OUTPUT O.T5.1

A PROPOSAL OF HARMONIZED POLICY TO REDUCE THE CARBON FOOTPRINT MINIMIZING THE ENVIRONMENTAL BURDENS AND COSTS

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This policy relevant document contains the outcomes of the discussions of the round tables at transnational level and presents a proposal of harmonized policy for the Alpine Region.

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1. Introduction

Policy harmonization is a solution to problems arising from differences in policy /regulation between different political units. Differences between laws and policies in different countries can be reduced by adopting similar laws or policies, even when there is no common authority. [1]

BB-Clean partnership approached systematically the development of low carbon policies for the Alpine Region focused on a sustainable use of biomass mitigating biomass burning impact on climate change and air quality. Starting from the knowledge building, adding strategic experiences from awareness raising activities and creating the technological, economic and social tools for the support, we reached the project goal, which is a policy relevant document for the advisory boards of Regional, National and EU Parties on new perspectives for tuning Biomass Burning for domestic heating in a more environmentally sustainable way.

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2. Policy solutions on EU level

Here we present the most important European Union policy solutions for reducing air pollution.

2.1 Ambient Air Quality Directive

Air pollution has been one of Europe's main political concerns since the late 1970s.
European Union policy on air quality aims to develop and implement appropriate instruments to improve air quality. The main instruments are a series of Directives setting ambient air quality standards to provide protection from excessive pollution concentrations, based on the latest research on the health effects of air pollution. The first major instrument was the **Air Quality Framework Directive** 96/62/EC and its daughter Directives, which established standards for a range of pollutants including ozone, particulate matter (PM_{10}) and nitrogen dioxide (NO_2), in the period up to 2004. As part of the 2005 Thematic Strategy on Air Pollution, the Commission proposed to consolidate the Framework Directive and the first three daughter directives into a **single Ambient Air Quality (AAQ) Directive**, adopted as 2008/50/EC, and to set objectives for fine particulate matter ($PM_{2.5}$). Together with the fourth daughter Directive 2004/107/EC, the Ambient Air Quality Directive provides the current framework for the control of ambient concentrations of air pollution in the EU. The control of emissions from mobile sources, improving fuel quality and promoting and integrating environmental protection requirements into the transport and energy sector are part of these aims. [2]
European legislation on air quality is built on certain principles. The first of these is that the Member States divide their territory into a number of zones and agglomerations, where the Member States should undertake assessments of air pollution levels using measurements, modelling and other empirical techniques and report air quality data to the European Commission each year. The Directive contains criteria both for the location and for the minimum number of sampling points. Where levels are elevated above limit or target values, Member States should prepare an air quality plan or programme to address the sources responsible and so ensure compliance with the limit value before the date when the limit value formally enters into force. In addition, information on air quality should be disseminated to the public. [2]

2.2 EU Clean Air Policy Framework

On 18 December 2013, the European Commission adopted a Clean Air Policy Package - a roadmap for air pollution action across the Community over the next decade and beyond. The Clean Air Programme for Europe aims to ensure full compliance with existing legislation by 2020. It also sets a pathway for the EU to meet by 2030 the long-term goal of reducing premature mortality due to PM and O_3 by 52 % relative to

year 2005. [8]

The EU's clean air policy is based on three main pillars:

1. Ambient air quality standards set out in the Ambient Air Quality Directives (EU, 2004, 2008) to protect human health and the environment.
2. National emission reduction commitments established in the National Emission Ceilings (NEC) Directive (EU, 2016).
3. Emission and energy efficiency standards for key sources of air pollution, from vehicle emissions to products and industry.

While the EU has a uniform legislative regime for tackling air pollution, the ways in which that is implemented varies greatly between Member States. This raises the need for a supportive and collaborative programme of information exchange – a dialogue– aimed at better understanding the models of implementation, the differences between those models, their successes and challenges and, in time, which elements could be useful in other countries under good practice exchange. The dialogues could also raise awareness in Member States of the funding streams available through EU funds to support action on air pollution and offer the opportunity for Member States to discuss the future direction of EU clean air policies with the Commission. [2]

2.3 National Emission Ceilings (NEC) Directive

The Directive, which was adopted in 2001 and revised in 2016, reflects the international air pollution reduction commitments assumed by the EU and its Member States to the United Nations Economic Commission for Europe (UNECE). The EU and its 28 Member States report their emission inventories to this UN Commission. [8]

A new National Emissions Ceilings (NEC) Directive (2016/2284/EU) transposes the reduction commitments for 2020 agreed by the EU and its Member States under the 2012 revised Gothenburg Protocol under the Convention on Long-range Transboundary Air Pollution (LRTAP Convention). The more ambitious reduction commitments agreed for 2030 are designed to reduce the health impacts of air pollution by half compared with 2005. Further, the Directive requires that the Member States draw up National Air Pollution Control Programmes that should contribute to the successful implementation of air quality plans established under the EU's Air Quality Directive. [4]

The NEC Directive highlights the importance of Member States regularly reporting air pollutant emission inventories for assessing progress in reducing air pollution in the EU and for ascertaining whether Member States are in compliance with their commitments.

Looking ahead to 2030, further efforts are clearly required by Member States in order for them to meet

their 2030 emission reduction commitments - more than half of the Member States are not on track to comply with their agreed reduction commitments for NH_3, NMVOCs, NO_x and $PM_{2.5}$, whereas eleven are not expected to meet their SO_2 reduction commitments. Sixteen Member States (Belgium, Bulgaria, Croatia, Czechia, Denmark, Estonia, France, Germany, Ireland, Latvia, Lithuania, Luxembourg, Netherlands, Romania, Slovakia and Spain) reported WaM projections for 2030.
For 2030 the proposal includes cost-effective national emission reduction obligations for the four original air pollutants (SO_2, NO_x, non-methane VOCs, and NH_3), and for two new ones: primary $PM_{2.5}$ (fine particulate matter, which has major health impacts) and CH_4 (methane, a key short-lived climate pollutant). In implementing the $PM_{2.5}$ reductions, particular emphasis will be placed on reduction of black carbon (BC), the other major short-lived climate pollutant. The CH_4 and BC measures will provide direct climate co-benefits whilst also preparing the ground for international action. [5]

One of the main instruments to achieve the required reductions is the Ecodesign Directive, tackling emissions from domestic combustion sources.

2.4 Ecodesign Directive (2009/125/EC)

Directive 2009/125/EC of the European Parliament and of the Council of 21 October 2009 establishes a framework for minimum eco-design requirements which goods that consume energy must meet before they can be used or sold in the EU. It also supports industrial competitiveness and innovation by promoting the better environmental performance of products throughout the internal market. [7]
The Energy Labelling Regulation complements those Ecodesign requirements with mandatory labelling requirements.
Both, the Ecodesign and Energy Labelling Directive are framework directives and indicate conditions and criteria to for binding requirements specific to each product group. The Article 16 (1) of the Ecodesign Directive foresees that each three years Commission has to publish a working plan setting out an indicative list of energy-related product groups. The latest Working Plan 2020-2024 sets out the Commission's working priorities for this period.

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Table 1: List of energy efficient products Regulations: by product group related to domestic combustion [6]

Product groups	Energy labelling legislation	Ecodesign legislation
	Framework Regulation:(EU) 2017/1369 Use of tolerances: Regulation (EU) 2017/254 Internet labelling: Regulation (EU) No 518/2014	Framework Directive: 2009/125/EC Use of tolerances: Regulation (EU) 2016/2282
Local space heaters	(EU) 2015/1186 Transitional methods of measurement and calculation: 2017/C 076/02 Guidelines – November 2017	(EU) 2015/1188 Impact Assessment [SWD(2015) 90] Executive Summary of the Impact Assessment [SWD(2015) 91] Transitional methods of measurement and calculation: 2017/C 076/02 Guidelines – November 2017 (EU) 2015/1185 Transitional methods of measurement and calculation: 2017/C 076/02 Guidelines – November 2017
Solid fuel boilers and packages of a solid fuel boiler, supplementary heaters, temperature controls and solar devices	(EU) 2015/1187 Transitional methods of measurement and calculation: 2017/C 076/01 Guidelines - 2018 Mandate M/551 : C(2016) 7764	(EU) 2015/1189 Impact Assessment [SWD(2015) 92] Executive Summary of the Impact Assessment [SWD(2015) 93] Guidelines - 2018 Mandate M/551 : C(2016) 7764
Space heaters, combination heaters, packages of space heater, temperature control and solar device and packages of combination heater, temperature control and solar device	(EU) No 811/2013 Transitional methods of measurement and calculation: 2014/C 207/02 Tool for calculating the energy efficiency of packages of space, water and combination heaters Mandate M/535: C(2015)2626 Guidelines – 2018	(EU) No 813/2013 Impact Assessment [SWD(2013) 297] Executive Summary of the Impact Assessment [SWD(2013) 296] Transitional methods of measurement and calculation: 2014/C 207/02 Mandate M/535: C(2015)2626 Guidelines – 2018

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3. Summary of proposed policy scenarios of BB-Clean

Within the BB-Clean project policy solutions were collected with desktop survey, individual interviews and virtual discussion rooms with experts coming from all the countries involved in the BB-CLEAN Project.

Among all potential policies collected a selection of policies was performed by the project partnership, based on their relevance for all the countries involved on one hand and on the possibility to translate their potential implementation in the Alpine Region through the help of modelling simulations on the other hand.

The selected policies were translated into the following 9 different scenarios (A1-G):

- **A1**: Replacement of 50% of old wood burning stoves/boilers with latest pellet stoves/boilers: It foresees the substitution of obsolete small scale biomass combustion plants by 50% with last generation boilers and stoves.
- **A2**: Replacement of 100% of old wood burning stoves/boilers with latest pellet stoves/boilers: It foresees the substitution of obsolete small scale biomass combustion plants by 100% with last generation boilers and stoves.
- **B1**: best practices for domestic BB causes a 20% drop in emissions from all wood biomass appliances
- **B2**: best practices for domestic BB causes a 40% drop in emissions from all wood biomass appliances

  Scenarios B1 and B2: The modelling simulations foresees a reduction of a percentage "X" of PM emissions due to primary measures (better combustion, better fuel quality, regular cleaning of chimneys, regular control of the performance of the appliances while operating on field, a better use in terms of operating hours) to improve the efficiency of the actual small scale combustion appliances installed in the three case studies investigated and lower their emissions.
- **C**: replacement of 100% of old primary wood burning heating systems with latest pellet boilers with Electrostatic precipitators: This scenario foresees the substitution of all obsolete small scale biomass appliances with new high efficiency (5 stars) pellet boilers with electrostatic precipitators or equivalent systems to drastically abate PM emissions.
- **D**: Transition of all wood biomass appliances to natural gas boilers: This scenario foresees the substitution of all small scale wood biomass combustion systems with natural gas boilers. In order to obtain a complete change of fuel for domestic heating (natural gas instead of wood biomass) the only conversion of primary energy consumptions due to biomass (expressed in GJ/y) into m3 equivalent of natural gas is necessary.
- **E**: Realization of a centralized biomass plant with district heating: a 70% coverage of heat demand will be covered by the centralized plant. The centralized plants will be treated as point emission

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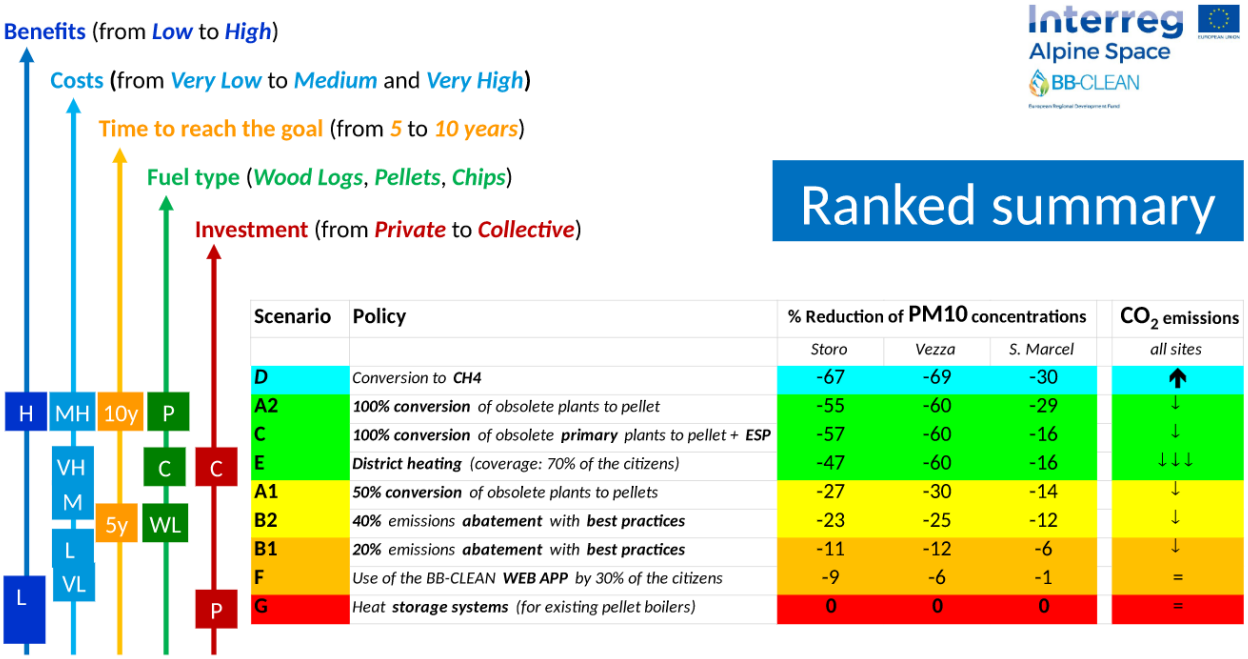
sources eliminating 70% or 100% of all the emissions due to residential heating (including heat demand at present covered even by natural gas and/or diesel and not only wood biomass). Average thermal energy losses along the district heating grid will be considered too.

- **F**: 30% of people with secondary heating systems follows the BB-CLEAN mobile app indications: According to this scenario, a 30% of the residents will use the WEB APP developed by the BB-CLEAN project. During the hours when the APP presents a red traffic light, the scenario will foresee a stop of biomass burning of 30% of all wood stoves, pellet stoves and open and closed chimneys. The avoided PM emissions during the hours of red traffic light will be replaced by the (low) emissions due to the activation of natural gas boilers (secondary heating system). This scenario does not foresee the presence of a heat storage system so that pellet boilers that do not foresee a secondary heat production system will not be interested by this specific simulation.
- **G**: Change of the operational hours of biomass appliances with heat storage systems: According to this scenario incentive schemes will foster the adoption of heat storage systems for both wood and pellet boilers and wood and pellet stoves. A temporal shift of PM emissions will thus be possible without using secondary systems (natural gas boilers or diesel boilers). Chimneys and traditional stoves will not be interested by this scenario since a heat storage system could not be foreseen.

The modelling simulations were performed in the framework of project activities aimed at investigating the potential environmental benefits in terms of PM_{10} emissions and concentrations reduction as well as a decrease of NO_X and CO emissions due to the implementation of 9 specific policies (A1, A2, B1, B2, C, D, E, F and G) with respect to the state of the art (status quo scenario) in three different case studies (Storo, Vezza d'Oglio and Saint Marcel territorial domains, all located in the Italian Alpine Region).

Based on their benefits, costs, time period, type of investment and fuel type, the scenarios were ranked as following:



Scenario	Policy	% Reduction of PM10 concentrations			CO_2 emissions
		Storo	Vezza	S. Marcel	all sites
D	Conversion to **CH4**	-67	-69	-30	↑
A2	**100% conversion** of obsolete plants to pellet	-55	-60	-29	↓
C	**100% conversion** of obsolete **primary** plants to pellet + **ESP**	-57	-60	-16	↓
E	**District heating** (coverage: 70% of the citizens)	-47	-60	-16	↓↓↓
A1	**50% conversion** of obsolete plants to pellets	-27	-30	-14	↓
B2	**40%** emissions **abatement** with **best practices**	-23	-25	-12	↓
B1	**20%** emissions **abatement** with **best practices**	-11	-12	-6	↓
F	Use of the BB-CLEAN **WEB APP** by 30% of the citizens	-9	-6	-1	=
G	Heat **storage systems** (for existing pellet boilers)	0	0	0	=

Figure 1: Ranked summary of 9 scenarios based on their implication.

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4. A proposal of harmonized policy

After we searched for policy solutions for cleaner biomass burning, modelled different possible regulative scenarios and summarized the pros and cons of the considered scenarios at the workshops and round-tables, we developed a proposal of a harmonized policy for cleaner biomass burning based on cooperation with experts, policy makers, government representatives, users, chambers of crafts, biomass producers. A developed policy is summarized in the table 2 below. We clustered the solutions by two directions:

- The solutions were separately defined for **dense populated** and **sparsely populated areas** due to difference in a supply of burning fuel and the related infrastructures in cities compared to rural areas. Moreover, the target groups show very different usage structures of the existing heating solutions and commitment / openness towards new heating solutions.
- Further differentiation is based on time line - policies investigated could need different time frame for their implementation (i.e. the implementation of the web app could need 1 or 2 years while the substitution of a percentage greater than 50% of obsolete biomass appliances could take at least 10 years). We set three periods: **short, medium and long term**.

Table 2: A proposal of harmonised policy to reduce the carbon footprint minimizing the environmental burdens and costs (focused on domestic heating)

	Short Term < 5 y	**Mid Term 5y - 10y**	**Long Term > 10y**
Dense populated areas – city, town	**B1**: best practices for domestic BB causes a 20% drop in emissions from all wood biomass appliances **+** **F**: 30% of users follow the BB-CLEAN mobile app indications	Change of 30 % of appliances to new generation appliances and introduction of heat storage systems (**G**). **+** **B2**: best practices for domestic BB causes a 40% drop in emissions from all wood biomass appliances **+** **F**: 30% of users follow the BB-CLEAN mobile app indications	70 % of users of current small scale appliances connect to district heating (**E**) **+** Remaining 30 % of users change appliances* and introduction of heat storage systems (**G**) **+** **B2**: best practices for domestic BB causes a 40% drop in emissions from all wood biomass appliances *Priority: change to pellets

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	Short Term < 5 y	Mid Term 5y - 10y	Long Term > 10y
Sparse populated areas – separate houses, small villages	**B2**: best practices for domestic BB causes a 40% drop in emissions from all wood biomass appliances + **F**: 30% of users follow the BB-CLEAN mobile app indications	**A1**: Replacement of 50% of appliances with latest pellet stoves/boilers + **B2**: best practices for domestic BB causes a 40% drop in emissions from all wood biomass appliances + **F**: 30% of users follow the BB-CLEAN mobile app indications	**A1**: Replacement of 50% of appliances with latest pellet stoves/boilers + Remaining 50% of appliances change to new generation appliances + **B2**: best practices for domestic BB causes a 40% drop in emissions from all wood biomass appliances + **F**: 30% of users follow the BB-CLEAN mobile app indications

The percentage in the table refers to the households using fossil fuels or biomass heating solutions.

4.1 Cluster 1: Solutions for dense populated areas

The first cluster of harmonized policy solutions presents the proposal for dense populated areas. Dense populated areas like towns and cities show the following characteristic related to heating solutions:

1) Dense population mainly living in medium-sized buildings with large central heating and additional wood based ovens in the apartments;
2) Higher rate of rented living space;
3) Various sources for emissions (industry, traffic, …);
4) Wood/biomass supply more difficult due to logistics reasons;
5) Different habits and usage related to wood-based heating installations (mostly secondary heating).

4.1.1 Short term approach

In a short term period (under 5 years), we propose to focus the policy on the following two actions:

- First, we would see a strong information and awareness raising policy to have an important effect on the emissions. We estimated a 20% reduction by promoting and adapting **best practices** in wood based biomass appliances.
- Further, this should be combined with setting up and promoting the use of a **mobile app** that gives specific individualized advices and indications to optimize the use of wood biomass based applications. We estimate to reach 30% of the households with the app and that they will use the

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app and its indications.

The advantages of this scenario are a time and financial perspective. Developing an app and promoting best practices are policies that can be implemented in a relatively short period. Moreover, especially the younger generation (Generation Z) is used to include mobile apps in their daily life. Even one could think to include some gamification functions in the app.

4.1.2 Midterm approach

Having a look on a midterm policy (time period between 5 and 10 years), we identified a different approach by implementing the following three activities:

- First, we would continue the promotion and usage of the **mobile app** - we estimate to keep 30% of the households using the app and its indications.
- With more targeted approach in awareness raising campaigns a 40% reduction of emissions can be reached by promoting and adapting **best practices** in wood based biomass appliances.
- Further the policy should start with the transition of wood biomass appliances to new generation appliances. This for sure would need important investments. We estimated that 30% of the installations could be replaced supported by related financial incentives. Biomass appliances with heat storage systems are preferred, that enable an efficient action in changing the operational hours.

4.1.3 Long term approach

In the long term period (over 10 years) the most suitable policy solution in dense areas is to our results a transformation towards centralized biomass plant with district heating that would serve most of the households in dense area as heating source. The advantages are clear - one installation for multiple households means that less resources are used for the same amount of energy produced. The highly efficient biomass plant can be set up near to the city and provide the related parts of the city with heat. Logistics would be very easy and the infrastructure can be set up in a focused way. Due to the density of people, we could reach many households with one centralized biomass plant.

This action should be framed by the other actions already started in the midterm period. These were the change of the appliances to new generation ones for the household not connected to the district heating and for this target group the continuing of the awareness raising – promoting the best practices for domestic BB can lead to a 40% drop in emissions from all wood resting biomass appliances.

The mobile app will lose its importance in this phase.

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4.2 Cluster 2: Solutions for sparse populated areas

The second cluster of harmonized policy solutions has been developed for sparse populated areas - the rural areas and small villages. They show the following characteristic related to heating solutions:

1) Sparse population mainly living in own houses or small buildings ;
2) Wood based heating installations are also used as first heating source – space for wood is often individually available;
3) Lower rate of rented living space compared to dense populated areas;
4) Heating is one of the mains sources for emissions;
5) Wood/biomass supply is quite easy / even at place available;
6) Society in rural areas may be less “digital”.

4.2.1 Short term approach

Even if the population may be less “digital” oriented, (average age may be higher in rural areas) we would propose in a short term (less than 5 years) to intensively inform and raise awareness of local population on best practices for domestic BB. This could cause a 40% drop in emissions. As in rural areas more households are occupied by its owners, they are more interested and aware of using / changing to best practices, as it is their own house.
This activity should be combined with promoting the mobile app.

4.2.2 Mid-term approach

Having a look on a midterm policy (time period between 5 and 10 years) we propose to continue the promotion of the mobile app and the use of best practices. The latter would of course lead to a larger emission reduction over the time. However, in the midterm we see that a replacement of old stoves/boiler will have a very important effect on the emission reduction. In our models, we estimated a replacement of 50% of the old stoves. Taking the experiences in Germany into account, achieving a replacement rate of 50% will need at least 7-8 years.

4.2.3 Long term approach

In the long term (over 10 years), we would continue the actions started in the medium term.
A replacement of 50% of appliances is foreseen with the pellet stoves / boilers, while the remaining appliances are changed with new generation ones.
Approaches like centralized heating installations (like proposed for the dense areas) would be difficult to

implement, as over the distance between the houses/villages too much heat is lost. In addition, the habits of the users are different compared to the dense populated areas.

4.3 Recommendations to introduce the proposed solutions – A policy implementation framework

Having described the different harmonized policy solutions in the previous section, one may raise the question on how to introduce these solutions in the most efficient way. The way to do this will be presented in this section.
We divided the implementation recommendations into three parts, the legal framework, the development of knowledge capacities and the improvement of organisational and management solutions. We will have a look on both policy clusters, those for dense and those for sparse populated areas and will try to give hints and a possible guideline (a roadmap) to implement the policies.
These recommendations are based on our research in the various work packages as well expert interviews.

We introduce the following policy implementation triangle:

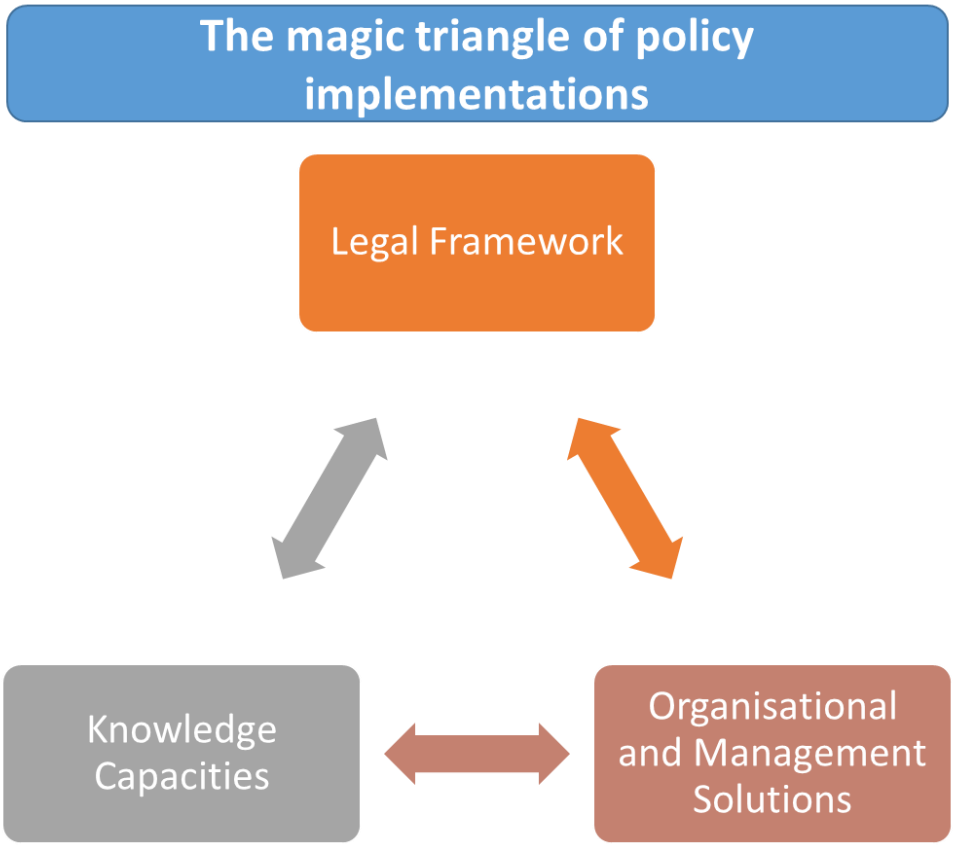

Figure 2: Policy implementation triangle.

4.3.1 Recommendations to improve existing legal framework

Policy makers usually base their actions on strong legal frameworks. Those legal boundaries often include positive and negative incentives (stick and carrot approach).

4.3.1.1 Recommendations to improve existing legal frameworks

Recommendations to improve existing legal framework are:

- Improvement of control
- Improvement of fines system
- Mandatory prohibition of fossil fuels in new buildings
- Incentive schemes to support regular cleaning of chimneys by chimney sweepers
- Incentive schemes to support regular checks of the emissions from domestic appliances
- Predefining of district heating already in the phase of spatial planning of the settlements

As defined above in this chapter we would propose to foster best practices and promote the mobile app in the short term. A legal framework to implement best practices should therefore contain the following aspects:

1) Clear emission levels and standards/benchmarks
2) Specific ecosystem with support and control institutions
3) Detailed mixture of regulations and enabling instruments to support the target groups meeting the legal regulations

The following figure shows the interaction between the three elements:

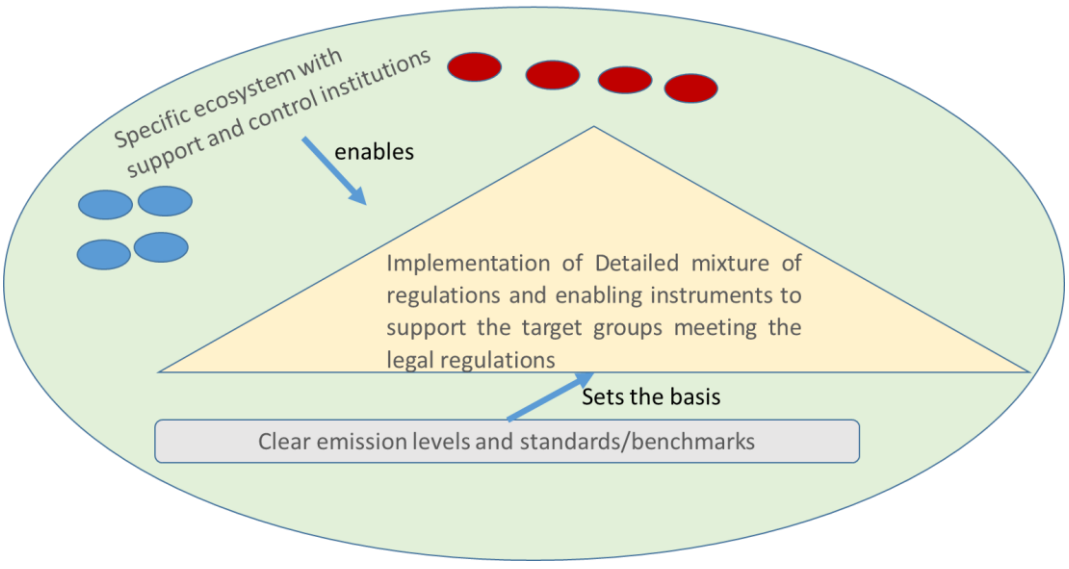

Figure 3: Interaction between elements of the legal framework.

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The ecosystem enables the implementation of the detailed regulations and enabling instruments defined by the governmental organisations. The (scientifically defined) emission levels and industry standards are the basis for the related figures of the regulations.

a) Recommendations in the context of cluster 1) for dense populated areas

In the short term, we proposed to define and implement best practices on usage and technology as well as developing the mobile app. In order to reach the discussed emission reduction rates these policies have to be backed by a comprehensive legal framework. The best practices could be part of new regulatory guidelines. One idea would be to define a yearly obligatory consulting session by a local expert (e.g. the chimneysweeper) in the household to identify potential best practices to be implemented. This consulting session would be the basis for a financial support instrument that would support best practice investments. Further, the mobile app could include a lot of technical control and consulting functions that could be used to meet the regulations of the legal framework. Meeting the defined regulations based on the use of the app would lead to a financial benefit for the household.

In the medium term, we proposed beside continuation of the app to change the operational hours and start with a change of appliances to new generation ones. From a legal framework perspective, promoting the technological change represents the most important challenge. The related regulations have to include various incentive schemes including forcing and enabling aspects. Apart from all the technical aspects, the legal framework has to include at the beginning the ban and replacement of old wood-based appliances. This needs very strong communication activities as well as clear emission standards to be set by the legal framework.

In the long term, we identified the change towards district heating solutions as the main action. Here again the legal framework plays a very crucial role. The decision for a private household to change to district heating has to be supported or imposed by the legal framework. Supportive frameworks that combine with the individual commitment of the target groups is for sure desirable. However it will not always work. Further, the change towards large-scale district heating solutions will change infrastructure and business models as well as value chains. Such a policy will mean high financial loss for many players in the actual value chain focussing on “individual heating installations”. Here the legal framework has to propose solutions for these companies.

b) Recommendations in the context of cluster 2) for sparse populated areas

Having a look at the sparse populated areas, we focused in the short term on best practices and the mobile app. Like in the dense populated areas, the mobile app could include a lot of technical control and

consulting functions that could be used to meet the regulations of the legal framework. Meeting the defined regulations based on the use of the app could lead to a financial benefit for the household. In the sparse populated areas, the app could even include remote consulting and support functions for trouble shooting, as distances to service providers could be long.
Further, related to the best practices the same legal framework mechanism as is the dense populated areas could work in the sparse populated areas. The yearly obligatory consulting session by a local expert (e.g. the chimneysweeper) in the household to identify potential best practices to be implemented is for sure very important. This consulting session could be the basis for a financial support instrument that would enable best practice investments.

In the medium term, we would focus on the replacement of old installations. For this, a clear emission standard is mandatory to define when a replacement makes sense and the framework should then support this financially. In Germany e.g., the replacement strategy was and is clearly defined by the legal regulations and controlled by the chimneysweepers. In the meantime, a large financial support instrument has been setup that was used by the households.

In the long term, there is no important change in the activities proposed by us. Therefore, the legal framework will not change substantially and all midterm actions will be continued.

4.3.2 Recommendations to improve knowledge capacities

In order to improve knowledge capacities the knowledge management cycle developed is a very good basis to derive focused recommendations. The cycle is presented in the following figure:

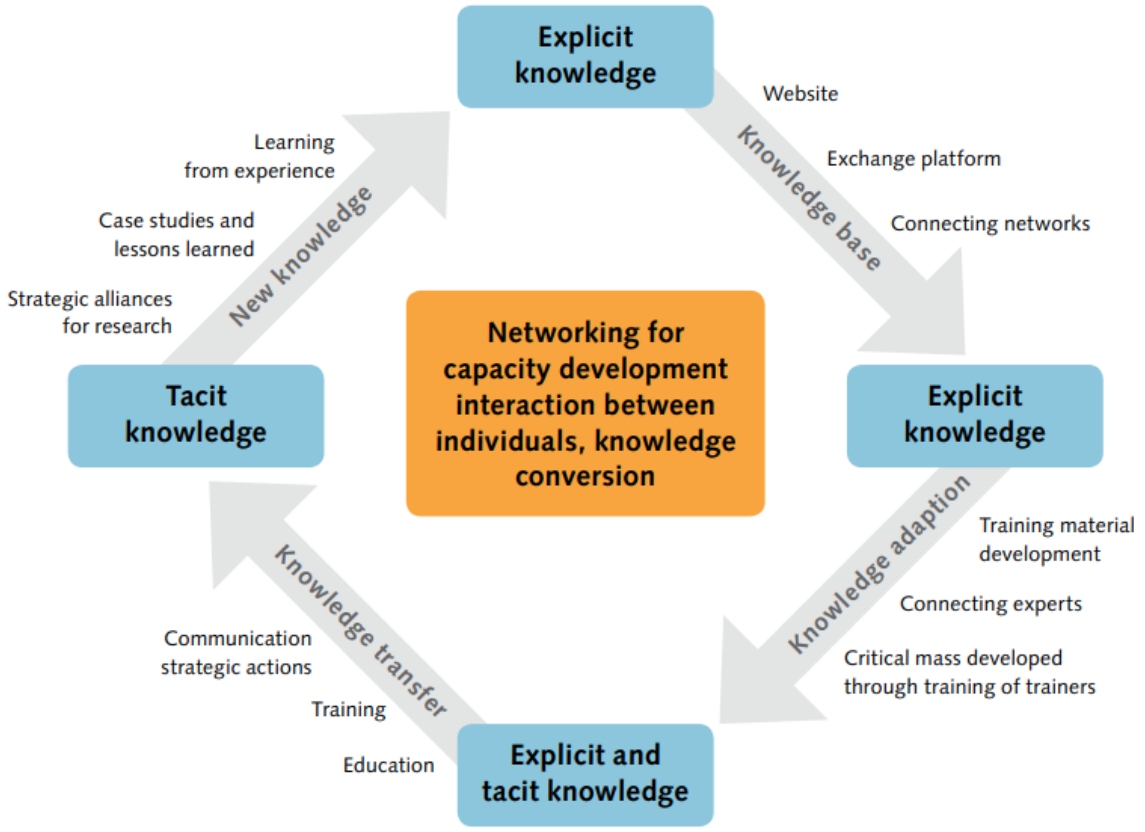

Figure 4: The knowledge management cycle for capacity-building networks. [3]

The main questions to be defined are shown in the figure:

1) How can the knowledge base be developed and shared?
2) How can the knowledge be adapted in various contexts?
3) How can the knowledge be transferred?
4) How can the knowledge be further broadened?

Related to the improvement of knowledge capacities we see two target groups of potential action:

- On the one hand, one may enhance the knowledge capacities of the public related to cleaner use of biomass burning installations. The local awareness raising remains a main step for sensitize the general public since the households are still not aware of the challenges and potential in the context of this topic.

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- On the other hand, it is important to deepen further the knowledge capacities of all players along the value chain as well as governmental support institutions on expert level. The recommendations are almost the same for the two clusters.

To improve the knowledge capacities of the users / households in cities and towns the mobile app is one very important approach. It enables to collect and share the knowledge base and may include even an exchange network. The knowledge adaptation should mainly be conducted by training sessions. Here a train the trainer concept on community level could help to broaden the knowledge of the public. This could even be connected with the app and include a gamification aspect to improve the use of the BB-Installation by exchanging emission optimization results. The adaptation of knowledge and transfer could further be enabled through digital means like the app. The peer-to-peer (user) exchange by a (social) platform in the app would lead to a higher commitment by the public to the general topic. Case studies and learning from the experience of others are further aspects we can include in the app.
Additionally in the medium and long term, we see a need for broad communication activities to convince the public and create knowledge on district heating solutions and value.

To improve the knowledge capacities of the experts along the value chain specialized workshops and knowledge tools shall be set up. For the collection, dissemination and adaptation of knowledge leaflets like those that we developed in the frame of BB-Clean project are one of the important means. Further, the online collaboration across countries should be supported to exchange the experiences. This should not only be linked to technical aspects. In addition, to improve legal framework and incentive activities the exchange would be an important way to share the knowledge. As the change towards new generation appliances and district heating will lead to important changes in the value chain new business model development should also be enabled by cross sectional workshops and development of best practices to be transferred to and adapted by the institutions in the value chain.

An important role in improving knowledge capacities will have within the framework of the BB-Clean project established international policy observatory. The observatory will serve as a connection between citizens and experts / institutions in the field of biomass burning by enabling an exchange of good practices, collecting feedback from users, experts…

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4.2.3 Recommendations to improve organisational & management solutions

The third part of the implementation triangle focusses on the improvement of organisational and management solutions.

Organisational solutions mainly deal with the question what institutional and process aspects have to be considered to enable efficient implementation of the proposed harmonized policies.

Management solutions are more focussing on the specific implementation itself including communication, business model development and new innovative approaches for interaction and exchange.

Here we detail both aspects for both two clusters together.

The main challenges on the organisational level as we understood during the BB-Clean project are linked to the development of efficient support organisations and to the improvement of the support process. As described before the knowledge capacities have to be strengthen. The support organisations on local and regional level are missing. These local consulting and information hubs are very important as main contact for the public. In dense populated areas these hubs can be set up at place. In sparse populated areas the hubs have to be mobile to reach the various places. Conidering the support process many households are not willing f.e. to ask for financial support as the application processes are too complicated and not clear. Here a lean support for this process and a lean financial application process itself would be necessary. Digital means (websites) could be one important tool in this context.

An important support on the organisational level can be offered by the within the framework of the BB-Clean project established international policy observatory, that will serve as a connection between citizens and experts / institutions in the field of biomass burning by enabling an exchange of good practices, collecting feedback from users, experts…
The main goal of Transnational BB policy observatory is to improve air quality in Alpine Space by promoting exchanges and disseminating inspiring practices. In particular, the Observatory activities will focus on promotion of clean biomass burning practices based on outputs and lessons learned of the BB-Clean project and considering the different expertise and skills among the Partners.
Among the others, the Observatory will

- promote and support training schemes for professionals and end users;
- empower Observatory members as "ambassadors" for clean biomass burning;
- select specific activities connected to reach the clean biomass burning to communicate on every year;
- promote citizen access to data on air quality (https://www.eea.europa.eu/data-andmaps/explore-interactive-maps/up-to-date-air-quality-data);
- provide up-to-date and curated information about technological innovations, regulatory developments, and policies implemented at the local level;
- support future EU directives for Biomass burning and their disposition to national level;
- promote and support action plan for clean biomass burning.

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Linked to the improvement of management solutions we have identified some important approaches in our project. One would be to offer business model workshops along the value chain as the entire industry logic will change when new generation appliances and district heating solution will be supported and installed. The government has to support especially the SMEs and craftsman in their transformation. Further we would recommend to include open innovation tools on expert levels to promote innovative ideas along the value chain. The exchange across sectors and countries will help to strengthen the knowledge base and even develop new technical ideas and solutions.

A very important recommendation on the organisational & management level is the promotion of local biomass supply chain. According to the feedback of Italian policy makers at the workshop improving the Italian wood supply chain is the key step to implement a real new green economy for the Italian Biomass Burning District.

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