

Результати, що були отримані в ході експерименту співпадають з результатами робіт, що відносяться до дослідження поверхонь обертання [2].

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## THE EVALUATION OF OCCUPATIONAL HEALTH AND CLIMATE RISKS FROM ENERGY CHOICES

Generally accepted, that all fossil fuels contribute to global climate change as their combustion releases CO<sub>2</sub>, ozone precursors, black carbon, methane and other climate-altering pollutants. Chemicals can be transported through air, water and soil, fossil fuels pollutants may widespread well beyond their point of origin. Climate change originates risks to human health through direct impacts on heat stress, floods, drought, and intense storms, as well as through adverse impacts on air pollution, the spread of diseases, food insecurity and under-nutrition, displacement, mental ill health etc. [1].

Ambient air pollution is considered as one of the leading reasons of human death from heart attacks, strokes, chronic obstructive pulmonary disease, lung cancer and other diseases. According to the World Health Organization report in 2008, nearly 1.3 million deaths globally were related to ambient air pollution. The total number increased to 3.7 million in 2012. Two million deaths were attributable to the effects of household air pollution in 2008. This number also increased to 4.3 million according to the report based on 2012 data by the World Health Organization. More than two million premature deaths each year were related to air pollution. Globally, 7.0 million deaths were attributable to the joint effects of household and outdoor air pollution in 2012 [2].

Coal accounts for nearly 40% of carbon dioxide emissions worldwide and is regarded as major contributor to climate change. Coal waste contains toxic and radioactive elements, e.g. mercury, lead, chromium, cadmium. Combustion of coal is associated with cardiovascular and respiratory diseases, cancer, asthma, central and peripheral nervous system toxicity. To main occupational health risks belong pneumoconiosis (silicosis, anthracosis), bronchitis and lung cancer.

Similar to coal, combustion of petroleum generates a wide range of air pollutants (carbon dioxide, carbon monoxide, methane, hydrocarbons, oxides of nitrogen and sulfur, metal compounds and so on). Public and occupational health risks are associated with chemical and carcinogenic exposures, cardiovascular and respiratory diseases, lesions of the nervous system.

Natural gas combustion generates about half of CO<sub>2</sub> per unit of energy released as does coal combustion. From the other side methane is a much more potent greenhouse gas than carbon dioxide. Unconventional gas may be a source of water contamination with methane and toxic chemicals. Exposures of toxic chemicals are also of great significance.

The risks from hydroelectric power production is associated with dams and consist in altered water flow, reduced water quality, disruption of fish migration, loss of wetlands and species extinction [3]. Decomposition of organic matter following flooding leads to the release of carbon dioxide and methane. Hydroelectric projects may also increase the risk of infectious diseases. Dam failures can be catastrophic to populations living downstream.

Each step in nuclear energy production produces radioactive and chemical emissions, as well as wastes that contaminate water sources and food chains. The health impact among people living near nuclear power plants remain controversial; a range of studies found increases in the incidence of cancer. In addition to the routine risks of nuclear power, nuclear accidents may result in physical and mental health effects.

Nowadays mature, robust and affordable renewable energy technologies are available and up to the task of replacing hazardous conventional energy sources. For example, renewable power plants based on wind and solar in just one single year of 2011 – the year of Fukushima accident, were capable of generating as much electricity as 16 large nuclear reactors. In one year renewables had helped to reduce carbon dioxide emissions in the European Union by the equivalent of the annual emissions of Spain [4].

Three technologies are used solar energy generation: photovoltaic cells, concentrating solar power thermal systems and solar towers. Solar energy is clean and limitless; it is an inconsumable resource that does not generate air pollution. The major health concern from solar power is associated with hazards typical for manufacturing industries such as injuries, traumas, professional diseases, noise, vibration, electric current, chemical exposures (cadmium, arsenic, chromium, lead, arsine, phosphine, silane, copper indium diselenide) and so on. Environment emissions are comparatively low. However, waste management and end-of-life product disposal are important.

Wind is a clean energy; no air or water pollution is generated. A 500kW wind turbine releases the CO<sub>2</sub> cleaning process equal to 57000 trees [5]. Climate impact of wind energy sources as a rule is associated with equipment manufacture. In some European countries wind turbines are banned to be installed within national parks because of their environmental effect or nearby them (the influence on wild birds population). The other drawbacks are noise from moving gear trains and turbine blades, visual impact on the landscape and stress related disorders. Overall health impact for wind energy to be far less than that of any of fossil fuels. Health benefits of wind power include the absence of greenhouse gases emissions during operation and the absence of routine waste streams.

According to ReMAP (IRENA's methodology) the share of renewables would rise to 50% by 2030 (compared to 29% in 2015); in the end-use sectors renewables would account for shares of 42% in buildings, 36% in industry and 17% in transport [6]. The potential would result in nearly 350GW of wind power and 250% GW of solar power, while other technologies including hydropower, biomass, geothermal and marine energy would contribute nearly 50 GW.

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## **ДОСЛІДЖЕННЯ МЕТОДІВ ОЦІНКИ ВЕЛИЧИНИ НАПРУЖЕНОСТІ РОБОТИ ВОДІЇВ НА МІСЬКИХ АВТОБУСНИХ МАРШРУТАХ**

Міський автомобільний транспорт є складовою частиною єдиної транспортної системи країни, який здійснює перевезення пасажирів разом з іншими видами пасажирського транспорту. Найбільшу частку серед всіх видів перевезень (70%) займають автобусні перевезення. Організація перевезень пасажирів повинна забезпечувати найменший час поїздки пасажирів, регулярність руху транспортних засобів на всьому шляху прямування, раціональне використання рухомого складу, безпеку й високу культуру обслуговування пасажирів з прийнятними витратами.

Для отримання вихідної інформації було проведено натурне обстеження маршрутної мережі КП «Київпастранс». В основу дослідження були покладені натурні спостереження та метод експертних оцінок.

Встановлено, що основними групами факторів, які впливають на роботу водіїв міських автобусів є фактори[1], наведені на рис. 1.