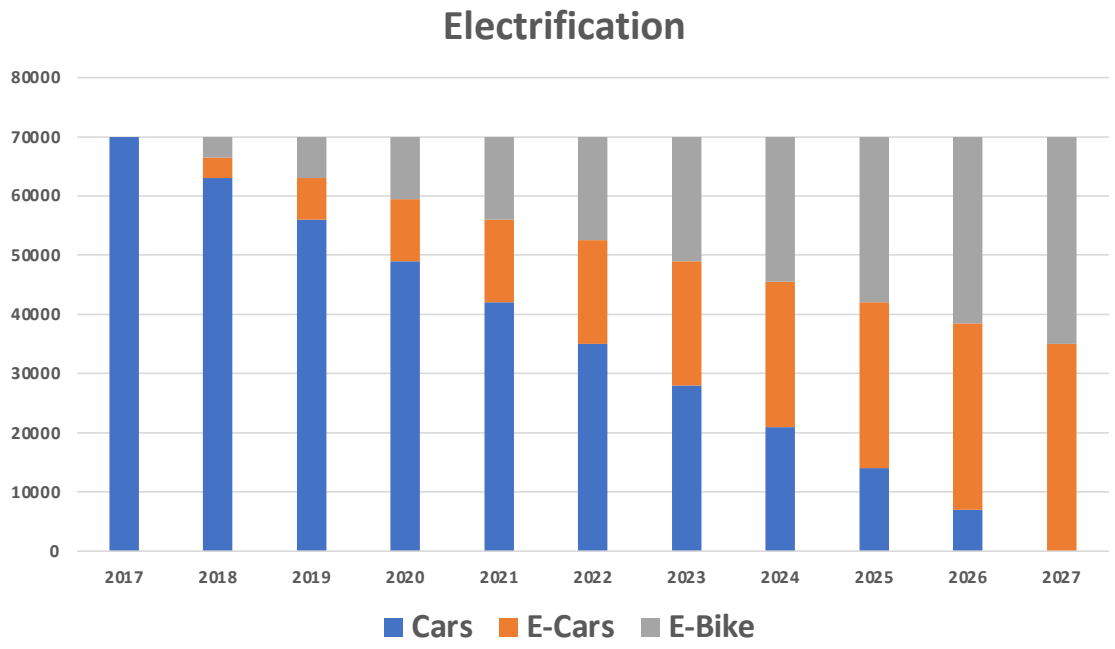




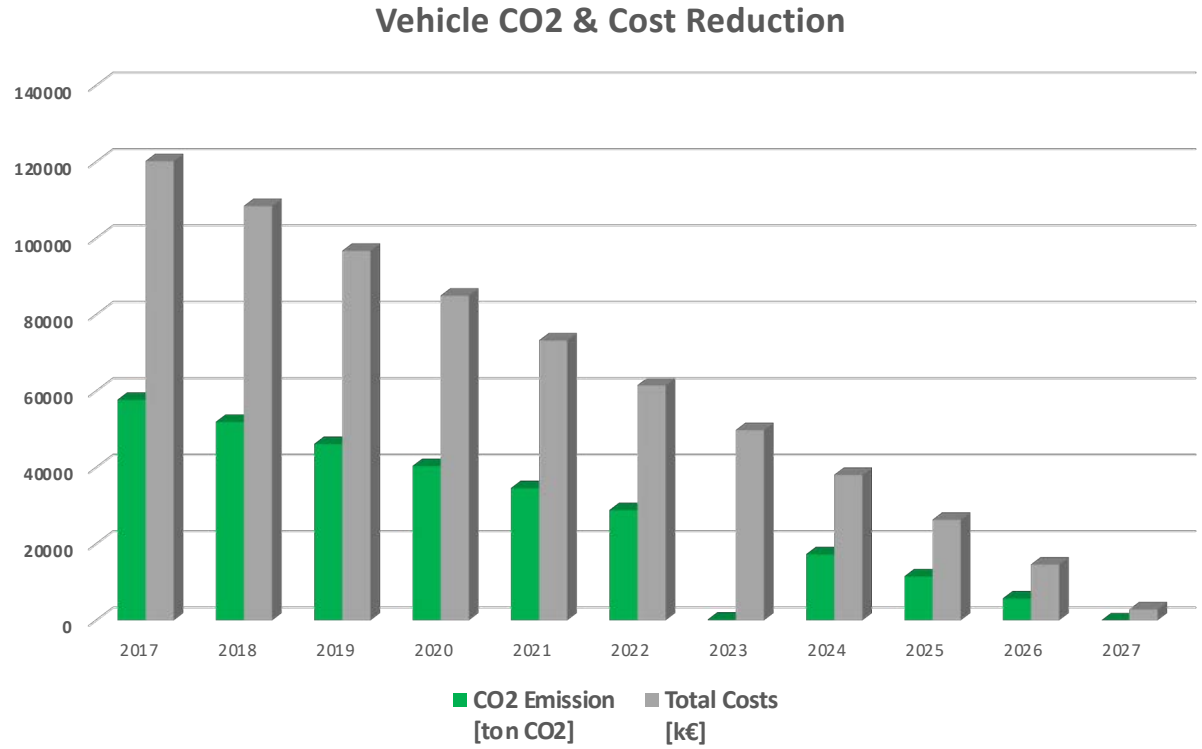
Electric mobility

Every year: replace 10% of cars by electric vehicles

50% E-Bikes & 50% E-Cars



Electric Mobility



Cost of Renewable energy

Residential PV Installation (< 10kWp) : 1,012 € / kWh
= Revenue for local installers

Industrial PV Installation (> 10kWp) : 0,812 € / kWh

E-Cars (leased): 0,32 € / km

E-Bikes (leased): 0,04 € / km

Wind turbines

Large scale 1,230 € /kWh

Conclusions

Shared vision for the island

Holistic
Ambitious
Confident

Be pro-active

Begin today
Have a **development plan** for the city re urban design

Local focus.

Use the expertise you have
Invest in local businesses

No more Fossil fuel investment

Spend monies on energy conservation
Develop expertise in passive heating and cooling
Invest in renewables
Develop smart grids

If in doubt, cover roofs with Photovoltaics!!


Zero energy Menorca
CITY-zen
New urban energy
Set yourselves up as living laboratory as soon as you can.
Make your own Roadmap
Start immediately
You can do it!!

ISLA

SOSTENIBLE
'MENORCA'
ROADSHOW

(24th – 28th Apr)

CITY-zen
New urban energy

Muchas gracias!

For more information please contact:
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Jesús Cardona (jcardona@nontropia.com) Menorca Roadshow Coordinator

SEVENTH FRAMEWORK PROGRAMME

Institut Menorquí d'Estudis

MENORCA
RESERVA DE BIOSFERA

MENORCA TALAIÒTI
Candidata Patrimoni Mundial
Única al món!

CONSELL INSULAR
DE MENORCA

DEM
directrius estratègiques de menorca

COL·LEGI OFICIAL
D'ARQUITECTES
ILLES BALEARS