

MONITORING INDICATORS

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Nareme Herrera López, Laura Asensio Martínez, Francisco García Sánchez

This document establishes a set of indicators that serve as a basis for monitoring the Adaptation Plan and is based on two basic elements:

- The set of indicators defined by the Fundación Biodiversidad for the framework of the city renaturation programme, whose purpose is to facilitate the monitoring of project progress and the evaluation of the results of the projects, as well as to establish the basis of a medium and long-term management framework to evaluate the progress of the municipality in its urban renaturation process. Several indicators of the Guide for the Measurement and Monitoring of Indicators in urban renaturation projects managed by the Fundación Biodiversidad have been incorporated as part of the Action A2 Climate Change Adaptation Plan.
- The definition of specific monitoring indicators for each of the proposed measures, guaranteeing the evaluation of the achievements obtained in terms of urban adaptation.

A Climate Change Adaptation Measures Indicator Monitoring Plan is essential to evaluate the effectiveness of the implemented actions and to adjust them as necessary. Although an Indicator Monitoring Plan is not the subject of development in this document, it has been considered advisable to establish a first list of monitoring and evaluation indicators. In a further specific development of the Indicator Monitoring Plan, the tool should contain the following components:

- The goals and targets encompassing the adaptation measures defined in this Plan provide a framework for selecting the indicators and for assessing progress towards these goals over time.
- Complementary to the indicators defined for each of the measures in this Adaptation Plan, new relevant indicators should be added to monitor the progress of the adaptation measures. Indicators should be specific, measurable, relevant, achievable and timely. They may include indicators of exposure, vulnerability, impact and adaptive capacity, among others.
- Baselines should be established as far as possible for each indicator to provide a reference point for assessing progress and determining the impact of actions.
- It is desirable to establish clear mechanisms for collecting the necessary data for the selected indicators, such as collecting existing data, implementing new monitoring systems and collaborating with different actors to obtain the required information.
- The plan should specify the frequency with which data will be collected and analysed, as well as responsibilities for monitoring each indicator. Individuals or enti-

ties responsible for collecting, analysing and reporting data should be designated. It is estimated that an annual assessment may be necessary for most indicators, although longer timeframes may be set for some indicators.

Finally, the plan should include provisions for regular reporting on the analysis and progress of the Adaptation Plan with the preparation of internal reports for decision makers, as well as communication of the results to different stakeholders, including the general public and other relevant actors.

BASELINE SENSITIVITY INDICATORS

The average municipal value (baseline) of the sensitivity indicators is presented below:

TABLE 7.1. *Base value Sensitivity Indicators (Municipal mean value)*

SENSITIVITY INDICATORS (MUNICIPALITY AVERAGE)	SENSITIVITY INDICATORS (BASELINE)
SE1-1: Percentage of population with income per consumption unit below 60% of the national median	18.70%
SE2-1: No. of dwellings <45m ² /No. of total low-income dwellings (between 20-40% of the population with incomes > 60% of the national median)	470 / 0.51%
SE2-2: Percentage of one-bedroom in low-income dwellings	0.16%
SE2-3: No. of dwellings without collective or private heating/No. of dwellings	13,515 / 14.70%
SE3-1: Unemployed population / Active population	5.80%
SE4-1: Gini index	31,006
SE5-1: Illiterate, uneducated or with first degree / Population > 15 years of age (%)	12.95%
SE6-1: Percentage of population residing outside the optimal service areas of public health facilities.	2.06%
SE6-2: Percentage of surface area outside the optimal service areas of public health centres.	42.00%
SE7-1: No. Inhabitants / km	4,792
SE8-1: Population aged >65 years/ Total Population (%)	25.73%
SE8-2: Population aged <5 years/ Total Population (%)	3.89%
SE9-1: Percentage of employed in dependent sectors/ Total Employed Population	1.21%
SE10-1: Percentage of Women	53.95%

[.../...]

Continuación **TABLE 7.1**

SENSITIVITY INDICATORS (MUNICIPALITY AVERAGE)	SENSITIVITY INDICATORS (BASELINE)
M1-1: Percentage of dwellings in pre-1940 buildings / total number of dwellings	12.63%
M2-1: % of dwellings with deficient construction quality / Total No. of dwellings	15.90%
M3-1: % dwellings in a dilapidated, bad or deficient state / Total number of dwellings	8.30%
M4-1: No. dwellings / ha	25.75
A1-1: Built-up volume / municipal area	1,267
A1-2: % Impermeable urban area / Municipal area	62.26%
A2-1: Estimated % pop affected by noise > 65 dB (FB indicator CBA-004)	22.16%
A2-2: Level of Air Pollution from Vehicular Traffic	
A3-1: Tourist Function Rate (bedplaces per 100 inhabitants)	4.85
A3-2: Socio-environmental Pressure Index in tourist areas (Mobile)	
A3-3: Tourist Function Fee for unregulated accommodation (Airbnb)	
A4-1: Surface m ² of green areas (recreational + public spaces) per inhabitant (Recreational spaces: green areas and pedestrian areas for recreation)	21.97
A5-1: % Surface area of degraded areas	7.49%
A6-1: Estimated population outside the optimal level of waste management coverage	0.,20%
A7-1: % of Buildings without energy certification or with category below class E	86.23%
A8-1: % Population >400m of public green area (or recreation space) of 0.5Ha of minimum area (CBS-002 of the FB)	3.47%
A9-1: % Estimated population without private green spaces	53.85%

Fuente: CINCc (UC) – FIC, 2024.

SPECIFIC INDICATORS FOR ADAPTATION MEASURES

BIODIVERSITY GOAL	
B1. Promote Biodiversity and soil quality for increased urban resilience	
Percentage of permeable surface area / Municipal surface area	
Percentage of permeable surface of open spaces / Total surface of open spaces	
Percentage of surface area of private green areas / Surface area of public open spaces	
Percentage of green areas in private spaces / Private non-built-up areas	
Percentage of surface area with degraded areas / Municipal surface area	
Number of invasive alien species per hectare	
River corridors and water bodies naturalised, created or restored (No., m ²)	
Surface area of Blue Infrastructure / Municipal surface area	
No. of demonstration actions of NBS solutions	
No. of communication and awareness-raising projects	
No. of knowledge transfer activities	
B2. Making urban green infrastructure an ally in the face of climate change impacts	
Percentage of species adapted to the future climate / Total municipal catalogue of species	
Length (m) (km) of urban green infrastructure for coastal protection	
Annual volume of water reused in municipal irrigation	
Percentage of adapted species / Total number of species in municipal catalogue	
Annual volume (m ³) of rainwater collected and stored	
Annual volume (m ³) of water reused for municipal irrigation / Annual volume (m ³) municipal irrigation water	
B3. Ensure the participation of society in the management of green infrastructure in the face of climate change	
Area (m ²) of coastal space threatened by loss of biodiversity	
Area (m ²) with coastal and marine restoration projects	
Identification of discharges and effluents (no.) on the coastline	
Surface area of degraded areas / Surface area of natural areas	
No. of natural areas with management and conservation plan (land stewardship)	
RESILIENT CITY GOAL	
R1. Develop tools to enable planning for a climate resilient city	
No. of sectors benefiting from the adaptation action	
GHG reduction value of the adaptation action (mitigation benefits)	
Existence of future climate analysis in urban planning	
No. of Urban Adaptation Areas identified	
Surface area (m ²) of the General System of Open Spaces destined to climatic refuges	
Identification of blue spaces	
Area of naturalised water bodies created or restored	
No. of blue spaces with ecological functions	

No. of monitoring protocols by areas or sectors of activity
No. of adaptation measures carried out or promoted by actions
No. of safety and resilience assessments of the municipal electricity system
Time to restore service in the event of grid outage or collapse
Percentage of diversification of supply sources / Degree of external dependence
Total annual agricultural area / Municipal area
Diversity and typology of organic crops / Total agricultural area
Soil organic matter level (Annual values)
No. of dwellings in unhealthy conditions / Total no. of dwellings in the municipality
R2. Reducing the impact of extreme temperatures on the urban fabric
Surface area of new naturalised areas / Areas with potential for high temperatures
No. of trees and shrubs planted in identified high temperature areas
Area of green - cool roofs / Total area of roofs in heat island zones
Area of green façades
No. of public spaces with weather protection features
No. of infrastructures and equipment for protection from rain and sunshine
Paved area with high albedo / Total paved area
Percentage of high albedo industrial roof surface in heat island areas
Length (m) of revegetated paths or trails
Percentage of the network of paths and trails with tree cover
Surface area of open spaces with protected areas / Total surface area of open spaces
No. of trees per total length of roads and footpaths in public areas
R3. Reducing the impact of extreme precipitation events on the urban fabric
No. of Sustainable Urban Drainage Systems implemented
Permeable area promoted by SUDS / Municipal permeable area
Percentage of the sewerage network of a separate nature with respect to the total
Volume (hm ³) collected by storm tanks
Percentage of permeable open spaces / Total area of open spaces
Installed area of rain gardens
Rain garden catchment area
No. of bus stops protected from wind and precipitation
No. of land use transfer projects for retrofitting
Permeable area generated with land-use transfer projects
Identified surface area of water recharge reservoirs
Annual volume (hm ³) of abstraction from recharge ponds
R4. Reducing the impact of sea level rise on the coastline
No. of buildings exposed to coastal flooding
Building area exposed to sea level rise
Area included within the security perimeter for extreme coastal events
Budget allocated to security and surveillance measures for extreme coastal events
Volume (m ³) of sediment with coastal protection capacity

R5. Be prepared with protocols for early warning and response to extreme events
No. of monitoring tools
No. of people assigned to monitoring extreme events
No. of protocols for monitoring against drought / Sector of activity
Volume (hm ³) of water stored in supplemental systems
No. of safety and resilience assessments of the municipal electricity system
Time to restore service in case of grid failure or collapse
Economic value of policy coverage for climate change-related risks
Economic amount supported by policies for climate change impacts
R6. Optimize and control water resources in a climate change scenario
No. of leaks identified and repaired
Annual volume (hm ³) of water lost in leaks / Total volume of supply water
Average consumption of water resources (l/inhab/day)
Water consumption per inhabitant and floating population
No. of public awareness events and outreach materials
Stormwater storage capacity (Volume m ³) public and private
Volume (hm ³) of rainwater directly used for municipal irrigation
Permeable surface of aquifer recharge areas / Surface area of the recharge area
HEALTH GOAL
SL1. Developing mechanisms for monitoring and tracking climate change impacts on health
No. of persons employed at the Biometeorological-Human Health Research Laboratory
No. of research and studies published by the laboratory
No. of data collection stations
Daily count of particulate matter concentration below 2.5 microns
Number of optimised Smart City sensors
Sensor coverage area
No. of vectors identified
No. of annual vector surveillance campaigns
Surface area of areas identified as sources of disease vectors
No. of inhabitants in areas at risk due to wind south
No. of people affected in hospitals depending on the frequency and duration of the events
SL2. Capacity to respond to extreme weather, minimising its effects on health
No. of people with secured access to the Early Warning System
No. of official protocols approved for the Management of extreme heat events
No. of health service staff involved in the management of heat waves
No. of protocols established for different typologies of heat pests
Volume (m ³) of water in treated open air sources and storage sites

SL3. Reduce the risk of the most sensitive population to extreme temperatures
Hourly temperature and humidity data collection in urban heat island areas
Naturalised area with green and blue infrastructure in urban heat island areas
No. of vehicle traffic management protocols in periods of intense heat (vehicles/hour)
No. of park-and-ride car areas
Proportion of use of combustion vehicles and non-polluting and non-heat emitting vehicles
Length (m) (km) of roads incorporated into the control network for extreme events
No. of hospitalisations of elderly people in periods of extreme heat
No. of programmes disseminating information on preventive activities against Heat waves
No. of people and workplaces in heat stress conditions
No. of hospitalisations per year due to extreme heat wave effects
No. of people identified as being vulnerable to heat
SL4. Reduce the negative environmental factors affecting health
No. of deaths associated with climatic processes
No. of pathologies influenced by climatic conditions
Budget for low-noise gardening equipment
No. of low noise impact gardening equipment / Total no. of equipment
Area (m ²) blue infrastructure identified as therapeutic spaces / Blue Infrastructure surface
Length (m) (km) of strategic sanitation network resized for extreme events
ADAPTED SOCIETY AND ECONOMY GOAL
SE1. Be prepared to respond to extreme events
No. of contingency plans according to sectors adjusted to expected climate variability
No. of climatic shelters
Total capacity of climatic shelters
Population coverage within 300 m and urban area of climate shelters
No. of people registered in the early warning system mobile application
No. of annual events with concentrations above the municipal response capacity
Record of exceedance of established levels
No. of events cancelled or modified by extreme weather conditions
SE2. Monitor and assess the climate change impacts on Santander
No. of extreme weather events per year
No. of climate events exceeding expected thresholds
No. of adaptation measures implemented
No. of climate adaptation experience exchange programmes participated in
No. of adaptation projects developed in coordination with other cities and regions
No. of events - congresses for the exchange of experiences held
Funds in European programmes with an impact on urban adaptation
No. of people involved in the development of the municipal body for adaptation
No. of adaptation measures managed by the municipal adaptation body annually
No. of heritage elements exposed to extreme climatic phenomena
No. of impacts suffered due to exposure to extreme events of the inventoried assets

SE3. Understanding the implications of climate change and promoting citizen participation in adaptation
No. of outreach campaigns
No. of outreach and awareness-raising materials
No. of training activities for staff in technical areas of the administration
No. of people benefiting from the transfer of knowledge on adaptation
No. of visits to the climate change web section
Average time spent browsing the climate change sections of the website
SE4. Reduce social vulnerability to climate change
Assessment of the energy performance of buildings
No. of rehabilitated dwellings
Percentage of dwellings with vulnerable people rehabilitated / Total number of vulnerable dwellings
Public funds earmarked for climate retrofitting
Total no. of people vulnerable to climate change identified annually
Percentage of elderly people living alone and receiving care from social services
Percentage of people receiving support for electricity supply
No. of people participating in the cultivation of municipal urban allotments
Total area of urban allotments / Total municipal urban population
Volume (kg) of food produced in the urban gardens / Participating people
SE5. Promote a business fabric that is prepared and adapted to climate change
No. of companies with recognised environmental certifications / No. of companies in the municipality
No. of public-private partnership agreements aimed at urban adaptation
Percentage of eligible actions with environmental benefits
Volume (Tn) of CO2 emissions avoided from the agreed adaptation measures
No. of people in the catering sector with food handling certification
No. of training and capacity building activities for professionals in the sector
SE6. Promoting sustainable and climate change adapted tourism
No. of hotel tourist establishments / Unbuilt-up area of the census section
No. of tourist beds / Population of the census section
No. of tourism promotion campaigns
No. of tourism events in low season
Funds earmarked for projects to adapt the tourism sector to climate change
Ratio of tourists over resident population
No. of extra - hotel dwellings / No. of dwellings per census section
No. of plans for tourism with climate adaptation criteria
Intensity of tourist use per hectare in vulnerable or exposed areas
No. of redefined tourism itineraries with future climate adaptation criteria
Energy efficiency in the tourism sector
No. of tourist buildings renovated and adapted to new climatic conditions
No. of cancelled or modified events due to extreme climate conditions