

Using Nature-Based Solutions to Decarbonize Buildings in Canadian Cities

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Abstract : The Intergovernmental Panel on Climate Change (IPCC) report stated the urgent need to cut greenhouse gas emissions to avoid the adverse impacts of climatic changes. The United Nations has forecasted that nearly 70 percent of people will live in urban areas by 2050 resulting in a doubling of the global building stock. Given that buildings are currently recognised as emitting 40 percent of global carbon emissions, there is thus an urgent incentive to decarbonize existing buildings and to build net-zero carbon buildings. To attain net zero carbon emissions in communities in the future requires action in two directions: I) reduction of emissions; and II) removal of on-going emissions from the atmosphere once de-carbonization measures have been implemented. Nature-based solutions (NBS) have a significant role to play in achieving net zero carbon communities, spanning both emission reductions and removal of on-going emissions. NBS for the decarbonisation of buildings can be achieved by using green roofs and green walls - increasing vertical and horizontal vegetation on the building envelopes - and using nature-based materials that either emit less heat to the atmosphere thus decreasing photochemical reaction rates, or store substantial amount of carbon during the whole building service life within their structure. The NBS approach can also mitigate urban flooding and overheating, improve urban climate and air quality, and provide better living conditions for the urban population. For existing buildings, de-carbonization mostly requires retrofitting existing envelopes efficiently to use NBS techniques whereas for future construction, de-carbonization involves designing new buildings with low carbon materials as well as having the integrity and system capacity to effectively employ NBS. This paper presents the opportunities and challenges in respect to the de-carbonization of buildings using NBS for both building retrofits and new construction. This review documents the effectiveness of NBS to de-carbonize Canadian buildings, identifies the missing links to implement these techniques in cold climatic conditions, and determine a road map and immediate approaches to mitigate the adverse impacts of climate change such as urban heat islanding. Recommendations are drafted for possible inclusion in the Canadian building and energy codes.

Keywords : decarbonization, nature-based solutions, GHG emissions, greenery enhancement, buildings

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