

- Simulation modeling: developing computer models that simulate road conditions and traffic flow. This approach can help identify the most critical locations on the roads and develop effective measures to reduce the number of road traffic accidents.

All of these methods can be used to investigate and predict road traffic accidents in urban planning. Combining different research methods helps to obtain more accurate and reliable forecasting results.

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INNOVATIONS IN CONSTRUCTION

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Innovative technologies allow bringing the construction economy to a higher level (simplify and accelerate the construction process, reduce its cost, increase the life cycle of the building, ensure energy saving, etc.). Low construction and environmental costs play an important role in innovation, as they distinguish new technologies from existing ones.

Much of the innovation comes from the production of building materials. The construction materials market received unique products in 2019-2020.

The Netherlands has developed self-healing concrete. There is cement that can be reduced by lactic acid calcium and some bacteria that process it by converting it into limestone that fills cracks and prevents it from growing. It saves time for repairs, increases the life of the building.

Quartz Vinyl floors are developed which are fire- and water-resistant, and which contain quartz sand. With the addition of plasticizers, the tile becomes flexible.

German specialists created innovative material (liquid wood) from polymers and ground wood. Wood is used as wood flour and makes up 70% of the bulk of the composite. The composition may not be wood, in the material can add straw, rice husk, foam. If the composition includes antimicrobial components,

temperature stabilizers or substances that make the material shock resistant, the price increases, as does the quality.

The introduction of new devices on the market affected technological development. One of the fastest growing areas in this field is construction 3D printing. 3D printing equipment is successfully applied in the process of building construction. In 2014, private companies in the United States and China began work on the creation of 3D-printers for concrete printing were introduced. The first models were used to create small architectural forms. It is possible to build a residential house with interior partitions, door and window openings, and installation for laying of engineering communications in 24 hours.

Manufacturers offer mobile or stationary devices for printing construction elements. Depending on the parameters of the building being erected, the type of 3Dprinter is selected: printer size, nozzle (for the delivery of the building mix), the capacity of the concrete mixer. The thickness of the printing mixture, the configuration of the building, the creation of multi-chamber walls, the automatic mixing of ingredients- all printing details are entered with special software, and the preparation takes no longer than 30 minutes.

The houses were built in Shanghai using a 3D printer by Win Sun (150 m long and 10 m wide). Such a printer is able to print a building six meters high in a few days. Getting ready-made building blocks or other elements directly on the site reduces the cost of production, logistics, and personnel. Thanks to 3D modeling technologies, it became possible to create elements of concrete, biopolymer, cement, gypsum, clay and other materials.

Printed buildings appear in the United States, Saudi Arabia, Italy, France and other countries of the world. The experience of these countries has shown that 3D printing has proven its viability not only in low-rise, but also in multistory construction. In addition to residential buildings, office buildings, pavilions, bridges were created. 3D printer is used not only in construction, but also in the restoration of modern buildings.

The use of 3D technologies demonstrates the interest of scientists of all countries in the development of this method. The 3D printing technology of buildings and structures is innovative and promising.

It is difficult to identify or outline at least indicative directions that may continue in the future. There are many, and the close interrelationship of different approaches in direct construction makes it impossible to distinguish between technology specializations. The latest technologies in construction are aimed at achieving a specific task with consideration and development of related areas. It is impossible to predict what construction will be in 20-50 years. In any case, new technologies in construction will focus on the traditional set of characteristics of a modern home - energy efficiency, comfort and durability, safety and economy.