Mid-Term Implementation Action Plan – ÉVORA

D-WP 6 – Deliverable D.6.4

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Executive Summary	
This is the Midterm Implementation Action Plan for the city of Évora. It includes the Interventions promoted through the MCDA process; Economic analysis, Proposed funding schemes and the Ten years implementation steps.	
Keywords	Action plan, Economic analysis, Funding schemes, Implementation plan steps

Table of contents

List of Tables

Acronyms and Definitions

- CIMAC – Comunidade Intermunicipal do Alentejo Central
- CME – Câmara Municipal de Évora (*Municipality of Évora*)
- ESCO - Energy Service Company
- FCT/UNL – Faculdade de Ciências e Tecnologia - Universidade Nova de Lisboa
- GESAMB - Gestão Ambiental e de Resíduos, EIM: intermunicipal waste company
- LED - Light-emitting diode lamp
- MCDA – Multi Criteria Decision Analysis
- PEDU - Planos Estratégicos de Desenvolvimento Urbano (Strategic Urban Development Plans)
- PIAE – Parque Industrial Aeronáutico de Évora (*Aeronautical Industrial Park of Évora*)
- PITE – Parque Industrial e Tecnológico de Évora (*Industrial and Technological Park of Évora*)
- POSEUR - Programa Operacional de Sustentabilidade e Eficiência no Uso de Recursos (Operational Program for Sustainability and Efficiency in the Use of Resources)
- TIMES - The Integrated Markal-EFOM System model generator of the Energy Technology System Analysis Programme of the International Energy Agency
- TREVO – public urban transport company

1. Introduction

The measures considered in this plan were developed by the CME and FCT team. The measures result from the work carried out in WP5 with the TIMES-Évora model and the MCDA selection process. The work in WP5 provided generic, aggregated values for the measures, which were screened and analysed by the CME team in more detail in this report, making use of available information to the team.

In the WP5, using the TIMES-Évora model, the following 22 scenarios were tested, each translation a measure or combination of measures to promote sustainable energy in the city:

1. For public lighting: change luminaires with more efficient lamps (two variants of this for 2020 and 2030, i.e. PL1 and PL2[1]);
2. For residential buildings:
    a. Install solar thermal hot water panels in a share of dwellings (two variants of this for 2020 and 2030, i.e. RSD1 and RSD2);
    b. Install solar PV panel in dwellings (two variants for 2020 and 2030, i.e. RSD3 and RSD4);
    c. Retrofit 80% of residential dwellings with double glazing (RSD6);
    d. Retrofit 50% of residential dwellings with small scale insulation solutions (RSD7);
    e. Retrofit 60% of residential dwellings with walls and roofs insulation options (RSD8);
3. For waste, water and waste water treatment:
    a. Increase by 35% the share of recycled MSW after 2020 (R1);
    b. Decrease MSW production per capita in 20% from 2013 values (R2);
    c. Improve energy efficiency in water treatment plants in 50% by 2030 compared to 2009 values (R3);
    d. Improve energy efficiency in waste water treatment plant in 30% compared to 2009 by 2030 (R4);
4. For transport[2]:
    a. Promotion of cycling by extending the existing cycling lanes combined with making city bikes available from 2020 onwards (TRA1);

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[1] The code for each scenario refers to the identification codes adopted in the D-WP 5 – Deliverable D5.3 - Report on optimum sustainability pathways –ÉVORA.

[2] It must be noted that the measures TRA2 - Parking rate increase, TRA3 - Traffic restrictions and TRA4 - Speed reduction were reported in the WP3, deliverable D.3.7. Transport Scenarios Results Report Évora as not contributing to energy consumption reduction. In fact, the first two were then expected to increase slightly the energy consumption and the third are expected increase it substantially. However, during the conclusion of WP3 adjustments in previous calculations were necessary, which led to new estimates made by the partner SYSTRA. According to these estimates in fact the three measures lead to lower passenger mobility needs and thus lower energy consumption, which was considered and modelled in WP5.

    b. Duplicate parking fees in historic centre from 2020 onwards (TRA2);

    c. Interdiction of traffic for all type of vehicles, except residents, public transport and commercial vehicles, to the Évora Acropolis from 2020 onwards (TRA3);

    d. Introduce a speed limitation to 30km/h, for all vehicles in the urban area outside the historical centre from 2020 onwards (TRA4);

    e. Deploy electric vehicles up to 5% of passenger cars are electric by 2030 (TRAelc);

    f. Ensure that all busses use biofuels by 2030 (TRAbus);

    g. Construction of 3 parking lots with a total of 500 parking spaces for non-residents in the historic centre from 2020 onwards (TRA7);

    h. Implement 300 new disperse parking spaces for residents in the historic centre from 2020 onwards (TRA8);

    i. Increase busses availability in order to shift of 15% from private cars mobility to public transportation from 2020 onwards (TRA9).

Through the implementation of the MCDA analysis in WP5, these 22 scenarios/measures were ranked. The most desirable measures were identified, making use of two complementary perspectives: a) all scenarios ranked together and b) ranking of only the scenarios that are under the influence[3] of the municipality, and which are the following:

    a. Change luminaires with more efficient lamps (two variants of this for 2020 and 2030, i.e. PL1 and PL2);

    b. Increase by 35% the share of recycled MSW after 2020 (R1);

    c. Decrease MSW production per capita in 20% from 2013 values (R2);

    d. Promotion of cycling by extending the existing cycling lanes combined with making city bikes available from 2020 onwards (TRA1);

    e. Duplicate parking fees in historic centre from 2020 onwards (TRA2);

    f. Interdiction of traffic for all type of vehicles, except residents, public transport and commercial vehicles, and concerning all purposes to the Évora Acropolis from 2020 onwards (TRA3);

    g. Introduce a speed limitation to 30km/h, for all vehicles in the urban area outside the historical centre from 2020 onwards (TRA4);

    h. Ensure that all busses use biofuels by 2030 (TRAbus);

    i. Construction of 3 parking lots with a total of 500 parking spaces for non-residents in the historic centre from 2020 onwards (TRA7);

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[3] The scenarios of paragraphs b), c), h) and k) depend indirectly from the municipality. However, the municipality can contribute to achieving the realization of these targets by: promoting new population habits (waste separation) or by influencing the companies responsible by the implementation of these scenarios, either since the municipality owns part of the company or since the municipality can influence and review clauses in the service concession contracts.

   j. Implement 300 new disperse parking spaces for residents in the historic centre from 2020 onwards (TRA8).

   k. Increase busses availability in order to shift of 15% from private cars mobility to public transportation from 2020 onwards (TRA9).

Among all the scenarios, the most highly ranked consensual options in the MCDA, among the four different groups of stakeholders, were:

1. TRAelc – Shift of 5% from private cars mobility to public transportation from 2020 onwards;
2. TRAbus – All buses use biofuels in 2030[4];
3. R2 – Decrease MSW production per capita in 20% from 2013 values;
4. TRA4 – Speed limitation to 30km/h, for all vehicles in diverse zones from 2020 onwards;
5. RSD7 – Small scale insulation solutions in 50% of dwellings by 2030;
6. RSD8 – Wall & Roof insulation combined in 60% of dwellings by 2030;
7. RSD6 – Double glazing in 80% of dwellings by 2030;
8. RSD2 – Install solar thermal hot water panels in 40% of dwellings in 2030;
9. TRA2 – Duplicate parking fees in historic centre from 2020 onwards;
10. TRA3 – Interdiction for all type of vehicles and concerning all purposes to the Évora Acropolis from 2020 onwards.

Out of these, it was decided to exclude TRAelc because it is not under the direct influence of the municipality, and RSD2 for the same reason. RSD6, RSD7 and RSD8 were maintained, since there is an ongoing plan to retrofit dwellings that can closely align with these scenarios.

It was also decided to include all other transport related measures since they are under the area of direct influence of the municipality (except TRAbus and TRA9). For the same motive, it was added the public lighting measure (only the more ambitious PL2).

Finally, during the previous stages of the INSMART project, it was not possible to study in detail the energy saving possibilities regarding the municipal buildings and fleet, due to lack of detailed data. However, this is a top priority for the municipality, and thus these two measures are now introduced in the plan.

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[4] It was concluded during the TIMES modelling that this scenario will lead to an increase in energy consumption, but also to a reduction in CO_2 emissions. The reason is that more biofuel is needed to operate such buses than for conventional ones.

1.1. Interventions promoted through the MCDA process

In the next table are described all the measures included in the plan, that will be further analysed in the following section. As previously explained, in this list of measures are included: (1) all the measures promoted from the modelling and MCDA that are in the range of action of the Municipality, and (2) other measures directly dependent from the municipality that weren't considered in the modelling and MCDA (municipal buildings and fleet, financial incentives to the residents and waste collection).

Table 1 – Measures included in the Évora plan

Measure	Details
Municipal buildings	
Municipal buildings efficiency	Study in detail the several available options to reduce energy consumption in the CME municipal buildings (walls and windows isolation, warming/cooling systems, equipment, lighting, etc.)
Municipal fleet	
Municipal fleet renovation	Study in detail the several available options to reduce energy consumption in fleet and other vehicles directly managed by the municipality
Public lighting	
LED (previously PL2)	Change the light fixtures in 100% of the equipment to LED in 2030 (in 2014 LED were installed in 0,4% of the equipment)
Residential buildings	
Financial incentives (corresponding to a combination of RSD6, RSD7 and RSD8 only in the historic centre)	Review of the existing municipal programs for the private buildings renovation in the historical centre and provide access to credit schemes for residential owners, aiming to install a combination of double glazed windows, light insulation options and wall and roof insulation in at least 50% of the dwellings by 2030
Transports	
Cycle lanes (previously TRA1)	Increase length of cycle lanes - implementing the Bacelo-PITE lane with 7km length, combined with making free public bicycles available.
Parking rate increase (previously TRA2)	Double the price of parking in the historical centre (after 2020) *[today costs 0.7€/hour to 11€/day]*
Traffic restrictions (previously TRA3)	Prohibition of motorized vehicles in the acropolis of the historical centre, except for residents and shop retainers (after 2020) *[today there's no restriction]*
Speed reduction (previously TRA4)	Speed reduction in the majority of the residential area of the city – outside historical centre – to 30km/h (after 2020)
Parking lot (previously TRA7)	Increase the concentrated parking areas (3 parking lots) in the historical centre, for non-residents (500 new places after 2020) *[in 2014 there were 215 parking places for non-residents]*

Street parking (previously TRA8)	Increase the street parking places in the historical centre for residents (300 new places after 2020) *[in 2014 there were 2019 street parking places, 748 of them to residents]*
Public transport Biofuel (previously TRAbus)	Negotiate with bus company to gradually move towards having buses running exclusively on biofuels, from 2030 onwards *[in 2014 there were no buses running on biofuels]*
Public transport Frequency (previously TRA9)	Negotiate with the bus company to review the conditions of the concession with the municipality, in order to increase the frequency of public transports running between the train station and the Industrial Aeronautic Area. (PIAE).
Waste	
Waste collection (previously R1)	Public communication campaign to increase 35% the urban waste collected separately for recycling (after 2020) *[in 2014, 7% of the urban waste was collected separately to recycling – GESAMB (the waste company) predicts getting 24% until 2020]*
	Assess in more detail the benefits of installing computer management of waste collection operated by the municipal services (waste collection route planner and electronic radio devices in trash containers), aiming to reduce the energy consumption by 30% until 2020)
Waste reduction (previously R2)	Encourage behaviour changes to lower waste production (objective: reduce 20% of the waste produced *per capita* from 2013 to 2020) *[in 2013 it was 502 kg per capita]*

2. Economic Viability Analysis

2.1. Methodology

As previously described, the measures included in this plan, described in the previous section, include some that were tested using the TIMES-Évora model in WP5 and other that were not modelled, but are nonetheless considered important to the municipality.

The measures of this plan include some that are considered financial investments and others that can be seen as social/public investments. The first case refers to the measures that require capital investment and are expected to generate financial benefits to the investor (municipality). These are:

- Municipal buildings efficiency
- Municipal fleet renovation
- LED
- Parking lot
- Street parking
- Waste collection
- Waste reduction

The second case includes the measures that do not require capital investment for the municipality and/or do not generate any financial benefit to the municipality. Nonetheless, these measures in the second group generate added value, such as benefits to the public and/or to the environment, that are very hard to estimate and are not included in this document. This second group of measures may or not require capital investment, as are listed below:

- Financial incentives
- Cycle lanes
- Parking rate increase
- Traffic restrictions
- Speed reduction
- Public transport

The first group of measures justifies the realization of an economic viability analysis prior to the investment. Although, for the moment, the Municipality does not have detailed studies (engineering/architecture) concluded on those measures and there is no rigorous data to support a detailed viability analysis. A simplified study can already be made to provide some insights.

Currently ESCO's proposals are being assessed by the municipality regarding the implementation of some of the above-mentioned measures. In the proposals being made by the ESCO's the achieved energy savings will pay the ESCO service of implementing measure. In these cases, the investment will not be made by the municipality.

The following tables resume the modelling results obtained from the TIMES Évora model used by FCT during the WP5 phase. Investment costs indicated in the tables are

rough estimates made by FCT and /or CME. This data is the general economic data for the measured considered in this plan, and is the basis perspective for the analysis done in section 2.2. It should be considered with some caution, because: (i) the values are obtained from a cost-optimisation model that assumes perfect foresight and thus had an inherent drive to implement energy efficiency measures: (ii) they are a relative difference to a Baseline case (i.e a model run where the measure was not fully or at all implemented) for the year of 2030. Note that the costs for the transport related measures and for the waste related measure were not obtained from TIMES-Évora, but form estimates made by the project team (CME and FCT). More explanations on these can be found in the Deliverable 5.3 of WP5.

Table 2 - Performance of the modelled measures for all zones of Évora considered in InSmart. The energy savings and CO2 emission reduction values are a relative difference to a Baseline case in 2030 where the respective measure is not implemented obtained from the TIMES-Évora model in WP5. The financial effort was estimated via different approaches as indicated.

Code	Reduction of energy consumption in 2030 (GJ)	Reduction of CO_2 emission in 2030 (t)	Financial effort for the whole period of the investment (euros 2015)		Estimate source
			Investment	O&M	
PL2	525,08	56.163,31	4.022.638,85	66.695,35	Estimate from TIMES-Évora model
R1	692,29	64.615,98	200.000,00	n.a.	Estimate CME/FCT-NOVA
R2	950,87	89.661,35	300.000,00	n.a.	Estimate CME/FCT-NOVA
TRA1	2.958,89	197.633,11	1.190.000,00	n.a.	Estimate CME
TRA2	3.695,38	261.206,75	0	n.a.	Estimate CME
TRA3	1.617,27	109.703,48	15000	n.a.	Estimate CME
TRA4	18.340,87	1.303.332,86	20000	n.a.	Estimate CME
TRAbus	-37.399,19	2.272.947,66	1.802.422,92	333.240,49	Estimate from TIMES-Évora model
TRA7	901,77	58.467,00	7.000.000,00	n.a.	Estimate CME
TRA8	952,66	62.173,32	13.500,00	n.a.	Estimate CME
TRA9	9.217,64	657.772,23	10.000,00	n.a.	Estimate CME

n.a. – not applicable

Code	Reduction of energy consumption in 2030 due to the measure (GJ)	Reduction of CO_2 emission in 2030 (t)	Financial effort for the whole period of the investment (euros 2015)	
			Investment	O&M
RSD6 historical centre - small scale insulation	5.918,43	1.108.710,65	5.633.621,53	n.a.
RSD7 historical centre – wall and roof insulation		1.112.240,23	355.504,83	n.a.
RSD8 historical centre – double glazing		1.112.240,23	11.388.164,06	n.a.

n.a. – not applicable

The savings reflect a combination of the three measures and were modelled with TIMES-Évora. The investment costs were estimated via a survey of insulation options available in the Portuguese market and estimating its application considering the building typologies available in the historic centre, as mapped in WP1 and WP2.

2.2. Economic Viability Analysis

The economical estimated details for each measure are described below. These descriptions include the estimated capital investment, when known, as well as other type of efforts to implement the measure. For each measure, the capital investment needed was estimated in two ways: some were roughly estimated for this plan and others were estimated based on detailed studies concluded by the municipality.

It is also presented the expected savings for each measure accomplishment, expressed in energy savings. These savings were obtained in the WP5 with the model TIMES-Évora.

For the measures that are also seen as financial investments for the municipality, identified in section 2.1, it was not possible to give robust estimates for annual financial revenues resulting from the measures. The main reason for this lack of data is the inexistence of detailed engineering/architecture/urban studies that need to be done to support each measure – some of them running today but are not concluded (detailed information is provided below). Additionally, the municipality does not have decided yet on the way to realize the investments. These can include the negotiation with other institutions or companies, applying for funding schemes and/or getting loans (more information about funding is provided in section 3).

To give a better insight of the consequences of each measure, they were identified other non-financial benefits, that could help to consolidate the economic analysis and the decision when the financial data and analysis could be achieved

2.2.1 Municipal buildings efficiency

This intervention includes two types of investment:

- 1 - In the existing buildings there should be realized energy efficiency improvements. The municipality is presently conducting energy audits that should result in detailed recommendations and respective budget for each building. The municipality considers three ways to implement the recommendations that will be made by the audits: by using its own means (municipal operational services); by contracting external services; and by negotiating with a private investor (ESCO), that will be paid by the savings of energy bills for a certain period (to be negotiated). After that period the savings revert fully to the municipality.

- 2 - Some municipal services should move from a rented building to a municipal one that needs refurbishment work – this investment should be made by the municipality. The main savings are the rental costs. The investment in the current municipal building to be occupied is still under study. Specific solutions to lower the energy consumption of the building are being analysed in the on-going architecture project.

This measure was not modelled during the project, due to lack of data, and detailed descriptions of the different forms of investments are still being prepared and not available at the moment.

Economic data: Measure not modelled in InSmart. Investment and cash-flows are under study by the municipality.

2.2.2 Municipal fleet renovation

The municipal fleet is composed essentially by diesel cars, with an average of more than 10 years. The municipality plans to gradually substitute some old diesel vehicles by more efficient diesel cars or by electric ones. With this action, it is expected to reduce the fuel costs and the maintenance costs.

In 2017, the municipality has a budget of 560 000€ for new vehicles and machines (to buy two waste collection trucks, one van, working machines and cars)

Economic data: Measure not modelled in InSmart due to lack of data. Investment and cash-flows are currently being studied by the municipality.

2.2.3 LED *(previously PL2)*

This intervention is being negotiated to be realized by a private investor (ESCO), that will be paid through the savings of the energy bills for a certain period (to be negotiated). After that period the savings revert to the municipality.

Simultaneously, CIMAC (Intermunicipal Community of Alto Alentejo) promoted a detailed study to change public lighting to LED in the municipalities of the region. This study includes the conversion of existing public lighting to LED and reinforcement of lighting where needed. The study is running and there is still no conclusive data on the investment amounts and the achievable savings. The company responsible by the study has a rough estimate for an investment cost of 8400 000€ in Évora, that should be more detailed as the study continues. For the moment, it does not have estimates for the savings achievable, and thus the ones from TIMES-Évora are used.

Economic data: Measure modelled in InSmart. Detailed study should be available by the end of April 2017.

Table 4 – overview of LED measure

Municipal investment	Rough estimate: 8.400.000€ (funding modality still to decide)
Municipal estimated energy reduction	525.08GJ
Other non-financial benefits	reinforcement of lighting where needed

2.2.4 Financial incentives *(corresponding to a combination of RSD6, RSD7 and RSD8 only in the historic centre)*

The Municipality has a financing aid program for private owners of buildings in the historical centre. This main goal of this program is to contribute for the conservation of the historical centre buildings, classified by UNESCO as World Heritage, and to contribute to the comfort of the inhabitants of these old buildings, which have lower energy efficient standards and/or are deteriorated. The financial aid of the program is focused on windows, façades and roof works. This program was suspended recently.

The municipal executive wants to review this program, which is seen as an opportunity to introduce some energy efficiency improvements on the eligible refurbishment work. This review has not started yet and the InSmart scenarios RSD7, RSD7 and RSD8 should be of great value for that.

The expected financial incentive should be a special credit line for building renovation, to be made available to residential owners. The investment of the municipality will be administrative work and as such is not quantified.

Economic data: Measure modelled in InSmart in TIMES-Évora (group of three scenarios – insulating windows, walls and roofs and light insulation measures). Regulation and financial aspects of the program are to be studied by the municipality.

Table 5 – Overview of Financial incentives measure

Municipal investment	administrative work, not quantified
Private investment (potential)	5 633 600€ for double glazing; 355500€ for small scale insulation solutions; 11388 200€ for walls and roofs insulation options
Private estimated energy reduction	5 918.43GJ
Other non-financial benefits	revitalization of the historic centre

2.2.5 Cycle lanes *(previously TRA1)*

The cycle lane between Bacelo and the Historical Centre is ready to start being built. The architecture project is done and external funding approved. The expected cost is 328 875.15€ for all the works except lighting; lighting should be around 45 000€. Other cycle lanes will be studied.

The main goal of this measure is to establish a pedestrian and cycle connection of a big urban area very close to the centre of the city. Those users must travel in a busy and straight road which has no safety conditions. This measure is seen as an urbanistic investment. Due to the small distance from this area to the city centre, it is expected a shift from cars to pedestrian or cycle travels, as modelled in WP3 and WP5.

Economic data: Measure modelled in InSmart. Architecture project made by the municipality and co-funding approved in the national program PEDU.

Table 6 – Overview of Cycle lanes measure

Municipal investment	173.875.15€
PEDU financing program investment	250 000€
Private estimated energy reduction (shift to pedestrian or bicycle)	2 958.89GJ
Other non-financial benefits	Urbanistic (transport) qualification; safety and quality of the travels; reduction of energy in private daily travels

2.2.6 Parking rate increase *(previously TRA2)*

This measure consists in increasing the parking rate of the existing parking places inside the historical centre. It is essentially an administrative procedure, requiring administrative work and filed work to readjust parking machines, which will be realized by the municipal services.

The social impacts of this measure are yet to be studied, as well as the costs of the implementation. The implementation of this measure is expected to increase revenues to the municipality, but is not seen as an investment. It is considered a change in the transport policy of the city and its impacts on residents and commerce still have to be studied in detail.

Economic data: Measure modelled in InSmart in terms of energy savings (in WP3 and WP5). Social and economic aspects of the measure are to be studied by the municipality.

Table 7 – Overview of Parking rate increase measure

Municipal investment	administrative work, not quantified
Private estimated energy reduction (reduction in car travel)	3 695.38GJ
Other non-financial benefits	Quality of life improved in the historic centre

2.2.7 Traffic restrictions *(previously TRA3)*

Some of the streets of the acropolis area (the centre of the historical centre and where the most important monuments are) are already only pedestrian. With this measure, it is intended to enlarge this restriction to motorized traffic to all the acropolis area.

The expected works are essentially administrative and traffic signs substitution, which should be realized by the municipal services.

The traffic flow, social and commercial impacts of this measure are yet to be studied, as well as the costs of the implementation. The main expectation with the implementation of this measure is to bring social dynamism (residence and commerce) to the urban centre. It is not seen as a financial investment.

Economic data: Measure modelled in InSmart regarding energy savings (in WP3 and WP5). Social and economic aspects of the program are to be studied by the municipality.

Municipal investment	administrative work, not quantified, and traffic signs change, roughly estimated in 15.000€
Private estimated energy reduction (reduction in car travel energy)	1 617.27GJ
Other non-financial benefits	Quality of life improved in the historic centre

2.2.8 Speed reduction *(previously TRA4)*

This scenario represents a speed reduction in great part of the residential area of the city, outside historical centre, from 50 to 30km/h. With this measure, it is intended to promote an energy consumption reduction. Other benefit considered with this measure is the increase of safety and urban quality for pedestrians and cyclists.

This measure was analysed from the point of view of energy consumption, but other expected effects from this measure are still to be studied, such as social acceptance.

The expected works are essentially administrative and traffic signs substitution, which should be realized by the municipal services.

Economic data: Measure modelled in InSmart (in WP3 and WP5). Social and mode detailed impact in traffic flow effects should be further studied by the municipality.

Table 9 – Overview of Speed reduction measure

Municipal investment	administrative work, not quantified, and traffic signs change, roughly estimated in 20 000€
Private estimated energy reduction (reduction in car travel energy consumption)	18 340.87GJ
Other non-financial benefits	Safety and urban quality improved in the city

2.2.9 Parking lot *(previously TRA7)*

This measure consists in constructing 3 parking lots in the historical centre of Évora, offering 500 new places for non-residents. This scenario was tested with the premise that these parking lots should be inside the city centre.

Today, the municipality has identified several spots in the historical centre where such parking lots could be constructed. It is a scenario yet to explore because there are not

conclusive studies available, including archaeology, architecture/engineering and financial.

For the moment, it was estimated a possible cost of construction, which is a very rough estimate, considering that there is not even a selection of places to study these constructions in detail yet. At this moment, this measure is seen only as a strategic guideline by the municipality, due to the big uncertainty of the technical aspects regarding the construction, that require further studies.

There is also the intention of the Municipality to revert to public use an existing parking lot currently ceded to the use of the University of Évora, inside the city centre, and to improve another existing park managed by the municipality.

Economic data: Measure modelled in InSmart (in WP3 and WP5). Requires further detailed technical studies, to be made by the municipality, to better assess the measure.

Table 10 – Overview of parking lot measure

Municipal investment	Study, project and construction investment. The construction was roughly estimated in 7 000 000€
Municipal returns (parking fees)	Not studied
Private estimated energy reduction (reduction in car travel)	901.77 GJ
Other non-financial benefits	Hypothetical impact on city centre residents and workers, and on tourism, still to be studied

2.2.10 Street parking *(previously TRA8)*

This measure consists in increasing the parking places in the historical centre streets, offering 300 new places for non-residents. The expected works are traffic sign changes, occasional pavement adjustments to new definitions of street and sidewalk areas, and administrative work, both expected to be done by the municipal services.

The municipality does not have a detailed study for this measure, but it was estimate that, according to the number of street park places and the available spaces, it could be possible to create 300 new places.

This scenario was tested and, within WP5, was roughly estimated a cost of 13 500€ for the works. This includes sign change, but does not include specific pavement works and administrative work.

This measure will generate some revenues for the municipality, since residents have to pay an annual fee to park inside the historic centre, but the revenues were not estimated. This measure can be seen as a financial investment, but is manly faced as a strategic

urbanistic measure, that will increase the quality of living of the residents and could attract new residents to the historic centre.

Economic data: Measure modelled in InSmart (in WP3 and WP5). Needs a further detailed urbanistic plan to start the implementation.

Table 11 – Overview of street parking measure

Municipal investment	Study and construction investment to be done by the municipal services. The sign change was roughly estimated in 13 500€
Municipal returns (parking fees)	Not studied
Private estimated energy reduction (reduction in car travel)	952.66 GJ
Other non-financial benefits	Urban quality improved in the city centre

2.2.11 Public transport – Biofuel *(previously TRAbus)*

The urban public transport is operated by the company TREVO, with which the Municipality established a concession contract. Currently, all buses of the company are running on diesel. This scenario represents a gradual change of the diesel fleet to a biofuel fleet. To do so, the municipality should negotiate with TREVO new service conditions, including the change of buses. At the moment, the negotiation has not started and there is no counterpart estimated for the company, to make this investment.

The implementation of this measure will be considered at the next review of the concession agreement.

Economic data: This scenario was modelled in InSmart (WP3 and WP5). The economic details need to be negotiated with TREVO.

Table 12 – Overview of Biofuel buses measure

Municipal investment	Administrative work for negotiation and financial compensation for TREVO to do the investment
TREVO investment	1 802 400€ (rough estimate to buying new biodiesel buses)
TREVO estimated energy reduction	-37 399.19 GJ (biodiesel buses consume more energy)
Other non-financial benefits	Urban quality improved in the city

2.2.12 Public transport – Frequency *(previously TRA9)*

The Industrial Aeronautic Area (PIAE) is a new and fast growing industrial area. Many of the workers live outside Évora and travel daily for the factories to work. They could travel by train and get an urban bus to get to the factories, but the frequency and time schedules of buses are not adjusted to the trains and worktime schedules.

This scenario represents the negotiation with TREVO, the urban public transport operating in Évora with a concession agreement with the Municipality, in order to increase the frequency of public transports running between the train station and the PIAE. This would facilitate the travels of the outside workers by public transports.

Economic data: This scenario was modelled in InSmart (WP3 and WP5). The economic details need to be negotiated with TREVO.

<div align="center">

Table 13 – Overview of Frequency of buses measure

</div>

Municipal investment	Administrative work for negotiation and financial compensation for TREVO to implement this action
TREVO investment	10 000€
Private estimated energy reduction (reduction in car travel)	9 217.64 GJ
Other non-financial benefits	Urban quality improved in the city

2.2.13 Waste collection *(previously R1)*

This intervention includes two types of investment:

- 1 - Realizing a public communication campaign to increase 35% the urban waste collected separately for recycling.

- 2 - Assess in more detail the benefits of installing computer management of waste collection operated by the municipal services (waste collection route planner and electronic radio devices in trash containers), aiming to reduce the energy consumption by 30%.

The waste management in Évora is done by the municipality and by the company GESAMB. This company collects the separated waste from specific containers and manages the landfill. The municipality collects the unseparated waste and pays for its deposit in the landfill.

The two actions of this measure have environmental positive impacts: separate waste collection increased efficiency and reduction of CO_2 emitted by the waste trucks. Furthermore, these actions may have a positive financial impact to the municipality. The

first action should increase the urban waste separation for recycling, that will lower the cost for collection and deposit to the municipality. The second action should increase the waste collection efficiency and then reduce its cost.

This effect of improving energy efficiency in waste collection was modelled in WP5, but not the effect of implementing computer management schemes, due to lack of data.

Economic data: Measure modelled in InSmart, assumption of the FCT and CME team. The assessment of a computer management waste system in Évora should be made by the municipality services.

<div align="center">Table 14 – Overview of Waste collection measure</div>

Municipal investment	200 000€ (rough estimate for a public communication plan to increase waste separation for recycling)
Municipal returns	692.29 GJ saved energy
Other non-financial benefits	Lower CO2 emissions in waste collection

2.2.14 Waste reduction *(previously R2)*

This measure consists in a public campaign to encourage the reduction of waste produced by the community, to reduce 20% of the waste produced *per capita* from 2013 to 2020. This is a more ambitious goal than the previous measure 2.2.13, since this one is considered more difficult to attain but with better results, both environmental and financial. It is also considered by the municipality more urgent to implement.

The financial positive impacts are the eventual downsizing of the waste collection systems (municipality and GESAMB) and the reduced costs for recycling and to deposit at the landfill.

The accomplishment of the goal of this measure would represent a decrease of 27.800tons of waste produced.

Economic data: Measure modelled in InSmart in WP5, investment costs are rough assumption from FCT and CME teams.

Table 15 – Overview of waste reduction measure

Municipal investment	300 000€ (rough estimate for a public communication campaign to lower the production of waste)
Municipal returns	950.87 GJ saved energy
Other non-financial benefits	Lower CO_2 emissions in waste collection; downsizing the waste treatment by GESAMB

3. Proposed funding schemes

3.1. Available funding schemes

The funding schemes available in Portugal for sustainability, development and climate mitigation existing in Portugal are the following:

1. Portugal 2020 as part of the European Regional Development Funds;
2. National Energy Efficiency Fund;
3. European Union LIFE Programme;
4. JESSICA Holding Fund Portugal;
5. ELENA mechanism;
6. ESCO's and Energy performance contracting.

The **Portugal 2020 programme** is part of the European Regional Development Funds programme. Within Portugal 2020, the financing lines more suited for the measures of the Évora Sustainable Energy Plan are:

- POSEUR - Programa Operacional de Sustentabilidade e Eficiência no Uso de Recursos (*Operational Program for Sustainability and Efficiency in the Use of Resources*);
- PEDU - Planos Estratégicos de Desenvolvimento Urbano (*Strategic Urban Development Plans*);
- Alentejo 2020 (*Regional Development Plan for the Alentejo Region).*

Besides Portugal 2020 funding, there are other national funding possibilities, in particular the **Energy Efficiency Fund (FEE)** implemented through the Decree Law no. 50/2010 with the goal of financing measures considered in the National Energy Efficiency Action Plan (NEAP). This possibility is relevant for retrofitting some households and for improvement in public buildings.

Regarding, European financing possibilities, the following were identified:

- **LIFE EU environment program**; which is a co-financing European programme aiming to "supporting environmental, nature conservation and climate action projects throughout the EU";
- **JESSICA - Joint European Support for Sustainable Investment in City Areas,** was developed by the European Commission in collaboration with the European Investment Bank (EIB), and the Council of Europe Development Bank (CEB). JESSICA is a new way of using existing Structural Fund grant allocations to support urban development projects, and thus should be considered jointly with some of the Portugal 2020 funding. In Portugal, the JESSICA Urban Development Fund is operated with the following financial institutions: Banco BPI, CGD and Turismo de Portugal. JESSICA's operation requires an integrated approach and the funds could be targeted specifically at projects promoting urban rehabilitation, energy efficiency and renewable energy.

- **ELENA – European Local ENergy Assistance**, which is a technical assistance mechanism run by the European Investment Bank (EIB) and supporting regional/municipal authorities to accelerate investment plans on energy efficiency and renewable energy. ELENA is funded through the European Commission's Horizon 2020 programme, and covers up to 90% of the technical support cost needed to prepare the investment programme for implementation and financing, including feasibility and market studies, programme structuring, energy audits and tendering procedure preparation.

Finally, **ESCO's services** and to a less extent, **Energy Performance Contracting**, is becoming more and more common in Portugal. ESCO's are offering to the municipalities to implement some of the energy efficiency measures (in particular regarding public lighting) which is in study in Évora.

3.2. Proposed funding approach

This plan is written when the municipality of Évora was recognized as *municipality in structural financial imbalance*, and as such is under national government financial aid. In this context, the municipality has severe limitations on new investments and on requesting new loans.

The financial solutions used recently by the municipality involve accessing fund schemes that ensure the major part of the investment or finding private investors willing to invest on energy savings in municipal systems (e.g. ESCO's) which finance the implementation of a measure and are paid through the savings obtained for a certain period of time.

The investment solutions identified and/or still under study for the measures of this plan are explained in detail in section 2.2.

4. Ten years' implementation plan steps

To better detail the implementation of this plan, the next tables details about the timing, engaged resourced and monitoring.

4.1. Timing implementation

To classify the timing of each measure, it was considered a ten-year period divided in three steps: immediate 1-2 year, intermediate 3-5 years, further ahead 6-10 years. More immediate timing means that this is also considered with a higher priority for the Municipality.

Table 16- Timing of implementation

Interventions:	TIMING		
	Immediate (1-2 years)	Intermediate (3-5 years)	Further ahead (6-10 years)
Municipal buildings efficiency	X		
Municipal fleet renovation		X	
LED	X		
Financial incentives	X		
Cycle ways	X		
Parking rate increase			X
Traffic restrictions			X
Speed reduction			X
Parking lot		X	
Street parking		X	
Public transport		X	
Waste collection		X	
Waste reduction	X		

4.2. Engaged resources

The engaged resources information is described in the next table. Much of the measures resources are in study or are to study. Details about each measure are provided in section 2.2.

Table 17 – Resources allocated to the plan

Interventions	RESOURCES		
	Investment Costs covered by the Municipality	Municipality Staff Engagement	Costs external to the municipality
Municipal buildings efficiency	Under study	Municipality financial services	Under study
Municipal fleet renovation	Under study	Municipality financial services	Under study
LED	Under study	Municipality financial service	Under study
Financial incentives	Under study	Municipality financial services	Under study
Cycle ways	123.875,15€	Municipality transport service	250.000€ (PEDU)
Parking rate increase	0€	Municipality transport service	0€
Traffic restrictions	To be studied	Municipality transport service	To be studied
Speed reduction	To be studied	Municipality transport service	To be studied
Parking lot	To be studied	Municipality transport service	To be studied
Street parking	To be studied	Municipality transport service	To be studied
Public transport	To be studied	Municipality transport service	To be studied
Waste collection	To be studied	Municipality cleaning service	To be studied
Waste reduction	To be studied	Municipality cleaning service	To be studied

4.3. Monitoring

In the next tables are listed the Key Performance Indicators (KPI) that can be used to monitor the plan's implementation. The sources of information are the several municipal services, including the municipal financial and operational departments. The suggested monitoring frequency is annual.

The indicators selected for monitoring the implementation of the sustainable energy implementation plan in Évora are presented in the following tables.

Table 18 – Évora InSmart KPI

SECTORS	KPI	Unit
Energy		
Transport	Variation of FEC	GJ
	FEC per capita	J/inhab
Residential Buildings	Variation of FEC	GJ
	FEC per capita	J/inhab
Public Buildings	Variation of FEC	GJ
	Energy intensity	J/public employers
Public Lighting	Variation of FEC	GJ
	Share of LED over total lighting	%
Waste services	Variation of FEC in waste systems	GJ
	FEC per capita	J/inhab
INTEGRATED CITY	Variation of TPEC	GJ
	New PV Installed Capacity in roof tops	MW
	New Utility scale PV Installed Capacity	MW
Climate		
Transport	Variation of GHG emissions in transport	tCO2e
Residential Buildings	Variation of GHG emissions in residential buildings	tCO2e
	Average household carbon intensity	kgCO2/household
Public Buildings	Variation of GHG emissions in public buildings	tCO2e
	Average buildings carbon intensity	kgCO2/m2
Public Lighting	Average carbon intensity	
Waste services	Variation of GHG emissions in waste systems	tCO2e
	Average carbon intensity	kgCO2/inhab
INTEGRATED CITY	Variation of GHG emissions	% change from base-year
	Emissions per capita	tCO2e/inhab

SECTORS	KPI	Unit
	Total GHG emissions	tCO2e
Financial		
Transport	Investment in Transport measures	M€
Public Buildings	Investment in public buildings measures	M€
Public Lighting	Investment in public lighting measures	M€
Waste services	Investment in sectoral measures	M€
Other		
Transport	Extension of bike lanes	km
	Public bikes	No.
	EV charging points	No.
	New parking lots	No.
Public Buildings	Zero Energy Buildings	No
Public Lighting	New automated management	No.
Waste services	Variation of waste production	t
	Variation of recycling rate	% from base year