



INNOVATIVE EDUCATIONAL INTEGRATION OF URBAN  
PLANNING BASED ON BIM-GIS TECHNOLOGIES AND  
FOCUSED ON CIRCULAR ECONOMY CHALLENGES

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TASK 03/A2. INTERACTIVE HANDBOOK OF LCA CONSTRUCTION MATERIALS LINKED TO UrbanBIM

## Task O3/A2

# INTERACTIVE HANDBOOK OF LCA CONSTRUCTION MATERIALS LINKED TO UrbanBIM



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Centro Tecnológico  
del mármol, piedra y materiales



Warsaw University  
of Technology



Consortium members: Universitatea Transilvania din Braşov (UTBV), Asociația Romania Green Building Council (RoGBC), Universidad de Sevilla (USE), Asociación Empresarial de Investigación Centro Tecnológico del Mármol, Piedra y Materiales (CTM), Politechnika Warszawska (WUT), Datacomp sp. z o.o. (Datacomp).

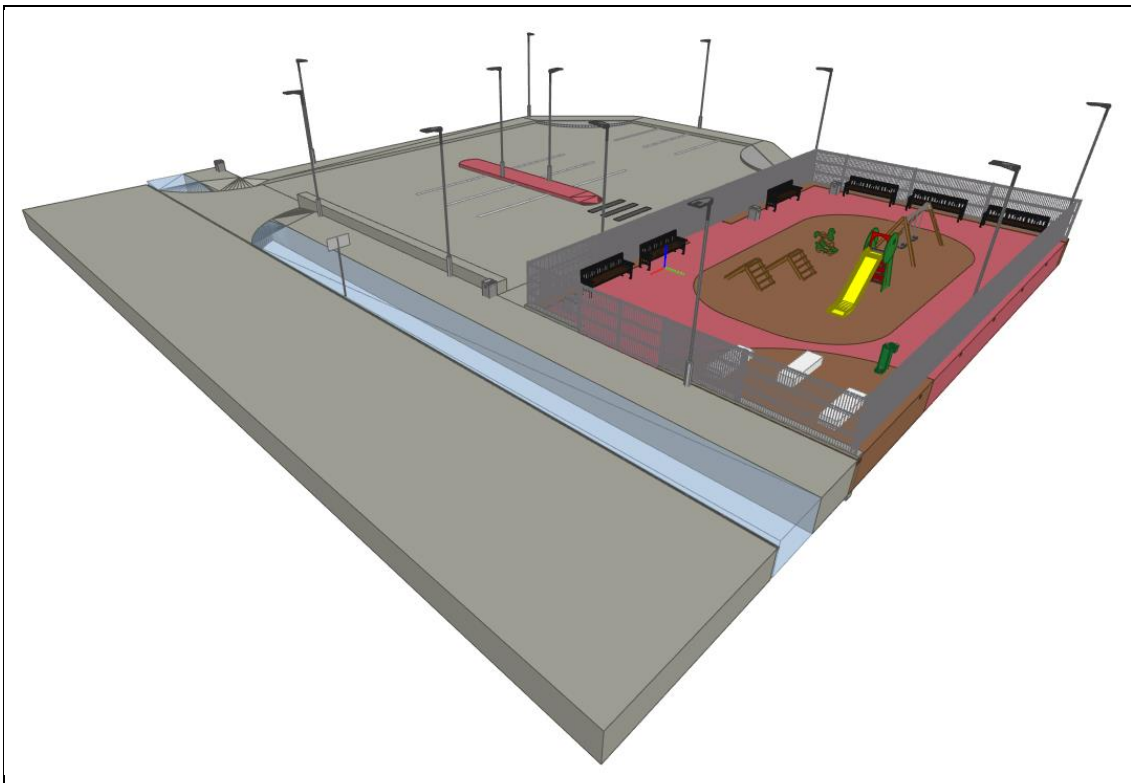
## 1. Introduction.

This Interactive Handbook has been integrated with the methodology of the UrbanBIM learning application and linked to the Online Educational Collaborative Platform (OECF), which it will content visual examples and other training materials to a better understanding of LCA of constructive materials for students, teachers and professional of AEC (Architecture, Engineering, Construction).

## 2. BIM Model.

It can be viewed at the following link: <http://urbanbim.eu/bim-objects/>

This BIM Model can be used as an example for the UrbanBIM plug-in which is used to determine the environmental impact of structural components based on material characteristics associated with product life cycle analysis (LCA).



### 3. LCA Data base.

BIM classification			Code			Element definition		Environmental impact			Budget
Element IFC	Clase IFC (Spanish)	Class UrbanBIM	Clasificación BCCA (Spanish)	Uniclass code	Unit of ref.	Description		(t CO2eq/u. ref.)	(m3/u. ref.)	MJ/u. ref.	EUR/u. ref.
IfcSlab	Slab	Pavement	15PPP50120	EF_30_60	m2	Pavement in parking area with paving blocks		0,078	1,230	491,540	54,374
		Pavement	15PPP50250	EF_30_60	m2	Pavement in children's play area with artificial grass and absorbent t		0,025	1,580	371,890	41,207
		Sidewalk	15PPP50110	EF_30_60	m2	Sidewalk with concrete paving blocks		0,081	1,290	471,420	31,912
		Cycle paths	15PPP50180	EF_30_60	m2	Cycle paths		0,098	1,960	669,740	33,217
		Driveway	15PPP50110	EF_30_60	m2	Bituminous Concrete Driveway		0,047	1,930	515,010	22,637
IfcTank	Tanks	Tanks	15ADD50005	Pr_60_50_96_15	m3	Rainwater tank		0,313	64,171	5612,002	326,915
		Container	15UR50050	Pr_40_50_07_22	u	Underground container 4000 L		6,719	584,790	34708,583	5950,121
IfcUrbanFurniture	Urban Furniture	Streetlight	15EPP00105	Pr_70_70_48_73	u	Galvanized steel streetlight 6m LEDS light		3,425	70,992	56601,628	1023,065
		Bench	15UPA0010	Pr_40_30_29	u	Bench, METALLIC SUPPORT and nordic pine seat		-0,041	0,227	655,704	256,290
		Bin	15URP00010	Pr_40_50_07_96	u	Metallic public bin		0,271	4,348	1979,086	457,779
		Bench	15UPA0005	Pr_40_30_29	u	White concrete bench		2,052	28,071	13531,694	940,840
		Fountain	15UFF50010	Pr_40_20_87_24	u	Drinking fountain		0,066	107,280	6684,950	1379,350
		Fountain	15UFF50011	Pr_70_55_98_30	u	Street fountain		25,402	5456,979	363222,888	45732,756
		Rocker	15UPB00100	Pr_40_30_61_88	u	Children's rocker		0,396	7,351	4847,629	1005,295
		Traffic light	15CSS50120	Pr_70_75_70_14	u	Transfer traffic light 6m height		2,240	78,850	25973,480	4589,570
Sign	15CRR10102	Pr_70_75_72_30	u	Vertical traffic sign		0,310	6,141	4513,018	114,121		
IfcPipeSegment	Pipe	Pipe	15ACW50110	Pr_65_52	m	Stoneware pipe DN 600		0,278	17,190	5300,200	211,390
IfcFooting	Foundation	Trenches	15ACV50140	Pr_65_52_07_89	m	Trench to draining pipe DN 200 up to 3m deep		0,1464	26,0905	3381,52	138,45934
		Wells	15APP50145	Pr_65_52	u	Concrete well for DN 600		1,8605	101,35	15380,32	1126,88

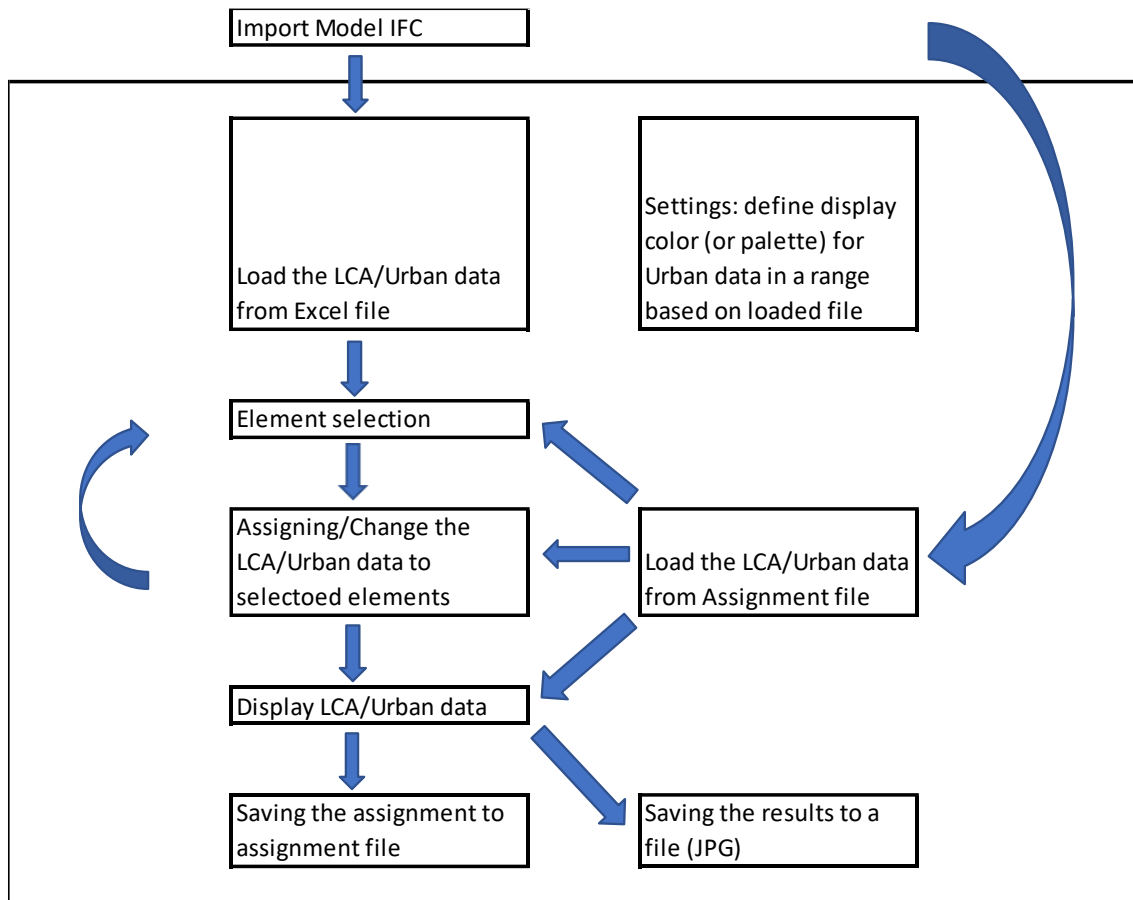
The UrbanBIM tool allow the calculation of the Carbon Footprint, Water Footprint and Embedded Energy of urban developments for the work units where these environmental impacts have been calculated. It this necessary to download the excel database in order to be used in the UrbanBIM tool: <http://urbanbim.eu/bim-objects/>

### 4. Guideline.

A Guideline notes with functional specifications was set out the for the development of the Educational software of Urban BIM learning application. Mainly, the expected capabilities, appearance, and interactions with users. These functional specifications are a guide for the user. It can be download here:

<http://urbanbim.eu/applications/>

In the following graphic, it is explained the workflow about how the UrbanBIM tool works:



Load the LCA/Urban data from Excel file

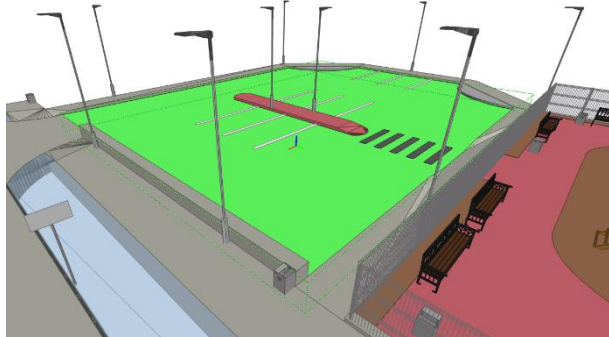
1. Selection of the loaded file and load (BIM Sheet or BASIC sheet)
2. quick checking of the loaded file - warnings if no units, description , footprint vaues defined
3. Display the loaded file in a form
4. Possible edit and corrections - (maybe better to edit it in excel)

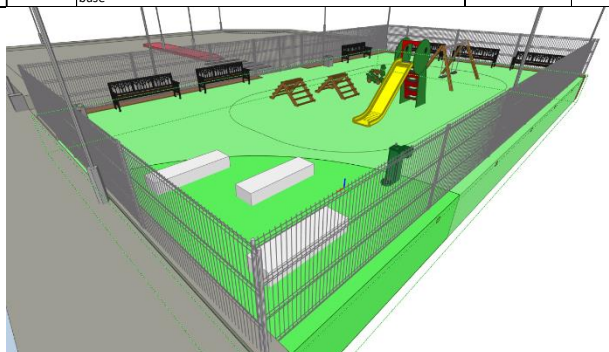
Assigning/Change the LCA/Urban data to selected elements

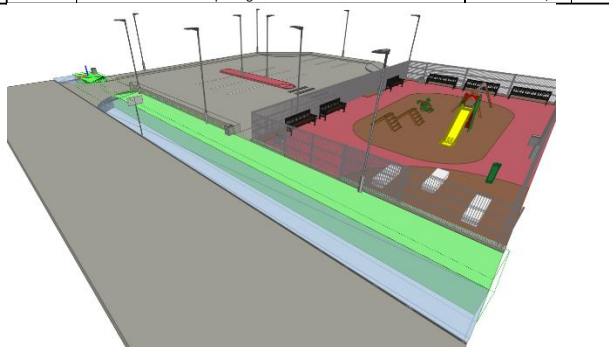
1. On the current element selection select the element from LCA/Urban data and assign the data to the selection
2. Check if proper units match the selected element
3. Make calculation - unit value x take-off
4. Put the results it in a form
  - carbon footprint
  - water footprint
  - embodied energy

## 5. BIM objects and LCA data.

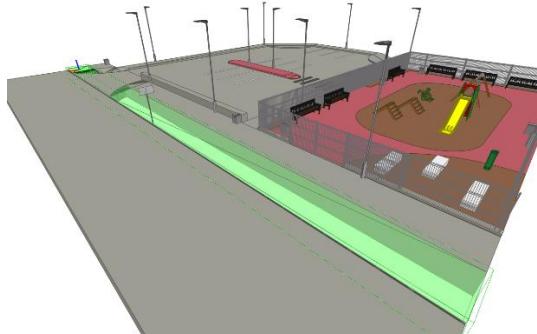
Here, you can find a detailed explanation of the developed BIM objects, including LCA data per each element:

BIM classification	Code		Element definition		Environmental impact			Budget
Element IFC	Clasificación BCCA (Spanish, Andalucía)	Uniclass code	Unit of ref.	Description	(t CO2eq/u. ref.)	(m3/u. ref.)	MJ/u. ref.	EUR/u. ref.
IfcSlab	15PPP50120	EF_30_60	m2	Pavement in parking area with paving blocks	0,078	1,230	491,540	54,374
IFC Class								
Slab								
Class UrbanBIM								
Pavement								
								

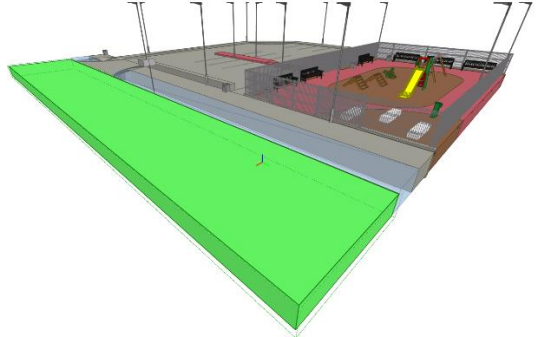
BIM classification	Code		Element definition		Environmental impact			Budget
Element IFC	Clasificación BCCA (Spanish, Andalucía)	Uniclass code	Unit of ref.	Description	(t CO2eq/u. ref.)	(m3/u. ref.)	MJ/u. ref.	EUR/u. ref.
IfcSlab	15PPP50250	EF_30_60	m2	Pavement in children's play area with artificial grass and absorbent base	0,025	1,580	371,890	41,207
IFC Class								
Slab								
Class UrbanBIM								
Pavement								
								

BIM classification	Code		Element definition		Environmental impact			Budget
Element IFC	Clasificación BCCA (Spanish, Andalucía)	Uniclass code	Unit of ref.	Description	(t CO2eq/u. ref.)	(m3/u. ref.)	MJ/u. ref.	EUR/u. ref.
IfcSlab	15PPP50110	EF_30_60	m2	Sidewalk with concrete paving blocks	0,081	1,290	471,420	31,912
IFC Class								
Slab								
Class UrbanBIM								
Sidewalk								
								

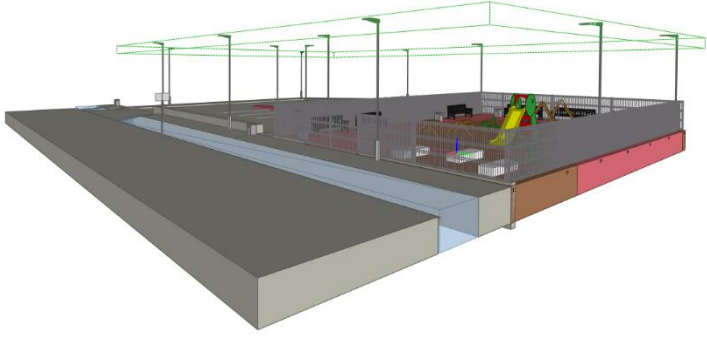
BIM classification	Code		Element definition		Environmental impact			Budget
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IfcSlab	15PPP50180	EF_30_60	m2	Cycle paths	0,098	1,960	669,740	33,217
IFC Class								
Slab								
Class UrbanBIM								
Cycle paths								



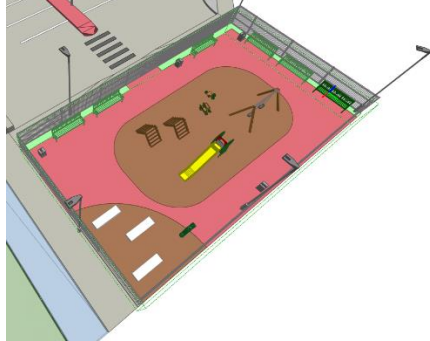
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Element IFC	Clasificación BCCA (Spanish, Andalucía)	Uniclass code	Unit of ref.	Description	(t CO2eq/u. ref.)	(m3/u. ref.)	MJ/u. ref.	EUR/u. ref.
IfcSlab	15PPP50110	EF_30_60	m2	Bituminous Concrete Driveway	0,047	1,930	515,010	22,637
IFC Class								
Slab								
Class UrbanBIM								
Driveway								




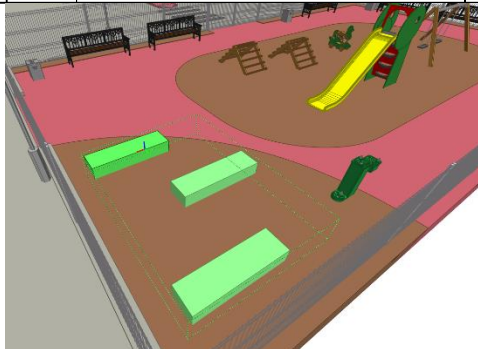
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IfcUrbanFurniture	15EPPP00105	Pr_70_70_48_73	u	Galvanized steel streetlight 6m leds light	3,425	70,992	56601,628	1023,065
IFC Class								
UrbanFurniture								
Class UrbanBIM								
Streetlight								

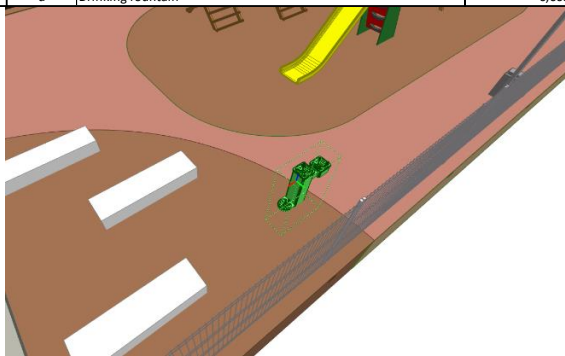


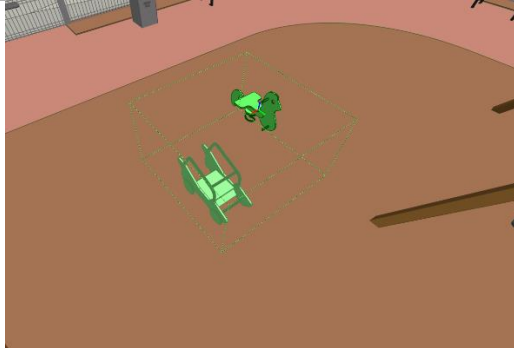
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IfcUrbanFurniture	15UPA0010	Pr_40_30_29	u	Bench, metallic support and nordic pine seat	-0,041	0,227	655,704	256,290
IFC Class								
UrbanFurniture								
Class UrbanBIM								
Bench								
								

BIM classification	Code		Element definition		Environmental impact			Budget
Element IFC	Clasificación BCCA (Spanish, Andalucía)	Uniclass code	Unit of ref.	Description	(t CO2eq/u. ref.)	(m3/u. ref.)	MJ/u. ref.	EUR/u. ref.
IfcUrbanFurniture	15URP00010	Pr_40_50_07_96	u	Metallic public bin	0,271	4,348	1979,086	457,779
IFC Class								
UrbanFurniture								
Class UrbanBIM								
Bin								
								

BIM classification	Code		Element definition		Environmental impact			Budget
Element IFC	Clasificación BCCA (Spanish, Andalucía)	Uniclass code	Unit of ref.	Description	(t CO2eq/u. ref.)	(m3/u. ref.)	MJ/u. ref.	EUR/u. ref.
IfcUrbanFurniture	15UPA0005	Pr_40_30_29	u	White concrete bench	2,052	28,071	13531,694	940,840
IFC Class								
UrbanFurniture								
Class UrbanBIM								
Bench								
								

BIM classification	Code		Element definition		Environmental impact			Budget
Element IFC	Clasificación BCCA (Spanish, Andalucía)	Uniclass code	Unit of ref.	Description	(t CO2eq/u. ref.)	(m3/u. ref.)	MJ/u. ref.	EUR/u. ref.
IfcUrbanFurniture	15UFF50010	Pr_40_20_87_24	u	Drinking fountain	0,066	107,280	6684,950	1379,350
IFC Class								
UrbanFurniture								
Class UrbanBIM								
Fountain								
								

BIM classification	Code		Element definition		Environmental impact			Budget
Element IFC	Clasificación BCCA (Spanish, Andalucía)	Uniclass code	Unit of ref.	Description	(t CO2eq/u. ref.)	(m3/u. ref.)	MJ/u. ref.	EUR/u. ref.
IfcUrbanFurniture	15UPB00100	Pr_40_30_61_88	u	Children's rocker	0,396	7,351	4847,629	1005,295
IFC Class								
UrbanFurniture								
Class UrbanBIM								
Rocker								
								

BIM classification	Code		Element definition		Environmental impact			Budget
Element IFC	Clasificación BCCA (Spanish, Andalucía)	Uniclass code	Unit of ref.	Description	(t CO2eq/u. ref.)	(m3/u. ref.)	MJ/u. ref.	EUR/u. ref.
IfcPipeSegment	15ACW50110	Pr_65_52	m	Stoneware pipe DN 600	0,278	17,190	5300,200	211,390
IFC Class								
Pipe								
Class UrbanBIM								
Pipe								
