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МАТЕРІАЛИ

ІІ обласної студентської науково - практичної англомовної інтернет-конференції для закладів фахової передвищої освіти

«BURNING ECOLOGICAL PROBLEMS IN THE FIELDS OF HUMAN ACTIVITY: TRANSPORT, SHIPPING, MEDICINE, INDUSTRY, INFORMATION TECHNOLOGIES, AGRICULTURE»

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Наведені матеріали подані для обговорення на ІІ обласній студентській науково - практичній англомовній інтернет-конференції для закладів фахової передвищої освіти «Burning ecological problems in the fields of human activity: transport, shipping, medicine, industry, information technologies, agriculture». В матеріалах висвітлено результати досліджень щодо аналізу нагальних екологічних проблем, спричинених діяльністю людини у таких сферах, як: транспорт, судноплавство, медицина, промисловість, сільське господарство,інформаційні технології.

ЗМІСТ

SECTION 1
URGENT ISSUES OF NATURAL RESOURCES PROTECTION OF KHERSON REGION

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PROTECTION OF NATURAL RESOURCES OF KHERSON REGION: DYNAMICS OF EMISSIONS OF POLLUTANTS FROM STATIONARY AND MOBILE SOURCES INTO THE ATMOSPHERE

One of the global problems is the problem of air pollution, which affects the human body, animals and vegetation, harms the national economy, causes profound changes in the biosphere. The main pollutants of the region, as in previous years, are enterprises engaged in the production and distribution of electricity, gas and water (33.87%). The main sources of air pollution in the city of Kherson were: SE "Kherson Sea Commercial Port" PJSC "Kherson CHP", Kherson Line Production Department of Main Gas Pipelines "Kharkivtransgaz" PJSC "Ukrtransgaz", City Utility Company "Khersonteploenergo", PJSC "Tavria Construction Company", LLC "Firm – 24 industrial complex "Ship", PJSC "Khersongaz", PJSC "Kherson Oil Refinery", PJSC "Kherson Butter Plant". The main air pollutants in the city are: formaldehyde dioxide, nitric oxide, phenol, carbon monoxide. The main costs of fuel, heat and electricity accounted for industry – 58.9%, conventional fuel of the total costs; agriculture – 11.75%, transport, warehousing, postal and courier activities – 4.1%, construction – 0.4%, as well as enterprises and organizations of other activities – 24.9%.

. At present, human economic activity is increasingly becoming a major source of air pollution. Various chemicals that are in the waste, getting into the soil, air or water, pass through the ecological links from one chain to another, eventually getting into the human body. Atmospheric air pollution in the degree of chemical danger to humans ranks first. This is primarily due to the fact that air pollutants are the most widespread and fall into different environments. Substances that pollute the environment are very diverse. Depending on their nature, concentration, time of action on the human body, they can cause various adverse effects. Short-term action of small concentrations of such substances can cause dizziness, nausea, burning in the throat, cough. Getting high concentrations of toxic substances into the human body can lead to loss of consciousness, acute poisoning and even death. Examples of such actions are smog generated in large cities in windless weather, or accidental emissions of toxic substances by industrial enterprises into the atmosphere. The body's reactions to pollution depend on individual characteristics: age, sex, health status. As a rule, children, the sick and the elderly are more vulnerable. At systematic or periodic receipt in an organism of rather small quantities of toxic substances there is a chronic poisoning.

Among the vehicles in terms of emissions, cars are in the lead, namely vehicles that are privately owned by the population. The rest, emissions are from aviation, rail, water transport and production equipment. The main toxic ingredients that polluted the air during the operation of mobile sources were: carbon monoxide (35.9 thousand tons, or 74.5% of the total), nitrogen oxides (5.6 thousand tons, or 11.6%), volatile organic compounds (5.3 thousand tons, or 10.9%), sulfur dioxide (0.6 thousand tons, or 1.2%), hydrocarbons (0.003 thousand tons, or 0.006%) and substances in the form of suspended solids (0.6 thousand tons, or 1.2%). The remaining

emissions were methane, benzene(a)pyrene and ammonia. In addition, 709.3 thousand tons of carbon dioxide were emitted into the atmosphere by mobile sources of pollution. It should be noted that the inflow of pollutants from mobile sources of pollution and industrial equipment in all areas of the region prevails over emissions from stationary sources [1].

The main ways to reduce air pollution are the development and implementation of cleaning filters, the use of environmentally friendly sources, waste-free production technology, the fight against car exhaust, landscaping and repair of the road surface.

In our opinion, measures to prevent, reduce or eliminate air pollution should include the implementation of modern planning solutions, as well as take into account the possibility of effective solutions of technological, sanitary and organizational nature, positive domestic and foreign experience, including low-waste and zero-waste technologies, integrated use of natural resources, facilities and devices for effective capture, disposal and disposal of harmful substances and control devices of their content in emissions and air [4].

So, we propose such main measures to reduce air emissions in the Kherson region as:

1) creation of gas capture installations and devices for technological systems and ventilation;

2) development of technological equipment for neutralization of exhausts of internal combustion engines;

3) switching to gaseous fuel, exclusion of leaded gasoline, use of toxic exhaust neutralizers.

4) introduction of equipment for afterburning and purification of gases from boilers and other heating furnaces;

5) development and implementation of combined methods to reduce emissions of nitrogen oxides and sulfur from boilers

6) conversion of heating furnaces and devices to fuel with less harmful substances, etc.

7) repair of the road surface during the reporting period.

We analyzed the news reports of the Kherson region and made statistical conclusions: 67 inspections of compliance with the requirements of environmental legislation in terms of air protection were carried out. 55 protocols were drawn up, 39 people were brought to administrative responsibility for the revealed violations, who were fined in the amount of UAH 4,352 thousand, collected taking into account the previously imposed UAH 4,233 thousand. The total amount of calculated damages caused to the state as a result of violation of environmental legislation in terms of air protection is 1111,885 thousand UAH. 6 claims in the amount of UAH 1,111,828 thousand were filed, 4 claims in the amount of UAH 12,260 thousand were reimbursed. 8 inspections of compliance of economic entities with the requirements of the Law of Ukraine "On Atmospheric Air Protection" with the implementation of instrumental and laboratory control over the content of pollutants in emissions organized 12 stationary sources of emissions and 12 sources of pollutants. 36 pooled samples were taken and 456 pollutant concentrations were determined [2].

The Inspectorate sent letters to provide a copy of the reports on the inventory of sources of emissions of pollutants into the atmosphere LLC "Grimat Group", "Belozerskaya Correctional Colony (№105)" Office of the State Penitentiary Service of Ukraine in Kherson region, "Darya Correctional Colony" (№10), Management of the state penitentiary service of Ukraine of the Kherson area [3]. According to results of carrying out the state instrumental and laboratory control over stationary sources of pollution of atmospheric air of area it is revealed: 2 sources of emissions, the content of pollutants in which exceeded the standards of approved maximum allowable emissions, owned by LLC "Agroinvest Kherson" and LLC "Ecobiotech Ukraine";

1 unaccounted source of formation and 1 unaccounted source of CL emissions at the Northern Correctional Colony № 90 and Ecobiotech Ukraine LLC; 2 unaccounted sources of formation and 2 unaccounted sources of CL emissions at PJSC "Tavria Construction Company". As part of the commission formed by SE "Khersonstandardmetrologiya", 3 laboratories participating in the control of emissions of organized stationary sources of air pollution (PE "RIC", PJSC "Kherson Thermal Power Plant", "Measurement" PE "Kotlomonta") took part in the certification, and certification of the laboratory of observations of air pollution of the Kherson regional center on hydrometeorology and measuring laboratory [2].

As a result of inspections of enterprises, we found that many enterprises do not comply with the Law of Ukraine "On Air Protection" and violate it. Therefore, many of these companies had to pay damages due to violations of environmental legislation in the part – protection of atmospheric air, as well as many reports were drawn up for violations and many people were brought to administrative responsibility.

. So, today one of the most pressing problems is the problem of air pollution, which affects the human body, animals and vegetation, harms the economy, causes profound changes in the biosphere. The main polluters of the region and the city of Kherson are enterprises engaged in production and distribution electricity, gas and water. Thanks to inspections and protocols we were able to reduce emissions into the air from various enterprises and provide them to the residents of the Kherson region a little easier "breath into the new future".

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THE TECHNOLOGY OF PLASMA GASIFICATION AND THE PROBLEMS HINDERING ITS DEVELOPMENT IN OUR COUNTRY AND CITY

Due to the fact that the amount of solid waste increases over time, today consumers are offered a large number of ways to dispose of waste. Of course, all these methods work to reduce the total amount of waste, but each of the methods has both clear advantages and a number of significant disadvantages that do not allow the use of a particular method of waste disposal more widely.

The common feature of all these methods is a narrow focus. That is, each of the methods of waste disposal is suitable only for a particular type of solid waste. In addition, each method of disposal has specific disadvantages. For example, the most common method of waste disposal - waste

disposal - makes it possible to get rid of significant amounts of waste by burying them. But this method very significantly disrupts the surrounding ecosystem. After all, both the landfill and the soil near the landfill are very polluted by that kind of utilization. From this we can conclude that a significant amount of land that is potentially suitable for agricultural use, become unusable as a result of this.

So, for example, the method of Plasma gasification is a very environmentally friendly method of processing toxic ash and chemicals, as well as bio-waste into synthetic fuel or electric energy[1]. This technology is very commercially successful in Japan, England, the USA and China. This method also helps to empty old waste landfills, thereby preventing the poisoning of the earth by degradation products from these landfills, completely eliminating toxic materials and gases. What is the problem of this method and, for example, why is it not actively used in Ukraine, you ask? The answer is simple – high production costs, difficulties in organizing and finding raw materials for the enterprise, and we need constant supplies of raw materials so that the plant does not work at a loss, a long period of so-called payback. Although, in general, if, for example, it is installed in a similar plasma gasification plant in, for example, Kherson, then the only problematic issue will be the regular supply of raw materials to the enterprise. And well, in the case of the transition of our region to this technology, the current recycling and sorting enterprises will be forced to either close or re-equip, and in any case this will be a significant reduction in jobs, since modern plasma gasification technology provides only a small amount of maintenance staff, with a fairly high performance. And for certain reasons, the number of all waste processing and sorting enterprises in Ukraine not only does not grow, it has decreased by more than a third over the last ten years, so this is also a kind of obstacle. Still, according to the tariffs for the processing and disposal of waste, it is much stiffer and easier to bury. And in order for a garbage disposal market to appear in Ukraine, disposal should be at least at the same price as recycling. Potentially, disposal at a landfill should cost much more [2].

According to the Antimonopoly Committee of Ukraine, only 6% of the waste should be disposed of, while the remaining percentage of waste is simply disposed of in landfills, but the problem is that most of the landfills do not meet European requirements, and waste completely violates domestic environmental safety standards. Turning to the topic of ecology, to note that according to the same data, the Kherson region ranks 10th in terms of pollution among 27 regions [3]. In the last place, by the way, the Zhytomyr region. Kherson should take the initiative of Zhytomyr to combat pollution, and it is possible to “set an example to follow” to other regions, because, perhaps, we will overtaken by the ecological catastrophe in our country only on sunset of their days, but now, for our descendants, this will be a real sad prospect.

One of the most promising methods of solving pollution is Plasma gasification, but there are many other ways to solve the problem like this, but we considered this method as the most effective, in our opinion. As well as we did not consider all the reasons why reclamation industry almost does not develop in our country. In general, we need to say that the problem of waste disposal both in Ukraine and in its specific regions is worth acute, and if we do nothing – we will just drown in trash. There is a way out of any situation, but it can’t be found if we don’t do anything. The same thing can be said about the pollution in the Kherson region, if we do not pay attention to this problem, then it will not go away by itself. We believe that even one person can react on pollution, the main thing to remember is that the future of the earth is only in our hands. At last, we offer you a question: “if this world is saved in vain by us, then what is our happiness?”

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ACTUAL ISSUES OF PROTECTION OF NATURAL RESOURCES OF THE KHERSON REGION

Kherson is one of the richest areas for natural resources in Ukraine, but unfortunately, due to the careless attitude of society towards nature, our wealth is being exhausted over the years. Unfortunately, people pay little attention to today's problems, which are actually very important and global in the modern world. Therefore, we would like to direct your attention to the disclosure of this urgent issue regarding the protection of natural resources of the Kherson region.

The nature of the Kherson region is undergoing catastrophic changes – plowing of the steppes, water and wind erosion of the earth, flooding and devastation of soils, pollution of water, air, direct destruction of plant species, fungi and animals.

This process needs to be stopped, while plots of land that represent all types of vegetation characteristic of the Kherson region have been preserved. Many people ask themselves the question: "How to avoid this?"

Regarding the steppe vegetation, it is necessary to raise the question of extracting from the crop rotation some of the fields, especially those areas where rocky parent rocks are very close to the surface, for renewing the steppes on them [1]. After the resumption, it can become stud farm lands, hayfields, with an appropriate regime, pastures with an adjustable load, and partly sanctuaries, nature reserves, nature reserves, natural monuments, etc. An optimal network of nature reserve fund objects must be created, since the modern network is extremely insufficient . The area of protected objects in the steppe zone should occupy at least 10% of the territory, that is, it should be doubled. It can really ensure the stable development of the Kherson region, since the balance between natural and man-made landscapes will be at least slightly restored [2].

Concerning to water and wind erosion of the earth, we think, two important tasks need to be solved:

1) to prevent weathering;
2) to stop erosion of the upper horizon.

In our opinion, to achieve the aim, we need to apply some measures:

1) conducting continuous monitoring in order to exercise control over the process of erosion development;
2) the implementation of crop rotation with the adoption of the necessary measures for the protection of soil, which suggest the following:

2.2. Cultivation on slopes perennial cultivated plants (e.g., legumes). Seeding is necessary to make across the hills (the planting of row crops on steep slopes is not allowed);

2.3. The method of green manuring, or plowing into the soil of fresh green mass. Thus, in

addition to increasing the resilience of soil to erosion and weathering, it is enriched with organic matter. For this purpose, most commonly used Lupin and other legumes (seradella, clover, sweet clover, white mustard and buckwheat);

2.4. Install an effective system of snow retention, the task of which is to prevent the erosion of fertile layer of melt water;

2.5. Timely application of fertilizers that enrich the soil;

2.6. Speed plowing in the fields, which are located under the incline up to 6º [3].

As well a very important problem is pollution of water and air. We need to prevent rubbish dumping in excessive amounts in water of the Dnieper and its tributaries. For this we need to put more bins in recreational areas. Also curb the emission of harmful substances into the air and into the river. In this way we can save not only millions of lives but also Flora and Fauna of the Kherson region.

To drastically improve the environmental situation, both on the earth as a whole and in the Kherson region, it is necessary to implement measures of this nature:

1. Legal: these include the creation of environmental laws. Equally important are international agreements.

2. Economic: the elimination of the effects of anthropogenic impact on nature requires serious financial injections.

3. Technological: in this area there is where to disperse the inventors and the innovator. The use of new technologies in the mining, metallurgical and transport industries will help to minimize environmental pollution. The main objective is the creation of environmentally friendly energy sources.

4. Organizational: they consist in the uniform distribution of transport in streams to prevent its long accumulation in one revenge.

5. Architectural: it is advisable to plant large and small settlements, to divide their territory into zones with the help of plantings. Equally important is the planting of plantings around enterprises and along roads. The approach to environmental issues is complex. It should include long-term and planned activities aimed at all areas of society.

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THE IMPACT OF TRANSPORT ON THE ENVIRONMENT IN KHERSON

The relevance of our article is that the impact of transport on the environmental situation in our region can reach a critical level. That is why we decided to analyze and systematize data on a particular environmental problem in our region.

.The environmental impact of transport is significant because transport is a major energy consumer and burns most of the world's oil. Let's look at some of the pros and cons of this.

Firstly, it creates air pollution, including nitrous oxide and particulate matter, and is a significant factor in global warming due to carbon dioxide emissions.

Secondly, harmful emissions from cars are produced in the lowest, surface layers of the atmosphere, where the main human activity takes place and where the conditions for their dispersal are the worst [1].

Compounds of sulfur and nitrogen oxides emitted into the atmosphere with exhaust gases from automobile engines undergo chemical transformations, forming various acids and salts. Such substances return to the earth in the form of "acid" rains. It has now been proven that acid sediments cause significant damage to water spaces, lead to the destruction of fauna, cause increased corrosion of metals and the destruction of building structures. In addition, nitrogen oxides contribute to the brown color of the air, and in combination with various aerosols cause mud fog, impairing visibility.

Today, a car is a mobile source with an unstable process of emission of harmful substances. There is no equipment in the Kherson region that allows us to conduct environmental studies of such objects. Information on this aspect of Ukrainian car manufacturers, which make up the majority of the vehicle fleet in the region, is very contradictory and not always objective. The main reasons for increased air pollution by road are: poor quality of motor fuel; low technical and operational indicators of the fleet of vehicles [2].

It would be unfair not to mention the fact that thanks to the car there is a high speed of delivery, a wide scope of application by territorial basis, types of cargo and communication systems; less capital investment.

In the matter of protecting the natural complex, Kherson region, located in the lower reaches of the Dnieper, is of no small interest. According to some experts, in Kherson, elevated hydrogen sulfide and ozone were recorded in the air. One recent analysis showed that in the area of Perekopskaya Street there was an excess of two indicators: ozone and hydrogen sulfide. Peak indicators showed ozone twice, and hydrogen sulfide up to 14 times [3]. This may be directly related to the increased amount of exhaust gases that react with sunlight.

Summing up, we can say that we need more extensive development and improvement of the legislative framework in the field of transport ecology. One way to solve the problem of electromagnetic pollution is to transfer all power lines underground in the form of cables. Of course, this is much more expensive than laying overhead power lines, but electromagnetic radiation disappears almost completely and the problem of aesthetic attractiveness of landscapes, as well as environmental problems, is solved.

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MARINE ENVIRONMENT POLLUTION CONSEQUUENCES

Today it is difficult to imagine our lives without transportation services, such as: air transport and sea transportation. The main and most profitable way of transport is sea transport, because it requires less fuel, but even this transport has its drawbacks, or rather - time. Unfortunately, the transportation time in this way is very slow.
Maritime transport uses maritime routes that are prone to pollution, so recently several organizations have been established to prevent pollution, such as IMO.

Our planet can be called a water planet, since the area occupied by water is three times the land area. The sea sand oceans of the Earth have a huge impact on the vital activity of our planet. A huge mass of ocean water forms the planet's climate, and also serves as a source of precipitation. It was the Ocean that became the cradle of life on Earth; now about four fifths of all living creatures of the planet live in it.

In our time, the oceans have a large role in the life of mankind. As a means of transportation for ships, as well as a pantry of plant and animal wealth. In addition, sea water can be used to produce fresh (drinkable) water. At the moment, the oceans are quite polluted, one of the most dangerous substance of pollution is oil. Oil is a noily, viscous liquid that is brown-black in color and exhibits weak fluorescence. Oil consists of hydro aromatic hydrocarbons; they have a very negative effect on them marine environment. Oil and petroleum products are the most common pollutant sin the oceans. By the beginning of the 00s more than 14 million tons of oil annually received in the ocean. The next marine pollution material is plastic. I would like to mention the cases that occurred on January 21, 1992 in the Pacific Ocean, a bulk carrier transporting 30 thousand rubber ducklings from Hong Kong to Tacoma fell into a hurricane and as a results everal containers fell over board. Therefore, a large number of ducklings went on free travel. More interesting, because these plastic ducks began to be carried away by different currents and ended up in different parts of the world.

What is the problem? And in fact that as every one knows, plastic is decomposed for a very long time and during its decomposition it releases a large amount of toxins such as car cinogenic formaldehyde, phthalate sand allergenic chloridevinyl, which, if it enters into living organisms, does physical harm, for example, problems with internal organs.

In connection with the "global problems of the marine environment", special conventions have recently been created that are aimed at the complete or partial elimination of this problem. The most famous convention on the prevention of marine pollution is MARPOL. In 2018 alone, 87 ships were fined in Istanbul due to pollution of the Black Sea. After this incident, fines for pollution increased almost 3 times.

MARPOL Convention - has several units that obey certain criteria, and they are called Annexes.There are 6 Annexes of MARPOL:

- Regulations for the Prevention of Pollution by Oil and Air Pollution from Ships
- Regulations for the Control of Pollution by Noxious Liquid Substances in Bulk
- Prevention of Pollution by Harmful Substances Carried by Sea in Packaged Form
- Prevention of Pollution by Sewage from Ships and by Garbage from Ships

Kherson region is larger than other regions; the famous Dnieper River runs through this region, which flows into the Black SeaQuite a large part of the land is washed by the sea. Our city also has a commercial sea port. The state of the aquatic environment cannot be called excellent, but it cannot be called bad either, because most of the pollution does not lie on ships, but on human hands. The last known case of pollution occurred on April 13, 2012. Large spots with a clay film were found on the surface of the river during the bathing in the hydropark by the residents of the Komsomolsky district, the city of Kherson. Respectively, soon the police was called. The culprit was never found. Earlier on February 27, 2012, the source of pollution was established, namely the m / v SBO-2 (flag of Ukraine, shipowner branch of PJSC Shipping Company Ukrrichflot). The amount of discharged oil products was 0.340 kg. The responsible person was brought to administrative responsibility in the amount of 1190 UAH., A claim was filed against the shipowner in the amount of 111 US dollars. Fortunately, the amount of fines was increased by more than 5 times, and therefore, until January 2020, not a single pollution was recorded by ships.

Figure 1 – Oil spill in the river

I believe that in order to prevent pollution of the marine environment, the amount of fines should be increased as much as possible, because only this can stop the human factor andmake the people think about the consequences.

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GREEN SCHOOL IN ANTONIVKA IS AN ECO-EXAMPLE FOR ENTIRE UKRAINE

The current scale of environmental change poses a serious threat to human life. Atmospheric air pollution has reached a critical level in many cities of Ukraine. The disastrous state of the environment, which now significantly determines the health of people and their lifespan, prompts everyone - adults and children - to follow the road of cooperation with nature.

Because of the aggravation of the ecological situation in Ukraine, its current orientation on

environmental policy and entry into the pan-European global system of environmental safety, effective ecological education of children should play an important role [1].

A newly-built green school was inaugurated in the suburb of Antonivka in Kherson, Ukraine. The school, which relies on energy- efficient design, thermal insulation, and solar collectors, was built with the support of an earmarked financial contribution from the Finnish Government. The city of Kherson had, in turn, covered all costs related to groundworks, as well as the expansion of the water and sewage systems.

The Green school in Kherson was inaugurated by Minister Mykkänen, who was the guest of honour at the occasion. The school's building elements had been provided by the Finnish company Elemenco, which won a tendering competition run in 2015. The Nordic Environment Finance Corporation, NEFCO, had administered the project and handled the procurement of services and disbursement of funds. The newly enlarged school has a capacity of over 410 pupils. Part of the building will also be used as a service center providing social and psychological support to refugees living in the area. The project is one of many municipal projects supported by the Nordic Energy Efficiency and Humanitarian Support Fund [2].

Figure 1.- The Head of the city of Kherson together with the Finnish delegation solemnly cut the ribbon opening new building

The project "Green school" is the key to the health and happy future of the children of Antonivka village which was created by employees of the Department of education of the Kherson city Council. It involved the construction of a two-story building of an energy-efficient school using modern European technologies, environmental architecture to significantly increase the energy efficiency of buildings approaching the standards of a "green" building of new quality. There had not been a single school that was built at least close to the " green " standards on the territory of Ukraine

The project corresponds to the priority areas of programs of socio-economic development of the city of Kherson, Kherson region and Ukraine. The essence of innovation is to work out innovative architectural, constructive and engineering decisions in the design process of energy-saving facilities of Antonivska secondary school taking into account the specifics of local environments and equipping of energy-efficient technological equipment.

Figure 2 - Green school's front plate

Figure 3 - The building of Green school

The nature of innovation is technological. This part of the school will consume significantly reduced amounts of electricity, water, and fuel throughout its life cycle.

The project was implemented as humanitarian aid by the Nordic Initiative for Energy Efficiency and Humanitarian Support (Ukraine) and prefabricated portable structures for social infrastructure in Ukraine by the Nordic Environmental Finance Corporation (government of Finland).

The building was assembled on the construction site from ready-made wood-frame panels imported to Ukraine from Finland. The design of outer walls, ceilings, windows was selected according to Finnish standards. Thus it meets the requirements of European energy efficiency standards .

The power grid, which is powered by solar panels, consists of the solar panels and an inverter that can convert direct current to alternating current. 80 solar panels have been installed on the roof of the building to provide electricity to the school, which will provide almost half of the electricity demand during daylight hours and will significantly reduce electricity consumption from the grid. The main material used for the manufacture of photovoltaic cells is silicon. Solar panels can generate electricity for 20 years or more. A properly installed solar panel will be a quiet and reliable source of energy for many years.

Such engineering systems of the building as heating, ventilation, air conditioning, cold and hot water supply, sewerage, electrical networks and artificial lighting networks will provide comfortable conditions for students and teaching staff. The classrooms are equipped with multimedia projectors and computers, as well as modern blackboards.

The school building is equipped with modern engineering networks and systems:

- heating, ventilation and air conditioning;
- water supply, sewerage and hot water supply;
- indoor and outdoor lighting;
- internal power supply systems;
- video surveillance;
- Internet;
- lightning rod and ground loops ;
- fire alarm and fire surveillance;
- voice notification;
- automatic local fire extinguishing shields;
- smoke removal

The applied technologies make it possible to bring the created building nearer to the "green" standards defined by environmental architecture in the Green school of the village Antonivka [3] .

It isn’t impossible to love something without knowing it. Therefore, to love nature means to study it, to observe it, to analyze it. The future state of the environment largely depends on the successful implementation of environmental education and the formation of new environmental thinking.

Kherson - an interesting region for Europe, as it offers foreign investors a number of promising investment projects. Concerning school building assure that considerable attention was paid to working life and energy-saving qualities so that parents and teachers are essential conditions in which children will learn them [4] .

The experience of Antonivska school 21 is a striking example, which can be distributed in other educational institutions of the Kherson region.

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ENVIRONMENTAL PROTECTION IS OF A UNIVERSAL CONCERN

Since ancient times Nature has served Man, being the source of his life. For thousands of years people lived in harmony with environment and it seemed to them that natural resources were unlimited. But with the development of civilization man's interference in nature began to increase.

Nowadays large metropolises with thousands of smoky industrial companies are seen all over the world. Their by-products pollute the air we breathe, the water we drink, the land we grow our seeds and vegetables on. Each year, the global industry pollutes the atmosphere with 1,000 million tons of dust and other harmful products. [3] Almost all mega cities suffer from smog. Extensive forests are being cut down and burned into ashes. Their loss does not maintain an oxygen balance. As a result, some exceptional species of animals, birds, fish and plants are lost forever, and a number of rivers and lakes are drying up. Air and large ocean pollution, destruction of the ozone layer is the result of careless interaction between man and nature, a symptom of ecological decline. Extremely terrible ecological cataclysm was understood by Ukraine and its public after the Chernobyl disaster (Figure 1.) in April 1986. [5]

Figure 1.- Chernobyl disaster

Within 18% of the land of Belarus was contaminated with radioactive preparations. More damage was done to agriculture, forests and people's well-being. The results of this explosion at the nuclear power plant are tragic for the Ukrainian, Belarusian and other peoples. And even the whole world.

We should say, that Khersonsky plavni(meadows) is a unique natural phenomena(Figure 2). The Dnieper floodplain in a wide, 10-20-km strip crosses the territory of the Kherson region from north-east to south-west, separating its right-bank and left-bank parts. As a result of the Kakhovskaya hydroelectric station dam construction above the city of New Kakhovka, the floodplain was under the water of an artificial sea, so the area of the Dnieper plavni was significantly reduced. The regulation of the Dnieper in connection with the construction of hydroelectric power plants, water intake canals and irrigation systems of vineyards and fields caused a significant change in the regime of the river water level and their salinity. An increase in the recreational load, the development of tourism, water sports, the expansion and construction of new recreation areas, holiday villages not only revived the shores that were deserted in the past, but also complicated the task of preserving the floodplains - a kind of green oasis of arid Kherson region. And also every year Kherson suffers from the fact that someone is setting fire to plavni. In this way, a large number of insects, animals, birds and plants perish. This does not observe the ecological balance of our natural wealth.

Figure 2 Kherson plavni

Of course it is one of the top environmental problems of the world(Figure 3). [4] They are: climate change; polar ice caps;. transportation; natural resource use; the nitrogen cycle; lowered biodiversity; air pollution; ocean acidification; ozone layer depletion; acid rain; overfishing; urban sprawl; deforestation; water pollution; population growth; waste production;

Figure 3 - Environmental concerns

The security service around the environment is an overwhelming concern. As a result, it is

necessary to take serious measures to create a system of environmental protection. Concrete progress has already been made in this direction. The institutions for protection of the environment have been established in 159 UN Member States. [2] Countless conferences have been held by these agencies to discuss the challenges facing ecologically poor areas, covering the Aral Sea, Midday Urals, Kuzbass, Donbas, Semipalatinsk and Chernobyl. An international ecological scientific center has been created on Baikal. The international organization Greenpeace is still preparing almost everything for the storage of the surrounding environment.

Nature must be taken care of. But these are only the initial steps and they must be carried onward to protect nature, to save life on the planet not only for the sake of the present but also for the future generations.

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PROBLEMS OF PROCESSING AND DISPOSAL OF SOLID WASTE IN THE KHERSON REGION AND WAYS OF SOLUTIONS BASED ON THE EUROPEAN COUNTRIES EXPERIENCE

With the development of modern technology, people completely forgot about the environment. Now, more and more diverse waste is dumped into rivers and buried in the ground. Man brings permanent harm to nature. Even 2000 years ago people began to bury all their garbage in deep holes in the ground. But at that time, garbage was only organic waste. With the development of civilization and technological progress, most waste is of inorganic origin: plastic, glass, iron, etc.

Since 1960s there has been a city dump or solid waste storage facility in Kherson. This repository spreads over vast territories more and more every decade, captures agricultural lands, future forests, gardens and, in the end, people's places of life. For a long time people did not think what to do with it until it entered into their daily life.

Since 2009, the Kherson Solid Waste Landfill has acquired its owner in the person of RIMZ Limited Liability Company; until 2016, this company was engaged in servicing the landfill.

It's responsibilities included:

- Collection and storage of solid waste;
- MSW (Municipal Solid Waste) disposal;
- Burial of solid waste that cannot be recycled.

In 2016, the enterprise self-liquidated due to the inability to cope with such volumes of solid waste. And the city authorities transferred the territory of the landfill to the private company “Ithaca”, which is engaged in this landfill to these days.[1]

But the new company faced the same problems as the previous one:

- The complexity of the collection of solid waste;
- Lack of capacity for processing solid waste;
- Lack of legislative framework;
- As well as the irresponsibility of citizens who are ready to save money for the disposal of waste and are ready to dump waste in inappropriate places.

In turn, state bodies cannot force an enterprise to carry out certain regulatory acts in connection with a moratorium on inspection of enterprises. Although government agencies help in the disposal of solid waste, some attempts to help are not always appropriate. For example, the purchase of cheap sand from Montenegro, which turned out to be unsuitable for covering MSW burials.[2]

At the moment, the company does not think about the mistakes of its predecessors, continues to store waste and increase the payment for its delivery, thereby making it clear to the population that independent disposal or the organization of unauthorized landfills is much more profitable than centralized disposal and processing.

How can this problem be solved? In different countries, this is done in different ways. Here are some examples.

In Germany, there is a separate waste collection and disposal program. This system has been working for many years, leading European countries such as France, Italy, Spain, the UK and even Poland have joined it (despite the fact that it has long been under the influence of the USSR, but was able to overcome the old mentality and begin to change the idle system). The system of separate collection and disposal of garbage has some flaws, nevertheless, it saves the ecology of these countries.

For example, in Poland it happens that the company does not cope with this process or operate at maximum capacity. But in Germany, recycling and waste management companies have learned to produce many related products. Such as fuel pallets or compost for plants.

What opportunities exist to improve the process of recycling and disposal of waste in Ukraine as a whole and in Kherson in particular?

We have learned how to produce many products and goods, but we do not know how to process them. For example, an ordinary plastic bottle: its production costs about 10 kopecks, and the processing of 1 hryvnia. In this regard, it is worth considering that there is an overabundance of plastic products in the world. Therefore, it is necessary to begin an active policy against excessive production of plastic. Since the difference in costs between the production and processing of this product in different countries can reach several thousand times.

In order to get rid of the problem of excess garbage, the construction of waste sorting lines is necessary. For further delivery to factories for the processing of various types of waste.

Today, many countries of the world are faced with the problem of storage and disposal of waste. This problem is global and every country in the world comes to the stage when it is necessary to intervene and solve this problem. There are countries in the world that have learned how to recycle their waste by 99.2%. For example, in Sweden 52.6% of the garbage goes for recycling, 47.6% of the garbage goes for reuse, only 0.8% is buried in the ground.[3]

Japan is a country with one of the most developed economies in the world. There, more than

50% of garbage is burned, the rest is recycled. But they do not burn it spontaneously, as we used to do, incidentally burning forests, floodplains, villages, cities; but they do it centrally.

Every Japanese city has an incineration plant that provides energy to residential areas, enterprises, and critical infrastructure and destroys unnecessary waste. It seems like a simple technology, install an oven and install filters. The Japanese are building such plants in the city center, as the level of technology allows to protect the population from the gases and fumes of this plant.[4]

Our region needs to accelerate the experience of other states and take action. Create lines for sorting solid waste, create plants for the processing or recycling of certain goods or packaging elements.

It is also necessary to develop a culture of efficient waste management that works in different countries of the world. Offer beneficial waste collection conditions to the public. And strengthen government control over landfills and companies that work with solid waste. It is also necessary to create an environmental police force that will monitor the state of waste collection points, the environmental status of administrative units, as well as the implementation of environmental legislation by different enterprises and the population.

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PETROL AND DIESEL MOTOR VEHICLES AS A SOURCE OF ENVIRONMENTAL POLLUTION

Ecological problems are causing great damage to our environment. Among the most urgent ones are the ozone layer, acid rains, global warming, toxic pollution of atmosphere and others. In our article we would like to investigate the harmful effect of using petrol and diesel engines for our planet.

The combustion of gasoline and diesel fuel in vehicle engines produces emissions of several potentially harmful substances. These emissions result from a combination of the engine design and the fuel characteristics, abrasion and wear of tyres and metallic components, resulting in emissions of a variety of metals and carbon compounds.

The transport network in Ukraine is quite dense, the number and activity of vehicles in cities is large, and it causes very significant damage to the environment. The main reasons for this are outdated engine designs, fuel used (petrol and diesel) and poor traffic management, especially in

cities, at crossroads. Emissions of pollutants by road transport are about 5.5 million tons per year (39% of total emissions in Ukraine). In large cities, air pollution by exhaust gases sometimes reaches 70-90% of the total level of pollution.

Anthropologic greenhouse gas (GHG) emissions from transport are key contributor to global climate change. Carbon dioxide (CO_2) represents the largest proportion of GHG emissions. Over the past three decades, CO_2 emissions from transport have risen faster than those from all other sectors and are projected to rise more rapidly. At present industrialized countries are the main sources of transport emissions. However, the proportion of emissions being produced in developing countries is increasing rapidly. The majority of transport fuel emissions (76%) are from road transport, including four-wheeled vehicles and personal pickup trucks. Air travel produces around 12% of transport CO_2 emissions and its share is growing rapidly [5].

The exhaust gases emitted by our cars contain about 280 different harmful substances, among which carcinogenic benzopyrenes, oxides of nitrogen, lead, mercury, aldehydes, oxides of carbon and sulfur, soot, hydrocarbons are especially dangerous.

More than 1 million trucks and more than 2.5 million cars are operated in Ukraine.As for Kherson region there were 240 584 new regitrated cars for the last 5 years. Each of them annually burns from 12 to 30 tons of high-octane gasoline, in which lead is used as an antiknock (the concentration of lead in this gasoline is up to 0.36 g / l, while in gasoline in the UK - 0.15, USA - 0.013 g / l). The exhaust gases of our diesel engines are much more toxic than those of carburetors, because they contain a lot of carbon oxides, nitrogen and sulfur dioxides, as well as soot (up to 16-18 kg per ton of diesel fuel)

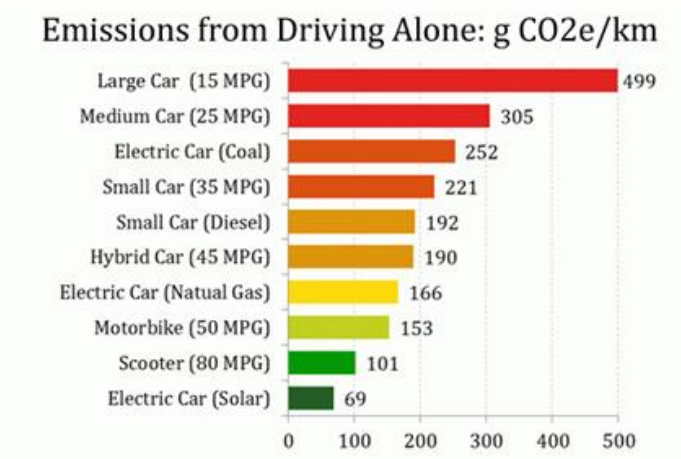

Figure 1 – a small model of our planet [4]

Motor transport also has a negative impact on acoustic (noise) pollution on central highways. The results of acoustic measurements and sociological research show that the main source of acoustic pollution in the city is vehicles. Approximately every second inhabitant of the city suffers from the noise created by it. Levels of acoustic pollution in the city can have a negative impact on the health and well-being of the population, including increasing the number of cardiovascular diseases. Efforts of public authorities and environmental services, in particular, should be aimed at preventing and reducing the harmful effects of transport on the environment and public health, by implementing organizational measures to create highways without stopping traffic, bypasses, the use of unleaded gasoline and liquefied natural gas and other measures.

Measures to reduce the impact of transport on the environment in Kherson region and Ukraine.

To improve air quality, measures should be taken to reduce gross emissions from vehicles

by more than 40 percent, to prevent lead emissions. To this end, the following main measures are planned:

- improvement of provisions in the system of legislation that stimulate the implementation of environmental measures;
- equipping new cars with efficient systems and devices to reduce emissions (catalytic neutralization, automatic starting and heating, fuel vapor capture systems);
- increase in the fleet of cars and buses running on gaseous fuel; cessation of production and use of ethyl gasoline;
- production of fuels and lubricants that reduce the negative impact of internal combustion engines on the environment;
- development and introduction of new types of internal combustion engines with high economic characteristics,
- development of new types of environmentally friendly vehicles using alternative energy sources.

To solve environmental problems in motor transport it is necessary:

- to ensure the priority of development in large cities of Ukraine of public passenger transport by electric traction with a consistent reduction of bus service;
- provide stricter environmental standards for the design of new models of cars and engines;
- develop and implement a system of certification of cars and engines for environmental safety and control over their compliance with certificates;
- to develop a set of technologies, methods and technical means for assessing the environmental safety of cars during their operation;
- to develop a set of technologies and technical means for the assessment and protection of the environment from pollution in the production areas of car companies.

Transport is one of the key sources of GHG emissions. In order to effectively reduce global GHG emissions, developing cities with dramatically increasing populations and emissions will have to address climate change issues and contribute to its mitigation. The comprehensive approach that sustainable urban transport policies offer is a way forward to meet the needs for transport and mobility in an environmentally, socially and economically sustainable way.

Decision-makers and city administrations may have concerns regarding the impact of reducing the level of motorized transport on the economy. But there is evidence to suggest that by encouraging travel by sustainable transport modes GDP can continue to grow and economies can continue to develop. Sustainable urban transport can improve the local environment, reduce local air pollution and congestion levels – and thus make cities more desirable places to live, work, and visit.

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SECTION 2. ALTERNATIVE ENERGY SOURCES

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RENEWABLE ENERGY OPTIONS FOR SHIPPING INDUSTRY

The sustainable power can transform the global shipping fleet at all levels and in various scales, including: international and domestic transport of products, people and services; fishing; tourism and other maritime cases. Renewable power applications are encouraging and promoting the development of clean technology in general. [1] Potential sustainable energy sources for shipping include solar photovoltaics, biofuels, wind, wave energy and the usage of super capacitors charged with renewables. These clean energy options can be mainstreamed through reenactments to the existing fleet or incorporated into new shipbuilding system, with small number of new vessels aspiring for 100 percents of using renewable power.

In relation that heavy oil fuel covers 82 percents of the sector's energy needs, decarbonising global shipping will have a critical role in reaching climate objectives. Navigational way to a renewable future explores the effect of maritime shipping on Carbon Dioxide emissions, the design of shipping and main areas that need to be addressed to reduce the sector's Carbon footprint. [2] When the cost of renewables decreases, the decarbonisation options will become increasingly competitive. Moreover, by 2030 alternative low-carbon fuels could reach par with heavy fuel oil, that's why it's really important that the shipping industry prepares itself for a low-carbon future. Reducing carbon emission levels in 2008 by half in 2050 requires a combination of clean energy options and alternative fuels based on renewables.

Figure 1 – Maintenance of fossil fuels

It includes a change from fossil fuels to alternatives like hydrogen-based fuels or advanced biofuels, modernization of onshore infrastructure and procedures during docking, electrification. It's also important to reduce fuel demand by improving operational performance. Fossil fuels can be replaced by ready-to-use biofuels, such as Bio-LNG, hold tremendous potential as a transitional fuel. [3] Other synthetic fuels can effectively reduce, and even eliminate, emissions in the shipping industry if produced from sustainable feedstocks using renewable electricity. So, it can produce hydrogen through electrolysis.

Figure 1 – Karadeniz Powership

However, currently alternative fuels are expected to become sustainable as their prices decrease, adoption grows, and technology improves. [4] Nevertheless, a change from heavy oil to a clean fuel would also provide some corrections to the refueling structure in about 100 ports which constitute 80 percents of global freight. 85 percents of global shipping emissions are produced by such types of ships as bulk and container carriers, oil and chemical tankers which represent only one quarter of the global shipping fleet.

So, I think that relating to short distance applications, such as ferries and other small ships, electric vessels powered by batteries are currently a realistic option. On the other hand, complete electrical power can become available also for bigger, long-distance vessels, only in the long run, with the development of batteries and other technologies and reducing of costs.

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POTENTIAL OF GEOTHERMAL ENERGY IN UKRAINE

There are many alternative ways to generate energy in the Ukraine, but now I want to talk about one of them, namely geothermal.

Geothermal energy is the industrial production of energy, in particular electricity, from hot springs and thermal groundwater. And geothermal energy in Ukraine has significant potential resources. Areas of its possible use are Zacarpattia, Prykarpattia, Donetsk, Zaporizhia, Poltava, Kharkiv, Kherson and Chernihiv regions. [2]

Geothermal energy (natural heat of the Earth), accumulated in the first ten kilometers of the Earth's crust, reaches 137 trillion tons, which is 10 times more than the geological resources of all fuels combined. [4] Of all types of geothermal energy, hydrogeothermal resources have the best economic indicators - thermal waters, steam-water mixtures and natural steam

Hydrogeothermal resources, which are used today in practice, make up only 1% of the total thermal reserve of subsoil. Experience has shown that promising in this regard should be considered areas where the temperature rise with depth is quite intense, the reservoir properties of rocks allow to obtain from the cracks significant amounts of heated water or steam, and the mineral part of thermal waters does not create additional difficulties to combat salt deposits and corrosion of equipment.

The "land of glaciers", as Iceland is called, effectively uses the hydrothermal energy of its bowels. There are more than 700 known thermal springs that reach the earth's surface. About 60% of the population uses geothermal water to heat homes, and in the near future it is planned to increase this number to 80%. At an average water temperature of 87 ° C, the annual energy consumption of hot water is 15 million GigaJ, which is equivalent to saving 500 thousand tons of coal per year. In addition, Icelandic greenhouses, which grow vegetables, fruits, flowers and even bananas, consume up to 150 thousand m3 of hot water annually, ie more than 1.5 million gigaj of thermal energy.[3]

The quality of geothermal energy is low and it is better to use it for heating buildings and preheating the working bodies of conventional high-temperature installations. This heat is also used for fish farms and greenhouses. If the heat from the subsoil comes out at a temperature of more than 150 ° C, we can talk about electricity production.[1]

The scale of geothermal energy use is determined by several factors: capital costs for the construction of wells, the price of which increases with increasing depth. The optimal depth of wells is 5 km. Geothermal water is used in two ways: fountain (coolant is released into the environment) and circulating (coolant is pumped back into the productive stratum). The first method is cheaper, but environmentally unsafe, the second is more expensive, but protects the environment.

The category of hydrothermal convective systems includes underground pools of steam or hot water that come to the surface from the ground, forming geysers, fumaroles, mud lakes, and so on. They are used to generate electricity using a method based on the use of steam generated by the evaporation of hot water on the surface.

Another method of electricity generation based on high- and medium- temperature geothermal waters is the use of a process using a double-circuit (binary) cycle. In this process, the water obtained from the pool is used to heat the secondary coolant (freon or isobutane), which has a lower boiling point. Installations using freon as a secondary circuit coolant are now prepared for the temperature range of 75-150 ° C and at a unit power of 10-100 kW.[3]

There are also developments on the use of geothermal using gas or oil wells at the last stage of their operation.

Thanks to alternative energy sources, millions of people can not overpay for electricity. Alternative energy sources are very helpful to humanity, and will continue to help for many years to come. Ukraine has a good potential for the development of geothermal energy. The transition to alternative energy sources, including geothermal, may be one of the reasons for the faster development of the country's economy and the preservation of its ecology.

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UNCONVENTIONAL AND RENEWABLE ENERGY SOURCES

At the threshold of the XXI century, a man began to think more and more about what will become the basis of their existence in the new era. There are many components that play an important role in people's lives, but energy is occupied a special place in it. Nowadays the transition to non-traditional (alternative energy sources) due to the shortage and limitation of fuel resources is necessary.

We will look at the main possibilities of using non-traditional methods of energy production, which are not so popular yet in the modern world, but are necessary in the future.

Electric power industry - this is an integral part of energy, the task of which is to generate power energy at power plants and transfer it to consumers at the power lines. Power Energy is the most important part of human life. It is the basis for the development of forces production in any state. Electricity is a single industry produced at power plants, whose products cannot be stored.

Type of power plants

Thermal (TPP) It is built quickly and cheaply, but consumes a large amount of fuel, so there is the cost of extracting and transporting fuel.They work in a constant mode, but require a long stop during repairing. Coal-fired power plants emit a lot of solid waste and solid gases into the atmosphere[4].

Hydraulic (HPP) They are built longer, the cost is higher than all types of power plants, use the energy of the supplied water, have a small maintenance staff, and the minimum cost of electricity. They can cover heavy loads and are easily switched on at the right time. There are annual flooding of the most valuable land valleys, running off control activities are in the rivers.

Atomic (APP) They are built longer and are expensive, but electricity is cheaper than on TPP. It uses uranium, does not depend on fuel resources, and requires precision equipment and skilled workers When working without accidents - the impact on the environment is insignificant, it requires the disposal of radioactive waste[1].

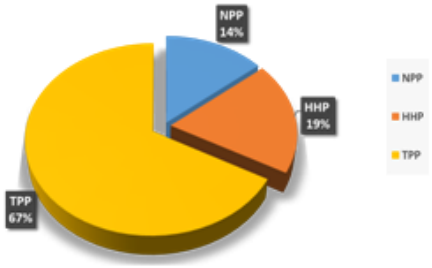

Figure 1 – Power generation at the various types of power plants

The diagram (Figure 1) shows that the largest production is at the TPP, the HPP followed by, and the last is the nuclear power plant.

Alternative power sources

Scientists warn that the proven reserves of organic fuel at the current rate of growth in energy consumption will only last for 70-130 years. Such conclusions once again confirm the need for an early transition to alternative sources of electricity. The main types of "non-traditional" energy processed into electric power:

- Solar;
- Wind;
- Geothermal;
- The energy of the tides;
- The thermal energy of the ocean;
- Sea current;
- Wave power;
- Hydrothermal energy;
- Hydrogen as the fuel of the future.
- Solar energy[3]

This is the kinetic energy of radiation (mainly light), formed as a result of reactions in the subsoil of the Sun. Since its reserves are almost inexhaustible (astronomers have calculated that the Sun will "burn" for several million years), it is classified as a renewable energy resource.

Methods for obtaining electricity and heat from solar radiation:

1. The production of electricity using photovoltaic cells.
2. Heliothermal energy-heating of the surface that absorbs the sun's rays and further distribution and use of heat.
3. "Solar sail" can convert solar rays into kinetic energy in an airless space.
4. Thermal air power plants (conversion of solar energy into air flow energy).
5. Solar balloon power plants (generation of water vapor inside the tank of the balloon due to solar radiation of the balloon surface). (Figure 2)

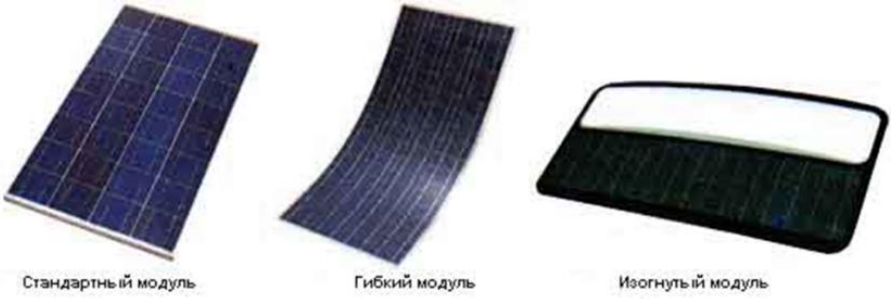

Figure 2 – Solar modules

Wind energy

Wind energy is a huge energy of air masses moving. Wind power is the use of kinetic wind energy.

The most favorable regions for the construction of wind farms are the Carpathians and Crimea. The principle of operation of wind turbines is very simple: the blades, which rotate due to the wind force, transmit mechanical energy through the shaft to the electric generator. Than it generates electrical energy[2].

Geothermal energy

Geothermal energy is the production of electric power, as well as thermal energy from the thermal energy is contained in the earth's interior. In volcanic areas, circulating water overheats above the boiling point at relatively shallow depths and rises to the surface through cracks, sometimes manifesting itself as geysers. There are the following principal possibilities for using the heat of the earth's depths. Water or a mixture of water and steam, depending on their temperature, can be sent for hot water and heat supply, for electricity generation, or simultaneously for all three purposes[4].

The energy of the tides

The strategy for optimal operation of a tidal power plant (TPP) is simple: accumulating water in the reservoir behind the dam during tides and use it to generate electricity when there is a "peak consumption" in the unified power systems, in one time reducing the load on other power plants.

The thermal energy of the ocean

Mini-OTES and OTES - 1 installations have been created (OTES – initial letters of the English words Ocean Thermal Energy Conversion, i.e. conversion of ocean thermal energy – we are talking about conversion to electrical energy). This is one grandiose tube, at the top of which is a circular machine room, where all the necessary devices for converting energy are located.

The upper end of the cold water pipeline will be located in the ocean at a depth of 25-50 m. The engine room is designed around the pipe at a depth of about 100 m. there will be installed turbine units running on ammonia vapor, as well as all other equipment[3].

Energy of sea currents

Inexhaustible reserves of kinetic energy of sea currents are accumulated in the oceans and seas can be converted into mechanical and electrical energy using turbines submerged in water (like windmills "submerged" in the atmosphere).

Wave power

At the bottom of the sea or lake, a vertical pipe is installed, in the underwater part of which a "window" is made; getting into it, a deep wave (and this is an almost constant phenomenon) compresses the air in the mine, and it turns the generator turbine. During the reverse movement, the air in the turbine is rarefied, driving the second turbine. Thus, the wave power plant operates continuously in almost any weather, and the current is transmitted to the shore by an underwater cable[4].

Hydrothermal energy

Principle of energy generation by hydrothermal power plants. (Figure 3) This requires an installation that operates on the principle of "reverse refrigerator". The hot steam generated as a result of heat exchange condenses, its temperature rises to 110 C, and then it can be used for power plant turbines, or for heating water in Central heating batteries to 60-65 C.

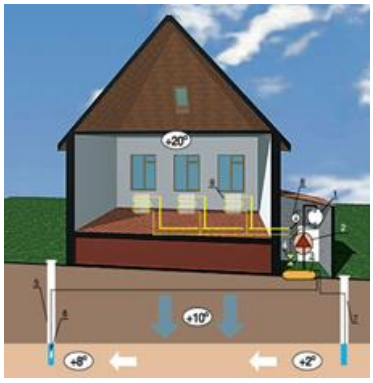

Figure 3 – energy generation by hydrothermal power plants

Hydrogen is the fuel of the future

Hydrogen can be considered an ideal fuel. It is everywhere where there is water. When hydrogen is burned, water is formed, which can be decomposed again into hydrogen and oxygen, and this process does not cause any pollution of the environment (Figure 4).

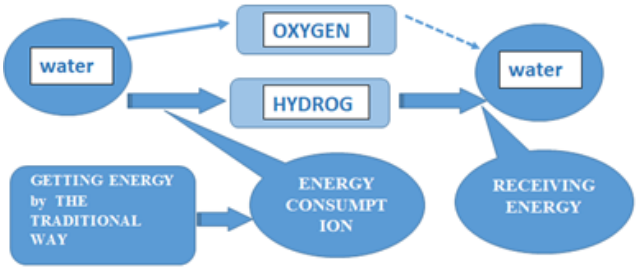

Figure 4 – Formation of Hydrogen fuel

At the moment, hydrogen is the most developed "fuel of the future". There are several reasons for this: when hydrogen is oxidized, water is formed as a by-product, and hydrogen can be extracted from it. And it is considered that 73% of the earth's surface is covered with water, then we can assume that hydrogen is an inexhaustible fuel. It is also possible to use hydrogen for thermonuclear fusion, which has been taking place on our sun for several billion years and provides us with solar energy[4].

So, people can use an alternative energy sources that are not harmful to the environment, but nowadays, these methods are not so common, due to low efficiency in comparison with fuel. The energy strategy of Ukraine defines the following promising directions for the development of alternative and renewable energy sources: Bioenergetics; Mining and utilization of mine methane; Using of secondary energy resources; Wind and solar energy; Thermal energy of the environment; Development of economical and viable hydro potential of small rivers in Ukraine.

The problems of the development of alternative energy sources in Ukraine.

- There is no industry in the country that combines all the disparate developments into a single strategic plan.
- There is no practically strategy for a full-scale transition to alternative energy.
- The problem of financing is relevant and most important.

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ALTERNATIVE ENERGY SOURCES AS A WAY TO SOLVE ECOLOGICAL PROBLEMS IN THE KHERSON REGION

Everyone knows the effect that greenhouse gas production and global warming is having on our Earth. We feel that it is vitally important for individuals, and especially governments, to start taking these problems seriously; before it is too late. Even though technology has greatly advanced in the last decade most countries around the world still use fossil fuel-based methods of energy production. The use of these fuels has two major problems; it depletes the natural supply and eventually we will run out; and the burning of the fuel (i.e. coal) creates vast pollution in the form of greenhouse gases (such as carbon monoxide, dioxide, and sulfur dioxide). It is these gases which lead to global warming and slowly destroy our planet. Only through the use of alternative sources of energy, such as solar power, wind energy, geothermal power, hydroelectric energy, biofuels, biomass energy, tidal energy, hydrogen gas (which are virtually non-polluting) we can slow down this destruction and save our planet.

The Kherson region has a huge potential for production of wind and solar power.

Solar power is a viable alternative to fossil fuels and some alternative energy sources, as it gives off no carbon dioxide waste and uses natural energy from our sun to generate electricity. After the solar panel lifetime, the materials that were used to make it could be recycled as no material is used in the energy generating process.

How does it work? Solar panels have always been thought to be very expensive as they used to be made only from the purest silicon. Solar power has in many ways been eliminated as a viable option as a result of its high manufacturing costs. But a recent breakthrough in the hunt to find an alternative to silicon has dramatically decreased the price of solar power, and also increased its effectiveness. This achievement came from Professor Vivian Alberts from the University of Johannesburg in South Africa and his team of physicists, who have formulated a new procedure of making solar panels using copper-indium-gallium-di-selenide (CIGS).

The production of CIGS solar panels is very complex and any slight deviation from the purest, high-quality elements can result in an ineffective solar cell.

Three metals: copper (Cu), gallium (Ga), and indium (In), have to be formed in an extremely pure alloy.

Next, the alloy that was formed needs to be converted into an equally pure semiconductor.Then a buffer layer of other semi-conductors are laid carefully on the CIGS layer.The cell is then finished off by attaching conductive electrical contacts on either side.[3]

Advantages

- The sun's energy is free to use, which makes the process cheaper.
- The process is completely non-polluting.
- Can be used in a wide variety of locations the world over. Wherever there is sun.

Disadvantages

- Cost of the panels and equipment is expensive. This will, however, become cheaper in time.

- Can only work when the sun is available; therefore weather dependent. [4]

Wind power is when we covert the power of the wind, physical energy, to more useful types of energy. The most common type of energy it is converted to is electricity. A wind farm is a large area of land on which there are a number of wind turbines generating electricity, as a power plant does. How does it work? The most common type of energy generated from wind is electrical energy. This is by making the use of an electrical generator which is turned by turbine blades which are turned by the wind and thereby turning the turbine, creating electricity.

Advantages:

- Wind is free and in abundance we have the technology to capture the power of wind efficiently

- The costs for wind turbines are only initial costs; once the turbine is built there are minimal maintenance costs which are involved.

- In the rural areas which are not connected to a country's power grid it can be used to generate its own power.

- The space which a wind turbine takes up on land is very small as the moving parts are quite a distance above the ground.

- Wind turbines produce energy with minimal damage to the world’s environment and produce "clean power". Disadvantages:

- Pollutants are given off into the atmosphere in the creation of a wind turbine.

- Wind turbines can be quite noisy.

- The wind speed is not constant and therefore there will not always be a definite supply of electricity form a wind turbine.

- Large numbers of wind turbines are needed to power towns, as the largest turbine is able to produce electricity to sustain only +/- 500 homes.

Many people feel that wind turbines are unsightly and that they should not disrupt the natural beauty of landscapes.[5]

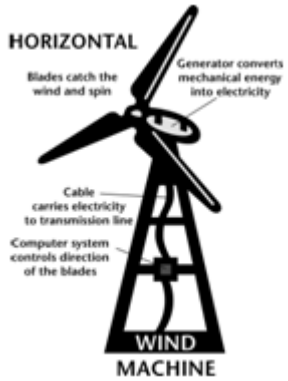

Figure 1 –Wind generator

Its specific gravity among Ukrainian regions is 10% (according to scientific researches it is possible to construct wind power plants with installed capacity 4,385 MW).

As of January 1, 2020 there are 7 operating wind power plants with total capacity of 337.67 MW and 47 operating solar power plants with total capacity of 418.577 MW in the region. These plants produced more than 1,000 million kW/h of electric power in 2020. Volume of produced electric power increased in 2.7 times compared with the same indicator in 2018.

By 2021 it is planned to increase total capacity of renewable energy objects on the territory of the region up to 1,170 MW.

There is a rather favorable legal framework for alternative energy development in Ukraine. A relatively high “green” tariff guaranteed by the state by January 1, 2030 is in force. Thus, Ukrainian legislation guarantees that all volume of generated energy by renewable energy sources will be purchased at “green” tariff herewith payments for electric power will be made in the first place to those producers that use alternative (renewable) energy sources. [1]

Figure 2 –a Map network of operating wind and solar power plants in the Kherson region

Important information: the first stage of the plant for production of solar panels was opened in Vinnytsia by the Ukrainian company Kness Group on February 5. Total investment in the construction of the plant amounted to 5 million euros. The plant was built within a year: from February 2018 to February 2019. So today for the construction of solar power plants, now you do not need to supply parts from abroad. [2]

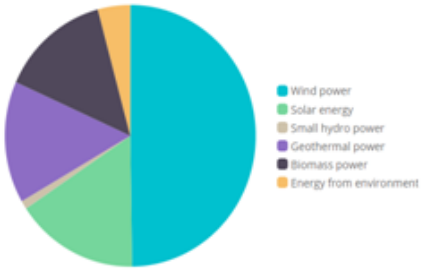

Figure 3 –Annual potential of renewable energy sources (RES) in the Kherson region

As the issues that result from the use of traditional fossil fuels become more prominent, alternative fuel sources like the ones mentioned above are likely to gain further importance.
Their benefits alleviate many of the problems caused by fossil fuel use, particularly when it comes to emissions. However, the advancement of some of these technologies has been slowed down due to the amount of investment needed to make them viable.
Through combining them all we may be able to positively affect issues like climate change, pollution and many others.

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WIND POWER POTENTIAL DEVELOPMENT IN UKRAINE

The wind is a clean, free, and readily available renewable energy source. Each day, around the world, wind turbines are capturing the wind's power and converting it to electricity. Wind power generation plays an increasingly important role in the way we power our world – in a clean, sustainable manner.

But how is wind energy created? Wind turbines allow us to harness the power of the wind and turn it into energy. When the wind blows, the turbine's blades spin clockwise, capturing energy. This triggers the main shaft of the wind turbine, connected to a gearbox within the nacelle, to spin. The gearbox sends that wind energy to the generator, converting it to electricity. Electricity then travels to a transformer, where voltage levels are adjusted to match with the grid.

Wind power is one of the fastest-growing energy sources in the world because of its many advantages.

Firstly wind power is cost-effective in many regions. Another advantage to wind power is that it is a domestic source of energy, harnessing a limitless local resource.

It doesn't pollute air like power plant relying on combustion of fossil fuel. It does not produce atmospheric emissions that cause acid rain or greenhouse gases (carbon dioxide (CO2) or methane (CH4)).

Wind energy is plentiful, readily available, and capturing its power does not deplete our valuable natural resources. In fact, an environmental benefit to wind power is its ability to counter the detrimental effects of climate change.

Wind energy has a drawback that it is not a constant energy source. Although wind energy is sustainable and will never run out, the wind isn't always blowing. For a wind turbine to be efficient, the location where it is built needs to have an adequate supply of wind energy.

Wind turbines generate noise. A single wind turbine can be heard from hundreds of meters away.

Birds can be killed by flying into spinning turbine blades. However it is believed that wind turbines pose less of a threat to wildlife than other man-made structures such as cell phone masts and radio towers.

The importance of wind energy development in our country is determined by the fact that 70% of the territory of Ukraine, where 10% of the population lives, is in the zone decentralized energy supply, which practically coincides with the zone potential wind resources.

Ukraine has a rather high climatic potential of wind power, which provides productive work not only of autonomous power units, but also of powerful wind power plants. The interest in exploring the most promising places for using wind energy is growing, based on its climatic potential and indicators of its possible utilization. According to the Global wind energy council,

about 40% of the areas are suitable for wind power generation.[1] In the medium term, it is possible to develop about 5,000 MW of wind energy, that is, 20-30% of total electricity consumption in the country.

For the effective operation of wind turbines, certain requirements for their placement are required. Thus, for relatively constant operation of wind turbines, wind turbines are required to be located in areas where the wind potential is 2,500 hours per year. Wind conditions of the district in relation to wind use are characterized by wind energy potential, which includes various wind indicators, determined by the consequences of long-term observations: average and monthly wind speed; repeatability of wind speed and direction during the year, months, days; data on gusts, recessions and maximum values of wind speed; change it with height, etc.

The most attractive regions for use of wind energy is the coast of the Black and Azov Seas, mountainous areas temporarily occupied the Autonomous Republic of Crimea, the territory of the Carpathian Mountains, Odessa, Kherson and Mykolayiv regions. [2]

The largest wind power plants are situated in the south of Ukraine.

Botiieve is the largest wind power plant in Ukraine with a total capacity of 200 MW, which is almost half of the total wind power capacity in the country. It is located in Zaporizhia Oblast. Its construction began in 2012 and was completed in 2014. The plant includes 65 WMs with a unit capacity of 3.075 MW. Projected average annual wind power generation is 686 million kW·h. At the time of commissioning, Botiieve WPP was one of the top five largest wind power plants in Central and Eastern Europe. [4]

The second largest wind power plant in Ukraine is Novoazovsk. The plant is located in the temporarily occupied part of Donetsk Oblast. The first stage of the plant was put into operation in 2011. Its current total capacity is 57.5 MW. However, it was designed for a capacity of 107.5 MW. It has twenty-three WMs with a unit capacity of 2.5 MW. [4]

The third in capacity is the Ochakivskyi windmill park, located in Mykolaiv Oblast. It includes Dmytrivka and Tuzly WPPs. Construction of the windmill park began in 2011 and was completed in 2015. The total installed capacity is 47.5 MW, consisting of 19 WMs with a unit capacity of 2.5 MW.[4]

Kherson region has a huge wind power potential. Its specific gravity among Ukrainian regions is 10% According to scientific researches it is possible to construct wind power plants with installed capacity 4,385 MW. As of January 1, 2020 there are 7 operating wind power plants with total capacity of 337.67 MW and 47 operating solar power plants with total capacity of 418.577 MW in the region. These plants produced more than 1,000 mln kW/h of electric power in 2020. Volume of produced electric power increased in 2.7 times compared with the same indicator in 2018.[3]

In 2020, according to the UWEA, stable growth of wind power capacity at the level of 200 MW per year is expected. The new wind power plants will be built in the following oblasts: Zaporizhia, Kherson, Mykolaiv, Odesa, Lviv and Ivano-Frankivsk.[4]

The development of the wind industry, as well as that of RES-generation in general, is what our country needs at this stage. Therefore, the development of alternative energy in Ukraine is the path to energy independence for our country.

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ALTERNATIVE SOURCES OF ELECTRIC ENERGY AND GREEN TECHNOLOGIES IN THE KHERSON REGION

All countries, including Ukraine, to a greater or lesser degree face the challenges of depletion of limited natural resources and climate change. To solve these problems it is necessary to use alternative sources of energy. Sometimes we forget that we get electricity to our houses from Thermal Power Plants (TPPs) or Nuclear Power Plants (NPPs), which harm our environment. In our opinion, alternative sources of energy like solar and wind energy are the alternative for the future. These are really good technologies to take advantage of our geographical location and to preserve the environment clean.

Fortunately, the relief of our country is predominantly flat, that is why we can successfully use wind energy. Regardless of the type of wind farm, its principle of operation is the same: a stream of wind of a certain strength spins the blades of a wind generator. The following literally happens - the moving part rotates, transmitting the same rotation directly to the generator. Due to this, an electric current is formed in the system.

Then it charges the installed batteries, which are connected to the inverters. They, in turn, convert the resulting current to normal voltage, which is necessary to power the devices, and equipment. To obtain a larger amount of power, individual wind generators are connected to the network, thus forming a wind power station. [3] The most basic advantage of a wind farm is its independence from fossil fuels. To work and generate electricity, wind farms use a completely free source – wind. In addition, the wind farm does not cause nature any damage, such as, for example, hydroelectric power plants. That is why the wind farm is an environmentally friendly and harmless method of generating energy.[4]

Figure 1 – Wind farm in the Kherson region

Figure 2 – Home wind generator

In the Kherson region 12 wind generators of the Novotroitska wind farm has been put in operation. [2] After completion of construction, the power plant will enter the top three customers in Ukraine. We continue to build our own energy capacities. But that's not all! In addition to a large number of industrial wind power plants, small "home" installations are gaining popularity. They are used to provide electricity to greenhouses for irrigation systems and to heat water.

There are a large number of plants with a total capacity of 337 megawatts. While the total solar power is 418.5 megawatts. But in reality, wind power has the highest potential in our region. In addition to wind power, we can accumulate and use the energy of the sun! To install solar panels we need a lot of space. We can use fields or houses' roofs. It is advisable to use the sunny side of the house. And the solar battery should rotate to follow the sun. Its principle of operation is based on the PN junction in semiconductors.

Today, the advantages and disadvantages of solar panels allow us to talk about these energy sources as the most promising for the near future. Why is solar energy so good and what allows us to talk about the advantages of batteries not only for the home, but also for large enterprises and factories. The main advantage of solar panels is their environmental friendliness. But here we have the same problem as with electric cars. Batteries themselves are environmentally friendly, but in their production, as well as in the production of power plants and various conductors, toxic substances are used that pollute the environment. [5]

Today, both wind and solar power systems are used in the Kherson region. [1] Also in Kherson, a huge d-tech solar power plant was installed, which can produce 12 million kilowatt-hours per year. This is really important, because now the surroundings of Kherson are fully provided with environmentally friendly electric power, and there are a large number of projects for the installation of solar power plants both on industrial scales and for private houses.

Figure 3 – Household solar battery

Figure 4 – Solar power station near Kherson.

In the Kherson region there are more than forty large solar power plants. The largest power plants are located in Nova Kakhovka, Lyubymivka and Oleshky with a total capacity of 24 MW. [6] “Sunlight NK”, “Sun Volt”, “The steppe sun”. These LLCs and many others focus on the development of green technologies. There is also Altek company which offers a wide choice of home power plants for the installation. [7]

Figure 5 – Altek staff sets up home solar battery

From all the above mentioned, we can conclude that in our area there is an opportunity to create and develop sources of green energy. But industrial power plants are not a chapel. Not many home business owners use home power plants, and the more people understand this, the sooner we will really master this niche. Still, it is worthwhile to understand that the energy around us in the sun and wind should not so easily disappear.

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ALTERNATIVE ENERGY SOURCES AS THE MAIN STEP FOR SAVING OUR PLANET

Today there are a lot of duscussions about benefits and cons of alternative energy sources. Some people say it is a huge project of hippies and even a development of aliens[4].It is very important for humanity to search for new renewable resources. The initial reason for using alternative energy sources is to reduce the emission of greenhouse gases and toxic substances generated by the combustion of oil, gas and petroleum products. Our planet and its inhabitants have been feeling their effects for a long time. Humanity mercilessly uses non-renewable or hard-to-renew resources to warm itself, light it, transport it, and feed it. These actions disrupt the delicate ecological balance on the planet.So in this article I`d like to explore some sources of energy and make a decision if they are useful or no.

. Use of solar energy. It is known that every year the world consumes as much oil as it is formed in natural conditions for 2 million years. The huge rate of consumption of non-renewable energy resources at a relatively low price, which does not reflect the real total costs of society, essentially means living in loans, loans from future generations, who will not have access to energy at such a low price[2]. Energy-saving technologies for a solar home are the most acceptable for their economic efficiency. Their use will reduce energy consumption in homes by up to 60%. As an example of successful application of these technologies, we can mention the project "2000 solar roofs" in Germany. In the United States, solar water heaters with a total capacity of 1,400 MW are installed in 1.5 million homes.

For a very long time, observing the destruction caused by storms and hurricanes, people have been thinking about whether it is possible to use wind energy. Windmills with wings-sails made of fabric were the first to be built by the ancient Persians over 1.5 thousand years ago. In future, windmills were improved. In Europe, they didn’t only grind flour, but also pumped out water, churned butter, as, for example, in Holland. [3]The first electric generator was constructed in Denmark in 1890.Twenty years later, hundreds of similar installations were operating in the country. To obtain wind energy, windmills of different designs are used: multi-blade "daisies"; propellers like airplane propellers with three, two, or even one blade (then it has a cargo counterweight); vertical rotors, resembling a barrel cut lengthwise and impaled on the axis; a kind of "standing on end" helicopter propeller: the outer ends of its blades are bent up and connected to each other. Vertical structures are good because they catch the wind in any direction. The rest of them have to turn around in the wind.

The development of alternative ways of obtaining energy is hindered by producers of traditional energy sources: they have a strong position in power and have the opportunity to defend their interests. Alternative energy is still quite expensive compared to traditional energy, because almost all manufacturing plants produce experimental batches in very small quantities and are therefore very expensive. The organization of mass production and certification of installations require significant investment, which is completely absent. State support could help to reduce the cost. However, this is contrary to the interests of those whose business is based on the production of traditional hydrocarbon fuels. No one needs extra competition

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SOLAR ENERGY EQUALS SAFE ENERGY

Because of the development of production technologies and a significant deterioration of the environmental situation in many regions of the globe, mankind is faced with the problem of finding new energy sources. On the one hand, the amount of energy produced must be sufficient for the development of production, science and the public utilities sector, on the other hand, energy production must not adversely affect the environment.

This statement of the question led to the search for the so-called alternative energy sources - sources that meet the above requirements. Through the efforts of world science, many such sources have been discovered, at the moment most of them are already used more or less widely.

One of these sources is solar energy, which we wrote about in our article.

In our country, it is not profitable to install solar panels to generate electricity for sale in small quantities, due to high taxes and low payback. That is, you need to either install batteries for personal use, or install them in very large quantities to sell energy to the state.

Figure 1 – Solar panel

For example, the cost of a set of equipment for a 10 kW solar station is 10 422 €. In the case of installation within the Kherson region, it will have a generation of at least 10,000 kW / h per year. Presumably, the consumption of electric energy by the house is 1000 kW hours. The payback period of investments will be equal

$$\frac{10\,422\$}{(10\,000-1\,000)*0{,}18\$} = 6\text{years } 5\text{ months}[3]$$

(and this does not take into account the fact that a person does not spend electric energy consumed from the city network)

Solar equipment is constantly getting cheaper, and its productivity is growing. This reduces the share of unit costs for generating a unit of energy by about 20% annually. Reducing the rates of the "green tariff" is only 10% in five years, which allows us to assess the prospects for the development of solar energy in Ukraine as the most positive.[1]

The State Energy Efficiency of Ukraine reported that as of the end of 2018, about 7.5 thousand Ukrainian families had installed solar power plants with a total capacity of almost 160 MW. The amount of investment in such SES (solar energy system) amounted to about 151 million euros. Unlike nuclear and hydropower, solar energy is the safest for people and environment (Figure 1).

Table 1 – Comparison of different types of energy

	Pluses	Minuses
Nuclear power	1.Consumes little fuel 2.High power 3.Low cost of energy	1.Thermal pollution of the environment 2.The possibility of accidents at nuclear reactors 3.Shortlife 4.The high cost of installation and maintenance 5.The disposal of nuclear waste requires a lot of space, and negatively affects the environment
Hydro power	1.No emissions to the environment 2.Low energy cost 3.Long-term operation	1.Disruption of ecosystems in rivers 2.Water logging The formation of microclimate 3.The possibility of flooding the territory. 4.Seasonal powerf luctuations.
Solar power	1.The use of inexhaustible resources 2.Environmental safety 3.Solar panels are silent 4.The ability to install for personal, home use.	1.Dependence on weather (in the case of a small number of sunny days - they are useless) and time of day, that is, fluctuation in power 2.High construction cost

The concept of solar activity in modern science is associated with the term "solar insolation." Insolation is understood as the amount of radiation received during one daylight hours, or, simply put, the degree of “irradiation” of 1 square meter of land for a specific period of time.[2]

Approximately 80% of the territory of Ukraine, the insolation level does not fall below 3 units, which is a very promising result in comparison with other European countries. So, the installation of solar panels can become a new round in the development of energy technologies in Ukraine, and in particular in some of its areas.[2]

For example, in the Kherson region the annual level of solar insolation is 3.55 units, this is the highest level in all of Ukraine after Simferopol. It is worth noting that in all regions of Ukraine, the level of solar insolation does not fall below 2.92 units (Lviv region).[2]

Solar panels are one of the most environmentally friendly forms of alternative energy. Unfortunately, there are not so many of them in Ukraine, but their number is growing every year and this is very good for our ecological state. Of course, they also have their drawbacks, the main ones being the dependence on weather conditions and their cost. The wider use of this particular energy source will lead to a reduction in environmental pollution. That is why we believe that the use of solar panels will contribute to the environmental situation in our region.

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WIND POWER ENGINEERING: STATE AND PROSPECTS OF DEVELOPMENT

Alternative energy sources are becoming more popular in the world. Their advantage is in the renewability of energy resources. They are solar energy, wind energy, tidal energy, the Earth's deep heat, biomass fuel.

People are increasingly thinking about using reliable safe and friendly alternative ecology sources. For example, the energy of winds, which is very high in power. We can get this energy without polluting the environment.

For the first time, wind energy was used to move sailing ships, later- to lift water and grind grain. It is believed that the first wind turbines were made in China, Japan and Tibet more than two thousand years ago. Ancient Babilonians used them for drain swamps. Wind mills and mills were built in Egypt and the Middle East.

China, the USA and Germany are three leaders in the global generation of electricity with the help of the wind. If we compare the part of wind power plants in each specific country then Denmark, Portugal and Spain are leaders. This factor depends on climate conditions and the place of location [1].

Figure 1.-. Wind Tribunes

This type of energy became an object of research for innovations on the territory of our country only after the revolution. With the beginning of electrification of agriculture, work on creating wind energy power stations was organized .The world's first industrial wind farm was

built in Crimea, and in 1934 under the leadership of Yuri Kondratyuk (who calculated the flight path to the moon), a project was developed to build a tower 165 meters high and two 80 meter turbines located on to levels. And in 1956 more than nine thousand wind turbines were produced [2].

Wind is one of the most powerful energy sources, which under favorable conditions can be widely used in national economy, appears thanks to constant circulation of movement of air masses in the atmosphere, caused by uneven heating of the earth's surface by the sun. In most developed countries, under conditions of state stimulation of electricity production based on renewable energy sources, great progress has been made in recent years in the construction and use of wind power plants (wind turbines).

Wind energy consists of two main parts: wind engineering, which develops the theoretical foundations and practical methods of designing technical means (units and installations), and wind use, which includes theoretical and practical issues of optimal use of wind energy, rational operation of installations and their technical and economic indicators, generalization of application experience installations in the national economy.

Wind farms of the 21st century bear little resemblance to windmills, although the principle of operation of wind turbines has not changed: under the pressure of the wind, a wheel with blades rotates, transmitting torque to other mechanisms. The larger the diameter of the wheel, the greater the airflow it captures and rotates faster. Today, two types of wind turbines are widespread in the world: vane and rotary. There are still drum and some other original designs [3].

Wind energy meets all the conditions necessary for classifying it as environmentally friendly methods of energy production. Its main advantages are: lack of environmental pollution; use of a renewable, inexhaustible source of energy, saving on fuel, on the process of its extraction and transportation; the area in the immediate vicinity can be fully used for agricultural purposes; minimal losses in energy transmission; easy maintenance, quick installation, low maintenance and operation costs.

Naturally, one cannot omit the disadvantages of this type of energy, although in comparison with the harm caused by traditional energy sources, they are insignificant: high investment costs; power variability over time; noise; threat to birds (probability of collision); the possibility of distortion of the reception of a television signal; changes in the landscape. Due to its accessibility, wind energy is also widely used in small wind energy, in local energy supply systems of consumers.

In Ukraine there is a need and there are conditions for the rapid development of wind energy. However, Ukraine in terms of wind energy use is in 14th place among European countries.

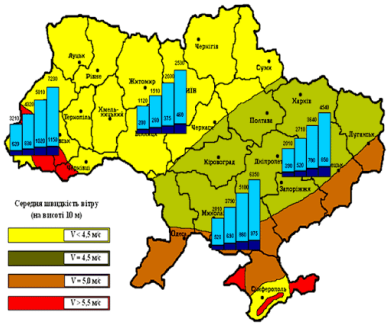

Figure 2 - The map of wind farms construction in Ukraine.

Developed by the NAS of Ukraine in conjunction with the National Space Agency of Ukraine (NSAU), "Supplements to the Energy Strategy of Ukraine for the period up to 2030 with regard to the development of wind energy", provide for the construction of wind farms in Ukraine with a total capacity of 16,000 MW by 2030 [4]. It is planned to build a wind farm system in the

territories of five regions: in the Crimea, in the Nikolaev, Kherson, Donetsk and Zaporizhzhya regions.

According to analysts, in the coming years, wind energy in Ukraine will develop faster than other types of renewable energy, and the total capacity of wind farms will exceed the capacity of solar stations by 10 times. According to experts, this is due to the fact that, compared with photovoltaic modules, with the same power, wind turbines occupy a smaller area and are much cheaper. The production of electricity with the help of wind has several advantages: ecology clean production without harm waste, economy of the high expensive fuel (traditional for nuclear plants), affordability and practical inexhaustibility.

Modern wind energy is one of the most developed and perspective sectors of alternative energy. Ukraine has a better base for the development of wind energy than other countries in Eastern Europe, because it has vast areas of shallow water areas with high wind potential that are not used in the economic sectors.

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ALTERNATIVE ENERGY RESOURCES – NECCESARY STEP FOR GREEN AND BRIGHT FUTURE OF EARTH AND ITS INHABITANTS

Humanity began to use energy long time ago. During many centuries a lot of new sources of energy appeared, and then demand in them only grow. Energy in our time is one of the most important things around the globe, just like the way that we use to get this. Most sources of energy pollute our world, and there is way to reduce this pollution – alternative energy sources. Mankind should think over about greener future for next generations.

Renewable energy, often referred to as clean energy, comes from natural sources or processes that are constantly replenished. For example, sunlight or wind keep shining and blowing, even if their availability depends on time and weather. It’s important to note that there is variety of energy sources, and their characteristics which are given bellow.

Unlike other forms of natural gas, hydrogen is a completely clean burning fuel. Once produced, hydrogen gas cells emit only water vapor and warm air when in use. The major issue with this form of alternative energy is that it is mostly derived from the use of natural gas and fossil fuels. As such, it could be argued that the emissions created to extract it counteract the benefits of its use. Example of Hydrogen gas station. (Figure 1).

Figure 1 – Hydrogen gas station in Berlin

Tidal Energy,[3] while tidal energy uses the power of water to generate energy, much like with hydroelectric methods, its application actually has more in common with wind turbines in many cases. though it is a fairly new technology, its potential is enormous. A report produced in the United Kingdom estimated that tidal energy could meet as much as 20% of the UK's current electricity demands. The most common form of tidal energy generation is the use of Tidal Stream Generators. Example of tidal energy plant. (Figure 2).

Figure 2 - tidal power plant in french Brittany

Biomass energy.[3]Biomass energy comes in a number of forms. Burning wood has been used for thousands of years to create heat, but more recent advancements have also seen waste, such as that in landfills, and alcohol products used for similar purposes. Focusing on burning wood, the heat generated can be equivalent to that of a central heating system. Furthermore, the costs involved tend to be lower and the amount of carbon released by this kind of fuel falls below the amount released by fossil fuels. Example of biomass energy plant. (Figure 3).

Figure 3 – Biomass energy farm

Wind Energy.[1] This form of energy generation has become increasingly popular in recent years. It offers much the same benefits that many other alternative fuel sources do in that it makes use of a renewable source and generates no waste. Unfortunately, this form of energy generation also presents challenges. Wind turbines restrict views and may be dangerous to some forms of wildlife. Example of Energy wind farm. (Figure4).

Figure 4 – Energy wind farm

Geothermal Power.[3]At its most basic, geothermal power is about extracting energy from the ground around us. It is growing increasingly popular, with the sector as a whole experiencing five percent growth in 2015. The World Bank currently estimates that around forty countries could meet most of their power demands using geothermal power. This power source has massive potential while doing little to disrupt the land. However, the heavy upfront costs of creating geothermal power plants has led to slower adoption than may have been expected for a fuel source with so much promise. Example of Geothermal power plant. (Figure 5).

Figure 5 – Geothermal power plant

Natural Gas.[2]Natural gas sources have been in use for a number of decades, but it is through the progression of compression techniques that it is becoming a more viable alternative energy source. In particular, it is being used in cars to reduce carbon emissions. Despite this, natural gas does come with some issues. The potential for contamination is larger than with other alternative fuel sources and natural gas still emits greenhouse gases, even if the amount is lower than with fossil fuels. Example of Natural gas station. (Figure 6).

Figure 6 – Natural gas station

Biofuels.[2] In contrast to biomass energy sources, biofuels make use of animal and plant life to create energy. In essence they are fuels that can be obtained from some form of organic matter. They are renewable in cases where plants are used, as these can be regrown on a yearly basis. However, they do require dedicated machinery for extraction, which can contribute to increased emissions even if biofuels themselves don't. Biofuels are increasingly being adopted,

particularly in the United States. They accounted for approximately seven percent of transport fuel consumption as of 2012.

Figure 7 – Biofuel farm

Wave Energy.[2] Water again proves itself to be a valuable contributor to alternative energy fuel sources with wave energy converters. These hold an advantage over tidal energy sources because they can be placed in the ocean in various situations and locations. Much like with tidal energy, the benefits come in the lack of waste produced. It is also more reliable than many other forms of alternative energy and has enormous potential when used properly. Again, the cost of such systems is a major contributing factor to slow uptake. We also don't yet have enough data to find out how wave energy converters affect natural ecosystems. Example of Wave energy plant. (Figure 8)

Figure 8 – Wave energy plant

Hydroelectric Energy. Hydroelectric methods actually are some of the earliest means of creating energy, though their use began to decline with the rise of fossil fuels. Hydroelectric energy carries with it a number of benefits. Not only is it a clean source of energy, which means it doesn't create pollution and the myriad issues that arise from it, but it is also a renewable energy source. Better yet, it also offers a number of secondary benefits that are not immediately apparent. The dams used in generating hydroelectric power also contribute to flood control and irrigation techniques. Example of Hydroelectric power station. (Figure 9).

Figure 9 – Hydroelectric power station

Solar Power.[1] When most people think about alternative energy sources they tend to use

solar power as an example. The technology has evolved massively over the years and is now used for large-scale energy production and power generation for single homes. The United Kingdom's 'Feed-in Tariff' is one of examples, as is the United States' 'Solar Investment Tax Credit'. This energy source is completely renewable and the costs of installation are outweighed by the money saved in energy bills from traditional suppliers. Nevertheless, solar cells are prone to deterioration over large periods of time and are not as effective in unideal weather conditions. Example of Solar power plant. (Figure 10).

Figure 10 – Solar power plant

There are many kinds of less pollute energy sources and who knows how many kinds of them will appear, but they are can be more expensive than the other solutions which are more dangerous for our planet. So question is in people, which don't care about environment and want only to save as much as possible of their money. World governments should realise that problems of environment are not somebody else, if nothing is done about this, humanity will be on the brink extinction .

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MODERN WASTE UTILIZATION METHODS IN THE SHIPPING INDUSTRY

Since ancient times, garbage was a huge problem for the whole of humanity at that time, but in our 21st century, the problem of garbage has been submitted for global consideration. Every day, each person produces a breathtaking amount of garbage, if we add all the garbage thrown out during a year, we can build a pyramid that is 6 times higher than Cheops. More precisely, each person produces 1 to 1.5 kilograms of garbage per day. Even 100 years ago garbage could be successfully buried, but at the moment it is already impossible to do, so it is simply dumped into giant piles. An example is the events that originate on the outskirts of Lebanon, Beirut, where garbage is successfully delivered to the place where the sandy beach was recently located. The height of the rubble here reaches more than 40 meters. Wastes decompose, emitting methane and

other chemicals that poison the soil and air that 200,000 residents of the city breathe. Local fishermen suffer from decomposition products that enter the sea. This is not a local issue, since a giant dump affects the environmental situation off the coast of Cyprus, Syria and Turkey, located next to Lebanon. All these countries complain that their beaches are constantly flooding with garbage. And this is only one local case, there are still thousands, even millions, of garbage everywhere, its number is constantly increasing. Landfills are rapidly expanding around the world.

Every day, about 3 million kilograms of garbage are removed from the coastal strip around the world. According to environmentalists, smokers leave a huge amount of waste. Cigarette butts are not biodegradable because they consist of acetate cellulose. Once in the water, they secrete toxins, poisoning planktonic organisms and fish. It is known that most of the garbage produced by residents of Jakarta (Indonesia) falls into the waters of Keelung, a river that has become one of the most polluted in the world. Besides, that there is no garbage management system in the city. In river water all kinds of waste are decomposed, even dead animals, releasing cadaveric poisons. It is estimated that it will take 20 years to clean up the river. At the same time, the lives of millions of people depend on Keelung, the main source of drinking water. But only a small part of the trash remains in place. The river carries almost all waste to the sea, where it causes irreparable harm to many species of marine animals. According to the United Nations, there are 46 thousand units of garbage per square kilometer of the oceans. It seems that almost everyone knows about a large garbage spot in the Pacific Ocean. This area is called a large Pacific Garbage Patch; it receives waste from the coastal regions of North America and Japan. According to preliminary data, there areabout one hundred million tons of garbage gathered. However, these clusters do not look like giant islands of plastic and waste. Under the influence of light, plastic breaks up into small particles, and marine animals confuse them with plankton. Thus, plastic is included in the food chain and reaches the person who eats fish and other seafood.

There aretwo large seas on the territory of Ukraineand therefore there isaurgent problem of marine pollution. The problem of pollution of the Sea of Azov arose in 1940. A lot of pesticides, various chemicals and oil products come into the sea. As a result, the activity of aquatic organisms is decreased by more than two times. The situation is aggravated also by the fleet, which has already reached the age of 40+ years and does not meet the requirements of MARPOL due to which there are a lot of CO_2 emissions and there are a lot of accidents which result in tons of oil spillsin the sea.Though there are ways to save the Sea of Azov. Weneed to regulate the maritime transport and monitor the installation of modern waste processing equipment, reduce dangerous shipping by sea and also constantly monitor the water area.

Marine debris, also called marine trash, is any human-made solid material that is disposed of or abandoned on beaches, in waterways that lead to the ocean, or in the ocean itself, regardless of whether disposal occurred directly, indirectly, intentionally or unintentionally. Dead seaweed, shells, carcasses or other naturally-produced materials are not included. Marine debris, including plastics, paper, wood, metal and other manufactured materials is found on beaches worldwide and at all depths of the ocean. About 60%-80% of all marine debris is composed of plastic and Ocean Conservancy's Trash Free Seas Alliance estimates that 8 million metric tons of plastic enters the ocean every year.[1]

All garbage on a ship consists mainly of plastics, waste, packaging materials, cleaning materials, food waste, and paint residues. Crucial in preventing marine pollution is the proper handling of this garbage. Maximum efforts should be made to reduce and manage waste in order to ensure a safe and healthy working environment on board, as well as the preservation of an environmentally friendly marine ecosystem. Sailors should take an active part in the efficient operation of ships and in reducing the production of garbage on ships to reduce its quantity.

To prevent and reduce debris at sea there are special regulations, which protect environment in the seas and oceans. Each regulation operates in a specific area and has specific goals, but the most important and significant convention is MARPOL 73/78. According to MARPOL, which aims to prevent pollution of the marine environment by ships from operational or accidental causes, there are measures to preserve the world ocean and minimize accidental discharge of oil and other harmful substances. The Convention includes regulations aimed at preventing and minimizing pollution from ships - both accidental pollution and that from routine operations - and currently includes six technical Annexes. Besides, MARPOL stipulates protected zones, called Special Areas, with strict controls on operational discharges included in most Annexes.[2]There are ways to reduce the amount of garbage being thrown. All maritime companies must create a clear waste management system and implement it with proper storage and handling procedures for different categories of garbage, such as plastics, food waste, batteries and so on. All maritime operators must strictly observe MARPOL rules and maintain a zero discharge policy on board their vessels. But rubbish of selected types, such as plastic, metals, glass, batteries, medical waste, oil rags, sludge, used oils and so on that should not be recycled or burned.For separating glass from metal and mercury new methods should be allowed. There is an environmental management system (EMS), which monitors the maintenance of appropriate conditions on board the vessel and what measures are taken to avoid environmental pollution.

Summing up the above mentioned, we can suppose that caring for nature is not just words, but necessity. Our environment is getting worse and worse every year. Some measures are being taken to avoid pollution, but this is not enough. Each shipping company is trying to save on freight, thereby earning more.In 90% of cases, this is precisely the reason of oil spills, disposal of garbage in prohibited areas, air pollution by harmful gases, and the release of toxins into the water, which make the water world and its entire environment an unfavorable living environment.Improper operation of ships, also inefficient garbage management and faulty operation of waste recycling equipment, inefficient crew actions, all these steps lead to pollution of all water spaces and land in particular.

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SECTION 3. MODERN WASTE DISPOSAL METHODS – THE WAY OF GREENER FUTURE FOR OUR PLANET

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PROCESS OF GLASS RECYCLING: WHERE AND HOW

Glass recycling is an important industry in utilization, which is necessary to protect the environment and save natural resources. However, this sector is poorly developed and more glass is not recycled. In this article, we describe why it is necessary to process glass waste and how this processing is performed.

Crushed glass is therefore considered to be safe. However, people should gather crushed glass for future recycling because of many reasons. [1]

First of all, glass is not biodegradable, for example, as organic waste. A simple glass soda bottle has a decomposition time of 1,000 years or even more. It is clear that without recycling and processing glass, our entire planet in a short period would be filled with glass waste.

Glass products are fragile. Broken glass that has fallen into the environment poses a threat to both animals and humans. Also, a soil, which is full of glass, is unfavorable for vegetation growth.

One more use of waste glass containers and crushed glass allows us to save natural (exhaustible and non-renewable) resources. For example, the use of a 10% crushed glass helps to save gas by 3%. If a person, who is engaged in the production of glass products, uses only crushed glass at his/her enterprise, he/she will thereby reduce gas consumption by 30%.In Ukraine, a relatively small proportion of glass waste is recycled. But even this amount of recyclable waste ensures the conservation of about 10,000 hectares of land that could turn into huge landfills.

Glass containers and crushed glass are completely recyclable materials, that is, the recycling of glass is waste-free, which is extremely important for protecting the environment from the negative impact of industrial and other enterprises.

In addition to natural gas, the reuse of this type of waste allows us to save more than 1 ton of materials used in the production of limestone and sand.

One more reason for gathering and recycling the crushed glass is that people receive money for this. It’s important to underline that glass utilization is necessary, first of all, to protect our ecology, to save natural resources, and for cheaper production of glass products and materials.

Which glass is recyclable?

The main types of recycled glass waste include:

1. Glass containers: glass jars and bottles. Usually, people take bottles into specialized glass collection points. Then, glass containers are recycled for reuse. At the same time, it is washed, treated with disinfectants, after which the glass containers can again be used as containers for drinks.

2. Crushed glass is broken glass containers.

Crushed glass is classified according to color. For example, green crushed glass, colorless crushed glass, brown crushed glass, etc

We should pay attention to that all glass materials of different products are made based on the same substances (as mentioned above, sand or lime are used).

However, various impurities are added to several glass products (for example, windows,

bulbs), the surface of many products is also treated with various special coatings. For this reason, only glass bottles and cans are recyclable. Recycling glass at home is even possible. This process is feasible, but it requires a certain amount of time and effort.

How the glass is recycled?

Crushed glass recycling is a phased process consisting of the following main stages:

- collection of waste from glass;
- transportation of collected waste to a glass processing plant;
- separation, purification from various impurities, washing of wastes;
- grinding glass on special equipment, grinding small pieces into powder;
- packaging of glass powder for future use.

Recycling of glass bottles (or rather crushed glass) directly at the glass factory itself is competent and rational disposal of waste.

Consider how this process is carried out.

1. First stage. Separation from crushed glass all non-glass components. Grinding the battle and separating the remaining metal parts with magnets. Separation of plastic and paper components from the crushed mixture in vacuum processes.

2. Second stage. Sending the mixture to the secondary manufacture of containers. The battle is added to the feedstock (lime, soda, etc.), then the mixture is mixed and converted (at 1500°C) into a glass fraction.

3. Third stage. Pouring glass mass into molding containers and formation of new bottles.

The quality of such a bottle produced during the recycling of glass corresponds to the quality of a bottle made from 100% fresh components of raw materials. The use of crushed glass in the manufacture of glass containers significantly saves energy. [2]

Modern enterprises use such basic equipment for glass recycling as:

- automatic systems that sort crushed glass by color and shade;
- tanks for sorted crushed glass;
- sinks for a dirty crushed glass with the paper;
- different types of filters;
- electromagnetic and vacuum equipment;
- crushers,belt conveyor;
- packaging systems.

Glass containers and crushed glass are usually received at reception points located in most cities of Ukraine. Such points are organized by individual entrepreneurs since glass is a recyclable material, which is profitable to sell to factories for the manufacture of glass products. Also, containers and crushed glass are accepted by the companies involved in glass recycling and/or glass production.

. As for the conclusion, we want to say that glass recycling in Ukraine is a very urgent problem today. The amount of waste is constantly increasing, and the development of glass processing industries is poor. Therefore, the glass waste recycling business can be the solution to this difficult environmental and economic task.

Thus, the recycling of glass containers and crushed glass is not only an activity aimed at protecting our ecology but also a promising business, the development of which requires government support. As a business, recycling glass waste with proper management is profitable and rational.

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BATTERY RECYCLING AND RE-UTILIZATION

Battery recycling is a recycling activity that aims to reduce the number of batteries being disposed as municipal solid waste. Batteries contain a number of heavy metals and toxic chemicals and disposing of them by the same process as regular trash has raised concerns over soil and water pollution.

Each of us probably used at least one battery in the life. Remotes, watches, toys, phones, a lot of other things in the house there is always something that runs on batteries. And they tend to develop their resources. However, does everyone know what to do with used batteries? Should we put it in the bin along with the rest of the household waste? This is wrong! On the case the batteries are almost always present the sign a crossed out wheeled bin, indicates that it should not be disposed of with other household waste. [1] But what is so harmful or dangerous to batteries? Despite the fact that the battery may explode, leak and damage your equipment, the most harm it will cause, if not properly disposed of.

Generally, a battery is a chemical device with elements which enter into the reaction, giving at the output the electricity that we use. These elements are mostly toxic and dangerous.
They are as following:

- lead (accumulates in the body, affecting the kidneys, n
- ervous system, bone)
- cadmium (lungs and kidneys)
- mercury (affects the brain and nervous system)
- nickel and zinc (may cause dermatitis)
- alkali (burn mucous membranes and skin) and other [2]

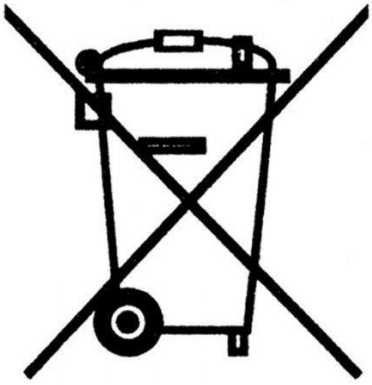

Figure 1 – a crossed out wheeled bin sign

After rejecting the metal coating of the battery is destroyed from corrosion, and heavy metals get into the soil and groundwater, where it comes close to rivers, lakes and other water bodies used for drinking water supply. Mercury is one of the most dangerous and toxic metals, tends to accumulate in tissues of living organisms and can enter the human body directly from the water and when eating food made from contaminated plants or animals.But if the battery burned in the incinerator, all the contained toxic materials escape into the atmosphere.

According to statistics, Ukrainian family annually emits 500 grams of batteries. In total, the

capital gain 2-3 thousands of tons of batteries. In the United States every year Americans purchase nearly three billion different batteries, and about 180 thousand tons of these batteries end up in landfills across the country.

It is hard to imagine how much harm it does to the environment on a global scale.

What shall we do with worn-down batteries? [3]

Storing at home is not recommended because of emission of dangerous substances into the air. According to the rules, they must be disposed of in special plants. Although the fun is not cheap, in developed countries the process of collecting used batteries from the public and the subsequent proper disposal are well established. So, in many countries of the European Union, in Canada and the USA, points for receiving batteries are everywhere. In New York, for example, throwing batteries into the trash is prohibited by law. And manufacturers and large stores selling batteries are required to collect used batteries - otherwise a fine of up to $ 5,000 may follow.

Batteries need to be recycled at special plants, because their components can be valuable raw materials for reuse. Non-ferrous metal batteries contain hundreds of times more than the ore from which these metals are mined. True, while their processing is more expensive than the subsequent sale of the resulting raw materials. But the fight against the consequences of environmental pollution, an increase in the number of diseases caused by toxic pollution, costs a person a much higher price.

There are three battery recycling plants in Europe. [4] The collection of waste cells is strictly controlled by EU laws: they are seriously engaged in this, and waste battery collection points are found at every step. In many countries, the collected batteries are stored in isolation, as they say, “until better times”, when the technologies for their processing reach a qualitatively new level both in the degree of extraction of useful components and in the cheapness of the process.

How to dispose of batteries, reduce harm from them? Firstly, it’s worth switching to batteries - they last longer and have to be thrown away much less often. Secondly, save up batteries and wait for better times when reception points appear. Even now they periodically work from action to action, during which activists collect batteries from the population, after which they themselves hand them over.

In Japan, they say, batteries are collected and stored until the optimal recycling technology is invented.

And what about us?

Everything is rather sad with us: if you firmly decided not to harm nature, then the reception point will have to be carefully searched even in the capital - what can we say about other cities. In Europe there are only three factories with battery processing facilities, and one of them is located in Ukraine - this is the Lviv state enterprise Argentum. However, due to the poor organization of the collection of batteries from the population, the plant cannot function - the enterprise is designed to process tons of batteries per day, while half a ton was not able to be collected.

Figure 2 – a small model of our planet

The battery recycling and re-utilization methods are the most important for our planet

nowadays, because the amount of batteries is growing with every year. Considered, that one finger battery pollutes with heavy metals about 20 sq.m. of the soil. So, it is very significant to preserve the eco system of our planet for our future generations

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EFFICIENT METHODS OF WASTE RECYCLING

Every year, waste occupies more and more territories in all corners of our planet. Today, waste recycling is the most acute, global and the most pressing environmental problem. The level of environmental pollution due to waste and its disposal is growing catastrophically fast. That is why it is necessary to introduce garbage processing technologies that would minimize the risks of nature destruction.

Nowadays, there are several options for recycling garbage. Some of them cause severe environmental damage, while others, on the contrary, are more gentle and effective. Nevertheless, there are some technologies for waste utilization:

Landfills (waste storage): a large amount of solid waste is dumped in both authorized and unauthorized (natural) dumps. These are temporary undeveloped territories that are operated with deviations from the requirements of sanitary and epidemiological surveillance. Most landfills are not equipped, in accordance with sanitary norms and rules and do not have entry control posts. In this regard, waste in landfills is a source of environmental pollution. Decaying waste in landfills penetrates the soil, infecting it. Toxic fumes pollute the air. Residues of solid waste falling into groundwater and water bodies have a detrimental effect on the state of water. [1] All these consequences adversely affect human health. Moreover, with an increase in population, economic development and an increase in living standards, the amount of garbage also increases. Due to this situation, the landfills are all crowded, many are closing or will be closed in the near future. The main problem of garbage processing is their unsorted nature. [2]

Figure 1 – example of landfill

Recycling: it is the reuse or recycling of production waste or garbage. Types of secondary raw materials are metals such as iron, steel, copper, aluminum, as well as paper, plastic, rubber, glass and similar waste. Appliances, batteries and fats are recyclable.[3] The use of these wastes in production prevents the excessive consumption of natural resources. Recycling of waste along with the conservation of natural sources reduces the cost of raw materials and energy required for the production process. Another plus of recycling is the reduction in the amount of municipal solid waste to be disposed of. This reduces the damage to the environment, and reduces the area places for garbage. The main step in the recycling process is to separate the waste into unusable and recyclable waste and collect it in special containers for secondary raw materials.

Solid waste incineration methods: waste incineration is the most developed and most common method of processing solid waste in the world. Its main advantage is the reduction of waste by more than 10 times. Burning also eliminates unpleasant odors, pathogenic bacteria, and also obtain thermal energy. However, when burning wastes containing hydrocarbon and chloride substances, at a temperature below 1200 ° C, dioxins are formed - very toxic compounds. [4] Waste incineration is a complex and high-tech option for waste management and can be considered as one of the components of a comprehensive recycling program. Burning an unshared waste stream is considered extremely dangerous. Therefore, pre-treatment of solid waste is required. When separating from solid waste, large fractions, metals, plastic, power elements, batteries are removed. It should be borne in mind that in solid waste there are potentially dangerous elements characterized by high toxicity: compounds of halogens (fluorine, chlorine, bromine), nitrogen, sulfur, heavy metals (copper, zinc, lead, cadmium, tin, mercury).

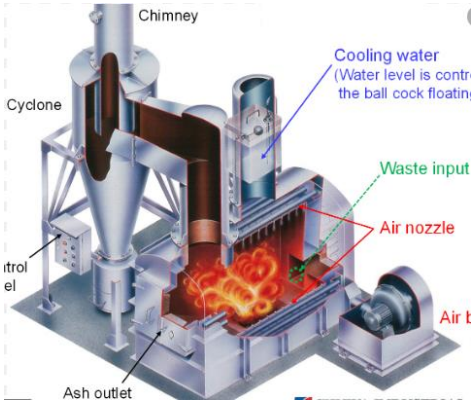

Figure 2 – incinerator (for combustion of waste)

Composting: by making compost, a person helps nature, creating good conditions for their life activity to microorganisms that break up waste. Waste mainly breaks down bacteria, fungi, radiation fungi and worms, and a group of all kinds of microorganisms helps them. As a result of the work of microorganisms, water / water vapor, carbon dioxide, nutrients and thermal energy are released from the waste. At the same time, humus important for the progeny of the earth is formed. Compost microorganisms use for their food both the waste laid in compost and their own kind. In the process of their life, they generate heat in compost. Thanks to this, compost can even heat up to 70-80 degrees, which is a good factor for the formation of high-quality compost soil.

The importance of waste disposal has both environmental and resource-saving reasons. Many materials in nature are limited, and their replenishment time significantly exceeds the life spans of several generations of people. Accumulating waste pollutes the environment. Among

them are those, having decomposition period, which in natural conditions is measured for centuries. Their accumulation can be avoided, in particular, by using their processing and return as secondary raw materials to industrial processes. In this case, significant savings in natural resources, energy for their processing, as well as labor costs are often achieved.

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MODERN WASTE UTILIZATION METHODS IN THE SHIPPING INDUSTRY

Since ancient times, garbage was a huge problem for the whole of humanity at that time, but in our 21st century, the problem of garbage has been submitted for global consideration. Every day, each person produces a breathtaking amount of garbage, if we add all the garbage thrown out during a year, we can build a pyramid that is 6 times higher than Cheops. More precisely, each person produces 1 to 1.5 kilograms of garbage per day. Even 100 years ago garbage could be successfully buried, but at the moment it is already impossible to do, so it is simply dumped into giant piles. An example is the events that originate on the outskirts of Lebanon, Beirut, where garbage is successfully delivered to the place where the sandy beach was recently located. The height of the rubble here reaches more than 40 meters. Wastes decompose, emitting methane and other chemicals that poison the soil and air that 200,000 residents of the city breathe. Local fishermen suffer from decomposition products that enter the sea. This is not a local issue, since a giant dump affects the environmental situation off the coast of Cyprus, Syria and Turkey, located next to Lebanon. All these countries complain that their beaches are constantly flooding with garbage. And this is only one local case, there are still thousands, even millions, of garbage everywhere, its number is constantly increasing. Landfills are rapidly expanding around the world.

Every day, about 3 million kilograms of garbage are removed from the coastal strip around the world. According to environmentalists, smokers leave a huge amount of waste. Cigarette butts are not biodegradable because they consist of acetate cellulose. Once in the water, they secrete toxins, poisoning planktonic organisms and fish. It is known that most of the garbage produced by residents of Jakarta (Indonesia) falls into the waters of Keelung, a river that has become one of the most polluted in the world. Besides, that there is no garbage management system in the city. In river water all kinds of waste are decomposed, even dead animals, releasing cadaveric poisons. It is estimated that it will take 20 years to clean up the river. At the same time, the lives of millions of people depend on Keelung, the main source of drinking water. But only a small part of the trash remains in place. The river carries almost all waste to the sea, where it causes irreparable harm to many species of marine animals. According to the United Nations, there are 46 thousand units of garbage per square kilometer of the oceans. It seems that almost everyone knows about a large garbage spot in the Pacific Ocean. This area is called a large Pacific Garbage Patch; it receives

waste from the coastal regions of North America and Japan. According to preliminary data, there areabout one hundred million tons of garbage gathered. However, these clusters do not look like giant islands of plastic and waste. Under the influence of light, plastic breaks up into small particles, and marine animals confuse them with plankton. Thus, plastic is included in the food chain and reaches the person who eats fish and other seafood.

There aretwo large seas on the territory of Ukraineand therefore there isaurgent problem of marine pollution. The problem of pollution of the Sea of Azov arose in 1940. A lot of pesticides, various chemicals and oil products come into the sea. As a result, the activity of aquatic organisms is decreased by more than two times. The situation is aggravated also by the fleet, which has already reached the age of 40+ years and does not meet the requirements of MARPOL due to which there are a lot of CO_2 emissions and there are a lot of accidents which result in tons of oil spillsin the sea.Though there are ways to save the Sea of Azov. Weneed to regulate the maritime transport and monitor the installation of modern waste processing equipment, reduce dangerous shipping by sea and also constantly monitor the water area.

Marine debris, also called marine trash, is any human-made solid material that is disposed of or abandoned on beaches, in waterways that lead to the ocean, or in the ocean itself, regardless of whether disposal occurred directly, indirectly, intentionally or unintentionally. Dead seaweed, shells, carcasses or other naturally-produced materials are not included. Marine debris, including plastics, paper, wood, metal and other manufactured materials is found on beaches worldwide and at all depths of the ocean. About 60%-80% of all marine debris is composed of plastic and Ocean Conservancy's Trash Free Seas Alliance estimates that 8 million metric tons of plastic enters the ocean every year.[1]

All garbage on a ship consists mainly of plastics, waste, packaging materials, cleaning materials, food waste, and paint residues. Crucial in preventing marine pollution is the proper handling of this garbage. Maximum efforts should be made to reduce and manage waste in order to ensure a safe and healthy working environment on board, as well as the preservation of an environmentally friendly marine ecosystem. Sailors should take an active part in the efficient operation of ships and in reducing the production of garbage on ships to reduce its quantity.

To prevent and reduce debris at sea there are special regulations, which protect environment in the seas and oceans. Each regulation operates in a specific area and has specific goals, but the most important and significant convention is MARPOL 73/78. According to MARPOL, which aims to prevent pollution of the marine environment by ships from operational or accidental causes, there are measures to preserve the world ocean and minimize accidental discharge of oil and other harmful substances. The Convention includes regulations aimed at preventing and minimizing pollution from ships - both accidental pollution and that from routine operations - and currently includes six technical Annexes. Besides, MARPOL stipulates protected zones, called Special Areas, with strict controls on operational discharges included in most Annexes.[2]

There are ways to reduce the amount of garbage being thrown. All maritime companies must create a clear waste management system and implement it with proper storage and handling procedures for different categories of garbage, such as plastics, food waste, batteries and so on. All maritime operators must strictly observe MARPOL rules and maintain a zero discharge policy on board their vessels. But rubbish of selected types, such as plastic, metals, glass, batteries, medical waste, oil rags, sludge, used oils and so on that should not be recycled or burned.For separating glass from metal and mercury new methods should be allowed. There is an environmental management system (EMS), which monitors the maintenance of appropriate conditions on board the vessel and what measures are taken to avoid environmental pollution.

Summing up the above mentioned, we can suppose that caring for nature is not just words

but necessity. Our environment is getting worse and worse every year. Some measures are beingtaken to avoid pollution, but this is not enough. Each shipping company is trying to save on freight, thereby earning more.In 90% of cases, this is precisely the reason of oil spills, disposal of garbage in prohibited areas, air pollution by harmful gases, and the release of toxins into the water, which make the water world and its entire environment an unfavorable living environment.Improper operation of ships, also inefficient garbage management and faulty operation of waste recycling equipment, inefficient crew actions, all these steps lead to pollution of all water spaces and land in particular.

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USING OF WASTE DISPOSAL EQUIPMENT AS AN EFFECTIVE ECO-FRIENDLY METHOD OF GARGABE UTILIZATION ONBOARD

Nowadays shipping remains an actual and demanded method of cargo and passenger delivery due to its undeniable advantages.But at the same time, in the process of normal operation of the vessel and the work of people, garbage is formed, i.e. all kinds of food, domestic and operational waste, all plastics, cargo residues, incinerator ashes, cooking oil, fishing gear, and animal carcasses generated during the normal operation of the ship and liable to be disposed of continuously or periodically.

In order to prevent pollution of the seas from ships and stop the destruction of the planet, annex V to MARPOL 73/78 on regulations for the prevention of pollution by garbage from ships was adopted, which, inter alia, established requirements for the equipment of ships with special waste disposal devices. Therefore, in our work we will consider waste disposal equipment as an effective eco-friendly method of gargabe utilization onboard, principle of operation, advantages and disadvantages.

In accordance with the requirements of Annex V of MARPOL 73/78, one of the following types of equipment for the prevention of marine pollution by garbage should be provided on board: garbage collection devices, devices for the processing of garbage, waste incinerator.

Therefore, there are two ways to dispose of garbage: collection and treatment on board the ship.The vessel can be equipped with waste treatment and disposal devices such as: incinerators, comminutors, compactors.

A thermal method of ship waste treatment has been significantly developed and widely used in recent years. Wastes are incinerated in special incinerator furnaces. This method can destroy almost all types of ship waste, except metal and glass, which should be separated from the total mass.

Incinerators have the following advantages: possibility to process all types of waste and significantly reduce its volume, sterility of the resulting residues, process

automation.Disadvantages of the method include sufficient fire hazard on the vessel, increased fuel consumption and laborious additional maintenance.

The incineration process in the incinerator can be divided into two stages: pre-drying and incineration itself.

Drying the waste allows to make fuller use of its calorific value and thus to save fuel. Waste drying in incinerators is carried out by means of convection transfer of heat from hot air flows, as well as by heating from the flame or from the combustion chamber surface. The amount of heat is achieved by burning the fuel injected through special nozzles. Knowing the calorific value of each component included in the waste, the volume of accumulated waste and its composition,it is possible to calculate the total calorific value of the mass and determine the required type of incinerator.

In modern incinerators, the waste is pre-dried directly in the furnace. Before burning the waste should be prepared: separate the objects capable of melting the grate holes and thus reduce the air supply, such as objects of aluminum alloys or glass (their melting point respectively about 700 and about 1100 ° C).

The furnace is usually heated to a temperature of at least 500 ° C and filled with solid waste. At a temperature of about 300 ° C from organic substances begins to evaporate gaseous fractions. The so-called dry distillation of solid waste takes place. The gases are lifted up into the upper part of the furnace and are completely combusted there by means of an auxiliary torch. At a temperature of more than 750 °C, the gases decompose within a few seconds.

Liquid waste is fed into the incinerators atomized through special slurry nozzles. Preparation of liquid waste for combustion consists in preparation of a mixture containing at least 50% of fuel and preheated to 60 ... .80 °C. Theoretically, about 4 kg of atmospheric air is required for burning 1 kg of liquid waste. To be sure in complete waste combustion it is recommended to provide 50 % of excess air. Therefore, the recommended consumption is 6 kg of air per 1 kg of waste. [1]

Comminutorsare also used for treatment of solid waste - units equipped with special cutting devices that allow shredding any type of solid waste. Comminutors have not been distributed, although there are known cases of their use on some vessels. This is because this device makes it virtually impossible to abandon other types of waste treatment equipment, in particular containers. The fact is that the fleet is largely located in special areas where the dumping of shredded solid waste, other than food waste, is prohibited. Of interest is the method of shredding food waste implemented in some ships and in some ports. On ships, food waste is shredded by a shredder installed in the galley, after which the shredded food waste is sent to the ship's collection tank. When the vessel leaves the port beyond the 12-mile zone, the shredded food waste is pumped overboard. [2]

This is more problematically, when the transfer of waste to shore is difficult or impossible. There are cases where ports are not equipped with the necessary waste reception and handling equipment.MARPOL 73/78 states that the lack of equipment in ports should not be the ground for dumping overboard in port waters, raids and coastal waters. In order to reduce the amount of ship-generated waste, it is recommended to use special compactors - devices that reduce the amount of solid waste by about 8-10 times.

Press as a method of waste treatment has the following advantages: possibility of treatment of any kind of solid waste; press units have a simple design and require almost no maintenance; possibility of installation anywhere on the ship, including the deck; low power consumption. The disadvantages of this method include the fact that the storage of compacted waste requires space and decontamination when storing the compacted waste on the vessel. [3]

Based on a combination of facts, we have come to the conclusion that each of the above-mentioned methods of waste disposal has its advantages and disadvantages. But this is more better,

than not using such devices at all. After all, with the help of this equipment almost every ship will be able to minimize the emission of waste and other hazardous objects. And this, in turn, will help stop the destruction of our planet. After all, the Earth is, so far, our only home and we shouldn't let it die.

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YOUR WAY TO BE MORE ENVIRONMENTALLY-FRIENDLY AND GREENER

Nowadays, the automotive industry, aircraft, construction, chemical, instrument-making industries are developing rapidly. Each of these industries produces a lot of waste that is very harmful for the environment, if not disposed. Of course, not all utilization methods have a positive effect on nature, or in other words have no side effects. Some of them cause damage even worse than if waste remains on the ground. So, the purpose of our research is to study the conditions of the main modern utilization methods and determine the most suitable way for us to be more environmentally-friendly and thus, find the way of greener future for our planet.

There are eight methods of waste processing accepted and approved by the experts, they are: processing, landfill, recycling, waste sorting, waste disposal, burning, incineration, power generation [1].

One popular method is landfill, which focuses on landfilling. This method can be considered to be good enough only in case of instillation of organic substances, but not for the burial of building materials, microcircuits, batteries and other inorganic objects.

Incineration is also often used as a disposal method. It is used for solid waste, for example household waste, but it is fraught with many risks, such as: the production of carbon dioxide, the destruction of the ozone layer, the appearance of acid rain. It should be stressed that the land under waste burns out and will no longer be suitable for farming, what significantly reduces the area of usable land.

A more useful method is recycling of waste. It is actively used for the re-production of goods such as disposable bottles, dishes, cutlery, waste paper is recycled into toilet paper, notebooks, and this is much better than if plastics were burned, trees would be cut down for paper production. Another method is to re-use the part of waste. For example, instead of trying to burn the chip, you can clean it, and it will be ready for use in another device. At home, you can also reuse something. Plastic water bottles can be refilled with filtered water and taken with you on walks, thereby not only reducing plastic consumption, but also saving money on ordinary water. From shoe boxes you can make organizers, cardboard shelves and all sorts of coasters.

Nowadays, methods of making organic disposable tableware, for example, from avocado seeds, are becoming popular. Such devices decompose in the earth for six months and become a fertilizer of the soil. Unscrupulous factory owners often throw waste into water bodies, what is very harmful to the environment, it is predicted that by 2025, three tons of fish in the ocean will

have a ton of garbage [2]. Many fish eat plastic, tin, get confused in thrown out ropes and die. Some birds eat small particles of harmful waste that clog their stomachs, causing them to die. Some materials not only burn out, but also poison the earth and plants that could become food for wild animals.

The best way to utilize waste is to reduce its generation. Instead of plastic bags, you can use paper or rag bags, instead of chemical detergents; you can use soda or mustard powder, which cope well with various contaminants, thereby reducing the soap concentration in wastewater. Another way of greener future for our planet is to save natural resources. There are many ways individuals and society can help conserve water, for instance. Just be more water-conscious and less wasteful. Think before you throw water down the drain. Spend five minutes in the shower instead of fifteen. Fill the sink with enough water to rinse the soap off the dishes, but don't leave the water running!

Finally, communities can help by looking for alternative ways of supplying water. This is a simple and inexpensive solution that will save fresh water for other important users. In general, people should consider exactly how much water they need and not use even a drop more!

There is a lot of the ordinary person can do to help, for example, the rainforests. You could stop eating fast-food that has come from cattle kept in areas that used to be rainforests. Apart from that, you can make an effort to use less paper by wasting as little as possible and by using only recycled paper. You could even use free paper, made from other plants. You could also join a group and get involved in raising money. You can write about the problem or protest to the companies who are destroying the rainforests [3].

Unfortunately, there is no ideal recycling method at the disposal of mankind, but science does not stand still and, I think, in 10-20 years we'll come up with something that will be able to cope with tons of waste without harm to humans, animals and nature. So far, we can recycle old waste by making new materials out of them or give a second life to each object. But not all people are responsible for the ecology and health of the planet, so you do not have to wait for quick results, but to take an active part in making our planet greener by yoursel!

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CIRCULAR ECONOMY SYSTEM

A circular economy is aimed at removing waste and keeping goods, products, equipment and a majority of materials in continual use. It is based on principles of: converting waste, pollution, carbon emissions, food, raw materials and other substances in a reusable way for humanity and the environment. This regenerative approach is in contrast to the traditional linear economy, which has a "take, make, use, dispose, pollute" model of production.

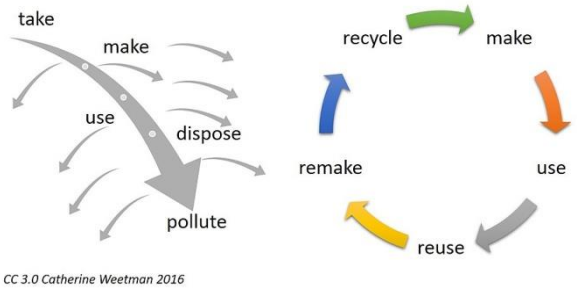

Figure 1. Models of traditional linear economy and circular economy

"Today's wasteful, linear economy is broken. Our research in Europe shows how shifting to a circular economy could bring new opportunities for innovation, growth and resilience" "Dame Ellen MacArthur"

In order to generate a brighter and more resourceful future, we need to look at what we have got at the moment. We have an economic model that drives everything that we refer to as the linear model. It is a "take, make, dispose" model. After manufacturing process we end up with tons of unutilized garbage and vast amounts of waste [1]. Huge volumes of waste release toxic chemicals that have devastating consequences for the air, land and oceans. Our current model of the economy is about throwing goods away after we consume them. Therefore, we increase the waste levels and do not make the most out of resources that we have. So the economy has a linear shape. This system is the opposite of the life cycle of nature, whereas the circular economy has a recycling stage after consumption - meaning that new products may be created from used materials. Thus, the circular economy is a zero-waste production process. Reshaping the economy is not a simple process. We have to change how we think, how we behave and how we consume.

Everything on our planet was in a circular flow but when the industrial revolution happened our ability to do things has changed and we developed an effective way to make new products and needs. So, our economy has been getting more and more linear. It was the first time in history that items and goods were in mass production and it resulted in the negative impact for the environment [2]. At present it is essential to assess our real needs. There is a constant stream of new products being manufactured and advertised. As a consequence, we developed an appetite for up-to-date products and technologies. Unfortunately, nature cannot renew itself at the speed we consume. For instance, American lifestyles require the equivalent of Five Earths. This causes a lot waste and resource scarcity. Circular economy brings new ideas and principles that support our humanity structure on the planet [3]. We should concern about resources that should be used in an appropriate, efficient manner and in nutrient cycling way.

For shifting our economy-system should be involved everything and everyone: governments, businesses, countries, cities, also substituting to reusable consuming materials in jobs, institutions, schools and everything there [4]. And only then the environmental impact will be positive. But the main part of change is people. When we will realize that current system destroys the global environment and planetary resources - ONLY THEN we will be able to effectively collaborate towards achievement of circular-economy worldwide.

At first, we should stop extracting raw materials from the ground and stop producing waste. Start using only secondary raw materials (stuff that is already in the manufacturing process). Then produce, following "eco design" principles. Which means that all manufactured goods can be reused continuously. After their usage we can take them apart and redistribute to component parts to create new goods. Likewise, we need to evolve our perception of consumption, in a way that we are not owners, we do not use goods until they break down and, in the end throw away. We are subscribers for products use, that we extract from nature. We can minimize the amount of waste by

sending used products back to companies for reuse and recycle. After all, circular economy is about collaboration of manufacturers and consumers. Even though this idea is not widely practiced, some companies are shifting their manufacturing processes towards this framework. For example, HYLA Mobile works with many of the world's leading manufacturers and service providers to repurpose and reuse either the devices themselves, or their components. It's estimated that more than 50 million devices have been reused, making $4 billion for their owners and stopping 6,500 tons of e-waste(smartphones and other technological devices) ending up in landfill.

Circular economy is not something new and innovative framework. This is a pretty logical and rational approach - not to ditch planet resources because they are finite and limited [5]. Nonetheless, very few companies are engaged in circular system. Great stocks of our generous land are disappearing. We simply ignore the enormous amount of litter that gets dumped into the oceans and fields of waste which expand every minute. While it will not occur overnight, the switch to a circular economy from the linear economy will be ultimately sustainable and benefit not only our planet, but generations to come. We should change this system and the sooner, the better. Lastly, it is crucial to raise global awareness amongst all of us. We cannot have future growth without understanding the current problems.

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MODERN UTILIZATION SYSTEMS USED ON MERCHANT VESSELS

Currently, when lorries and aircraft appeared, shipping by sea remains an urgent and sought-after way of delivering goods and passengers due to its indisputable advantages. But along with this, in the normal operation of the vessel and the work of people, garbage is formed, all types of food, household and operational Do not forget also that the oceans not only serve as a source of income, i.e. as a way of freight transportation and a source of fish or natural resources, it is also a source of life on earth. [2]The oceans form the planet's climate, serve as a source of precipitation, more than half of the oxygen enters the atmosphere from the ocean, and it also regulates the carbon dioxide content in the atmosphere, as it is able to absorb its excess. In this regard, to prevent pollution of the seas, from ships in the MARPOL Convention 73/78, annex V "On the rules for the prevention of pollution by garbage from ships" was adopted, which in particular

established requirements for equipping ships with special garbage disposal devices. Therefore, in the work we will consider the main devices for the disposal of household waste, their characteristics, the principle of operation, as well as advantages and disadvantages.

The vessel can be equipped with devices for the processing and destruction of garbage, such as: installation for the burning of ship-generated waste (incinerators); garbage comminutor (screen); garbage pressing plant.

Significant development and widespread use in recent years has received the thermal method of processing shipboard waste. Waste is burned in special incinerator furnaces. This method can destroy almost all types of shipboard waste, with the exception of metal and glass, which should be separated from the total mass. A good example of modern generation plants is the Japanese VTH-30. The VTH-30 incinerator consists of two units: the actual waste incinerator and the unit for the preparation and supply of liquid waste for incineration. The furnace body is a horizontally located cylinder, on the front wall of which there are nozzles of diesel fuel and liquid waste, an ignition unit, a flame detector, a hatch for removing ash and inspecting the inner surface of the furnace, as well as a number of other devices and fittings. The solid waste loading hatch is located on the right in the upper part of the cylindrical chamber, at the end of which there is an exhaust gas dilution chamber. The combustion zone has double walls lined with refractory material. The cooling of the case is facilitated by an air chamber formed by the space between the double walls. A fan is located under the cylindrical part of the furnace, which serves to supply air to cool the walls and to dilute the exhaust gases through the chimney. Solid waste can be burned separately or simultaneously with liquid waste. Fuel and oil sludge, as well as sewage sludge, are recommended to be burned if the water content in the resulting mixture does not exceed 40%.[1]

Also, for the treatment of municipal solid waste, comminutors equipped with special cutting devices that allow to grind any kinds of solid waste, including glass objects, cans, wooden boxes, etc.

Of interest is the method of crushing (grinding) food waste, introduced on some ships and in some ports. On ships, food waste is crushed by a comminutor installed on the galley, after which the crushed food waste is sent to the ship’s collection tank (for example, to the wastewater collection tank). After the vessel leaves the port beyond the 12-mile zone, the crushed waste together with the NE is pumped overboard.

An example of a modern waste comminutor is S3 / 3, it is designed to grind and reduce the volume of various materials and waste to 80%. The device consists of a grinding compartment, in which there are two hexagonal shafts of opposite rotation, equipped with round blades of a given thickness with one or more hooks. Material is fed through a feed hopper located above the grinding compartment. Rotating blades with hooks located around their circumference direct the material to the center of the grinding chamber, where it passes through the blades, is crushed and falls down under gravity.[1]

The situation is more complicated in cases where the transfer of waste to shore is difficult or impossible. There are times when ports are not equipped with the necessary equipment for receiving and processing garbage. This situation may be complicated if the ship is forced to linger in the port, as the capacity of ship containers may not be enough. Pressing as a method of processing waste has the following advantages: the ability to process any kind of solid waste; compactors have a simple design and require almost no maintenance; the ability to install anywhere on the ship, including the deck; low power consumption. The disadvantages of this method include the fact that for the storage of compressed waste requires premises and disinfection during storage of compressed waste on board the vessel.

Thus, the main devices for garbage disposal on board are: incinerators, presses, shredders

and garbage containers. The most widespread are incinerators, as they are capable of destroying almost all types of household garbage accumulating on a ship, and the sterility of the treated waste allows them to be dumped overboard, carried out under the convention. The disadvantages of this device are again harmful emissions into the atmosphere, which does not allow the use of incinerator in the port, as well as the high fire hazard associated with high temperatures and pressures above normal. The use of containers is difficult because there are cases when the ports are not equipped with devices for receiving and processing garbage. And shredders and presses are not widely used due to the fact that they require other types of waste disposal devices, such as containers. Also, the ship spends a certain part of its time in coastal zones, in the waters of ports, as well as in inland waters, where the discharge of any waste, even shredded, is prohibited. The adoption of conventions such as MARPOL 73/78 made it possible to take control of the dumping of garbage and other harmful substances from ships. Also, the equipment of garbage disposal vessels played a huge role in preventing pollution of the oceans.[3]

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WASTE DISPOSAL METHODS IN UKRAINE

The problem of waste is not new for Ukraine, but it has not been solved yet. Accumulation of various wastes in the environment is one of the factors to destabilize the ecological situation and ecological security in the country, guaranteed by Article 50 of the Constitution of Ukraine [1] i.e. everybody's right for safe life and environmental health. Ukraine is obliged for natural environment protection and maintaining an ecological balance [1]. But disposal of garbage in our country has become a real environmental collapse. Mountains of waste of human activity infest not only the small towns and villages, but also millionaire cities.

In the modern world an incredible amount of diverse products is produced. Moreover, a significant part of it is absolutely useless and short-term in use. Almost all European countries have strict regulations on the sorting of garbage for recycling. For example, in Switzerland, Germany and Sweden, over 80 per cent of the waste is separated by people. Solid waste is not only sorted but also used as recyclables in Denmark, Belgium, Switzerland, the Netherlands, Austria, France, Italy, USA and Japan.

Today, Ukraine is the leader in terms of waste generation and accumulation. Each Ukrainian annually creates 200-250 kg of solid waste, a resident of a big city - 330-380 years. In general, Ukrainians annually produce about 12 million tons of solid waste. Moreover, according to environmentalists, the amount of waste every year continues to grow but Ukrainians don't rush to sort and recycle garbage.

The practice of solid waste management in Ukraine shows a lack of protection of the population and the environment from their negative influence. This situation is typical for almost all regions of Ukraine and is a national problem that must be solved immediately.

On average Ukraine produces about 17 million tons of garbage (household and industrial)

annually. Unfortunately only 5% of this amount is recycled. The remaining 95% goes to area landfills.[2]

There are several reasons. Firstly, in Ukraine there is no system of separate collection of solid waste components. Secondly, there are not enough plants for processing and recycling garbage.

There are only 4 waste incineration plants - in Kiev, Dnipro, Kharkov, and Rivne. Today the most modern complex is the Rivne Waste Processing Plant. It doesn't only recycle household waste but also produces alternative fuel from it for large industrial plants.

There are a lot of problems with waste paper. Today it is difficult for recycling companies to find suppliers of paper waste, so they have to import waste paper from abroad.

The average volume of waste paper imports to Ukraine is about 200 thousand tons per year. At the same time, the population throws their paper waste into area landfills.

From one ton of waste paper about 25,000 school notebooks can be produced. From every 60 kg of paper waste you can make as many goods as from one tree. Moreover, paper production is water - and energy-consuming, so using a ton of waste paper saves 1000 kW / h of electricity and 200 cubic meters of water. In most European countries, wrapping paper, paper products, newspapers are made entirely from waste paper and recycled materials. Europeans conserve more than 1.5 million hectares of forest due to the fact that they collect and process more than 50 million tons of recycled materials every year.

More than 3 thousand tons of a double-A battery are imported to Ukraine annually. One double-A battery can kill 16 square meters of earth for 50 years. Heavy metals - mercury, lead, and cadmium contained in double-A batteries can be transported for long distances through groundwater, absorbed by plants and enter the human body. They should not be dumped together with ordinary household waste.[3]

Every year millions of domestic wastes is stored in Ukrainian garbage dumps. There are 6,500 legal and 35,000 illegal garbage dumps in Ukraine. According to 2019 data, authorized landfills in Ukraine could be compared to the size of Cyprus and spontaneous landfills to whole Belgium.

Unless there is no well-established separate collection system in our country, everyone can help their hometown not to drown in garbage. To do this, you only need to learn how to properly handle household waste.

1. At home, it is necessary to divide the garbage into two buckets: for organic waste (food and other things) and everything else that can be recycled in the future.

2. The contents of the bucket with recyclable waste should only be thrown into special tanks. To do this, find out about the availability of the nearest container for recyclable waste. If there is no such container nearby, try to talk with the residents of your house and write a statement to the Housing Office about the replacement of the container.

3. As much as possible garbage should be sorted and taken to recycling points (waste paper, PET bottles, polyethylene, plastics, aluminum cans and cullet).

4. Buy as few extra items as possible, such as plastic bags.

5. Follow the “principle of three Rs”: Reduce (reduce consumption), Reuse (reuse), Recycle (recycle).

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WASTE MANAGEMENT AS RECOVERY OF USEFUL COMPONENTS FOR THEIR REUSE

Today, humanity faces the problem of environmental pollution. In addition to the emission of gases into the atmosphere, the injection of toxic waste into water bodies, a person produces a huge amount of non-decomposable waste every day. Every year, the volume of garbage per inhabitant averages 10.6 tons. [3] Currently, many materials recovered from waste are being processed, including glass, paper, aluminum, asphalt, iron, fabrics, various types of plastic and organic waste (sources of numerous harmful substances and even bacteria and viruses). In some cases, individual waste processing processes are technically impractical or economically disadvantageous due to the prohibitive costs of material, transportation, financial and human resources. But in addition to materials that can be recycled, there are waste products that can be reused. This is called recycling.

Most of the products we use are made from natural sources. Meanwhile, rapidly growing consumption along with population growth leads to the exhaustion and complete disappearance of natural sources. To preserve the limited natural sources in production, the use of alternative methods is inevitable, and one of them is the recycling of waste.

Recycling is the reuse or recycling of production waste or garbage. Types of secondary raw materials are metals such as iron, steel, copper, aluminum, as well as paper, plastic, rubber, glass and similar waste. Appliances, batteries and fats are recyclable. The use of these wastes in production prevents the overconsumption of natural resources.

Recycling of waste along with the conservation of natural sources reduces the cost of raw materials and energy required for the production process. Another plus of recycling is the reduction in the amount of municipal solid waste to be disposed of. This reduces the damage to the environment, and reduces the area allocated for garbage.

The first step in the recycling process is to separate the waste into unusable and recyclable waste and collect it in special containers for secondary raw materials. Contribution to the recycling of waste is to help protect natural resources and prevent their waste. [1]

Waste management - the use of waste for the production of goods (products), work, services, including the reuse of waste, including reuse of waste for its intended purpose (recycling), its return to the production cycle after appropriate preparation (regeneration), as well as recovery of useful components for their reuse (recovery).

Recycling refers to the following. The first is waste management at various stages of their technological cycle. The second isensuring the reuse or recycling of waste and old or discarded products. [1]

Every person is obliged to protect the cleanliness of the environment. This does not apply solely to his living conditions. In the process of human life, in factories, in medical institutions, the appearance of all kinds of waste is normal. But according to experts, waste management is a

question that ranks first among other problems that harm the environment. If it is not addressed, then it is not global warming or ozone holes that threatens humanity. All living things on earth can die under the mountains of their own garbage.

At the moment, there is a single environmental service that defines the main types of waste such ashousehold, production, chemical, medical, food, liquid, dangerous, equipment and office equipment. [2]

It makes no sense to describe each species separately. From the names it is clear what constitutes a certain type of waste. It is more important to know that the world of high technology does not stand still. And the issue of waste management is solved precisely with the use of high technology.

In some companies, a landfill method is still acceptable. But it is it that causes a global catastrophe. Experts provided data according to which 24 million tons of hazardous waste in European countries is generated annually. And only a quarter of this is disposed of properly. The remaining 75% is simply buried at specialized landfills. Needless to say, how dangerous and harmful to the environment is it?

Basic Waste Management Methods can be divided into burning, composting and briquetting. [2]

Burning.Waste incineration is no less harmful, despite the fact that it is produced in several ways:layered;chamber; in a fluidized bed.

These are more environmentally beneficial methods. Although even in the suburban area of large cities, you can often see smoking landfills with garbage.

Composting:Only organic waste can be disposed of in this way. With the help of various microorganisms, the decomposition process is started. The result is an organic fertilizer - compost. Part of the waste contributing to the formation of parasites cannot be exposed to this method. These are meat, bones, animal fats.

Briquetting:This is a relatively new method, which involves the preliminary sorting of garbage with the subsequent layout in briquettes. The feasibility of this method is not yet entirely clear. Often it is used for further recycling of garbage.

There is a waste disposal equipment that is currently running for a given period of time. There are wastes for which none of the listed methods is acceptable. This is plastic, polyethylene, some industrial and medical waste, harmful substances and so on. Modern technologies designed to address the global issue of waste disposal, not only allow you to safely dispose of waste, but also make it a profitable business.

Enterprises use such equipment as crushers;autoclaves;dryers;granulators;magnetic separators. [4]

This is a high-tech equipment that allows not only to destroy garbage, but also to produce secondary raw materials from it. Polyethylene, paper, fuel briquettes, fuels and lubricants, household items and so on. Moreover, it helps to minimize harmful effects on the environment.

Many utilities in big cities continue to work the old fashioned way. This is a scheme worked out over the years: container - landfill - burning or burial. Needless to say, how high is the level of pollution and harm caused to humans during such work.

Enterprises that provide waste disposal services, for the most part, are private. The state is not yet interested in solving this problem. Meanwhile, the mountains of garbage in the vicinity of cities are growing, poisoning the lives of ordinary citizens. Therefore, caring citizens receive licenses from the Ministry of Ecology and organize useful business. Similar enterprises do not experience a shortage of raw materials for activities.

The garbage disposal production process consists of several stages such as collection and removal, sorting, processing.

Rubber crumb is produced from used car tires, which rubber goods manufacturing enterprises are pleased to purchase. Glass is processed into glass granules, which also do for the

further production of glass products. The usual for each toilet paper is made from recycled waste paper.

Garbage disposal, as a business, has several drawbacks. Here, manual labor is still actively used. Permits for the implementation of the activities of such an enterprise sometimes have to wait several months. But in general, this is a profitable and incredibly useful production for man and for the nature that surrounds him.

Summing up the conclusions, humanity should realize that without the adoption of new laws, rules, methods for waste disposal, and most importantly the awareness and decency of people, the planet will not become cleaner. To reduce the concentration of waste generated, community need not only to resort to methods of burning, composting, briquetting, etc., they also need not to disdain to use resources several times, as well as produce more environmentally friendly items. To date, humanity has indeed begun to take steps towards lesser consumption of toxic and non-degradable substances and a modern approach to the recycling of resources. For example, we are increasingly refusing plastic bags, replacing them with reusable bags, or paper bags, which in turn began to be produced not only from trees, but fallen leaves were also used. Small progress in this direction will soon yield results.

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