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Title: *Arctic Development and Adaptation to Permafrost in Transition (ADAPT)*

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Permafrost is a defining feature of the circumpolar Arctic, and throughout this region it is on the brink of massive change. The permafrost region of Canada encompasses a vast area, accounting for around 50% of the country's land mass, with diverse landscapes and ecosystems. The program ADAPT has been formulated in response to the immediate need for fundamental knowledge to understand how the structure and functioning of these northern geo-ecosystems are linked to permafrost behaviour and climate change. Additionally, the infrastructure and resources for northern settlements, from drinking water and exploited wildlife to runways, roads and housing, critically depend upon the state of the Arctic permafrost, and ADAPT is also addressing some of these issues. The program ADAPT involves 15 laboratories across Canada (www.cen.ulaval.ca/adapt/), with many collaborations, including with the analogous European program PAGE21 (Changing Permafrost in the Arctic and its Global Effects in the 21st Century; page21.org). The program is organized as four interlocking modules: 1) Permafrost dynamics in natural and engineered environments; 2) Permafrost and aquatic ecosystems; 3) Microbes and biogeochemical fluxes of nutrients and carbon; and 4) Tundra permafrost ecosystems: vegetation and wildlife. The activities are integrated across modules by way of common protocols; a central permafrost systems hypothesis focused on the key roles of liquid water and snow in affecting the terrestrial Arctic's "Natural Infrastructure"; and a conceptual three-layer model of permafrost systems. Our most recent results from Module 3 are drawing attention to the role of thermokarst lakes as diverse microbial ecosystems and dynamic biogeochemical reactors converting tundra carbon to greenhouse gases.