**Social Determinants of Low Emission Limitation in Urban and Rural Areas in the Middle Odra (Poland)**

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**Abstract.** Poor air quality causes a number of adverse social effects, which can be burdensome for people living in areas particularly exposed to low emission. The most important low-emission social effects include the more frequent occurrence of diseases that can even lead to death. According to WHO data, about 48 thousand people die every year due to poor air quality in Poland. One of the main reasons for too much pollution in the air is low emission. Low emission is created at a level up to 40 m above ground level. The most important low-emission sources include house-type boilers, which serve to heat buildings, road transport and small and medium-sized industrial plants.

**Local Conditions Related to Low Emission**

Human harmful components contained in low emission usually appear in the air along with greenhouse gases, which in the long term may affect the deterioration of the quality of life through global warming. In turn, global warming may cause more frequent occurrences of violent atmospheric phenomena [1], the effects of which can be observed more and more not only in the world, but also in Poland [2].

Problems with air quality in the Middle Odra Region (Fig. 1) are mainly related to low incomes achieved by a significant part of society. However, this is not the only reason for this. There are a number of other causes that directly affect bad air quality [3]. These include social issues, such as lack of knowledge about the harmfulness of combustion of low-quality fuels and waste in home-house boilers, and the use of old and non-ecological cars[4].

Unfortunately, it often happens that residents burn bad quality fuels and wastes in their furnaces, even though they know what the consequences of such treatment are. Some people in Poland ignore ecological issues that are related not only to environmental protection, but also to human health. Unfortunately, some Polish residents are of the opinion that their actions have little impact on the environment. Although the share of residents who contribute to the deterioration of air quality by their actions is not a large majority, it is still too much. It turns out that the activities of some residents lead to the creation of exceedances of some harmful substances in the air [5]. Despite the fact that the solution of the low emission problem in the Middle Odra Region will be associated with higher costs incurred by the public for heating flats or for thermal modernization of buildings, it should be noted that there is growing public support for pro-ecological solutions [6].
Factors Affecting the Quality of Life of the Society

The quality of life should be considered not only in categories that are most often taken into account by people and are usually the quantity of goods owned, which contribute to economic well-being, but also with regard to the comfort associated with good quality of the environment. An important element of the quality of life is the low emission level, which significantly affects the comfort of staying in a given place. Clean air significantly increases the quality of life and is now appreciated by a large part of Poles [5].

The quality of life and the subjective assessment of the life situation of people are significantly influenced by various measurable and immeasurable factors, such as:

- the state of the environment; economic situation, which includes both income and assets owned;
- the patency of information channels and the articulation of social problems;
- the level of people's trust in each other;
- structure of public spending;
- stability and predictability of life;
- social pathologies;
- sense of security;
- purchasing power of the population's income;
- political stability;
- opportunities for social advancement, accessibility of social services;
- life expectancy and health status;
- level of education; social security;
- forms of social activity, political freedoms, level of development of democracy and civil society;
- functioning of state institutions;
- family and community ties;
- employment security and a good atmosphere at the workplace;
- cultural, religious and psychological conditions;
- climate and geographical-natural conditions;
- access to free time, stress level accompanying human life [8].

Social Costs Related to Poor Air Quality

The problem of poor air quality contributes to the formation of social costs that affect the deterioration of the quality of life. Low emission directly affects the level of expenses incurred by the society and enterprises [9]. It should be emphasized that nowadays the inhabitants who heat their buildings or use cars are largely responsible for the increased level of pollution in the air. On the other hand, the negative impact of the business on the environment has decreased. Low emission has a negative impact on people's quality of life. Limiting this unfavourable phenomenon would increase the life satisfaction of local communities. Reducing the amount of pollution in the air would directly affect the better health of children and adults, and could encourage residents to frequent outdoor activities, including increased physical activity [5].

The solution of problems related to low emission may be associated with many social problems, as it will be necessary to introduce solutions that will increase the expenses incurred by households [10]. In order to reduce the problem of low emission, it is necessary to properly manage various types of instruments that will allow for the gradual introduction of a number of regulations without the opposition of local communities [11]. The implementation of top-down regulation in a short period of time that already exists in other EU countries could cause significant costs to households which already have many economic problems. Different types of legal solutions should be supplemented by actions that will prevent further pauperization of the society. It should be emphasized that the problem of excessive amounts of emission from the energy industry was solved in Poland for many years. Therefore, the related costs were spread over a longer period of time [5]. Similarly, the problem of low emissions in Poland will not be solved in a short time. However, solutions aimed at reducing the amount of harmful substances in the air should be slightly different in rural areas, where single-family housing prevails. In turn, one should look for other solutions to reduce low emissions in urban areas, where there are more residential buildings and greater car traffic [12,13].

Actions to Improve Air Quality in the Middle Odra Region

As part of activities aimed at reducing low emission, it would be necessary to carry out thermal modernization of residential buildings with the replacement of old boilers for solid fuels. Due to the fact that a significant part of people in the Middle Odra Region does not have financial resources to carry out this type of investment, one should focus on activities that will be able to bring the greatest environmental effect with regard to the financial resources involved. Moreover, various types of financial incentives should be introduced for residents, which will encourage them to replace obsolete heating devices with newer and more ecological ones. At the same time, it is necessary to consider introducing restrictions that will apply to the energy class of boilers used for heating buildings. In addition, in regions with the highest concentrations of harmful substances in the air, a ban on the use
of certain solid fuels should be considered, especially with reference to the lower quality of coal [14]. A separate problem is pollution from road transport. Some of the actions that can be implemented are within the competence of the local government and should be taken into account. By conducting prudent traffic management in densely populated areas, it is possible to significantly reduce emissions caused by road transport. The first step on the road to reducing low emission from road transport could be the exclusion of city centres from car traffic. The measures implemented so far aimed at reducing low emission have proved insufficient [15,16]. Unfortunately, the currently planned activities also do not provide certainty of achieving air quality improvement. In order to reduce the level of harmful substances in the air, apart from educational activities, it is necessary to implement a number of regulations that will force residents to ecological attitudes. It turns out that it is possible without radical opposition of citizens. Although residents will have to bear higher costs associated with heating apartments or car transport. An example could be the implementation of radical legal solutions in Krakow, which were preceded by an information campaign on the impact of poor air quality on human health. It should be emphasized that it is necessary to continue monitoring activities that are to reduce low emission in Poland. Moreover, it is necessary to analyse the work undertaken to reduce low emission in terms of their effectiveness and consider the possibility of implementing solutions that gave the intended effect in other parts of the country [5]. It should be emphasized that solutions implemented in other parts of the country function for too short a period of time, so that they can be unambiguously assessed [17,18].

Summary

So far, no significant measures have been implemented to limit low emission in the Middle Odra Region. Planned activities for the coming months and years also do not give great opportunities to achieve significant improvement in air quality. In order to improve air quality, apart from educational activities, it is necessary to implement a number of legal solutions that will encourage residents of the Middle Odra Region to use more environment-friendly fuels for heating buildings, to install modern power boilers and to use ecological means of transport. Legal actions must be complemented by financial support, which should reach less affluent citizens and encourage the use of ecological solutions in various areas of life.

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