The fourth phase focuses on the implementation of measures and related actions identified in the SUM, carried out through systematic monitoring, evaluation and communication. At this stage, actions are implemented.

Currently, some of Ukrainian cities have their own developed Sustainable Urban Mobility Plans. These include Ivano-Frankivsk, Poltava, Mykolaiv, Vinnytsia (Concept of Integrated Development), Zhytomyr, Podilsky District of Kyiv and Lviv. Kharkiv SUMP was not completed due to the beginning of the war. The creation of the SUMP remains an urgent task for Ukrainian cities as it is focused on increasing satisfaction in the mobility needs of the population, especially at the stage of reconstruction of the territory and the country after the war.

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MODERN DEVELOPMENTS OF ENGINEERING

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Engineering has become an essential component of modern society, with advances in technology and new developments in engineering driving innovation and progress in various industries. In recent years, modern developments in engineering have focused on enhancing sustainability, improving energy efficiency, and reducing environmental impacts. This paper presents a comprehensive review of the latest advancements in engineering, focusing on sustainable engineering, energy-efficient technologies, and smart engineering.

Sustainable engineering refers to the process of designing and developing technological solutions that meet the needs of society while minimizing their impact on the environment and ensuring the efficient use of natural resources. It is a multidisciplinary field that combines principles of engineering, environmental science, and social science to create solutions that are economically viable, socially acceptable, and environmentally sustainable.

The goal of sustainable engineering is to promote the development of technologies and processes that reduce the negative impact on the environment and society while providing economic benefits. This can be achieved through various methods, such as reducing energy consumption, minimizing waste generation, utilizing renewable resources, and implementing environmentally-friendly materials and technologies.

Examples of sustainable engineering projects include the design of energy-efficient buildings, the development of renewable energy sources such as wind and solar power, and the use of sustainable materials in manufacturing processes. Sustainable engineering can also include the design of sustainable transportation systems, such as electric or hybrid vehicles and the use of mass transit systems.

Overall, sustainable engineering aims to balance economic, environmental, and social considerations to create a more sustainable future for the planet and its inhabitants.

Energy-efficient technologies are designed to reduce the amount of energy required to perform a given task or provide a service. These technologies are essential for reducing greenhouse gas emissions and combating climate change, as the energy sector is one of the largest sources of greenhouse gas emissions globally.

There are many types of energy-efficient technologies that can be used to reduce energy consumption and increase energy efficiency. Some examples include:

- LED Lighting: LED lights consume significantly less energy than traditional incandescent or fluorescent lighting and have a longer lifespan.
- Smart Thermostats: These thermostats can be programmed to adjust the temperature in a building based on occupancy or time of day, which can save energy and reduce heating and cooling costs.
- Energy-Efficient Appliances: Appliances such as refrigerators, washing machines, and dishwashers can be designed to consume less energy while still providing the same level of performance.
- Solar Panels: Solar panels can be used to generate electricity from sunlight, which can be used to power buildings and reduce the reliance on fossil fuels.
- Efficient HVAC Systems: HVAC systems can be designed to use less energy by using high-efficiency motors and optimizing the design of the ductwork and ventilation systems.
- Energy Storage Systems: Energy storage systems such as batteries or flywheels can be used to store excess energy generated by renewable energy sources, which can be used during times of high demand or when renewable energy sources are not available.

Overall, energy-efficient technologies play a critical role in reducing energy consumption, lowering greenhouse gas emissions, and creating a more sustainable future.

Smart engineering is the use of technology and data-driven solutions to improve the efficiency, safety, and sustainability of engineering processes and systems. It involves the integration of advanced technologies such as the internet of things (IoT), artificial intelligence (AI), and machine learning (ML) to create smarter and more automated engineering systems.

The goal of smart engineering is to create systems that can adapt and respond to changes in real-time, and to optimize performance, reduce costs, and improve safety. Some examples of smart engineering applications include:

- Smart Transportation: Intelligent transportation systems use real-time data to optimize traffic flow, reduce congestion, and improve safety. Smart engineering can also be used to develop autonomous vehicles that can operate safely and efficiently without human intervention.

- Smart Grids: Smart grids use advanced technologies to manage the distribution and consumption of electricity. These systems can optimize energy usage and reduce waste, as well as integrate renewable energy sources such as solar and wind power.

- Smart Buildings: Smart buildings use sensors and automation systems to optimize energy usage, reduce waste, and improve comfort and safety. Smart engineering can also be used to develop building materials that are more energy-efficient and sustainable.

- Smart Manufacturing: Smart manufacturing systems use data-driven approaches to optimize production processes and improve efficiency. This can include the use of machine learning algorithms to optimize production schedules, reduce waste, and improve quality control.

Overall, smart engineering is about using technology and data to optimize processes and create more efficient, sustainable, and safe engineering systems. By embracing smart engineering, we can create a more connected, intelligent, and sustainable world.

Modern developments in engineering have led to significant advancements in sustainability, energy efficiency, and smart engineering. Sustainable engineering has led to the development of environmentally friendly materials and renewable energy sources. Energy-efficient technologies have focused on smart grids and energy-efficient buildings to reduce energy waste and lower greenhouse gas emissions. Smart engineering has incorporated advanced technologies such as digital twins and predictive maintenance to optimize the design, development, and operation of products, processes, and systems. These advancements have the potential to revolutionize various industries, leading to a more sustainable and efficient future.

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FLYING HOUSES AGAINST EARTHQUAKE IN JAPAN

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As we know, earthquakes don't kill people. People's houses in the midst of earthquakes kill them. Look at the statistics and you'll know that the vast majority of fatalities from earthquakes large or small come from buildings, or parts of buildings, falling on their residents. What is better way to avoid tragedy then, when an earthquake suddenly comes?

Japan in the second half of the twentieth century and now in the twenty-first century has rightly been called an ultramodern power. Today, Japan's technology not only makes the country one of the most advanced in the economy, but has also become an integral part of its culture. They help defend against the harsh natural conditions of small islands and contribute to the world's scientific progress.

If you look at the "flying" houses built, of which there are already more than a thousand, you will not see anything special. An ordinary residential house, no different from any other building, but in the event of an earthquake it will not only save the lives of all the occupants, they will not even feel the tremors. To achieve such structural stability, Air Danshin Systems specialists came up with the idea to build houses without a rigid connection to the foundation.

The product of inventor Shoichi Sakamoto, the house sits, during more stable times, on a deflated air bag. When sensors feel a tremor, they switch on a compressor within a second. The compressor pumps air into an airbag, inflating it within a few more seconds, and ultimately lifting the entire house a good three centimeters off its supposedly earthquake-proof concrete foundation. There the structure will hover, its inhabitants able to casually go about their business, for the duration of the quake. Then the airbag deflates and the house gently settles back down.

The company built such a house on a "shake table" and equipped it with a few inhabitants, some furniture, and a couple of glasses of wine. When the mock tremors hit, in front of a rapt, hardhat-outfitted audience, the denizens hardly noticed, and not a drop of wine was spilled. The system will be added to new, otherwise typically built homes of an appropriate weight, and can be retrofitted to existing structures as well.