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Review of the Russia-Ukraine War and its Impact on Public Health

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ABSTRACT

Introduction This paper adopted a desk review of existing information from peer-reviewed articles, scientific reports, and grey literature through triangulation of data sources. This article aimed to provide a concise and comprehensive overview of some environmental and public health problems resulting from the Russia-Ukraine war.

Conclusions Just sixteen months into the face-off, the crisis has been characterized by diverse public health challenges such as environmental-induced pollution; nuclear and technological threat; energy crisis; food insecurity; humanitarian castatropic; and the likelihood of a surge in COVID-19 and other infectious diseases. The escalation of conflict in Ukraine has caused civilian casualities, forcing people to flee their homes seeking safety and protection. So far, it is estimated that 9,083 civilians have been killed and 15,779 injured in Ukraine; with over 18 millions refugees diplayed within and outside Ukraine as of 19th June, 2023. Furthermore, the war has notably triggered food price spike, economic pressure and social stress in most part of Africa, with the inclination to precipitate political upheaval especially in volatile countries in the continent. We opined that prompt attention should be given by international bodies and humanitarian agencies to restore public health sanity in Ukraine by providing critical protection services and humanitarian assistance. Conclusively, a cease-fire by the belligerent nations remains the only panacea to the highlighted problem.

Keywords Armed Conflicts; Ukraine; Russia; Environmental Health; Public Health; Epidemiology

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Introduction

The United Nations was established after World War II (WW II), which raised expectations of a new era of peace. However, as evidenced by the multiple wars that the world experienced after WW II, this was a false hope. The conflicts of the twenty-first century are frequently characterized by guerilla-style civil wars, in which women and children are not only the primary victims but are specifically targeted [1]. Some of these wars include but not limited to the following: Israel-Palestine crisis (2021); Yemeni civil war (2015-present), Gaza war (2014), Libyan crisis (2011-present), Syrian civil war (2011-present), Boko Haram crisis (2009-till date), second Lebanon war (2006), Iraq war and insurgency (2003-2011), war in Afghanistan (2001-2014), second intifada (2000-2005) etc. All kinds of armed and political confrontations, as well as other unresolved issues dating back to the 20th century, can be blamed for the beginnings of the multiple wars waged in the 21st century. Although ethnic and religious prejudice appears to be the main cause of most wars today, other causes-including territorial expansion, resource appropriation, corruption, nepotism, and neo-colonialism- are quickly gaining importance.

As the carnage and vindictive blood-bath in eastern Europe rage persistently, there is ongoing international anxiety that this crisis with all its oscillations and antecedents has in its nucleus the prospect of plugging the world into yet another global crisis (WW III). The Russian military invasion of Ukraine on February 24, 2022, Russia's occupation of Crimea in 2014, and the conflict in the Donbas are not just disputes or conflicts between Russia and Ukraine, but rather a continuation of the cold war and a fundamental ideological conflict between the capitalist and socialist blocs.

Following the Ukrainian Revolution of Dignity in February 2014, Russia annexed Crimea and separatists backed by Russia seized a portion of southeast Ukraine, sparking the Donbass War [2,3]. Russia begins a significant military buildup along its border with Ukraine in 2021, sparking an international confrontation. Russian irredentist ideas that questioned Ukraine's legitimacy to statehood and the North Atlantic Treaty Organization's (NATO) relationship with Ukraine inspired and promoted this action [4-6]. These events culminated on February 24, 2022, in a full-scale military invasion of Ukrainian territory by Russian forces. This was followed by missile and airstrike attacks on buildings and monuments throughout Ukraine, including the capital Kyiv, and a sizable ground invasion from a number of directions [7]. There was widespread condemnation of this Russian intervention, including by the United Nations General Assembly, which passed Resolution ES-11/1. Numerous countries imposed fresh sanctions, causing Russia to go bankrupt, while numerous nations have continuously provided Ukraine with humanitarian and military aid. Protests were held around the world in support of Ukraine; however, any rallies held within the borders of Russian territory were treated with widespread skepticism and increased media restriction, including the banning of the terms "incursion" and "war."

The threat of a negative feedback loop between conflict and public/environmental health is illustrated by the continuing war between Ukraine and Russia. Conflict-related environmental pollution, food shortages, health issues, bioterrorism, gender-based violence, risks of infectious diseases, long-term dangers, mental and psychological trauma, post traumatic stress disorde decreased life expectancy, and other factors disrupt public health and have a variety of manifestations [8-10]. This article provides a concise and comprehensive overview of some of the environmental and public health problems resulting from the Russia-Ukraine war. It sought to raise awareness among the general public and spur immediate action from international and humanitarian organizations regarding the necessity of resolving environmental disasters and restoring public health integrity in Ukraine, which has wider ramifications not only within Ukraine but also throughout Eastern Europe and the world.

Historical Background of the Crisis

Russia and Ukraine may have the same origins and a similar history. The two countries share an Eastern European-wide Slavic identity. Only briefly (1917–1921) before the founding of the erstwhile Union of Soviet Socialist Republic (USSR) was Ukraine separated from Russia. Despite having a large territorial force, Ukraine has always been ruled by Russia and the Russian culture. It is crucial to note that there were cultural exchanges between the populations of Ukraine and Russia during the Soviet Union era, with both countries acting as homes for the other residents. But following the collapse of the USSR in 1991, Ukraine started to exist as an Independent Republic and is now the second-largest nation in terms of landmass in Europe.

After the Soviet Union (USSR) collapsed in 1991, Ukraine and Russia have continued to have close ties. As a non-nuclear state, Ukraine agreed to accede to the Treaty on the Non-Proliferation of Nuclear Weapons in 1994. All of the former Soviet Union's nuclear weapons were relinquished by Ukraine to Russia after the signing of this pact, where they were destroyed [11]. Through the Budapest Memorandum on Security Assurances, the United Kingdom, the United States, and Russia nation declared their commitment to uphold the political independence and national unity of Ukraine in reaction to this act [12, 13]. The Charter for European Security, signed in 1999, "reasserted the intrinsic right and liberty of each participating member state to select or alter its

security blueprints, including treaties of alliance, as they emerge" [14]. Russia was one of the signatories to the Charter. Many former Eastern Bloc countries joined NATO in the years following the fall of the USSR, much to the dismay of Russian officials, who saw the move as a violation of Western powers' promises that NATO expansion would not move eastward [15].

Ukrainian nationalism has been a contentious issue both domestically and regionally. Ukraine has been entangled in the web of monotheistic and pluralistic nationalism over the years. According to the Monists, the unifying factor of Ukraine as a nation-state must be Ukrainian identity. In contrast, Pluralists hold the belief that Ukraine belongs to everyone, both Ukrainians and non-Ukrainians, especially the Russian minority. Similar to this, these two ideologies have led to conflict in the majority of the world's nations. Russia believes that if Ukraine secedes from the Soviet Union, this will lessen its dominance in the country that was previously the USSR [16]. All Russian authorities, present and past, hold this ideology in high regard and would like all of the former Soviet Union's nations to be their client states. Aside from political considerations, Russia wants to be the de facto guardian of the Russian-speaking citizens of Ukraine. As a result, Russia has consistently favored Pluralist nationalism in Ukraine over the concept of self-determination [17]. Additionally, the only two nations standing between Russia and NATO are Ukraine and Belarus, creating a huge buffer. On the other hand, Belarus is a Russian puppet, and Ukraine has made a concerted effort to play on the tension between the West and Russia. This includes Ukraine's desire to join NATO and move the alliance to its neighbor Russia's doorstep.

The current conflict might be seen as the culmination of the little occurrences previously covered in this article. Nevertheless, there are a few circumstances that have contributed to the huge crisis and the events' automatic progression.

Volodymyr Zelensky, the country's current president, scored a resounding victory in the general election held in 2019, which was marred by conflict. This individual has been one of the most outspoken opponents of Russia and its meddling in the resource-rich and industrially important Donbas region of eastern Ukraine. Russia has been actively influencing events in Donbas continuously since 2014. It allows for the coexistence of Luhansk and Donetsk, two separate provinces with pro-Russian governments. After the invasion of Crimea, Ukraine experienced an outpouring of international comfort and assistance, including military aid capable of inciting Moscow. Russia has been fervently seeking a change of government in Ukraine ever since. This clarified the reason why Russia has been intolerant and has been preparing its military for war in Ukraine for the past three years. Russia abhors Ukraine's cooperation with the West. Putin's Russia believes that Ukraine will soon be accredited with NATO and the European Union (EU).

Environmental and Public Health Issues

Air Pollution

The first few months of the crisis were marked by attacks on military architecture in Ukraine by Russian forces, including those proximal to civilian habitations. Attacks on ammunition dumps, fuel storage tanks, and bombing of arsenals led to fires that emitted air pollutants, heavy metals, and other high ionizing substances that affected the civilian population and posed a danger to local and regional air quality [18, 19].

Copious evidence from numerous scientific literatures, warfare analyses, and surveys by humanitarian deminers have shown the acute and chronic dangers associated with explosives-linked heavy metals, energetic compounds viz Trinitrotoluene (TNT), Hexogen (RDX), and propellants from missiles and rockets (Table 1) [20-23]. Evidence have also shown that heavy metals pollution and aerosols cause numerous deleterious and chronic health impacts on human; and that their toxicity poses a perennial problem for the total environment due to their persistence and non-degradability [24-27]. Thus, the health of the Ukrainian population and even future generations are at greater risk, as these hazards will persist for a long even after the cessation of the acute violence.

Inaccessibility to Portable Water and Water Bodies Pollution

Nearly 100,000 people were deprived of water supply before the incursion due to the destruction of water facilities. This scenario has constituted a nagging problem since the Donbas War in 2014 [28, 29]. Various United Nations (UN) and humanitarian agencies have documented the widespread destruction of hydro facilities in the ongoing war. The World Health Organisation (WHO) cautioned that this situation could create marginal environmental problems attributed to the spread of contagious diseases arising from the lack of clean and portable water [30].

The use of grenades in urban sprawl areas would lead to the damaging of sewers resulting in the generation of sewage run-off. Over the years, sewage has been recognized as a significant source of water contamination, especially in the urban environment [31]. Thus, the heterogeneous composition of sewage provides a congenial medium for the growth of divergent heterotrophic microbial populations, prominent among which are the fecal coliforms- a culprit in major epidemics of diseases caused by water-borne pathogens [32-34]. Thus it will not be surprising if epidemics of water-borne diseases become an offshoot of the ongoing imbroglio in Ukraine.

Table 1. Different types of heavy weapons used in warfare and their health impacts

Types	Health impacts
Heavy metals	
Iron (Fe)	At high doses, it causes inflammation of the stomach lining and ulcers.
Copper (Cu)	At high doses, it causes vomiting, nausea, abdominal pain, and kidney and liver damage.
Chromium (Cr)	Chronic inhalation of Cr(VI) compounds increases the risk of lung, nasal, and sinus cancer. Severe dermatitis and painless skin ulcers can result from contact with Cr(VI) compounds.
Tungsten (W)	It irritates eyes and skin; and causes diffuse interstitial pulmonary fibrosis; loss of appetite; nausea; cough; and changes in the blood.
Uranium (U)	Large concentrations cause lung cancer, kidney damage, and cancers of the bone or liver.
Beryllium (Be)	It causes breathing difficulties, liver enlargement, spleen, right heart, and kidney stones.
Zinc (Zn)	It causes nausea, vomiting, diarrhea, metallic taste, kidney and stomach damage.
Propellants	
Nitrocellulose (NC)	Exposure can cause headaches, nausea, vomiting, dizziness, difficulty breathing, and loss of consciousness.
Nitroglycerine (NG)	Exposure causes headache, dizziness, lightheadedness, nausea, and flushing.
Dinitrotoluene (DNT)	The primary targets of DNT toxicity are the hematopoietic system (cyanosis, anemia, and leukocytosis), the cardiovascular system (ischemic heart disease), the nervous system (tremors, paralysis, paresthesia in extremities), and the reproductive system (reduction of sperm counts, alteration of sperm morphology, and spermatogenesis).
Nitroguanidine (NQ)	It causes eyes, skin, and respiratory tract irritation.
Ammonium perchlorate (AP)	Inhalation causes nose and throat irritation. High levels can interfere with the ability of the blood to carry oxygen, causing methemoglobinemia
Lead (Pb)	Exposure to high levels of lead may cause anemia, weakness, and kidney and brain damage.
Explosives	
Trinitrotoulene (TNT)	It causes anemia, abnormal liver function, skin irritation, and cataracts.
Hexogen (RDX)	It causes anemia, abnormal liver function, skin irritation, and cataracts—convulsions and unconsciousness accompanied by headache, dizziness, and vomiting. Ingestion can cause liver and lung cancer.
Pentaerythritol tetranitrate (PETN)	Exposure causes headache, dizziness, irritability, convulsions, hypotension.
Dintroanisole (DNAN)	It causes mild ocular and skin irritation. It is a neurotoxicant. Presently there is no consensus on the mode of DNAN toxicity.
Nitrotriazolone (NTO)	It causes skin, eye, and respiratory irritations.
Pyrotechnics and obscurants	
Hexachloroethane (HC)	It acts primarily as a central nervous system (CNS) depressant in humans when acutely exposed—moderate irritation to the skin, mucous membranes, and liver in humans.
Anthracene	Exposure in humans causes headaches, nausea, loss of appetite, inflammation, or swelling of the stomach and intestines.
White phosphorus (WP)	Exposure causes severe burns upon contact with the skin or eyes. Eye, respiratory tract, and severe gastrointestinal irritation. It causes life-threatening organ impairments such as cardiac arrest, fatty infiltration of the liver and kidney, and hepatomegaly. Hematological and neurological effects have also been observed.
Red phosphorus (RP)	Inhalation of red phosphorus causes respiratory tract irritation, coughing, and bronchitis.

Russian troops have also attacked several Ukrainian vessels and ports, with non-combatant cargoes, in the Black Sea since they invaded Ukraine. Similarly, the Ukrainian forces are guilty of the same. Many of these vessels blown up were conveying fuel, ammunition, and chemicals, resulting in local spills. These scenarios will resultantly lead to the death of marine organisms, disruption of the natural biota of the water body, and bioaccumulation of pollutants in the marine organisms [35]. When pollutants or their leachates are inadvertently dumped in the environment, they percolate through the soil profile and contaminate the aquifer [36, 37].

Technological and Industrial Devastation

Ukraine is a densely industrialized nation with numerous metallurgical works, chemical processing plants, and mines, posing a huge technological disaster. The Donbas region is Ukraine's industrial heartland and is notorious for its high level of environmental contamination even before the advent of the current war [29]. Throughout history, the region has been battling with the management of its toxic wastes arising from chemical manufacturing, metallurgy, and coal mining [2, 29]. Thus this ongoing war has the propensity to aggrandize the environmental contamination in this region and increase the incidence of occupational-related accidents and diseases due to unwholesome working ambiance [38]. Although the bellicose parties are oblivious to these environmental risks, the intensification of war for political gains beclouds their sense of humanity.

Nuclear and Radiation Disaster

The ongoing war poses a threat to four nuclear industrial-related sites in Ukraine. The capturing of the Chornobyl facility by the Russian troops instigated a global arousal, as radiation monitoring reflected a spike in the readings of several radioactive substances. However, this was afterward associated with particulate resuspension created by the movement of combatants in the Exclusion Zone. Other scary incidents in the ongoing war are the near miss of Russian missiles at the radon radioactive waste disposal site near Kyiv and the shelling of Zaporizhzhia Nuclear Power Plant, hosting six of Ukraine's fifteen nuclear reactors. These scenarios create a global reminiscence of the Chornobyl disaster of April 1986, which remains the largest

nuclear disaster in human history. This disaster led to widespread environmental contamination in many European countries and caused health, economic, and social havoc [39-41].

Food Crisis

The current battle also has resonating effects beyond the shore of Ukraine, as the nation is christened the "breadbasket of Europe" and is a prime supplier of crops for countries across the globe, according to the Food and Agriculture Organisation (FAO) [42].

Ukraine and Russia are the leading grain exporters in the world; consequently, the ongoing crisis, if not nipped early, can create price spikes that will exacerbate food (grain) unavailability globally. Ukraine exports nearly half of its corn and wheat to Africa and the Middle East; these regions are already belabored with food insecurity and could be endangered by food crises due to the ongoing conflict [43]. A significant proportion of this export comes from the threatened eastern region of Ukraine, and the UN has alerted that any brawl that goes further than the separatist-controlled area could precipitate famine [44].

Humanitarian Castatrophes

The war in Ukraine, barely more than four months since its inception, has resulted in the loss of thousands of lives and also led to millions of people fleeing their homes. This conflict has led to the worst refugee scenario Europe has witnessed since World War II. According to the Office of the High Commissioner for Human Rights (OHCHR), estimated civilian casualties of 24,862 have occurred: 9,083 killed and 15,779 injured in Ukraine as of 18th June 2023. Of those annihilated, 535 have been affirmed to have been juveniles, and 1,047 children injured. However, the real casualties could be significantly higher than reported [45].

According to the United Nations High Commissioner for Refugees (UNHCR) [46], more than 8.2 million refugees from Ukraine have been recorded across Europe, with more than 5.4 million people remaining internally displaced as of 6th of June, 2023.

Most of these refugees in countries neighboring Ukraine in order of magnitude are Russian Federation (2,852,395), Poland (1,593,860), Germany (1,061,623), Czech Republic (516,100), United Kingdom (203,700), Belarus (22,820) and other European countries (1,957,479). It is important to note that the numbers of casualties and refugees are accelerating daily due to the dynamics of the war. Hence, Eastern Europe might be on the edge of the precipice, and this could snowball into another global imbroglio if the situation is not curtailed early.

Spread of COVID-19 and other Infectious Diseases

Before the entry of Russian troops on Ukraine soil, the country was struggling to curtail the spread of the COVID-19 pandemic [47]. It was tardy to launch its Covid-19 vaccination campaigns vis-à-vis other countries in Europe. While the government spurred the citizens to get immunized, most of the populace found it difficult to get the shot or showed widespread vaccine skepticism [47].

Consequently, only 34.07% of the Ukrainian population had been fully vaccinated as of 25 February 2022, making it the least-vaccinated country in Europe [48]. Ukraine experienced a surge in cases attributed to the Omicron variant in November and another peak in the first week of February, mostly likely ascribed to its low level of vaccination [49]. According to the WHO [50], there have been over 5.53 million infection cases in Ukraine since the inception of the pandemic, resulting in 112,210 deaths as of 15 May 2023. Although cases have dwindled, the ongoing crisis could accelerate the spread of the virus due to a lack of testing and vaccination.

This relatively low vaccination in Ukraine, coupled with the unvaccinated refugees moving to the neighboring countries, could trigger a spike in the cases of COVID-19 in Eastern Europe. In addition to the political and social upheaval caused by the ongoing war, not only are spikes in the infections of SARS-CoV-2 and other infectious diseases [diarrheal-related disease, tuberculosis, and sexually transmitted disease] inevitable, but there is also a high propensity for new variants to emerge, which put the globe at greater risk [51, 52].

This assertion is valid, going by the reminiscence of World War 1, where armed conflicts facilitated the spread of epidemic and pandemic diseases and thus resulted in the death of millions of people across the globe [53].

Energy Crisis

The Ukraine-Russia war, in addition to the enormous human cost, has upended the global energy system, and the price spikes are symbolic of a global scramble for fossil fuels as nations in Europe and other parts of the globe strive to substitute Russian energy exports. This posed a question mark over the sustainable deliveries of energy to the European bloc [54]. The European Union (EU) heavily depends on Russia for its oil and gas, as more than a quarter of the EU's imported crude oil comes from Russia. The European Commission has announced plans to cut the EU's dependence on Russian gas by two-thirds this year, including a ban on energy imports from Russia among sanctions imposed on Moscow. Such an embargo would squeeze European households, probably leading to gas rationing [55].

Moreover, the disruption of the global maritime trade of oil tankers and bulk cargo ships navigating the black sea from Russia and Kazakhstan will have a devastating consequence on global oil supply [56]. The dwindling supplies of Russian oil and natural gas to the world markets will have cascading impacts and further heighten the cost of coal and Liquefied Natural Gas (LNG). Unfortunately, all these are ominous indications of a more excruciating global oil price hike that will persist for a longer time, even if the crisis ends abruptly [57].

Public Health Impacts of the War on Africa

The Russia-Ukraine crisis came at a period when most African countries have been sapped by the COVID-19 pandemic and are yet to recover fully from its socio-economic repercussions. Africa largely depends on food importation from Russia and Ukraine, and within a few months of the crisis, the continent is already experiencing price spike and disruption in the supply chain of wheat, sunflower, and other grains/cereal crops. Consequently, this crisis will greatly impact food security in Nigeria and other African countries [58].

Also, Russia is one of the largest fertilizer exporters in the world. Hence, the sanctions imposed on Russia by Western nations will greatly impair commercial fertilizer flows between Russia and Africa due to the cessation of important port operations in the Black Sea [58]. The ripple effects of fertilizer shortage in Africa will be escalating food prices, with knock-on effects on agricultural production and food security. Simultaneously, the global fluctuation in crude oil prices is expected to lead to soaring fuel prices and higher food production costs. This increasing food prices and economic pressure may not only trigger civil uproar but precipitate political unrest and imbroglio across the continent. A good example to corroborate this assertion is the Arab Spring in 2011 which was stimulated by food price rises [58].

The war in Ukraine has also diverted global political interest away from Africa's problem, making it a herculean task for the United Nations to lead international peace-making efforts in the most volatile countries in Africa. Most international organizations are donating funds to support Ukraine's refugees, and many donor countries are diverting more money to national defense to boost their military prowess against external aggression. The Ukraine crisis, therefore, will notably escalate political tension and economic and social stress in African countries that are already on the edge of a precipice due to climate change and teeming population crises. Countries like Nigeria and those in the Horn of Africa and the Sahel have latent or actual conflicts that will be intensified [59].

Epidemiology of the War and its Effect on Health

Epidemiology, a principal discipline in public health, is a viable tool for quantifying morbidity and mortality arising from war, and it elucidates the determinants of these outcomes. It has been enunciated that 2 to 3% of all mortalities globally are ascribed to intercontinental grievances, including conflict-linked injuries. Hence the importance of epidemiologic analysis to pinpoint predictors and mitigate the probability of dying from these causative factors is paramount. The health implications of conflict do not halt with damages arising from the imbroglio. Crude estimates surmise that for every life taken explicitly by war, nine will be annihilated implicitly-albeit the estimate varies with the magnitude of the crisis and the fundamental conditions for health in the belligerent nations. War rapes the environment and distorts its aesthetics. The ongoing war in Ukraine has witnessed the intentional targeting of both the built environment and the health services intrinsic to them. These acts have negatively impacted health services and public health due to inaccessibility to health facilities by health workers and patients; and impediment to transportation of essential health goods. Thus conflict-related injuries and trauma will aggravate owing to lack of access to vaccines and medical supplies, insecurity, and lack of access to lifesaving drugs [60]. Health outcomes, particularly among gravid mothers and infants, will swiftly degenerate since it is a fact that child and obstetric-related mortality are predominantly high during armed conflict [61]. The physical and mental health problems encountered by the millions of refugees and internally displaced persons will be significant, and the indelible cicatrix of physical bruises and psychological trauma suffered by millions in Ukraine will be felt for a chronic time after this crisis is over. Also, the conflict has the propensity to exasperate the risk of gender-related violence, maternal health issues, and bioterrorism and drastically reduce life expectancy. Before the war, life expectancy in Ukraine was relatively low, and it is more likely to dwindle in the years to come due to this conflict [62, 63].

This article is limited to the information available at our disposal. Still, the true magnitude of the humanitarian disaster, public health, and environmental impacts of this ongoing war can only be assessed and quantified after the imbroglio. It is recommended that all necessary pundits, facilities, and finance to adequately recognize, examine, and remediate the environmental hotspots and address the congenial public health issue should be promptly made available. International bodies and humanitarian agencies should prioritize providing critical protection services and humanitarian assistance as displacement and needs grow exponentially. To mitigate the worst effects of COVID-19, it is pertinent to vaccinate incoming refugees and also protect the health systems and humanitarian services in Ukraine. This article opined that to mitigate the social and economic stress posed by this current crisis on Nigeria and Africa, it is exigent for African countries to invest more in large-scale agricultural and food productivity by taking advantage of their large arable land. This will help to reduce its dependence on food importation from outside the continent and help tackle food and nutritional insecurity caused by external shocks. Likewise, the Africa Union and governments need to step out of their neutrality and be proactive by stepping in and exert pressure on Russia to end this war. Lastly, to circumvent future food price crises instigated by escalating global oil and gas prices, African nations must boost their oil and gas

production and exploration capability to fill any lacuna that may result from disruption in the supply chain among the major global producers.

Conclusion

Numerous precarious events emanate from the current crisis that call for prompt policing based on the aforementioned discourse. Most notable are the risks of radioactive disaster around nuclear plants or spillage of radioactive wastes from storage facilities. Also, the crumbling of environmental governance in the municipal centers of Ukraine will, in the short and long term, constitute deleterious consequences in conjunction with poor solid waste management, which could aggravate further public health and environmental risks. The large refugee camps set up across adjoining countries of Ukraine could serve as conduits for the global spread of COVID-19 and other contagious diseases. It is important to stress that a pandemic does not halt war. The war creates enabling conditions for infectious diseases to thrive due to densely crowded habitations, forced transboundary migration, and limited access to health resources, thus resulting in more suffering and mortality.

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