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## Green Building Technologies and Environment

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### 1 ABSTRACT

Scientists believe that buildings construction and maintenance consume up to 50% of the total energy resources. We damage the environment by using non-renewable energy resources. Sustainable development paradigm promotes minimal usage of scarce resources based on the resource-saving technologies, i.e. getting raw materials as a result of recycling processes. Green building makes it possible to preserve natural resources for the next generations by reducing pollution and increasing ecosystem self-recovery. However, green building is not widely spread in Russia because it has low economic efficiency for business. Construction companies strive to profit from their investments and ignore the building's operating costs. Developer companies note that the up-front cost usually makes up about 20% of the life cycle cost. Green building suggests the recycled usage of the construction materials thus increasing energy efficiency of real estate property. Russian government doesn't provide any incentives for green building. Government can take care of the environment by supporting green building technologies, particularly in municipal and state buildings construction. Nowadays the only tender criterion applied is minimal up-front costs.

### 2 BUILDING DAMAGES

Buildings construction consumes a lot of energy resources especially the manufacturing of building materials and constructions (BM&C). It manufacturing involves extraction, transportation, and raw natural processing. All these stages of building (BM&C) damage the environment and require high energy consumption. Energy production in itself also harms the environment.

Russia uses primarily heat, hydro, and nuclear energies. Extraction of coal, oil, natural gas serving the main energy resources for the thermal power stations, also damages the environment. These kinds of energy resources are exhaustible, non-renewable, so it is necessary to reduce their consumption. Larger parts of fertile lands are flooded during the process of building the hydroelectric power plants and the artificially created ponds impact the sites' air humidity and temperature. The ecological consequences of the nuclear energy usage widely are known after Chernobyl's and Fukushima's disasters. Therefore in order to reduce the damaging impact on the environment it is necessary to seek ways to reduce energy consumption and at the same time switch on to ecologically safe energy (that of the sun, the wind, and the tides, etc.).

Sustainable development paradigm promotes minimal usage of scarce resources based on the resource-saving technologies, i.e. getting raw materials as a result of recycling processes. Germany pays close attention to the recycling of the building materials and constructions because construction and demolition wastes equals about 60% of all the country's wastes. Research results of Brandenburg Technic University scientists in Germany proved that concrete quality with recycled stone pearls is conformance to standard and is not worse quality than ordinary concrete (1).

According to the EU legal standards, since 2020 more than 80% of buildings' construction and demolition waste is to be recycled. Because of the limited access to natural building materials, the Netherlands and Belgium occupy the leading place in Europe in using the recycled materials. The quota of the construction waste recycling in the Netherlands is more than 90%. In Austria and Switzerland, the construction waste recycling share is 70-80%. In Spain, the recycling quota in 2003 used to be only 10% (2).

Recycling is not extensively used in Russia because raw materials recycle costs are higher than the value of the raw materials. In addition, filling the landfills with the construction waste is much cheaper than the realization of the recycling process. This is another aspect of environmental pollution in building property.

### 3 GREEN BUILDING BENEFITS

Green buildings make it possible to preserve natural resources for the next generations by reducing pollution and increasing ecosystem self-recovery. Green building is environmentally responsible and resource-

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efficient throughout a building's life-cycle. The Green Building practice expands and complements the classical building design concerns of economy, utility, durability, and comfort. A life cycle assessment (LCA) can help to avoid a narrow outlook on environmental, social and economic concerns by assessing a full range of impacts associated with all the stages of a process from cradle-to-grave (i.e., from extraction of raw materials through materials processing, manufacture, distribution, use, repair and maintenance, and disposal or recycling). Impacts taken into account include (among others) embodied energy, global warming potential, resource use, air pollution, water pollution, and waste.

The International Energy Agency released a publication that estimated that existing buildings are responsible for more than 40% of the world's total primary energy consumption and for 24% of global carbon dioxide emissions (3).

As high-performance buildings use less operating energy, embodied energy has assumed much greater importance – and may make up as much as 30% of the overall life cycle energy consumption. Green building brings together a vast array of practices and techniques to reduce and ultimately eliminate the impacts of buildings on the environment and human health. However, green building is not widely spread in Russia because it has low economic efficiency for business. Solitary projects green buildings of the business centres as rule are implemented foreign real-estate developers. In Russia some companies, as a rule, project, another - build while the others - maintain the buildings because each company aims at gaining benefits from its business. It is easier to sale reasonable property, then expensive because construction companies worry about building norms and not the energy efficiency of buildings. Operation costs don't worry constructors and builders, because they sell accommodations to private ownership whereas the management companies, upkeep of buildings cover the operation costs, including managing costs, at the expenses of the occupants. Developer companies note that the up-front cost usually makes up about 20% of the life cycle cost.

While the environmental and human health benefits of green building have been widely recognized, 'A Report to California's Sustainable Building Task Force' confirms that minimal increases in upfront costs of about 2% to support green design would, on average, result in life cycle savings of 20% of total construction costs -- more than ten times the initial investment. For example, an initial upfront investment of up to \$100,000 to incorporate green building features into a \$5 million project would result in a savings of \$1 million in today's dollars over the life of the building (4). These findings clearly support the work of the Sustainable Building Task Force and reinforce our commitment to build the greenest state facilities possible.

Russian government doesn't provide any incentives of green buildings. Government can take care of the environment by supporting green building technologies, particularly in municipal and state buildings construction. State investments are the taxpayers' money that has to be spent economically not only at the stage of building's construction but also in the process of its maintenance.

In Russia state investment can to spend only as the result tendering. Nowadays the only tender criterion applied is minimal up-front costs. This approach is less beneficial as taxpayers have to cover the expenses of energy-inefficient state buildings for many years which as the result of the investment expenses minimization. In my opinion, the life cycle net present value of the building should be the only criterion for selection, including both up-front and operation costs. Sticking this criterion will encourage penetration green building for municipal property in the social sector, that protecting occupants' health in this buildings.

#### 4 CONCLUSION

In base of the above can draw a conclusion. Bilding damage include embodied energy, global warming potential, resource use, air pollution, water pollution, and waste. The introduction of green building will reduce the load on the environment, shrink energy consumption and preserve the health of the nation.

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