APPROACHES TO ESTIMATING THE TRANSFER OF RADIONUCLIDES TO ARCTIC BIOTA

BERESFORD N.A., WRIGHT S.M., BARNETT C.L., GOLIKOV V., SHUTOV V. & KRAVTSOVA O.

Address of first author: Centre for Ecology and Hydrology, Lancaster Environment Centre, Library Avenue, Bailrigg, Lancaster, LA1 4AP, United Kingdom, email: nab@ceh.ac.uk

There is increasing concern over potential radioactive contamination of the Arctic due to the wide range of nuclear sources. Environmental characteristics of the Arctic also suggest that it may be comparatively vulnerable to contaminants. Here we review collated data and available models for estimating the transfer of radionuclides to terrestrial biota within the Arctic.

The most abundant data are for radiocaesium and radiostrontium although many data for natural radionuclides were available from studies in the Arctic. For some radionuclides no data are available for describing transfer to Arctic biota.

Allometric-kinetic models have been used to provide estimates of transfer for radionuclide-biota combinations for which data were lacking. Predicted values were in good agreement with observed data for some radionuclides (e.g. Cs, U) although less so for others. However, for some radionuclides where comparison appeared poor there were relatively little observed data with which to compare and the models developed were simplistic excluding some potentially important transfer pathways (e.g. soil ingestion).

There are no bespoke models to enable the dynamic prediction of radionuclide transfer to Arctic biota. A human foodchain model is available which includes limited parameterisation for Cs and Sr transfer in Arctic ecosystems. This has been relatively easily adapted to estimate ^{137}Cs and ^{90}Sr transfer to some Arctic biota and could be readily adapted to other radionuclide-biota combinations.

There are many factors of Arctic ecosystems which may influence radionuclide behaviour including short growing seasons, prolonged freezing of soil, and effects of low temperatures on biological rates. However, these are not included within existing predictive models (for human or biota exposure). If exposure to ionising radiation within Arctic ecosystems is to be robustly predicted such factors must be fully understood and properly incorporated into models.