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

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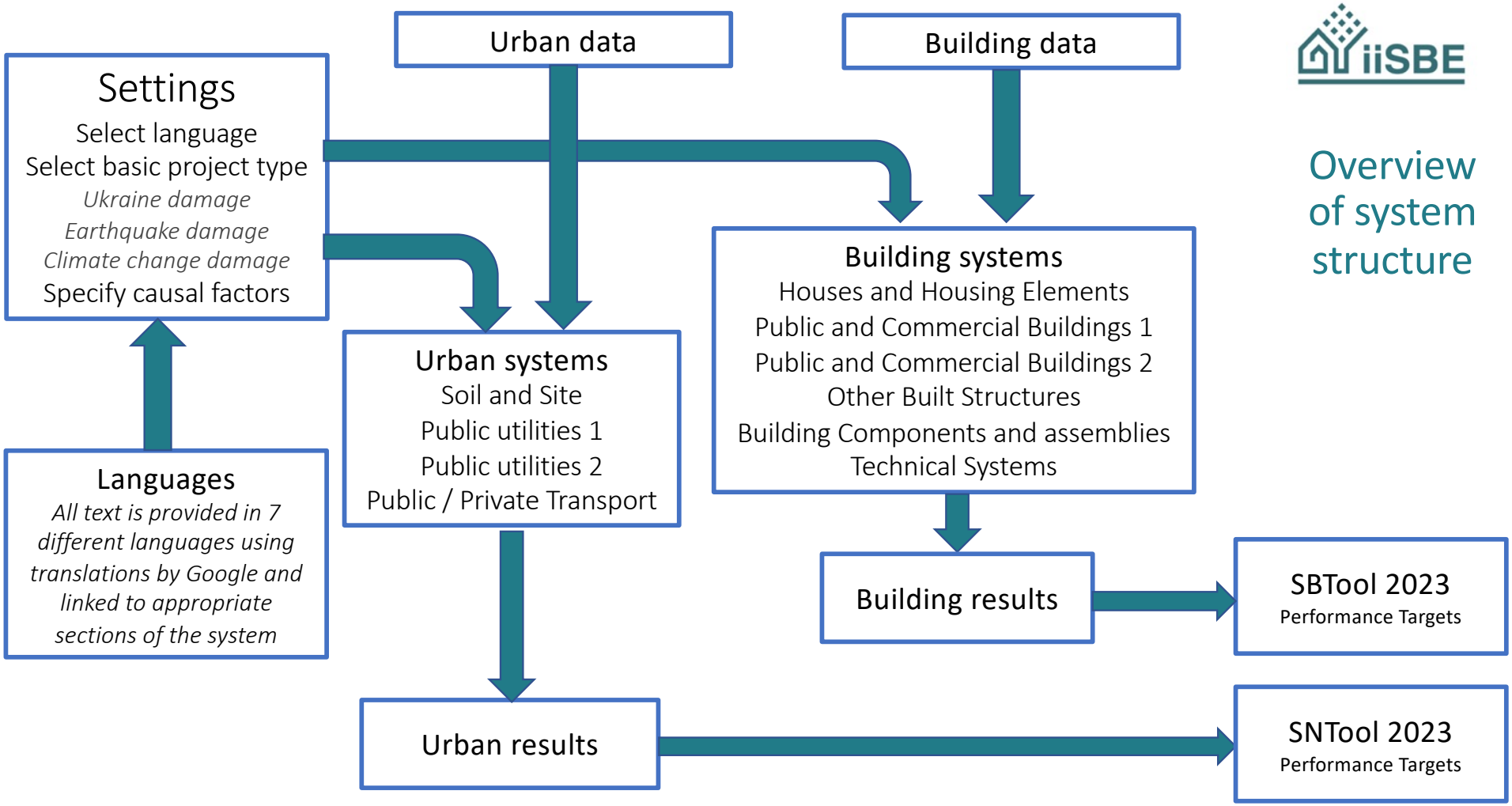
International Initiative for Sustainable Built Environment (iiSBE)

24 November 2022

iiSBE Damage Assessment Tool



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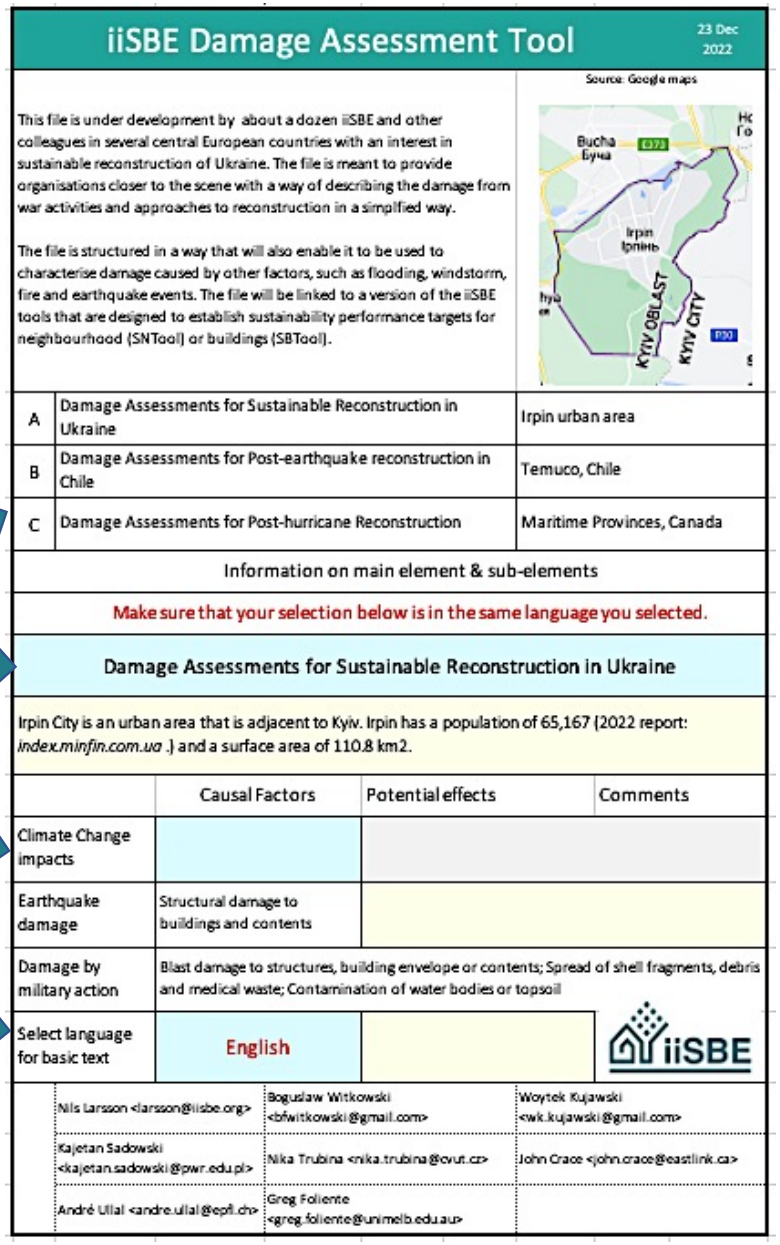
Overview of system structure

The iiSBE Damage Assessment Tool

Select one of 3 scenarios

Identify other causes of damage

Select one of 7 languages



iiSBE Damage Assessment Tool — 23 Dec 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).

Source: Google maps

A	Damage Assessments for Sustainable Reconstruction in Ukraine	Irpin urban area
B	Damage Assessments for Post-earthquake reconstruction in Chile	Temuco, Chile
C	Damage Assessments for Post-hurricane Reconstruction	Maritime Provinces, Canada

Information on main element & sub-elements

Make sure that your selection below is in the same language you selected.

Damage Assessments for Sustainable Reconstruction in Ukraine

Irpin City is an urban area that is adjacent to Kyiv. Irpin has a population of 65,167 (2022 report: *index.minfin.com.ua* .) and a surface area of 110.8 km2.

	Causal Factors	Potential effects	Comments
Climate Change impacts			
Earthquake damage	Structural damage to buildings and contents		
Damage by military action	Blast damage to structures, building envelope or contents; Spread of shell fragments, debris and medical waste; Contamination of water bodies or topsoil		
Select language for basic text	English		

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What it is:

Free

Operates on Excel

Seven language options

Default scenarios for

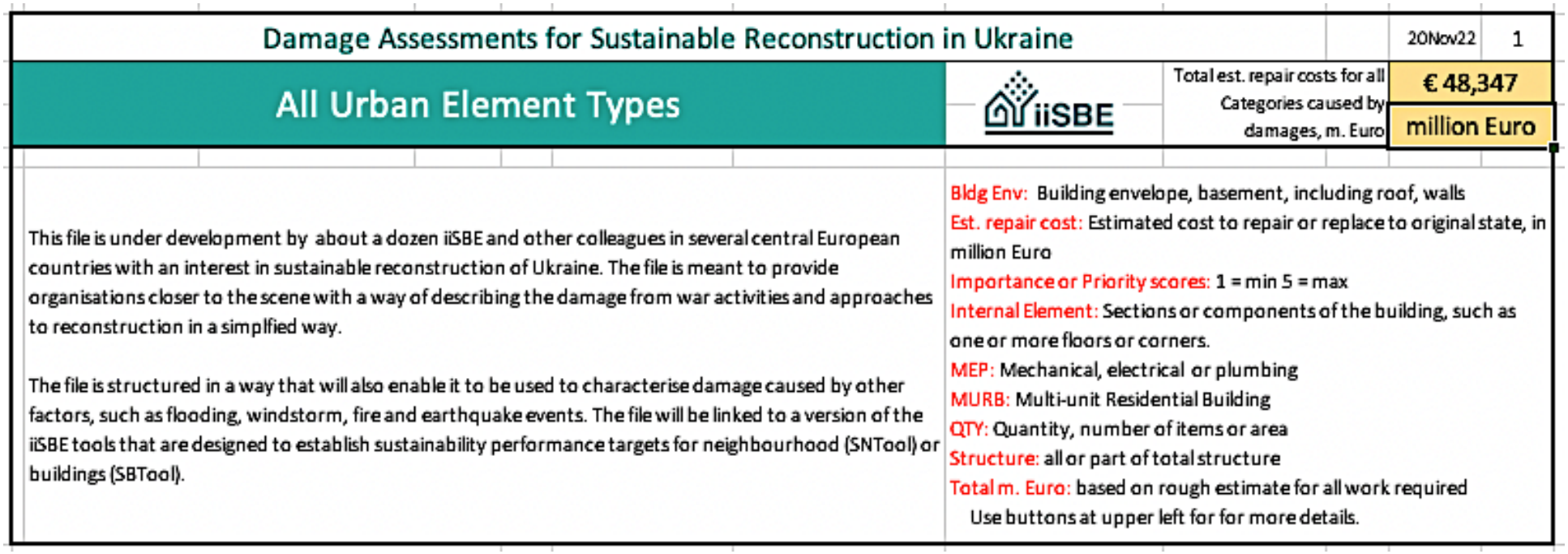
* Ukraine war damage;
* Earthquake damage;
* Climate Change impacts such as hurricanes, flooding etc.

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



Damage Assessments for Sustainable Reconstruction in Ukraine

20Nov22 1

All Urban Element Types

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Total est. repair costs for all Categories caused by damages, m. Euro

€ 48,347

million Euro

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Bldg Env: Building envelope, basement, including roof, walls
Est. repair cost: Estimated cost to repair or replace to original state, in million Euro
Importance or Priority scores: 1 = min 5 = max
Internal Element: Sections or components of the building, such as one or more floors or corners.
MEP: Mechanical, electrical or plumbing
MURB: Multi-unit Residential Building
QTY: Quantity, number of items or area
Structure: all or part of total structure
Total m. Euro: based on rough estimate for all work required
Use buttons at upper left for for more details.

The Urban tab, level 1

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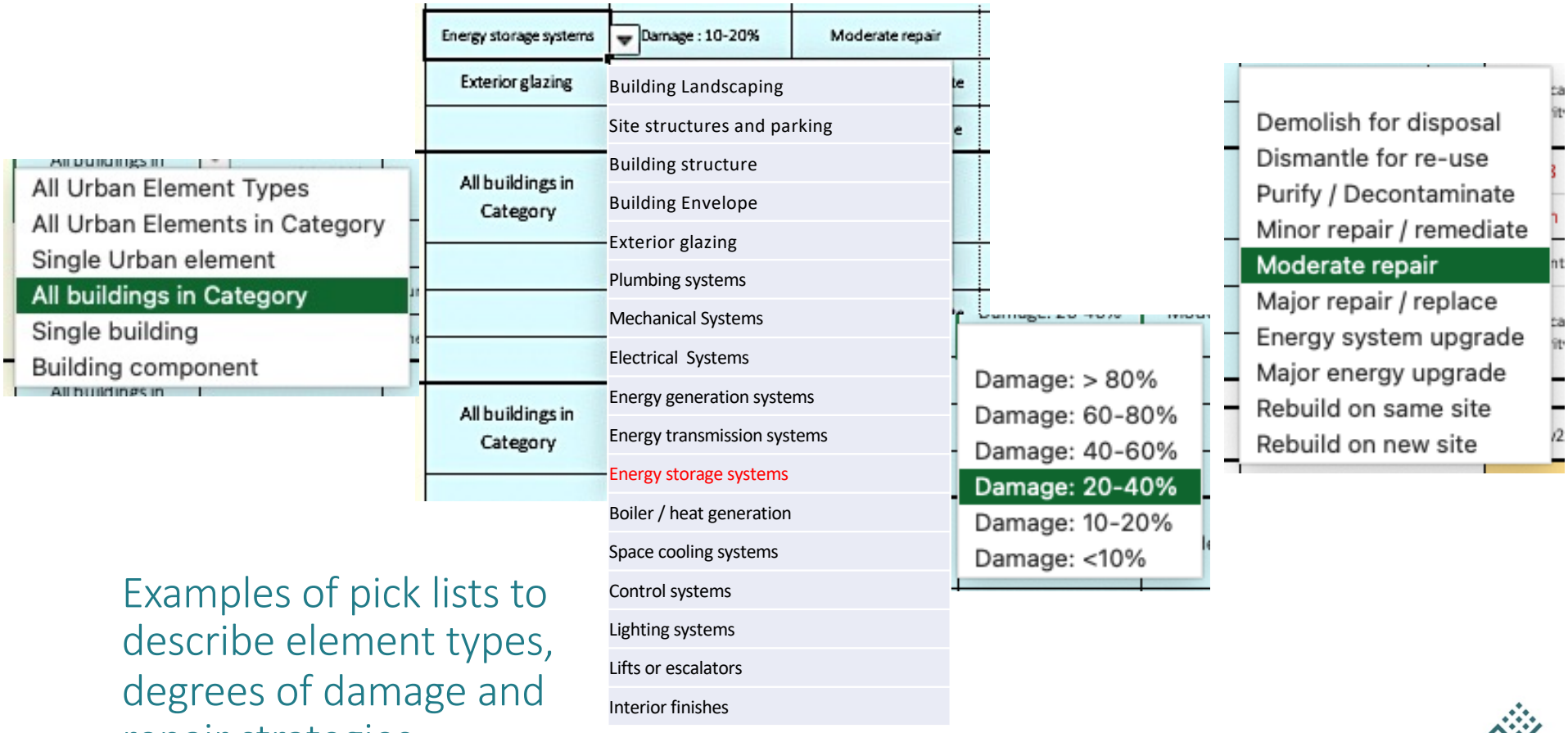

Examples of pick lists to describe element types, degrees of damage and repair strategies

The iiSBE Damage Assessment Tool

Damage Assessments for Sustainable Reconstruction in Ukraine									20Nov22	3
Soil and site 2	Information on main element & sub-elements	Area and/or quantity assessed		Enter information on type and area / quantity of elements, descriptions of type and extent of damage; also ball-park estimates of funds required to restore the elements to their original functions.			Approximate repair costs in Category, m. Euro		€ 377	
		Total Qty	Unit type	Notes	Damaged urban elements and infrastructure	Post-event damage level	Actions		Est. Repair cost	
							Action required	Priority 1 - 5	Total m Euro	Per unit
Natural landscape	Single Urban element	1		Assumes that 50% of 110 km2 surface area is natural or semi-natural landscape	Single Urban element	Damage: 40-60%	Purify / Decontaminate	3	€6 million	€6.0
	Aggregate area, km2.	55								
Park/landscape	Single Urban element	1		Assumes that 20% of 110 km2 surface area is cultivated landscape or parks	Single Urban element	Damage: 20-40%	Purify / Decontaminate	4	€11 million	€11.0
	Aggregate area, km2.	22								
Urban tree grove(s)	Single Urban element	20		Assumes that 10% of 110 km2 (11,000 ha.) surface area is urban tree groves	Single Urban element	Damage: <10%	Purify / Decontaminate	5	€200 million	€10.0
	Aggregate area, ha.	5,000								
Community garden(s)	Single Urban element	100		Assumes that 1% of 110 km2 (1,100 ha.) surface area is community gardens	Single Urban element	Damage: <10%	Minor repair / remediate	4	€80 million	€0.8
	Aggregate area, ha.	1,100								
Sports field	Single Urban element	100		Assumes that 2% of 110 km2 (2,200 ha.) surface area is sports fields	Single Urban element	Damage: <10%	Purify / Decontaminate	5	€80 million	€0.8
	Aggregate area, ha.	2,200								

Urban tab, level 1

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The iiSBE Damage Assessment Tool

Urban tab

Damage Assessments for Sustainable Reconstruction in Ukraine

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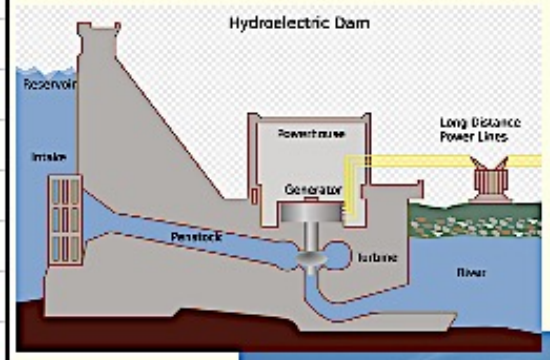
Public utilities and services 2	Information on main element & sub-elements	Area and/or quantity assessed: Total Qty	Area and/or quantity assessed: Unit type	Enter information on type and area / quantity of elements, descriptions of type and extent of damage; also ball-park estimates of funds required to restore the elements to their original functions.	Damaged urban elements and infrastructure	Post-event damage level	Actions: Action required	Actions: Priority 1 - 5	Est. Repair cost: Total m Euro	Est. Repair cost: Per unit
							Approx. repair costs, priority 4 & 5 elements, m. Euro		€ 75 m. euro	
							Approx. total repair costs, m. Euro		€ 97 m. euro	
Hydroelectric power plant	Single Urban element	1		There are 11 hydroelectric plants. 4 of these are pumped-storage plants (Wikipedia).	Single Urban element	Damage: 10-20%	Minor repair / remediate	4	Net/gross costs activated by priority score >	3
	Aggregate output, MW	630			Site structures and parking	Damage: 40-60%	Moderate repair	3	€0.8	€0.8
	Avg. MWe output	630	Mwe		Building Envelope	Damage: 40-60%	Moderate repair	5	€3.0	€3.0
					Structure	Damage: 10-20%	Moderate repair	3	€6.0	€6.0
					Control systems	Damage: 60-80%	Moderate repair	4	€4.0	€4.0
					Forebay	Damage : 10-20%	Moderate repair	3	€1.0	€1.0
					Intake Structure	Damage : 10-20%	Moderate repair	3	€14.0	€14.0
					Penstock	Damage : 10-20%	Moderate repair	4	€2.0	€2.0
					Surge Chamber	Damage: 40-60%	Major energy upgrade	5	€3.0	€3.0
					Hydraulic turbines	Damage: 40-60%	Major repair / replace	5	€44.0	€44.0
					Power house	Damage : 10-20%	Moderate repair	5	€12.0	€12.0
					Draft tube	Damage: 40-60%	Energy system upgrade	5	€2.0	€2.0
					Tailrace		Moderate repair	4	€5.0	€5.0

Top: conventional hydroelectric dam. Bottom: Pumped-storage dam



The iiSBE Damage Assessment Tool

Urban tab, level 2

Damage Assessments for Sustainable Reconstruction in Ukraine

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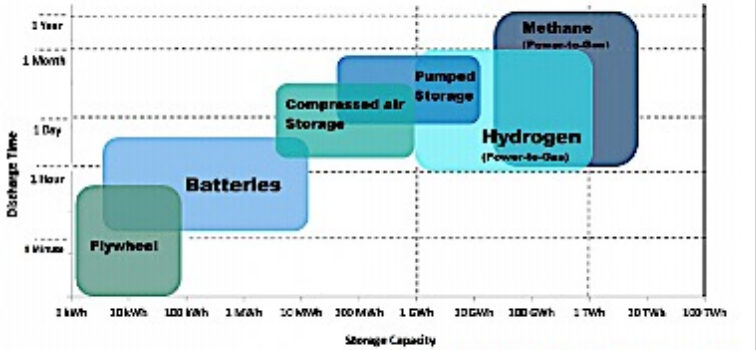
Public utilities and services 3	Information on main element & sub-elements	Area and/or quantity assessed: Total Qty	Unit type	Notes	Damaged urban elements and infrastructure	Post-event damage level	Actions: Action required	Priority 1 - 5	Approximate repair costs in Category, m. Euro: € 6,036 — Est. Repair cost: Total m Euro	Per unit
Energy storage facility	All Urban Elements in Category	60			All Urban Elements in Category	Damage: 20-40%	Moderate repair	3	€36 million	€0.6
	Aggregate output, MW	5,400								
	Avg. MWh capacity	90 MWh								
	Common examples of energy storage are the rechargeable battery, which stores chemical energy readily convertible to electricity to operate a mobile phone; the hydroelectric dam, which stores energy in a reservoir as gravitational potential energy; and ice storage tanks, which store ice frozen by cheaper energy at night to meet peak daytime demand for cooling. https://en.wikipedia.org/wiki/Energy_storage									
High-voltage elec. distribution	All Urban Elements in Category	400			All Urban Elements in Category	Damage: <10%	Moderate repair	3	€6,000 million	€15.0
	Aggregate output, MW	2,400,000								
	Avg. MW output	6,000 MW				Damage: <10%	Moderate repair	3	Enter Euro/unit first	
						Damage: 40-60%	Moderate repair	4	Left: typical repair actions and priority for repair	
						Damage: 40-60%	Moderate repair	4		
	Add note on infrastructure type and context					Damage: <10%	Purify / Decontaminate	4		



Source: School of Engineering, RMIT University (2015)

Figure 3. Available storage technologies, their capacity and discharge time.

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Buildings tab level 2

Damage Assessments for Sustainable Reconstruction in Ukraine

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Houses and housing 2	Information on main element & sub-elements	Area and/or quantity assessed: Total Qty	Unit type	Enter information on type and area / quantity of elements, descriptions of type and extent of damage; also ball-park estimates of funds required to restore the elements to their original functions. Notes	Damaged building(s) and key building components	Post-event damage level	Approx. repair costs, priority 4 & 5 elements, m. Euro: € 129 m. euro Approx. total repair costs, m. Euro: € 129 m. euro Actions: Action required	Priority 1 - 5	Estimated Repair cost: Total m. Euro	Estimated Euro per m2

According to the data ... more than 88% of existing residential apartment buildings in Ukraine were built before 1991.... About 40% of them are large-panel buildings of mass construction series in industrially developed regions of Ukraine and large cities such as Kyiv, Kharkiv, Dnipro, Zaporizhzhia, etc....As mentioned earlier, around 817,000 residential units were impacted by the war, 38% of them destroyed beyond repair]. This number includes apartment units, single family houses, and dormitories. Apartment buildings have been the most affected. The extent of housing damage is spread unevenly across the regions, with the Donetsk, Luhansk, Kharkiv, and Kyiv regions accounting for over 82% of the total damage to the housing stock in the country. Apartment buildings are predominant in urban areas and constitute almost 67% of the urban population. In big cities, this share increases to 79%. Apartment units, particularly Soviet-period apartments, have experienced the bulk of the damage (84%), indicating that the conflict has mainly impacted dense urban areas..

Source: A BIM-Based Method for Structural Stability Assessment and Emergency Repairs of Large-Panel Buildings Damaged by Military Actions and Explosions: Evidence from Ukraine; Petro Hryhorovskyi, Iryna Osadcha, Andrius Jurelionis , Vladyslav Basanskyi and Andrii Hryhorovskyi; Buildings 2022, 12(11), 1817; https://doi.org/10.3390/buildings

MURB building =< 3 floors	All buildings in Category	500		All buildings in Category	Damage: 20-40%	Minor repair / remediate	4	€55.8 million	€31
	Aggregate area, m2	1,800,000							
	Avg. gross area / MURB	3,600 m2		External and site structures			3	Enter Euro/m2 first	
				Exterior glazing			3	Left: typical repair actions and priority for repair	
				Building Envelope			3		
				Structure			3		
MURB building 4+ floors	All buildings in Category	200		All buildings in Category	Damage: 20-40%	Moderate repair	4	€73.0 million	€38
	Aggregate area, m2	1,920,000							
	Avg. gross area / MURB	9,600 m2				Moderate repair	3	Enter Euro/m2 first	
							4	Left: typical repair actions and priority for repair	
							3		
							3		

For more info contact:

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