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## **Stability of territorial communities in normal situations and emergency**

### **Introduction**

As current experience shows, ecologists, economists, and security professionals are increasingly finding a field for collaboration. For regional and national development, environment economics means not only improving the environment but also achieving economic benefits (through the use of wasted resources, saving energy), social (making workplaces, improving health conditions of a population) or political (non-dependency on raw material suppliers, in particular, energy) and creates acceptable conditions for human life, which are largely based on the provision of appropriate conditions for the safety of its stay in the environment. Therefore, one of the main measures of reforming the administrative and territorial structure of the country is to build a modern system of the population and territories protection from emergencies, which can ensure human's safety and stability of the functioning of the territorial community.

### **Eco-industrial way of realization of self-sufficiency of territorial communities in normal conditions of life**

Aspects of the intersection of ecology and economics are studied by some scientific schools. Thus, the School of Environment Economics and Resources (formally launched in the United States in 1975 together with the establishment of the relevant Association with the support of the Factory of thoughts "Resources for the Future") underlies the parameters of neo-economists [1]. The emergence of the "Ecological Economy" in the mid-1980s is due to the desire of environmentalists to influence the directions of social development more. Its supporters do not share the optimism of neoclassical economists that the combination of technology, regulatory and market mechanisms will solve the problems of the environment, energy shortages, and food. They consider the permissible level of pollution lower than the neoclassical economists [1].

Another relatively new discipline is Industrial Ecology, which explores the interaction of ecology and business within the following three areas: 1) technical

(technological aspects of restoring, processing and reusing materials in the context of single companies or multi-company associations); 2) social networks (broader cooperation of business structures not only for the exchange of materials but also for sharing services, vehicles, equipment) and 3) interaction between business and the public (public relations, human creativity, community resources, institutional resources) [2].

There is a growing number of territorial communities think about the implementation of strategies so-called “Eco-Industrial Development” (EID), which is the practical side of “Industrial Ecology”. The EID is based on the idea that developed economics and a healthy environment can coexist effectively and be implemented through a range of approaches: pollution prevention, product sharing, technological innovation, green design, life-cycle analysis, collaborative learning programs, public participation.

The EID provides the building of relationships between companies for the most efficient system for the extraction, production, and use of products, their recycling, and waste disposal. Many eco-industrial projects involve the reuse of abandoned industrial facilities or military bases. These remodeled facilities are attractive for businesses to create new jobs, retain existing ones, and improve the environment.

EID projects take two practical forms: 1) Eco-industrial parks (EIP) – closed structures where the right combination of companies and technological design creates waste-free systems, characterized by the absence of pollutants and green buildings that can be dismantled or remodeled. They are difficult to put into practice, so recently there is a tendency to expand their regional framework, and to allow their participants to interact with companies and communities outside the park. Thus, we are already talking about 2) eco-industrial networks [2].

Examples of EID are Kalundborg (Denmark), Port of Cape Charles Sustainable Technologies Industrial Park (USA), Londonderry Ecological Industrial Park (USA). It would be extremely useful for Ukraine to study western experience to evaluate the effectiveness of EID activities, to study technologic aspects of project implementation, and to clarify aspects of investment management and policy.

Ecological modernization can be an effective development for the state and territorial communities, where economic growth is achieved without harming the environment by implementing effective technologies and improving the work of organizations that make decisions. According to M. Hawes, the main elements of environmental modernization are 1) technological innovations; 2) cooperation with economic imperatives; 3) political and institutional changes; 4) transforming the role of social movements; 5) change of discourse [3]. There are several main areas for achieving economic, social and other benefits from eco-modernization measures.

*1. Energy-saving.* Nowadays, Ukrainian economics is one of the most energy-efficient and energy-dependent in the world, using 3-4 times more energy per unit of GDP than similar industrial economics. The depletion of its main fund has exceeded 60-70%, the equipment has not been upgraded for more than 40 years [4]. Ukraine with the population about 40 million is in the top ten countries in terms of gas consumption

and it is imported in the world [4]. If current trends continue, in 2020 Ukraine's dependence on gas and oil imports will increase by 65-70% [5]. The most costly is the utility sector, which is about 30% of total final energy consumption in Ukraine [4] (about 45% of which is natural gas). Heating and lighting of one square meter of residential and office-production space in Ukraine consume 6-7 times more energy than in EU countries [4]. Losses of outdated heat distribution networks reach 30%, and heat losses in poorly isolated buildings – 35-50% [4].

Exploring ways to improve the situation, in addition to effective thermal insulation, we should pay attention to the technology of selection and use of process heat (which is the richest industrial centers), heat sewage and ventilation systems. Thermal modernization of Ukrainian buildings based on effective technologies will reduce gas consumption for heat supply by almost 15 billion cubic meters per year [4].

Even efficient economics are taking care of energy savings. Thus, the US government foresees the modernization of 75% of federal buildings and 2 million private houses to reduce electricity consumption. Once, G. Bush banned the use of incandescent light bulbs. Even Belarus aims to save \$1.5 billion annually in the energy-saving target, to reduce energy demand by 25% in 5 years while maintaining GDP growth [4]. Instead, Ukraine's energy strategy for 2030 sets very low targets for energy conservation: it is planned in 2030 that we will not reach even today's level of our western neighbors [4].

Experts recognize that the structural component of the energy-saving potential can compensate 40% of the required increase in energy use, and technical and technological equipment – almost 60%. Expenditure on energy-saving measures is 2.5-3 times more effective than investing in the construction of new energy generating facilities [4]. Energy saving in the conditions of limited investment is the most rational. Energy-saving is a priority for European countries.

2. *Waste treatment.* For Ukraine, waste treatment is a field of large profits. Paper recycling should be especially emphasized. Recycled paper consumes 64% less energy than produced from wood. Each ton of such paper rescues an average of 17 trees [6] (due to the low efficiency of wood processing for the production tonnes of paper in Ukraine consume 25.7 m<sup>3</sup> of the forest, in Finland – 4.8 m<sup>3</sup>). In the world, the annual volume of waste treatment reaches 80-90% of available stocks, in our country – about 40% [4]. In general, in our country, about 95% of all waste is not recycled [4]. In Ukraine, "Map of Technogenic Deposits" was developed, which includes 386 objects with the accumulated waste of metallurgy, fuel and energy and other industries [4]. These deposits should become an additional source of raw materials and their development should be used to improve the environmental situation.

3. *Renewable energy sources.* Today, almost 92% of thermal power units in Ukraine have exhausted their estimated life, 64% – the limit of physical wear [4]. The situation with nuclear power is similar. Native reserves of raw materials for producing energy at thermal power plants are also exhausted. The development of renewable energy sources (RES) in the Ukrainian situation is an important task of the energy industry.

Nowadays, in Ukraine, RES account for 3% of the country's total energy balance, by 2030 it is planned that RES will reach 7% [4]. The share of RES in the national energy production of countries aspiring to EU membership should be at least 6%. At that time, it is already 5-10% in the EU today [4], and it is planned to bring the installed capacity to 20% by 2020 [7]. In China, it is planned to increase the contribution of renewable energy to 15% by 2020.

According to statistics, investments in alternative energy worldwide amounted to more than \$ 100 billion, and global electricity generated by RES is estimated by experts to reach 240 GW [8]. A report from the European Council on the Development of RES states that RES will be able to provide 50% of world energy consumption by 2040 [4].

Ukraine has already significant production capacity to develop alternative sources, but growth rates are unsatisfactory. The total annual technically available energy potential of renewable energy in Ukraine is about 79 million tonnes of conventional fuel, in particular, 63 million tonnes due to the utilization of alternative energy sources, 16 million tonnes due to the use of off-balance sheet (energy recovery) [4].

Consider RES which is perspective for the development in Ukraine. The use of wind energy resources is justified for 40% of Ukraine territory. The most promising are the regions of Pryazovia, Crimea, the Black Sea, some regions in Dnipropetrovsk and Donbas, as well as the Carpathians and Transcarpathia. Moreover, the Crimean potential is second only to the Norwegian one. In general, in Ukraine, the wind power potential is 5000 MW (42 billion kWh per year) (in the Crimea alone – 1000 MW) [5].

The potential of Ukraine's biogas resources from livestock farm waste is 1.1-1.6 million tonnes of waste per year [5]. Annual agricultural waste is 49 million tonnes, of which about 34 million tonnes is used for agricultural use. The rest is a potential raw material for energy production [9]. Biogas has already generated more than 10 million MW of electricity and about 10 million Gcal of heat every year in the EU today. Germany, the United Kingdom, the United States, Canada, Brazil, Denmark, China are leaders in the use of biogas technologies. According to expert estimates, the potential of our country allows providing up to 10 billion m<sup>3</sup> of biogas production by 2020 [8].

Annually, more than 10 million tonnes of solid industrial waste is generated in Ukraine, with the decomposition of the organic part of which biogas with a methane content of about 50% is produced. The theoretical potential of biogas from landfills is estimated at 5.8 million tonnes. [10]. 1.4 million m<sup>3</sup> of annual logging waste, 1.1 million m<sup>3</sup> of wood waste and 3.8 million m<sup>3</sup> of firewood are suitable for energy purposes [9].

Technologies for producing solid biofuels in the form of briquettes and pellets from "energy plants" are promising for Ukraine. Such plants can produce large biomass increments in a relatively short period. For example, the plantations of the popular willow twigs remain productive for 20-25 years, with a dry weight gain of 25 tonnes per 1 ha per year. A plantation of 25 hectares of energy willow is planted in Volyn, and 100 hectares are planned to be planted in Lviv. When growing energy crops, the costs in terms of energy equivalent are ten times lower than the cost of

traditional energy sources. Thanks to “energy” plantations new jobs are created and additional funds are paid to local budgets [8].

The source of energy can be not only the landfill gas but also the garbage itself. Thus, urban waste is the main fuel in the hot water supply system of Gothenburg, Swedish. Every city is a constant source of garbage that can be used to eliminate gas from heat supply systems.

According to the Ministry of Agrarian Policy, 42 biodiesel plants have been built in Ukraine, which can produce 500,000 tonnes of biodiesel per year [8]. Only in Kalush, the plant for 170 thousand tons was built, in Donetsk region, the construction of the plant for the production of biodiesel with the capacity of 300 thousand tons per year is planned, in the Khmelnytsky region the project of reconstruction of Kamyanytsya-Podilsky sugar plant is being implemented, which will allow the enterprise to produce 75 thousand tons tonnes of biodiesel annually [11]. It is known that Ukraine’s annual demand for diesel is about 5 million tonnes, of which 1.7 million tonnes of consumes agricultural production. Thus, today Germany produces twice as much biodiesel as our rural economy requires [4].

At the same time, Germany sows 1.59 million hectares of rapeseed, France – 1.65 million hectares, and Ukraine – 1.7 million hectares. Ukraine, which ranks first in Europe in the area of rapeseed crops, sold 80% of the plant’s seed-grown abroad [8]. By exporting rather than processing these raw materials, Ukrainian producers are losing opportunities for producing biofuels and waste from processing – rapeseed meal that is used as livestock feed.

Ukraine exports 10 million tonnes of fodder grain each year at the lowest prices. If this raw material is processed in Ukraine for bioethanol, it is possible to get 3.5 million tonnes of additives for gasoline [4]. The cheapest bioethanol is from the molasses produced by sugar beet processing. It is possible to produce 4,000 liters of bioethanol from one hectare of sugar beet. With proper development by 2020, Ukraine could produce about 4.5-5 million tonnes of bioethanol and about 6 million tonnes of biodiesel in a year [4].

Biodiesel production has significant state support in the EU. In Germany, diesel fuel that is added to biodiesel is taxed with zero excise duty, the state compensates the excise duty in France 75%. The EU has a special incentive rate for rapeseed producers. The benefits of buying biodiesel are introduced in the United States. In Spain, drivers who use biofuels are allowed free parking, and in Brazil, a comprehensive advocacy program has been implemented with the well-known politicians, athletes, and stars of show business. In general, in Europe, a liter of such fuel is 0.10-0.15 euros cheaper than diesel.

In Ukraine, the adoption of the law “On Amendments to Certain Laws of Ukraine on the Production and Use of Biological Fuels” will contribute to the development of the biofuel market. It introduces a range of incentives for biofuel producers: from January 2010, 10% of VAT exempted from biofuel sellers and businesses selling equipment for its production. According to the author of the law S. Pashynski, in the

next 5 years Ukraine will be able to replace at least 30% of imports of traditional fuel with biofuel of its production.

Also promising for Ukraine is the use of solar energy, which can reduce traditional fuel consumption by 8-12% [6].

Table 1. RES potential in Ukraine [4]

The direction of RES development	Technically achievable annual energy potential		Annual volumes of natural gas replacement
	billion kWh	Million tonnes	Billion m <sup>3</sup>
Wind energy	41,7	15,0	13,04
Solar energy	28,8	6,0	5,22
Geothermal energy	105,1	12,0	10,43
Hydropower	27,7	10,0	8,70
Bioenergy	162,8	20,0	17,4
Environmental Energy	154,7	18,0	15,65
Total RES	520,8	81,0	70,44

*4. Improving population health.* Environmental modernization measures can have a positive effect in terms of improving population health and, as a consequence, reducing medical costs. According to Czech ecologists, 5-6 years after the widespread introduction of cleaner production, the environmental situation in the previously disadvantaged region is completely normalized. The effect on public health, while not instantaneous, will certainly manifest itself.

According to US Administration statistics, the \$ 23-26 billion previously spent on retrofitting power plants to environmental standards will result in savings of \$ 120-193 billion that will not be spent on disease treatment and compensation for lost work. Thus, one dollar spent saves 5-7 dollars [12].

*5. Labour market support.* Efficient use of resources, energy savings through the use of energy savings and the use of unconventional energy sources can free up financial resources for human resources. For example, in 2005, Cascades Fine Papers, a Canadian paper mill, started extracting biogas from a landfill near Montreal, providing 75% of its raw material needs. This kept it closed and saved 300 jobs [12].

The aforementioned plan by the US administration also foresees the creation of 1.6 million new workplaces, of which 150 thousand are part of a \$ 4.5 billion greening project for federal buildings. [13]

*6. Ecotourism, recreation.* Tourism is one of the most profitable industries in the world. One of the fastest-growing segments of tourism is the so-called ecotourism, whose annual growth is at the level of 10-30%. It refers to travel in unspoiled terrain civilization, wildlife watching, outdoor pursuits.

In Ukraine there are areas suitable for the development of ecotourism; its incentives are appropriate and necessary. Wildlife restoration is an additional incen-

tive. It is estimated that a male lion's income is \$ 500,000 during his life (almost 7 years) in Kenya. After killing his skin costs only \$ 1,000. Each of the 20,000 Kenyan elephants brings \$ 20,000 in revenue. Thus, for 60 years of his life, he can earn up to one million dollars [14].

The restoration of man-caused landscapes that are created by industrial production, can develop recreational potential and arouse tourist interest in remodeled sites, thereby stimulating income flow and further enhancement of territories. For example, lakes formed as a result of flooded sulfur quarries in the Lviv Region have significant "post-technogenic" recreational potential.

Ecological modernization is a difficult process and requires a balanced and flexible approach, careful analysis of existing foreign experience. Borrowing the best practices for implementing energy-efficient solutions, legislation, organizational structures, and financial mechanisms can be the best solution.

A system of eco-fines and taxes for eco-harmfulness is required to ensure that the national producer is not destroyed. Accordingly, a system of incentives and subsidies for eco-efficiency should be considered. Much of the work on eco-modernization should be transferred from the state budget to a private initiative – thanks to effective legislative incentives, which is an effective European practice. It should be clear and unchanged market mechanisms in the energy market, market-based and transparent pricing and tariffs for electricity, including clear planning of industry development. Devices for the metering of consumed thermal or energy resources, in particular in the municipal sector, should be installed everywhere.

It is important to maximize the promotion of RES as a guarantee of energy independence and eco-efficiency. It is appropriate in this context to introduce and improve "green tariffs", whereby renewable energy producers are guaranteed a certain price for energy sold that may be higher than market energy. Active participation of the public in the processes of greening different spheres of public life is also necessary. Active information policy is also needed. The implementation of all the above measures will contribute to a new revival of the region.

### **Implementation of strategies for protection of the population and territories of communities in emergencies**

It should be noted that local authorities play an important role in the prevention and rescue work in the civil protection systems of the European Union countries. In the field of emergency prevention and response, much attention is paid to planning and supporting the ongoing preparedness of local rescue services and units. Municipalities, through the management of civil protection services, work on the forecasting of possible accidents, catastrophes, and natural disasters, preparing the population for emergency response, accounting for local resources that can be used to solve emerging problems. They also organize ongoing monitoring of the situation to identify threats on time and take prompt measures to prevent their development. However, in the case of large-scale emergencies, local authorities are given extraordinary powers [15]. Voluntary and various charitable organizations, which are available in almost

all cities, are also involved in helping the affected population. The civil protection systems of the EU countries differ, but they share common fundamental goals and principles. In the EU Member States, quite powerful and effective systems of civil protection and their financial and resource support are in place, capable of protecting the population and territories of their states from emergencies of different nature. Experience in the operation and construction of a system of governance that can be beneficial for our country and will help to increase the efficiency and effectiveness of civil defense services in times of peace and war [16]. Thus, the main problems can be outlined:

1. The models of civil protection of the countries differ, but they share common fundamental goals and principles – prevention, fight against and recovery after anthropogenic, natural and man-made disasters, regardless of their causes for the protection of rights and citizens' freedoms, their property, the democratic structure of the state and the market principles of the economy.
2. One of the most important issues for the organization of civil defense abroad is the interaction of civil protection authorities and the armed forces, especially the ground forces.
3. Local authorities play a major role in preventive and rescue work.
4. An important element of civil protection in many countries is the availability of specialized rescue organizations and units that are targeted for action primarily abroad.
5. It should also be noted that in the system of emergency response measures developed in developed countries of the world, training of rescue services specialists is a significant part.

Therefore, building a modern and effective civil protection system in Ukraine requires additional organizational and practical measures to address specific issues, including:

1. Improvement in the field of civil protection should not be restricted by the reform of the State Emergency Service of Ukraine. At the same time, it is necessary to carry out the development of infrastructure, cities, and settlements with the removal of critical industries outside settlements, decommissioning of obsolete and dangerous industries and their alternative replacement, restoration of ecological balance, reclamation of contaminated lands, etc.
2. The priority of the civil protection system in modern conditions should be given not to the elimination of the consequences of the NA, but the forecasting, monitoring and, if possible, the prevention of emergencies.
3. Comprehensive techniques should be developed for the collection, processing, transmission and analysis of information on the likelihood and occurrence of emergencies in the Unified State Civil Protection System, as well as high technical support for such works. Since, at present, monitoring and forecasting of emergencies in Ukraine are carried out only at the level of regional, sectoral or other independent systems, which are not integrated into single information and

analytical complex, the national system of monitoring the sources of emergencies and their forecasting in the country has not been created.

4. The legislation on the organization of notification and informed of the state authorities and the population of Ukraine on the threat and emergencies needs to be improved and clarified. At the legislative level, the structure of public administration bodies is defined, but the information support system, as a separate component in legislative acts, is not defined. Therefore, the component of civil protection should not be the elements of information security, but the system of information and analytical support of civil protection of Ukraine.
5. The material and technical base of the notification and information system is in poor condition and needs to be upgraded to modern technologies. In the light of our international experience, in our opinion, it should be possible to create opportunities and conditions for the provision of technical assistance by the state and business to the united territorial communities to create an effective and high-tech local alert system.
6. The urgent issue of ensuring the functioning of civil protection is currently the technical re-equipment of the formations and divisions of the Civil Protection Operational Rescue Service. Also available in the emergency and fire and rescue units are equipment that requires replacement and equipment of modern means of communication. Considering the legislation of Ukraine, in particular the Law of Ukraine “On the basics of national security of Ukraine”, it would be appropriate to create a modern European rescue service that meets high international standards and can eliminate any emergency in a timely and reliable manner. Consideration should also be given to the training of these services.
7. Given the international experience, as well as the decentralization of power and the unification of territorial communities in Ukraine, it is necessary to adopt the necessary legislative and regulatory acts to ensure the effective planning, coordination, and control of the implementation of civil protection measures at the level of all, without exception, territorial communities. To improve public administration of civil protection, it is necessary to amend the Code of Civil Protection, specifying the work of the units of territorial subsystems of the Unified State Civil Protection System in peacetime and during a special period. The implementation of the SES Reform Strategy [17] was planned to be implemented in three phases during 2017-2020.

The first stage (2017) envisaged the preparation of proposals for amending the laws on:

- the regulatory environment of the issue of state supervision (control) in the field of fire and technogenic safety by obligatory carrying out routine inspections of only high-risk economic entities and public institutions, as well as the introduction of civil legal insurance liability of medium and low-risk entities for damage that may be caused to third parties or their property;
- the implementation of Directive 2012/18 / EU of the European Parliament and of the Council from 4 July 2012 on the control of major accidents involving danger-

ous substances (SEVESO III), in particular as regards the definition of criteria for state control of high-risk objects;

- transfer of property complexes of state fire-rescue units and other property of SES from state to communal property;
- determination of the required number of fire and rescue units (fire units) of local and voluntary fire protection in the united territorial communities, their number, locations based on the time of arrival at the place of call (10 minutes in the city and 20 minutes in the countryside), financially – economic justification for their creation and maintenance;
- formation of voluntary movement in the field of civil protection.

The second stage (2018) envisaged the reorganization of the SES Civil Defense Forces:

- providing methodological and practical assistance to local self-government bodies in setting up fire and rescue units (fire units) of local and voluntary fire protection in the united territorial communities, taking into account the time of arrival of 10 minutes in the city and to the most remote settlement in rural areas not more than 20 minutes from the moment of notification of the occurrence of a fire or emergency;
- equipping fire and rescue equipment and special equipment of existing fire and rescue units (fire units) of local and voluntary fire protection in the united territorial communities by their consent, including at the expense of surplus property and equipment of SES, implementation of local, state and international humanitarian programs;
- integration of the SESA into the system of state market surveillance authorities with the assignment to the authority of the SESA the implementation of market surveillance in respect of civil, fire protection, pyrotechnic articles.

In the third stage (2019-2020), the organizational structure of the SESP at the central, regional, territorial and object level is optimized:

- introduction of a technogenic and fire safety management system based on a risk-oriented approach and European standards for the assessment and analysis of risks of fire and technogenic safety of economic entities;
- commissioning of aircraft intended for aviation search, rescue, firefighting, transportation, and other tasks, taking into account the requirements of international standards, placing them in regions (or adjacent to them) with a high risk of emergencies;
- modernization of the centralized public alert system at the central and regional level;
- creation of a system of alerting at the level of united territorial communities.

It should be noted that the measures and methodological recommendations aren't mentioned the question about developing the documentation of the section about the engineering and technical measures of the CP, which is required by DSTU-N B B.1.1-19: 2013 [18]. The implementation of the CPI section of the Peacetime CP should begin with an analysis of the basic solution of the planning structure of a small town (urban or

rural settlement) of a territorial community following the master plan. In the analysis of the planning structure, emphasis should be placed on identifying its features, namely, ensuring the tasks of rescuing peoples for peacetime by urban development.

It is necessary to add the supplement to the Code of Civil Defense, specifying the work of the USS CP in wartime, as well as in the conditions of terrorist acts and armed speeches of gangs, we propose to return to the unification of the management of the SSES and the relevant units in the administrations of the regions in a single body – Staff of Civil Protection.

The Strategy identified the main problems in the activity of the SSES of Ukraine, as well as the ways of their solution in the medium term. However, the Strategy does not fully reflect the complex of measures for the development and modernization of the civil protection system of our country, first of all taking into account the peculiarities of conducting modern military and political conflicts of “hybrid-type”, as well as the experience of implementing civil protection measures during the anti-terrorist operation on eastern Ukraine.

## Conclusion

The implementation of the Strategy, as well as additional accompanying economic measures, will help to ensure: economic self-sufficiency of territorial communities; an adequate level of population life security, protection of economic entities and territories from the threat of emergencies; creating an effective modern European system of prevention of emergencies and fire prevention, improving the system of reaction on fire, creating the optimal management system of the unified state system of civil protection.

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