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DISCUSSION PAPER

Tapping into the co-benefits of low-emission economy in cities

Joanna Wis, Camille Serre, Aleksander Śniegocki,
Franciszek Jackl, Andrzej Kassenberg and Wojciech Szymalski

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Authors:	Joanna Wis, Camille Serre, Aleksander Śniegocki, Franciszek Jackl, Andrzej Kassenberg and Wojciech Szymalski
Design:	adelphi
Pictures:	Michal Koralewski
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Executive Summary

Cities are much more than a compound of streets, buildings and infrastructure. They are vivid organisms where people interact, create networks of common values and interests, and develop new, collective ideas. At the same time, cities are facing a wide range of socio-economic and environmental challenges that are deeply intertwined.

A **transition to a low-emission economy** is a vision that can deliver social, economic and environmental benefits for local communities. In practice, it encompasses, for instance, the deployment of clean technologies, new forms of collective action, improved energy systems, the promotion of sustainable urban design and green mobility. There is a crucial role for individuals, communities and networks in developing, testing and scaling-up those solutions – alongside decision-makers.

Transformations do not unfold without tensions. A low-emission transition will require profound changes in terms of infrastructure, business models as well as individual habits. In order to support this process and nourish the debate, the independent think-tanks adelphi, WiseEuropa and Institute for Sustainable Development **launched a bilateral discussion on the benefits of a low-emission economy for local development.** In early 2016, a roundtable was held in Warsaw under the project *Polish-German cooperation for low-emission economy in cities* [1] which brought together civil society representatives and local governments from both countries. Participants shared their unique experiences and demonstrated that a transition to a low-emission economy in cities can bring both immediate and long term benefits for local development. The following paper draws on this discussion, and **offers a basis for further reflection about selected benefits based on evidence from both countries.**

Low-emission policies and actions on the local level may:

- **Enhance public health,** by reducing the local air pollution that endangers human health and by promoting active lifestyles. Measures can be taken in the fields of energy production and distribution, urban planning, as well as transportation.
- **Improve the quality of life of citizens and increase the attractiveness of municipalities:** Shorter routes, less congestion, greener cities – at the district or municipality scale, solutions can be developed together with civil society, urban planners and local businesses to shape a sustainable future for the city.
- **Bring financial savings for municipal and individual budgets:** energy savings may positively affect the financial capacities of both individuals and the municipality. This, in turn, makes funds available for other municipal priorities and assists in the alleviation of energy poverty.
- **Generate additional revenues and jobs:** Energy efficient construction, retrofitting buildings, the deployment of renewable energies, green transportation – to name a few examples – may lead to new business opportunities, the creation of new business models and new markets.

Against this background, this discussion paper seeks to **trigger a reflection on the role that civil society and think-tanks can play in supporting local leaders and local communities** in realizing these benefits and participating in the transformational change towards low-emission urban development. The four main roles presented for discussion in the following paper are:

1) Visit the project website at: http://low-emission-project.de/ (available in English, Polish and German)

- Developing a vision and taking on a leadership role,
- Launching and evaluating demonstration projects,
- Building new coalitions of actors,
- Developing enabling tools for decision-makers and citizens.

Illustrative examples and recommendations for each of these roles are identified in the full version of the report and proposed for debate with the goal to nourish local debates in Polish cities and stimulate bilateral exchanges among civil society actors from both countries.

Contents

1 Introduction

The national contexts for a transition to a low-emission economy appear to be at odds in Germany and Poland. Whilst Germany has positioned itself as a forerunner in European climate policy over the past couple of decades, pushing for ambitious greenhouse gas reduction targets, Poland's attachment to the coal industry prevails in the strategic orientation of the country. On the local level, however, priorities of municipalities and communities often converge **to achieving – or maintaining – economic prosperity, as well as ensuring a good quality of life for all, including efficient infrastructures and a clean environment.**

There is evidence that **local communities in both countries are taking action for a cleaner, sustainable future:** Social movements such as *Smog Alert or More than Energy Campaign*, which advocate for improved air quality and a more democratic energy system, are growing in importance in Polish cities and are yielding their first signs of success. In Germany, citizen energy cooperatives are no longer isolated cases operated by forerunners of the anti-nuclear movement. On the contrary, owning and shaping the *Energiewende* from the bottom-up has become a concern in many municipalities across the country **– a promise of socio-economic gains and a guarantee of a safe future for generations to come.**

This **echoes the trends unfolding at the global level,** where two key milestones were reached in 2015: In September, the United Nations General Assembly adopted the 2030 Agenda for Sustainable Development, which sets a new international framework for development by defining 17 Sustainable Development Goals. One of these goals specifically focused on building sustainable cities and communities. In December, the 195 parties to the United Nations successfully concluded negotiations on the new framework for achieving climate mitigation and adaptation goals. The challenge is clearly stated: *"bold and transformative steps [...] are urgently needed to shift the world onto a sustainable and resilient path" (Agenda 2030),* and to *"put the world on track to avoid dangerous climate change by limiting global warming to well below 2°C"* (Paris Agreement). In both cases, the success of the associated implementation processes will largely depend on the actions of local governments and communities, as the latter are **both objects and subjects of the transformational changes required.**

2 Cities as key socio-economic actors

2.1.1 Global-local nexus

Today's world is the world of cities: over half the global population currently lives in urban settlements. In Europe, almost three-quarters of the population are currently urban dwellers. In Poland, the share of the urban population is expected to grow to 70% by the year 2050 (UN 2014).

Cities are global engines for innovation and development: 60% of the global GDP is generated by only 600 urban centres (Dobbs et al. 2011). Urban areas have a large potential for transformational change, due to their high level of investment in infrastructure, the nexus between built and natural environment, and above all, due to the people inhabiting and shaping them. Cities, in interaction with their hinterland and rural areas, will shape the future of our economies and societies.

Modern urban settlements, both large metropolitan areas and smaller towns, face numerous economic, environmental and social challenges. Against the increasing trends of globalization and urbanization, the real challenge for urban dwellers is to achieve and maintain a high standard of living, whilst reducing associated social and environmental impacts.

Cities compete to attract talent, investment and business. Municipalities of all sizes face pressing questions: how to respond to diverse global challenges using their local strategies, how to grow in the most beneficial, and inclusive way, and how to respond to globalization and competition from larger urban centres. In Poland and Germany alike, many smaller municipalities estimate that their biggest challenge is to attract new investors and to address the issues of a declining population and the associated grim economic prospects: a shrinking population means a declining workforce and a less favourable environment for local businesses.

2.1.2 Environmental problems: climate change risks and poor air quality

From Cracow to Beijing, air pollutants, such as nitrogen oxides, sulfur dioxide, benzo(a)pyrene or suspended dust, cause serious harm to public health, the environment and the economy. According to a recent study by the WHO and the OECD, air pollution costs amount to the equivalent of one tenth of GDP in Europe (4.5% in Germany and 12.9% in Poland).[2] A ranking prepared by the European Environment Agency shows that out of the top ten cities with the worst air quality in Europe, six are located in Poland. **The European Environmental Agency estimates that in 2012, 44.000 premature deaths could be attributed to particulate matter (PM2,5) in Poland (i.e. 11 per ten thousand citizens); the number reaches 59.500 in Germany (7 per ten thousand citizens)** (EEA 2014). Additionally, the study conducted by WHO, reveals that another 61.000 premature deaths occur each year in Europe as a consequence of air pollution from wood and coal heating. Urban dwellers and assets also face the risks associated with more frequent **extreme weather conditions** likely influenced by global climate change (EPA). **The costs of storms in Europe in December 2015 reached EUR 1.5 billion**, whilst the heatwaves of July/August 2015 might have caused the deaths of over 1.200 people (Munich RE 2016). The heat has also endangered Polish energy security, prompting the first power-supply curbs since the 1980s. The weather conditions cut power production and hampered electricity transmission as low water levels in Polish rivers hindered cooling processes. In Warsaw, according to the underlying statistical analysis, it can be stated that the heat waves (without external causes) result in an increase mortality reaching 14%, and for men 70+ even 25% (Rabczenko et al. 2015). According to Polish government estimates, failure to adapt to the climate change may result in PLN 119 billion (EUR 28 billion) in domestic losses over the next decade (Ministry of Environment 2013).

2) Economic costs in this study focus on the costs of mortality and morbidity in terms of social welfare loss using the value of a statistical life. For more details, see chapter 2 of the publication. WHO Regional Office for Europe, OECD 2015: Economic cost of the health impact of air pollution in Europe: Clean air, health and wealth. Copenhagen. Retrieved from http://www.euro.who.int/__data/assets/pdf_file/0004/276772/Economic-cost-health-impact-air-pollution-en.pdf p.27-29

In other words, cities are facing a wide range of deeply intertwined socio-economic and environmental challenges. This occurs in a context where not only economic opportunity, but also **quality of life – including the state of the environment – play an important role in attracting citizens and businesses.** Indeed, this is a challenge, but also an opportunity for municipalities of all sizes to redefine themselves and choose solutions that will reconcile local development and protection of the environment.

2.1.3 Low-emission transition as a solution to modern socio-economic challenges

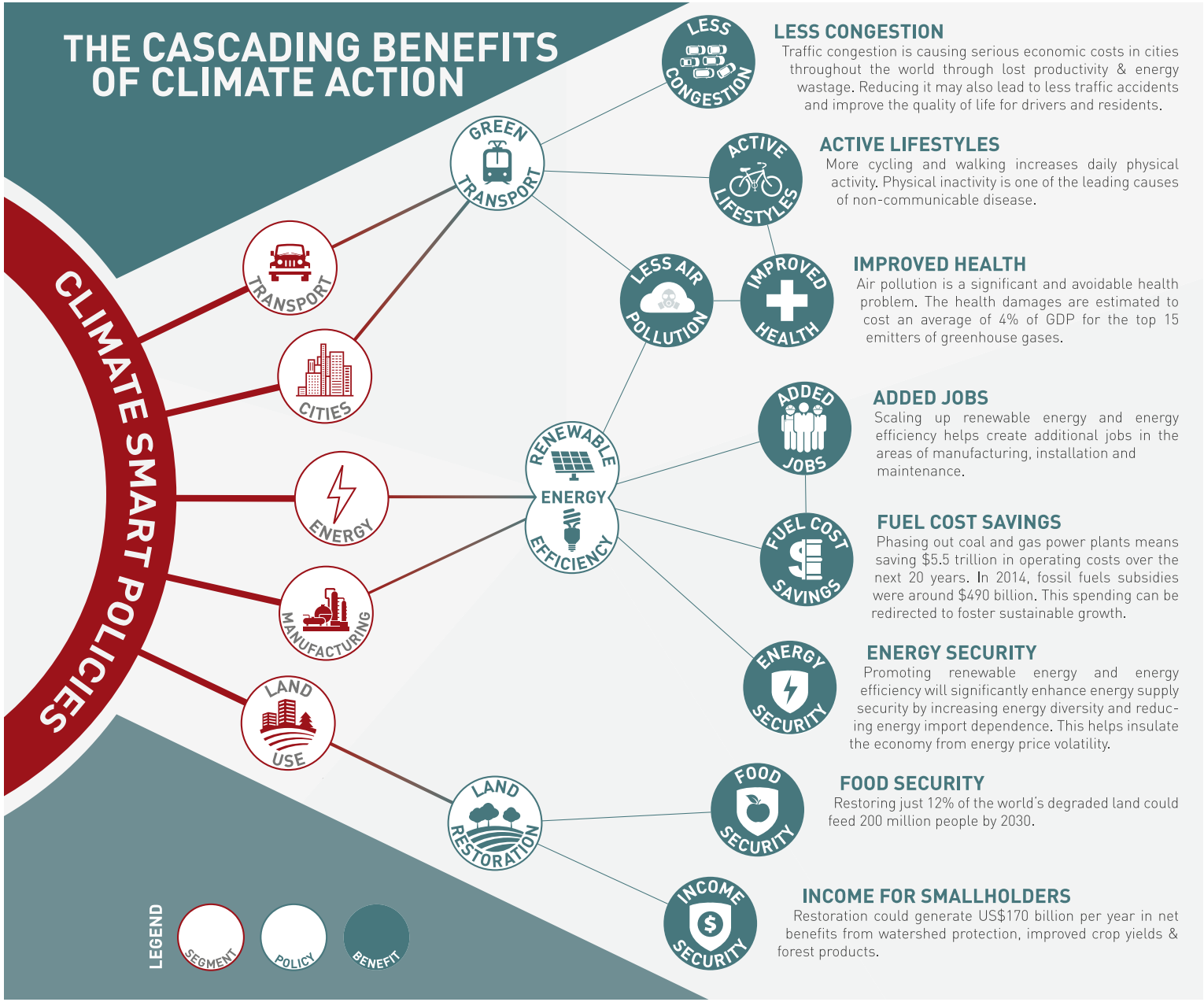
A growing number of studies and initiatives demonstrate the existence of a positive relationship between the transition to a low-emission economy and social, economic, and environmental development. According to the Global Commission on the Economy and Climate, "at least 50% and – with broad and ambitious implementation – potentially up to 90% of the actions needed to get onto a 2°C pathway could be compatible with goals of boosting national development, equitable growth and broadly shared improvements in living standards" (GCEC 2014). The IPCC finds in its 5th assessment report that "by contributing to a phase-out of conventional fossil fuels, nearly all mitigation measures have major health and environmental benefits for society [...] and lead to improved energy security at the national level for most countries" (Clarke et al. 2014).

The Warsaw Institute for Economic Studies (WiseEuropa) and Institute for Sustainable Development (ISD) found that a low-emission modernization would add 3,5% to Polish GDP by 2050 compared to the business-as-usual scenario, as a result of resource-efficiency improvements and increased innovativeness of the Polish economy. By 2050, Poland can decrease its GHG emissions by 30%, whilst achieving net financial benefits. Another 30% reduction comes at a moderate cost, and further 20% cuts require the introduction of innovative solutions. **Overall, a low-emission transition in the energy sector, transport, buildings, agriculture, and industry could lead to cumulative savings of EUR 83 billion up to 2050** (WISE, ISD 2013). Furthermore, economic sectors that emit the most greenhouse gases coincide with the main sources of locally harmful pollutants.

The benefits of smart climate policies are real and significant. **Climate action provides new opportunities for economic growth, creates jobs, improves energy security, reduces air and water pollution, improves resource efficiency, and protects the nature and human health.**

The following graphic was prepared by adelphi in the context of rethinking climate diplomacy to provide impetus for raising national mitigation ambitions. It illustrates the main benefits that can be identified at an aggregated level and in the key economic sectors, while highlighting their inherent interconnections. Many of the following have direct influence on wellbeing of the city dweller.

Fig. 1 The cascading benefits of climate action



Source: adelphi 2015

3 Fostering local development with low-emission solutions

This section explores the benefits of a low-emission transition in cities. It does not aim to provide an exhaustive list of evidence. Rather, it presents illustrative examples of the benefits that can be tapped through selected measures in the sectors of energy, buildings, transportation and sustainable urban planning. The overview of measures implemented in Polish and German cities highlights how low-emission solutions may contribute to a better quality of life and socio-economic development. Whilst some benefits can be directly linked to specific policies or policy areas, there are a number of interconnections among sectors leading to a complex, yet also promising net of benefits.

3.1 Improved quality of life

3.1.1 Cleaner air

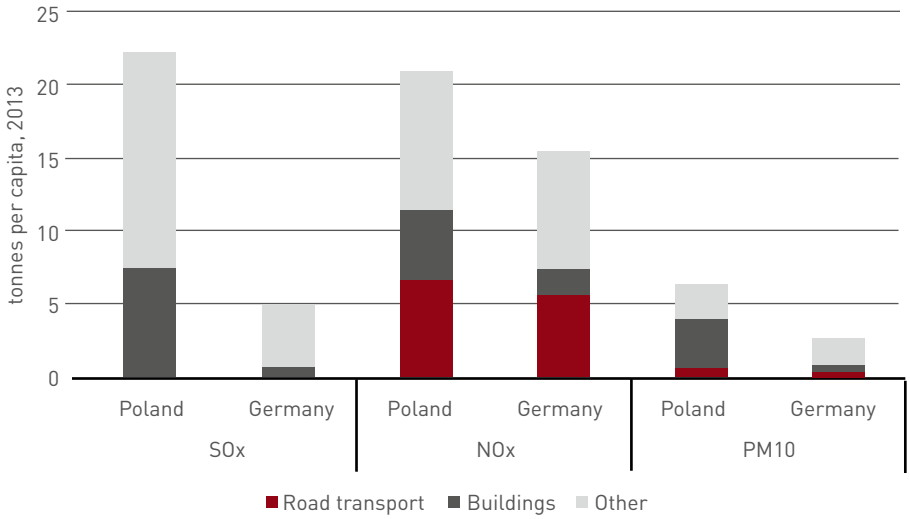
The air quality in cities across the globe has dramatically worsened over the course of recent decades. Central Europe has notably been confronted with recent research proving that the region is experiencing a high concentration of particular matter (PM 2.5) in the air. An important source of this air pollutant is **residential heating with wood and solid fuels, which also emit carcinogenic compounds.** These induce serious health effects, including respiratory and cardiovascular morbidity and mortality (see p.10). Short- and long-term exposures to residential-heating smoke have additional negative impacts on health, including cancer-causing compounds (WHO 2015).

Widespread use of cleaner fuels, efficient heating systems, as well as broader implementation of energy efficient buildings can significantly improve outdoor and indoor air quality. Indoor air quality is an especially important factor, considering people spend 60-90% of their life in indoor environments (WHO 2014). Poor quality of indoor air is responsible for sick-building syndrome (SBS), allergy and asthma symptoms, and transmission of infectious diseases. **These effects can be reduced by refurbishment investment, bringing improved energy efficiency, increased use of renewable energy sources, implementation of proper ventilation and, finally, behavioural change.**

Another significant source of harmful pollutant is **transportation**, especially diesel fuels responsible for higher nitrogen oxides (NOx) emissions. Today the demand for transport in Europe is significantly highest than in 2000 and is expected to continue growing. The EC estimates that by 2050, passenger transport is projected to grow more than 50% and freight transport by 80% compared to 2013 levels (EEA 2016, p. 5).

As cities grow in size and number, the transportation sector will increasingly be responsible for issues relating to public health.

Fig.2 Per capita emission of selected air pollutants in Germany and Poland in 2013
Source: WiseEuropa calculations based on Eurostat data



To combat air pollution emitted by residential heating as well as transport there is a need for a low-emission transition in cities. Primary, there is a necessity to limit car dependency. Many cities currently explore such solutions through the **scaling up of public and green transportation**, i.e. developing multimodality (various forms of mobility) and intermodality (increasing the connection between the various forms of mobility). For example, this is illustrated by the development of rental biking systems (see Figure 3), the expansion of public transportation fleets and a switch to cleaner vehicles, such as electric or biogas-fuelled buses. This not only decreases GHG emissions and the associated air pollutant emissions, but also offers additional economic opportunities (see p.18). In order to complement these technology driven solutions, it is paramount that municipalities and urban planners work together to develop more human-friendly urban patterns focused on shorter routes and on an enhanced coexistence of car drivers, cyclists and pedestrians. The following section presents additional benefits associated with sustainable urban design.

Fig. 3 Good Practice: Warsaw Bicycle Sharing System

Challenges addressed: congestion & air pollution

Project: The Veturilo public bicycle sharing system, operating since August 2012 in Warsaw, with its 205 stations and more than 3,100 bikes, created 60 to 70 new jobs (at the company managing the project). The system is an incentive to use a healthy and environmentally-friendly mode of transport for everyday work, school and social commuting. It may also help reduce the number of cars on the streets of Warsaw.
Over the past four years, Veturilo was rented a total of 7,5 million times and more than 410 thousand people registered within the system – therefore, the Warsaw City Bike is not only one of the seven largest systems, but also one of the most popular rental systems in Europe. Such popularity of cycling is also influencing the overall bicycle market in Poland.

Benefits: less congestion – improved health – active lifestyle, new business opportunities

3.1.2 Attractive cities: less congested, more human

Road users in the UK, France, Germany, and the US spend on average 36 hours in gridlock every year in metropolitan areas, and this is predicted to increase by 6% between 2013 and 2030. Traffic congestion has a direct impact on the quality of life of urban dwellers, notably on their everyday stress levels and, hence, on the overall attractiveness of a given city. This loss of time (along with associated costs for wasted fuel) can be estimated in economic terms, thereby putting a price on the lessened quality of life: in European towns and cities, chronic traffic congestion is estimated to cost EUR 80 billion annually. "Total economy-wide costs in the four above mentioned countries may rise from USD 201 to 293 billion from 2013 to 2030" (Cebr 2014). **In Poland, residents of the most congested cities spend more than eight hours per month in traffic jams.** PLN 14,6 million is lost

per day and more than PLN 3,8 billion per year standing in a traffic jam – according to a report by Deloitte and Targeo. Each motorized inhabitant of the seven largest Polish cities lost an average of PLN 3.300 per year due to traffic (Deloitte, Targeo 2016, p.55).

The traditional response to congestion issues in the 20th century was to invest in **new infrastructure** such as roads, highways, and tunnels. However, UN Habitat warns that "these developments engender a vicious circle: more infrastructure stimulates urban sprawl because access to peripheral urban areas is eased, increasing the use of cars which, in turn, calls for further infrastructure development, and so on" (UN-Habitat n.d.).

The transportation issue is not of infrastructural nature only; it is also deeply linked to the design of the cities. In 2008, the Urban Land Institute (ULI) found that "with more compact development, people drive 20 to 40% less, at minimal or reduced cost, while reaping other fiscal and health benefits" (Urban Land Institute 2008). Many architects, social movements, and government agencies such as the US Environmental Protection Agency (EPA), UN Habitat and others have supported **new urban models: walkable, compact cities or neighbourhoods centred on high-quality public transportation systems, with necessary green public spaces.** Such developments minimize stress, related to traffic noise and commutes, while the green spaces and access to open waterways contribute to psychological well-being. In addition to these lifestyle improvements, sustainable urban planning also helps mitigate the heat island effect – projected to increase due to global warming – improves air quality (see below), as well as supports biological and hydrological systems. So-called **Transit- Oriented Development** (TOD), also similar to the wider concept of "**cities for people**" put forward by Jan Gehl – in other words, cities that are "**lively, safe, sustainable, and healthy**" – is a fast-growing trend. It combines "regional planning, city revitalization, suburban renewal, and walkable neighbourhoods" (TOD n.d.).

In order to complement this holistic concept, sectoral measures at a lower level can help make cities more attractive for citizens. Energy-efficiency improvements in buildings, for instance, can lead to a great increase in the comfort and standard of living of households. A study assessing the motivations of Polish households to implement energy-saving measures shows that 60% mentioned the increase in thermal comfort (Institute of Environmental Economics 2014). Overall, most of the benefits listed in this section have an indirect effect on increasing the attractiveness of cities and, thereby, provide solutions to demographic changes negatively affecting many municipalities

3.1.3 Active lifestyles

Another important lever to improve the quality of life and public health is to **foster healthy lifestyles**. According to the WHO, insufficient physical activity is one of the 10 leading risk factors of global mortality, with about 3,2 million deaths annually attributable to this factor. Globally, 23% of adults over the age of 18 were insufficiently active in 2010. In Poland the figure is around 20%. Research conducted by ULI illustrates "that the built environment (including buildings, streets, and neighbourhoods) has a profound impact on health outcomes. An American Journal of Preventative Medicine study found that people who live in neighbourhoods with shops and retail establishments within walking distance have a 35% lower risk of obesity" (Urban Land Institute 2016). The solutions proposed above in the sector of green mobility, notably **shortening distances through compact urban design and promoting non-motorized transportation modes**, enable health benefits to be tapped into on the local level.

3.2 Socio-economic benefits

3.2.1 Energy cost savings

Poland has a very large potential for energy-efficiency improvements, Actions in this field can bring the most immediate financial savings necessary for further investment. Several pioneer cities in Poland have already demonstrated that implementing **energy management strategies, combining energy monitoring and energy-efficiency have a positive impact on city budgets.** The energy and environment management program implemented in public buildings by the City of Częstochowa brought PLN 27 million in savings (about EUR 6 million) over 10 years of its implementation (Herbus 2016). Monitoring of energy and the water use influences also the patterns of consumption of end users. Another good practice of energy management leading to considerable savings in energy costs is the city of Bielsko-Bala (see Fig. 4).

Fig. 4 Good Practice: City-wide Energy Management in Bielsko-Biała
Challenges addressed: high energy consumption & energy bill

Project: Bielsko Biała is one of the leaders in energy management among Polish cities. The Office of Energy Management (part of the City Hall structures) has been implementing its programs since 1997. The energy management system monitor the heat and the energy consumption in public buildings. At the same time the office is responsible for secure continuity and quality of energy supplies. To fulfill its obligations and maintain the energy prices at a responsible level the trilateral agreement between the city, the local distributor of heat, and the biggest producer of heat and electricity has been sighed. Based on data from 2014, the city managed to reduce its energy consumption by 20.3%in public buildings (in relation to 2008 levels), while compared to 1990 – by 49.6%. The same data for the city as a whole amounts to 5.1% and 33.01% (does not include the transport sector). Saving generated by the city in the relation to reduced energy consumption in buildings amounts to 4.4 million PLN/year compared to 2008, and as a result of the purchase of electricity in the tender group – 1.8 million PLN average compared to the price list. Energy savings in the city as a whole can only be roughly estimated as equivalent to about 34 million pln.

Benefits: Cost savings, increased air quality

Residential buildings in Poland as well have a large potential for energy savings: 72% of single-family residential buildings are characterized by low or very low energy standards, of which 70% are heated with coal. It is estimated that three million boilers are currently based on outdated, inefficient technological solutions (Institute of Environmental Economics 2013). This efficiency gap is a common trait among countries in the former Eastern bloc. Indeed, this is a legacy of the old political and economic system, but it has also proved to be a business opportunity.

Commercial buildings and industries can also tap significant benefits when reducing their energy consumption through the deployment of low-carbon technologies and optimization of their energy management (see Fig.5). These measures often have low investment costs and/or a fast return in investment, providing attractive opportunities to businesses. Energy cost savings additionally, and indirectly, boost the productivity and, hence, the competitiveness of businesses on the market.

Fig. 5 Good Practice: Energy efficiency in a dumplings factory – Piaski
Challenge addressed: energy use – air pollution

Project: Low-carbon technologies in small and medium-sized enterprises in Poland are still used quite rarely. One of the innovative examples is "Dumpling Piaski" – in Lublin province. The owners decided to use technologies such as photovoltaic panels, heat recovery from process cooling, replacing traditional lighting with LED and exchange industrial ovens from the electric to gas. As a result the factory achieved 40% reduction in the energy consumption per year, as well as a reduction of GHG emissions up to 31 tones /year (data calculated based on the energy audit). The technologies are turning at a rapid pace by reducing annual energy costs. The investment in LED lighting only returned within 3 years, while the purchase and the installation cost of photovoltaic panels are estimated to return in within 10 years. The overall cost reduction related to the energy efficiency reaches of approximately 50%.

Benefits: energy efficiency – energy saving – less GHG

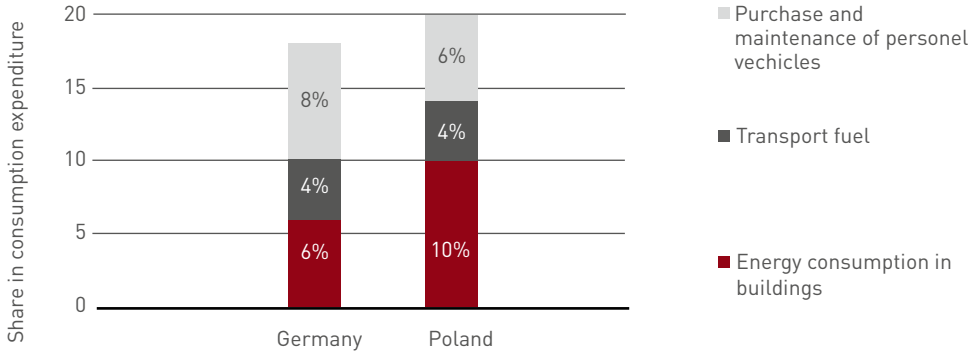
3.2.2 Poverty alleviation

Energy consumption in buildings and the use of personal vehicles for transportation are major components of household budgets both in Poland and Germany.

Low-emission investments in cities focused on energy efficiency, renewables, and sustainable mobility provide opportunities for significant savings for citizens, as they can decrease expenditures on energy and fuels (and sometimes also personal vehicles), whilst maintaining or even improving their living conditions.

This is especially relevant for low-income households, which may be locked into high-emission infrastructures (old, inefficient dwellings, neighbourhoods without easy access to public transport), unable to invest in the solutions which will decrease their costs of living. In this case, public support may be necessary to break this vicious cycle, limit material deprivation among vulnerable households, and limit harmful emissions. This dimension may be especially important in the case of urban revitalization projects.

Fig. 6 The share of energy and transport costs in household's consumption expenditure in Poland and Germany in 2016



Source: WiseEuropa calculations based on Eurostat data

In the buildings sector, low-cost investments and small behavioural changes, such as reducing energy consumption related to lighting, heating, cooling, and ventilation, or upgrading installed equipment in households, helps reduce the energy bills of citizens. This is of particular relevance to a country like Poland where, in 2013, nearly half of the population faced energy poverty: 44,4% of the Polish population (17,2 million people) spent 10% of their income on their energy and heating requirements (Owczarek and Miazga 2015). Initiatives can target poorer households to help them assess their current energy consumption, and present simple and efficient energy saving solutions. Additionally, these initiatives can raise awareness about simple changes in behavioural patterns that can lead to great reductions in energy bills and, thus, an improved quality of life.

3.2.3 New sources of income for local businesses and citizens

With decreasing costs in renewable energy source (RES) technologies, decentralized power generation (owned and managed by small businesses and private households) is gaining in popularity. This brings multiple business opportunities, as well as other positive social changes at the community level:

- **Citizens, community companies or cooperatives may become local energy producers.** In Germany, 35% of RES installations are owned by private households, over 10% by farmers (thereby providing them a complementary source of income) and 14 % by businesses (Mühlenhoff and Dannemann 2015, p. 5). The highest profits can be generated from the operation and maintenance of RES installations. **Citizen cooperatives** are an increasingly popular form of action, where groups of committed citizens own and operate renewable installations in a democratic and transparent manner. Each shareholder has an equal right to the decision-making at the general assembly. Shares are often set at a low price (e.g. only 500 Euros in the small municipalities of Lehrte and Sehnde near Hanover) so that low to middle income households are not excluded from participation and potential profit.

- **Local energy innovations or RES installations and production** allow for the generation and redistribution of profits within the community. Geothermal installations in Poland (Białka Tatrzańska, Mszczonów, Uniejów, Toruń, where the significant part of components are produced in the same region or country while the services are delivered by local entities), provide examples of this kind of setup.When the RES technology is not produced locally, the investment cost related to purchasing the technology and appliances will be "exported". Yet, **installation and maintenance services, as well as the profit from energy generation and savings from avoided purchase of the conventional energy,** would stay in the community. This model is popular in wealthier communities, as well as in bigger regions. This is due to the fact that the inhabitants in the areas of a higher wealth, are often under stable law and economic conditions and the capital required for investment has significantly accumulated.

In the field of **green mobility**, the popularity of cycling in Poland (see p. 12) is also influencing the overall cycling market of the country. "In 2013 alone Poles bought over one million bicycles, more than passenger cars", according to data from stats office GUS (Ministry of Treasury 2014). Economic benefits can be harvested on further markets: investment in public transport provides a boost to domestic industry. Public transport manufacturers (both buses and trams) are currently at the forefront of manufacturing growth in Poland. Companies such as Solaris – the manufacturer of modern buses from Bolechów – started producing electric buses almost five years ago. In 2015, the company generated $ 1.7 billion of revenues. They are currently the market leader in Poland, as well as an important player on the global market with nearly 1000 buses sold abroad in 2015. The latest product the Solaris Urbino won the "Bus of the Year 2017" award (Wozniak 2016).

Low-emission transport – with e-mobility at the forefront – is a particularly promising business niche recognized by Polish companies, as well as the national government. This niche also includes other less polluting solutions such as biogas-fuelled vehicles. Sweden, for instance, promotes methane-gas-powered public transport and taxis. The methane for these vehicles is produced from biogas waste-power plants.

Encouraging **building refurbishments** may also yield economic benefits for local communities, most notably in the sector of construction and planning. For example, in Germany, in 2011, **over 1 billion Euros of income after tax was generated in the craft industry, due to energy related refurbishments in buildings** across the country (Weiß et al. 2014). This opens up considerable opportunities for local communities, as these jobs and income predominantly have a strong local component, whereas other economic effects linked to refurbishments – e.g. the production of material or technical input – may benefit businesses located outside the region, potentially even in another country. The above mentioned study by the IÖW finds that **particularly the reinstallation of gas condensing boiler systems had by far the strongest effects in terms of value creation and employment** – a great incentive for Polish municipalities that would like to move away from coal-based heating in public buildings and private households. Local governments can work hand in hand with local businesses, implementing energy-efficient, environmentally-friendly solutions through local financial schemes and partnerships.

In the longer-term, energy efficiency improvements may also bring **solutions to the challenges of demographic change and unemployment if embedded in a revitalization strategy** at a higher level, e.g. at the district level. Thinking beyond the technical improvements to be realized at the building level allows for developing a vision for a district taking into account the available financial and human potentials, as well as built and green infrastructure. Such district retrofit projects are already being developed across Europe: In Germany, for instance, several municipalities of the Ruhr area – Bottrop, Herten, Gelsenkirchen – are looking to reinvent themselves and increase their attractiveness in the face of the structural change. Revitalization projects can deliver transformative, positive social changes support social and human capital development

encouraging new networks and social engagement by increasing the standard of living for citizens. This can in turn positively influence the value of properties (especially important in cities where the citizens are the owners of flats and buildings), improve sense of security and minimize migration.

3.2.4 Employment impact

Both investment in **energy efficiency and RES** create a significant amount of jobs, including on the local labor market. Deep retrofits of buildings in Polish cities and towns are especially interesting from this perspective, as they provide employment opportunities in the construction industry across the country. According to estimates by 3CSEP, large-scale building retrofit programs may have created over 100.000 jobs in Poland (3CSEP 2012). These projections are confirmed by recent regional experiences: in the Czech Republic, the "Panel" public financial scheme supporting thermal insulation in residential buildings has retained or created almost 60.000 annual job opportunities in the previous decade, while another program launched in 2009 has generated over 19.000 additional job opportunities during the first year of operation (Zamecnik and Hlavac 2011). Local energy networks are also primarily the source of local jobs. RES installations may also be manufactured locally in Poland, as it is often the case with solar heat panels.

In Germany, employment in the RES sector in 2014 reached almost 350.000 jobs. A direct effect of RES development on employment is due to the production of RES technologies themselves. Germany has developed an industrial strategy to become an important actor on this market. This has also been driven by municipalities and regions that are looking for new comparative advantages, e.g. in the Ruhr area, former heart of the coal mining industry. However, job-creation opportunities are not limited to the production of RES equipment. Municipalities and regions that do not have the capacities and support to follow that strategy may still benefit from the development of RES through the following steps of the "value-creation chain" identified by the Institute for Ecological Economy Research (IÖW) and Renewable Energies Agency (AEE): planning and constructing RES installations has a greater effect on job creation than processing raw materials and manufacturing components. Particularly positive effects on employment comes from the bioenergy sector, which creates agricultural jobs for dedicated crops, permanent jobs in operation and maintenance, etc. Job creation, therefore, does not stop after the installation stage (Mühlenhoff and Dannemann 2015, p. 26).

Tab1 Direct employment in the renewable energy sector in Germany and Poland in 2014

	GERMANY	POLAND
Wind	149.200	2.500
Biomass	48.500	18.500
Biogas	48.300	400
Photovoltaic	38.300	250
Biofuels	23.100	5.900
Heat pumps	16.100	700
Hydro	11.800	2.000
Solar thermal + CSP	11.000	2.600
Geothermal	1.100	200
Waste	n.a.	50
Total	347.400	33.100

Source: Eurobserv'er 2015

A comparison of employment in the German and Polish renewable-energy sectors indicates that there is a significant untapped potential in this area for Poland. While the German labour market is approx. 2,5 times bigger than Polish, the difference in RES-related employment is an order of magnitude. This disproportion is visible in all RES technologies, Thus, deployment of various distributed RES technologies may provide new employment opportunities on the local markets. The National Development Plan for Renewable Energy Sources micro installations 2020 conducted by the Institute for Renewable Energy in cooperation with the Association of Employers' Forum for Renewable Energy in 2013 estimated the potential of a significant increase in the number of prosumers in Poland from 233 thousand to 2.523 thousand (IEO and ZPFEO 2013).

While the bulk of studies focus on the positive employment effects of renewable energies, investments in energy-efficiency in buildings, i.e. energy-related refurbishments may also have a considerable impact on employment. In Germany, investments in the building sector may lead to additional 35000 jobs by 2020 compared to a business-as-usual scenario, whilst effects of energy efficiency measures may bring another 130,000 jobs per year (Lehr et al. 2012). The programs of the German Bank for Reconstruction (KfW) offering funding opportunities for energy-efficient construction and rehabilitation are estimated to have led to the creation of respectively 341,000 jobs and 79,000 jobs in 2013 – over 80% of which were created in small and medium-sized businesses (Diefenbach et al. 2014).

3.2.5 Positive effect on municipal households

Low-emission measures – notably the deployment of renewable energies and energy efficiency improvements – may have multiple direct effects on the municipal budgets. Improved energy management (see p. 16) and a reduction of the demand for conventional energy that may be imported from other regions or countries can lead to great energy cost savings (see p.16). In addition, new sources of income may arise from the local production of renewable energy:

- Municipalities can generate revenues from leasing municipal land to external investors to develop RES.
- Investors that settle in a particular municipality will pay business and income taxes, while employees bring income tax, both leading to an increase of municipal income. In Germany, the added value generated at the local level through the expansion of RES was estimated at about 11 billion Euros in 2012 (Aretz et al. 2012).
- In small municipalities profits from the rent of land, or taxes paid by external investors in RES energy production, are redistributed among community and local government. This solution has already been introduced in Poland (Margonin, Kobylnica, Kisielice). Even a modest contribution to local budgets from investor income may significantly influence its budget (even by 20% like in Margonin).

3.2.6 Closing the financial gap

There is a substantial, estimated financial gap between overall low-emission investment needs in Poland and the existing national-supporting schemes. For instance, a recent analysis conducted by the Building Performance Institute Europe (BPIE) indicates that the vast majority of buildings (out of a total of 6 ml.) in Poland have a very high level of demand for final energy and, thus, are key targets for thermo-modernization. However, the existing national financial schemes supporting building refurbishment in Poland, available until 2020, will only cover between 3,2% to 13,6% of the total needs for the multi-family building stock, equivalent to an annual rate of 0,6 – 2,7%. The rates for non-residential buildings and single -family buildings are even lower (0,4 – 1,8% of the commercial building needs and 0,04 – 0,16% single family -per annum) (Staniaszek and Firlag 2016). Data from the Central Statistical Office indicate that about 50% of residential buildings in Poland have been insulated, but in the majority of cases

to a sub-optimal level (Staniaszek and Firlag 2016, p. 13).

Leveraging private capital is therefore crucial, primarily for successful thermo-modernization of half of the Polish residential building portfolio generating huge energy losses (which in many cases causes the energy poverty among Polish households).

It is possible for local governments and businesses to look for solutions and new opportunities to close this gap. Such models already exist in many European countries. One example is blending public and private finance for energy efficiency investments in buildings. Other locally available solutions include:

- Creating local public-finance instruments e.g. the Amsterdam Investment Fund, the Brussels Green Loan Scheme,
- Establishing partnerships with communities, energy utilities (see Fig. 7), businesses,
- Engaging in internal contracting (e.g. Stuttgart)
- Using Energy Saving Companies (ESCOs) to leverage public and private capital.

In its overview of the 2014 ESCO market, the European Commission presented several types of enterprises established by public institutions, utilities, and finally citizens, creating access to capital and undertaking building refurbishments, among many other energy-efficiency measures via ESCOs (Bertoldi et al. 2014).

Fig. 7 Good Practice: New City-wide Financial Scheme proKlima

Challenges addressed: High energy consumption / energy bills

Project: A climate fund initiated in 1998 by municipal utility Stadtwerke Hannover AG, the city of Hanover, and the surrounding municipalities of Hemmingen, Laatzen, Langenhagen, Ronnenberg, and Seelze. The total amount of funding available depends on the municipal utility's profits from the previous year and a gas price component. The programme is unique in Europe as it allows Stadtwerke Hannover AG's customers to play a role in financing the climate protection activities in Hanover. Currently proKilma supports climate friendly projects with a budget around EUR 4.4 million each year.
proKlima funds energy-efficient construction and renovation, as well as the renewable energy technologies, combined heat and power (CHP), educational activities and energy-efficiency consultations with energy experts (EnergieLotse) for private households. The fund also aims to promote best-practice models to inspire other residents and municipalities.

Benefits: Lower energy bills, greater energy independence, training citizens for green jobs.

4 The role of civil society in the transition towards a low-emission economy

The previous section presented a comprehensive – yet not exhaustive – list of benefits related to measures undertaken at the local level – regardless of the national context – that can lead to a transition to a low-emission economy. These measures directly reflect the local challenges that mayors and local communities are facing and propose solutions supporting socio-economic development, public health, and energy security. In this section of the paper the authors explore how civil society – including non-governmental organizations (NGOs), think-tanks and other non-municipal and non-market stakeholders from the local community – can support the process of transition to a low-emission economy by tapping into the benefits for the local development.

The concepts of civil society and local community encompass a wide range of actors representing various interests and sometimes adopting contradictory strategies. Also, societal transitions are complex, non-linear processes that unfold over decades. Therefore, no one-size-fits-all answer can be given to this question. In the following section the authors explore possible steps and roles, illustrated by hands-on examples in Germany and Poland, and derive recommendations from this knowledge. The goal of the Discussion Paper is to hereby nurture the debate in Poland by promoting a variety of visions shared by Polish civil society. The Discussion Paper examines a possible way forward towards the low-emission transition, first and foremost in Poland, but also in other Central and Eastern European countries.

The theoretical framework that we propose to discuss the role of civil society is inspired by the work of Loobarch on transition management (Loorbach 2010) adapted to the specific context of the transition to a low-emission economy in Poland, and nourished by the outcomes of the Polish-German roundtable that took place on January 26, 2016. The paper identified four main roles that can be fulfilled by actors from the civil society in order to achieve a transformative change in the core of the society: support the transition to a low-emission economy: developing a vision and taking on a leadership role, launching and evaluating demonstration projects, building new coalitions of actors, and developing enabling tools for decision-makers and citizens. These four roles are presented in more details in the following sections.

Fig. 8 Community engagement tools and process

Source: adelphi 2015

4.1 Visions and the leadership

4.1.1 From inspirational vision to societal transition

A societal transition starts with a long-term vision of a brighter future that can be shared by the majority. Such an approach motivates individuals to act and get involved for the common good. At the same time, it has a practical objective: "Long-term visions can function as a guide for formulating programs and policies and setting short-term and long-term objectives" (Loorbach 2010). In order to be effective, transition images must be **inspiring**, but also **realistic** in order to mobilize a wide range of actors and help move beyond the status quo.

Individuals or groups can react very differently to the vision reflecting change: from trying to undermine it, passively resisting it, to sincerely embracing it. Particularly in times of uncertainty, people are prone to react more greatly to potential present loss than the future gain, a phenomenon called loss aversion: "losses loom larger than the corresponding gains" (Kahneman and Tversky, 1979). The future well-being will be underestimated if there is a present need or perception of sacrifice (e.g. related to financial means, comfort and daily habit). The sacrifices seem even greater if the future gain does not reflect present beliefs and values. This is why every change will have its opponents, and the leaders of change need to inspire with strong visions but when necessary also be able to raise concerns and even dismay the community resistant to change.

4.1.2 Leaders of the change

A common understanding is that leaders – either political leaders or members of the civil society – should develop such a vision to guide the local community towards sustainability. In Poland, as in Germany, local decision-makers certainly have played a decisive role in triggering processes that led to the implementation of low-emission strategies and actions, thereby tapping into the associated benefits presented in the previous section. But there is also evidence of missed opportunities. In Poland, this vision could have been captured in the over 800 Low-Carbon Economy Plans (LCEPs – Plany Gospodarki Niskoemisyjnej PGN) that have been funded by the National Fund for Environment Protection and Water Management and developed by municipalities since 2014 in order to fulfil requirements to access European structural funds. LCEPs were a great opportunity to start a community-wide discussion on the guiding principles and goals necessary for the sustainable future of the municipalities. However, in practice, the bulk of these plans were developed without public consultation or reliable identification of local conditions, and with a CO_2 reduction targets that are used as a justification for already planned investments.

Fig. 9 Good Practice: Energy sufficiency in Kisielice

Kisielice is a small town in the Western tip of the Warmia-Mazury region. Since the early 90s, the local mayor has consistently developed a municipal strategy for energy self-sufficiency and managed to realize that in 20 years' time. In 1998, the local spatial development plan was changed to allow for the construction of wind farms on agricultural lands. In 2000, funds were found in order to conduct a wind resource assessment in the commune under the EcoLinks program. Between2003-2004, the program of modernization of the heating system in Kisielice was launched, based on the new straw-fueled heating plant, which started to operate in 2004. The first phase of the project of building the wind farm started in 2006, and the turbines took operation in 2007. The farm was extended with six more turbines later on. In 2014, an agricultural biogas energy plant was opened. The local community supported the project from the very beginning, which can be attributed to an educational campaign developed and run well in advance so that inhabitants had enough time to become accustomed to this idea and were rather keen to see the installations being built.

Commendable exceptions were driven by the local innovators: people or organizations with the drive to change, which were not afraid of the risks and were able to convince others to support the transition. Warsaw was one of the first cities in Poland to introduce participatory procedures during the development of their LCEP, inviting a variety of civil society representatives to

the dialog and the low-emission actions. This strategic document now serves as a roadmap for project implementation and a tool to gain the European structural fund. It was also designed to support external stakeholders with their low-emission efforts, as the beneficiary of the structural funds gained under the LCEP could be the local government itself or other entities.

Recommendations for actors of the civil society:

- **Propose narratives and visions that address the tension that arises when comparing "the world as it is" and "the world as it should be"**. The latter appeals to human values and triggers individual and collective action (Genz 2010). Comparing the reality of one's life, neighbourhood, community, city or even country with one's expectations triggers changes. Social justice, ecology and sustainable development are strong visions of a better life, better place to live and better future, especially when compared with experienced low-air quality, unstable access to energy supply and energy poverty. Local leaders using those visions have already influenced many actions in Poland and Germany.
- **Shape the discourse around benefits highlighted in the above section,** by articulating a common vision around socio-economic as well as environmental goals and images. The challenge is indeed to enable the emergence of visions that are not per se labelled as "green" or "sustainable" and propose principles, images, and goals that reflect the socio-economic priorities of the majority.
- **Initiate the transition by managing it, not leading it:** Actors of civil society can – alone or together with municipal representatives – facilitate the design of a common agenda based on shared visions and within a "transition arena" (Loorbach 2010), rather than promoting top-down visions that may not reflect the various opinions.
- **Rethink leadership and recognize the multiplicity of pathway expectations and interpretations,** by enabling various groups to contribute to the definition of sustainability visions. This "basket of images" (Loorbach 2010) will keep evolving along the way of the transition.

4.2 The power of demonstration projects

Theory suggests that energy transitions develop out of accumulated experience among networks of innovative projects in "niche" space" (Geels 2002). Small low-emission projects, with the potential to bring savings and profit to the local communities, are an important tool for the wider debate about the low-emission economy transition. These demonstration or pilot projects may fulfil a double role: 1) **testing solutions**, new forms of action, new sets of values, innovative technologies but also new sets of rules, in a protected space and, when successful, 2) **helping raise awareness of the potential benefits** that could be harnessed if the solution would be scaled-up.

4.2.1 Testing solutions

Niches can be seen as "incubation rooms" where new technologies can develop aside from the current regime, but also as "locations for learning processes, e.g. by learning by doing, learning by using and learning by interacting", and for building social networks (Geels 2002). Demonstration projects are helpful in order to test technological innovations – e.g. developing hydrogen and fuel cell technology that can be used in the future to scale-up low-emission transportation (the German municipality of Herten is betting on this technology through its Hydrogen Centre of Excellence "h2herten"), or power-to-heat systems that can help guarantee stable power supply even when a high share of renewables leads to supply fluctuations – as well as new forms of collective actions. On the practical level, soft, e.g. educational activities, with which residents will be able to interact directly, are crucial for the transition to be successful, as they contribute to the appropriation, reinforcement and further development of the sustainable vision and images mentioned above.

4.2.2 Raising awareness on potential benefits

Small-scale projects can help demonstrate that small steps can **deliver tangible benefits for the local community and help overcome the above-mentioned challenge of loss aversion** – notably in the case of societal innovations. In some cases, like the German initiative "**We are still cycling to work**" (Fig. 10.), citizen-driven pilot projects can combine the benefits of demonstrating the feasibility of switching to a low or even no-emission action (here: mobility), and that of raising awareness through their inherent engaging aspect (here: a competition). In this initiative, the competitive element and the requirement to cycle to work on a certain number of days meant that employees could see the financial and health advantages over a period of one month and, therefore, may have been more strongly incentivized to make cycling to work a new habit. Employers would also have had the time to see the advantages of healthier habits among employees – such as greater productivity or fewer sick days – and the value in encouraging employees to cycle to work with similar internal competitions or the installation of showers. The competition also sought to underscore that cycling is for all ages, budgets and fitness levels, not just athletes able to ride very far or in all weather conditions.

Fig. 10 Good Practice: "We are still cycling to work":

Klimapakt Flensburg e. V. is an association dedicated to making the northern German town of Flensburg carbon neutral by 2050. It has organized several initiatives to support sustainable transportation, including an e-mobility day and exhibition, a scheme to support cycling to school, and another to support cycling to work. The latter, entitled "Wir radeln immer noch zur Arbeit" (we're still cycling to work), aimed to encourage people to cycle to work, by emphasizing the health and financial advantages for employees and employers, as well as the environmental benefits. The campaign was organized as a competition, with businesses forming teams of between two and four people who had to ride to work at least ten times during the month-long competition period. At the end of the month, an event was held to award prizes to the teams in various categories, including most kilometers and most days ridden (individuals and teams) and best team name. All participants received a certificate. In 2013, 165 teams from 77 companies, schools and public institutions took part, riding over 85.000 km and saving between them 20 tons of carbon dioxide.asd

Whilst pilot projects cannot be expected to serve as blueprints for a wide-scale transformation, they "play a practical role in widening the diversity of ideas, possibilities, and resources for the hybrid re-configuring of socio-technical practices" (Smith 2010). In other words, they contribute to mutual inspiration and expand the range of possible solutions. At the same time, special attention in such projects should be given to gather extensive information on their process of implementation, local context, factors of success and results: there is an increasing number of examples of low-emission good practices on the local level, but only the ones that manage to show their actual results can inspire and convince others to replicate them by adapting them to other local contexts.

Recommendations for actors of the civil society:

- **Develop and support projects that have an intrinsic potential for awareness raising** due to their visibility in the public space and participation of a wide range of actors (not necessarily in quantity, but more the type of actors)
- **Facilitate and monitor small-scale pilot projects,** with a focus not only of technical results, e.g. technical output of a citizen-owned solar power plant, but **also documenting the socio-economic drivers of success and analysing local condition**s in order to derive potential factors of success in the replication to other municipalities / local communities.
- **Use new communication channels to disseminate the outcomes of these projects.**

4.3 Building new coalitions

4.3.1 Advocacy

Advocacy via coalition-building is a traditional role of civil society, notably that of NGOs. There are numerous examples of their contribution to political agenda setting, framing of the issues and mobilization of actors around a set of shared objectives at various policy levels. On the international level, the Climate Action Network has successfully brought together over 1.100 NGOs in 120 countries to inform and influence the international climate negotiations. In Poland, two interesting examples of coalition-building have emerged over the past 2 years: "**Alarm Smogowy**" (Polish Smog Alert)[3] and "**Więcej niż Energia**" (More than Energy Campaign)[4] both aiming for new regulations.

The "More Than Energy" Movement – a broad coalition of institutions supporting community owned RES, established in 2015, has already gained over 130 participants among NGOs, municipalities and regions advocating for a democratic energy system and RES development, raising awareness on possible alternative approaches to energy policy throughout Polish society. The clean air platform Polish Smog Alert (PSA), an organization established in February 2014 by three clean air grassroots movements: Krakow Smog Alert (KSA), Podhale Smog Alert, and Lower Silesia Smog Alert) has grown in only two years into a strong movement gathering 12 local smog alerts (LSAs) and impacting the public opinion and policy-making on air pollution beyond expectations: since September 2015, there have been around 1.000 media mentions in local, regional, and national press, radio, TV, etc., inspired by PSA and LSAs regarding air pollution and the need to tackle low-stack emission. Due to public pressure, the President of Poland signed an anti-smog amendment into the Environmental Protection Law Act late 2015 – the first piece of legislation curbing low-stack emissions. It provides regional authorities with a right to establish smoke-control areas either by banning, e.g., coal or solid fuels, in a particular area, or by introducing emission standards for solid fuel boilers (new and existing). To date, based on these provisions, Krakow has already introduced an anti-smog resolution banning all solid fuels from domestic heating from September 2019. Moreover, four provinces are considering application of these provisions on wider regional or agglomeration scales. These are: Lesser Poland, Lower Silesia, Upper Silesia, and Mazovia. PSA and/or LSAs are directly involved in the work on anti-smog regulations in these four regions. This is an unprecedented change – as before 2015 the issue of air pollution was largely ignored outside Krakow.

4.3.2 Positive feedback loops

The transition to a low-emission economy will necessarily spread over a long period of time. Therefore, civil society actors must not only come together around shared values and goals, but these coalitions need to be maintained and expanded over time (Lockwood 2015). Lockwood argues that a solution for this challenge is to **create positive feedback loops** – i.e. a self-transformation of interests, identity and political participation creating enabling conditions for future and bolder action. The opposite would be to create lock-in effects.

New types of collaboration, practices of energy use and new forms of investments will be required, in addition to new technologies, in order to deeply transform the urban infrastructure toward more sustainability and low emissions (Bulkley et al. 2011). As underscored in the previous section on the benefits of low-emission measures, there will be a trend towards more decentralized solutions. **This is a chance for the various actors of local communities to join**

3) http://wiecejnizenergia.pl/

4) http://www.polskialarmsmogowy.pl/

forces and develop new coalitions that not only lead to a more powerful advocacy, but also create new cooperation models and invest in new fields of action. They will therefore have the potential to lead to a transformation of interest, identity, and forms of political participation.

An illustration of these new forms of coalitions may be offered by citizen initiatives that not only came together to generate power from renewable sources but also decided to take over the local electricity distribution grid. **Schönau**, a small, rural town of Baden-Württenberg, became a pioneer in 1996: When the conventional energy provider tried to prematurely renew its contract for another 20 years, a coalition of citizens decided to take a bold step and propose a sustainable alternative. After years of coalition building, discussions with the local population, the creation of a citizen cooperative and several local referenda (1991 and 1996), the coalition of citizen won the concession. While this initiative has its roots in the German anti-nuclear-movement post-Chernobyl, it led the way for bold action in other bigger cities. Nowadays, the initiative "**BürgerEnergieBerlin**" brings together citizen from across the political scope and various professional backgrounds to win the concessional contract for Berlin's electricity grid.[5] As well as contributing to the development of a low-carbon energy system, the cooperative also aims to improve **public services** in Berlin by "empowering citizens to participate in designing the electricity sector and the grid" and ensuring that citizens "benefit directly from grid earnings". This shows a new, self-empowering role for the civil society: it has the potential of transforming the mobilization and interests of the population and may propose a response to the challenge of maintaining and expanding coalitions over time.

Recommendations:

- **Gain the attention of the local community, and beyond, through arguments that reflect the everyday life of citizens and aspects people can relate to.**
- **Build coalitions that bring together various types of actors and last over time, by, for example, including local businesses, promoting environmental and social entrepreneurship and/or empowering citizens as economic and political actors**, in order to increase the chances of delivering positive feedback effects over time. In the Polish context, it is also important to include the Catholic Church's institutions in these broad coalitions, which have a powerful reach, drawing on the ecological message of Pope Francis.

4.4 Acting as an interface: enabling tools

Additional means will be required to move from demonstration projects and coalitions of pioneer actors to a wide-scale implementation of low-emission solutions. Civil society has an important role to play here, notably institutions such as NGOs, universities or think-tanks that are already in a good position to **act as intermediaries between the leaders of change on one hand, and the wider population and decision-makers on the other hand.** This can help move from mobilization to the pragmatic implementation of concrete actions that deliver the benefits sought by both political leaders and the wider population. Several examples of enabling **tools which reveal the potential of low-emission measures on the individual or collective level** can be found in both Poland and Germany.

The following table presents tools that have been developed to support different stakeholders in their low-emission transition.

5) At the time of writing, the competitive tendering procedure in Berlin is still on-going. For updates, visit the initiative's website: http://www.buerger-energie-berlin.de/ (access: 29.07.2016).

ONLINE TOOLS SUPPORTING STAKEHOLDERS IN THE LOW-EMISSION TRANSITION	
local government	The Stadtklimalotse ("Urban climate action guide") is a web-based tool developed by TU Dortmund University aimed at politicians and public administrators involved in municipal and city urban development. It helps them to independently select no or low-regret climate action measures that will generate social, economic, and health benefits for their area. The tool guides users through a four-stage process to identify suitable measures from its database and potential partners to assist in implementation. Importantly, the online tool also points out potential synergies and conflicts between different measures. Each suggestion is accompanied by a description of the measure, information about the legal implications, relevant case studies, and further reading. At present the database includes 138 measures grouped into ten categories, 330 references to relevant legislation, and 61 examples of how the measures have been planned and applied.[7] This tool provides local decision-makers with a valuable means of exploring and better understanding the variety of options available to them in terms of developing a low-emission economy, and the economic, social, and environmental opportunities such a development would provide for their community.
local government	The Renewable Energies Agency has developed an online tool that calculates the direct value-added that RETs could provide in terms of increased municipal tax revenues from income and business tax, commercial profits and income from new employment, as well as the number of potential new jobs and reductions in carbon emissions, using national averages and various data provided by the user. Although the tool is only able to give an initial impression of what these benefits might be, it is an easy step that decision-makers can take with little effort and risk to win support before investing time and money in a professional consultation with experts.
local community	"PV Deutschland" is a free iPad app recently created by the CDW Foundation Network in Kassel that shows the output of solar PV panels across Germany in real time, and meteorological data to help predict how the sun's intensity will change over the next four days. Users can see how much electricity that will be generated from solar panels in their post-code area over the course of the day, how their region contributes to overall energy production in Germany, and compares their region with others across the country. The creators hope that the latter option will spur local decision-makers to strive for leadership in the transition to a low-carbon economy and to continue to increase support for local renewable projects.

7) http://www.stadtklimalotse.net/stadtklimalotse/

local community	A new online tool created by the municipal utility Stadtwerke Essen is helping individuals and organisations to assess the potential for producing electricity using photovoltaic (PV) solar panels and solar thermal systems on their property. The tool takes users through a two-step process. It first presents users with two maps where potential locations for solar PV systems and solar thermal systems are marked in different colours according to their suitability. As a second step, users interested in installing a solar PV system can combine the data from the map with information about financing conditions, feed-in tariffs, and their electricity usage to produce a short report evaluating the profitability of their system over a 20-year period. Average figures are also provided if they are only interested in gaining an initial impression. For many individuals, households and organisations, making the transition from a consumer to a "prosumer" of electricity seems like a complicated endeavour. A lack of knowledge about solar micro-generation and its financial advantages is therefore a significant barrier to entry for small-scale, non-professional actors. This tool addresses this problem by providing individual households with a quick and easy way to assess whether they can use the sun to produce their own electricity and the financial implications of installing a solar PV system.

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The multiplication of low-emission projects as well as the capacity building of communities could be successfully supported by tools enabling access to practical knowledge as well as promoting good practice dissemination. Such tools could be delivered by educational institutions and nongovernmental organizations for cities and municipalities across Germany and Poland. While the institutionalized members of the civil society are likely better equipped to develop such solutions, these tools can potentially be created by, or at least in cooperation with citizens or policy-makers, to increase their user-friendliness and actual potential impact on a wide-scale, and/or in collaboration with businesses that may have commercial solutions at hand.

Recommendations:

- **Develop pragmatic tools that will translate knowledge and evidence on the benefits of low-emission measures and reveal the social, economic, and environmental potentials on the individual and collective level**
- **Encourage involvement of end-users (citizen, policy-makers, local businesses) in the development of the tools** to increase chances of large-scale use

5 Conclusion

The transition to a low-emission economy may create unique opportunities and benefits for local development. Examples presented in the present Discussion Paper demonstrated that in both Germany and Poland:

- **Low-emission measures are an opportunity for local development:** They may lead to new business models, new jobs and economic growth, as well as helping to tackle many local challenges, such as air pollution, energy poverty, or brain drain.
- **There is no off-the-shelf solution:** Local governments need to look for their own individual opportunities using inspirational practices, and involving local stakeholders.

For this reason, this paper not only aimed to illustrate the various benefits that low-emission measures can deliver, but also explored the potential roles for actors from the civil society in the transition to a low-emission economy. In Poland, there are already inspiring examples of movements initiated by civil society. They partially emerged in reaction to threats to human health or threats to the environment itself (e.g. *Polish Smog Alert*), or gathered around a positive, sustainable vision for the future (e.g. the *More Than Energy* movement). In any case, there is space and potential for scaling this momentum up. In this paper, the authors highlighted four key roles that think tanks, universities, research institutes and local associations can adopt:

- **Entering into an open dialogue with different types of local actors, including citizens, to jointly shape common visions for the future.** The latter should, on the one hand, reflect the priorities of the local communities, and, on the other hand, draw on the benefits that a low-emission transition can deliver.
- **Promoting success stories from demonstration projects by evaluating and documenting** the respective success factors: providing insights from behind the scenes is key for a successful replication of good practices.
- **Strengthening existing alliances and building new coalitions.**
- **Developing tools** – ideally **with local decision-makers and/or citizens themselves** – that will enable them to visualize the potential gains of low-emission measures: there is still a gap to be filled in order to move from mobilization to concrete actions on everybody's level

These recommendations were thought as a first step to better understand the opportunities at hand and to trigger, shape and scale up low-emission measures and actions from the bottom-up. To move further ahead, the authors believe that the following questions should be further discussed in a multi-stakeholder dialog in cities:

- How to scale up the identified good practices, and mainstream the low-emission transition in the European cities for the benefits of local communities?
- Who can monitor the results of pioneer demonstration projects and assess their factors of success?
- Which specific coalitions may be built on the national and the regional level to boost the transition and tackle local challenges?

Existent Polish-German cooperation can and should be used to find answers to these questions. The focus should be on supporting not only the exchange of ideas and good practices, but also of know-how and pragmatic solutions on the local level. Potential actors to engage in this process could be the Chamber of Commerce of both countries. Joint ventures between industry associations, local governments or non-governmental organizations, as well as partner cities may be further useful levers.

The Polish-German cooperation project led by adelphi aims to do just that by supporting the development of joint projects in the field of low-emission actions through city partnerships, while enhancing the exchange of knowledge from peer-to-peer. Such projects could be further scaled-up, e.g. with the goal of further institutionalizing the Polish-German cooperation in the field of sustainable development, and notably, the cooperation between institutions, organizations, businesses. The national governments may also support this effort by launching a program to support cooperation projects in the field of local low-carbon economy bringing with wide range of co-benefits.

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adelphi
Alt-Moabit 91
10559 Berlin
Germany

WiseEuropa
Al. Jerozolimskie 99 lok. 18
02-001 Warsaw
Poland

The Institute for Sustainable Development (ISD)
Nabielaka 15/1, Warsaw,
Poland