Sino-Russian ASRTU Forum

Ecology and Environmental Sciences

ASRTU Forum
Ekaterinburg 2020

October 21-22, 2020 Ekaterinburg, Russia

BOOK OF ABSTRACTS

Ural Federal University
named after the first President of Russia B.N.Yeltsin

СТОЛЕТИЕ УНИВЕРСИТЕТА

Association of Sino-Russian Technical Universities
ASRTU

HOST

URAL FEDERAL UNIVERSITY NAMED AFTER THE FIRST PRESIDENT OF RUSSIA B.N.YELTSIN

ORGANIZING INSTITUTIONS

ASSOCIATION OF SINO-RUSSIAN TECHNICAL UNIVERSITIES
BAUMAN MOSCOW STATE TECHNICAL UNIVERSITY
HARBIN INSTITUTE OF TECHNOLOGY

PROGRAMME COMMITTEE

Members:	Bakaeva N., Moscow State University of Civil Engineering
	Chen Chuan, Harbin Institute of Technology
	Chigrinov V., Hong Kong University of Science and Technology
	Feng Yujie, Harbin Institute of Technology
	Genovese P., Tianjin University
	Kalaydo A., Moscow State University of Civil Engineering
	Kovaleva E., Ural Federal University
	Pervov A., Moscow State University of Civil Engineering
	Sun Kai, Harbin Institute of Technology
	Svalova T., Ural Federal University
	Zakharov V., Ural Federal University

LOCAL ORGANIZING COMMITTEE

Chairman:	Koksharov V.
Vice-Chairman:	Germanenko A., Kruzhaev V., Bugrov D., Sandler D.
Members:	Poltavets A., Mezentsev P., Kurochkin S., Fayustov A., Svalova T., Shur V., Krasnova A., Benemanskiy D., Zapotoczna A., Polyakova V., Pelegova E., Linker E., Brichuk O.

Email: pavic@163.com; Telephone number: +8618622701030

Abstract. The discussion of our study will be centred on a large-scale investigation concerning the geopolitics of the resources for the future of urbanization. This study is based on a study made by the author and currently under publication in China with the title of *Eco-District Construction Strategy Research: Planning and Management of Green Areas in China, Constructive Proposals for Green Life in the Future*. The presentation intends to summarize some of the key aspects of the book, especially pointing out the fundamental element of the Eco-District strategy for the future of urbanization. The author will present some important study cases in Europe and in China. Examples are Aarhus in Denmark, the Växjö city in Sweden, and important realization in China such as Sino-Singapore Tianjin Eco-City and Xiong'An in Hebei Province. The study will explain the theory beside the Eco-District, the best practice cases, the technologies that permit their realization and, finally, the necessary culture and management based on social participation.

The presentation will touch also a peculiar subject that the author called Multi-Scale Approach, and the theory and practice of Multi-Layer planning and Smart-Node, a fundamental strategy in the logic of the Eco-District for sustainable life.

The presentation will briefly add some analysis about the issue of the resilience of the city during the lock-down caused by the Covid-19, especially in the Chinese context. This is a fundamental issue that have to be put into consideration for the future of sustainable life after the recent tragic events that touch all the population in the world.

Key words: Eco-District, Eco-life, Sustainability, Smart nodes, Multi-Scale Approach, Circular economy

O4

Modeling the source and mechanism of radon entry into the building

N.V. Bakaeva[1], A.V. Kalaydo[2]

[1]*Moscow State University of Civil engineering (National Research University), 129337, Moscow, Russia*

natbak@ mail.ru

[2]*Lugansk State Pedagogical University, 91003, Lugansk, Lugansk People Republic*

kalaydo18@ mail.ru

Natural and artificial ionizing radiation acts continuously on a human throughout a life. Currently, almost completely individual annual effective radiation dose is formed by natural radiation sources, such as radon and its progeny, cosmic radiation, external terrigenous radiation, radionuclides in food and atmospheric air.

Radon and its progeny exposure is the greatest threat to public health from all natural radiation sources, because it provides more than half the annual individual dose. The specificity of radon exposure is that its negative effect is manifested in buildings only; in outdoor air the radon concentration is negligible.

Currently, radon exposure is recognized as a national threat to the collective health of the population in most countries of the world. In order to limit it, the maximum referent radon levels in indoor air are set by law. But their provision is possible only if the basic laws of the radon situation formation process in the building are understood.

To implement an unfavorable radon situation in a building, a radon source in the immediate vicinity must be present. Also needed are ways to radon transport into the building and the driving forces that can carry out this transport. Radon can exhalated from the walling materials and entry into a room with water and outdoor air, but soil under the building is the only significant source of radon in indoor air. Effectively restricting the radon entry from the soil ensures the radon safety of the building automatically.

The radon formation in the soil comes from maternal radium, while the rate of this formation G, $Bq \cdot m^{-3} \cdot s^{-1}$

$$G \approx C_{Ra} \cdot \rho_s \cdot k_{em} \cdot \lambda \cdot \frac{1-\varepsilon}{\varepsilon}, \qquad (1)$$

where C_{Ra} is the specific radium activity in the soil, $Bq \cdot kg^{-1}$; ρ_s is the soil density, $kg \cdot m^{-3}$; k_{em} is the soil radon emanation coefficient; λ is the decay constant of radon, s^{-1}; ε is the porosity.

Part of the resulting radon goes into the atmosphere, therefore, in the upper layers the radon concentration is lower. But from a certain depth radon does not have time to reach the surface; therefore, on it the radon concentration reaches its maximum value. Thus, the soil under the building can be considered a volume radon source with a constant power G. Radon formed in the soil is transferred to the underground building walling through two independent fluxes:

1. Diffusive, which is caused by the depth gradient of radon concentration A

$$q_{dif} = D \cdot \frac{\partial A}{\partial z}, \qquad (2)$$

where D is the diffusion coefficient of radon, $m^2 \cdot s^{-1}$.

2. Convective, which flowing under the action of a pressure gradient at the base slab external borders

$$q_{con} = \frac{k}{\mu} \cdot \frac{\partial P}{\partial z} \cdot A, \qquad (3)$$

where k is the soil permeability, m^2; μ is the dynamic viscosity of air, $Pa \cdot s$.

Each of the mechanisms may be dominant depending on the transport medium, since the soils permeability coefficient k can be in the range from 10^{-10} to 10^{-15} m^2. On the contrary, the variation range of the diffusion coefficient D is limited to one order and the diffusion flux varies to a lesser extent.

Through these same mechanisms soil gas with radon is transferred through the horizontal underground building walling. At this stage the dominant transport mechanism is determined by the basement permeability. Completely sealed building base ($k = 0$) eliminates the convective transport and diffusion remains the only mechanism for radon entry into the room.

Thus, it is possible to assess the radon accumulation in the lower floor premises of the designed constructions on the basis of the diffusion-convective model of radon transport

$$\frac{\partial A}{\partial t} = \frac{\partial}{\partial z}\left(D \cdot \frac{\partial A}{\partial z}\right) + \frac{\partial}{\partial z}\left(\frac{k}{\mu} \cdot \frac{\partial P}{\partial z} \cdot A\right) - \lambda A + G. \qquad (4)$$

Equation (4) can be solved by numerical methods, most often it can be reduced to a simpler form due to simplifying assumptions. The initial data for the calculation (C_{Ra}, and k_{em}) can be determined by gamma-spectrometric analysis of soil from the construction site, values of quantities k, D and ε for different soils and materials are contained in the reference literature.

O5

The Mesozoic Acipenseriformes in northeast China and adjacent areas

Xiaobo Li[1,2], Yingyu Chen[1]

1. Key-Lab for Evolution of Past Life and Environment in Northeast Asia, Ministry of Education, China, Changchun 130026, China

2. Dinosaur Evolution Research Center, College of Earth Sciences, Jilin University, Changchun 130061, China

Correspondence: lixiaobo@jlu.edu.cn