Groundwater flooding in Ukraine: what kind of management does it require?

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The development of the groundwater "slow" flooding phenomenon in an area takes place together with the groundwater table rising up to the soil surface. The phenomenon appears in groundwater discharge areas in the form of soils moistening, swamping and flooding. The various causes of groundwater flooding can be grouped as natural (climate, geomorphologic and geological processes) and artificial, which are provoked by human activities. Groundwater flooding facilitates aquifers pollution, soil subsidence and landslides. The phenomenon-related emergency events entail property damaging and technical failures, and rare fatal accidents. Generally such events follow unfavourable climatic anomalies; however, in accordance with long-term observations in the Ukraine the risk of disastrous groundwater flooding tends to stably increase (Jakovlev *et al*., 2002).

The problem of inundation of urban and industrial areas by groundwater flooding became visible in ex-USSR countries during the early 1970s. Today the phenomenon has become widely developed and almost all of the mentioned countries have groundwater flooding as a nation-scale challenge. In recent years in the Ukraine the groundwater flooding phenomenon has covered about 11% of urban areas in about 260 cities and towns, and in 280 smaller urban settlements. The objects of that phenomenon impact are distributed irregularly according to the geomorphology, urban and industrial development factors – the greatest density of groundwater flooding occurrences are in the northeastern and southern regions of the country (Fig. 1). Some experts estimate up to 20% of Ukrainian homes may be affected.

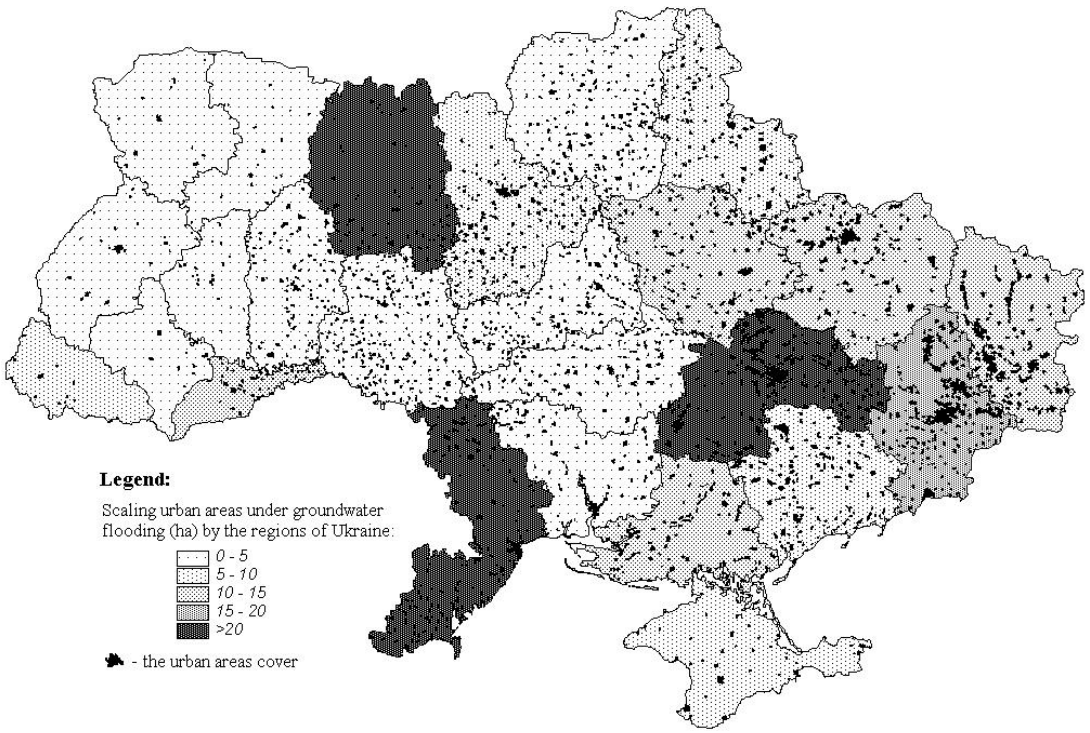

Fig. 1 Distribution of urban areas subject to groundwater flooding over the Ukraine.

The perception of the groundwater flooding problem in the Ukraine and other mentioned countries is that it is substantially a result of both weakly-controlled impacts on the environment and common socio-economic conditions. The human impact is intensified under the practice of historically-formed economic activities. Today, the inapplicability of pure technical solutions when applying for national budget resources to take control of the problem becomes clear. As a whole, there is a necessity for qualitative changes in approaches to solving environmental problems. Introducing sustainable development principles in groundwater management requires improvement in economic and environmental policies, including recruiting investors, and forcing social programmes and the participation of local communities and NGOs (Razmetayev & Chebanov, 2003). Some strong activity would have to be focused on several strategic topics, such as political, legislative, environmental, technical and socio-economic. The effective start of the integrated groundwater management requires concentration of efforts on several key tasks (Fig. 2), including: (1) improvement the environmental legislative base (concerning groundwater management and groundwater flooding relief); (2) starting assistance and insurance programmes for inhabitants who become victims as a consequence of groundwater flooding; (3) implementation of rehabilitation plans for industrial or municipal plants and services if their activities cause or facilitate development of groundwater flooding; (4) introducing innovative engineering solutions and updated technical tools (e.g. trenchless technologies) in groundwater control and construction activities; and (5) working out a national strategic plan together with revising action plans at all levels to solve the problem.

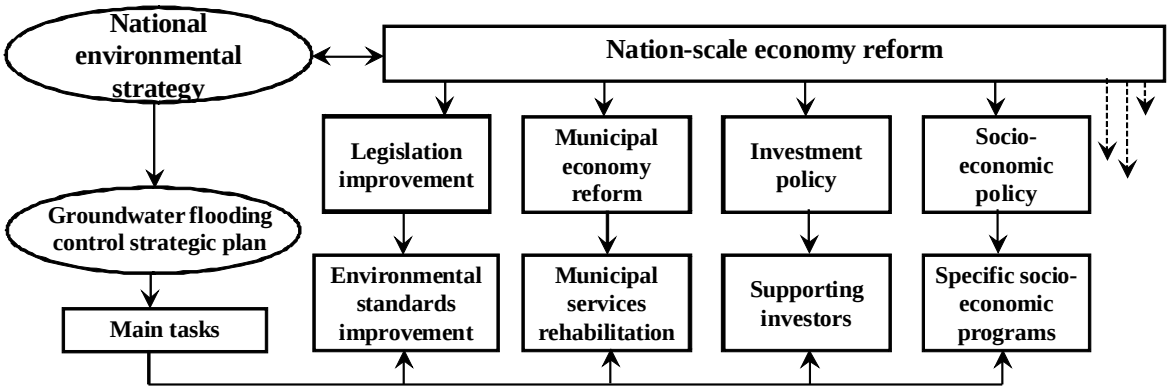

Fig. 2 Corresponding directions for reform of the economy and the main tasks in solving the groundwater flooding problem in Ukraine (Razmetayev & Chebanov, 2003).

Offering such a policy to the decision makers has to pave the way for replacement of traditional approaches of "fighting" or "liquidating" groundwater flooding using effective national and local actions plans.

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