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# From Economic Recovery to Global Food Security: The Urgent Need to Demine Ukraine

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*The Tony Blair Institute for Global Change thanks The Howard G. Buffett Foundation for supporting our work on mine action in Ukraine, without which this report would not have been possible.*

## Foreword

In the autumn of 2022, I visited a business producing tomato paste in Kherson. Workers were restoring the plant in the wake of the occupation, but they could not resume operations since the land where they grew tomatoes was impacted by landmines. This meant hundreds of people were left without work, unable to support themselves or their families, because they simply did not have access to the fields to harvest the tomatoes. This is just one example, but too many of these stories are arising across Ukraine, disrupting our economy and preventing the export of basic goods to many of the most food-insecure countries across the globe.

We often describe Ukraine as the most mine-affected country in the world since the second world war. This is not a generalisation, not just strong words. This is about hundreds of businesses in frontline and de-occupied cities that cannot work. This is about thousands of people who do not have jobs. Even worse, this is about the more than 1,000 victims of explosive ordnance.

In fact, more than 25 per cent of the country, or more than 139,000 square kilometres of Ukrainian land, needs to be surveyed. A huge area of land that could have been sown and harvested cannot be used productively. This is a significant blow to both Ukraine's economy and global food security. Until 2022, Ukrainian agricultural products could feed 400 million people around the world annually.

This report demonstrates why demining Ukraine is so crucial both for the country and the wider world. Without this, Ukraine's economic recovery will not fully begin. Demining is phase zero of the recovery process. The report finds that compared to 2021, mines and explosive ordnance impact Ukraine's GDP by \$11.2 billion annually. For frontline regions such as Kharkiv, Mykolaiv, Sumy and Chernihiv, the impact exceeds 20 per cent of pre-war GDP. Exports are reduced in value by \$8.9 billion annually, while regional tax revenues are reduced by \$1.1 billion.

Therefore, it is a critical priority of the government to clear explosive ordnance from agricultural land and return the land to productive use as soon as possible. This will contribute to the resilience of both the Ukrainian and European economies. It will also allow Ukraine to regain its position in global food-supply chains, preventing worsening hunger, especially in the global south.

The government of Ukraine has set an ambitious goal of returning 80 per cent of Ukraine's territories potentially affected by mines to productive use in ten years. This will require significantly increased investment, as the World Bank estimates that fully demining our country will cost \$34.6 billion. We also need 10,000 deminers, a third of whom are already working in the field, and demining equipment, including Ukrainian-made appliances. This sector is being actively developed, supporting not only Ukraine's security but also its economy. We are also actively testing innovative approaches to land surveys, including the use of drones and artificial intelligence. All these steps are included in the National Mine Action Strategy.

I am grateful to the Tony Blair Institute, partner countries that support our efforts and philanthropists such as Howard Buffett who are making a real difference for Ukraine. Thanks to them, millions of people around the world can prepare bread from Ukrainian grain every morning.

Only together can we make our land safe and, as a result, provide food to the most vulnerable people around the world. Thank you for being with us. We will never forget it.

Yuliia Svyrydenko

First Deputy Prime Minister of Ukraine, Minister of Economy of Ukraine

# 02

## Executive Summary

As of September 2024, roughly 139,300 square kilometres of land across Ukraine – an area larger than England – is in need of surveying for landmines and explosive remnants of war (ERW).<sup>1</sup> In addition to the immense humanitarian cost of landmines, restrictions on activity on potentially mined land have stifled agricultural production and impeded the recovery of the Ukrainian economy.

This report by the Tony Blair Institute for Global Change (TBI), in collaboration with Ukraine's Ministry of Economy, estimates that mines and ERW in Ukraine cost Ukraine more than \$11 billion in gross domestic product (GDP) per year. The World Bank estimates that fully demining Ukraine will cost as much as \$35 billion. This means that, should the funding needs for demining be met in full, it would take less than three and a half years for Ukraine to realise a return, just in terms of GDP.

While Ukraine has often been labelled the breadbasket of Europe, its impact on the supply of food reaches far beyond a single continent. In fact, the World Food Programme estimates that Ukraine produced enough food in 2021 to feed 400 million people worldwide,<sup>2</sup> with most of Ukraine's agricultural exports purchased by developing countries in Asia and Africa.

This means that landmines are not just a problem for Ukraine – they are a global issue. As an example, with wheat production in Ukraine having fallen by more than 40 per cent since the beginning of 2022, exports of wheat are projected to hit a ten-year low this year.<sup>3</sup> This has driven an increase in global food prices which disproportionately affects food-insecure communities across the Middle East, North Africa and elsewhere.

In spite of the clear social, economic and humanitarian imperative to demine Ukraine as quickly as possible, funding remains inadequate. Of all official development assistance (ODA), global mine-action funding amounted to just \$798 million in 2022, of which Ukraine received less than 50 per cent.<sup>4</sup> In particular, funding is urgently needed to address two of the most pressing issues hampering mine action in Ukraine – shortages in personnel and equipment. To this end, the establishment of innovative financing mechanisms has the potential to unlock increased scale, long-term predictability and

diversity of funding.

It is crucial that more be done to expand the provision of foreign aid to demining, as well as establish new sources of private-sector funding. Ukraine is no longer just the breadbasket of Europe; it is a cornerstone of food security across the globe. We must ensure it remains so.

## 03

# The Impact of Mine Action on Ukraine

## THE CONTEXT: LANDMINES AND ERW IN UKRAINE

Landmines and ERW pose a significant threat to Ukraine, endangering the civilian population and rendering productive land and critical infrastructure unusable. The scale of explosive ordnance that has been deployed since Russia's full-scale invasion of Ukraine is immense.<sup>5</sup> The situation continues to evolve; Russia fires an estimated 10,000 artillery shells each day, including older and degraded munitions with particularly high failure rates.<sup>6,7</sup> Ukraine is now considered to be the most heavily mined country in the world, with roughly 139,300 square kilometres of land – almost a quarter of the country – in need of survey for landmines.<sup>8</sup> While just a fraction of this land may be mined in reality, safety concerns dictate that it is off limits in its entirety until deminers can conduct surveys and confirm which areas are secure.<sup>9</sup> In the meantime, the prohibition of activity in territory in need of surveying inflicts a myriad of impacts on Ukraine's society and economy: farmers are prevented from working their plots, damaged power stations stay offline and civilians remain displaced from their homes.

To further understand the impact of unexploded ordnance in Ukraine, TBI has conducted analysis assessing the economic impact of landmines and ERW. An economic model developed as part of this analysis estimates the impact of landmines and ERW on Ukrainian GDP, regional tax revenues and exports. For further detail on this model, please refer to the accompanying [Methodology Note](#).

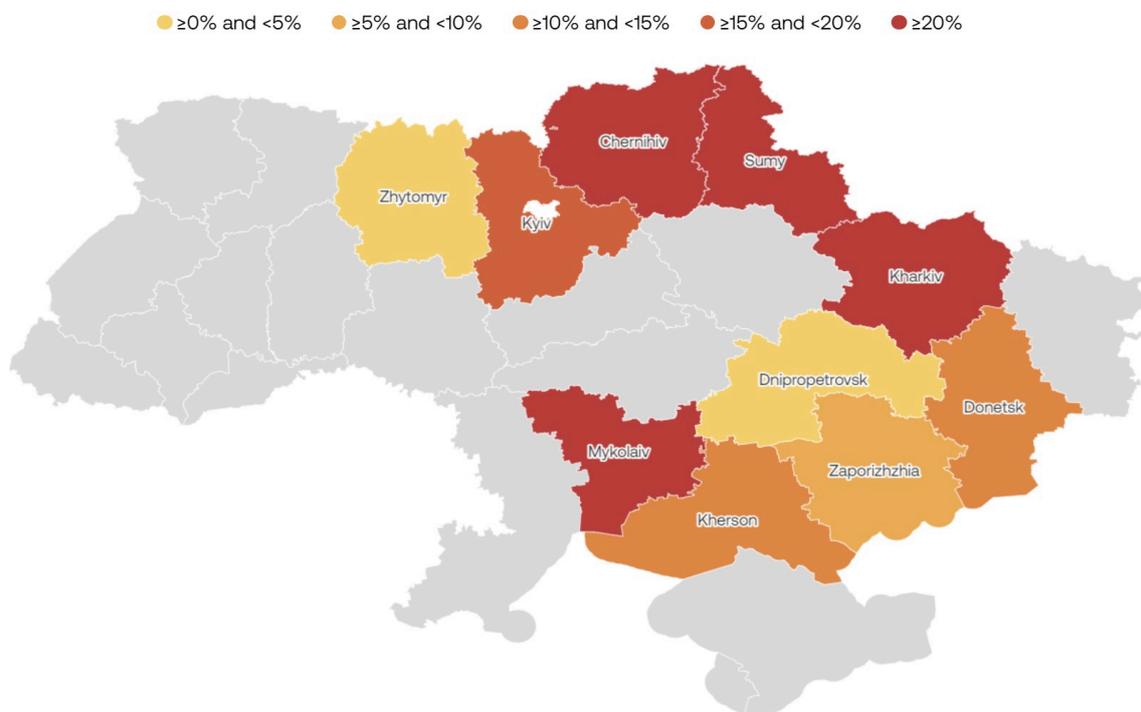
## THE IMPACT OF LANDMINES AND ERW ON THE UKRAINIAN ECONOMY

Ukraine's economy has been significantly impacted by Russia's full-scale invasion: Ukrainian GDP contracted by almost 30 per cent in 2022 and is only expected to reach pre-war levels in 2030.<sup>10</sup> The stifling of activity in areas affected by landmines and ERW is one of the most salient ways in which the war has affected the economy. Our model estimates that, at current levels, landmines and ERW are suppressing Ukraine's GDP by \$11.2 billion each year –

equivalent to roughly 5.6 per cent of GDP in 2021. In the most heavily affected oblasts (administrative divisions) – Kharkiv, Mykolaiv, Sumy and Chernihiv – we estimate that the annual impact on regional GDP exceeds 20 per cent.

FIGURE 1

## The impact of landmines and ERW on GDP varies significantly across oblasts



Source: Tony Blair Institute for Global Change: Landmine Economic Impact Assessment

The magnitude of the impact of landmines and ERW on GDP reflects the vast tracts of land that have been rendered unproductive due to unexploded ordnance. This is particularly pertinent to agriculture – the lifeblood of Ukraine’s rural economy – which, unlike many other sectors, cannot easily be relocated from affected areas to unaffected ones. An estimated 28,000 square kilometres of agricultural land has been abandoned across Ukraine as a result of landmines and other impacts of the war; this lost agricultural production cannot be made up for elsewhere in the country.<sup>11</sup> In Kherson Oblast, where we estimate landmines and ERW are suppressing regional GDP

by between 10 and 15 per cent, the situation has been exacerbated by Russia's destruction of the Nova Kakhovka dam, which has spread thousands of landmines and flooded tens of thousands of hectares of agricultural land.<sup>12,13</sup>

Regional administrations in Ukraine collect a variety of taxes, including property, income and local taxes. Our model finds that, at current levels, landmines and ERW negatively impact regional tax revenues by a total of \$1.1 billion each year – equivalent to 9.2 per cent of Ukraine's total regional tax revenues in 2021. This is significantly larger than our estimate of the impact on GDP (5.6 per cent). This greater impact on taxes is in part explained by the emergence of unofficial cultivation of land which is suspected to contain landmines and ERW, which has allowed some farmers to sell significant quantities of crops without paying taxes. Deputy Minister for Economic Development, Trade and Agriculture Taras Kachka estimates that as much as 40 per cent of grain harvests currently avoid taxation.<sup>14</sup>

The estimated impact of landmines and ERW on tax revenues is particularly salient given the pressures that the war has exerted on Ukraine's state budget, which in 2024 is likely to run its largest deficit ever (\$41 billion).<sup>15</sup> While we expect Ukraine to continue receiving financial support from international partners, measures to increase tax revenues will remain critical to alleviating public debt. To this end, our findings indicate that accelerating efforts to survey and clear land as quickly as possible will be indispensable in restoring Ukraine's long-term fiscal sustainability.

The suppression of economic activity by landmines and ERW has also impacted the volume of goods and services exported from Ukraine. Our model estimates that, at current levels, landmines and ERW reduce the value of Ukrainian exports by \$8.9 billion each year – equivalent to 13.2 per cent of total exports in 2021. This impact is more than double our estimated impact on GDP, reflecting the outsized damage that landmines have wrought on Ukraine's export-intensive agricultural sector. With agriculture accounting for 41 per cent of Ukraine's exports prior to the full-scale invasion, the impact of landmines and ERW on farmland has been central to driving the country's mounting trade deficit.<sup>16,17</sup> As discussed in further detail later in this report, this has had significant ramifications for international food security, given the critical role that Ukraine's agricultural sector plays in global food-supply chains.

## **BEYOND THE ECONOMY: THE OTHER COSTS OF LANDMINES AND ERW**

It is important to highlight that the impact of landmines and ERW is far from limited to economic concerns. From a humanitarian perspective, unexploded ordnance regularly injures and kills civilians, and will continue to pose a threat long into the future. In fact, the Ukrainian government reports that landmines and ERW have accounted for more than 1,000 civilian casualties since the start of the full-scale invasion.<sup>18</sup> Moreover, the impact of unexploded ordnance on civilians' access to their homes – as well as the closure of schools, hospitals and other infrastructure – has clear, negative consequences on the health and wellbeing of Ukrainians, particularly in rural and more vulnerable communities.<sup>19</sup>

Considering the pernicious impact that unexploded ordnance continues to inflict, the Ukrainian government faces the urgent task of surveying – and where necessary, demining – land as quickly as possible. To this end, the Ministry of Economy has set a goal of returning 80 per cent of territory in need of surveying in Ukraine to productive use within ten years.<sup>20</sup> This will come at significant financial cost – according to the World Bank, fully demining Ukraine will require an estimated \$34.6 billion.<sup>21</sup> As discussed in further detail later in this report, bringing the cost of demining down – as well as unlocking a significant uplift in funding – will be critical to supporting Ukraine's recovery and future economic development.

## 04

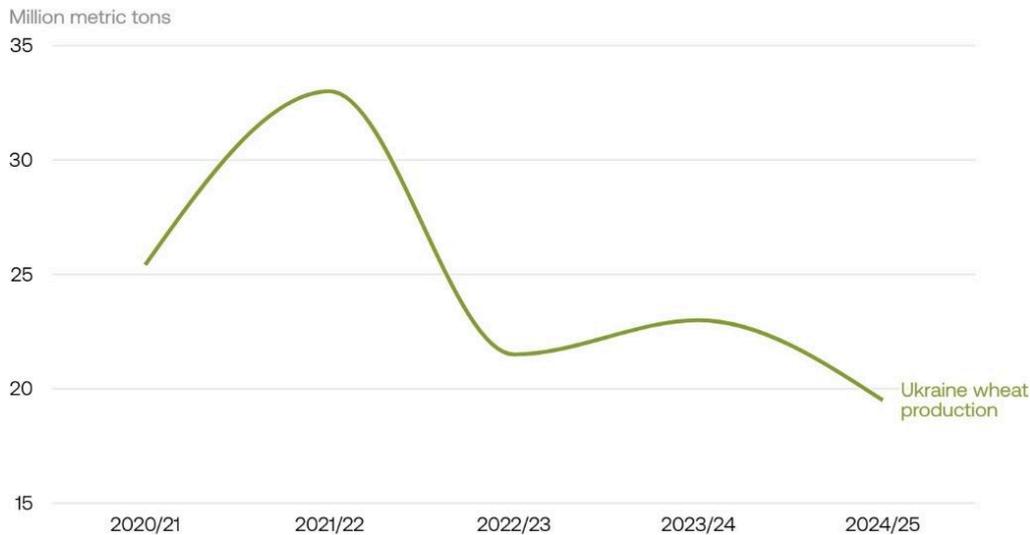
## The Impact of Mine Action on Global Food Security

Ukraine is one of the world's leading agricultural producers, thanks to its rich black soil and hospitable climate, which provide favourable conditions for high-yield crops. In fact, 71 per cent of Ukraine's land is agricultural and 56 per cent is arable, the highest proportion of any European country.<sup>22</sup> From the late 1990s to 2022, the value of Ukraine's agricultural exports increased rapidly, despite disruptions during the Covid-19 pandemic, the global financial crisis and the Russian invasion in 2014.<sup>23</sup> Before the full-scale invasion, Ukraine produced half of the world's sunflower-oil exports. Ukraine was also the third largest exporter of barley, fourth largest exporter of maize and fifth largest exporter of wheat.<sup>24</sup> According to the World Food Programme, prior to the full-scale invasion Ukraine produced enough food per year to feed 400 million people worldwide.<sup>25</sup>

The impact of the full-scale invasion has been devastating. From 2021–22 to 2024–25, Ukraine's wheat production has fallen by 41 per cent, with coarse grain production falling 37 per cent over the same period.<sup>26,27</sup> This slump in production is the product of multiple impacts of the war, including the abandonment of fields close to the front lines, the enlistment of farmers in the army and the illegal appropriation of Ukrainian territory by Russia, as well as the deployment of landmines on agricultural land. The consequences are staggering; it is estimated that the difference in wheat production alone could feed at least 40 million people worldwide per year.<sup>28</sup>

FIGURE 2

## Wheat production in Ukraine has dropped since the full-scale invasion



Source: [US Department of Agriculture Foreign Agricultural Service, Grain: World Markets and Trade](#) – 2024/25 forecast

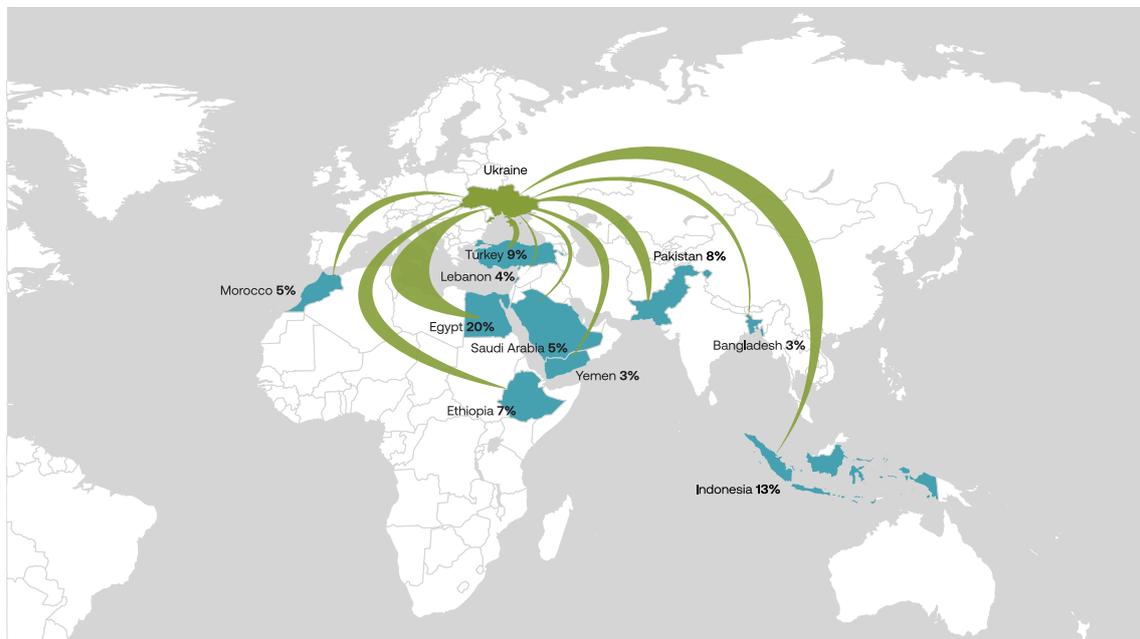
These figures are supported by the results of TBI's analysis on regional-level impacts of the war on Ukrainian exports. We estimate that, as a result of landmines and ERW, annual agricultural and food exports from Ukraine are \$4.3 billion lower than they otherwise would have been. Given Ukraine's outsized contribution to the global food supply, the full-scale invasion has had a significant impact on food prices. In March 2022, global food prices surged to their highest levels ever, after increasing 12.6 per cent in the month following the full-scale invasion.<sup>29</sup>

Food prices have remained high following Russia's withdrawal from the Black Sea grain deal, which had allowed Ukrainian grain to be shipped through the Black Sea. While Ukraine has since re-established export routes, Russia continues to target Ukrainian grain ships and silos with missiles, bombs and drones. In fact, global food prices remain almost 20 per cent above pre-pandemic levels.<sup>30</sup> This rise in food prices disproportionately affects the world's most vulnerable, with families in low-income economies often spending more than half their household income on food.<sup>31</sup>

Ukraine’s agricultural exports play a crucial role in ensuring a supply of basic sustenance to a number of developing countries. For example in 2021, nearly 40 per cent of Ukraine’s wheat was exported to North Africa, with 20 per cent heading to Egypt.<sup>32</sup> It is estimated 60 per cent of Egyptians live under or close to the poverty line, relying on government-subsidised food as a staple of their diet.<sup>33</sup> Egypt, along with many countries in the global south, relies on affordable wheat and grains to ensure financial stability and prevent starvation among its most vulnerable. Food supply and prices are also critical for political stability in many countries. As seen in the Egypt bread riots of 1977 and, more recently, in the revolution of 2013, the government’s ability to keep food affordable is central to retaining the support of the public.<sup>34</sup>

FIGURE 3

## Ukraine’s wheat exports have historically been concentrated in the global south (wheat exports by percentage of total value 2021)



Source: [European Council](#), [Resource Trade,Earth](#)

Wheat prices have stabilised somewhat since the full-scale invasion, partly

due to the large harvest in Russia last year which was boosted by the illegal seizure of Ukrainian grain.<sup>35</sup> However, Russia's control over the global wheat market is an ongoing and serious threat to both global food security and political stability. Russia has already shown its willingness, via its energy supplies, to use commodities as a tool for geopolitical coercion. Combatting Russia's influence over food supply requires a strong Ukrainian agricultural sector, which can only be achieved through rapid progress in demining.

# 05

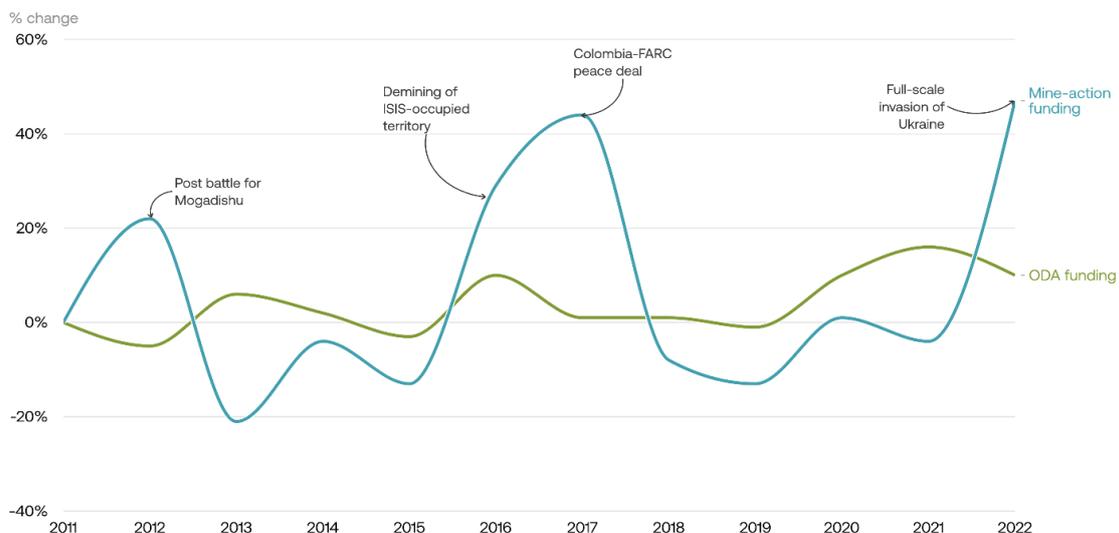
## The Key Measures Required to Accelerate Mine Action in Ukraine

### THE COST OF FULLY DEMINING UKRAINE AND THE FUNDING GAP

The World Bank estimates that it will cost \$34.6 billion to fully clear Ukraine of landmines and ERW.<sup>36</sup> To meet the Ukrainian government's ambitious target of returning 80 per cent of potentially mined land to productive use in ten years, funding will therefore need to increase from approximately \$300 million per annum to \$2.8 billion.<sup>37</sup> Another challenge, highlighted in a joint report by the Geneva International Centre for Humanitarian Demining (GICHD) and Symbio Impact, is that global mine-action funding is typically volatile, with peaks in financing which follow crises and then soon subside.<sup>38</sup> As such, securing long-term financial commitments is critical.

FIGURE 4

## Support for mine action is volatile, with funding peaks that soon subside after crises



Source: "Innovative Finance for Mine Action: Needs and Potential Solutions", GICHD and Symbio Impact

Funding will be required to address two of the most pressing issues hampering mine action in Ukraine – personnel and equipment. In September 2023, Prime Minister Denys Shmyhal laid out the need for more than 10,000 deminers to meet the government’s target of returning 80 per cent of potentially mined land to productive use in the next ten years (roughly 3,000 currently operate in Ukraine).<sup>39</sup> With training for one deminer costing as much as \$6,000, this will require a significant uplift in funding.<sup>40, 41</sup> To support reintegration of vulnerable groups into the labour market, the State Employment Service has already begun providing sapper training vouchers to combat participants, as well as those injured due to the war.<sup>42</sup>

Ukraine also remains short of the equipment needed to demine at scale, including mechanised demining machines and personal protective equipment. Nevertheless, the scale of demand in Ukraine means that it is a promising location for manufacturing demining equipment, with significant potential to cut costs and accelerate production. In fact, Deputy Minister for Strategic

Industries Anna Gvozdiar estimates that demining machines made in Ukraine will be twice as cheap as Western-made machines.<sup>43</sup> MV-4 and MV-10 demining vehicles have already begun to be partially manufactured in Ukraine.

As funding increases, it is important that more equipment be manufactured and procured domestically, in line with the government's recently launched "Made in Ukraine" policy. This should include the development and manufacture of innovative demining technologies, such as novel robotic systems. The Ministry of Economy has established an accelerator programme in partnership with Kyiv School of Economics to support the scaling of such technologies through training and mentorship programmes, as well as support with product testing.<sup>44</sup>

The Ukrainian government recently approved its national mine-action strategy to support its goal of returning 80 per cent of territory in need of surveying to productive use within ten years.<sup>45</sup> The strategy lays out in detail the critical underlying objectives to achieve its ambitious target, exemplifying Ukraine's commitment at a political level to accelerate mine-action operations. Going forward, regulatory change will also be critical to implement the strategy and scale demining activities in Ukraine – particularly with respect to certification and licensing.

Promisingly, Ukraine has committed to streamlining and expediting the certification process for demining – for example, through digitalising certain procedures to improve efficiency and transparency.<sup>46</sup> Additional regulatory measures could also play a role in encouraging the growth of commercial demining in Ukraine. While the involvement of non-profit operators in demining will remain crucial, encouraging the increased participation of commercial actors could expand the availability of demining services to landowners who have economically productive land and are able to pay for the costs of demining.

## **OPPORTUNITIES TO BRING DOWN THE COST OF DEMINING**

Of the \$34.6 billion needed to fully demine Ukraine, the World Bank estimates that between \$50 million and \$200 million will be needed for non-technical survey (NTS), \$8.95 billion will be spent on technical survey (TS) and an estimated \$25.5 billion will be used to fund land clearance.<sup>47</sup> However, given the likelihood that large tracts of land that have been designated as in need of survey are in actuality free of unexploded ordnance, this cost projection is

likely to be revised down as more NTS is carried out across the country. In fact, expenditure of \$20 million on NTS over the course of 2023 resulted in the estimated cost of demining Ukraine being revised down by \$3 billion.<sup>48</sup>

Nevertheless, it will still be vital to explore opportunities to bring down the costs of demining, including through the adoption of new technologies. For example, the integration of aerial survey and artificial intelligence has been shown to have the potential to significantly expedite NTS, potentially reducing projected costs from \$200 million to \$50 million.<sup>49</sup>

Should a substantial uplift in funding for demining be secured, costs can likely be expected to decrease through economies of scale. This could manifest through lower procurement and logistics costs for equipment, shared use of state-of-the-art technology, data and analytics, greater flexibility in allocation of employees across regions, as well as greater efficiency in training and onboarding staff. This underscores the argument for increasing investment in demining today, rather than postponing spending into the future. Only through increased expenditure in the short term can the economies of scale required to reduce overall costs be achieved.

### **BRIDGING THE GAP IN MINE-ACTION FUNDING**

Despite the potential to bring down cost, existing donor funding for mine action is insufficient to fully demine Ukraine on any reasonable timescale. Of all official development assistance, global mine-action funding amounted to just \$798 million in 2022, of which Ukraine received less than 50 per cent.<sup>50</sup> Given that demining Ukraine is expected to cost roughly \$35 billion, donor funding will be unlikely to bridge the funding gap alone.<sup>51</sup> Moreover, two and a half years after the full-scale invasion began, funding is at risk of falling off. Given these pressing challenges, there is an urgent imperative to explore innovative financing mechanisms which can attract additional funding from new sources.

Innovative financing presents an opportunity to tap into new sources of public and private-sector funding, providing increased scale, diversification and predictability. In 2024, the GICHD and Symbio Impact published a comprehensive review of innovative finance options that could bridge the funding gap for mine action around the world, including Ukraine. They reviewed a range of potential mechanisms, including public-private incentives, front-loading mechanisms, outcome-based finance, agricultural bonds and solidarity taxes. Two of the most promising mechanisms which emerged from

this analysis were front-loading funding and an agricultural bond market for demining. Analogous mechanisms have in the past proven successful in raising funds and complementing existing finance mechanisms in other development contexts. Crucially, many donors to the sector have expressed their support for the development of these mechanisms.<sup>52</sup>

## How innovative financing could catalyse demining funding



### WHAT IS FRONT-LOADING FUNDING?

A front-loading funding mechanism would use long-term government-donor pledges to raise bonds on capital markets, with the proceeds of these bonds being used to fund mine action immediately. This has potential to rapidly accelerate funding for demining, in a cost-effective manner,



### WHAT IS AN AGRICULTURAL BOND MARKET?

An agricultural bond market would involve issuing bonds to fund demining activities on agricultural land, with repayment of investors via revenue from agricultural activities carried out after the land is cleared. It would have the potential to significantly expand the scale of funding available by

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using donor commitments as security.

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leveraging new sources of private finance.

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Looking to the future, traditional funding avenues and innovative financing mechanisms will likely need to be expanded in parallel in order to bridge the gap in mine-action funding. This will be critical to accelerating the demining of Ukraine, restoring the country's long-term fiscal sustainability and safeguarding the food security of tens of millions of the most vulnerable people across the globe.

# 06

## Conclusion

As the most heavily mined country on Earth, Ukraine's recovery and future development hinge on advances in the pace of demining. Expediting the clearance of landmines from agricultural land is crucial to bolstering global food security, as well as safeguarding lives and livelihoods across Ukraine. Accelerating demining in Ukraine is one of the most powerful ways that financial resources can be brought to bear.

Realising this goal will require ambitious leadership from across the mine-action ecosystem. First, international donors – including foreign governments and philanthropists – must commit to supporting a radical uplift in funding for demining, in recognition of the immense benefits that this will engineer both in Ukraine and globally. Second, the Ukrainian government must build on its ambitious and comprehensive mine-action strategy, undertaking the necessary policy reforms to ensure its delivery and rapidly scale demining operations. Third, Ukrainian entrepreneurs and start-ups will need to play a critical role in developing and manufacturing the technological innovations that will enable demining operations to scale efficiently and effectively. Finally, the mine-action ecosystem in its entirety – including donors, international financial institutions and the Ukrainian government – should cooperate in accelerating the adoption of innovative financing mechanisms for demining.

Read our [Methodology Note](#).

# 07

## Glossary

**Clearance:** Tasks or actions to ensure the removal and/or the destruction of all explosive ordnance from a specified area to a specified depth or other agreed parameters as stipulated by the national mine-action authority/tasking authority.<sup>53</sup>

**Mine Action:** Activities which aim to reduce the social, economic and environmental impact of explosive ordnance.<sup>54</sup>

**Non-Technical Survey:** Refers to the collection and analysis of data, without the use of technical interventions, about the presence, type, distribution and surrounding environment of explosive ordnance, in order to define better where explosive-ordnance impact is present and where it is not, and to support land-release prioritisation and decision-making processes through the provision of evidence.<sup>55</sup>

**Technical Survey:** Refers to the collection and analysis of data, using appropriate technical interventions, about the presence, type, distribution and surrounding environment of explosive ordnance, in order to define better where explosive-ordnance impact is present and where it is not, and to support land-release prioritisation and decision-making processes through the provision of evidence.<sup>56</sup>

# Endnotes

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  - 25 <https://www.wfp.org/countries/ukraine>
  - 26 <https://fas.usda.gov/sites/default/files/2024-06/grain.pdf>
  - 27 While Ukraine's agricultural exports have recovered in recent months, this is not commensurate to a recovery of agricultural production. It likely reflects the export of crops that were stockpiled while Black Sea trade routes were under a blockade. This means that future agricultural exports will likely decline as these stocks become depleted and production remains low.  
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