The spatial dimension of the Flemish Covenant of Mayors: A comparative spatial analysis on the transition towards energy neutral municipalities

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Abstract: Previous research has proven the necessity of an energy transition. More and more local visions on an energy neutral future are being adopted, powered by targets on different policy levels (UN, EU, national and local) and the Covenant of Mayors initiative in Europe. These visions are flanked by a series of concrete actions that should be established by either 2020 or 2030. A comparative analysis of the Sustainable Energy Action Plans (SEAP), submitted within the framework of the Covenant of Mayors, however shows that although the ambitions within these visions are frequently high when setting long term targets for an energy neutral future in 2050, actions on the short term often focus on low-hanging fruit. While these quick wins are necessary towards an energy neutral future, they will not be enough to create a real transition. There seems to be a missing link between ambitious visions and concrete actions.

This paper will argue that territorial actions are needed to reach the energy goals and fill in the gap between those first, successful, but relatively easy actions and a full-blown energy transition. Moreover, the general awareness of the importance of spatial planning, of integrating energy goals into every spatial project and connecting different scale levels is often missing. Reducing energy, increasing energy efficiency and increasing renewable energy can all be linked with territorial factors. Furthermore, governance, going beyond government and including private and civil society actors is needed.

Keywords: Spatial Development, Energy Transition, Governance, Mitigation

Introduction

This paper will use the Covenant of Mayors (CoM) initiative in Europe as an approach to analyze if and how the local government as an actor is contributing spatially to the energy transition. The goal of this paper is (1) to analyze the extent in which the guidelines and methodologies put forward by the Covenant of Mayors (CoM) are taking territorial factors like the influence of land use and planning measures into account and (2) to analyze to what extend the developed and submitted SEAP's in Flanders are using these territorial factors within land use and urban planning measures to implement their short term and long term goals. The first section will introduce the Covenant of Mayors (CoM) initiative as a means to achieve energy neutral cities. The second part will focus on the reciprocal relationship between energy and space and how spatial planning can influence our energy needs and production. Here, a framework will be introduced to analyze to what degree plans take spatial

elements into account. In the third part the guidelines offered to the local government on how to develop their Sustainable Energy Action Plan (SEAP) are reviewed focusing on the suggestions for spatial actions. Then we turn to our case of Flanders and first of all introduce the way the CoM is implemented in Flanders. In the fifth section an in-depth analysis is made on five specific SEAP's in Flanders and the extend in which they take territorial factors into account. This paper ends with a discussion, a conclusion and recommendations for further research.

The Covenant of Mayors initiative underlines the importance of local governments within the energy transition

Several authors (Bertoldi, Cayuela, Monni, & De Raveschoot, 2010; Croci, Lucchitta, Janssens-Maenhout, Martelli, & Molteni, 2017; Hakelberg, 2014; Kona, Bertoldi, & Kılkış, 2019) stress the importance of local governments in achieving the global and European energy targets. Their potential is linked to a combination of local knowledge and power and responsibility (Melica et al., 2018). In 2008 the Covenant of Mayors (CoM) was introduced by the European Commission as a voluntary commitment to reduce municipal CO_2 emissions by at least 20% in 2020 or 40% by 2030. In order to achieve these commitments, municipalities engage themselves to develop and implement a Sustainable Energy Action Plan (SEAP) by 2020 or a Sustainable Energy and Climate Action Plan (SECAP) by 2030. While a SEAP only focusses on mitigation strategies and actions a SECAP also includes climate adaptation. By signing the CoM, municipalities commit themselves to follow standardized methodologies in setting CO_2 reduction targets and in designing and implementing policies and measures to reach these targets (Croci et al., 2017) and to submit a SEAP within the year following adhesion. Because at the moment not many municipalities have signed in for a SECAP this paper will focus on SEAP.

The first step within the CoM is to sign the agreement and committing to the reduction target of either at least 20% (2020) or at least 40% (2030). As a second step a municipality should make a Baseline Emission Inventory (BEI). This BEI indicates for each sector how much CO_2 is emitted due to energy consumption in the territory of the municipality in the baseline year. This inventory helps them first of all to identify the best field of action and the opportunities to reach the set goals (Bertoldi et al., 2010). Secondly, it helps them to monitor the progress linked to the third step of the CoM process. Differences in CO_2 emission levels between local administrations is mainly dependent on local specificities like urban form and landscape determining for instance potential for renewable energy generation, but also the possibilities for a modal shift. Climate conditions can furthermore influence the energy needs for heating and cooling (Croci et al., 2017).

The third step for a municipality is to develop and submit the SEAP itself. The SEAP should include actions of both public and private sectors, but since the municipalities themselves are the key players to implement actions, they mainly focus on their own buildings and infrastructures to act as role models for businesses and citizens. Since heavy energy-using installations like large power plants and industrial plants are part of the European CO_2 Emission Trading Scheme (ETS) (covering around 45% of emissions), these actors are excluded from the SEAP. The target sectors are buildings, transport, equipment/facilities, industry (non-ETS), local electricity generation (non-ETS) and local heating/cooling generation. As additional 'other' fields land use planning, urban regeneration, public procurement and participation are mentioned. These are the policy areas which a municipality can directly influence (Melica et al., 2018). The municipality is encouraged to distinguish between a long term vision towards 2050 and short term goals and actions towards 2020 or 2030. The vision for a sustainable future should be used as a guiding principle to make a SEAP together with the BEI.

As a fourth step the municipality should develop an implementation report and an action report. The implementation report contains information on the actions implemented and their impacts in a quantified way calculating the (hopefully reduced) CO_2 emissions. Part of the implementation report is a Monitoring Emission Inventory (MEI). The MEI follows the same methodology as the BEI. The action report on the other hand is a

more qualitative report about the implementation of the SEAP giving the status of the measures mentioned in the SEAP.

It is important to mention, especially for the next parts of the paper, that municipalities that are lacking capacities to make and implement their own SEAP can be supported by administrations or organizations that do have such capacities (Bertoldi et al., 2010) like a province or a region. These so called coordinators offer strategic guidance, financial and technical support to municipalities. Their existence has proven to support municipalities with less capacities to adhere (Melica et al., 2018; Pablo-Romero, Sánchez-Braza, & Manuel González-Limón, 2015). The three countries with the highest number of signatories (Italy, Spain and Belgium) also have the highest number of official coordinators (Melica et al., 2018).

Territorial factors are important to help the energy transition

Urban planning and land use planning are often overlooked areas to assist in reducing energy needs, increasing energy efficiency and increasing the integration of renewable energy forms in the landscape. Literature however indicates that urban form and locational factors are key influencers within the energy transition (Croci et al., 2017; Seto et al., 2014; Van Den Driessche, Nijs, Rédelé, Oelbrandt, & Van Steenkiste, 2019; Van Noordt, 2018; Wauters, Dhondt, Fremault, & Corens, 2017). This section wants to list and elaborate on the spatial actions that can be taken by local governments and use it as an analytical framework to asses first of all the level of territoriality of the CoM in general and secondly the existing CoM action plans in Flanders. Five territorial factors will be further elaborated: (1) General awareness on the importance of a territorial perspective; (2) Energy Reduction; (3) Energy Efficiency; (4) Renewable Energy Production and (5) Governance.

General awareness of the territorial perspective

The first and most important step is to raise the general awareness of policy makers and practitioners on the fact that the link between spatial development and energy policy and goals is a very important one. This relationship works in two ways: the framework set out by energy policy has important consequences regarding the spatial design of our environment. Measures to reach the targets, like siting wind turbines or reducing the energy used in transport, need to find their ‘place’ in our environment. They literally need to ‘land’ somewhere. The other way around, spatial policy and urban design also determine the energy system, the amount of energy used and the potential for efficiency and production (Van Noordt, 2018). It is important that policymakers become aware of the fact that ‘the energy transition’ is not a separate project which needs to be developed independently, but instead should become an integral part of every project a municipality starts. Policies and measures should look beyond the building level and focus to connect different scale levels from building to building block, neighborhood, city, region, nation and even global. Connecting these scale levels and looking beyond the building will help to translate policy ambitions into concrete actions while at the same time making the abstract consequences of the energy transition very tangible for citizens. By thinking beyond borders, whether this is the border of a specific project or municipality borders, linkages, opportunities and synergies can be detected (Van Den Driessche et al., 2019).

Energy reduction

Reducing the amount of energy needed in the built up environment is dependent on four variables (Seto et al., 2014). These factors are of course interrelated and interdependent and need to be taken into account together to achieve the maximum energy reduction. The first element is density. When applied to the city scale, low density developments result in higher transport needs with greater distances. Furthermore, low densities make it difficult to promote sustainable transport types like walking, biking or public transport. High density urban fabrics on the other hand reduce distances and so reduce travel need and energy needed for traveling while also promoting

alternative transport types (Seto et al., 2014). Finally, density can also be applied on the level of a building. The energy use in a building and so the potential to reduce this energy use is mainly determined by the size of the building, the surface-volume ratio and the insulation. Building more compact buildings, in greater densities and with sufficient isolation would therefor reduce the energy needs (Wauters et al., 2017). The second factor in the built up area is land use mix. Land use mix refers to the degree of mixing of different functions in an area. For example mixing residential, business, commercial and green areas. By bringing these types of activities into each other's proximity the need for transport (eg need for energy) is reduced. Historically, land use planning adhered the opposite: to separate functions because of possible negative effects from industrial areas (Seto et al., 2014). Regarding increasing the land use mix, the highest gains are achieved when daily activities are located close to each other (Wauters et al., 2017). The third factor is connectivity. The level of connectivity in a city can be measured by the average size of a building block and the amount of intersections. When a city or neighborhood has a very fine grained infrastructure system with attractive footpaths and cycle lanes, walking and biking is promoted, which reduces the GHG emissions (Gehl, 2010; Seto et al., 2014; Wauters et al., 2017). The last element in reducing the energy needs in the built up environment is accessibility. This factor is closely related to land use mix, but also to connectivity. Accessibility can be defined as access to people and places in a city (Seto et al., 2014) and access to sustainable types of transport (Wauters et al., 2017).

Energy efficiency

A third group of spatial actions are focusing on increasing the energy efficiency. At the moment a large part of energy from burning fossil fuels is lost due to the inefficiency of the extracting methods we are using. The heat produced in a car engine is lost to its environment, making the percentage of actual used energy compared to the potential energy of gasoline only 25%. The same comparison holds up for using high quality of natural gas to heat our buildings: most of the energy potential of this energy source is lost (Sijmons, 2014). By linking different end users and using collective installations instead of individual ones, the energy need can be brought down to 1/5th of the need of individual users (Posad, 3E, Universiteit Gent, & Resourcedesign, 2016). By introducing collective installations more thought needs to be put in the localization of these installations, the connections to individual users and the overall urban design. This is connected to the actions introduced for energy reduction. A specific type of collective installations are heat networks. Because of the specific characteristics of heat, this energy mode needs to be generated close to the place where it is used (Wauters et al., 2017). At the moment, like stated before, much of the heat generated is lost as a by-product. By activating lost heat, but also by introducing heat cascades, the energy can be used more efficiently. A heat cascade makes sure that high temperature heat gets used in processes needing high temperatures, like industrial processes, while the residual lower temperatures can be used for less demanding usages, like heating buildings. By creating networks of heat cascades the same amount of energy can be used in multiple ways, losing less high quality sources (Sijmons, 2014).

Renewable energy production

Within the energy transition a switch needs to be made from using fossil fuels towards using renewable sources. The energy density, or the amount of energy per volume, of a renewable energy source is however much lower compared to fossil fuels (Sijmons, 2014). This means that in order to generate the same amount of energy from renewable sources as from fossil sources, more space is needed (Posad et al., 2016). Moreover, because of the more direct link between renewable sources and the end users, smart solutions to integrate renewable sources within our built up environment are needed. Furthermore, the potential to generate renewable energy differs from place to place. Wind energy can only be generated when there is enough wind, while deep geothermal energy is dependent on aquifers at the right depth. Regarding renewable energy, two elements are taken into account. First of all the integration of renewable *electric* energy sources like solar panels and wind turbines in the (built up) landscape must be considered. Two possible, but not excluding, strategies can be applied. First of all large scale renewable energy projects can be sited in the landscape, producing a large amount of renewable

electricity. But it is also possible to integrate smaller scale renewable sources into the (built up) landscape, like siting solar panels on existing roofs (Wauters et al., 2017). A second element of renewable sources that need to be integrated in the urban environment is heat. Like explained above, heat cannot be transported over longer distances, so siting new heat sources, using residual heat and linking variated sources with demand through a heat network is a very place-based project. Moreover, a direct link with densification strategies mentioned above can be made. A heat network becomes more profitable in densely built-up areas.

Governance

The complexity of the energy transition necessitates the involvement of other actors besides the government. Literature argues that for transitions in general a wide variety of actors needs to be involved (Avelino & Wittmayer, 2016). In order to mobilize the public opinion, suggest new solutions and to form strong coalitions private actors and civil society together with academia are needed (Lemos & Agrawal, 2006). When talking about governance it is therefor important to stress the fact that actions can be initiated by the government, but also by civil society, companies and NGO's (Boelens, 2010). Governance is therefor by definition multi-actor (Newell, Pattberg, & Schroeder, 2012).

Table 1 summarizes the five elements understood under 'territorial factors'.

Territorial Factor	Spatial Element
General awereness	Reference to land use planning / urban planning
	Integrating energy goals into every project
	Connecting different scale levels
Energy Reduction	Promoting densification & reducing urban sprawl
	Promoting mixed use
	Connectivity
	Accessibility
Energy Efficiency	Use of collective energy installations
	Investing in heat networks with heat cascades
Renewable Energy	Reserving space for large scale renewable energy projects
	Integrating renewable energy sources in the (built up) landscape - electricity
	Integrating renewable energy sources in the (built up) landscape – heat/cold
Governance	Involving all actors: public, private and civil society

Table 1 Summary of territorial factors which can assist to reach the energy transition

The Covent of Mayors guidebooks help local governments with their SEAP

The CoM initiative exists for over 10 years now. The developed insights during this period has produced two guidebooks for municipalities: one in 2010 (Bertoldi et al., 2010) and a new, recently released version in 2018 (Bertoldi, 2018a) (Bertoldi, 2018b), both published by the Joint Research Centre (JRC). The new version is much more elaborate, drawing on good practices from submitted SEAP's and adding the component of climate adaptation and the connected Risks and Vulnerabilities Assessment (RVA) as part of a SECAP. This part will analyze the territorial factors suggested in these guidebooks focusing on energy actions using framework explained above.

Both the SEAP and the SECAP guidebooks point to the importance of land use planning especially when developing a long term vision. The guidebooks show great awareness of the link between spatial planning and

energy actions in general. Both guidebooks have a special section dedicated to urban and land use planning. The energy transition should become a core element in urban planning (Bertoldi, 2018b). A reference is made to the opportunity to make cities more energy neutral with every new development project within the territory of a local government. Missing out on these opportunities will have lasting consequences for the future. The guidebook therefor advocates a thorough integration of energy related considerations in all new developments (Bertoldi, 2018a).

When referring to the reduction of energy needs the guidebooks explicitly connect urban planning with transport. The actions to achieve this goal are to make more efficient use of space by promoting a compact city and targeting urban development to public transport, cycling and walking. Spatial planning is also stated when the attractiveness of alternative transport modes needs to be increased by delivering the required loading factors. Moreover there is a role for spatial planning in providing enough space for cycling and walking (Bertoldi et al., 2010). According to the guidebooks, land use planning has a key role to play to avoid urban sprawl, promote compact urban settings and mixed use. On the scale of buildings, planning regulations have an important role for the amount of energy used for heating, cooling and lighting. Adequate orientation and arrangement of buildings, building blocks and green elements can significantly reduce the amount of energy needed (Bertoldi et al., 2010). Moreover, by reducing urban sprawl, green and rural areas are preserved which may potentially provide carbon sequestration. What is interesting to see, however, is that the first guidebook on how to make a SEAP sees urban planning and regulation only important for new buildings, but less relevant for renovated buildings and not relevant for existing buildings (Bertoldi et al., 2010). The second guidebook also refers to urban regeneration by revitalizing old brownfield sites and to 'Ecodistricts' (Bertoldi, 2018b). Although the second guidebook goes further into which spatial actions are possible they both mainly refer to 'new' developments, either on formally used, but now abandoned sites, or on completely new sites. By referencing spatial planning towards buildings in this way, the guidebooks overlook several ways how spatial planning can influence the energy performance of the urban fabric, like explained above. By downgrading it's importance it is also less likely for a municipality to actually use spatial planning as an instrument.

Regarding energy efficiency, actions like promoting local electricity production to avoid transmissions losses and the promotion of district heating and cooling are put forward. Heat mapping is promoted to help determine where heat surpluses and heat demands are and to create robust energy strategies (Bertoldi, 2018b). Urban density and limiting sprawl are connected to opportunities for district heating. Other references are more on a regulatory level like modifying regulations to support heat pipelines through public spaces or shortening the time to obtain permits for renewable energy sources (Bertoldi et al., 2010).

According to the guidebooks, a careful planning of urban form can enable the production of renewable, low carbon and smart energy, while at the same time ensuring access to sustainable and secure energy supply. Like mentioned under energy efficiency, the guidebooks indicate the possible deterring effects of planning regulations on renewable energy projects. Complicated authorization procedures could become obstacles to promote renewable energy. Land use planning is also connected to the availability of space to achieve renewable energy projects. By using specific zoning laws certain areas can be safeguarded to be used for the installation of renewable energy sources. In order to select these areas a careful, integrated planning process is needed. The focus for energy generation is mainly on the possibilities there are within the municipalities own estate, or by public-private partnerships where the municipality plays a crucial role (Bertoldi, 2018b). Again, setting the right example is put forward as key for convincing its citizens. Community cooperatives are highlighted as projects which can enable citizens to have collective ownership, but in order for cooperatives to become successful there needs to be a certain level of citizen engagement and empowerment.

The guidebooks both stress the fact that a SEAP should not only focus on the local government itself, but all members of society should be involved to establish a common vision for the future and figure out how to achieve this common vision. Therefore, a SEAP should also include actions from the private sector (Bertoldi et

al., 2010). Moreover the guidebook calls the adhesion and participation of civil society as essential. The recommendation is to involve civil society in the elaboration, implementation and follow up of the SEAP. Especially the guidebook from 2018 refers to the concept of governance and the contributing roles of the private sector, academia and civil society (Bertoldi, 2018a, 2018b).

Support from regional, provincial and intercommunal level helps Flemish cities and municipalities submit their SEAP

Belgium is among the Member States with the highest number of signatories together with Spain and Italy (Melica et al., 2018). When looking at Flanders, 251 of the 300 municipalities have signed the CoM (Covenant of Mayors Office, 2019). What is even more interesting is that Belgium also has the highest number of Covenant Territorial Coordinators (CTC). These coordinators support local governments by providing strategic guidance, financial and technical support.

The Flemish government supports the municipalities by providing a website which offers datasets and tools. First of all inventories of CO_2 emissions are provided as an excel-sheet for each municipality for the years 2011 – 2016 and updated yearly. These inventories can be used to produce the BEI and MEI of each signatory. If they want, municipalities can also change the pre-made inventory by adding own data (Meynaerts, 2013). In addition, a 'measures tool' is offered. This tool suggests 10 example measures which can be taken to reduce energy use and thus reduce the CO_2 emissions. The actual reduction of CO_2 emissions for these measures is also calculated in an excel-sheet depending on the degree of implementation of the measure (Meynaerts, Renders, & Beckx, 2013). The example measures are all very much focused on individual buildings while the larger scale and possible measures related to urban and land use planning are not suggested. The tool mainly focusses on calculating CO_2 reductions. Although the suggested measure are of course only examples and municipalities are free to add their own measures in their SEAP, example measures given by a higher hierarchy could be very leading, especially for those local governments lacking the capacities to elaborate their own SEAP.

In the whole of Belgium 20 CTC's are registered, of which 8 provinces. In Flanders, all the five provinces have signed up as a CTC as well as seven intercommunal organizations. The province of Vlaams-Brabant and Limburg for example offer extensive support towards their municipalities. In addition to pointing to the inventory made at the regional level they also offer a guidance document on how to make a SEAP in Dutch. This guidance document follows the same logic as the first guidebook offered by JRC, which means spatial planning is seen as an optional sector for measures to implement (Provincie Vlaams Brabant, 2014). Together with this document they offer a list of possible measures which is much more extensive than the list offered at the regional level. The downside however is that this list does not automatically calculate the reduced CO_2 emissions. The list of measures includes: limiting urban sprawl, Transit Oriented Development (TOD), improving fine grained connectivity, supporting collective actions at the neighborhood level, research into the use of residual heat and heat networks, land use regulation measures like compact neighborhoods, active search for space for renewable energy sources, integrating energy transition principles into land use planning and area developments (Provincie Vlaams Brabant, 2015). Overall this list is very comprehensive and seems to integrate the territorial dimension quite well. As a last document the Province also offers a model of a SEAP containing a base text and guidance which the local government only needs to fill in (with the help of the inventory and the measure list).

In-depth analysis of 5 SEAP (Brugge, Gent, Antwerpen, Leuven, Hasselt) and their territorial dimension

The previous parts have first of all argued why territorial factors are important to reach the energy goals, secondly concluded that the guidebooks made available for municipalities mostly follow the insights derived from literature regarding the role of urban and land use planning and thirdly ascertained that Flemish

municipalities are very well supported by both the regional level by providing data and tools and the provincial and intercommunal level by helping them to make and submit their BEI and SEAP. This part wants to look into further detail to what degree SEAP submitted by Flemish cities follow the advice from the guidebooks. To do this, a selection of the SEAPs of the five Flemish provincial capitals is made. Because of the general larger size of these cities and thus the bigger capacity, it can be expected that these SEAPs will be more comprehensive and elaborate compared to the SEAP of other, smaller municipalities. This analysis will however provide us with a first insight into the territoriality of Flemish SEAPs.

The city of Hasselt, with 78.000 inhabitants, follows the model offered by the Province of Limburg for their SEAP. The overall goal of Hasselt is to reduce their CO_2 emissions with 20% by 2020, with a focus on reduction through the switch towards renewable energy. Hasselt choose to include spatial planning as a sector to take into account in their SEAP, showing their general awareness of the importance of spatial planning. Location policy is put forward as crucial for a sustainable development. Mobility is taken into account by making sure new developments are served by public transport. Within the other sectors actions like applying the principle of compact and efficient use of space, introduction of a heat network, looking into possibilities to apply a neighborhood approach, linking spatial planning to the realization of sustainable mobility policy, by reducing the need for cars and improving soft mobility infrastructure and maximizing the amount of wind turbines are put forward. A communication strategy needs to make sure citizens and other stakeholders are involved and can participate (Stad Hasselt, 2012).

The city of Leuven, with 101.000 inhabitants, drafted their SEAP with assistance of the KU Leuven and has set a goal of 22% CO_2 reduction by 2020. The SEAP is part of a long term process towards an energy neutral city of Leuven by 2030. As a part of this road map a structure will be set up involving the city, the private sector, academia and civil society, covering the governing aspect. One of the actions which is put forward is to turn Leuven into a bicycle city and to significantly improve the public transport possibilities. Areas which lack a sufficient degree of services should be upgraded to avoid unnecessary transport. In general the city has the ambition to promote mixed land use and compact development. Regarding new developments, priority should be given to realization within the existing urban fabric by densification. Furthermore, 10 wind turbines and 10 small scale heat networks fueled by pellet stoves should be installed (Stad Leuven, 2013). Land use and urban planning is not explicitly mentioned nor taken up as a separate sector, but some of the actions do refer to the territorial factors. The document of Leuven also explicitly states that it should be regarded as an interim document and that the city will develop a more elaborate action plan towards 2030.

The city of Antwerp is the largest city of Flanders with 523.000 inhabitants. It wants to become an exemplary city regarding sustainability. On the long term, Antwerp wants to become a CO_2 neutral city by 2050 and have at least 20% reduction by 2020. The SEAP elaboration involved a large group of people ranging from policy makers to private sector and civil society. The SEAP also stresses the importance of all these different actors in the implementation of the actions and has the ambition to have an integral approach. A separate section is devoted to spatial development with an overall goal to integrate sustainability and energy within spatial policy. The goal is to reach a spatial structure that encourages soft transport modes and public transport, compact buildings and neighborhoods with high densities, mixed use and heat networks and to create possibilities for the siting of renewable energy sources. The harbor of Antwerp is put forward as an area with high potential for the development of both solar parks and wind turbines, while heat networks mainly seem interesting for new developments (Stad Antwerpen, 2011). The SEAP of Antwerp seems to be an exemplary case in which an integrated, spatial approach is put forward to reach their goals.

The city of Gent, with 260.000 inhabitants, also wants to become one of the good example cities in Flanders regarding sustainability. The city of Gent was one of the first cities in Flanders to approve a local energy plan. Because of this early adoption, it was not yet sure about their own energy impact nor about the most efficient measures to implement. The whole document is there for conditional and will be further elaborated during its

implementation period. As an overall goal a CO_2 reduction of more than 20% by 2020 is put forward, with more specific goals for the administration of the city. The city sees cooperation with its citizens, companies and visitors as essential. The city wants to act as the initiator and stimulator. With this approach they want to show that the energy transition is a common responsibility. For new developments a sustainability note needs to be made and at least one project needs to be realized that can serve as an example on sustainability. The city also wants to develop a 'wind-plan' for the entire territory of the municipality taking the 'wind-plan' for the harbor of Gent as a starting point. The SEAP does couple mobility reduction with land use, but no concrete actions, besides the development of bicycle lanes are suggested (Stad Gent, 2008).

Lastly, the city of Brugge, with 118.000 inhabitants, has developed its SEAP with support of two external companies. The overall goal is a reduction of 20% by 2020. The city has put great emphasis on participation, working together with citizens and businesses to define the policies and measures that need to be put forward in the SEAP. In its SEAP, Brugge refers to the guidebooks of JRC as an inspiration for the selected measures, while the inventory of the regional level is used for its BEI. The document is referencing scientific literature and acknowledging the fact that taking only small steps will not be enough to evolve towards a climate neutral city by 2050, therefor the SEAP and its measures is combined with a long term vision. One of the focal points is spatial planning which needs to be organized around energy-neutral nodes based on public transport axis, while the use of cars needs to be minimized and the shift to biking and walking promoted and the use of 'green heat' should be investigated. Concretely, 35 measures are put forward. Brugge wants to realize 30 wind turbines on its territory, expand its existing heat network and wants to introduce micro heat grids in the historic center (Stad Brugge, 2015). A more concrete elaboration on the energy-neutral nodes is however missing.

Discussion and Conclusion

This paper wanted to analyze to which extend territorial factors are taken into account in local energy action plans in Flanders. Since most of the municipalities of Flanders have signed up for the Covenant of Mayors (CoM) initiative, local SEAP's were taken as the focus for this analysis. A first step was to produce a framework to analyze these territorial factors. With the use of this framework the guidebooks offered by the JRC were examined. Overall these guidebooks offer a very comprehensive overview of how to make a SEAP. When focusing on the possibilities of land use planning and urban planning the guidebooks also refer to the insights other literature sources offer on the connection between the spatial dimension and reaching long term energy goals. The actions offered, like increasing the urban density, promoting mixed use and offering space for renewable energy sources, are however more complicated to reach compared to other measures and therefore require more skills and more commitment. The focus, especially in the first guidebook was mainly on the very concrete actions municipalities could undertake themselves to improve the energy performance of their own buildings. Defining and implementing land use measures seems to be the next step. Moreover, regarding the built-up environment, measures for new developments are suggested, while the existing urban fabric seems to be neglected.

Turning towards Flanders, the support from the regional, provincial and intercommunal level seems to be very well developed to support local governments in drafting and implementing their SEAP. Although the data and tools offered by the regional level does not seem to be very aware of the territorial dimension of the energy challenges, the provincial level does take these types of actions into account. The actions suggested regarding land use and urban planning, although they do follow insights from literature and the suggestions from JRC, are however not very visible and more or less 'hidden' in between the multitude of actions suggested. The five analyzed SEAP's all take territorial factors into account, although in different degrees. This general awareness, however does not always translate into concrete actions. Moreover, even when actions are proposed, they often stay very high level without a very concrete elaboration.

Land use and planning measures are very complicated to implement, this therefor seems to be a step not many municipalities are able to take (yet). As a consequence, at the moment actions on the short term often focus on low-hanging fruit, like changing to LED lighting or focusing on the energy reduction in the municipalities own buildings. These quick wins are rightfully part of an action plan towards an energy neutral city, but they will not be enough to create a real transition. Moreover, actions focusing on land use often take a long time period to implement and also have a long-term effect. This means that policy and measure on this theme need to be established now, otherwise energy inefficient development realized today will have consequences regarding energy efficiency for generations to come. Furthermore, wrong developments now could trigger a lock-in effect, which hampers a full transition towards carbon-neutrality. When analyzing local energy policy documents there seems to be a missing link between ambitious visions and concrete actions.

Further research on the action reports and implementation reports (MEI) would provide additional in-depth insight into the territorial factors and into what extend the actions put forward in the SEAP's are achieved. Since the goals set are for 2020, a more elaborate evaluation should be made in the next couple of years. The insights gained until now should however not be overlooked. They can already provide valuable input for the SECAP's which need to be made and implemented by 2030. Moreover, this paper only looked into the SEAP's of the five provincial capitals, more insights could be derived from an analysis of a more representative sample, including smaller municipalities. It can be expected that smaller municipalities in general lack the capacity to elaborate and implement a SEAP. The support given by the provinces and intercommunal level, might be helpful for the elaboration of a SEAP, but the implementation requires even more support.

This paper has put governance forward as one of the key factors for the energy transition. While some first insights regarding the public sector were given, more in-depth research is also needed for the private sector and civil society. The framework elaborated above, with territorial factors can also be used to analyze actions from these actors.

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