Local government policy in the Silesian province with regards to a low-carbon economy

K Tobór-Osadnik
Silesian University of Technology, Faculty of Mining and Geology, 2 Akademicka Street, 44-100 Gliwice, Poland
E-mail: katarzyna.tobor-osadnik@polsl.pl

Abstract. In recent years, issues related to smog in various regions of Poland, including Upper Silesia, have become among of the primary aspects taken into consideration in the development of environmental policy. The search for ways to develop a low-carbon economy has influenced the creation of such strategies not only at a regional level, but also at city and municipal levels. In the article, the author reviews the actions of local government authorities and proposed solutions in low-carbon economy plans using the Silesian Voivodeship and a selected city and local government area.

1. Introduction
Local emissions are the source of threats to air quality around the world. This is particularly true with regards surface, point or linear sources. At the same time, with growth in population density, the amount of waste or increases in energy demand, all have a major impact on air quality. In addition to social and health effects, financial effects are important from an economic point of view. Therefore, the fight against smog must begin at the level of local authorities, primary education and promotional activities addressed directly to the public. Of course, even the best laws cannot replace changes in attitudes and behaviours. In the Silesian Voivodeship over the past decade or so, the focus has been on reducing emissions from particularly burdensome factories and plants (figure 1) [1].

This emission was effectively limited. The problem of smog, however, remained. Currently, the major sources of particulate matter, in this region, include low emissions from the individual furnaces and transport wheels (figure 2) [2]. The World Health Organization draws attention to PM10 and PM2.5 as well as carcinogenic compounds that are released during incomplete combustion of low quality carbon fuels [3] [4].
Figure 1. Emission of dust pollution from particularly troublesome plants in the Silesia Voivodeship in the years 2004 - 2014 (source: GUS).

Figure 2. Sources of PM10 dust particle emissions in the Silesia according to KOBiZE [2].

The first low emission reduction programs (LERP) initiated by local governments (mainly cities and villages Silesian province) appeared in the late 90s and continues today. In the years 2002-2004 Tychy was the first city in Poland, which under this program have exchanged the old coal-fired boilers and stoves in 15,000 single-family homes and the next program 700. These activities were funded by WFOŚiGW.
The amendment of two acts, popularly called "anti-smog" and "the quality of solid fuels" created a stronger legal basis and gave the local government authorities the opportunity to decide on the development of low-emission economy in your area, including the possibility of penetrating activities incompatible with the provisions of these laws and resolutions adopted by local governments.

Air pollution generates costs associated with treatment, absenteeism and even premature death. According to WHO estimates, the effects of air pollution in Poland cost approximately about 13% of the country’s GDP [5]. In response to this situation, the amendment in November 2015 of the Environmental Protection Law Act of 27 April 2001, including within its scope art. 96, under which the legislator granted regional councils the power to impose restrictions or prohibitions on the operation of installations in which fuels are combusted. This change allowed for the development of a project resulting in the introduction of restrictions throughout Silesia with regards to the operation of the installations based on combustible fuels. The resolution (No V/36/1/2017) was unanimously adopted by the Silesian Regional Assembly on April 7, 2017 [4].

Limitations imposed on the requirement to operate installations that meet the minimum emission standards in accordance with Class 5 have become applicable in the Silesian Voivodeship from 1 September 2017. Exempt are installations predating 1 September 2017. These installations will have limits imposed as follows [6]:

- from January 1, 2022, for installations operating for more than 10 years from the date of their production or installation, the age of which cannot be determined;
- from January 1, 2024 in the case of installations operating in the period from 5 to 10 years from the date of their production;
- from January 1, 2026 for installations operating for less than 5 years from the date of their production;
- from January 1, 2028 in the case of installations that meet the requirements with regards to the emission of pollutants specified for class 3 or 4 according to the PN-EN 303-5: 2012 standard.

In the case of installations such as fireplaces and kitchen stoves, only devices that meet the minimum levels of seasonal energy efficiency or standards regarding pollutant emissions for seasonal space heating specified in points 1 and 2 of the Annex to the Commission Regulation (EU) 162 with regard to requirements concerning ecodesign for local space heaters using solid fuel, are able to be used. Restrictions introduced in the case of fireplaces and kitchen stoves, which should meet the above requirements, will apply from January 1, 2023, unless their operation started before September 1, 2017 and these fireplaces achieve thermal efficiency of at least 80% or are equipped with a device that reduces dust particle emissions to [4]:

- 50 mg / m3 fine dust (at 13% O2) from open fireplace combustion stoves, heated with solid fuels;
- 40 mg / m3 fine dust (at 13% O2) from fireplaces and kitchen stoves with a closed combustion chamber using solid fuels other than wood pressed in the form of pellets;
- 20 mg / m3 fine dust (at 13% O2) for fireplaces with a closed combustion chamber using pressed wood in the form of pellets.

By issuing this resolution, the Silesian Regional Assembly encouraged towns and municipalities from this province to approve or modify their plans for building low-carbon economies [7].

2. Activities of local self-government authorities in creating a low-carbon economy - a case study
In the wake of the Silesian regional assembly’s directives, activities towards a low-carbon economy were commenced in other areas and municipalities of this voivodeship [8]. To illustrate the pro-quality activities undertaken in terms of the environment, this section will discuss the planned and current activities of the selected city and municipal area. The city of Skoczów in the Cieszyn government area
will be used as an example. Skoczów was chosen deliberately. The southern part of the Silesian region is perceived to be an outdoor tourist destination with clean air. The reality, however, could not be more distant from the truth. One of the highest concentrations of PM10 and PM2.5 particulate matter has been recorded here. The main sources of air pollution emissions are communal and municipal emissions from the development of urban and rural centres, pollution emissions particularly from heavy traffic and industry, those especially related to energy and heating, along main arterial roads. Industrial emissions are particularly pertinent to in the regions of Cieszyn and Skoczów. In low-lying areas, low municipal emission is important in terms of rivers and larger streamer [9].

It is for this reason that already in May 2017, Resolution No. XXXII / 201/17 Cieszyn District Council of 30 May 2017 was adopted, and thus leading to the adoption of the Environmental Protection Program for the District of Cieszyn [10]. The main environmental objectives and targets in the field of climate and air quality in Cieszyn County include:

- the local government being obliged to promote activities leading towards a low-carbon economy (ie. development of low-carbon economy plans in all the local government areas of the Cieszyn District);
- standards being introduced with regards to small sources of energy and rules pertaining to energy efficiency;
- principles being adopted with regards to necessary planning documentation in the area of thermal energy;
- the thermo modernization of buildings, the modernization of local and individual boiler systems, heating system exchanges being assumed as part of the main objectives, as well as the introduction of energy-efficient lighting, should there be sufficient funds.

The Skoczów City Council earlier, in April 2016, had developed its own initiative and adopted Resolution No. XVIII / 197/2016 [11], and the Plan for a low-carbon economy in the municipality of Skoczów (figure 3), (figure 4).

Figure 3. Leaflet promoting, among residents, the Low-carbon economy plan in the city of Skoczów (front page).
The decision of the city council proved correct, as was confirmed by the following years (2017, 2018) when decreases were noted in the emission levels of contaminants such as PM10 and PM2.5 dust particles. In March 2018, an air-quality sensor was installed on the Skoczów town hall building with a display showing information regarding air quality. One of the goals was to raise public awareness to the scale of the problem. It was found that the level of concentration of these dust particles in Skoczów, at their worst, were found to be ten times the norm. The low-carbon economy previously adopted by the Plan indicates a number of solutions that should contribute to a significant improvement of air quality and the environment in the region.

The main directions of activities were [11]:

- utilization of the RES potential in the Skoczów district;
- thermo modernization of public facilities (dependent on direct actions of the Council);
- the modernization of street lighting system in the Skoczów Municipality (including the lighting at the sewage treatment plant in Skoczów);
- the mainstreaming of renewable energy sources in public and municipal facilities;
- the implementation of "green public procurement" (inclusion of low-carbon conditions as mandatory in public tendering processes).

In order to promote renewable energy and measures aiming to improve energy efficiency in the municipality, it is planned that local law documents will specify the scope of using green energy.

Actions that may be introduced, dependent on the sources of financing obtained, include [11]:

- comprehensive energy management in public buildings, including energy audits of public and municipal buildings (10 most energy-consuming buildings);

Figure 4. Leaflet promoting, among residents, the Low-carbon economy plan in the city of Skoczów (back page).
• ensuring the municipality develops and runs an educational and promotional campaign among residents, supporting the transition of residents in terms of administrative, procedures and to inform them about current opportunities available and opportunities for subsidy in terms of investments;
• the development of renewable energy systems (including promotional and educational activities);
• the thermo modernization of residential buildings;
• the development distributed energy - micro installations;
• encouraging low emissions from residential buildings - replacement of heat sources.

The main problems with achieving the set goals include, among others, problems with poorly selected fuels for boiler systems. According to the CO2e inventory, in 2015 in the Skoczów area, around 64% of apartments were heated using solid fuels. As part of the planned activities, the replacement of boilers in approx. 250 residential facilities by 2020 was added to the Plan. The realization of this was made conditional to raised funds, particularly from the environmental protection fund. For other possible solutions included [11]:

• heat pump installations;
• micro cogeneration;
• development of distributed energy sources - solar panels;
• development passive and energy-efficient construction.

However, as one of the most important directions of action, it was assumed that steps would be taken to provide [11]:

• promotional and educational activities for the general public;
• support for residents in terms of understanding administrative procedures;
• information regarding current possibilities of obtaining financing for investments.

Attention was also drawn to the possibility of improving the quality of the environment through the gradual exchange of office equipment in local city council offices as well as electrical appliances (air conditioners, water heaters, appliances), and lighting to those more energy efficient. In addition, plans exist for the construction of Carports (2 shelters with the photovoltaic installations for vehicle charging), Ecodriving courses for residents and the construction of bicycle paths.

One of the most significant activities already being taken towards developing a low-carbon economy is the remodelling and expansion of the sewage treatment plant in Skoczow in terms of sewage sludge management along with the recovery of biogas from obtaining electricity in the aggregate cogeneration of electric power of approximately 190 Ee / 200 Ec or heat in 2 boilers about 250 kW each. In December 2017, the first biogas tank was installed (figure 5) [12]. Its task is to store biogas produced during the process of fermentation of sludge in a closed fermentation chamber. The resulting biogas, following desulfurization, will be directed to heating boilers for the production of heat energy or to an aggregate for the production of electricity. Both types of energy will be used for the treatment plant's own needs.
In September 2018, the most important part of the investment was completed - a digester (figure 6) [13], in which biogas arising from the stabilization process is captured. These activities should bring a reduction in the emission of dust particles and harmful substances into the atmosphere in the Skoczów region within the next few years. This effect, however, must be closely correlated with an active educational, promotional and motivational policies addressed towards the inhabitants of cities and villages in the Skoczów area.

3. Conclusions
Taking into account the importance of protecting the health of natural environment and its inhabitants, as well as the improvement of economic results, it is crucial that the improvement of the state of air
quality is addressed not only at a national level, but most importantly at local level [14][15]. Local
governments have great opportunities to shape and develop a low-carbon policy on a local, micro scale.
Owing to direct contact with residents, effective information and educational campaigns necessary
to change the behavior of people using coal for communal and living purposes, make this possible. Coal
is currently one of the main sources of PM10 and PM2.5 particle contamination. All these activities
should result in the possibility of people living with cleaner air and a healthier environment. The
example presented in the present article, Skoczów, shows that several directions of action in achieving
a low-carbon economy are able to be distinguished. Although their effectiveness is high, according to
the author, this is largely dependent on the effectiveness of their implementation and meticulousness in
their implementation, and above all on the level of financial resources involved.

4. References
[1] Łukaszczyk Z 2018 Systemy wspomagania w inżynierii produkcji Górnictwo – perspektywy, 
zagrożenia Węgiel, tania czysta energia i miejsca pracy 7 484
[2] Janssen N A H, Gerlofs-Nijl M E, Lank T, Salonen R O, Cassee F, Hoek G, Fischer P.,
Brunekreef B and Krzyzanowski M 2012 Health effects of black carbon (Copenhagen: 
Publisher WHO Regional Office for Europe)
[3] Kurczabiński L 2010 VII Ekoenergetyczna konferencja – Aktywizacja gminy za pomocą
innovacyjnej energetyki rozproszonej (Gliwice) pp 6-10
[4] Stala-Szlugaj K 2011 Środkowo-pomorskie towarzystwo naukowe ochrony środowiska, Rocznik
Ochrona Środowiska 13 1877
[5] Zanieczyszczenie powietrza: przedwczesne zgony i duże koszty, serwis informacyjny CIRE 24
https://www.cire.pl/item,104036,1,0,0,0,0, zanieczyszczenie-powietrza-przedwczesne-
zgony-i-duze-koszty.html 25th October 2018
[6] Uchwała nr V/36/1/2017 Sejmiku Województwa Śląskiego z dnia 7 kwietnia 2017 roku w sprawie
wprowadzenia na obszarze województwa śląskiego ograniczeń w zakresie eksploatacji
instalacji, w których następuje spalanie paliw https://www.infor.pl/akt-
prawny/U85.2017.066.0002624,metryka,uchwala-nr-v3612017-sejmiku-
wojewodztwa-slaskiego-w-sprawie-wprowadzenia-na-obszarze-wojewodztwa-slaskiego-
ograniczen-wzakresie-eksploatacji-instalacji-w-ktorych-nastepuje-spalanie-paliw.html 26th October
2018
[7] Rybak A and Manowska A 2018 XV Int. Conf. Multidisciplinary Aspects of Production 
Engineering vol 1 (Zawiercie) pp 483-89
[8] Stala-Szlugaj K 2015 Polityka energetyczna – Energy Policy Journal 18 49
[9] Raport z pilotażowego badania jakości powietrza Eko Patrol GIG w Katowicach 2018
(Katowice: Praca GiG 26th April 2018)
[10] Uchwała nr XXXII/201/17 2018 Rady Powiatu Cieszyńskiego z dnia 30 maja 2017 r. w sprawie
przyjęcia Programu Ochrony Środowiska dla Powiatu Cieszyńskiego
bip.powiat.cieszyn.pl/attachments/download
[11] Uchwała NR XVIII/197/2016 Rady Miejskiej Skoczowa z Planem gospodarki niskoemisyjnej w
gmninie Skoczów z dnia 19 kwietnia 2016 roku http://bip.skoczow.pl/plan-gospodarki-
niskoemisyjnej-dla-gminy-skoczow-1 28th October 2018
[12] http://www.sko-eko.skoczow.pl/2018/03/27/montaz-zbiornika-biogazu/ 12th May 2018
[13] http://www.sko-eko.skoczow.pl/2018/09/14/budowa-komory-fermentacyjnej/ 23rd October 2018
[14] Kowal B and Kustra A 2016 1st International Conference on the Sustainable Energy and
Environment Development vol 10 (Kraków: SEED vol 00129) pp 1-4
[15] Bluszcz A 2017 Soc. Indic. Res. 139 679

Acknowledgments
The article has a funding with grants No. 06/030/BK_18/0030 (Silesian University of Technology).