Isotopes are equivalents of the same chemical element, they are characterized by a different number of neutrons in the nucleus of their atoms, with the same number of protons. Isotopes can be divided into permanent isotopes (called stable ones) and unstable isotopes (called radioactive isotopes, are broken down at a given time into isotopes, usually another chemical element). In the case of the submitted project focus was on the analysis of the composition of stable carbon and nitrogen isotopes. In the environment are two stable isotopes of carbon characterized by the mass number of ^{12}C and ^{13}C, while for nitrogen there are also two stable isotopes, i.e. ^{14}N and ^{15}N. Various environmental elements, e.g. plants, water, lake sediments, are characterized by a specific composition of individual forms (stable isotopes) of a given element. The interrelationships between the above mentioned elements of the environment and the environmental factors affecting them lead to differences in the isotopes compositions between them (the proportions of the stable isotopes are different). Plants preferentially build structures using lighter carbon isotope which is ^{12}C, due to its easier processing in metabolic processes related to photosynthesis. This situation takes place till the concentration of $^{12}CO_2$ is on the satisfactory level for individual plants. However, if the concentration of lighter CO_2 decreases, plants must also use its heavier form, which is $^{13}CO_2$ (this is the case both in the terrestrial and aquatic environments), which in consequence leaves a trace in their structures. These changed proportions of the ratio of stable carbon isotopes are identifiable even after plants die when they form soils, bottom sediments or fossil fuels. Thanks to this, for example by means of core bottom sediment analysis, it is possible to identify periods in which plant growth conditions were more and less favourable. In addition, thanks to analyses of stable nitrogen isotopes, we can learn, for example, whether the soil or water has increased to fertility due to the use of fertilizers in agriculture, manifesting in the increased composition of heavier nitrogen (^{15}N) in organic matter of plants, organic matter and inorganic compounds in water, soil or bottom sediments. Using, among others, the above mentioned dependencies associated with the determination of a given stable isotopes composition, we can try to characterize the processes occurring in the environment and look for answers to what factors and how they affect the determination of the ratio of one isotope to another.

The implementation of the project will complement the knowledge about stable carbon and nitrogen isotope compositions in vegetation, water and bottom sediments of lobelia lakes in this type of study. Lobelia lakes are a unique type of aquatic ecosystems due to the presence of specific vegetation from the group of isoetids (*Isoëtes lacustris*, *Littorella uniflora*, *Lobelia dortmanna*, *Myriophyllum alterniflorum*). In addition, they are characterized by very clean waters, with low amounts of calcium, which are not very rich in organic matter by bottom sediments. They are sparsely-fertile water bodies, sensitive to changes in trophies, where often the increase in the fertility of water or sediments contributed to the disappearance of specific vegetation and replacing it with another.

The research was carried out along the gradient of water pH variability, in the natural environment, and in the trophic gradient, in a planned laboratory experiment. Particularly it was decided to look at selected species of plants found in lobelia lakes. This vegetation is diversified in terms of the photosynthetic pathways and the source of carbon source used for this process. The photosynthetic pathway of the CAM type was found for the *I. lacustris* and *L. uniflora*, intermediate between C_4 and C_3 for the *Elodea canadensis*, while for the other species included in the study type C_3 was found. Among the proposed for research plants there are those taking CO_2 only from bottom sediments for the photosynthesis process (e.g. *I. lacustris*, *L. uniflora*, L. *dortmanna*) as well as species collecting CO_2 from water and using other forms of carbon: HCO_3^- bicarbonates (e.g. *Elodea*, *Myriophyllum*, Charophytes).

Due to the progressing climate changes and still insufficient counteracting the accelerated increase of trophic ecosystems, the recognition of the dependence of isotopic organic matter deposited in sediments of these types of lakes seems to be necessary in order to later more reliable identification of degraded or historical sites that used to be lobelia lakes. Little is known so far about the composition of stable isotopes of particular species of vascular plants, bryophytes, and charophytes, as well as deposited sediments in the pH gradient and in the trophic gradient in the lobelia lakes. In order to the more reliable interpretation of the data buried in lake sediments, it seems reasonable to first recognize the relationship between $\delta^{13}C$ and $\delta^{15}N$ in living plants and sediments produced after their death and the factors determining them. In connection with the above, the obtained results may contribute to a significant increase in knowledge about the differentiation of established isotopic compositions and the $\delta^{13}C$ and $\delta^{15}N$ values. In addition, this new knowledge can contribute to a better understanding of the functioning of these unique and valuable natural ecosystems, which can also be used to some extent for the purpose of monitoring and protection actions.