Since pre-industrial era, the mean atmospheric concentration of methane increased more than two times from 722 ppb to 1848 ppb in February 2017 (NOAA). Next to water vapour, carbon dioxide, nitrous oxide, ozone, Freons and Halons, methane is one of the most important greenhouse gas (GHG). Globally, annual methane emissions exceeds 600 Tg, and almost 25% of emissions comes from wetlands. Due to the significant contribution of peatlands in global methane emissions, it is important to understand how the observed and predicted climate change will affect the functioning of these highly vulnerable ecosystems and in a consequence - CH_4 emissions. Climate change predictions for Central Europe assume an increase in air temperature by ~ 3°C until the end of century and little increase in precipitation by 10%. However, will this small increase in precipitation compensate the water losses caused by higher evapotranspiration resulting from higher temperatures? Will the surface of peatlands get drier? If so, will the biomass of vascular plants mediating the transport of methane from anaerobic peat layers to the atmosphere increase? As a consequence what would be an impact of these changes on methane emissions from peatlands? To answer for these questions, we need to continue measurements of methane emissions on existing wetland manipulation experiments and to create new measurement facilities that will investigate the impact of reduced precipitation and increased temperature on methane emissions.

Due to above, the main objective of the proposed project is to investigate the potential impact of changing climate conditions (increased temperature and reduced precipitation) on methane emissions from the unique peatland ecosystem located in the middle-west part of Poland. We will answer to the above questions and try to understand and describe the processes that lead to CH_4 emissions with the use of isotopic techniques (^{13}C isotope). Methane emission measurements will be carried out on the existing WETMAN climate manipulation experiment managed by the Poznan University of Life Sciences (since 2014). This experiment was developed within the WETMAN project (www.wetman.pl), which has just finished in April 2017. In this experiment, the active techniques of manipulation were used: infrared heaters to increase peat temperature and automatic curtain to reduce nighttime rains. The CH_4 emission measurements were and will be carried out on WETMAN site (thanks to this proposal – if funded) by means of automated novel mobile platform equipped with the closed dynamic chamber system and fast gas analyzers. Besides, we will use two new climate manipulation infrastructures developed within the NCN funded project: "*Sun Induced fluorescence and photosynthesis of peatland vegetation response to stress caused by simulated water deficits and increased temperature under conditions of climate manipulation experiment (FLUOGPP)"*. The manipulation sites are developed on the same peatland, but on areas dominated by other plant species. The main difference between these two sites will be in manipulation methods. The newly designated sites will be manipulated with passive techniques - the open top chambers (OTC) will be used to increase temperature of peat, while permanent Plexiglas cover will be used for reduction of precipitation. Periodic measurements of methane emissions on these two sites will be carried out by means of manual dynamic chamber system with LOSGATOS gas analyzer. The same type of measurements conducted in the same way on three different manipulation sites characterized with different vegetation structure and species composition, creates very unique conditions and will allow us to better understand the impact of applied manipulations on methane emissions from peatland.

According to our best knowledge, the WETMAN climate manipulation experiment and two other newly developed sites with passive manipulation are the only one in Europe, which are located on such a unique ecosystem like our Rzecin peatland. It should be noted that, this is not very common when two different manipulation techniques are applied on the same ecosystem. That is why we will compare also the efficiency of passive and active manipulation methods in the context of their impact on methane emissions. **In the project we will use the potential and research infrastructure developed within the WETMAN (finished) and recently started NCN projects, in order to assure continuity of research concept, measurements, but most of all assuring the most effective and complementary utilization of existed scientific and financial resources spent on science with the aim to better understand processes driving the production and emission of methane from peatlands in future climate conditions.**