



City Amberprint

The City Amberprint is a complement to the City Blueprint and the Trends and Pressures Framework. The main goal of the City Amberprint is a baseline assessment of the sustainability of Energy, Transport and ICT in cities. To comply with City Blueprint, indicators that have a score between 0 (there is a concern) to 10 (no concern) are proposed. The quantitative indicators were “normalise” on a scale of 0 to 10, where 10 points were assigned to cities that met or exceeded certain criteria on environmental performance. The overall sustainability of the three aspects is expressed as Amber City Index (ACI). The ACI is the geometric mean of the 22 indicators.

Table 1.1: List of City Amberprint indicators for Genova

Category	No.	Indicator	Score
ENERGY	1	Carbon footprint	
	2	Fuel poverty	
	3	Energy consumption	
	4	Energy self-sufficiency	
	5	Renewable energy ratio	
	6	Energy efficiency plans	
	7	Energy infrastructure investment	
TRANSPORT	8	Commuting time	
	9	Use of public transport	
	10	Bicycle network	
	11	Transportation fatalities	
	12	Clean energy transport	
	13	Transport-related pollutions	
	14	Transport infrastructure investment	
ICT	15	ICT access	
	16	ICT use households	
	17	ICT use water utilities	
	18	ICT use energy utilities	
	19	ICT use transport	
	20	ICT use waste management	
	21	Digital public service	
	22	ICT infrastructure investment	

Energy indicators

1.1 Carbon footprint

How city's carbon footprint (CF) per person per year does compare with the international range? A lower indicator score is given for a larger carbon footprint.

Definition of Carbon Footprint: the total sets of greenhouse gas emissions caused by an organization, event, product or person.

1.1.1 Calculation

The indicator is calculated as follows:

$$\text{Indicator 1} = 10 \times (16.464 - X) / (16.464 - 0.237),$$

Where X is the CF/capita/year in the city.

1.2 Fuel poverty

What is the proportion of households in the city that are considered to be fuel poor? The lower indicator score is given when the proportion is higher.

Under the Low Income High Costs definition, a household is considered to be fuel poor if:

- they have required fuel costs that are above average (the national median level)
- were they to spend that amount, they would be left with a residual income below the official poverty line.

1.2.1 Calculation

The indicator is calculated as follows:

$$\text{Indicator 2} = (100 - X) / 10,$$

Where X is the percentage of households in the city considered to be fuel poor.

1.3 Energy consumption

This indicator presents how does total energy consumption (domestic, industrial and commercial, and transport) per capita in the city compares with the international range (kgoe/cap/yr). A lower indicator score is given where the consumption is greater.

1.3.1 Calculation

The indicator is calculated as follows:

$$\text{Indicator 3} = 10 \times (5419 - X) / (5419 - 893.15),$$

where X is the total energy consumption for the city in kgoe/cap/yr.

1.4 Energy self-sufficiency

Measure of the proportion of a city's demand that could be met through indigenous production including renewable resources, waste, and traditional but generated locally in the city. A lower indicator score is given where self-sufficiency is lower.

1.4.1 Calculation

The indicator is calculated as follows:

$$\text{Indicator 4} = 10 \times X / Y,$$

where X is the the amount of energy generated locally, and Y is the total energy consumption in the city.

1.5 Renewable energy ratio

A measure of proportion of total energy derived from renewable sources in the city, as a share of the city's total energy consumption compared to the international range. A lower indicator is given where the percentage is lower.

1.5.1 Calculation

The indicator is calculated as follows:

$$\text{Indicator 5} = 10 \times (X - 1.15) / (98.8 - 1.15),$$

Where X is the percentage of energy derived from renewable sources.

1.6 Energy efficiency plans

Measure of the application of energy efficiency measures by the range of energy users across the city. A lower indicator score is given where efficiency measures are more limited. This measure is unlikely to already have a value applied. Instead, apply a self-assessment based on information from public sources (national/regional/local policy document, reports and websites of actors (e.g. energy companies, cities, provincial or national authorities). It should consider plans, measures and their implementation to improve the efficiency of energy usage:

- at household level, e.g. efficient household appliances,
- at community level by energy efficient buildings or energy recycling, e.g. heat can be collected in summer, and stored to use it in winter,
- by encouraging people to change their behaviour.

1.6.1 Calculation

The following guidance is proposed to make self-assessment score for Indicator 6.

Indicator score	Assessment
0	no information is available on this subject
1	limited information is available in a national document
2	limited information is available in national and local documents
3	the topic is addressed in a chapter in a national document
4	the topic is addressed in a chapter at the national and local level
5	a local policy plan is provided in a publicly available document
6	as 5 and the topic is also addressed at the local website
7	plans are implemented and clearly communicated to the public
8	as 7 plus subsidies are made available to implement the plans
9	as 8 plus annual reports are provided on the progress of the implementation and/or any other activity indicating that this is a very high priority implemented at the level of the local community
10	as 9 and the activity is in place for = 3 years

1.7 Energy infrastructure investment

A measure of the investment in the infrastructure for energy distribution compared to the international range. A lower indicator score is given where the investment is lower. The infrastructure investment is an indication of the commitment to regularly invest in the energy infrastructure. Investment can be in:

- a new infrastructure
- maintaining
- and refurbishing the existing one.

1.7.1 Calculation

The indicator is calculated as follows:

$$\text{Indicator 7} = 10 \times (100 \times X/Y - 0.06) / (2.29 - 0.06)$$

Where X is the investment in the city/region in a year (values of the investment over the last 5 years should be taken and average value per year used) divided by local population of the city/region and Y is GDP per capita in the country.

Transport indicators

1.8 Commuting time

A measure of the proportion of time spent on commuting (minutes per day). Includes average time spent in: public transport (bus, coach, train, underground, tram, light railway), car (as driver or passenger), motorcycle, moped, scooter, bicycle, taxi on the way to and from work. A lower indicator score is given where the time spent on commuting is greater.

1.8.1 Calculation

The indicator is calculated as follows:

$$\text{Indicator 8} = 10 \times (74.2 - X) / (74.2 - 10.8),$$

1.9 Public transport use

Kilometres travelled by public transport and bicycles compared to overall kilometres travel by all means of transport. A lower indicator score is given where the use of public transport and bicycles is higher.

1.9.1 Calculation

The indicator is calculated as follows:

$$\text{Indicator 9} = 10 \times X/Y,$$

Where X is the kilometres travelled by public transport and cycling (or %) and Y is the overall kilometres travelled by all means of transport (or %).

1.10 Bicycle network

Length of bicycle network per inhabitant compared to the international range. The lower indicator score is given where the length of bicycle network per inhabitant is lower.

1.10.1 Calculation

The indicator is calculated as follows:

$$\text{Indicator 10} = 10 \times (X/2.03),$$

Where X is the length of bicycle network per capita.

1.11 Transportation fatalities

A measure of transportation fatalities per 100 000 population in the city per year. A lower indicator score is given where the number is greater.

1.11.1 Calculation

The indicator is calculated as follows:

$$\text{Indicator 11} = 10 \times (33.4 - X/Y) / (33.4 - 3.6)$$

1.12 Clean energy transport

Clean energy transport and clean energy sharing transport. A lower indicator score is given where efficiency measures are more limited. This measure is unlikely to already have a value applied. Instead, apply a self-assessment based on information from public sources (national/regional/local policy document, reports and websites of actors (e.g. transport companies, cities, provincial or national authorities). It should consider plans, measures and their implementation to improve the transport efficiency by e.g.

- efficient public transport (electric train, subway/metro, tram, cable railway)
- efficient private transport (electric taxis or cars, electric scooter, bicycling)
- and encouragements to use public transport.

1.12.1 Calculation

The following guidance is proposed to make self-assessment score for Indicator 12.

Indicator score	Assessment
0	no information is available on this subject
1	limited information is available in a national document
2	limited information is available in national and local documents
3	the topic is addressed in a chapter in a national document
4	the topic is addressed in a chapter at the national and local level
5	a local policy plan is provided in a publicly available document
6	as 5 and the topic is also addressed at the local website
7	plans are implemented and clearly communicated to the public
8	as 7 plus subsidies are made available to implement the plans
9	as 8 plus annual reports are provided on the progress of the implementation and/or any other activity indicating that this is a very high priority implemented at the level of the local community
10	as 9 and the activity is in place for = 3 years

1.13 Transport-related pollutions

Air pollutant emissions (Sulphur oxides (SO_x), Nitrogen oxides (NO_x), Ammonia (NH₃), Non-methane volatile organic compounds, Particulates (PM₁₀) - airborne particulate matter with aerodynamic diameter less than 10 micrometres) from transport measured in kg per capita per year. A lower indicator score is given where the pollutant emissions are greater.

1.13.1 Calculation

The sub-indicators are calculated as follows:

- Sulphur oxides (SO_x):

$$SO_x = 10 \times (2.753 - A) / (2.753 - 0.114)$$
 where A is the emissions from the city (t).
- Nitrogen oxides (NO_x):

$$NO_x = 10 \times (0.337 - B) / (0.337 - 0.021)$$
 where B is the emissions from the city (t).
- Ammonia (NH₃):

$$NH_3 = 10 \times (9,153.3 - C) / (9,153.3 - 11.3)$$
 where C is the emissions from the city (t).
- Non-methane volatile organic compounds (Non-mth):

$$\text{Non-mth} = 10 \times (5.643 - D) / (5.643 - 0.432)$$
 where D is the emissions from the city (t).
- Particulates (PM₁₀):

$$PM_{10} = 10 \times (2.197 - E) / (2.197 - 0.169)$$
 where E is the emissions from the city (t).

Therefore the indicator is calculated as follows

$$\text{Indicator 13} = (SO_x + NO_x + NH_3 + \text{Non-mth} + PM_{10}) / 5$$

1.14 Transport infrastructure investment

A measure of the investment in the transport infrastructure compared to the international range. A lower indicator score is given where the investment is lower. The infrastructure investment is an indication of the commitment to regularly invest in the transport infrastructure. Investment can be in:

- a new infrastructure
- maintaining
- and refurbishing the existing one.

1.14.1 Calculation

The indicator is calculated as follows:

$$\text{Indicator 14} = 10 \times (100 \times X/Y - 0.02) / (3.89 - 0.02)$$

Where X is the investment in the city/region in a year (values of the investment over the last 5 years should be taken and average value per year used) divided by local population of the city/region and Y is GDP per capita in the country.

ICT indicators

1.15 ICT access

The ICT access is a measure of access to information and communication technology (ICT) in the city. A lower indicator score is given where the ICT access is lower.

1.15.1 Calculation

Following sub-indicators need to be calculated and an average value is taken.

- Mobile-cellular telephone subscriptions per 100 inhabitants, where X is the number of mobile-cellular telephone subscriptions per 100 inhabitants in the city: $A = 10 \times X / 120$
- International Internet bandwidth (bit/s) per Internet user, where Y is the International Internet bandwidth (bit/s) per Internet user in the city: $B = 10 \times Y / 787,260$

- Proportion of households with a computer, where Z is the percentage of households with a computer in the city: $C = Z/10$
- Proportion of households with Internet access, where Q is the percentage of households with Internet access in the city: $D = Q/10$

The indicator is calculated as follows:

Indicator 15 = $(A+B+C+D)/4$.

1.16 ICT use households

The ICT use in households is a measure of use of information and communication technology (ICT) in the city. A lower indicator score is given where the ICT use is lower.

1.16.1 Calculation

Following sub-indicators need to be calculated and an average value is taken.

- Proportion of individuals using the Internet, where X is the percentage of population in the city using the Internet: $A = X/10$
- Fixed (wired)-broadband subscriptions per 100 inhabitants, where Y is the number of fixed (wired)-broadband subscriptions per 100 inhabitants in the city: $B = 10 \times Y/60$
- Wireless-broadband subscriptions per 100 inhabitants, where Z is the number of wireless-broadband subscriptions per 100 inhabitants in the city: $C = Z/10$

Therefore, the indicator is calculated as follows:

Indicator 15 = $(A + B + C)/3$

1.17 ICT use water utilities

A measure of ICT implementation at the city utility level. A lower indicator score is given where there are less ICT tools implemented. This measure is unlikely to already have a value applied. Instead, apply a self-assessment based on information from public sources (national/regional/local policy document, reports and websites of actors (e.g. water companies, cities, provincial or national authorities).

1.17.1 Calculation

The indicator is calculated as follows:

Description	Score (0-10) evaluated locally	Comments
Operation		e.g. SCADA system, energy management
Maintenance		e.g. asset management data base and GIS
Planning and design		e.g. optimisation, GIS interface
Customer service		e.g. smart metering

Final indicator is an average of the four values.

1.18 ICT use energy utilities

A measure of ICT implementation at the city utility level. A lower indicator score is given where there are less ICT tools implemented. This measure is unlikely to already have a value applied. Instead, apply a self-assessment based on information from public sources (national/regional/local policy document, reports and websites of actors (e.g. water companies, cities, provincial or national authorities).

1.18.1 Calculation

The indicator is calculated as follows:

Description	Score (0-10) evaluated locally	Comments
Operation		e.g. SCADA system, energy management
Maintenance		e.g. asset management data base and GIS
Planning and design		e.g. optimisation, GIS interface
Customer service		e.g. smart metering

Final indicator is an average of the four values.

1.19 ICT use transport

A measure of ICT implementation at the city utility level. A lower indicator score is given where there are less ICT tools implemented. This measure is unlikely to already have a value applied. Instead, apply a self-assessment based on information from public sources (national/regional/local policy document, reports and websites of actors (e.g. water companies, cities, provincial or national authorities).

1.19.1 Calculation

The indicator is calculated as follows:

Description	Score (0-10) evaluated locally	Comments
Operation		e.g. coverage of installation of road sensing terminals and traffic control in the city
Maintenance		e.g. is there ICT system for planning the road maintenance and public transport vehicles?
Planning and design		e.g. is there ICT system for planning transport infrastructure expansion and improvement?
Customer service		e.g. mobile bus tickets, online feedback forms

Final indicator is an average of the four values.

1.20 ICT use waste management

A measure of ICT implementation at the city utility level. A lower indicator score is given where there are less ICT tools implemented. This measure is unlikely to already have a value applied. Instead, apply a self-assessment based on information from public sources (national/regional/local policy document, reports and websites of actors (e.g. water companies, cities, provincial or national authorities).

1.20.1 Calculation

The indicator is calculated as follows:

Description	Score (0-10) evaluated locally	Comments
Operation		e.g. ICT system for logistics of waste collection
Maintenance		e.g. is there ICT system for the pro-active maintenance of waste collection infrastructure?
Planning and design		e.g. is there ICT system for planning future enhancements and improvement of waste infrastructure?
Customer service		e.g. smart labelling of waste bags, online feedback forms, citizen engagement

Final indicator is an average of the four values.

1.21 Digital public service

A measure of ICT implementation within public administration (percentage of Internet users that have engaged with the public administration and exchanged filled forms online) and health system. A lower indicator score is given where there are less ICT tools implemented.

1.21.1 Calculation

Following sub-indicators need to be calculated:

- Proportion of eGovernment Users, A. Percentage of individuals sending filled forms over the internet to public authorities, or contacting public authorities by e-mail or website, or obtaining information from public authorities over the internet X divided by 10: $A = X/10$
- Medical Data Exchange, B. Percentage of general practitioners using electronic networks to exchange medical data with other health care providers and professionals and to transfer prescriptions to pharmacists, Y, divided by 10: $B = Y/10$

Therefore, the indicator is calculated as follows:

$$\text{Indicator 21} = (A + B)/2$$

1.22 ICT infrastructure investment

A measure of the investment in the ICT infrastructure compared to the international range. A lower indicator score is given where the investment is lower. The infrastructure investment is an indication of the commitment to regularly invest in the transport infrastructure. Investment can be in:

- a new infrastructure
- maintaining
- and refurbishing the existing one.

1.22.1 Calculation

The indicator is calculated as follows:

$$\text{Indicator 22} = 10 \times (100 \times X/Y - 0.09) / (1.5 - 0.09)$$

Where X is the investment in the city/region in a year (values of the investment over the last 5 years should be taken and average value per year used) divided by local population of the city/region and Y is GDP per capita in the country.