Research Terms of Reference
Area-Based Risk Assessment

UKR1906
Ukraine

13 December 2019
Version 1.0

IMPACT Shaping practices Influencing policies Impacting lives

1. Executive Summary

Country of intervention	Ukraine					
Type of Emergency	□	Natural disaster	**X**	Conflict		
Type of Crisis	□	Sudden onset	□	Slow onset	**X**	Protracted
Mandating Body/ Agency	ECHO, USAID					
Project Code	64DUR/64DTF					
Overall Research Timeframe	20/02/2019 to 07/03/2020					
Research Timeframe	1. Start collect data: 01/07/2019			5. Preliminary presentation: 30/01/2020		
	2. Data collected: N/A			6. Outputs sent for validation: 30/05/2020		
	3. Data analysed: N/A			7. Outputs published: 30/05/2020		
	4. Data sent for validation: N/A			8. Final presentation: 30/06/2020		
Number of assessments	X	Single assessment (one cycle) in 5 geographies: (Popasna raion, Bakhmut raion, Yasynuvata raion, Toretsk City Council, Volnovkha raion and Mariupol city)				
	□	Multi assessment (more than one cycle)				
Humanitarian milestones	**Milestone**			**Deadline**		
	□	Donor plan/strategy				
	□	Inter-cluster plan/strategy				
	□	Cluster plan/strategy				
	X	NGO platform plan/strategy (3P Consortium)		30/03/2020		
	□	Other (Specify): High-level donor meetings		ongoing		
Audience Type & Dissemination	**Audience type**			**Dissemination**		
	X Strategic **X** Programmatic □ Operational			**X** General Product Mailing (e.g. mail to NGO consortium; HCT participants; Donors) **X** Cluster Mailing (DRR working group) **X** Presentation of findings **X** Website Dissemination (Relief Web & REACH Resource Centre) **X** Intermal dissemination within 3P Consortium **X** Bilateral dissemination to local authorities		
Detailed dissemination plan required	**X**	Yes				No
General Objective	To improve understanding of technological, ecological and natural risks in raions along the contact line and inform local-level disaster risk reduction planning.					
Specific Objective(s)	1. To analyze hazard, exposure and vulnerability data from global, national and regional sources at the raion level to understand local-level technological, ecological and natural risks.					

	2. To inform local authorities about such risks using concise and accessible analysis relevant to preparedness and disaster risk management planning. 3. To analyze and map scenarios for hazardous objects in order to enable and inform advocacy for risk management priorities in the target areas.					
Research Questions	1. What is the profile of population and built assets in target arreas? a. What are the population demographics and vulnerabilities in the target area? b. What is the landuse profile of the target area? c. What is the transportation system profile of the target area? d. What is the built environment profile of the target area? 2. What is the environmental profile of the target area? a. What are the areas where extreme temperatures have occurred more often? b. What are the areas where fires have occured more frequently? c. What are the areas where droughts have occurred more frequently? d. What are the areas where land subsidence is happening? 3. What are the potentially hazardous objects in the area? a. Which populations, assets and environments are exposed to these main hazards? b. Which characteristics make the exposed populations assets and environments more vulnerable/resilient to these hazards?					
Geographic Coverage	Popasna raion, Bahmut raion, Yasynuvata raion, Toretsk City Council, Volnovakha raion, Mariupol					
Secondary data sources	Open Street Map, Wikimapia, OCHA for neighbourhood boundaries. UNOSAT for satellite detected damage of structures analysis.					
Population(s)	□	IDPs in camp		□	IDPs in informal sites	
	X	IDPs in host communities		□	IDPs [Other, Specify]	
	□	Refugees in camp		□	Refugees in informal sites	
	□	Refugees in host communities		□	Refugees [Other, Specify]	
	X	Host communities		**X**	Returnees	
Stratification	**X**	Geographical #:5[1] Population size per strata is known? **X** Yes □ No	□	Group #: _ _ _ Population size per strata is known? □ Yes □ No	□	*[Other Specify]* #: _ _ Population size per strata is known? □ Yes □ No
Data collection tool(s)	**X**	Secondary data review				
	Sampling method			**Data collection method**		
Structured data collection tool # 1	**N/A**			**N/A**		
Structured data collection tool # 2	**N/A**			**N/A**		
Semi-structured data collection tool (s) # 1	**N/A**			**N/A**		
Semi-structured data collection tool (s) # 2	**N/A**			**N/A**		
Target level of precision if probability sampling	**N/A**			**N/A**		
Data management platform(s)	**X**	IMPACT		□	UNHCR	
	□	[Other, Specify]				
Expected ouput type(s)	□	Situation overview #: _ _	**X**	Report #: 5	□	Profile #: _ _
	□	Presentation (Preliminary findings) #: _ _	□	Presentation (Final) #: _ _	□	Factsheet #: _ _
	□	Interactive dashboard #:_	□	Webmap #: _ _	□	Map #: _ _
Access	**X**	Public (available on REACH resource center and other humanitarian platforms)				
	□	Restricted (bilateral dissemination only upon agreed dissemination list, no publication on REACH or other platforms)				
Visibility	IMPACT, ECHO, USAID, 3P Consortium					

[1] The level of analysis will be conducted at the raion level for Popasna, Bakhmut, Toretsk, Volnovaha and Yasynuvata.

2. Rationale

2.1. Rationale

After more than five years of armed conflict in Eastern Ukraine, civilians continue to bear the effects of conflict. Since April 2014, more than 3,000 persons have died, and 9,000 have been injured.[2] As a result of the conflict, there are 1.5 million Internally Displaced Persons (IDPs). Today, despite the Minsk agreements, the conflict continues to affect 5.2 million people, of whom 3.5 million are in urgent need of protection and humanitarian assistance.[3] The UN Office for the Coordination of Humanitarian Affairs (UNOCHA) estimates that 3.2 million people are in need of humanitarian Water, Sanatation and Hygiene (WASH) assistance.[4] In parallel, the population remains vulnerable to pre-existing natural hazards such as extreme weather events, particularly during the harsh winters that are frequent in the region. Both conflict-related damage as well as dilapidation due to lack of maintainence of systems or infrastructures which could otherwise cope with these hazards have heightened vulnerability, alongside limited local capacity to plan and prepare.

Populations living close to the LoC face conflict-related hazards including frequent shelling, significant landmine/UXO contamination, frequent utility cuts (which are particularly dangerous in winter due to the risk of insufficient warmth). Such hazards are compounded by pre-existing industrial/ecological concerns including a significant number of hazardous sites due to the highly industrialised nature of the region prior to the conflict. Such industrial hazards suffer from a lack of monitoring and a lack of maintenance due to the additional hazards posed by conflict as well as ambeguity over the parties responsible for such maintenance and monitoring.

The conflict also compounds pre-existing natural hazards. Ukraine experiences severe weather conditions both in the winter and summer periods. Indeed, in 2010 the Luhansk region experienced a 24-day heatwave which triggered more than 1,200 wildfires. In 2006, some 60,000 residents of the city of Alchevsk (now NGCA) were left without heating for weeks during a severe cold spell due to heating system failure, and the child population had to be evacuated until heating was restored. This scenario was repeated to a lesser extent in February 2017 when military exchanges around Avdiivka led to a significant decrease in heating temperatures for several weeks, prompting local authorities (LAs) and humanitarian actors to set up heating points.

Despite the potential severe impact of such hazards, there remains a gap in analysis of a) an accounting of hazardous objects in the conflict-affected areas of Eastern Ukraine, b) the level of exposure of populations to such hazards or c) the extent to which certain populations would be more vulnerable or resilient to exposure.

With the ongoing digital transition in the state institutions of Ukraine, large amounts of data are being generated and compiled. In the year of 2019, however, there was still no functional platform for open geospatial data access. Data analysis for risk assessment poses a challenge: data is dispersed among various stakeholders on different levels, due to the lack of data governance data is stored in heterogeneous formats, has heterogeneous structure, and usually is not cleaned. Without such data, local authorities also lack an evidence-base to plan for disaster mitigation and response.

3. Methodology

3.1. Methodology overview

The Area-Based Risk Assessment aims to fill this gap by collecting, processing, and utilising existing openly-availabe geospatial data on capacity, vulnerability, and exposure in order to assess risk in the target areas from July 2019 to July 2020. The assessment will conduct analysis on the sub-regional level in order to provide information that is usable by local sub-regional authorities in their disaster mitigation and response planning process.

[2] OHCHR, 2019. Report on the human rights situation in Ukraine. Available here.
[3] UNOCHA, 2019. Humanitarian Needs Overview. Available here.
[4] *Ibid.*

Global datasets are used during the assessment where possible. Due to the level of granularity specified in the research design, it is only possible to use global geospatial datasets that possess resolution of 1km and less. However, large portion of area-based risk data should be acquired from the individual local data holders and is conducted parallel with geospatial consulting aimed to raise awareness of geospatial data usage in local planning and the importance of open data. Key stakeholders consulted during the data acquisition process include state structures, organizations and enterprises including:

- Popasna raion administration
- Bakhmut raion administration
- Yasynuvata raion administration
- Volnovakha raion administration
- Toretsk city council
- Mariupol city council
- State Emergency Services of Ukraine office in Popasna raion
- State Emergency Services of Ukraine office in Bakhmut raion
- State Emergency Services of Ukraine office in Yasynuvata raion
- State Emergency Services of Ukraine office in Volnovakha raion
- State Emergency Services of Ukraine office in Toretsk
- State Emergency Services of Ukraine office in Mariupol
- Central office of State Emergency Services of Ukraine in Donetska oblast
- Central office of State Emergency Services of Ukraine in Luhanska oblast
- Department of Environmental Monitoring in Donetska oblast
- Department of Environmental Monitoring in Luhanska oblast
- SE “Pervomaiskvuhillia”
- National Academy of Sciences of Ukraine
- National Environmental Academy of Postgraduate Education

Open data sources available from a variety of sources (both national and global) will also be used to improve mapping of hazards, exposure and vulnerability. Table 1 below provides an overview of such data sources.

3.2. Population of interest

The population of interest in this study includes host community members, IDPs and returnees in the five target areas of the assessment (Popasna raion, Bahmut raion, Yasynuvata raion, Toretsk City Council, Volnovakha raion, Mariupol city). These areas were selected due to a) being more affected by armed conflict, b) having higher rates of industrialisation prior to the conflict and c) their vulnerability profiles as identified in previous IMPACT studies, including the REACH Capacity and Vulnerability Assessments.

3.3. Secondary data review

Global hazard, exposure and vulnerability data will be used in the first steps of every risk assessment. This data includes global population datasets, such as the GHS Population Grid, satellite imagery (for example MODIS or Landsat 8 imagery available through USGS Earth Explorer and Google Earth Engine services), global exposure datasets and crowdsourcing map geodata services like OpenStreetMap. By definition, global datasets cover the entire planet or at least continent, meaning that they could be used for risk analysis in any country. However, global data are always presented on very generalized level and could be used only for the small-scale risk analysis on country level.

All above listed global datasets are available for the selected target areas. However, due to the lack of granularity, they are insufficient for a sub-regional risk analysis. For example, one image from MODIS Terra satellite (extensively used for global level extreme weather events analysis) covers area around 5.5 million sq.km, and territory of Popasna area is only around 1 500 sq. km.

National-level risk assessments

Only one national risk assessments has been conducted in Ukraine. The "Regional risk atlas ERRA" was developed for the State Emergency Services of Ukraine (SESU). Although it is not publicly available, the report was provided to IMPACT by request to the Kyiv office SESU.

This "Regional risk atlas ERRA" consists of 11 point layers. Layers are divided by risk type (chemical-, radiation-, waste-related risks) and each layer includes 50 points per oblast. For selected target areas only a few layers are fully available, (including sludge warehouses, waste, toxic waste) and they represent only the location of such hazards or in some cases the settlement which is exposed to risk. While, such data could be useful for national level risk planning and preparedness it lacks significant details which makes it useless on regional level.

Risk assessments in target areas

Considering the high level of industrial development of all target areas, several local-level risk assessments have been conducted in the last decades. However, due to the lack of access to records in areas currently outside of government control, such assessments have become inaccessible in the former offices of Donetsk and Luhansk SESU now in NGCA.

Additionally, the Organisation for Security and Cooperation in Europe (OSCE) has also conducted several assessments. For example, The Donbas Environment Information System, jointly developed by OSCE and the former Ministry of Ecology, incorporates information on the main industrial and ecological risks in Donetsk and Luhansk oblasts. This information system provides a valuable source of information about hazards (especially industrial) on oblast level. However, as with other data sources, they are insufficient for raion-level planning and decision making as the data is presented only in visual form, limiting the ability of other entities to utilise it for additional analyses.

The OSCE additionally contracted the Ukrainian Scientific Institute of Technical Ecology to conduct the "Donbas: territory of existing assessment" covering technological and ecological risks in Donetsk and Luhansk oblast. Despite presenting sufficient detail, interviews with local authorities within target areas demonstrated that results of this assessment were not effectively utilised for planning, potentially because the complete version of the report has restricted access, and the publicly available version only contains a brief overview summary which is not enough for comprehensive disaster risk reduction activities.

However, a number of data sources are available that will be compiled and analysed to provide the appropriate information at the sub-regional level. Such data sources are listed in Table 1.

Table 1. List of open data sources to be utilised

Data source	Short description	Area	Available data and comment	Risk data type
ACLED Conflict incidence	Conflict incidence 2018-present time	Ukraine	Conflict incidents as recorded by ACLED	Exposure
ASTER GDEM	Global DEM	Global	DEM	Exposure
Copernicus land use raster	Radar-based data of built environment, 2018	Global	Data on built environment exposure	Exposure
Donbas Environment Information System (DEIS)	dashboard developed by OCSE	Donetsk, Luhansk oblast	air quality post locations; water quality post locations; objects of critical infrastructure; nature conservation areas	Exposure
Electricity infrastructure	web-map, Leaflet	Donetsk oblast, GCA	locations of electricity transformers	Exposure
EO-1 - Hyperion	Hyperspectral (220 channels) RS data	Donetsk and Luhansk oblast	30 meters resolution, multispectral, could be used for soil contamination analysis	Exposure
GHS built environment raster (radar-based)		Global	Data on land exposure	Exposure

GHS Population raster	Global population raster	Global	Population raster, RS-based, classic	Exposure
GLOBELAND30	LULC	Global	30m resolution land cover raster (mostly Landsat based, 80% overall accuracy)	Exposure
GLS	LULC	Global	15-30m resolution land cover raster (Landsat based)	Exposure
Landsat 8	RS	Global	Multispectral imagery (15-30 meters)	Exposure
LandScan Population raster	Global population raster	Global	Population raster, RS and OSM based, more precise than GHS or WorldPop	Exposure
MODIS Land surface temperature	LST, 2001-2019	Global	Data on historical land surface temperatures	Exposure
OCHA Settlement Boundaries	Administrative boundaries	Ukraine	Admin boundaries	Exposure
OSM buildings network	Vector layer	Global	raw OSM	Exposure
OSM railway network	Vector layer	Global	raw OSM	Exposure
OSM river network	Vector layer	Global	raw OSM	Exposure
OSM road network	Vector layer	Global	raw OSM	Exposure
Sentinel-2	RS	Global	Multispectral imagery (10-30 meters)	Exposure
Sentinel-5P	RS	Global	Atmospheric SO_2, NO_2, CO, CH_4 concentrations	Exposure
Automated environmental monitoring system in Donetsk region	air pollution data	Donetsk oblast	Air pollution date from air quiluty posts	Exposure
SRTM	Global DEM	Global	DEM	Exposure
USGS-GLCC	LULC	Global	1-km resolution land cover raster	Exposure
WorldPop	Global population raster	Global	Population raster, OSM based	Exposure
European Severe Weather Database	Web-portal with information about severe weather events	Global	Meteorological data; Probably Need some additional request	Exposure, vulnerability
Open Spatial Planning	Web-portal with zoning plans (large scale)	Ukraine	Large scale zoning plans, mostly outdated and poor quality	Exposure, vulnerability
ECAD	meteorological datasets	Global		Hazard
Giovanni	meteorological datasets	Global		Hazard
Ministry of Ecology and Energy	web-map with description	Ukraine	Illegal dumps	Hazard
Ministry of Ecology and Energy	table with description	Ukraine	Potentially hazardous objects	Hazard
NOAA historical weather data	meteorological datasets	Global		Hazard
RP5	meteorological datasets	Global		Hazard
Waste site locations	web-map, ArcGIS Online	Donetsk oblast, GCA	waste site locations and characteristics	Hazard
Wikimapia	Crowdmapping portal	Global	Includes locations of dangerous objects (farms, waste-sites, industrial facilities)	Hazard
Google dataset search	data search engine	Global	Could be useful for SDR	Hazard, exposure, vulnerability
INFORM country risk profiles	Web-portal with risk estimation on country level	Global	Ranked hazard, exposure and vulnerability information on country level	Hazard, exposure, vulnerability
Ukraine natural, technological, social dangers and risk atlas	flash atlas	Ukraine	143 maps; Not available online but could be requested	Hazard, exposure, vulnerability
Ukrainian Open data portal	data portal	Ukraine	Could be useful for SDR, a lot of unstructured and irrelevant data	Hazard, exposure, vulnerability
Ukrainian Open data portal in ecology		Ukraine	Ecological data	Hazard, exposure, vulnerability
Water resources webmap	web-map with basins	Ukraine	Available borders of main river basins and subbasins	Hazard, exposure, vulnerability

Open access environment	Web-map with description	Ukraine	Surface water quality data	Vulnerability
SCORE	Reports, webmap	Ukraine	Socio-economic indicators obtained from HH surveys	Vulnerability
Surface water data	Surface water chemical data 2003-2007	Ukraine	Surface water quality data	Vulnerability
Water quality data	locations and main characteristics of water quality	Ukraine	CSV-dataset with coordinates, have time-series data	Vulnerability

3.4. Primary Data Collection

No primary data collection will be conducted as part of this assessment.

3.5. Data Processing & Analysis

Table 2 outlines the way in which geospacial data will be processed and analysed within each section of the Area-Based Risk Assessment.

Table 2. Summary of data processing and analysis.

Section name	Process/analysis
Periods of extremely high temperatures (MODIS LST)	Calculating zonal statistics for land surface temperatures for June-August 2001-2019 the target area: minimum, maximum, mean, standard deviation. Calculate mean number of days per season with temperatures above (mean+1 standard deviation), per pixel. Calculations carried out in Google Earth Engine with MODIS LST product.
Periods of extremely low temperatures (MODIS LST)	Calculating zonal statistics for land surface temperatures for December-February 2001-2019 the target area: minimum, maximum, mean, standard deviation. Calculate mean number of days per season with temperatures above (mean-1 standard deviation), per pixel. Calculations carried out in Google Earth Engine with MODIS LST product.
Fires: satellite data (FIRMS)	FIRMS dataset for months of June-August 2001-2019 was aggregated into 1 sq.km. bins, and then mean frequency and intensity of fires per season was calculated for each bin.
Fires: State Emergency Services of Ukraine data	SESU provided dataset for fire occurrence in Luhansk oblast for full years of 2015-2018. The data was cleaned and aggregated on the settlement level and raion level. Mean number of fires per season at reach level is reported, as well as most frequent reasons and locations of fire accidents.
Hazardous objects, tailing tips, tailing dams	Displays potentially hazardous object dataset, that was compiled of data from SESU, Donbas Environmental Information System, ACTED, OSM, IMPACT sources.
Conflict incidence (ACLED)	ACLED conflict incidence data for December 2018-December 2019 was aggregated into 3 sq.km. bins and displayed as average number of incidents per month.
Built environment	Displayed GHS built environment grid and protection zones of potentially hazardous objects
Population	REACH data on population from CVA, 2018
Land use	Displayed Copernicus land use raster, OSM industrial land use and protection zones of potentially hazardous objects
Road infrastructure	Cleaned and displayed OSM data
Electricity	Cleaned and displayed OSM data, digitized data from satellite imagery and state documentation
Hydrography	Displayed digital elevation data, OSM water objects, potentially dangerous objects (chemical), calculated runoff direction
Case study (Pervomaiskvuhillia)	Displayed object-level risk information: mine locations, tailing tips locations, digital elevation model. Mine fields and land subsidence information request pending.
Water infrastructure	Displayed WASH cluster data
Air pollution	3-month averaged (January 2020 – March 2020) Sentinel-5P data on atmospheric SO_2, NO_2, CO, CH_4 concentrations, highlighting the stationary pollution sources, mean values calculated within the setlements to use as risk exposure indicator.

Multi-hazard environmental and industrial risk	Based on the existing data, environmental risk will be calculated (based on zonal statistics of proximity/frequency of natural hazard occurrence). Technological multi-hazard risk will be calculated based on proximity of hazardous objects, industrial waste, and frequency of failures in the past.

4. Roles and responsibilities

Table 3. Description of roles and responsibilities

Task Description	Responsible	Accountable	Consulted	Informed
Research Design	GIS Officer, GIS Assistant	Country Coordinator	3P Consortium partners, GIS/Database Manager, IMPACT Research Design Unit	
Secondary Data Review	GIS Officer, GIS/Database Manager	GIS/Database Manager	Country Coordinator	3P Consortium partners
3rd Party Data Requests	GIS Officer	GIS/Database Manager	Country Coordinator	
Data Processing (Checking, Cleaning)	GIS Assistant	GIS/Database Manager	IMPACT Data Unit	
Data Analysis	GIS Officer, GIS Assistant	GIS/Database Manager	IMPACT Data Unit	
Map Production	GIS Officer, GIS Assistant	GIS/Database Manager	IMPACT GIS Unit	
Report Writing	GIS Officer, GIS Assistant	GIS/Database Manager	IMPACT Research Unit	3P Consortium partners
Report Translation	GIS Officer, GIS Assistant	GIS/Database Manager		
Report Design	GIS Officer, GIS Assistant	GIS/Database Manager	Country Coordinator, IMPACT Research Unit	3P Consortium partners
Dissemination	GIS Officer	Country Coordinator	3P Consortium partners	
Monitoring & Evaluation	GIS Officer, GIS Assistant	Country Coordinator		IMPACT Research Unit
Lessons Learned	GIS Officer	GIS Officer	GIS Assistant	IMPACT Research Unit

Responsible: *the person(s) who executes the task*
Accountable: *the person who validates the completion of the task and is accountable of the final output or milestone*
Consulted: *the person(s) who must be consulted when the task is implemented*
Informed: *the person(s) who need to be informed when the task is completed*

6. Monitoring & Evaluation Plan

IMPACT Objective	External M&E Indicator	Internal M&E Indicator	Focal point	Tool	Will indicator be tracked?
Humanitarian stakeholders are accessing IMPACT products	Number of humanitarian organisations accessing IMPACT services/products Number of individuals accessing IMPACT services/products	# of downloads of x product from Resource Centre	Country request to HQ	User_log	**X** Yes
		# of downloads of x product from Relief Web	Country request to HQ		**X** Yes
		# of downloads of x product from Country level platforms	Country team		□ Yes
		# of page clicks on x product from REACH global newsletter	Country request to HQ		**X** Yes
		# of page clicks on x product from country newsletter, sendingBlue, bit.ly	Country team		□ Yes
		# of visits to x webmap/x dashboard	Country request to HQ		□ Yes
IMPACT activities contribute to better program implementation and coordination of the humanitarian response	Number of humanitarian organisations utilizing IMPACT services/products	# references in HPC documents (HNO, SRP, Flash appeals, Cluster/sector strategies)	Country team	Reference_log	HNO 2021, DRR Working Group publications
		# references in single agency documents			
Humanitarian stakeholders are using IMPACT products	Humanitarian actors use IMPACT evidence/products as a basis for decision making, aid planning and delivery Number of humanitarian documents (HNO, HRP, cluster/agency strategic plans, etc.) directly informed by IMPACT products	Perceived relevance of IMPACT country-programs	Country team	Usage_Feedback *and* Usage_Survey template	IMPACT Usage Survey to be conducted in June 2020
		Perceived usefulness and influence of IMPACT outputs			
		Recommendations to strengthen IMPACT programs			
		Perceived capacity of IMPACT staff			
		Perceived quality of outputs/programs			
		Recommendations to strengthen IMPACT programs			
Humanitarian stakeholders are engaged in IMPACT programs throughout the research cycle	Number and/or percentage of humanitarian organizations directly contributing to IMPACT programs *(providing resources, participating to presentations, etc.)*	# of organisations providing resources (i.e. Staff, vehicles, meeting space, budget, etc.) for activity implementation	Country team	Engagement_log	□ Yes
		# of organisations/clusters inputting in research design and joint analysis			**X** Yes
		# of organisations/clusters attending briefings on findings;			**X** Yes

ANNEX 1: METHODOLOGY NOTES (IF RELEVANT)

ANNEX 2: [OTHER SPECIFY]