VALENCIA SUMMER SCHOOL ON SYNERGIC URBAN INFRASTRUCTURES

ENERGY INFRASTRUCTURE TEAM

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CITY OF VALENCIA ENERGY SYSTEM

NATIONAL AND REGIONAL GOVERNMENTS

ORGANISATIONS

STAKEHOLDERS

MEDIA

CITIZENS

ACTORS

CHALLENGES
- -Lack of emphasis on energy issues
- -Shortage of more actors
- -No hierarchy of applications
- -Regulatory and policy challenges

GOALS
- -Design and manage energy transitions
- -Collaboration of Private+public entities.
- -Education+social awareness
- -Monitoring and decision making process
- -Energy justice

TOOLS
- -Social networks+Media
- -Society collaboration
- -Education
- -Governments
- -Policies

CITY OF VALENCIA

PRODUCTION

- NATURAL GAS
- DIESEL
- PETROL
- RENEWABLES

CHALLENGES
- -High fossil energy
- -Lack of real-time data
- -Low renewable energy

GOALS
- -Be more transparent with the information
- -Increase production of renewable energies

TOOLS
- -Collaboration of private and public sectors
- -Regulations

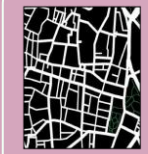
CONSUMPTION

SECTORS

- PRIVATE TRANSPORT 55.31%
- RESIDENTIAL 19.12%
- SERVICES 17.71%
- INDUSTRY 3.82%
- PUBLIC LIGHTING 0.94%
- PUBLIC TRANSPORT 3.1%

URBAN TYPOLOGIES

MEDIEVAL CITY



GRID CITY

OPEN BLOCK

ORGANIC

INCOMES

- LOW INCOME <7750€ 10%
- MIDDLE INCOME 7.750-20.000€ 20%
- MID-HIGH INCOME - 39.000€ 30%
- HIGH INCOME > 40.000€ 40%

CHALLENGES
- -Old buildings consume too much
- -Private transport consumes the highest

GOALS
- -Consume more clean energies
- -Reduce energy poverty

TOOLS
- -New construction policies
- -Restoration of buildings

EMISSION

59.45% 2.94% 3.12% 15.20%

13.83% 0.73%

CHALLENGES
- -Loss of energy
- -Transport has the highest
- -High percentage of emission

GOALS
- -Reduce greenhouse emissions
- -Reintroduce emissions into the city
- -Avoid heat island

TOOLS
- -Implement alternative ways of transport
- -Policies and regulations
- -Innovation

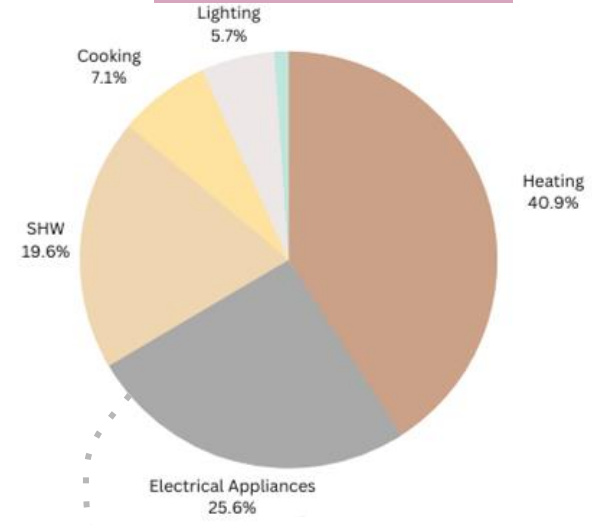
SELF-CONSUMPTION

CHALLENGES→ There is no self generation in valencia

GOAL→Circularity: increase internal production in cities

TOOLS→Laws, regulations and helping local initiatives

ENERGY CONSUMPTION BY USE AND DWELLING

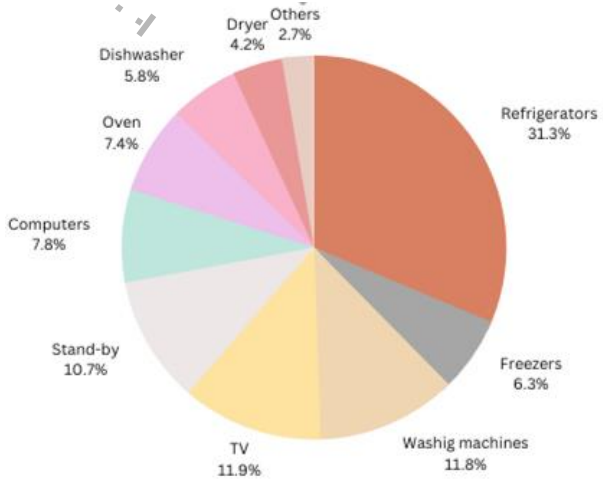


In Valencia, the consumption of energy is mainly dedicated to the **HEATING** of the buildings, followed by the usage of electrical appliances such as refrigerators.

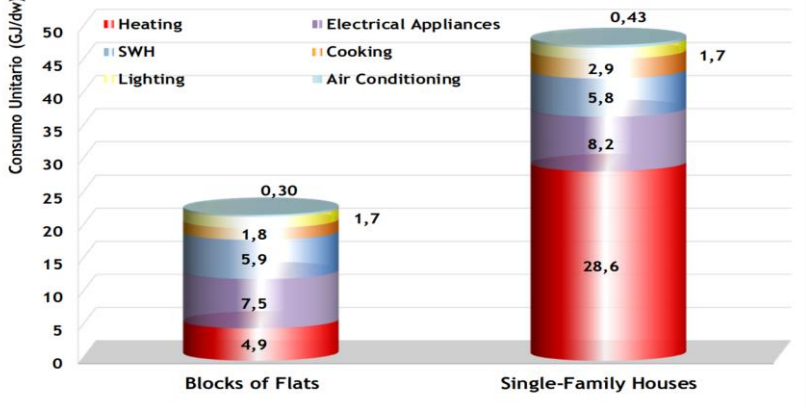
In terms of type of building, single family houses are consuming more than blocks of flats, mainly for heating purposes. Whereas blocks of flats destinate the energy to the use of electrical appliances.

	FINAL CONSUMPTION BY TYPE OF DWELLING		TOTAL SPAIN
	Blocks of Flats	Single-Family Houses	
FINAL USES	TJ	TJ	TJ
HEATING	105,874	182,065	287,939
SANITARY HOT WATER	85,328	30,533	115,861
COOKER	26,948	18,702	45,65
AIR COOLING	3,291	1,857	5,148
LIGHTING	17,300	8,066	25,366
ELECTRICAL APPLIANCES	89,982	43,488	133,47
Refrigerators	*28,261*	*12,573*	*40,834*
Freezers	*3,401*	*4,682*	*8,083*
Washing Machines	*11,023*	*4,789*	*15,812*
Dishwashers	*5,218*	*2,864*	*8,083*
Dryers	*2,721*	*1,748*	*4,469*
Oven	*7,593*	*3,428*	*11,022*
TV	*10,859*	*5,405*	*16,263*
Computers	*6,810*	*3,096*	*9,906*
Stand-by	*10,329*	*3,963*	*14,292*
Other Equipment	*3,767*	*940*	*4,707*
TOTAL CONSUMPTION	328,723	284,712	613,435

ENERGY CONSUMPTION BY USE

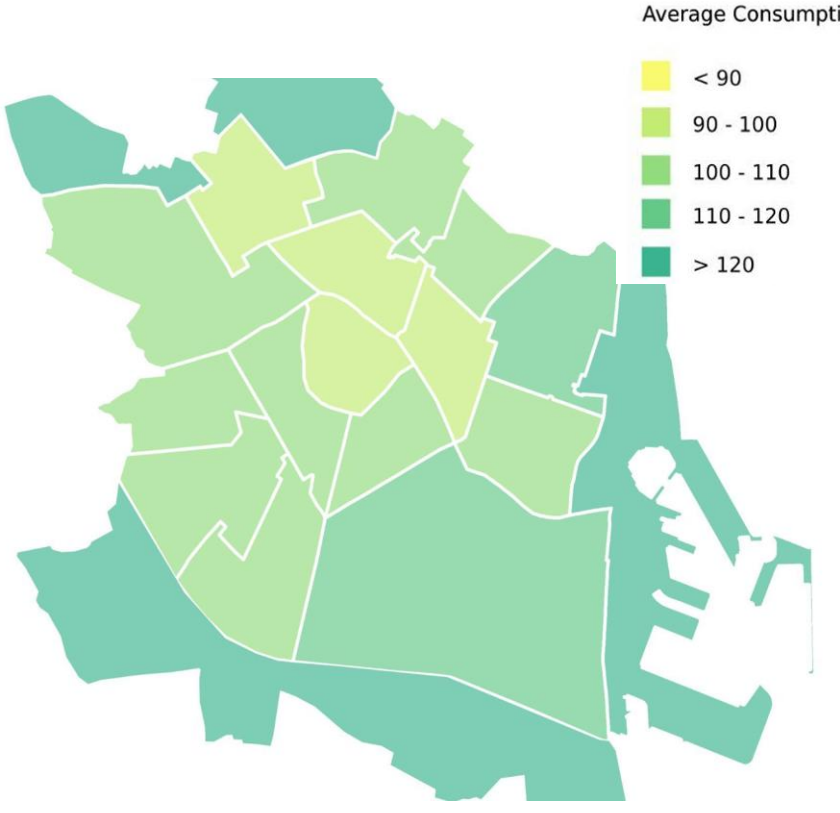


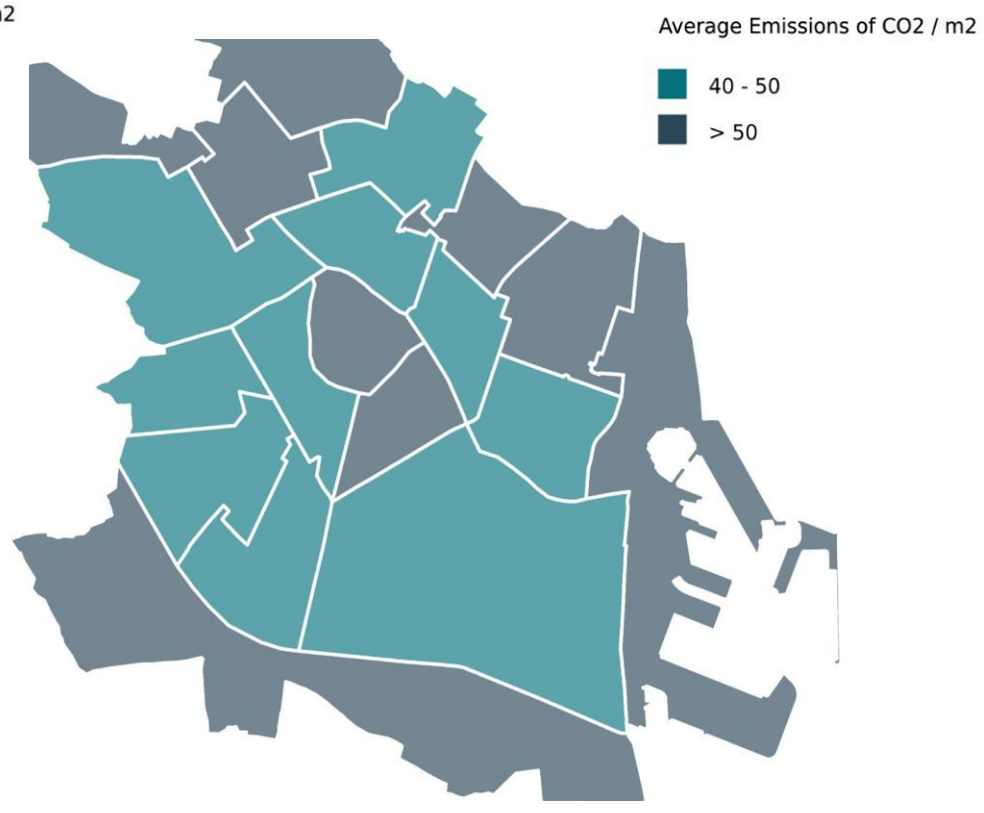
ENERGY CONSUMPTION BY TYPE OF DWELLINGS



ENERGY CONSUMPTION AND EMISSIONS - VALENCIA PER DISTRICT

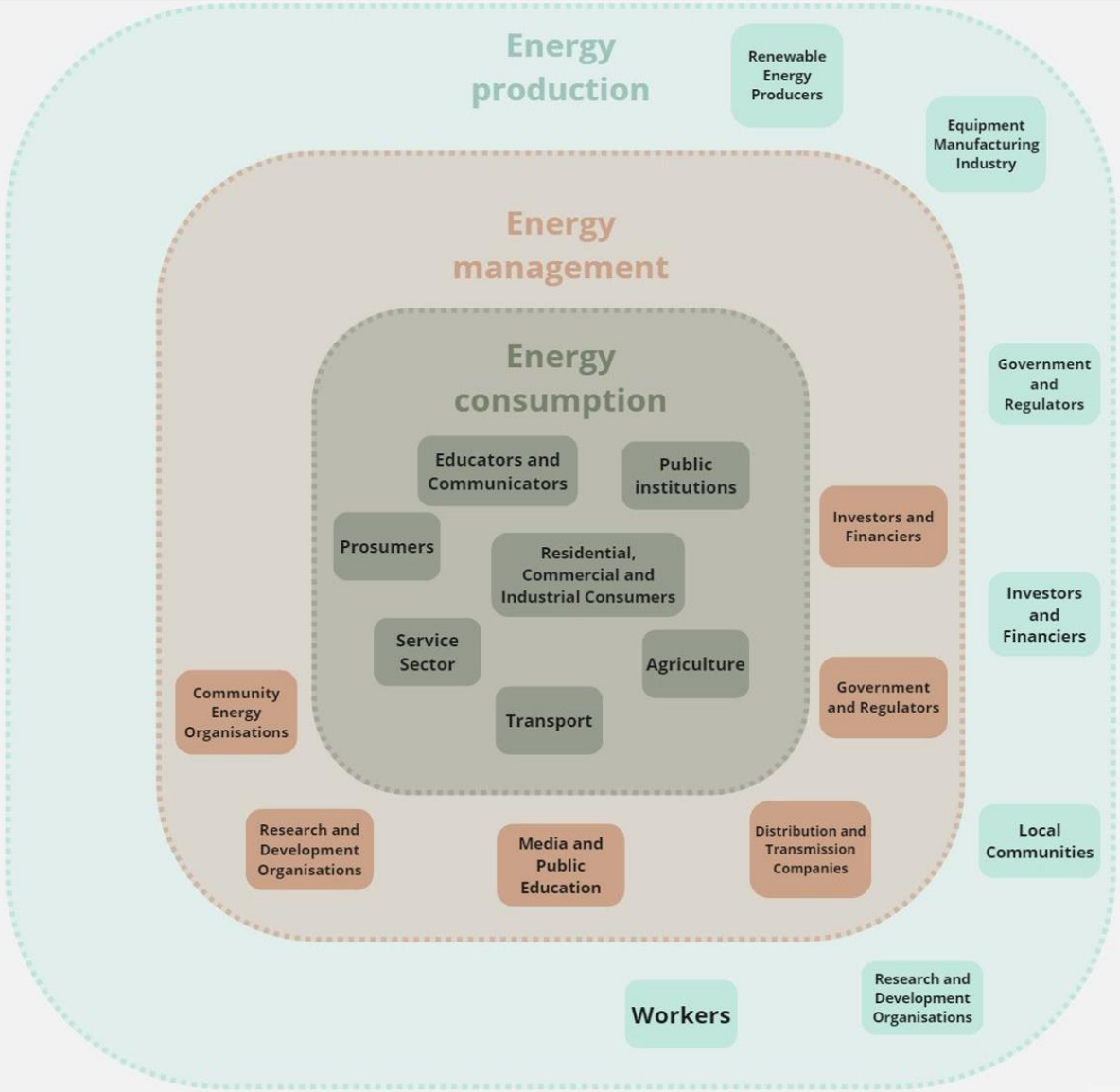
In Valencia, buildings with narrow, elongated plots and low-rise structures (1-3 floors), commonly found in *village districts*, exhibit elevated rates of consumption and CO2 emissions, attributed to their *"energy-inefficient structure ¨* and the year they were built in.



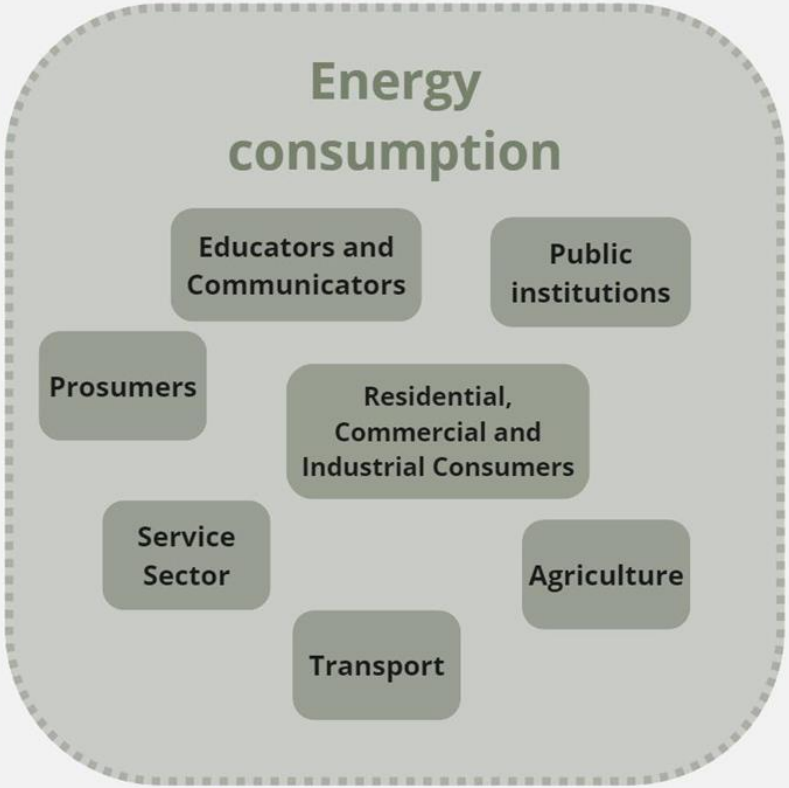


SOURCE: OWN BASED ON CARTO MAP

ACTORS


Energy production
Renewable Energy Producers
Equipment Manufacturing Industry
Energy management
Energy consumption
Educators and Communicators
Public institutions
Prosumers
Residential, Commercial and Industrial Consumers
Service Sector
Agriculture
Transport
Government and Regulators
Investors and Financiers
Investors and Financiers
Government and Regulators
Community Energy Organisations
Research and Development Organisations
Media and Public Education
Distribution and Transmission Companies
Local Communities
Workers
Research and Development Organisations

ACTORS



Prosumers:

Is a relatively new term that, in the energy field, most often denotes consumers who both produce and consume electricity. They 'self-consume' some of the electricity they produce, and sell the excess to the grid. But when their production falls short, they also buy power from the grid, which makes them both producers and consumers.

Examples:

residential prosumers – citizens who produce electricity on their property, mainly by installing solar PV panels on their rooftops or through micro combined heat and power (micro-CHP)

community/cooperative energy – citizen-led renewable energy cooperatives ('Res Coops'), housing associations, foundations, charities, which are not commercial actors, but produce energy meant for self-consumption, mainly by solar PV panels and wind turbines

commercial prosumers – SMEs, department stores, office buildings, industry and other business entities whose main business activity is not electricity production, but which self-consume the electricity they produce, mainly with rooftop PV panels and CHP, leading to significant cost savings

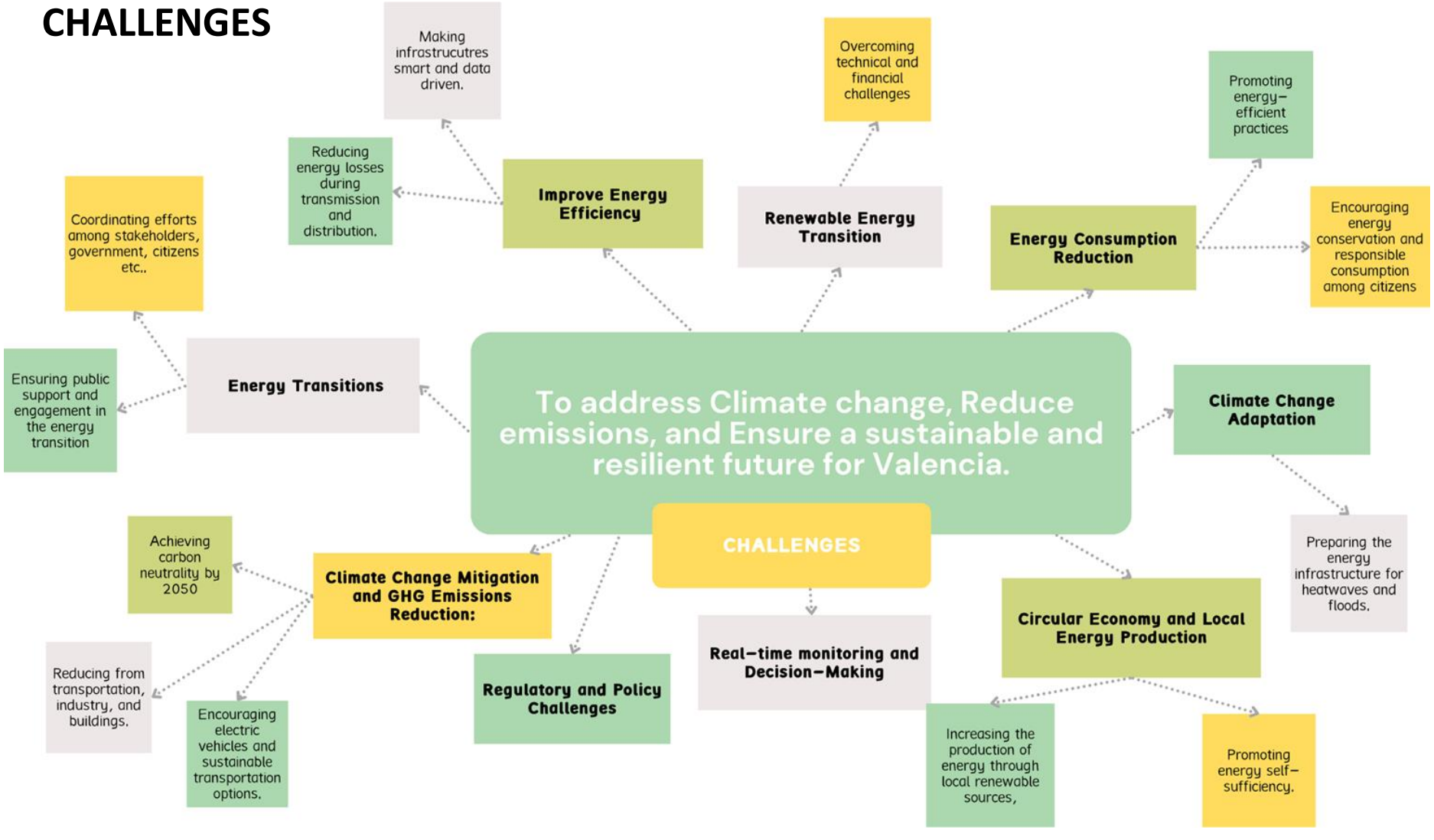
public prosumers – schools, hospitals and other public institutions that self- generate electricity.

Conclusion:

Production , management and consumption are linked and depend on each other for a successful energy transition. Clean energy production needs proper management to efficiently distribute the energy generated, and efficient management requires responsible consumption to avoid wasting resources.

Interconnecting these elements creates a synergy that can accelerate the adoption of renewable energy, improve system resilience and benefit both the environment and the economy. In short, the collaboration and commitment of all actors, from producers to consumers, is essential to achieve an energy transition that benefits present and future generations.

CHALLENGES


To address Climate change, Reduce emissions, and Ensure a sustainable and resilient future for Valencia.
CHALLENGES
Improve Energy Efficiency
Making infrastrucutres smart and data driven.
Reducing energy losses during transmission and distribution.
Renewable Energy Transition
Overcoming technical and financial challenges
Energy Consumption Reduction
Promoting energy-efficient practices
Encouraging energy conservation and responsible consumption among citizens
Energy Transitions
Coordinating efforts among stakeholders, government, citizens etc..
Ensuring public support and engagement in the energy transition
Climate Change Adaptation
Preparing the energy infrastructure for heatwaves and floods.
Climate Change Mitigation and GHG Emissions Reduction:
Achieving carbon neutrality by 2050
Reducing from transportation, industry, and buildings.
Encouraging electric vehicles and sustainable transportation options.
Regulatory and Policy Challenges
Real-time monitoring and Decision-Making
Circular Economy and Local Energy Production
Increasing the production of energy through local renewable sources,
Promoting energy self-sufficiency.

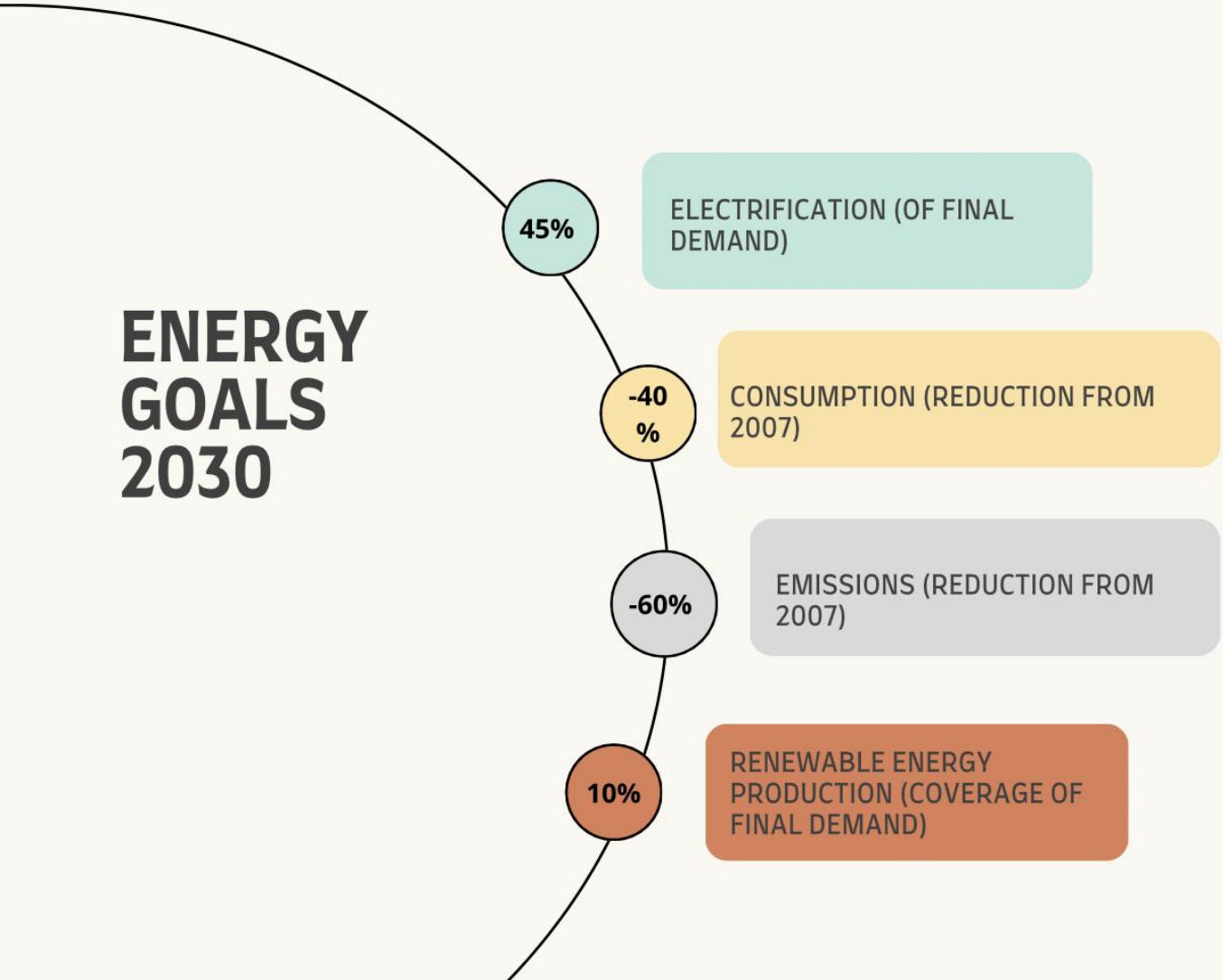
ENERGY STRATEGIC OBJECTIVES – VALENCIA

ENERGY STRATEGIC OBJECTIVES 2030

- INCREASE PRODUCTION OF RENEWABLE ENERGY
- CHANGE ENERGY CULTURE: SELF-CONSUMPTION, RESPONSIBLE ENERGY CONSUMPTION AND ENERGY EFFICIENTCY IN BUILDINGS
- ENSHRINE THE RIGHT TO ENERGY AS A FUNDAMENTAL RIGHT
- ACCELERATE THE DECARBONISATION OF MOBILITY

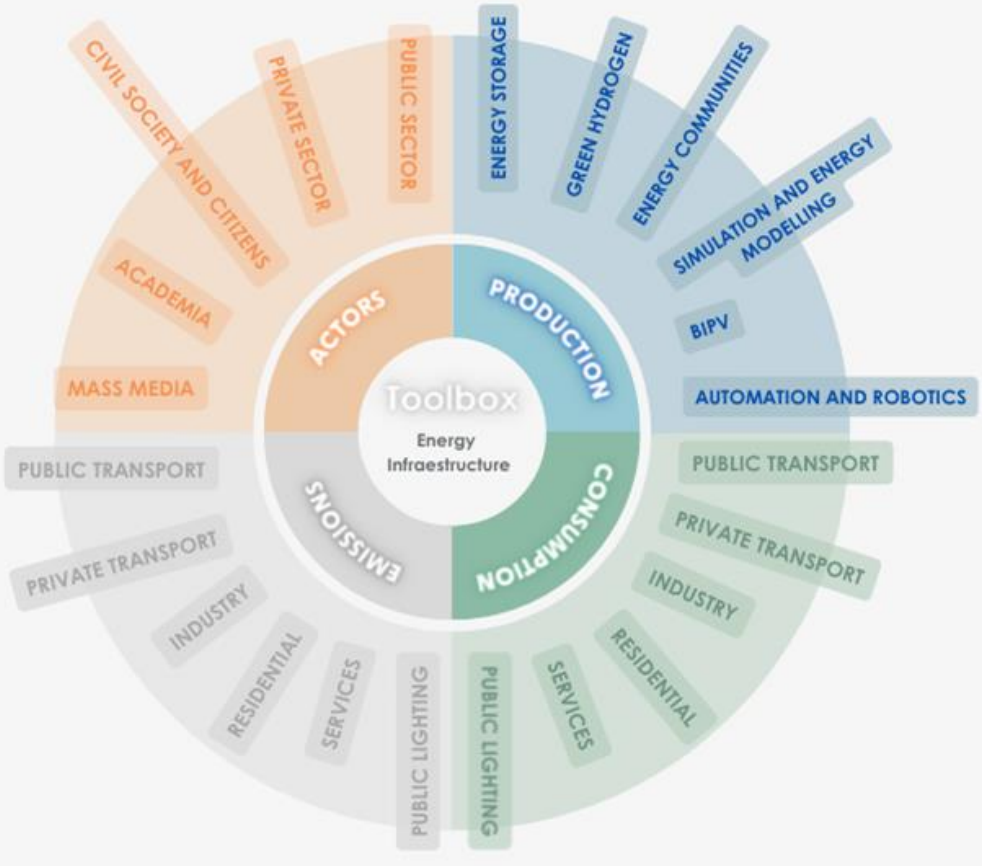
Source: València City Council

ENERGY GOALS – VALENCIA

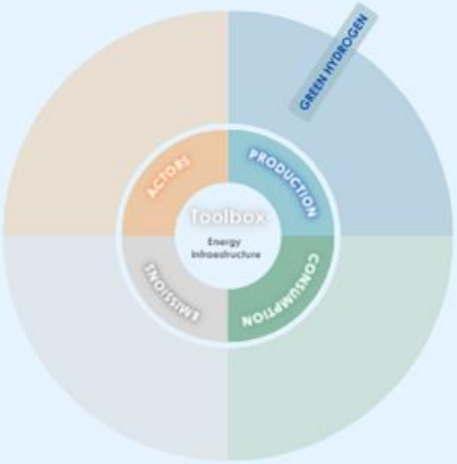


Source: València City Council

TOOLBOX


Toolbox
Energy
Infraestructure
ACTORS
PRODUCTION
EMISSIONS
CONSUMPTION
CIVIL SOCIETY AND CITIZENS
PRIVATE SECTOR
PUBLIC SECTOR
ACADEMIA
MASS MEDIA
ENERGY STORAGE
GREEN HYDROGEN
ENERGY COMMUNITIES
SIMULATION AND ENERGY MODELLING
BIPV
AUTOMATION AND ROBOTICS
PUBLIC TRANSPORT
PRIVATE TRANSPORT
INDUSTRY
RESIDENTIAL
SERVICES
PUBLIC LIGHTING
PUBLIC TRANSPORT
PRIVATE TRANSPORT
INDUSTRY
RESIDENTIAL
SERVICES
PUBLIC LIGHTING

TOOLBOX PRODUCTION TOOLS

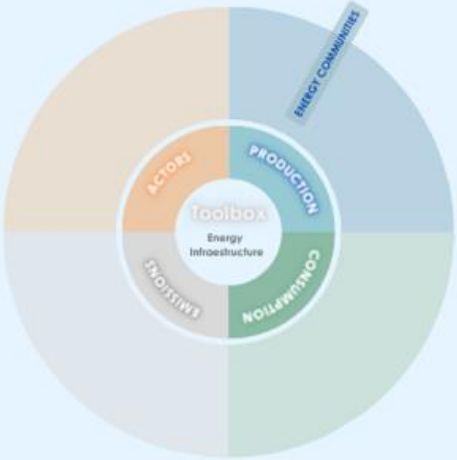


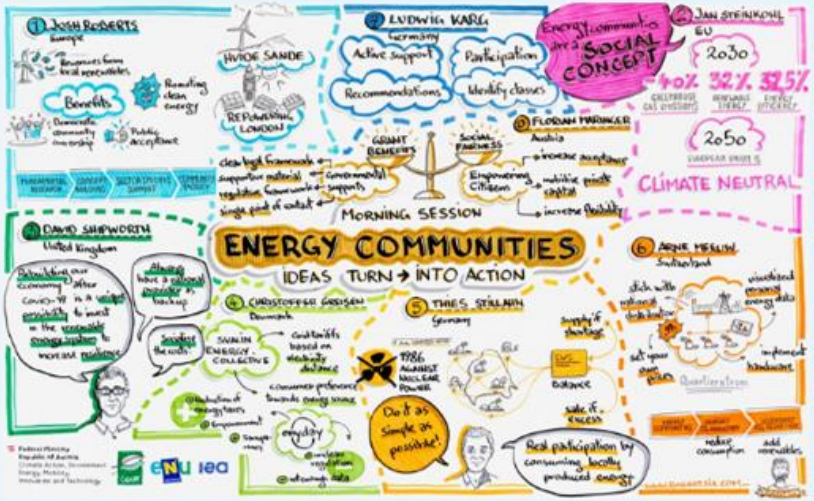
Hydrogen is the most abundant chemical element in nature. The global demand for hydrogen for use as a fuel has tripled since 1975 and reached 70 million tonnes a year in 2018. In addition, green hydrogen is a clean energy source that only emits water vapour and leaves no residue in the air, unlike coal and oil.

Hydrogen has a long-standing relationship with industry. This gas has been used to fuel cars, airships and spaceships since the beginning of the 19th century. The decarbonisation of the world economy, a process that cannot be postponed, will give hydrogen more prominence. In addition, if its production costs fall by 50 % by 2030, as predicted by the World Hydrogen Council, we will undoubtedly be looking at one of the fuels of the future.

Europe's largest green hydrogen plant for the production of zero emissions
The Puertollano plant (Ciudad Real, Spain)

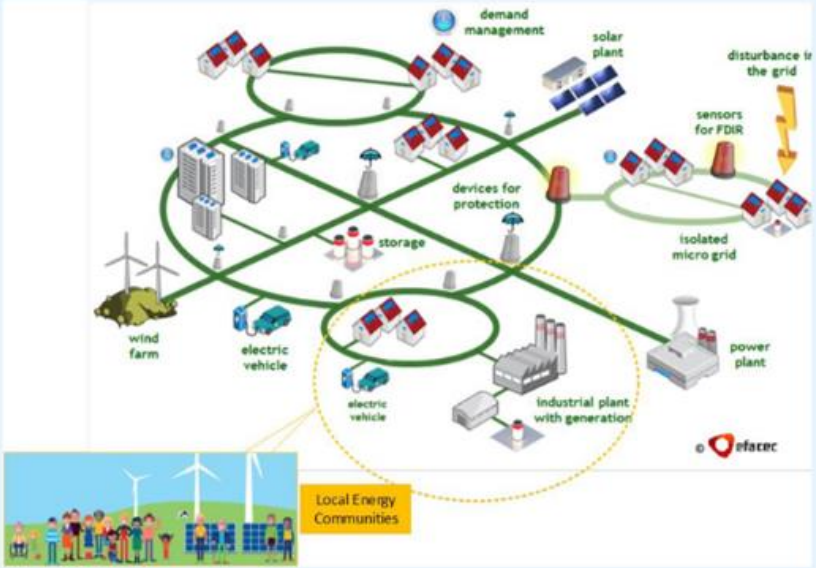
TOOLBOX PRODUCTION TOOLS



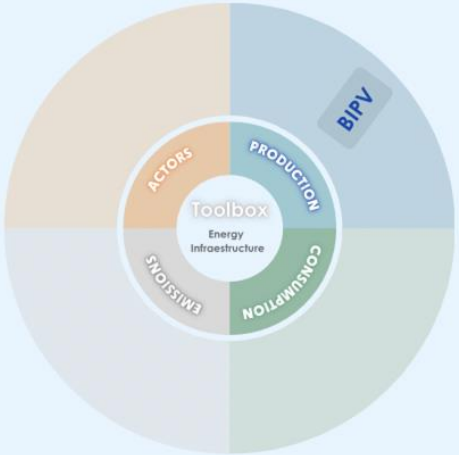


An energy community is a group of individuals, organisations or companies that work together to generate, consume and manage energy in a local and sustainable way. These communities seek to reduce their dependence on conventional energy sources and encourage the production and use of renewable energy, such as solar, wind or hydropower, in their area.

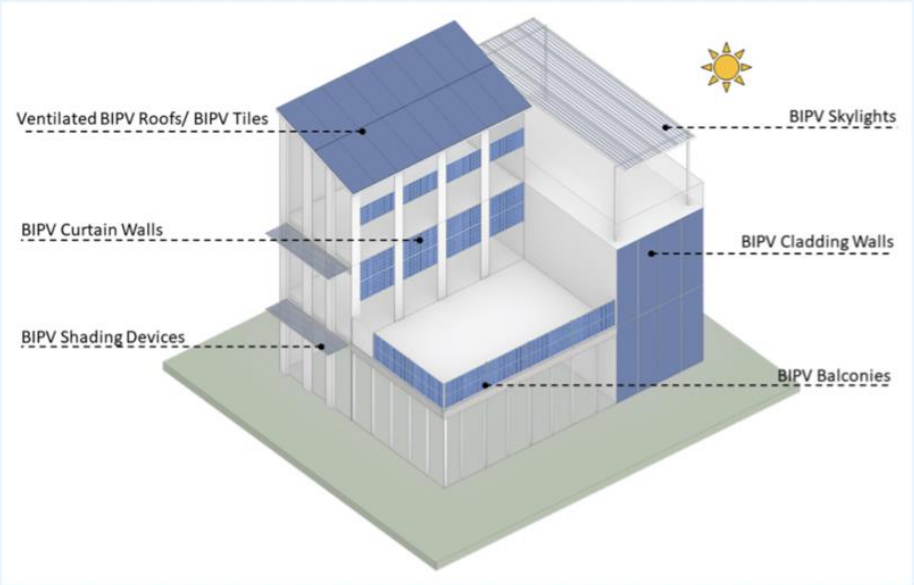
In an energy community, participants can share energy resources, such as solar panels or energy storage systems, and collaborate in the production and distribution of electricity. This can result in economic, environmental and social benefits, including reduced energy costs, lower carbon emissions and improved energy resilience.



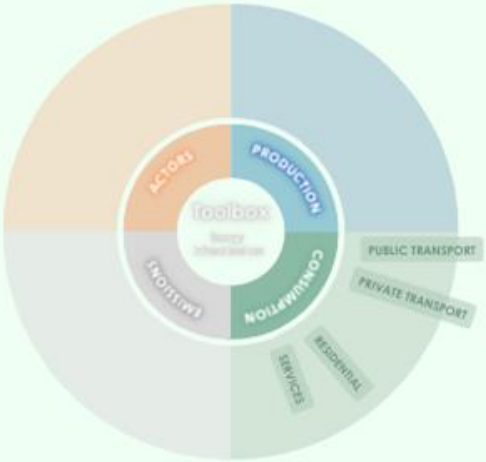
TOOLBOX PRODUCTION TOOLS

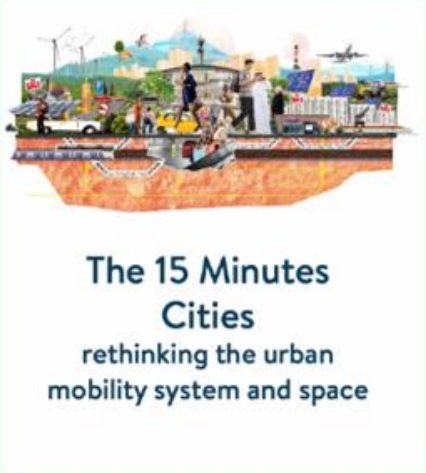


The energy transition implies a democratisation and decentralisation of energy generation and storage.
Renewable energy generation also becomes visible in the city, which requires their careful design.
Energy producing roofs and facades (BIPV), integrates solar energy production in buildings, using the space in an efficient, aesthetic way, and enhacing consumers energy independency



TOOLBOX CONSUMPTION TOOLS

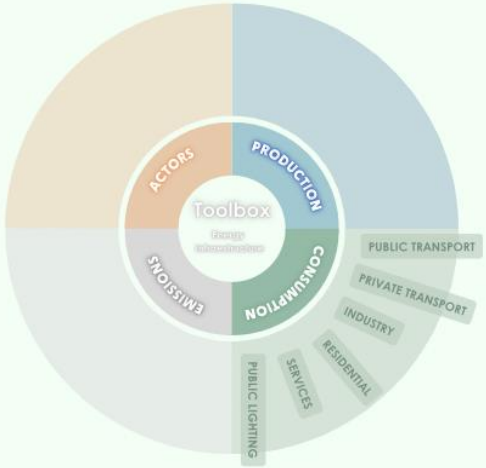




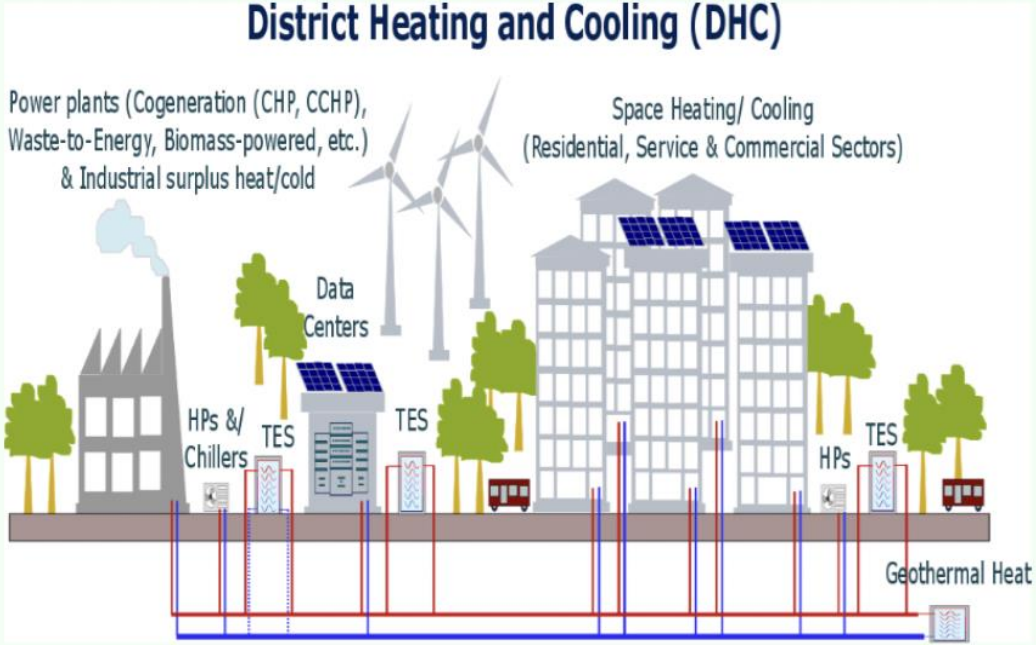
"15-minute cities"

An urban vision that promotes the creation of communities where most daily needs, such as housing, work, shopping and entertainment, are within walking or cycling distance in approximately 15 minutes. This means reducing reliance on private vehicles and promoting sustainable mobility, proximity to services and a higher quality of life in urban areas. This approach seeks the creation of more compact, green and liveable cities, where urban planning focuses on the well-being of residents and the reduction of the ecological footprint.

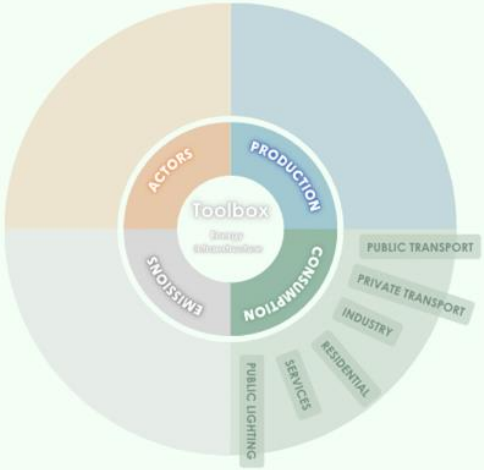
TOOLBOX CONSUMPTION TOOLS



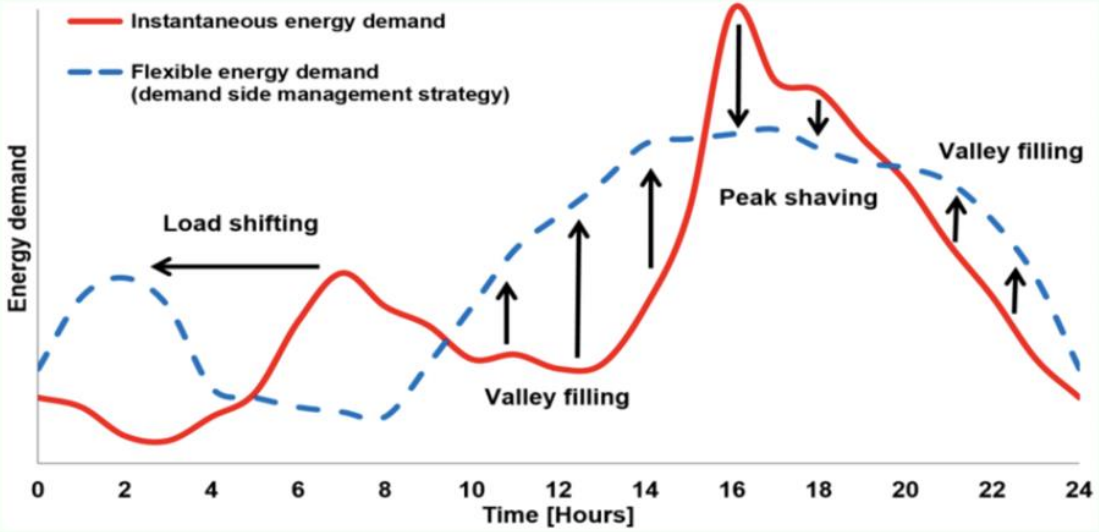
District heating and cooling (DHC)involves generating heat and cool in a centralized location and then distributing it to residences, businesses and industry in a local area.
DHC offers great potential for efficient, cost-effective and flexible large-scale use of low-carbon energy for heating and cooling in cities.



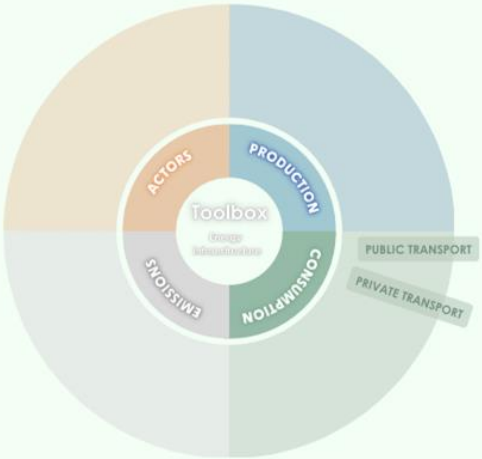
TOOLBOX CONSUMPTION TOOLS



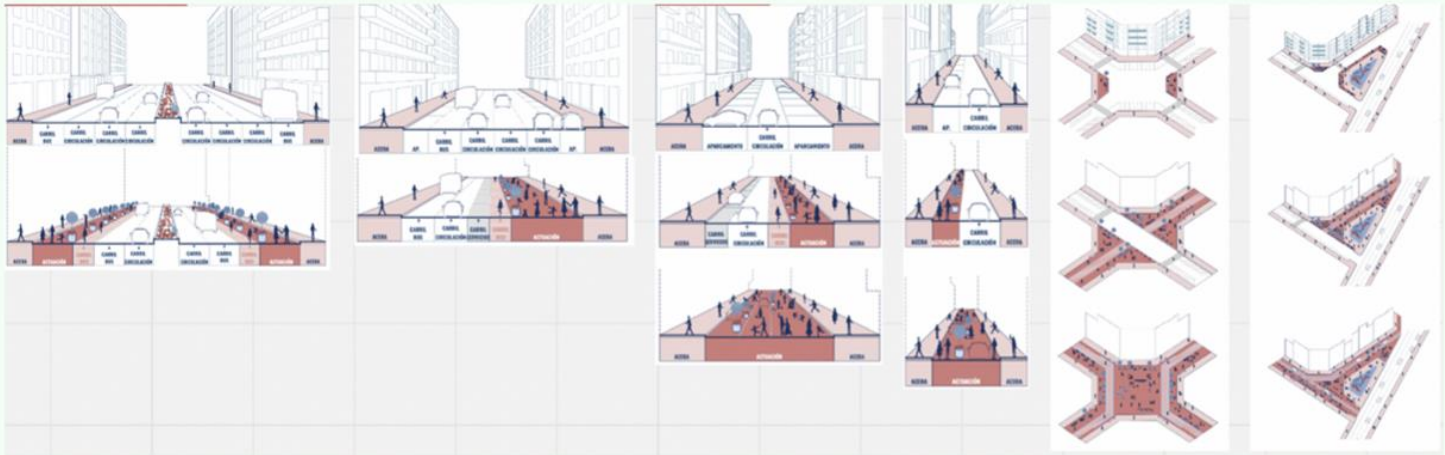
In a high-density urban environment where land is scarce, renewable energy technologies, such as solar photovoltaics, compete with other important urban functions. In order to create a sustainable and liveable urban environment, it is therefore crucial to utilise space most efficiently for the deployment of solar energy.
Demand-Side Management allows a better fit between energy availability and demand, so less solar panels and batteries are needed to meet energy requirements.
In this way, consumers can modify the pattern of their energy use by means of load shifting, peak shaving and valley filling (see in the Figure) to better fit with the climate conditions dependent renewable energies production.



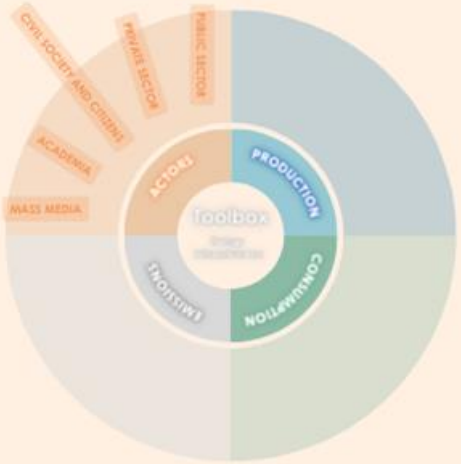
TOOLBOX CONSUMPTION TOOLS



Since transport gets the most of the energy consumption and energy-related emissions, a shift in urban mobility needs to be adressed for achieving energy independency and climate neutrality in cities.
One way to do this is through enhacing pedestrian and biking mobility, both in new urban planning and urban rehabilitation.
Urban design plays a key role in this mobility strategy, determining, as you can see in the figure, the relation between mobility, energy consumption, and neighbourhood livability in the different street tipologies



TOOLBOX ACTORS TOOLS



PUBLIC SECTOR

- Governments can establish policies and regulations that encourage the use of renewable energy, energy efficiency and carbon emission reductions. These policies can include tax incentives, renewable energy quotas, energy efficiency standards and environmental regulations.
- Collaboration between countries and regions is essential to address global issues such as climate change. Actors can engage in international agreements and partnerships to share knowledge and resources in the search for sustainable solutions.

PRIVATE SECTOR

- Private investors can finance clean energy projects, such as wind farms, solar installations and smart grids. Investment in clean technologies is essential for their development and adoption.

CIVIL SOCIETY AND CITIZENS

- Individual consumers can influence the energy transition by choosing products and services that are more sustainable and energy efficient, such as electric vehicles or energy-efficient appliances.
- Citizens can exert pressure on politicians and legislators to take concrete steps towards a sustainable energy transition, through voting, participation in advocacy groups and promotion of sustainable policies.

ACADEMIA

- Researchers can assess the environmental and social impact of energy projects, such as wind farms, solar plants and hydroelectric power plants. This helps to identify and mitigate potential negative effects and to design projects that are environmentally and socially sustainable.
- Academic institutions can provide education and training programmes in sustainable energy and clean technologies to train the next generation of professionals and leaders in the field.

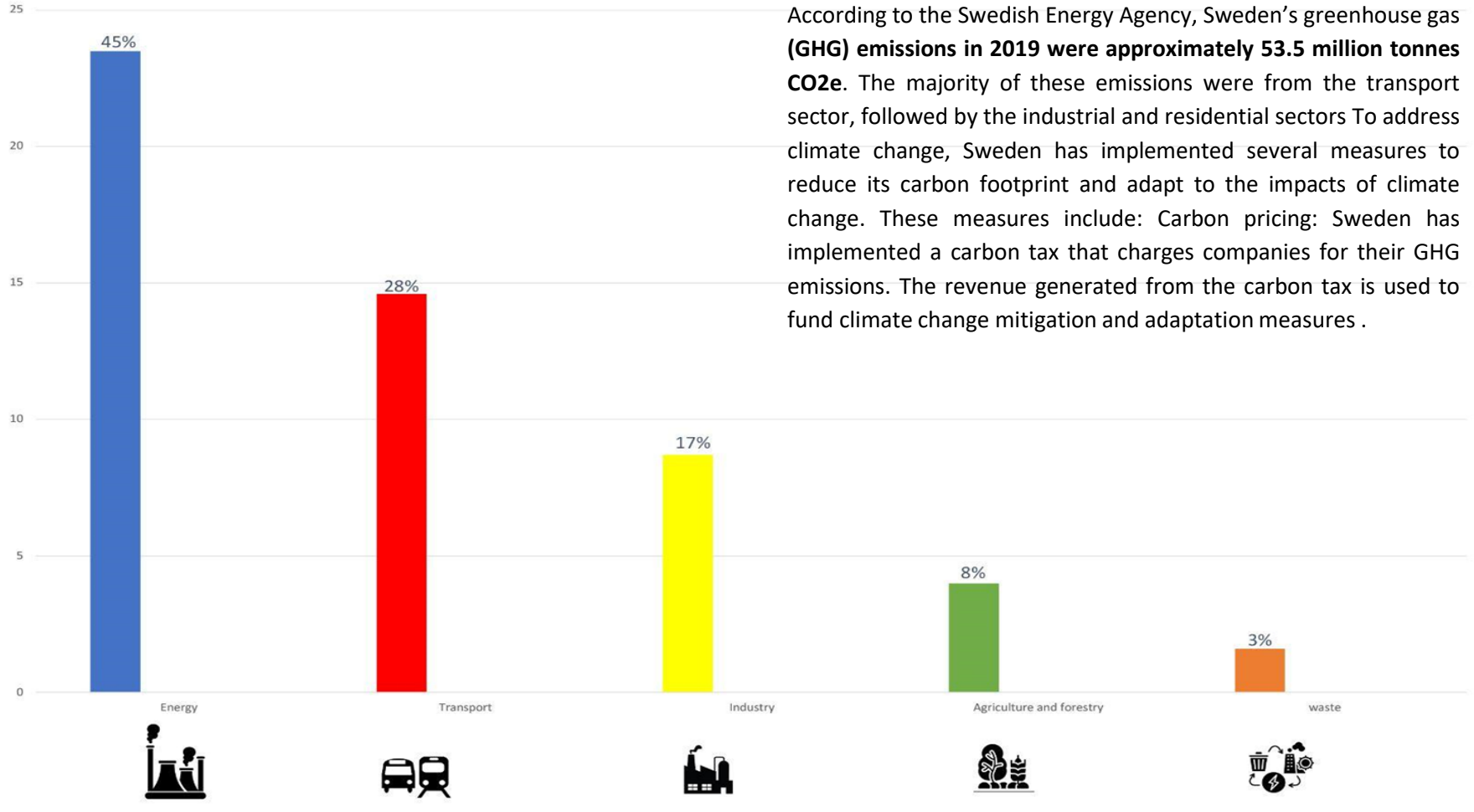
MASS MEDIA

- Quality journalism is essential to provide accurate, unbiased and comprehensive reporting on energy and environmental issues. The media can use this tool in a variety of ways.
- Education and Awareness, Research in Depth, Share success stories about clean energy projects, Encourage informed debate and expression of diverse views on energy and environmental issues...

BUILDING A RESILIENT AND ECO-FRIENDLY CITY

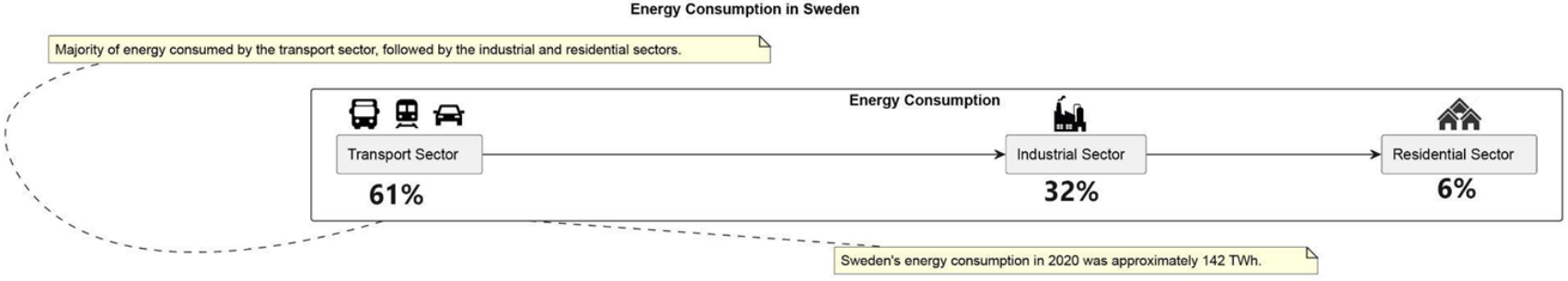
STOCKHOLM 2030: A SUSTAINABLE FUTURE

EMISSION TOOLS



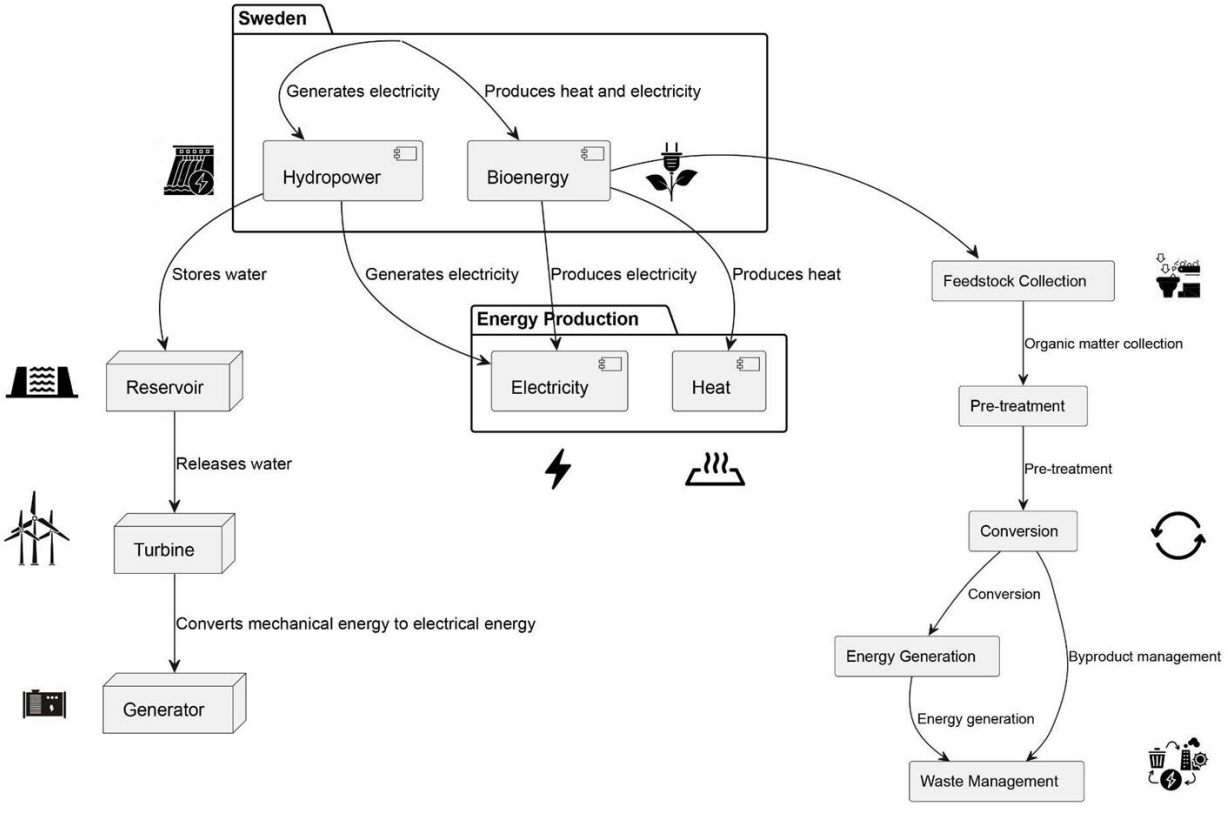
According to the Swedish Energy Agency, Sweden's greenhouse gas **(GHG) emissions in 2019 were approximately 53.5 million tonnes CO2e**. The majority of these emissions were from the transport sector, followed by the industrial and residential sectors To address climate change, Sweden has implemented several measures to reduce its carbon footprint and adapt to the impacts of climate change. These measures include: Carbon pricing: Sweden has implemented a carbon tax that charges companies for their GHG emissions. The revenue generated from the carbon tax is used to fund climate change mitigation and adaptation measures .

CONSUMPTION TOOLS



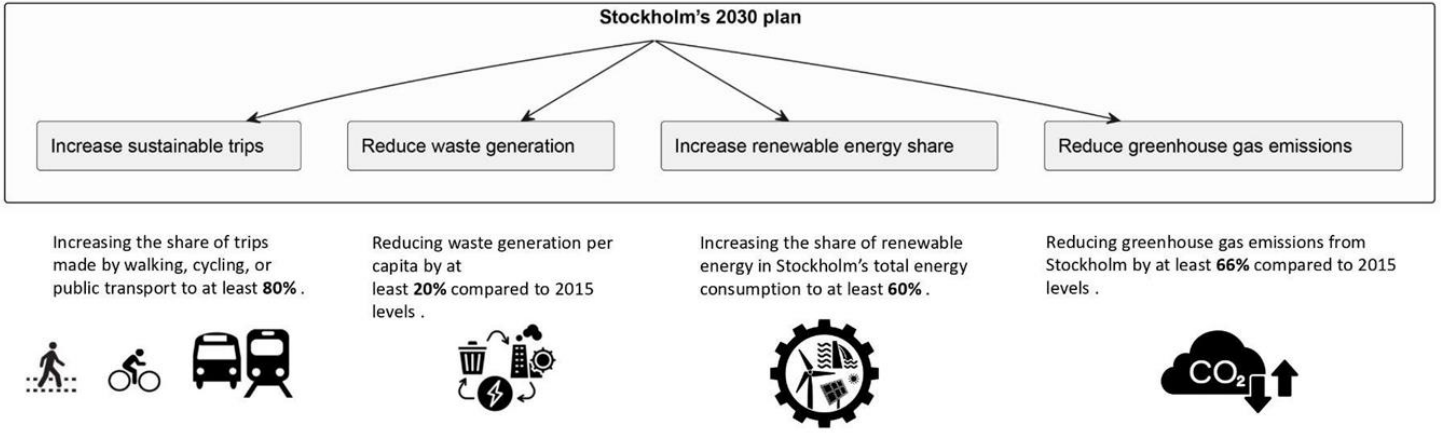
According to the Swedish Energy Agency, Sweden’s energy consumption in **2020 was approximately 142 TWh** . The majority of this energy was consumed by the transport sector, followed by the industrial and residential sectors

PRODUCTION TOOLS



Sweden has a rich supply of moving water and biomass, which contributes to the country's high share of renewable energy. ·**Hydropower (water) and bioenergy** are the top renewable sources in Sweden – hydropower mostly for electricity production and bioenergy for heating . **Hydropower** is generated by using the kinetic energy of falling water to turn turbines, which then generate electricity. Sweden has a large number of hydroelectric power plants, which are used to generate electricity . ·**Bioenergy** is produced from biomass, which is organic material derived from plants and animals. In Sweden, bioenergy is produced from a variety of sources, including forest residues, sawdust, bark, and wood chips. Bioenergy can be used to produce heat or electricity .

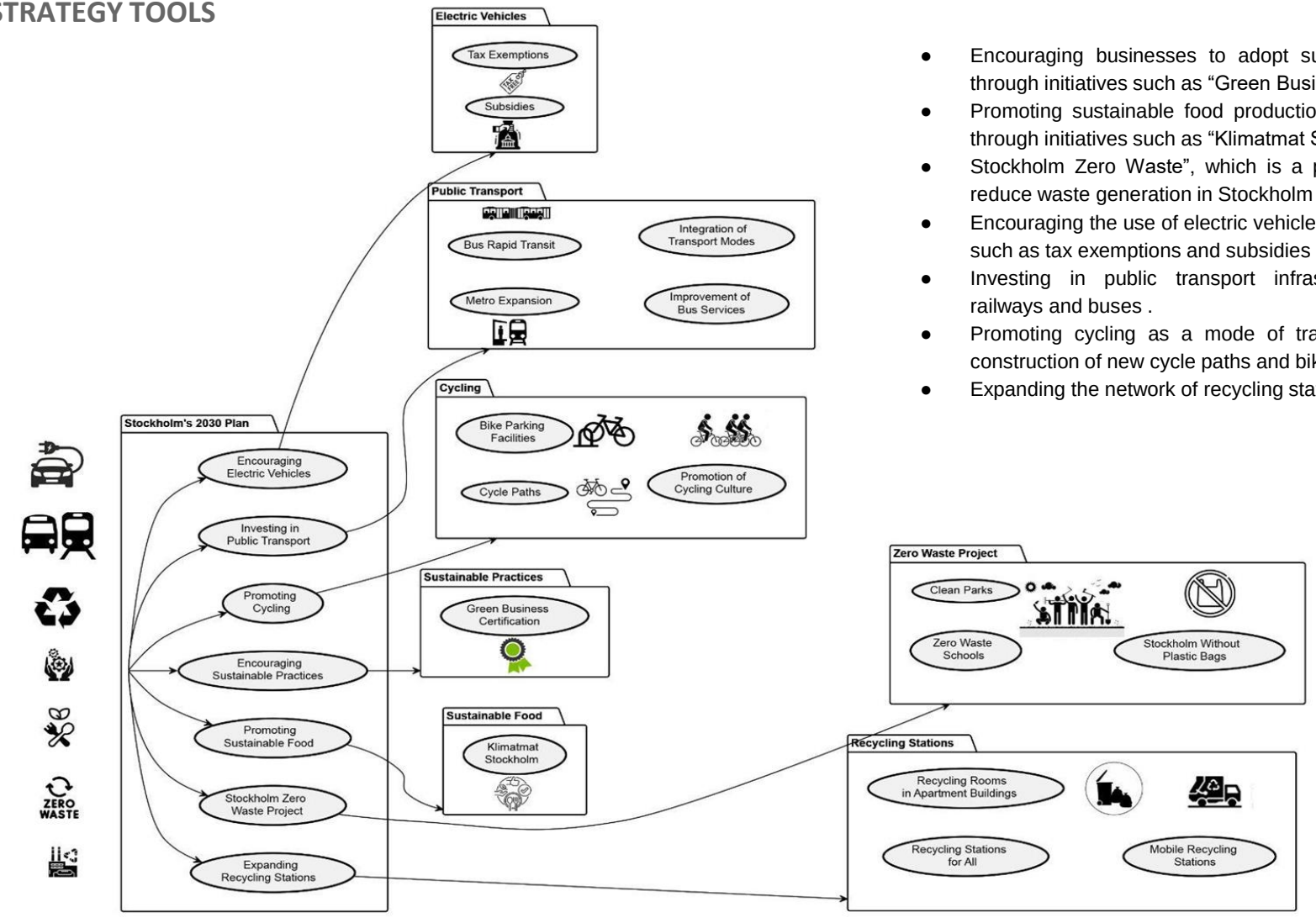
GOALS



Goals: Stockholm's 2030 plan sets several goals for the city to achieve by 2030. These goals include:

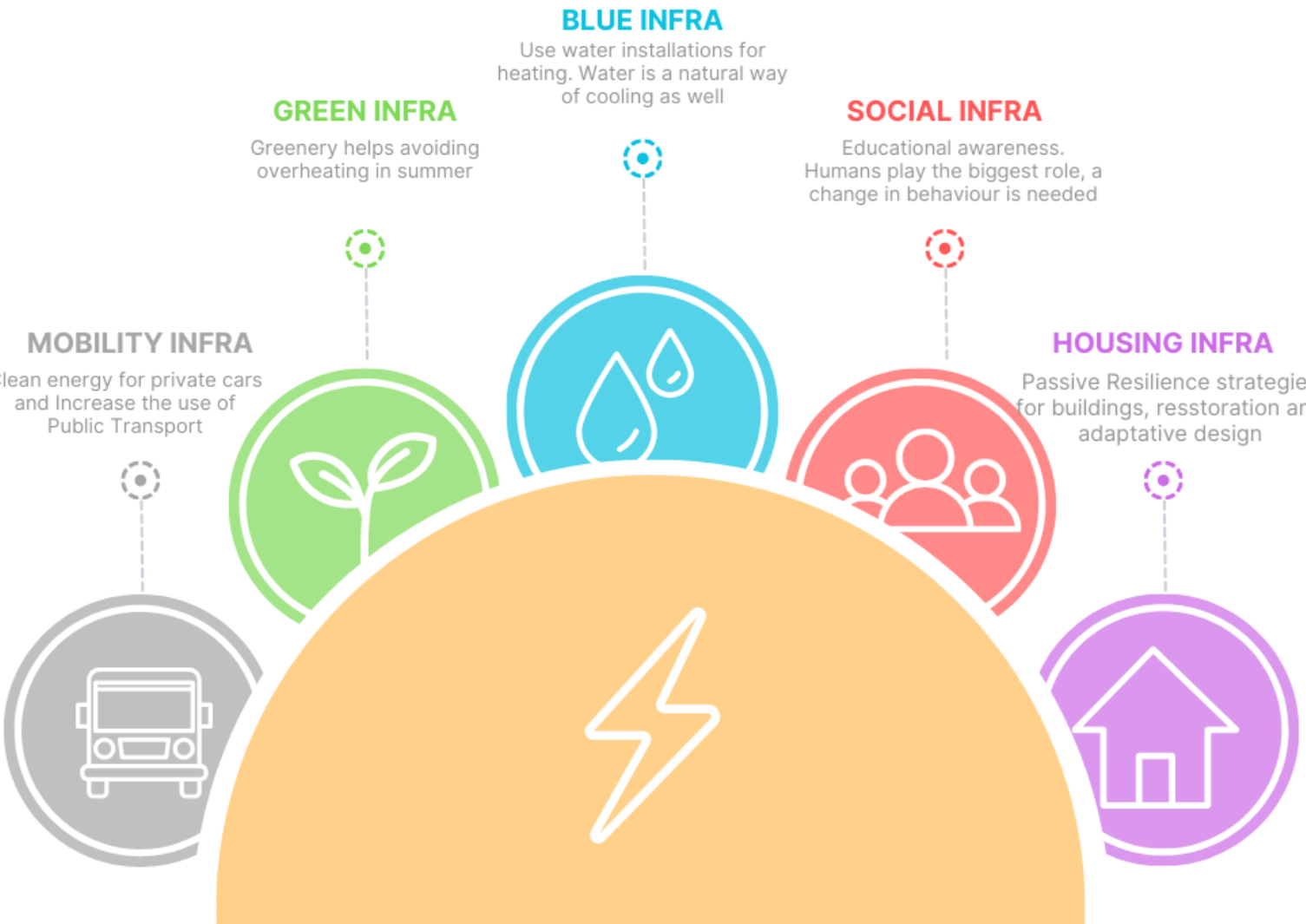
- Reducing greenhouse gas emissions from Stockholm by at least 66% compared to 2015 levels .
- Increasing the share of renewable energy in Stockholm's total energy consumption to at least 60% .
- Reducing waste generation per capita by at least 20% compared to 2015 levels . Increasing the share of trips made by walking, cycling, or public transport to 80% .

STRATEGY TOOLS



- Encouraging businesses to adopt sustainable practices through initiatives such as “Green Business” certification .
- Promoting sustainable food production and consumption through initiatives such as “Klimatmat Stockholm” .
- Stockholm Zero Waste”, which is a project that aims to reduce waste generation in Stockholm by 50% by 2030 .
- Encouraging the use of electric vehicles through incentives such as tax exemptions and subsidies .
- Investing in public transport infrastructure, including railways and buses .
- Promoting cycling as a mode of transport through the construction of new cycle paths and bike parking facilities .
- Expanding the network of recycling stations .

SYNERGIES WITH OTHER URBAN INFRASTRUCTURES



CITY OF VALENCIA ENERGY SYSTEM

NATIONAL AND REGIONAL GOVERNMENTS

ORGANISATIONS

STAKEHOLDERS

MEDIA

CITIZENS

ACTORS

CHALLENGES
- -Lack of emphasis on energy issues
- -Shortage of more actors
- -No hierarchy of applications
- -Regulatory and policy challenges

GOALS
- -Design and manage energy transitions
- -Collaboration of Private+public entities.
- -Education+social awareness
- -Monitoring and decision making process
- -Energy justice

TOOLS
- -Social networks+Media
- -Society collaboration
- -Education
- -Governments
- -Policies

CITY OF VALENCIA

PRODUCTION

- NATURAL GAS
- DIESEL
- PETROL
- RENEWABLES

CHALLENGES
- -High fossil energy
- -Lack of real-time data
- -Low renewable energy

GOALS
- -Be more transparent with the information
- -Increase production of renewable energies

TOOLS
- -Collaboration of private and public sectors
- -Regulations

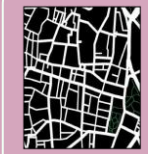
CONSUMPTION

SECTORS

- PRIVATE TRANSPORT 55.31%
- PUBLIC TRANSPORT 3.1%
- INDUSTRY 3.82%
- RESIDENTIAL 19.12%
- SERVICES 17.71%
- PUBLIC LIGHTING 0.94%

URBAN TYPOLOGIES

MEDIEVAL CITY



GRID CITY

OPEN BLOCK

ORGANIC

INCOMES

- LOW INCOME <7750€ 10%
- MIDDLE INCOME 7.750-39.000€ 20%
- MID-HIGH INCOME 7.750-39.000€ 30%
- HIGH INCOME > 40.000€ 40%

CHALLENGES
- -Old buildings consume too much
- -Private transport consumes the highest

GOALS
- -Consume more clean energies
- -Reduce energy poverty

TOOLS
- -New construction policies
- -Restoration of buildings

EMISSION

59.45% 2.94% 3.12% 15.20%

13.83% 0.73%

CHALLENGES
- -Loss of energy
- -Transport has the highest
- -High percentage of emission

GOALS
- -Reduce greenhouse emissions
- -Reintroduce emissions into the city
- -Avoid heat island

TOOLS
- -Implement alternative ways of transport
- -Policies and regulations
- -Innovation

SELF-CONSUMPTION

CHALLENGES→ There is no self generation in valencia

GOAL→Circularity: increase internal production in cities

TOOLS→Laws, regulations and helping local initiatives