Description for the general public: Climate changes influencing annual air temperature, are observed throughout the entire world. However, in the polar regions, both in the Arctic and Antarctic, these changes occur much faster and result in the dynamic transformation of landscape and ecosystems. The rapid climate warming significantly affect the ice cover of the seas and lands. The increase in temperature also generates changes taking place in very simple combination of tundra communities. While the ice disappearing is easy to observe, which example may be the melting of glaciers reducing their thickness and length, the changes of vegetation and soil properties are more difficult to notice.

The reason for choosing the research topic is a fact that development soil of and cryptogam succession as well as their interrelations in Arctic glacier forelands have been never studied in details. Furthermore, the proposed project fits into the current need for research on global climate change, which largely depends on the content of carbon dioxide (CO_2) and methane (CH_4) in the atmosphere. The content of these gases in the atmosphere is associated with the accumulation of carbon in the soil, so-called carbon sequestration.

The most significant changes that occur in polar terrestrial ecosystems under the climate change can be well observed in the deglaciation zones, where the large areas of bare ground and rock, unsorted rubble, gravel and sand form moraines. In such places, the primary succession process of vegetation can be observed, which simultaneously influence on the soil formation. It is assumed that cryptogams (the organisms reproduced only by spores and not by seed production) firstly enter on deglaciated areas. These organisms include e. g. lichens, mosses, liverworts, cyanobacteria forming biological soil crusts. Their pioneer role is associated with excellent adaptation to the harsh climatic conditions in the glacier foreland. In such places, without strong competition from vascular plants, cryptogams are dominant group of organisms. Despite this fact, only few studies consider succession of cryptogamic species in the glacier moraines and their impact on soil development.

It is easy to determine the initial stage of succession and soil formation that is the barren, free of life forms substrate, located right at the front of glacier forehead. The final stage of primary succession can be considered as the climax tundra community which is specific for the particular area of the Arctic. But which features distinguish the intermediate stages of cryptogamic communities and soil development? What is the rate of these processes? Are they similar in all Arctic glacier forelands? How important is the impact of cryptogamic species on soil properties? The answers to this questions will be the results of a proposed project that includes detailed studies on soil formation and cryptogam succession on eight glacier forelands located in two distant regions in Svalbard. The main aim of the project is to determine: 1) influence of cryptogams on initial development of soil and carbon sequestration; 2) rate of cryptogam primary succession and soil development; and 3) relationship between soil properties and cryptogamic species succession – on glacier forelands in Svalbard.

Interdisciplinarity of project locate it in the several science fields which are presently intensively developed, namely: dynamic of polar environment, dynamic of soil-forming processes, direction and rate of mineral transformation in soil, carbon sequestration, role of biological soil crusts, polar ecology, and biodiversity.