

Urban Resilience and Adaptation to Climate Change

Prof. Eleni Myrivili, Athens' Chief Resilient Officer



MEDELLÍN
COLOMBIA



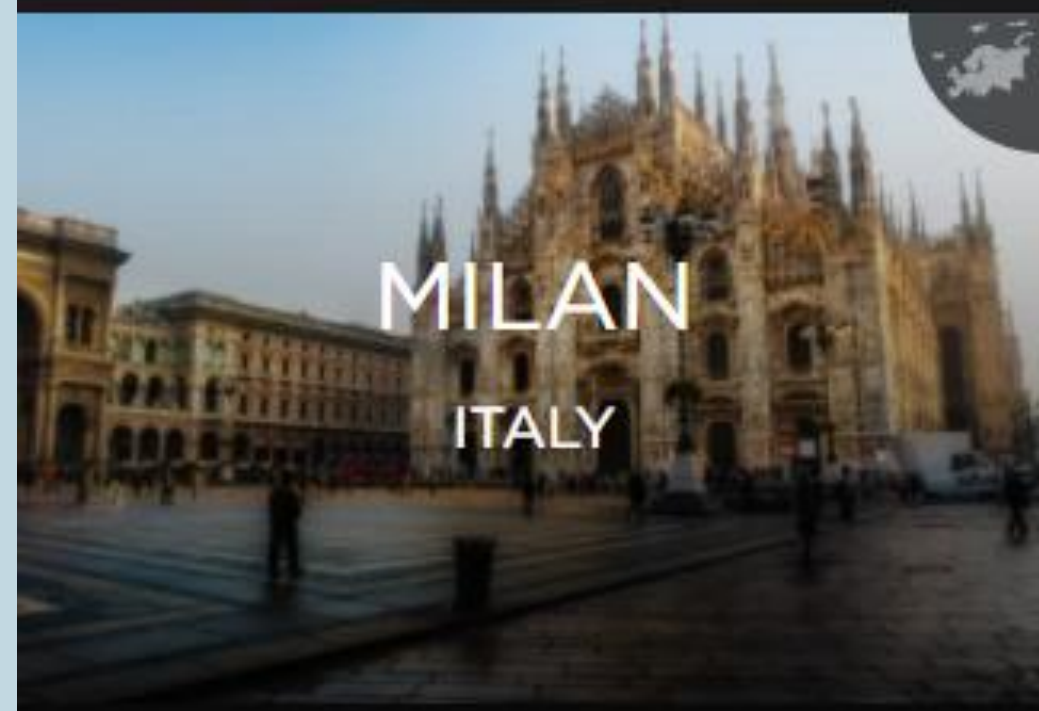
MELAKA
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MELBOURNE
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MEXICO CITY
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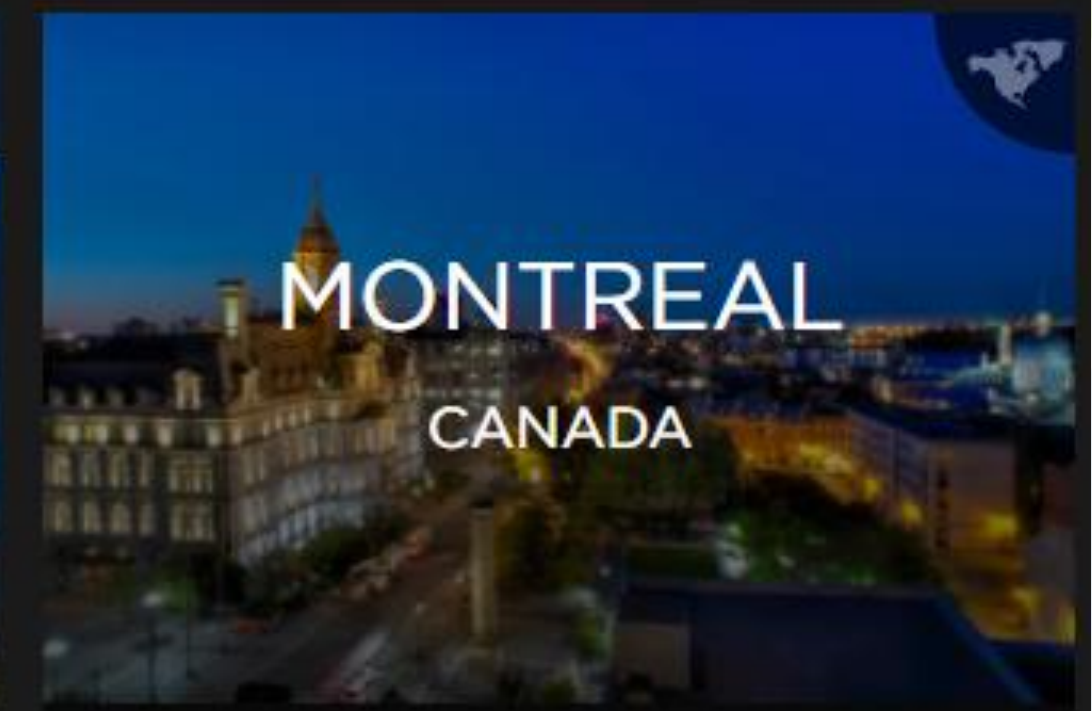
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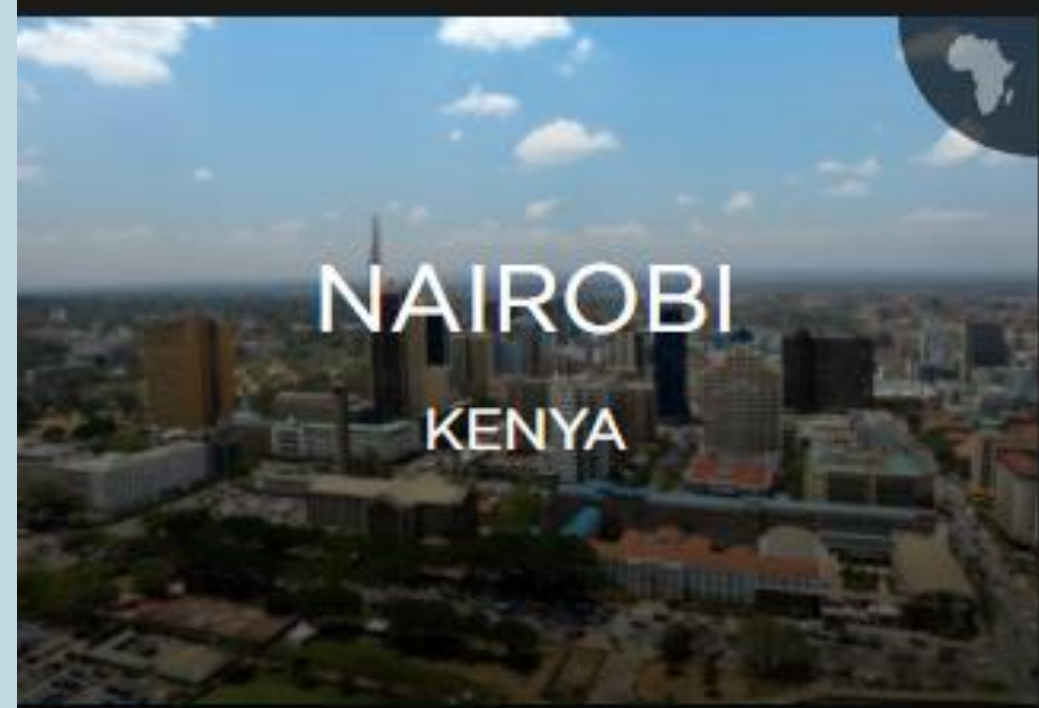
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CANADA



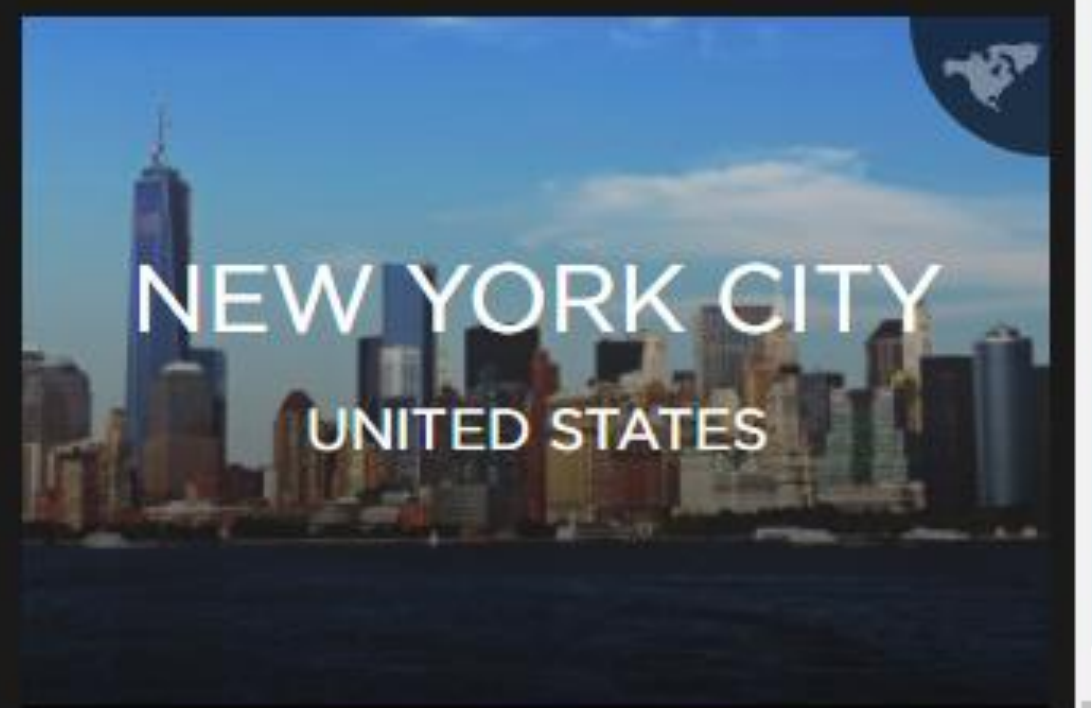
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NEW YORK CITY
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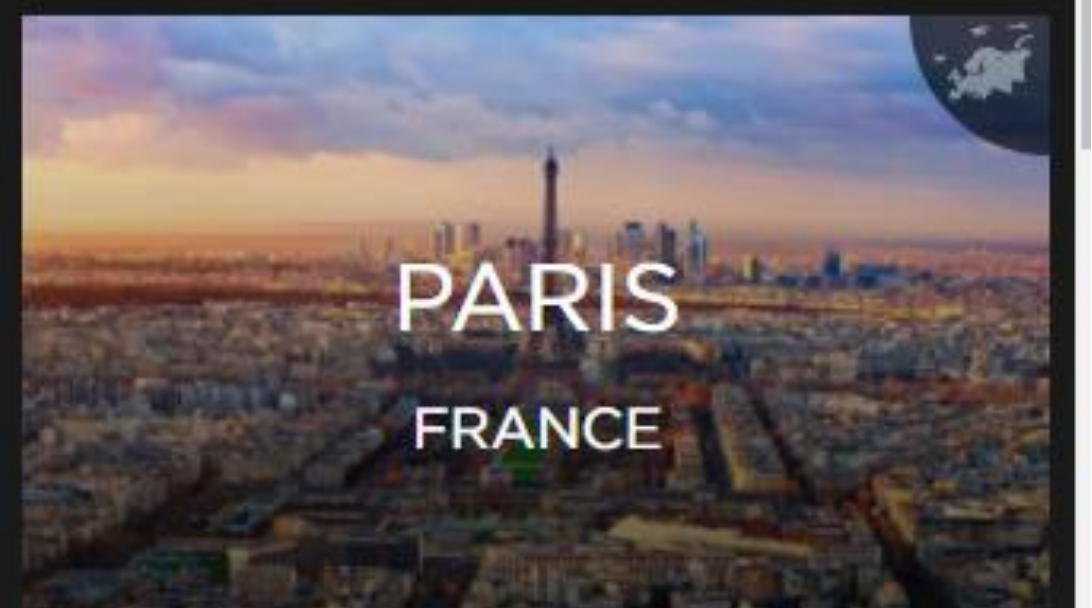
NORFOLK
UNITED STATES



OAKLAND
UNITED STATES



PANAMA CITY
PANAMA



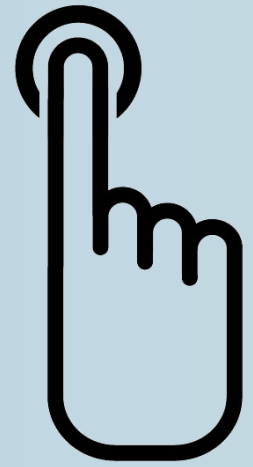
PARIS
FRANCE

Athens Resilience Strategy

participatory, inclusive and integrated

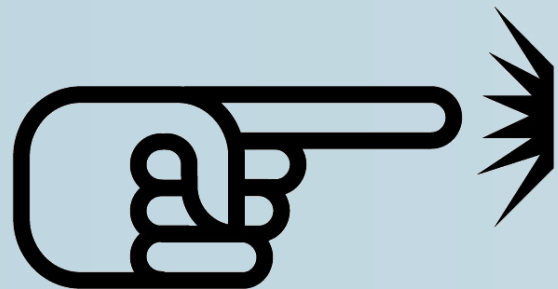
- 14 months of preparation
- **840 people engaged**
- 140 organizations in dialogue
- **40 workshops and events**
- 1 Preliminary Resilience Assessment
- **5 Discovery Areas**
- 138 Opportunities for the City
- **1 Resilient Strategy**
- 65 Resilient Actions and 53 Sub-actions

Athens stresses & shocks



stresses

- **Depressed Macroeconomic Conditions:** Unemployment - Poverty
- **Mistrust:** Lack of Effective and Transparent Governance – Lack of Data-Driven Policymaking
- **Large Scale Refugee & Migration Flows**
- **Ageing Infrastructure:** Vacant Buildings – Lack of Maintenance and Long Term Planning



shocks

- **Climate Change:** Heat Waves – UHI - Flash Floods – Air Quality
- **Earthquakes**
- **Civil Unrest:** Violence
- **Cyber-Attack**

Strategy hierarchy

The diagram illustrates and gives an overview of the pillars, goals, actions and supporting actions as well as highlights the Mega Resilience Projects included in this strategy.



The graphic adjacent to the goal represents the Resilience Value mapped on the CRF drivers.

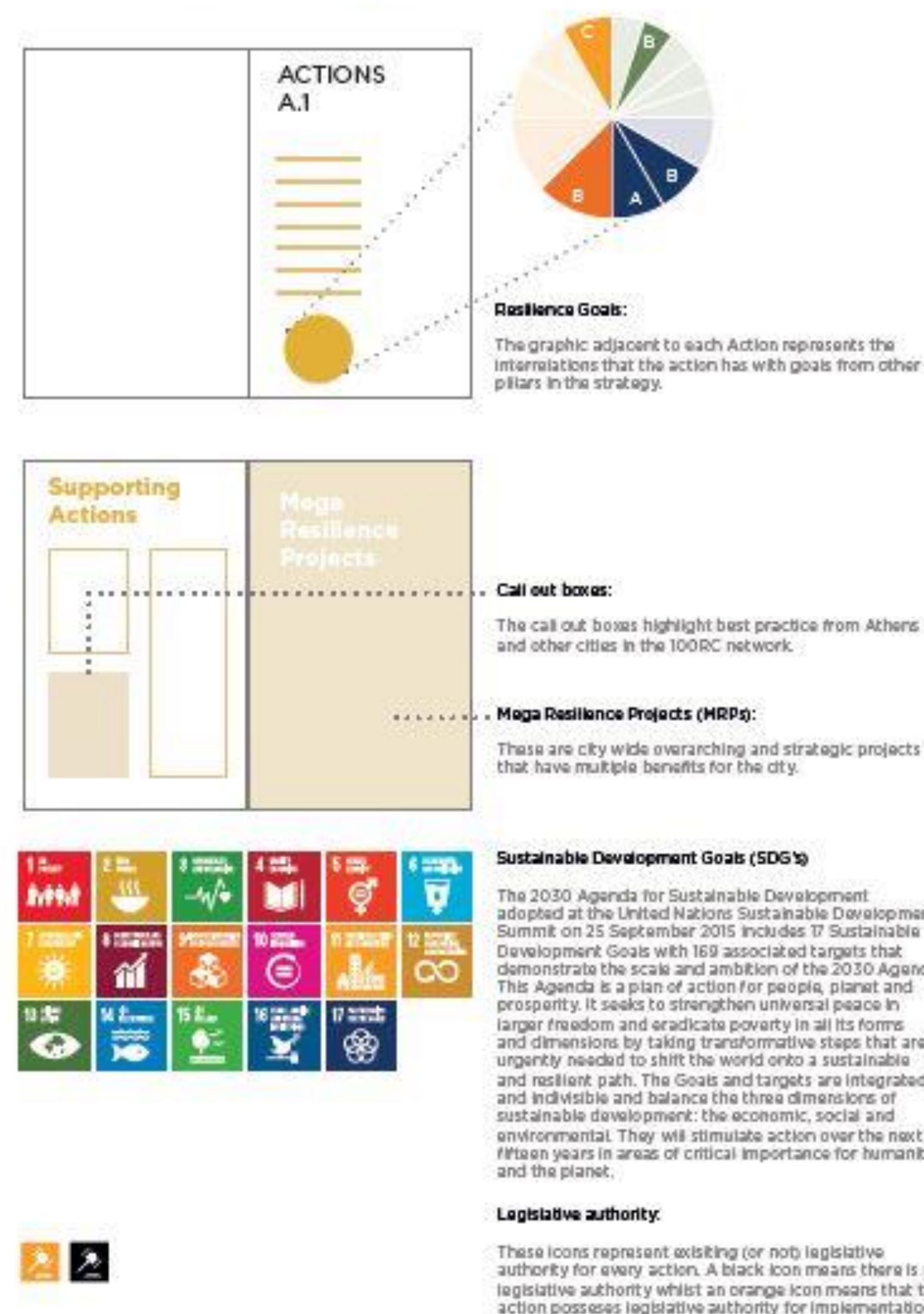
The CRF acts as a lens to understand the complexity of city systems and the drivers that contribute to city resilience. The framework is made up of four main dimensions and 12 drivers that together illustrate what makes a resilient city.

Refer to page 17 for more information.



Our Pillars, Goals and Actions

How to read this chapter



Green city

Green city

Goals

- A Integrate natural systems into the urban fabric
- B Make our city cleaner
- C Promote sustainable mobility and co-create public spaces
- D Foster sustainable food systems
- E Establish sustainable and equitable energy system

We need nature in Athens. The city of the future will meet our human need for proximity to nature and be able to withstand climate change and environmental challenges.

Objectives and Actions

- A.1 Climate change adaptation action plan
- A.2 Major green areas managing authority
- A.3 Triple green development project
- A.4 Elaionas: a resilient district
- B.1 Waste management action plan
- C.1 Sustainable mobility roadmap
- C.2 Public space rejuvenation initiative
- C.3 Public space co-development framework
- D.1 Sustainable food policy plan
- E.1 Climate change mitigation action plan
- E.2 Energy poverty mitigation roadmap
- E.3 Renewable energy cooperatives

Goal E

Establish sustainable and equitable energy system

The City of Athens has not had a Climate Action Plan until now. The baseline study of 2014 has indicated wasteful patterns of consumption and prominent GHG emission sectors, facilitating data driven and forward thinking policy making.





E.1

Climate change mitigation action plan



Description:

The City of Athens has joined the global efforts of cities to mitigate climate change and reduce greenhouse gas emissions (GHG). The Climate Change Mitigation Action Plan (CMAP) focuses on actions that aim at reducing energy consumption at the city level. The City of Athens has developed a GPC-compliant GHG emissions inventory, using 2014 as baseline year, through analyzing municipal, residential and commercial energy consumption. This also includes transportation, solid waste management and all related emissions. The greenhouse gas emissions were estimated at 5,069,040 tons of CO₂equivalent which is equal to 7.63t/capita. The reduction target set is 40% reduction in GHG by 2030. Furthermore, the measures taken to mitigate climate change offer wider benefits to the city, such as financial (deriving from the reduction of energy costs) and social (deriving from job creation and protection of vulnerable population).

Goal E

Establish sustainable and equitable energy system

Resilience Value:

- Support data-driven policy making
- Support integrated planning and strengthen municipal leadership
- Promote sustainable management and development
- Provide incentives for economic development
- Develop synergies with city stakeholders and enhance participation
- Support transparency and accountability
- Enhance and promote communication channels with the citizens
- Promote digital adaptation
- Raise awareness and appreciation for the City and its services
- Maximize the dynamic of the Athenian neighborhood
- Combine essential services with dynamic urban development
- Invest in local capacity building
- Promote equitable, cohesive and supportive communities
- Protect and maintain critical infrastructure
- Enhance city's identity
- Support and enhance natural environment
- Promote residents' well-being and ameliorate their quality of life
- Maximize urban assets

Action Owners: City of Athens (relevant depts. and ORS)

Partners: C40, platform partners, universities and research centers

Legislative authority:



Funding Sources: NSRF2014-2020, other EU funding, PPP/ESCOs, Municipal funds

Timeframe: Short-term (ongoing)

SDGs goals:



E.1 Climate change mitigation action plan

E.1.1 Municipal buildings and public lighting

a. The City of Athens owns and is responsible for the maintenance of over 1000 buildings. Most of them have been constructed in the period 1960-1990 and lack thermal insulation resulting in high energy demands. The City of Athens has implemented and will continue to implement energy retrofits and soft energy-saving actions within its buildings to improve efficiency and reduce energy costs. The use of Renewable Energy Systems on buildings is also another important factor for reducing GHG emissions. (Action 6.1.1, CMAP)

b. The city is upgrading street lighting, replacing the existing 25-year-old network, with LED technology. Municipal street lighting network covers 930km in the city expanding over 3300 streets. It corresponds to 66% of the total annual municipal electric energy consumption. The number of luminaires is estimated at 45000. The City of Athens is currently conducting a photo-technical study on the street lighting. (Action 6.1.2, CMAP)

Action Owner: City of Athens (Relevant departments and ORS)

Partners: C40, platform partners, universities and research centers, private sector

Funding sources: NSRF, Municipal funds, private donors

Time frame: Short-term (ongoing)

E.1.2 Commercial and residential sector

a. The City of Athens will establish dedicated campaigns to raise citizens' environmental awareness, encouraging them to cut costs by reducing their energy consumption at home. Statistical studies have revealed that 85.9% of the thermal energy consumed is used for heating, while 67.3% of the electrical energy used is spent on household appliances. Educational campaigns in schools will continue through seminars/workshops, leaflets, interactive communication focusing on children, their information and awareness regarding their carbon footprint. (Action 6.2.1, CMAP)

b. Support, promote and disseminate information regarding national energy saving programs. The program "ENERGY SAVING AT HOME" initiated in 2011, has already improved the energy efficiency of 40.000 houses. The City of Athens will promote national funding programs regarding energy savings. Such programs can lead to significant energy efficiency in the residential sector, reach up to 44% of the final energy used. (Action 6.2.2, CMAP)

c. Increase the use of natural gas for heating demand in residential buildings. Currently diesel is the dominant choice of fuel used for heating demands in residential buildings. Assuming that 30% of Athenian building will be connected to the natural gas grid through the National Savings Programs mentioned above, the City of Athens, in cooperation with the natural gas suppliers - will implement awareness raising activities, aiming at steering the remaining households towards energy efficiency. Choosing natural gas over diesel for heating demands could save up to 20% in total energy consumption in the residential sector of Athens. (Action 6.2.3, CMAP)

d. Promote nearly zero-energy buildings. The City of Athens will support in any possible way the conversion of 10% of the existing residential sector to nearly zero-energy-buildings until 2030. The City of Athens would like to become the point of reference for citizens seeking advice on this topic. (Action 6.2.4, CMAP)

E.1 Climate change mitigation action plan

e. Climate Change Mitigation actions: a. Increase green areas in low-green Athenian Districts, b. ameliorate local bioclimatic conditions through the use of cool materials, c. Include shading elements throughout public areas. The above actions will have a significant effect in the reduction of air-conditioning use as cooling devices during the hottest of months. (Action 6.2.5, CMAP)

f. Establish a municipal fund for energy upgrading of residential buildings. The City of Athens will establish a municipal fund that assists residents to implement energy upgrading of their buildings and cut costs. Its efforts will be based on the example of the "Prosopsi" facades regeneration program that managed to renovate 4000 building facades in the first decade of the 21st century. If the City of Athens provides funds for energy upgrades to 24.000 households until the year 2030, energy demands can be cut to 27% per residence. (Action 6.2.6, CMAP)

g. Advocate for the benefits of energy savings, targeting entrepreneurs. This measure addresses the tertiary sector. Up to 8.000 buildings have been recorded as hosting entrepreneurial activities in the City of Athens. The program "Building the Future," running under the Ministry of Environment and Energy, aims at the reduction of energy consumption in the tertiary sector. The City of Athens supporting this effort, will organize information campaigns on the benefits of energy savings, through ADDMA. (Action 6.2.7, CMAP)

h. Implementing Measures for energy savings in industry, which however has only a 3% contribution to the Athenian GHG emissions. (Action 6.2.8, CMAP)

Action Owner: City of Athens (Mayor's Office, relevant Depts., Deputy Mayor for Children, and ORS)

Partners: C40, Open schools to the Neighborhood

Funding sources: NSRF, Municipal funds, private donors

Timeframe: Short-term to Medium-term

E.1.3 Transportation

The actions corresponding to energy savings in the transport sector are the following:

a. By replace 20% of the existing old, diesel-fuel municipal fleet with new technology vehicles by 2030, the municipality could achieve a 20% reduction of costs from fuel consumption. (Action 6.3.1, CMAP)

b. The municipality will communicate and advocate for the benefits of eco-driving to the administration staff of relevant departments, residents of the City. (Action 6.3.2, CMAP)

c. Improve management and efficiency of the municipal fleet by using new technologies and rationalizing the existing routes. (Action 6.3.3, CMAP)

d. The municipality has commissioned a Sustainable Mobility Action Plan that aims at reducing the presence of cars in the city center, which would bring significant benefits regarding the mitigation of GHG emissions. (Action 6.3.4, CMAP)

Action Owner: City of Athens (relevant Depts. and ORS)

Partners: platform partners, universities, research centers, private sector

Funding sources: Municipal funds

Time frame: Short-term to Medium-term

E.1.4 Organic waste diversion

a. Waste management contributes the 7% to the city's GHG emissions. The City of Athens is developed a more sustainable strategic plan for waste management having as a target the 100% diversion of organic waste away from landfills by 2030. This action is one of the most significant, in respect to its contribution to emissions reduction in the City of Athens and to our target of 40% reduction of GHG emissions by 2030. (Action 6.4.1, CMAP)

Action Owner: City of Athens (relevant Depts. and ORS)

Partners: platform partners, private sector

Funding sources: Municipal funds, EU funding programs

Time frame: Medium-term to Long-term

Sector	GHG emissions tons CO2eq (baseline year 2014)	GHG emission reductions until 2030 tons CO2eq/y	% reduction
Residential Sector	1.595.033	447.469	-28,05%
Commercial and municipal sector	1.909.463	795.242	-41,65%
Manufacturing industries and industrial processes	142.184	30.023	-21,12%
On road transportation	1.015.754	423.567	-41,70%
Public transportation (metro, tram)	48.775	0	0,00%
Solid Waste (landfill)	334.082	334.082	-100,00%
Biological waste (alternative ways of management)	41	0	0,00%
Wastewater	23.342	0	0,00%
Total	5.069.040	2.030.383	-40,05%

Mitigation Actions (technological & non technological actions)	Energy savings (MWh/year)	GHG emissions reduction (CO ₂ eq/year)
Energy renovation of municipal buildings	27.219	15.186
Energy Upgrade of municipal lighting	26.402	30.639
Citizens Campaigns on low cost actions regarding residential building renovation	62.894	41.451
Promote national funding programs for energy saving (i.e. <i>"Saving at Home"</i>)	298.099	203.892
Connecting residential buildings to Natural Gas Network	45.151	12.084
Net Zero Energy Buildings (NZEB)	181.781	131.919
Climate Change Adaptation actions	8.319	9.961
Creation of fund for energy renovations of residential buildings	51.117	48.162
Campaign to entrepreneurs for energy saving	666.016	779.439
Municipal fleet upgrade	2.840	707
Eco-driving	2.422	585
Effective management of municipal fleet and fuels	4.845	1.169
Sustainable mobility plan	1.606.944	421.106
Bio-waste segregation from landfill		234.083

Relevant Municipal Projects

- **Energy Upgrades**
[municipal & school buildings, public lighting, IZNEB]
- **Urban Renewal**
[playgrounds, squares, trigono]
- **Waste Management**
[connection with tourism industry]

The proposed programs will be funded by municipal funds as well as the structural funds through Region of Attica



E.2

Energy poverty mitigation roadmap



Description:

Energy poverty tends to become one of the biggest social problems in Europe. Greece is no exception. According to a recent study almost 25% of Athenian households suffer from energy poverty due to the economic crisis and are unable to cover their basic domestic needs. These households are unable to afford any heating during the winter and live in indoor temperatures that do not exceed 6 to 7 degrees Celsius in the cold winter months.

The City of Athens will implement measures for energy poverty elimination at city level and will develop programs to alleviate the most vulnerable populations suffering from energy poverty.

Goal E

Establish sustainable and equitable energy system

Resilience Value:

- Support data-driven policy making
- Enhance and promote communication channels with the citizens
- Support transparency and accountability
- Develop synergies with city stakeholders and enhance participation
- Support integrated planning and strengthen municipal leadership
- Raise awareness and appreciation for the City and its services
- Invest in local capacity building
- Promote equitable, cohesive and supportive communities
- Protect and maintain critical infrastructure
- Provide incentives for economic development
- Promote sustainable management and development
- Support and enhance natural environment
- Promote residents' well-being and ameliorate their quality of life

Action Owners: City of Athens (ORS)

Partners: CRES and relevant municipal departments

Legislative authority:



Funding Sources: CRES, European Funds, and Municipal funds

Timeframe: Medium-term

SDGs goals:



E.2

Energy poverty mitigation roadmap

E.2.1 Energy poverty observatory

The City of Athens will establish in cooperation with the Center for Renewable Energy Sources and Saving (CRESS) an energy poverty Observatory that would be responsible for monitoring households that suffers from energy poverty and will deliver solutions for energy efficiency. It would also try to link energy demands to renewable energy production.

Action Owner: City of Athens (ORS) and CRES

Partners: Athenian Gas; Metropolitan Agency for Natural Gas; CRES; Heinrich Böll Foundation; Social Cooperative "Wind of Renewal," NGOs and Department of Social Services

Funding sources: CRES, European Funding and Municipal funds

Timeframe: Short-term

E.2.2 Energy saving awareness raising campaign and capacity building

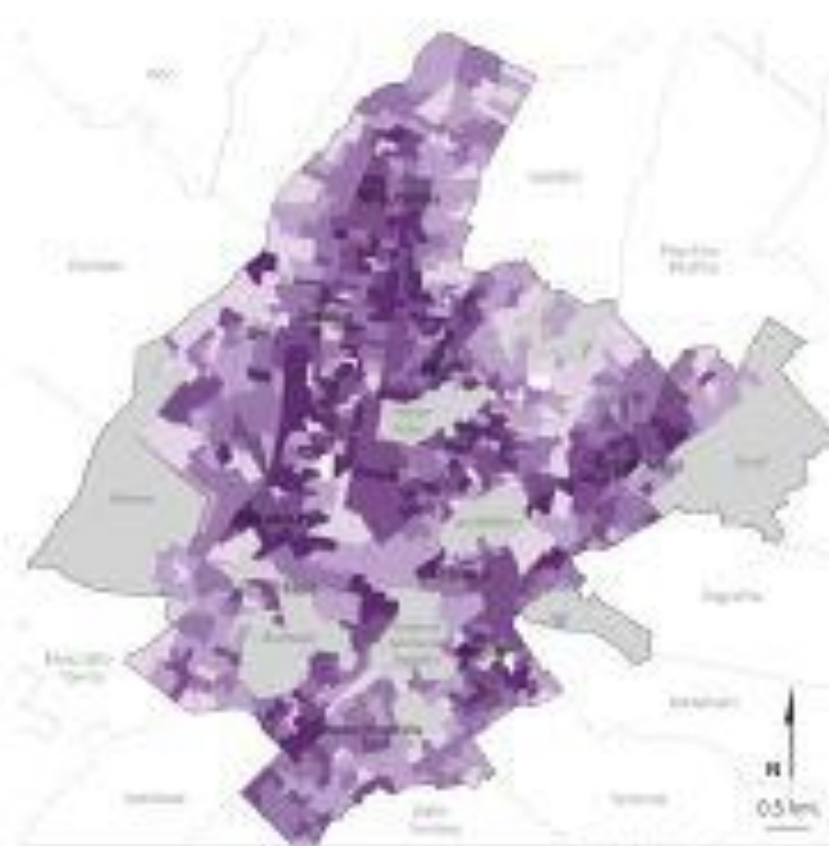
The City of Athens will consider a joint venture of public and private sector for planning and implementing a long-term campaign to provide information and build capacity among citizens regarding energy savings (energy inspectors, website, phone center, financial instruments consultation, etc.).

Action Owner: City of Athens (ORS, Mayor's Office)

Partners: ADDMA, Athenian Gas, Metropolitan Agency for Natural Gas, Heinrich Boell Foundation, Social Cooperative "Wind of Renewal," NGOs and private sector.

Funding sources: Municipal funds and private donors

Timeframe: Medium-term



Residence without insulation (%)^a

85 - 100
65 - 80
40 - 60
20 - 40
0 - 20

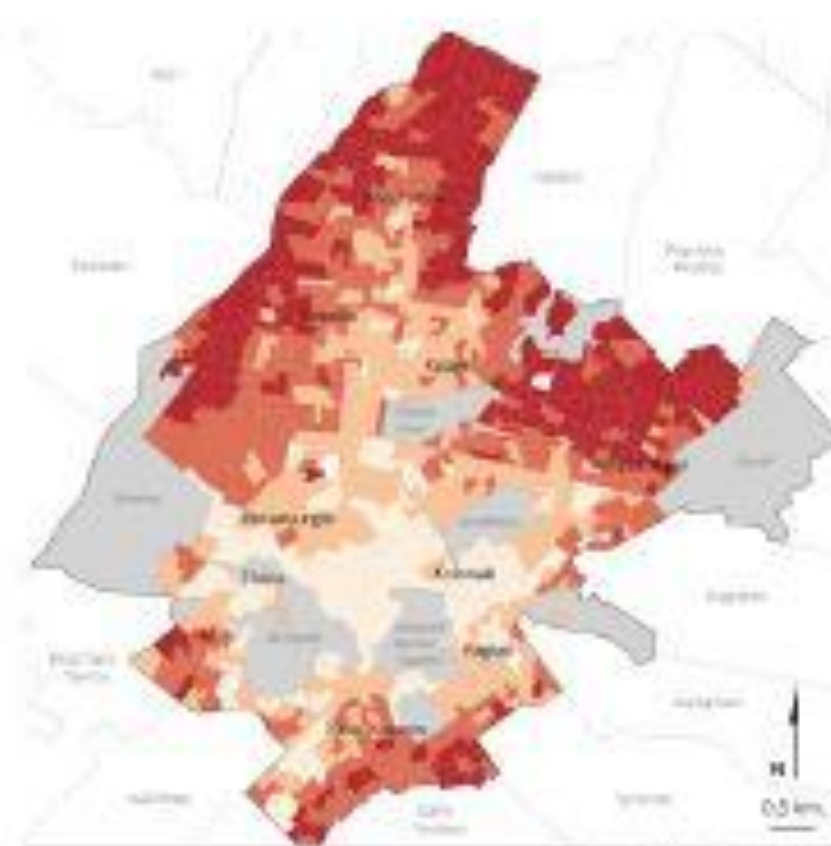
Is energy efficiency an ecological issue, speed of implementation?

Current NKT target

Realistic target (based on 2010)

© 2004 Blackwell Publishing Ltd *Journal of Internal Medicine* 255: 105–112

Source: Vatselakou F., Chatsikostantinou E., eds (2015) Athens Social Ajax. Mapping energy poverty in Athens during the crisis, <http://www.athenssocialis.org/en/energy-poverty/>



Households using heating oil (%)

- 45 - 74
- 40 - 45
- 20 - 40
- 5 - 20

Strongly supports
environmental rules,
spatial land use norms

Consists of two levels

Neighborhoods most opposed

Source: *Author's calculations*.

Source: Vatsis IF, Chatrikonstantinou E, gido (2015) Athens Social Atlas. Mapping energy poverty in Athens during the crisis (<http://www.athenssocialatlas.gov/en/article/energy-poverty/>).

E.2

Energy poverty mitigation roadmap

E.2.3 Building renovation passport

A Building Renovation Passport (BRP) is – a document outlining a long-term (up to 15 or 20 years) step-by-step renovation roadmap for a specific building, resulting from an on-site energy audit guided by specific quality criteria and indicators, in dialogue with the renters and building owners. The City of Athens in collaboration with CRES will develop a library with BRPs from its buildings in order to record the energy demands and the measures applied in long-term for energy savings so that in future an energy roadmap could be developed.

Action Owner: City of Athens (CRS) and CRES

Partners: CRES, Athenian Gas, Metropolitan Agency for Natural Gas, Heinrich Böll Foundation, Social Cooperative "Wind of Renewal," and Department of Public Works

Funding sources: CRES, European Funding and Municipal funds

Timeframe: Medium-term



Average family income (euro) *

- 50,000 - 74,999
- 75,000 - 99,999
- 100,000 - 124,999
- 125,000 - 149,999
- 150,000 - 174,999
- 175,000 - 200,000

Green squares: At the highest level, specific health care needs
 Pinkish circles: Priority

Source: *U.S. Census Bureau, Bureau of Economic Analysis, "GDP by State and Selected Regions, 1997-2000,"* <http://www.bea.gov/states/>.

Source: Vatselaki F., Chatzikonstantinou E., (eds) (2015) Athens Social Atlas. Mapping energy poverty in Athens during the crisis (<http://www.athenssocialatlas.gr/en/articles/energy-poverty/>)



E.2

Renewable energy cooperatives



Description:

According to the European Commission, in France, Spain, Croatia and even Greece citizens have started to invest in renewable energy cooperatives, but different legal contexts and lack of support mechanisms mean they still lag far behind northern European countries.

The depressed macroeconomic conditions in Greece, energy poverty and the lack of social cohesion could be mitigated by the creation of energy cooperatives in the form of either a social cooperative or a business association.

The main objective of this program is to enable the City of Athens to facilitate the development of either energy cooperatives at a neighborhood level or larger resident consortium, by recognizing potential legal and other barriers proposing and helping citizens to overcome them.

The Resilience and Sustainability Office will bring together experts and researchers from the public and private sectors in order to assess and promote the development of Renewable Energy Cooperatives.

Goal E

Establish sustainable and equitable energy system

Resilience Value:

- Support data-driven policy making
- Enhance and promote communication channels with the citizens
- Support transparency and accountability
- Develop synergies with city stakeholders and enhance participation
- Support integrated planning and strengthen municipal leadership
- Raise awareness and appreciation for the City and its services
- Invest in local capacity building
- Promote equitable, cohesive and supportive communities
- Protect and maintain critical infrastructure
- Provide incentives for economic development
- Promote sustainable management and development
- Support and enhance natural environment
- Promote residents' well-being and ameliorate their quality of life

Action Owners: City of Athens (Athenian Gas, Metropolitan Agency for Natural Gas and ORS)

Partners: Social Cooperative "Wind of Renewal," Ministry of Energy and the Environment

Legislative authority:



Funding Sources: Municipal funds, structural funds

Timeframe: Medium-term

SDGs goals:



International Networks working together in Athens

- MoU between C40 Cities and 100 Resilient Cities



Athens vision compatible with COP21 (Paris Agreement)

- 20% Renewable Energy Sources by 2030
- 40% reduction of GHG emissions by 2030

Athens has a high GDP and high GHG emissions. It would need a much more ambitious plan and everyone on board to reach the 1,5 Celsius goal or in order to reach the goal of 100% renewable energy generation by 2050

