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The fate of infrastructure in the Arctic is heavily depending on the stability of frozen ground which it is built on. Climate change and consequent degradation of permafrost will negatively affect various infrastructure types and can cause ultimate failure. Comprehensive pan-Arctic assessments are urgently needed to better quantify environmental, economic and societal risks and to help adaptation planning. The use of physical models can be a powerful tool for risk evaluation, but modelling challenges remain with respect to resolving construction details at infrastructure scales together with decadal-scale climate change impacts. Here we used the dynamic permafrost land-surface model CryoGrid3 to capture both - the effects from the interaction of small-scale infrastructure with permafrost and large-scale climate change effects evolving in the 21century under an extensive warming scenario. We discuss how infrastructure can affect ground temperatures, and how climate change increases the risk of future infrastructure failure. We modelled two exemplary cases of permafrost-affected infrastructure: a gravel road on continuous permafrost at Prudhoe Bay (Alaska), and the case of a diesel tank facility at Norilsk (Siberia) placed on permafrost already subject to degradation under present day climate. We use the latter example to discuss environmental risks from contamination of hazardous legacy waste stored on and in permafrostand discuss the urgency for near-term policy strategies.