D9.6 Impact assessment for the remaining 20 Member States

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The objective of deliverable 9.6 is to evaluate the replication potential of the SINFONIA approach in the 20 European countries that have not been represented in the project as pilot cities (Austria and Italy) or as Early Adopter Cities (Cyprus, France, Germany, Spain and Sweden).

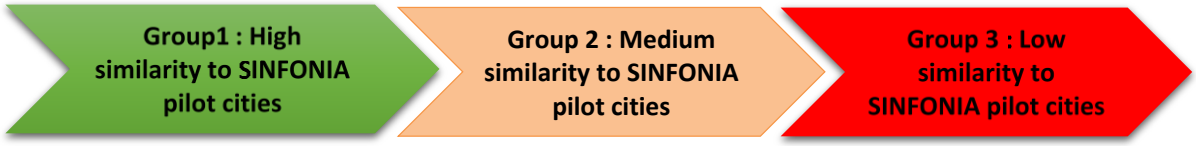
The main output of the SINFONIA project is the "district template" approach: a comprehensive interdisciplinary **refurbished city district model** for middle-sized European cities, which objective is to facilitate the implementation and replication of large-scale refurbishment plans by providing **optimal retrofitting solution for each type of district**.

District model analysed in the project answers mainly to the retrofitting need of pilot cities, Innsbruck and Bolzano, located in Austria and Italy. Both cities, however, are fully representative of a medium-size city in Europe and of their energy needs and constitute thus a sound foundation to replication actions. With the aim to identify the countries that can benefit the most form the SINFONIA approach, we have conducted a classification of the 25 remaining countries according to their **"distance"** to the reference situation. This distance was assessed based on a comparison of key characteristics of each city in comparison to the pilot cities.

Five dimensions have been analysed to elaborate this classification:

1. National policies and regulation, as a contextual parameter impacting energy retrofit at city, district or building scales
2. Sociological features about eco-innovation, referring to the readiness of citizens with regard to energy transition
3. Urban profile as a composite index characterizing the residential building stock in urban areas of the country
4. Energy price, as a global driver ruling energy refurbishment (and more generally energy transition) economics
5. Climate zone, since directly impacting the energy needs and the type of solutions among the SINFONIA portfolio of options.

According to these criteria, the 25 countries have been classified according to their 'distance to the two reference cities Innsbruck and Bolzano' in three groups:



PROXIMITY SCALE TO SINFONIA PILOT CITIES

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- **Group 1: High similarity to SINFONIA pilot cities**

  These countries are "near" to the pilot cities and can apply all the measures developed in the SINFONIA project: good practices, technical specifications, energy/environment simulation tools and socio-economic tools. As a result, 12 countries are classified in this group.

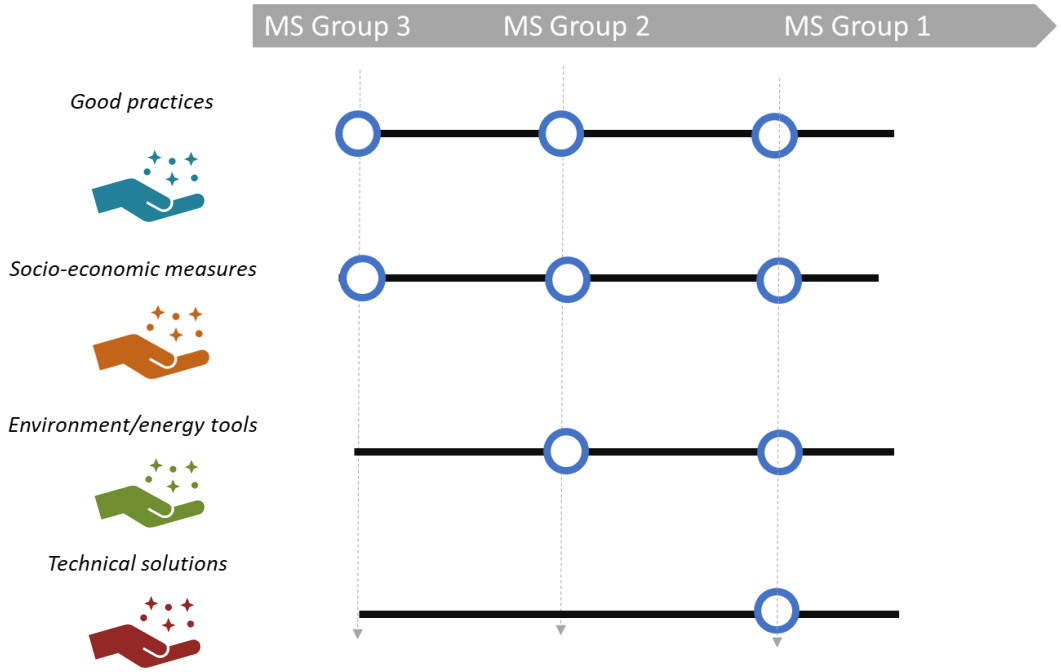
- **Group 2: Medium similarity to SINFONIA pilot cities**

  These countries are "farther" to the pilots' characteristics the than previous group from the reference situation because their energy price is lower than European average and their climate is similar to the pilot cities only in part of their territory. These countries cannot fully benefit from all the SINFONIA measures. They however can apply the specifications and environmental simulation tools partially and they can make use of the "soft measures" (good practices and socio-economic tools). 10 countries are classified in this group.

- **Group 3: Low similarity to SINFONIA pilot cities**

  These countries are the ones with less similarities to the pilot cities, highlighting the different climate zones and fewer national support measures for energy retrofitting initiatives. Cities in these countries can mainly benefit from the "soft measures" developed in the SINFONIA project. 3 countries are classified in this group.

As main conclusion of the replicability assessment, we can see that SINFONIA approach can be fully developed in 11 European countries, contributing to their energy/environmental objectives to reduce CO2 emissions and energy consumption through different technologies and decision-making tools. Therefore, the potential impact of the "district template" approach could be applied in almost half of the European countries, while the soft measures can support and benefit cities from all the European countries.



REPLICABILITY OF SINFONIA RESULTS

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1. INTRODUCTION

1.1 OBJECTIVE OF DELIVERABLE 9.6

The objective of SINFONIA work package 9 is to evaluate the long-term impact of the district retrofitting model developed in the project, beyond the demonstrations implemented in the framework of SINFONIA (specific districts located in Innsbruck (Austria) and Bolzano (Italy)), analysing the replication potential of this approach at city level, at country level and finally at European level.

Within this WP, the aim of task 9.8 is to evaluate the impact of the district retrofitting approach tested by SINFONIA project at European level, considering the replication potential of this approach in the different climate zones and regulatory regimes of the EC.

The results, technologies, tools and measures tested in the SINFONIA project have been implemented in some specific climate zones and under concrete regulatory regimes. The energy needs faced by both pilot cities are highly influenced by these two parameters, but other factors play also a role such as the sociological profile of citizens, the characteristics of the urban stock, and more generally the energy market conditions. Any replication of the SINFONIA approach initiated and demonstrated in the two pilot cities and pursued through proof-testing in the five early adopter cities requires an analysis of the boundary conditions of a city, including all these aspects.

A replication methodology was thus needed to validate the relevance of deriving the results obtained at two plus five local contexts and to guide any replication action.

1.2 OBJECTIVE OF WP9

This deliverable is the final document for WP 9 “Economic impact and EU-wide integrated assessment of replication potential of smart district template”, which aims at evaluating the long term economic, environmental and social impacts of the demonstrations implemented in Innsbruck and Bolzano, and assessing the replication potential of the district template model in the seven European countries participating in the project to finally evaluate the replication potential of the model in Europe.

Hence, the impact assessment process developed in this work package has grown from the small scale (city district level) to the large scale (EU level) through the different tasks and outputs:

- **District level**: Task 9.2 and 9.3: in these tasks, economic and environmental impacts of the building retrofitting and district heating developing have been calculated.
  - Deliverable 9.2 offers calculations of pay-back periods and Internal Rate of Return (IRR) of the investment in buildings (deep energy renovation) and district heating. These calculations show that, as expected, pay-back periods are long (more than 25 years), and therefore alternative funding sources are needed.
  - Deliverable 9.3 offers a calculation of the environmental impact of buildings’ deep renovation works and deployment of district heating in both pilot cities. The environmental impact analysis shows a remarkable decrease of the Global warming potential of both districts.

- **City level:** in task 9.4 and 9.5, the SINFONIA consortium has simulated the environmental and economic impact of the district template approach in Innsbruck and Bolzano. This simulation has been also implemented for the Early Adopter Cities (task 9.6) by using the CROCUS tool: a specific tool developed by DOWEL in the SINFONIA project. Deliverable 9.4 gather these

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simulations at city level, focusing on the potential reduction on CO2 emissions and energy savings, and calculating the pay-back periods and IRR for different districts in each city.

- **Country level:** task 9.7 aims at evaluating the replication potential of the district template approach at country level, and more specifically in each of the countries participating in the project: Austria, Cyprus, France, Germany, Italy, Spain and Sweden. The calculation or simulation of the potential environmental and economic impact in each country has been not possible to calculate due to the difficulty to move from the city scale to the country scale: the size of the sample (5-7 cities in each country) is not representative enough to build a consistent extrapolation at country level.

  Taking this difficulty into account, the consortium re-oriented this task to evaluate the readiness level of each country to adapt the SINFONIA approach. This process shows that all the mentioned countries can benefit from SINFONIA solutions, either completely or partially, concluding that SINFONIA project results can support cities in those countries to plan and implement energy retrofitting project.

- **EU level:** the final step of the process, developed under task 9.8, has been the evaluation of the replication potential of the district template approach in the remaining 20 European countries.

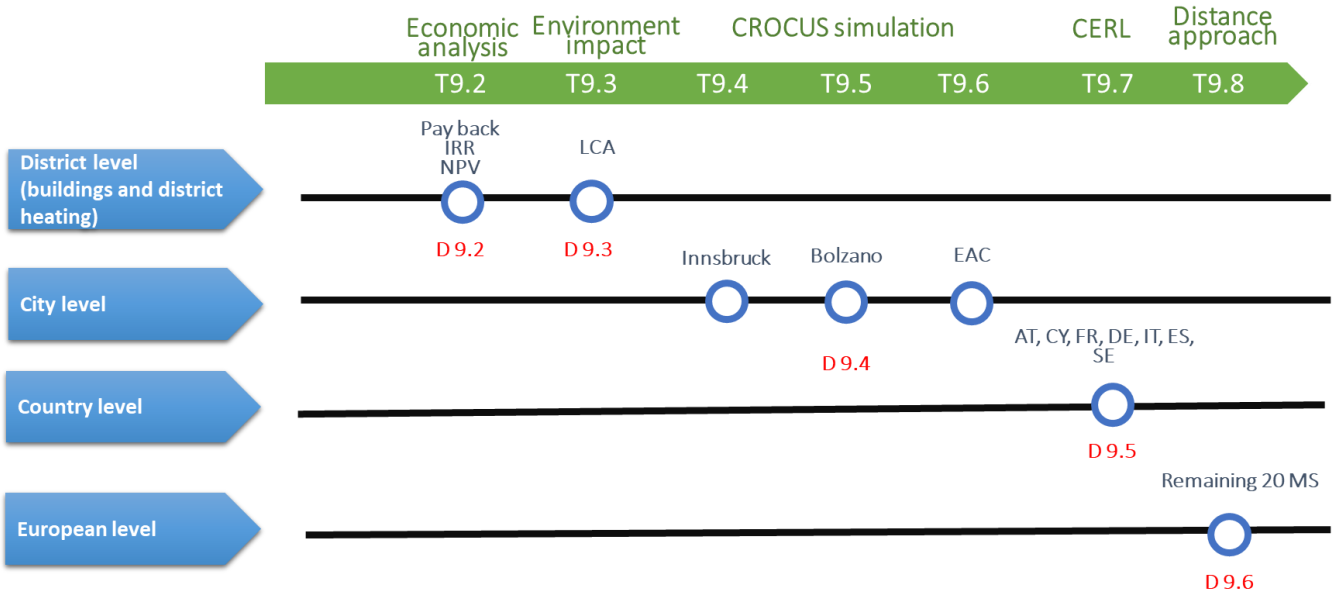

FIGURE 1: IMPACT AND REPLICATION ASSESSMENT IN WP9

1.3 TARGET GROUPS

This report aims to be useful for the following stakeholders:

- Cities with similar climatic conditions as the EAC located in the Member State or in a sister country
- Cities with recent refurbishment actions in order to assess the impact. If not, with refurbishment plans or intentions as a back-up solution
- Cities that have measured the impact of refurbishment actions
- Cities that have been involved in EU projects
- Cities planning future retrofitting projects

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1.4 SINFONIA APPROACH

Since the evaluation process explained in this deliverable wants to show the replication potential of the so called "SINFONIA approach", an explanation on this concept needs to be further explained in this section.

The SINFONIA's overarching goal is to validate a comprehensive interdisciplinary **refurbished city district model** for middle-sized European cities. The SINFONIA model or approach must have a built-in potential for scalability and replication, showing that innovative integrated energy system approach can lead to **optimal districts that combine energy efficiency and CO2 abatement**. The project brought together already planned/started actions on achieving district refurbishments in a coherent and comprehensive way, demonstrating that smart technology integration practices make political, economic and social sense. SINFONIA is about to improve the quality of life in Austria and in Italy together with the early adopting Cypriot, French, German, Spanish and Swedish cities which all share the ambitious vision for becoming the trademark of: "**S**mart **IN**itiative of cities **F**ully c**O**mmitted to i**N**vest **I**n **A**dvanced large-scaled energy solutions" (SINFONIA)**.**

The success of SINFONIA lies in demonstrating practical solutions to districts' needs which are realized and implemented innovatively with a readily clear potential for replication throughout Europe. SINFONIA includes a variety of building ages, both constructed between the 1950s and 80s (in most EU countries, half of the residential stock was built before 1970) and at the beginning of the 20th century: **it shows how the energy performance of all buildings can be improved significantly**. The project designed and implemented technical interventions suited to meet the need of the existing urban infrastructure, which set the grounds of the overall smart district concept. SINFONIA developed and validated instruments, procedures and tools to overcome administrative, social and economic barriers related to such technical interventions, like for instance the ones observed for the integration of a large share of energy generated from renewable sources.

Hence, going more into detail to the concept of "district template" its objective is to facilitate the implementation and replication of large-scale refurbishment plans by providing **optimal retrofitting solution for each type of district**. This is a main point of the SINFONIA project.

1.5 OUTLINE OF THE REPORT

This deliverable offers a description of the evaluation process developed and implemented within task 9.8 to calculate the potential replication of the SINFONIA approach in other countries. After the description, the document shows the classification of the European countries, according to their similarities to pilot cities, and gives some guidelines on the use of the most adequate SINFONIA measures depending on the classification of the country. Based on the similarity degree to the two pilot cities, the targeted city could benefit from the full range of SINFONIA results or from the so-called 'soft measures', e.g. the recommendations for implementation, lesson learnt and best practice. Finally, the document gathers conclusions and lessons learnt in the process.

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2. EVALUATION PROCESS

The main objective of the evaluation process implemented as part of the task 9.8 of the SINFONIA project is to analyse the replicability of the "district template" approach at European level. Therefore, this analysis has focused on evaluating the similarities of other European countries and its cities with both pilot cities that have tested the energy retrofitting solutions developed in the project. In order to evaluate the potential replicability of the SINFONIA approach in other cities/countries in Europe, a "distance approach" has been developed, being the two pilot cities the "reference situation".

2.1 EVALUATION METHODOLOGY: DISTANCE APPROACH

SINFONIA partners have designed a specific methodology, based on the "distance approach" to evaluate the replication potential of the SINFONIA solutions. The first approach for this replicability evaluation was the calculation of economic and environmental impacts in the remaining countries following an extrapolation process. This approach, however not feasible due to the lack of data available at city level: data from simulations done in the two pilot cities and EACs is not representative enough to develop a consistent extrapolation at country level, and there it is insufficient to extrapolate the impact at EU level.

Another barrier to implement the first approach is the lack of homogenised data of cities in Europe. The quantity and quality of data available on energy efficiency projects in cities is not enough to base an extrapolation process on it.

Therefore, and as alternative, we have focus on analysing the "enabling" characteristics of the remaining European countries in order to benefit from the SINFONIA approach. The impact of SINFONIA measures is not evaluated based on potential economic or environmental parameters. This impact is measured based on its replicability potential: how many countries at EU level van benefit or can adopt the district template approach?

Following this line, we have identified the main energy and city-related characteristics of pilot cities and then analysed the rest of the countries based on this "reference" characteristics. To calculate the "distance" to the reference situation, **six dimensions** have been identified as key parameters to measure the similarity of a certain country with the pilot cities and evaluate the potential of making full use of the technologies and tools tested in SINFONIA:

1. **National Policies and Regulations**: national support is key for cities who want to undertake retrofitting projects. This support may be facilitated in the form of national strategic funds, setting some mandatory requirements for energy efficiency, or in the form specific funding lines or fiscal incentives. Within this dimension, 7 parameters have been analysed:

Id	Value	Criterion	Application	Impact
A – seven parameters for national policies and regulation				
A1	Y/N	Existence of a climate protection initiative or plan published by the country by end of 2019 (NCEP) or for a Sustainable Growth	MS	High
A2	Y/N	Support to EE measures: non fiscal incentives - investment	MS	High
A3	Y/N	Support to EE measures: non fiscal incentives – energy savings certificates / white certificate	MS	High

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A4	Y/N	Support to EE measures: non fiscal incentives – Heat Fund or National Energy Efficiency Fund	MS	High
A5	Y/N	Support to EE measures: fiscal incentives (on energy or on CO2	MS	High
A6	Y/N	Support to EE measures: Building codes for renovation	MS	High

2. **Sociological features related to eco-initiatives:** The implementation of retrofitting projects needs to have social support in order to be effective, both to be effective after the deployment of technical measure and to foster the acceptance of the public expenditure and temporary inconveniences related to retrofitting projects.

Id	Value	Criterion	Application	Impact
S – Sociological features related to eco-initiatives				
S1	Index	Energy mindset of citizens in the country	MS	Medium
S2	Index	Cultural background for pushing citizen-centered initiatives	MS	Modulating factor

3. **Urban profile.** SINFONIA project has been specifically tested in medium-sized European cities, in districts were most of the building were constructed before 1970. Countries with a higher number of cities meeting these characteristics are more likely to take the biggest benefit from the SINFONIA solutions.

Id	Value	Criterion	Application	Impact
U – five parameters for characterizing the urban profile of the country				
U1	Nb.	Number of medium-size cities in the country (50 k to 250 k)	Boundary condition	High
U2	Nb.	Number of smart cities in the country	MS (Low)	Modulating factor
U3	Split in %	Profile of the building stock in the country (breakdown per age): focus on residential buildings	Boundary condition	High
U4	% decrease (2000-2015)	Progress in energy use and energy efficiency in residential (Odyssee-Mure)	Boundary condition	High

4. **Energy exogenous parameters.** Price of energy is another key parameter when calculating the pay-back period of the investment in energy retrofitting (see deliverable 9.2). High energy prices shorten significantly the pay-back period of the investment, and hence, countries with higher energy prices would be more benefitted of the retrofitting projects in economic terms, at least in the short term.

Id	Value	Criterion	Application	Impact
E - Energy exogeneous parameters				
E1	Value	Price of energy for households (gas)	Exoge-neous	High
E2	Value	Price of energy for households (electricity)		High

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E3	Value	Price of CO2		High

5. **Climate zones.** Both pilot cities are located in the Alpine Climate zone. Therefore, countries with this climate, or similar (cold winters) will be more benefited from solutions developed/tested in SINFONIA.

Id	Value	Criterion	Application	Impact
Z – Climatic zones: 6 zones from Z1 to Z6				
Z	Z1	Mediterranean climate area	Boundary condition	Medium
	Z2	Atlantic climate area		High
	Z3	Continental climate area		High
	Z4	Boreal climate area		High
	Z5	Alpine climate area		High
	Z6	Pannonian climate area		High

6. **Availability of data in cities.** The availability of detailed data about building stocks in cities is also key for a better decision-making process, which is essential for the future success of retrofitting projects. This parameter, however, has not been evaluated at European scale due to its complexity. This exercise has been duly developed in the deliverable 9.5, under the de CERL (cities energy readiness level) evaluation.

After agreeing on the main dimensions to be considered, we have collected and processed data to understand the situation of each parameters in each European country.

Based on this information, each country has been classified according to the "proximity" to both pilot cities in each of the dimension:

- 1: equal or very similar to pilot cities
- 2: similar in some parameters but different in others
- 3: completely different from pilot cities.

Once all the dimensions have been evaluated, each country has been classified according to the "distance", giving 1 point if the dimension is classified as "1". In the final classification, the consortium has decided to give more importance to the similarities in climate, as many SINFONIA solutions are efficient mainly in cold climates. Therefore, the climate zone dimension has been multiplied by 1,5 (instead of 1) to calculate the final evaluation for each country.

As a result of the evaluation, countries have been classified according to the overall distance to the reference situation in pilot cities:

- GROUP 1: very close to pilot cities (highest score)
- GROUP 2: some similarities with pilot cities, but some relevant differences
- GROUP 3: different or far from pilot cities in almost all the dimensions (lowest score)

2.2 COLLECTION OF DATA

The following initiatives and documents have been the sources for the evaluation process:

- Building stock: EU Building Stock Observatory (EU Open Data Portal), Eurostats.
- National plans: National Energy Efficiency Action Plans (NEEAPs), National Energy & Climate Plans (NECP).

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- Implementation of national plans: annual progress reports of National Energy Efficiency Action Plans (NEEAPs), progress reports of the Directive 2012/27/EU, Odyssee-Mure (monitoring of efficiency trends and policy evaluation in EU countries).
- Institutional studies and info systems (EU level): Smart city info system studies, European Innovation Partnership on Smart Cities and Communities (EIP-SCC), Joint Research Centre (JRC) studies, Cities of Tomorrow, Covenant of Mayors, and other studies developed by the EU.

2.3 DATA PROCESSING

SINFONIA partners have gathered the information from the official sources mentioned in the previous section and classify it according to the parameters defined for the evaluation process. For this evaluation, quantitative data related to each of the items explained above has been extracted and organised in order to have a homogenised and comparable picture of all the European countries.

SINFONIA partners have first identified this data for pilot cities, which have been used as reference, and the collected classified the same date for the rest of the countries.

2.4 EVALUATION PROCESS

After processing data from each country, we have offered a value to each country based on the similarities of each criteria to the "reference" situation (Innsbruck and Bolzano):

1. National Policies and Regulations: countries having national climate plans and at least a support measure for energy efficiency have been given an "A" mark. Countries with a single support measure have been given a "B" mark, while counties without climate plan and support schemes have been given a "C".
   (Source: EC portal on National energy and climate plans)

2. Sociological features related to eco-initiatives: countries with awareness rates higher than 50% have been given an "A" mark, countries with awareness rates between 50% and 25% have been given a "B" and finally, countries with awareness rates lower than 25% have been given a "C".
   (Source: Eurobarometer 2017)

3. Urban profile: Countries with a high number of medium- size cities (more than 40) have been given a "A" mark, countries with a number of medium-size cities between 40 an 10 have been given a "B" mark, and countries with less than 10 middle size cities have been given a "C" mark. The share of building stock constructed before 1970, although relevant for the major benefit of SINFONIA measures, has not been taken into account for the rating because it is very similar among the European countries.
   (Source: Eurostat, Factsheets Country EU Buildings (2016))

4. Energy exogenous parameters: countries with energy prices higher than the European average have been given an "A" mark, countries with energy prices equal to European average have been given a "B" and countries with energy process lower than the European average have been given a "C". The reason for this classification is that higher energy prices make energy efficiency projects more attractive in economic terms, reducing payback periods.

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5. Climate zones: countries in climates zones with cold winters have been given an “A” mark, countries with part of their territories with cold winter climate zones have been given a “B” and countries with warm or chill winters have been given a “C”.

Once all the items have been rated, we have done an overall classification of the countries in three different groups. For dimension 1 to 4, one point has been given to countries per “A” score, while climate zone dimension has been 1,5 point when rated as “A” due to the importance of the climate zone for the adequacy of technical measures.

Finally, the following groups have been classified:

- Group 1: High similarity to SINFONIA pilot cities (more than 4 points)
- Group 2: Medium similarity to SINFONIA pilot cities (4-2 points)
- Group 3: Low similarity to SINFONIA pilot cities (less than 2 points)

The complete evaluation can be seen in ANNEX 1 (DETAILED CRITERIA AND RANKING AT EU LEVEL).

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3. COUNTRY EVALUATION

Following the evaluation process defined by the SINFONIA partners, the 25 countries have been evaluated according to the parameters previously stablished.

3.1 REFERENCE SITUATION

This evaluation process has applied the "distance" approach. Pilot cities, Innsbruck and Bolzano, are the reference point or situation to measure the distance of the rest of the countries. Both pilot cities present the following characteristics:

- National policies and regulation: existence of national plans against climate change and one or more measures to support energy efficiency
- Sociological features about eco-innovation: on average, people are aware of their responsibility in climate change
- Urban profile: both cities are middle-size cities, with a relevant share of the building stock constructed before 1970.
- Energy price: energy price higher or equal to the EU average
- Climate zone: alpine climate/ continental climate (cold winters)

3.2 CLASSIFICATION OF COUNTRIES (DISTANCE APPROACH)

According to the "distance" of each country to the reference SINFONIA situation (pilot cities), European countries have been classified in the following three groups (see ANNEX 1 "classification of countries according to distance approach):

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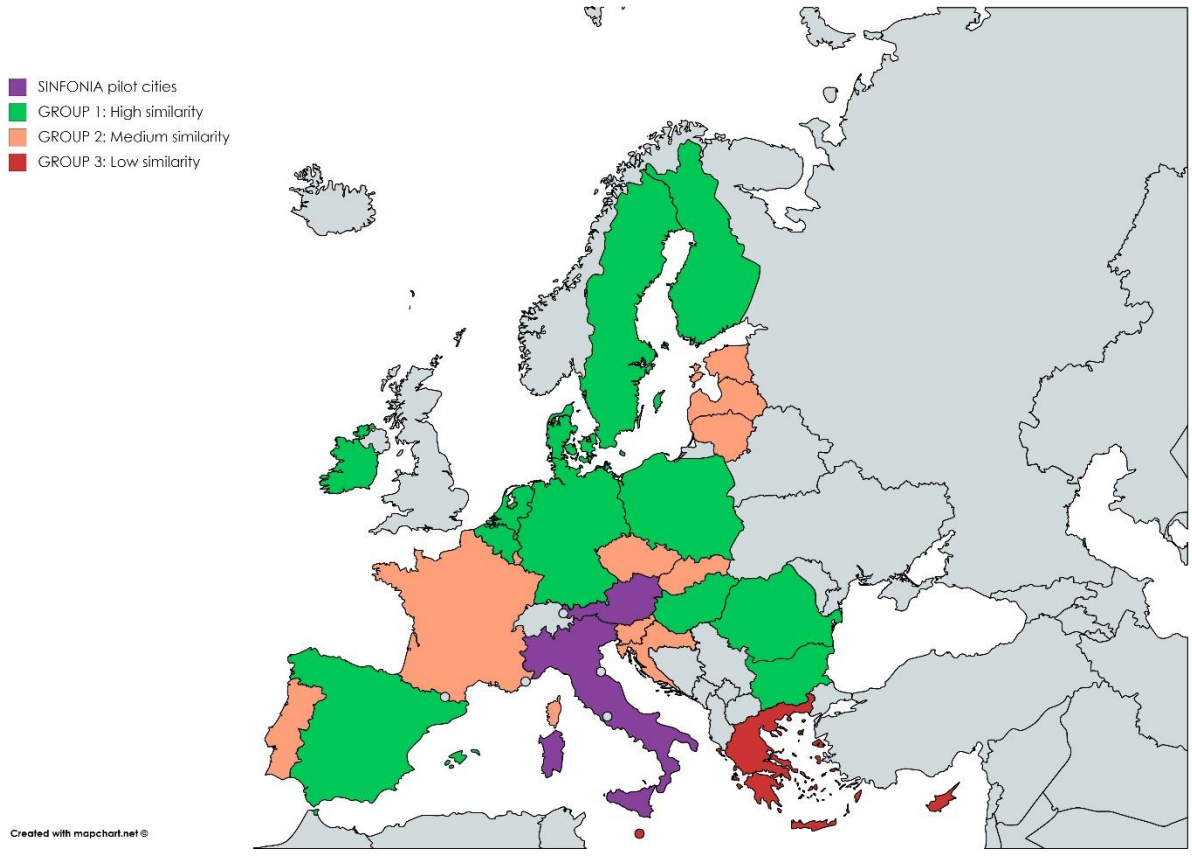

FIGURE 1: CLASSIFICATION OF EUROPEAN COUNTRIES ACCORDING TO THE "DISTANCE APPROACH"

At first glance, the classification seems to follow a geographical pattern:

1. Northern countries and continental countries have similar conditions to the pilot cities, and therefore are the ones than can benefit the most from the SINFONIA package.
2. Countries located in the "middle", south of the first group but north of the Mediterranean countries, can make use of some of the technical solutions.
3. Countries in Southern Europe, which can benefit from the "soft measures".

Criteria used for the classification, however, is not only based on climate factors, and therefore, three groups do not complete follow the geographical pattern:

- **Group 1**: Spain is the main exception to this groups. According to its climate conditions, only part of its territory (North and centre) can benefit from the whole SINFONIA measures, as climate in the Mediterranean coast and the South have different retrofitting needs. Spain however, counts on a support scheme to fund retrofitting measures, there is a big number of medium-scale cities in the territory (111), its share of residential building stock built before 1970 is high and the energy price is higher than the European average. Therefore, many cities in the countries may benefit from the SINFONIA solutions package, not only in environmental terms but also in economic terms.
- **Group 2**: France and the Baltic countries are the main exception in this group.
    - **France**: although this country is similar to group 1 in most of the dimensions (national policies and regulation, building stock and number of medium-scale cities), the technological measures developed in SINFONIA can be applied only in part of its

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territory and, which is more relevant, its energy price is lower than the European average. This factor makes SINFONIA solutions less attractive in economic terms and may discourage local authorities from implementing energy retrofitting plans due to the long pay-back periods.

- **Baltic countries (Estonia, Latvia and Lithuania)**: these countries climate conditions are ideal for the implementation of SINFONIA technical measures and the share of building stock built before 1970 is high. However, there are not many support measures for energy retrofitting initiatives, the number of medium-scale cities is low (2 in Estonia, 3 in Latvia and 4 in Lithuania) and the energy price in these countries is lower than the European average.

Concerning countries where pilot cities are located, Austria and Italy, we consider that according to this classification, both of them can benefit from the whole package of SINFONIA measures: while Austria, due to its climate classification, can implement the technological solution on its whole territory, Italy can only benefit from those solution in half of its territory. The reason why Italy is classified in group 1 is the same as Spain: all the dimensions are for the implementation of SINFONIA measures but the climate factor, that is similar only in half of Italy.

Group 1: High similarity to SINFONIA pilot cities (Green colour):

Countries included in this group area "close" to the pilot cities according to the following parameters:

- National policies and regulation: countries in this groups count on country support schemes for energy efficiency and national plan against climate change.
- Sociological features about eco-innovation: on average, people are aware of their responsibility in climate change.
- Urban profile: countries with a high number of middle-size cities, with a relevant share of the building stock constructed before 1970.
- Energy price: energy price higher than the EU average.
- Climate zone: alpine climate, continental climate and/or boreal climate in the whole or part of the territory.

12 countries have been classified in this group: Belgium, Bulgaria, Denmark, Finland, Germany, Hungary, Ireland, Netherlands, Poland, Romania, Spain and Sweden (in green colour in the map).

Group 2: Medium similarity to SINFONIA pilot cities:

1. National policies and regulation: climate plan or a single national support measure.
2. Sociological features about eco-innovation: lower percentage of people being aware of their responsibility in climate change.
3. Urban profile: countries with a high number of middle-size cities, with a relevant share of the building stock constructed before 1970.
4. Energy price: energy price lower than the European average.
5. Climate zone: alpine climate, continental climate and/or boreal climate only in part of the territory.

10 countries classified in this group: Croatia, Czech Republic, Estonia, France, Latvia, Lithuania, Luxemburg, Portugal, Slovakia and Slovenia (in orange colour in the map).

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*France is and exception in this group, as its dimension 1, 2 and 3 are the same as in GROUP 1, but it has a lower energy price and a big part of the territory is located in climate zones different from the pilot cities.

Group 3: Low similarity to SINFONIA pilot cities:

1. National policies and regulation: climate plan or a single national support measure.
2. Sociological features about eco-innovation: lower percentage of people being aware of their responsibility in climate change.
3. Urban profile: small number of middle size cities.
4. Energy price: energy price lower or equal to the European average.
5. Climate zone: Mediterranean or Atlantic climate zones.

3 countries classified in this group: Cyprus, Greece and Malta (in red colour in the map).

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4. RECOMMENDATIONS PER COUNTRY GROUP

This section synthetises the SINFONIA measures/solutions that can match with the retrofitting needs of the countries in each of the groups.

SINFONIA measures/solutions/tools have been classified in the following four groups depending on the field of application:

	Measures	Explanation
	Good practices	Lessons learnt, recommendations
	Socio – economic measures	Citizen engagement, co-benefits, models for financing and tools for economic assessment
	Environment/energy tools	CROCUS simulation tool (support to decision-making processes)
	Technical solutions	Technical solutions developed in SINFONIA (for buildings and district heating)

TABLE 1: SINFONIA MEASURES PACKAGE

Group 1: High similarity to SINFONIA pilot cities




Cities located in these countries can benefit from the whole package of SINFONIA measures:

- Good practices: lessons learnt during the local implementation of the measures.
- Socio-economic measures: citizen engagement, co-benefits of retrofitting plans, models for financing and tools for economic assessment.
- Environment/energy tools: CROCUS tools for the simulation of retrofitting measures, to support decision-making processes.
- Technical specifications: specific technologies/solutions developed and tested in the SINFONIA buildings and the district heating models. Due to their location, cities in these countries face similar energy needs as SINFONIA pilot cities, and hence, technical solution may be useful for retrofitting projects.

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Group 2: Medium similarity to SINFONIA pilot cities

Cities located in these countries can benefit from the some of the technical SINFONIA solutions and the "soft" measures:

- Good practices: Lessons learnt during the local implementation of the measures.
- Socio-economic measures: citizen engagement, co-benefits of retrofitting plans, models for financing and tools for economic assessment.
- Environment/energy tools: CROCUS tools for the simulation of retrofitting measures may be used for simulation in cities which climate similarities with the pilot cities.
- Technical specifications: some of the solutions maybe used, but it will depend on the economic viability, as this countries' energy price is lower than the European average and the measures may not be as interesting in economic terms.

Group 3: Low similarity to SINFONIA pilot cities

Cities located in these countries can benefit from the some of the technical SINFONIA solutions and the "soft" measures:

- Good practices: Lessons learnt during the local implementation of the measures.
- Socio-economic measures: citizen engagement, co-benefits of retrofitting plans, models for financing and tools for economic assessment
- Environment/energy tools: this tool cannot be used for simulations in these countries due to the different climate zones. This tool for simulation, however, could be calibrated and adapted to warm climates in the future.
- Technical specifications: these countries will require on alternative retrofitting measures due to the different climate zone, being weather the main problem to solve.

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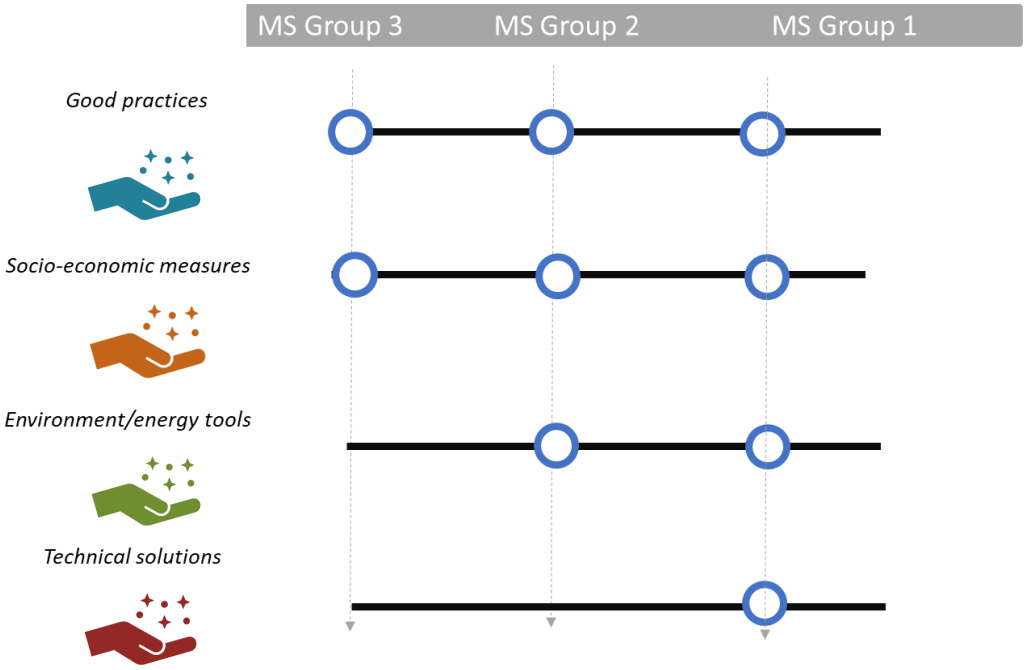

FIGURE 2: REPLICABILITY OF SINFONIA RESULTS

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5. CONCLUSIONS

The evaluation process developed in this document aims at measuring the potential replicability and hence, the potential impact of the SINFONIA "district template" approach at European level. As main result, it is important to highlight that the **SINFONIA solutions package can fully benefit to cities in 12 European countries** in order to meet their energy objectives and improve citizens welfare.

The reason of this first conclusion comes from the energy and retrofitting problems arising from the climate conditions: SINFONIA approach can be fully deployed in climate zones with similar needs as the ones identified in Innsbruck and Bolzano. Cities with cold climate conditions (cold winters) will be in the position of benefitting from all the technical solutions tested in SINFONIA, starting from thermal isolation of buildings to district heating systems.

Thus, SINFONIA measures have the potential to impact cities in almost half of the European countries. In addition to the technical solutions, "soft measures" developed within SINFONIA (citizen engagement, monitoring techniques, calculation of co-benefits and economic analysis of the investment) can be applied and replicated by all the cities located in the remaining 25 countries.

However, other factors than climate have also an impact in facilitating or hindering the full implementation of SINFONIA measures. Energy price is one of those factors: it is an important criterion in order to increase/decrease the interest that cities may have when deciding to implement an energy retrofitting project. These projects require significant investments and they have very long-term pay-back periods. Therefore, these projects may be more interesting in economic terms for cities with high energy prices, as they will benefit in a shorter term from energy savings resulting of the projects.

In the same line, cities that can obtain investment support schemes from their national governments will obtain more easily the resources needed to undertake retrofitting projects in their cities.

Thus, SINFONIA measures have the potential to impact cities in almost half of the European countries. In addition to the technical solutions, "soft measures" developed within SINFONIA (citizen engagement, monitoring techniques, calculation of co-benefits and economic analysis of the investment) can be applied and replicated by all the cities located in the remaining 25 countries

All in all, the evaluation above shows that at least the so called "soft measures" tested in the SINFONIA project can support retrofitting projects in cities all along Europe, and hence, this project can promote a positive impact un European cities, regardless their climates zone or energy mix, by sharing good practices and socio-economic tools.

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6. LESSONS LEARNT

During the evaluation process of this deliverable, the SINFONIA team have arrived at the following key messages or lessons learnt about European energy measures/support schemes:

- **Existence of enabling or of supporting measure at the MS level**: a variability in the implementation of the directive is shown either through the delay in the production of a national plan or in the spectrum of the various incentives that exist to the agents operating in the building renovation value chain. Some countries are experimenting a large panel of incentives (certificates, co-funding, heat funds, labels, tax reduction), while other remain limited to only one category (e.g. fiscal only).

- **Climate matters**: The energy use context in the two Sinfonia countries in Southern Europe was not adapted to specifications initiated in an alpine zone (Innsbruck and Bolzano). The development of some supporting tool took only partially the wide range of climatic zones.

- **Beyond climatic exogeneous factors**: the high diversity of energy use contexts in a medium scale European city is also a consequence of intrinsic parameters. This is why we developed a city energy readiness scale (Deliverable 9.5) that captures in a simple way (and in the same format as the well-known TRL scale) all the complexity of the track record and current initiatives of this city in its energy transition pathway.

- **Urban city stock:** the 'building stock' and its characteristics with regard to energy refurbishment is of course a key parameter, but another key parameter is the characteristics of the 'urban city stock' : the urban/suburban/rural repartition of buildings, the breakdown of cities/urban areas in the member state in large/medium or small size cities provide a good insight for elaborating homogeneous policy.

- **Networking and knowledge sharing** among cities is a key booster. Several alliances, clusters, labelling initiatives exist at national or international levels and should be further encouraged. One barrier that could prevent some cities is the lack of common standards and labels. The Covenant of Mayor has become an institution and offers several advantages for highlighting key actions according to a common format covering all areas (data gathering, process, communication). Out of the existing alliances that form a structural network of inter-cities cooperation (one could say: 'hardwired'), one should also mention the importance of the 'softer type' initiatives such as EC funded R&I projects like SINFONIA ('softer' since time wise limited). They indeed foster small or medium size cities to initiate or to gain knowledge and tool to formalise and further implement their energy efficiency actions.

- **Sociological features and energy awareness** of citizens has been identified as playing a critical role. Sociologic features have however to be analysed close to the cost of energy. Higher costs of energy constitute indeed the first driver for action, even though a steady increase of the energy mindset of citizens (which remains very different per EU country: see Eurobarometer), while a collapse in energy prices would make life much harder for energy efficiency economics.

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7. ANNEXES

ANNEX 1: DETAILED CRITERIA AND RANKING AT EU LEVEL

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ANNEX 2: DOCUMENT INFORMATION

SINFONIA DELIVERABLE FACT SHEET	
PROJECT START DATE	1 June 2014
PROJECT DURATION	72 months
PROJECT WEBSITE	http://www.sinfonia-smartcities.eu
DOCUMENT	
DELIVERABLE NUMBER:	9.6
DELIVERABLE TITLE:	Impact assessment for the remaining20 Member States
DUE DATE OF DELIVERABLE:	March 2020
ACTUAL SUBMISSION DATE:	31/03/2020
EDITORS:	
AUTHORS:	ZABALA (Lucía Eguillor, Leire Martiarena) DOWEL (Athanase Vafeas)
REVIEWERS:	RISE
PARTICIPATING BENEFICIARIES:	ZABALA, DOWEL
WORK PACKAGE NO.:	9
WORK PACKAGE TITLE:	Economic impact and EU-wide integrated assessment of replication potential of smart district template
WORK PACKAGE LEADER:	ZABALA
WORK PACKAGE PARTICIPANTS:	All
DISSEMINATION LEVEL:	
CO (CONFIDENTIAL, ONLY FOR MEMBERS OF THE CONSORTIUM INCLUDING THE COMMISSION SERVICES)	
PU (PUBLIC)	PU
PP (RESTRICTED TO OTHER PROGRAMME PARTICIPANTS, (INCLUDING THE COMMISSION SERVICES)	
RE (RESTRICTED TO A GROUP SPECIFIED BY THE CONSORTIUM INCLUDING THE COMMISSION SERVICES)	
DRAFT/FINAL:	Final
NO OF PAGES (INCLUDING COVER):	23
KEYWORDS:	Impact, replication

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