The aim of the project is to assess the impact of air pollution in Eastern Poland on regional public health. As the region is characterized by low socioeconomic status, in the cold season the residents' suboptimal heating choices are in result posing a major anthropogenic threat to air quality in the form of low emissions. Both the poor heating choices as well as the specific geographic location of Eastern Europe, especially at times of frosty Russian weather conditions characterized by high pressure, cold air and sunshine, favor the formation of the phenomenon known as "Polish smog". The air pollution, rich in compounds such as $PM_{2.5}$, PM_{10}, and polycyclic aromatic hydrocarbons (benzo(a)pyrene) from low emission associated with household heating with solid fuels (coal, wood, and often also waste), imposes detrimental effects on health and life of the population, in particular in the context of cardiovascular effects.

Our project will be conducted in Eastern Poland - the area characterized by unique natural features, large areas covered by forests, lack of factories, and relatively low industrialization. The vast majority of studies on air pollution were conducted in highly polluted areas, in which patients are exposed to moderate and extreme concentrations of pollutants. Taking into consideration the scarce number of surveys from areas with a low level of pollution we intend to analyze the relationship between air pollution and cardiovascular and renal outcomes in Eastern Poland. The examination of the impact of so-called "Polish smog" on mortality and morbidity in the study area is not without significance. It would be the first major study of the impact of this type of pollution on human health.

In light of extant body of literature, the following will be considered as the public health indicators: acute coronary syndromes, episodes of atrial fibrillation, kidney disease hospitalizations or emergency room visits, cardiovascular and renal mortality. According to the current state of knowledge, the authors define three groups of factors which may determine public health indicators. The first group consists of air quality indicators, namely $PM_{2.5}$, PM_{10}, SO_2, NO_2, benzy(a)pyrene, and weather conditions (humidity, atmospheric pressure, and temperature). The second group includes individuals' specific factors including age and gender. The third group constitutes of factors covering general macroeconomic situation (GDP per capita or its approximation), labor market outcomes as well as other indicators that may be relevant to regional research.

The main hypothesis of the project states as follows: "The effects of air pollution on the frequency of hospital admissions and mortality due to acute coronary syndromes, atrial fibrillation, and renal disfunction are noted also in areas perceived as pollution-free (due to the lack of large industry)". The authors of the project are of the opinion that the reason of that state is not only the level of air pollution itself but also the composition as well as structure of emission linked to "Polish smog". Not without a significance is the fact that none of the previous research has been carried out in that area and that the local authorities' actions in fighting air pollution are insufficient.

The work plan of the project includes the procurement and collection of data concerning mortality and morbidity in 2016–2021 from the National Health Fund and Central Statistical Office which will be used for creation of the long-term county levels spatial maps of air pollution exposure models in studied area based on the Voivodeship Inspectorates for Environmental Protection. We will perform the analysis of the short- and long- term influence of air pollution on the number of hospital admissions for acute coronary syndromes, atrial fibrillation, and cardiovascular mortality as well as for kidney disease and renal function mortality. The last task of the project will evaluate whether the reduction of air pollution affects the decrease of mortality and morbidity. The analyses will be carried out both for the entire sample, and for separate subgroups of counties, age, sex and sub-periods taking into account the data gathered before and at the time of pandemic.

The results of the proposed project can be expected to make a major contribution towards the development of public health science for at least three reasons. First, it will provide insight into not only the impact of air pollution on the prevalence of the conditions evaluated in the project, time and spatial lags and asymmetries, but also into sensitivity to the pollution across different subgroups. Second, the model linking occurrence of conditions under study with air quality, individuals' characteristics and general economic outcomes in analyzed regions will be created and the verification of hypotheses will enable to take a stand on the existing state of knowledge in the literature. Third, in the future, the results of the project can provide a good basis for conclusions and recommendations for public health policy. The project, next to scientific contributions, may provide insights valuable for both regional as well as national environmental policy makers.