Brief User Guide for iiSBE Tool for assessment of damage from military action, earthquakes or climate change impacts

Nils Larsson, Kajetan Sadswski and others

International Initiative for Sustainable Built Environment (iiSBE)

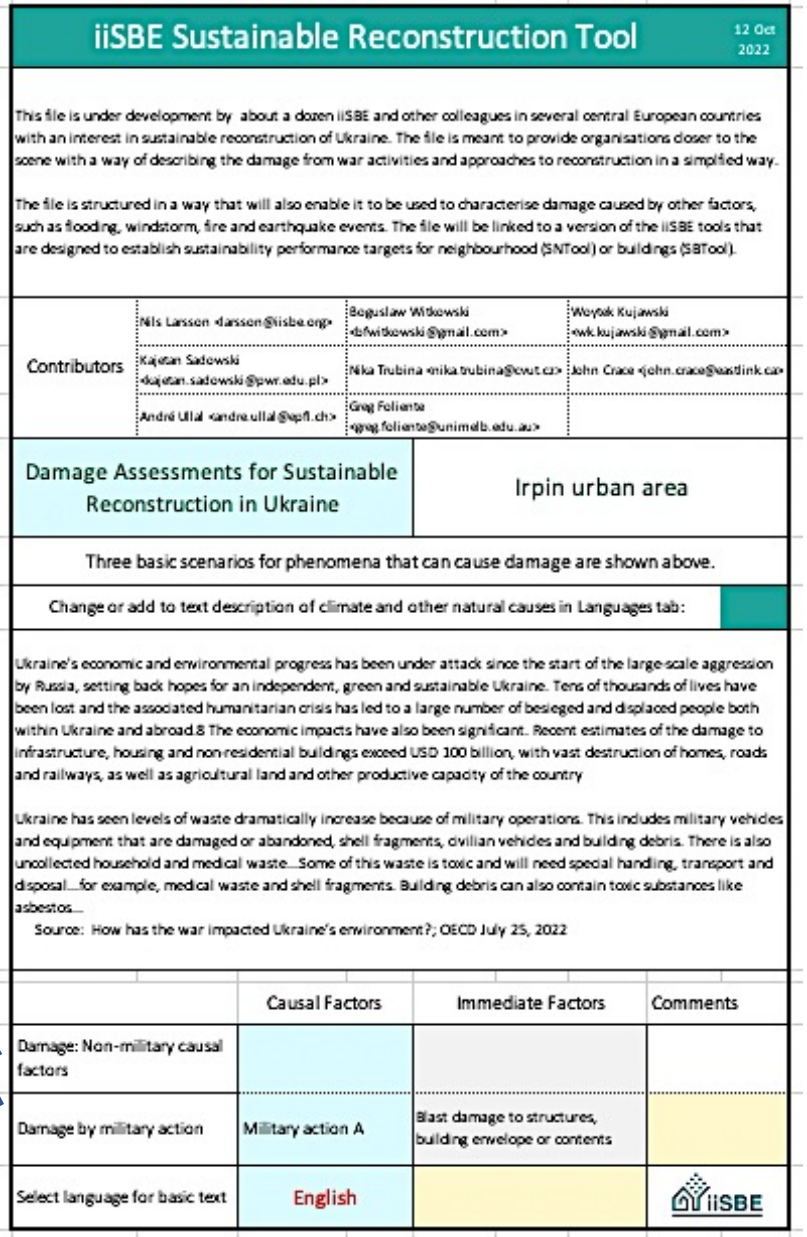
14 October 2022

The iiSBE Damage Assessment Tool

Select one of 3 scenarios

Select specific causal factors

Select one of 7 languages



iiSBE Sustainable Reconstruction Tool 12 Oct 2022

This file is under development by about a dozen iiSBE and other colleagues in several central European countries with an interest in sustainable reconstruction of Ukraine. The file is meant to provide organisations closer to the scene with a way of describing the damage from war activities and approaches to reconstruction in a simplified way.

The file is structured in a way that will also enable it to be used to characterise damage caused by other factors, such as flooding, windstorm, fire and earthquake events. The file will be linked to a version of the iiSBE tools that are designed to establish sustainability performance targets for neighbourhood (SNTool) or buildings (SBTool).

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Damage Assessments for Sustainable Reconstruction in Ukraine	Irpin urban area

Three basic scenarios for phenomena that can cause damage are shown above.

Change or add to text description of climate and other natural causes in Languages tab:

Ukraine's economic and environmental progress has been under attack since the start of the large-scale aggression by Russia, setting back hopes for an independent, green and sustainable Ukraine. Tens of thousands of lives have been lost and the associated humanitarian crisis has led to a large number of besieged and displaced people both within Ukraine and abroad.8 The economic impacts have also been significant. Recent estimates of the damage to infrastructure, housing and non-residential buildings exceed USD 100 billion, with vast destruction of homes, roads and railways, as well as agricultural land and other productive capacity of the country

Ukraine has seen levels of waste dramatically increase because of military operations. This includes military vehicles and equipment that are damaged or abandoned, shell fragments, civilian vehicles and building debris. There is also uncollected household and medical waste...Some of this waste is toxic and will need special handling, transport and disposal...for example, medical waste and shell fragments. Building debris can also contain toxic substances like asbestos...

Source: How has the war impacted Ukraine's environment?; OECD July 25, 2022

	Causal Factors	Immediate Factors	Comments
Damage: Non-military causal factors			
Damage by military action	Military action A	Blast damage to structures, building envelope or contents	
Select language for basic text	English		iiSBE

What it is:

Free

Operates on Excel

Seven language options

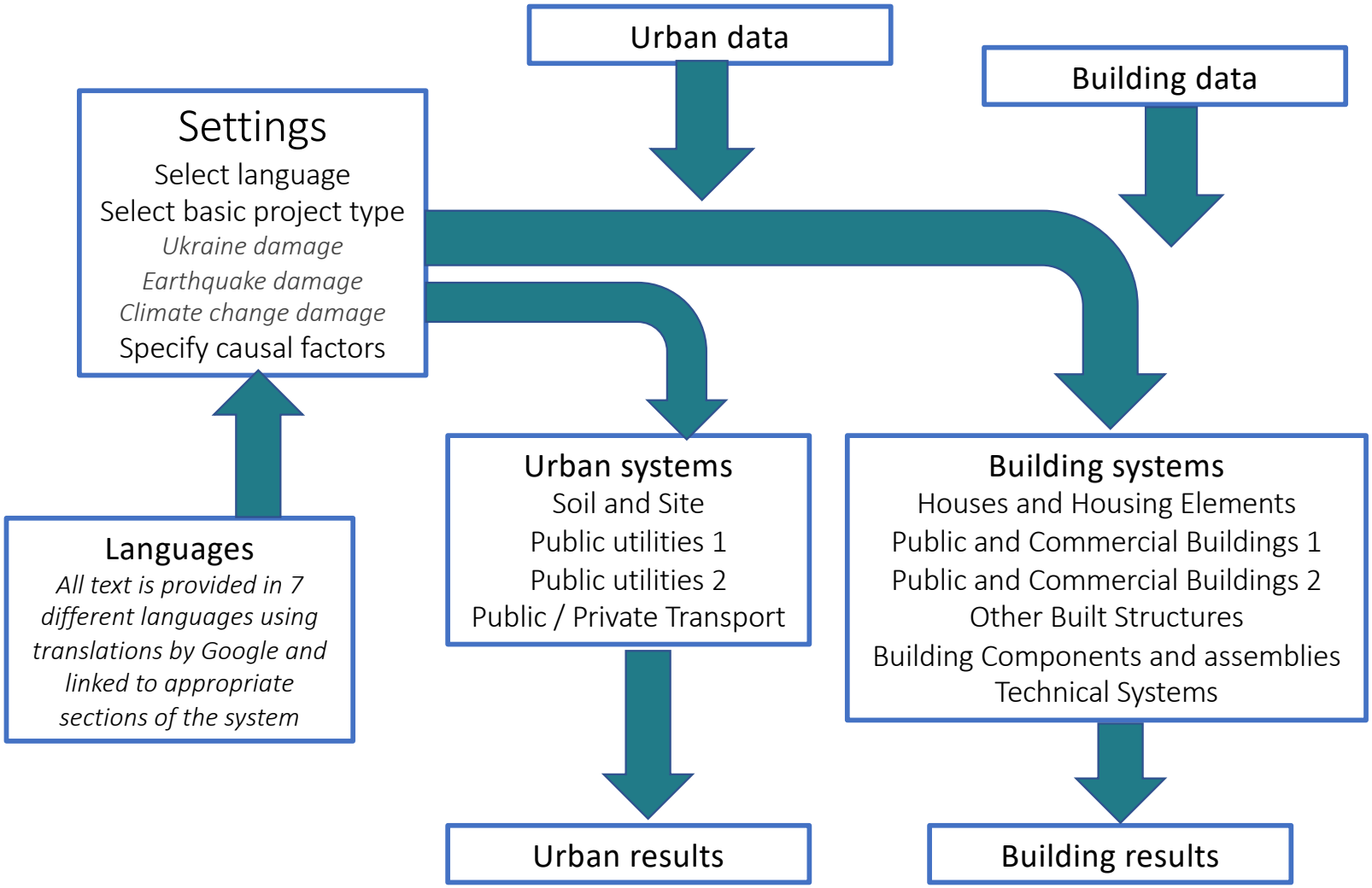
Default scenarios for

* Ukraine war damage;
* Earthquake damage;
* Climate Change impacts such as hurricanes, flooding etc.

What it is not:

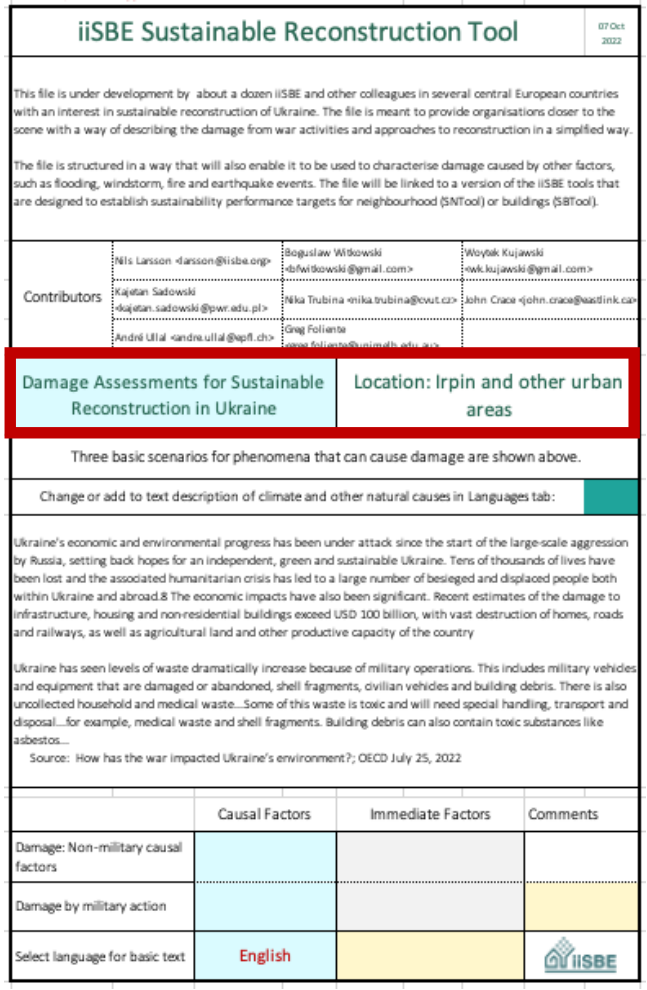
* Not yet fully developed
* Not yet linked to sustainable reconstruction guidelines

Overview of the system structure



The iiSBE Damage Assessment Tool

The iiSBE Damage Assessment Tool



iiSBE Sustainable Reconstruction Tool — 07 Oct 2022

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Damage Assessments for Sustainable Reconstruction in Ukraine	Location: Irpin and other urban areas

Three basic scenarios for phenomena that can cause damage are shown above.

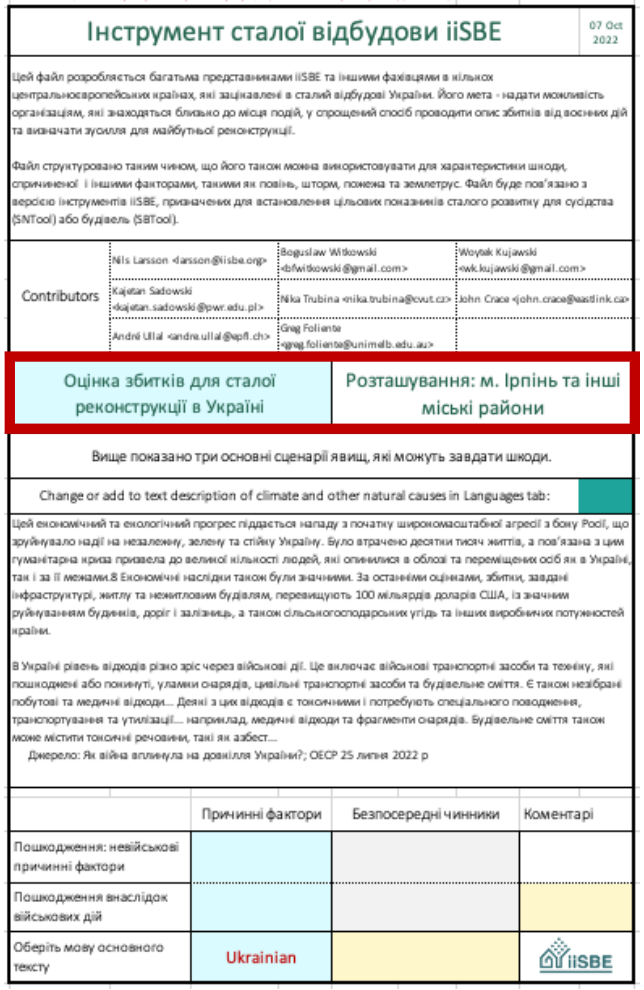
Change or add to text description of climate and other natural causes in Languages tab:

Ukraine's economic and environmental progress has been under attack since the start of the large-scale aggression by Russia, setting back hopes for an independent, green and sustainable Ukraine. Tens of thousands of lives have been lost and the associated humanitarian crisis has led to a large number of besieged and displaced people both within Ukraine and abroad.8 The economic impacts have also been significant. Recent estimates of the damage to infrastructure, housing and non-residential buildings exceed USD 100 billion, with vast destruction of homes, roads and railways, as well as agricultural land and other productive capacity of the country

Ukraine has seen levels of waste dramatically increase because of military operations. This includes military vehicles and equipment that are damaged or abandoned, shell fragments, civilian vehicles and building debris. There is also uncollected household and medical waste...Some of this waste is toxic and will need special handling, transport and disposal...for example, medical waste and shell fragments. Building debris can also contain toxic substances like asbestos....

Source: How has the war impacted Ukraine's environment?; OECD July 25, 2022

	Causal Factors	Immediate Factors	Comments
Damage: Non-military causal factors			
Damage by military action			
Select language for basic text	English		iiSBE



Інструмент сталої відбудови iiSBE — 07 Oct 2022

Цей файл розробляється багатьма представниками iiSBE та іншими фахівцями в кількох центральноєвропейських країнах, які зацікавлені в сталій відбудові України. Його мета - надати можливість організаціям, які знаходяться близько до місця подій, у спрощений спосіб проводити опис збитків від воєнних дій та визначати зусилля для майбутньої реконструкції.

Файл структуровано таким чином, що його також можна використовувати для характеристики шкоди, спричиненої і іншими факторами, такими як повінь, шторм, пожежа та землетрус. Файл буде пов'язано з версією інструментів iiSBE, призначених для встановлення цільових показників сталого розвитку для суєдства (SNTool) або будівель (SBTool).

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Оцінка збитків для сталої реконструкції в Україні	Розташування: м. Ірпінь та інші міські райони

Вище показано три основні сценарії явищ, які можуть завдати шкоди.

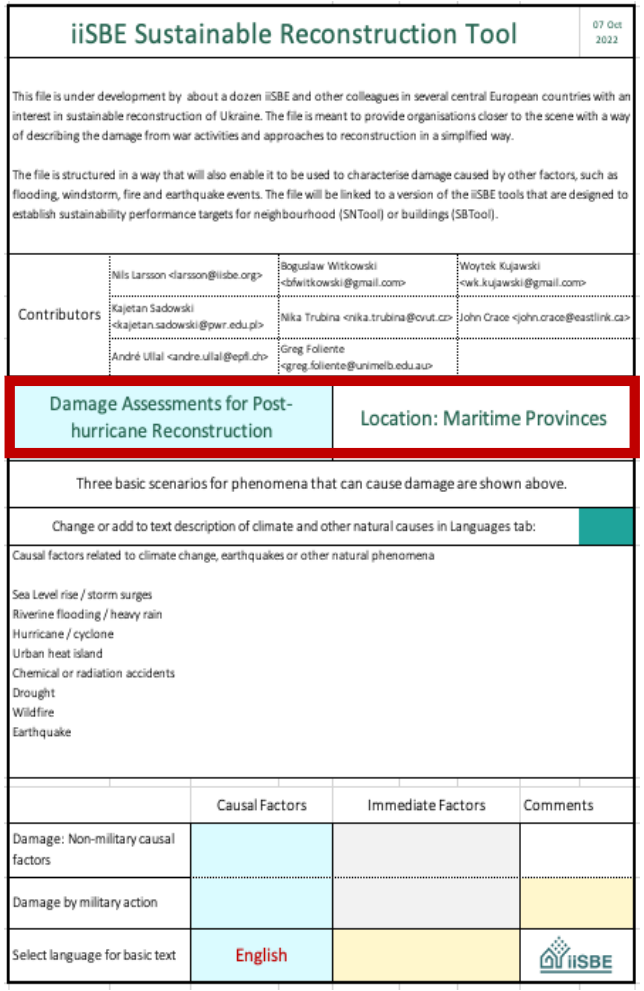
Change or add to text description of climate and other natural causes in Languages tab:

Цей економічний та екологічний прогрес піддається нападу з початку широкомасштабної агресії з боку Росії, що зруйнувало надії на незалежну, зелену та стійку Україну. Було втрачено десятки тисяч життів, а пов'язана з цим гуманітарна криза призвела до великої кількості людей, які опинилися в облозі та переміщених осіб як в Україні, так і за її межами.8 Економічні наслідки також були значними. За останніми оцінками, збитки, завдані інфраструктурі, житлу та нежитловим будівлям, перевищують 100 мільярдів доларів США, із значним руйнуванням будинків, доріг і залізниць, а також сільськогосподарських угідь та інших виробничих потужностей країни.

В Україні рівень відходів різко зріс через військові дії. Це включає військові транспортні засоби та техніку, які пошкоджені або покинуті, уламки снарядів, цивільні транспортні засоби та будівельне сміття. Є також незібрані побутові та медичні відходи... Деякі з цих відходів є токсичними і потребують спеціального поводження, транспортування та утилізації... наприклад, медичні відходи та фрагменти снарядів. Будівельне сміття також може містити токсичні речовини, такі як азбест....

Джерело: Як війна вплинула на довкілля України?; ОЕСР 25 липня 2022 р

	Причинні фактори	Безпосередні чинники	Коментарі
Пошкодження: невійськові причинні фактори			
Пошкодження внаслідок військових дій			
Оберіть мову основного тексту	Ukrainian		iiSBE



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Damage Assessments for Post-hurricane Reconstruction	Location: Maritime Provinces

Three basic scenarios for phenomena that can cause damage are shown above.

Change or add to text description of climate and other natural causes in Languages tab:

Causal factors related to climate change, earthquakes or other natural phenomena

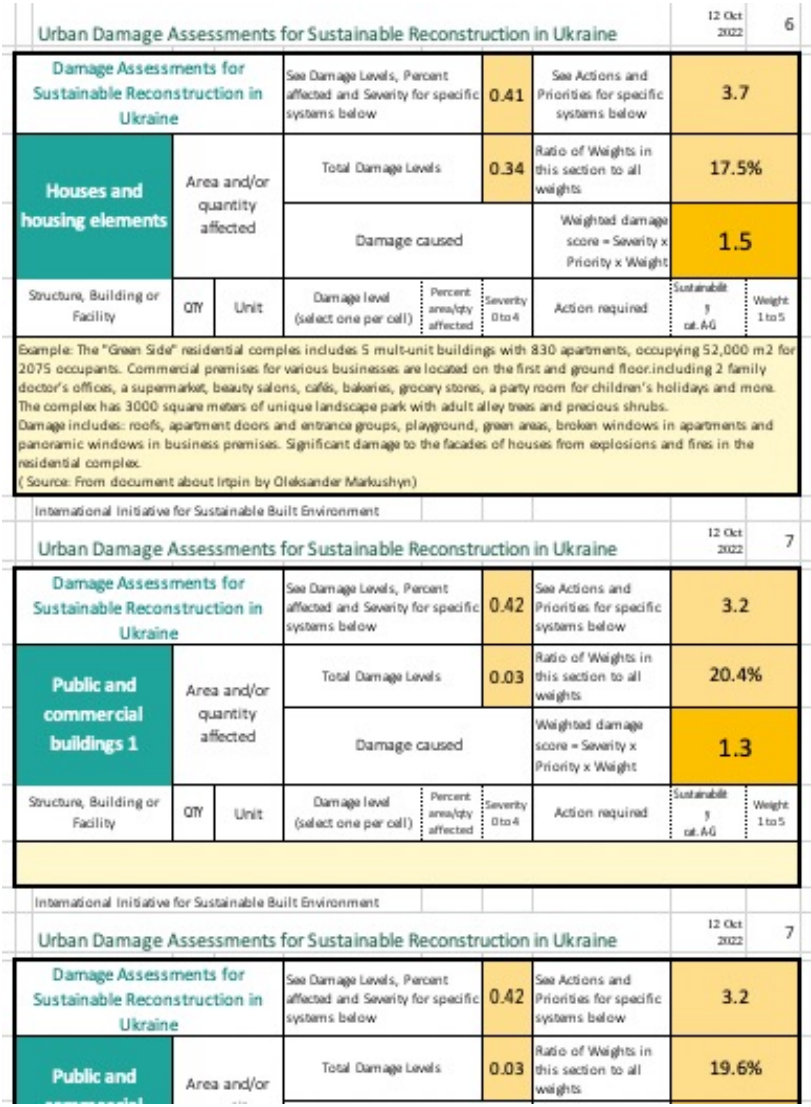
Sea Level rise / storm surges
Riverine flooding / heavy rain
Hurricane / cyclone
Urban heat island
Chemical or radiation accidents
Drought
Wildfire
Earthquake

	Causal Factors	Immediate Factors	Comments
Damage: Non-military causal factors			
Damage by military action			
Select language for basic text	English		iiSBE

The Settings tab, shown in two languages for 3 different scenarios (7 languages are available)

The iiSBE Damage Assessment Tool

Below: Level 1 – Summary Info



Urban Damage Assessments for Sustainable Reconstruction in Ukraine — 12 Oct 2022 — 6

Damage Assessments for Sustainable Reconstruction in Ukraine			See Damage Levels, Percent affected and Severity for specific systems below	0.41	See Actions and Priorities for specific systems below	3.7
Houses and housing elements	Area and/or quantity affected		Total Damage Levels	0.34	Ratio of Weights in this section to all weights	17.5%
			Damage caused		Weighted damage score = Severity x Priority x Weight	1.5

Structure, Building or Facility	QTY	Unit	Damage level (select one per cell)	Percent area/qty affected	Severity 0 to 4	Action required	Sustainability cat. A-G	Weight 1 to 5

Example: The "Green Side" residential comples includes 5 mult-unit buildings with 830 apartments, occupying 52,000 m2 for 2075 occupants. Commercial premises for various businesses are located on the first and ground floor.including 2 family doctor's offices, a supermarket, beauty salons, cafés, bakeries, grocery stores, a party room for children's holidays and more. The complex has 3000 square meters of unique landscape park with adult alley trees and precious shrubs.
Damage includes: roofs, apartment doors and entrance groups, playground, green areas, broken windows in apartments and panoramic windows in business premises. Significant damage to the facades of houses from explosions and fires in the residential complex.
(Source: From document about Irtpin by Oleksander Markushyn)

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Urban Damage Assessments for Sustainable Reconstruction in Ukraine — 12 Oct 2022 — 7

Damage Assessments for Sustainable Reconstruction in Ukraine			See Damage Levels, Percent affected and Severity for specific systems below	0.42	See Actions and Priorities for specific systems below	3.2
Public and commercial buildings 1	Area and/or quantity affected		Total Damage Levels	0.03	Ratio of Weights in this section to all weights	20.4%
			Damage caused		Weighted damage score = Severity x Priority x Weight	1.3

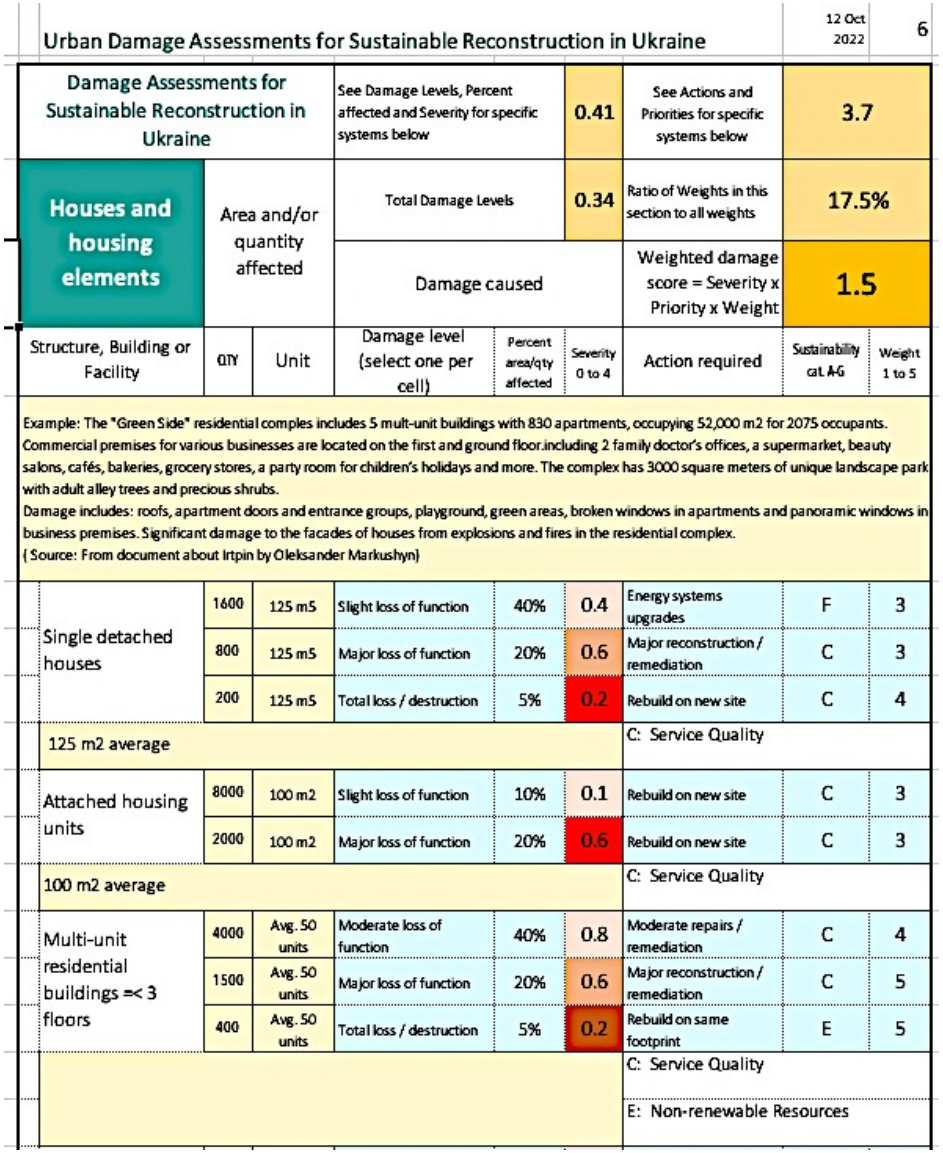
Structure, Building or Facility	QTY	Unit	Damage level (select one per cell)	Percent area/qty affected	Severity 0 to 4	Action required	Sustainability cat. A-G	Weight 1 to 5

International Initiative for Sustainable Built Environment

Urban Damage Assessments for Sustainable Reconstruction in Ukraine — 12 Oct 2022 — 7

Damage Assessments for Sustainable Reconstruction in Ukraine			See Damage Levels, Percent affected and Severity for specific systems below	0.42	See Actions and Priorities for specific systems below	3.2
Public and	Area and/or		Total Damage Levels	0.03	Ratio of Weights in this section to all weights	19.6%

Below: Level 3 – most detailed



Urban Damage Assessments for Sustainable Reconstruction in Ukraine — 12 Oct 2022 — 6

Damage Assessments for Sustainable Reconstruction in Ukraine			See Damage Levels, Percent affected and Severity for specific systems below	0.41	See Actions and Priorities for specific systems below	3.7
Houses and housing elements	Area and/or quantity affected		Total Damage Levels	0.34	Ratio of Weights in this section to all weights	17.5%
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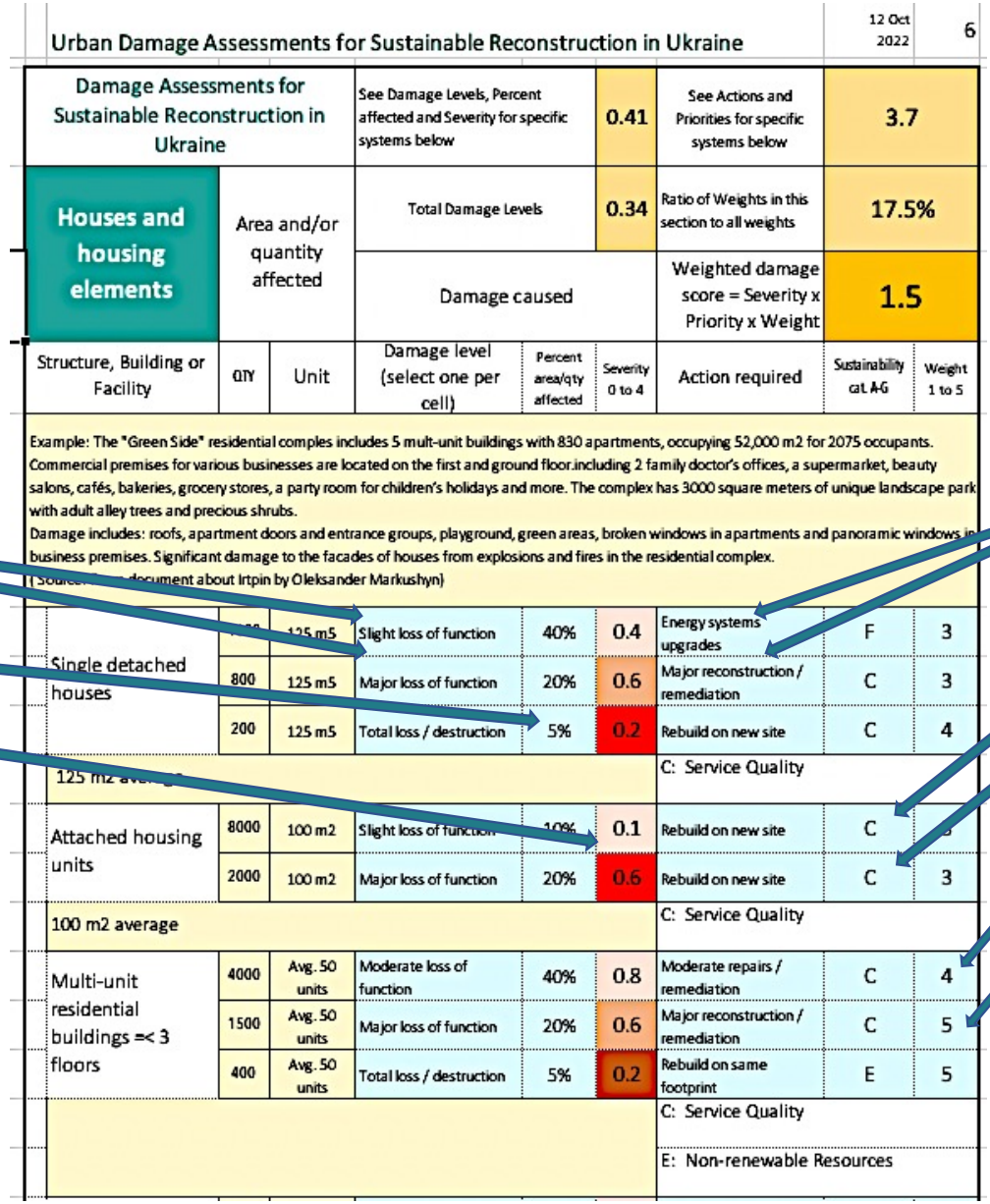
Structure, Building or Facility	QTY	Unit	Damage level (select one per cell)	Percent area/qty affected	Severity 0 to 4	Action required	Sustainability cat. A-G	Weight 1 to 5
Example: The "Green Side" residential comples includes 5 mult-unit buildings with 830 apartments, occupying 52,000 m2 for 2075 occupants. Commercial premises for various businesses are located on the first and ground floor.including 2 family doctor's offices, a supermarket, beauty salons, cafés, bakeries, grocery stores, a party room for children's holidays and more. The complex has 3000 square meters of unique landscape park with adult alley trees and precious shrubs. Damage includes: roofs, apartment doors and entrance groups, playground, green areas, broken windows in apartments and panoramic windows in business premises. Significant damage to the facades of houses from explosions and fires in the residential complex. (Source: From document about Irtpin by Oleksander Markushyn)								
Single detached houses	1600	125 m5	Slight loss of function	40%	0.4	Energy systems upgrades	F	3
	800	125 m5	Major loss of function	20%	0.6	Major reconstruction / remediation	C	3
	200	125 m5	Total loss / destruction	5%	0.2	Rebuild on new site	C	4
125 m2 average						C: Service Quality		
Attached housing units	8000	100 m2	Slight loss of function	10%	0.1	Rebuild on new site	C	3
	2000	100 m2	Major loss of function	20%	0.6	Rebuild on new site	C	3
100 m2 average						C: Service Quality		
Multi-unit residential buildings =< 3 floors	4000	Avg. 50 units	Moderate loss of function	40%	0.8	Moderate repairs / remediation	C	4
	1500	Avg. 50 units	Major loss of function	20%	0.6	Major reconstruction / remediation	C	5
	400	Avg. 50 units	Total loss / destruction	5%	0.2	Rebuild on same footprint	E	5
						C: Service Quality		
						E: Non-renewable Resources		

iiSBE

The iiSBE Damage Assessment Tool

Each system or element type can have multiple descriptors of Damage type, Percent damaged, Weighted Damage Score, Action required, Sustainability Category and Priority Weight



Urban Damage Assessments for Sustainable Reconstruction in Ukraine — 12 Oct 2022 — 6

Damage Assessments for Sustainable Reconstruction in Ukraine			See Damage Levels, Percent affected and Severity for specific systems below		0.41	See Actions and Priorities for specific systems below	3.7	
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Structure, Building or Facility	QTY	Unit	Damage level (select one per cell)	Percent area/qty affected	Severity 0 to 4	Action required	Sustainability cat A-G	Weight 1 to 5
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	400	Avg. 50 units	Total loss / destruction	5%	0.2	Rebuild on same footprint	E	5
						C: Service Quality		
						E: Non-renewable Resources		

Damage type

Percent damaged

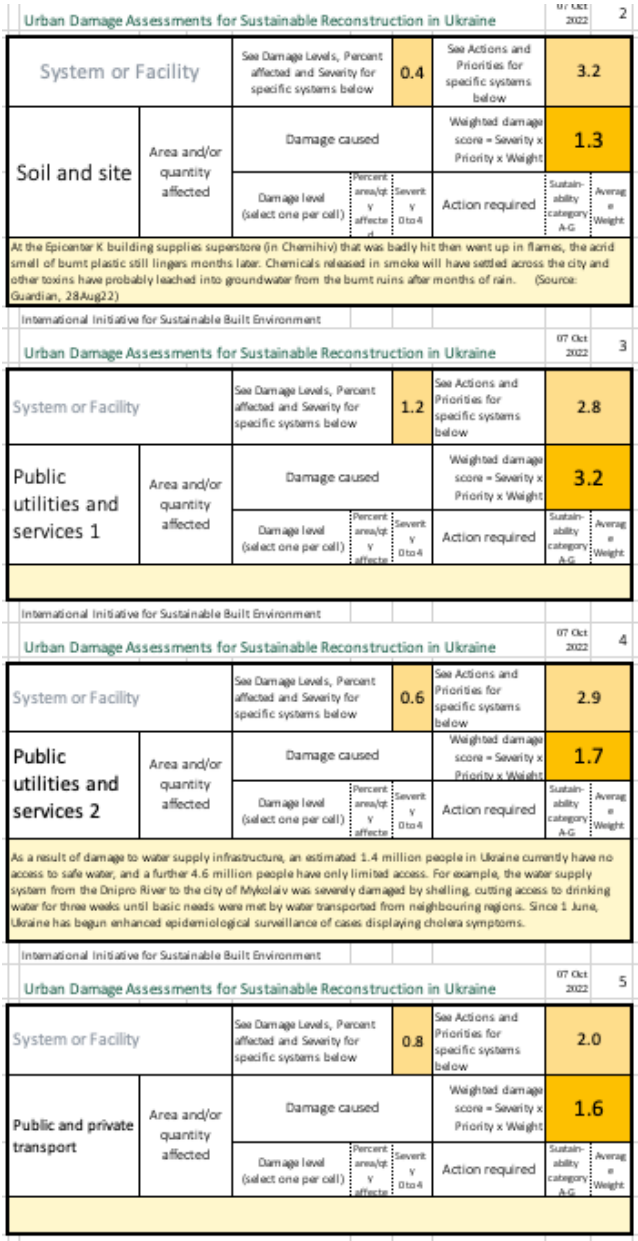
Weighted Damage Score

Actions required

Sustainability Categories

Priority weights

The iiSBE Damage Assessment Tool



Urban Damage Assessments for Sustainable Reconstruction in Ukraine — 07 Oct 2022 — 2

System or Facility		See Damage Levels, Percent affected and Severity for specific systems below	0.4	See Actions and Priorities for specific systems below	3.2
Soil and site	Area and/or quantity affected	Damage caused		Weighted damage score = Severity x Priority x Weight	1.3
		Damage level (select one per cell)	Percent area/qty affected	Severity 0 to 4	Action required	Sustainability category A-G	Average Weight

At the Epicenter K building supplies superstore (in Chernihiv) that was badly hit then went up in flames, the acrid smell of burnt plastic still lingers months later. Chemicals released in smoke will have settled across the city and other toxins have probably leached into groundwater from the burnt ruins after months of rain. (Source: Guardian, 28Aug22)

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Urban Damage Assessments for Sustainable Reconstruction in Ukraine — 07 Oct 2022 — 3

System or Facility		See Damage Levels, Percent affected and Severity for specific systems below	1.2	See Actions and Priorities for specific systems below	2.8
Public utilities and services 1	Area and/or quantity affected	Damage caused		Weighted damage score = Severity x Priority x Weight	3.2
		Damage level (select one per cell)	Percent area/qty affected	Severity 0 to 4	Action required	Sustainability category A-G	Average Weight

International Initiative for Sustainable Built Environment

Urban Damage Assessments for Sustainable Reconstruction in Ukraine — 07 Oct 2022 — 4

System or Facility		See Damage Levels, Percent affected and Severity for specific systems below	0.6	See Actions and Priorities for specific systems below	2.9
Public utilities and services 2	Area and/or quantity affected	Damage caused		Weighted damage score = Severity x Priority x Weight	1.7
		Damage level (select one per cell)	Percent area/qty affected	Severity 0 to 4	Action required	Sustainability category A-G	Average Weight

As a result of damage to water supply infrastructure, an estimated 1.4 million people in Ukraine currently have no access to safe water, and a further 4.6 million people have only limited access. For example, the water supply system from the Dnipro River to the city of Mykolaiv was severely damaged by shelling, cutting access to drinking water for three weeks until basic needs were met by water transported from neighbouring regions. Since 1 June, Ukraine has begun enhanced epidemiological surveillance of cases displaying cholera symptoms.

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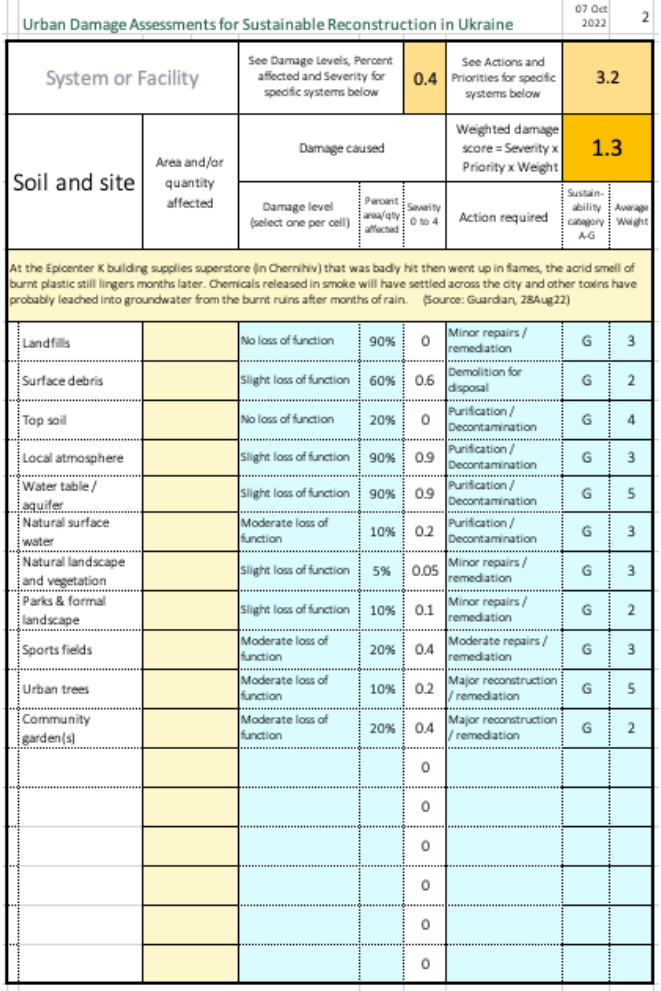
Urban Damage Assessments for Sustainable Reconstruction in Ukraine — 07 Oct 2022 — 5

System or Facility		See Damage Levels, Percent affected and Severity for specific systems below	0.8	See Actions and Priorities for specific systems below	2.0
Public and private transport	Area and/or quantity affected	Damage caused		Weighted damage score = Severity x Priority x Weight	1.6
		Damage level (select one per cell)	Percent area/qty affected	Severity 0 to 4	Action required	Sustainability category A-G	Average Weight

Left: the Urban tab, level 1



Urban Damage Assessments for Sustainable Reconstruction in Ukraine — 07 Oct 2022 — 2

System or Facility		See Damage Levels, Percent affected and Severity for specific systems below	0.4	See Actions and Priorities for specific systems below	3.2
Soil and site	Area and/or quantity affected	Damage caused		Weighted damage score = Severity x Priority x Weight	1.3
		Damage level (select one per cell)	Percent area/qty affected	Severity 0 to 4	Action required	Sustainability category A-G	Average Weight

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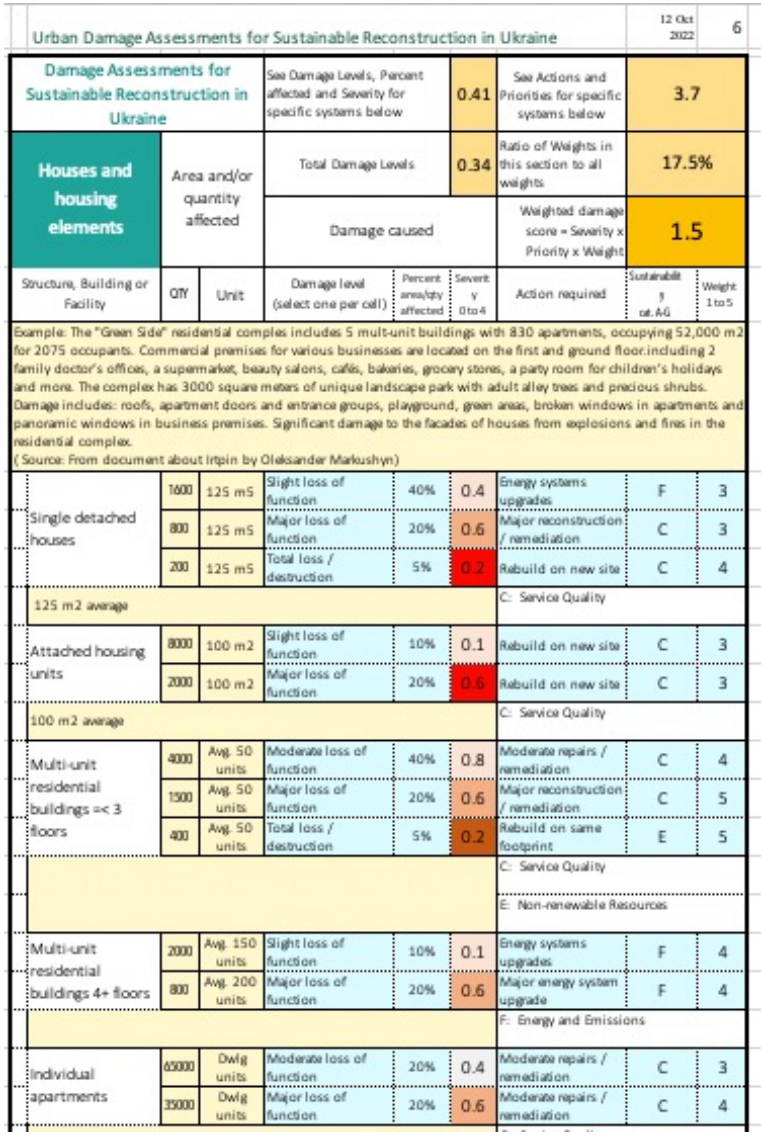
Landfills		No loss of function	90%	0	Minor repairs / remediation	G	3
Surface debris		Slight loss of function	60%	0.6	Demolition for disposal	G	2
Top soil		No loss of function	20%	0	Purification / Decontamination	G	4
Local atmosphere		Slight loss of function	90%	0.9	Purification / Decontamination	G	3
Water table / aquifer		Slight loss of function	90%	0.9	Purification / Decontamination	G	5
Natural surface water		Moderate loss of function	10%	0.2	Purification / Decontamination	G	3
Natural landscape and vegetation		Slight loss of function	5%	0.05	Minor repairs / remediation	G	3
Parks & formal landscape		Slight loss of function	10%	0.1	Minor repairs / remediation	G	2
Sports fields		Moderate loss of function	20%	0.4	Moderate repairs / remediation	G	3
Urban trees		Moderate loss of function	10%	0.2	Major reconstruction / remediation	G	5
Community garden(s)		Moderate loss of function	20%	0.4	Major reconstruction / remediation	G	2
				0			
				0			
				0			
				0			
				0			
				0			

The Urban tab, level 2



Urban Damage Assessments for Sustainable Reconstruction in Ukraine — 12 Oct 2022 — 6

Damage Assessments for Sustainable Reconstruction in Ukraine			See Damage Levels, Percent affected and Severity for specific systems below	0.41	See Actions and Priorities for specific systems below	3.7
Houses and housing elements	Area and/or quantity affected		Total Damage Levels	0.34	Ratio of Weights in this section to all weights	17.5%
			Damage caused		Weighted damage score = Severity x Priority x Weight	1.5

Structure, Building or Facility	QTY	Unit	Damage level (select one per cell)	Percent area/qty affected	Severity 0 to 4	Action required	Sustainability cat. A-G	Weight 1 to 5

Example: The "Green Side" residential complex includes 5 multi-unit buildings with 830 apartments, occupying 52,000 m2 for 2075 occupants. Commercial premises for various businesses are located on the first and ground floor including 2 family doctor's offices, a supermarket, beauty salons, cafés, bakeries, grocery stores, a party room for children's holidays and more. The complex has 3000 square meters of unique landscape park with adult alley trees and precious shrubs. Damage includes: roofs, apartment doors and entrance groups, playground, green areas, broken windows in apartments and panoramic windows in business premises. Significant damage to the facades of houses from explosions and fires in the residential complex.
(Source: From document about Irpin by Oleksander Markushyn)

Single detached houses	1600	125 m5	Slight loss of function	40%	0.4	Energy systems upgrades	F	3
	800	125 m5	Major loss of function	20%	0.6	Major reconstruction / remediation	C	3
	200	125 m5	Total loss / destruction	5%	0.2	Rebuild on new site	C	4
125 m2 average						C: Service Quality		
Attached housing units	8000	100 m2	Slight loss of function	10%	0.1	Rebuild on new site	C	3
	2000	100 m2	Major loss of function	20%	0.6	Rebuild on new site	C	3
100 m2 average						C: Service Quality		
Multi-unit residential buildings =< 3 floors	4000	Avg. 50 units	Moderate loss of function	40%	0.8	Moderate repairs / remediation	C	4
	1500	Avg. 50 units	Major loss of function	20%	0.6	Major reconstruction / remediation	C	5
	400	Avg. 50 units	Total loss / destruction	5%	0.2	Rebuild on same footprint	E	5
						C: Service Quality		
						E: Non-renewable Resources		
Multi-unit residential buildings 4+ floors	2000	Avg. 150 units	Slight loss of function	10%	0.1	Energy systems upgrades	F	4
	800	Avg. 200 units	Major loss of function	20%	0.6	Major energy system upgrade	F	4
						F: Energy and Emissions		
Individual apartments	65000	Dwlg units	Moderate loss of function	20%	0.4	Moderate repairs / remediation	C	3
	35000	Dwlg units	Major loss of function	20%	0.6	Moderate repairs / remediation	C	4

The Urban tab, level 3

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