## HELSINKI GREEN AREA FACTOR TOOL Guide for modifying the Excel-based tool

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## 1 BACKGROUND

#### 1.1. Extent of this manual

This manual is NOT intended to introduce the user to Microsoft Excel. Good knowledge of using Excel, the Excel-specific Visual Basic for Applications (VBA) programming language and the program's terminology are required. It is therefore strongly recommended that modifications of the tool's contents, and especially its structure, are done only by an expert Excel user.

#### 1.2. Protected mode

The standard version of the Green Factor Tool is protected, so that users cannot accidentally modify any cells containing essential content like default values and formulas. To apply modifications to the structure of the file, an unprotected version of the file has to be used, which can be requested from jari.viinanen@hel.fi.

#### **1.3. References and sections**

The following guide uses references to cell ranges. References to cells, columns, rows or ranges within this manual refer to the original unprotected version of the tool only. Certain ranges within the tool are often referred to as sections and are usually marked on the corresponding figures.

Changes and adjustments to the tool should be checked in comparison to an unmodified reference file with the same setup for limitations and elements.

#### 1.4. Special elements

Since the tool is Excel-based, it contains a large amount of formulas, a few controls and some macros.

#### 1.4.1. Formulas

The Excel tool is largely based on the usage of formulas. The formulas' names depend on the language of the installed Excel version and are usually translated automatically. Formulas may contain flexible or static links to cells or ranges on the same or other sheets within the workbook. Generally moving or adding cells, rows or columns will adjust formulas and their references automatically. Deleting cells, rows or columns on the other hand may sometimes result in breaking some formulas, whose references were lost and therefore need to be replaced.

#### 1.4.2. Macros

The tool contains a few VBA macros, which are mainly used for navigating through the sheets, while some are also needed for internal checks. They contain references to the names of the sheets and the location of specific cells. Any structural changes within the sheets or the workbook are therefore likely to result in a need to update the macros as well.

#### 1.4.3. Controls

The "Limitations" sheet contains controls depending on the type of limitation. Controls in Excel are accessed via the Developer toolbar and modified by resetting their properties. The tool currently uses several radio buttons and dropdown menus. When making structural changes to this sheet, the controls might need to be adjusted.

## **2** MODIFICATIONS WITHOUT CHANGING THE STRUCTURE

#### 2.1. General

This chapter applies to the modification of values in existing cells only, without any structural changes (moving, adding deleting cells, rows, columns) within the sheets.

#### 2.2. Instructions

The "Instructions" sheet can be modified as long as none of the hyperlinks and buttons are deleted. This sheet does not contain any formulas.

## 2.3. Target level

The target levels for the existing land use types can be changed within the "Limitations" sheet. The values are defined within the cells C41:F41 (Figure 1). The target level is set from column C for "Residential" to column F for "Industrial/Logistics". For adding or removing land use types, please check Chapter 3.



Figure 1. Modifying the target level within the marked range (a) only.

## 2.4. Weighting/Scoring

All weightings have to be modified within the sheet "New elements weights" (only visible in unprotected version), NOT within the "Green Factor" nor the "More information" sheet. This section applies to changing the weightings of existing elements only (order, type and amount of elements remain untouched). If the structure of categories and/or elements needs to be changed as well, please refer to Chapter 3.

The overall weightings were derived from expert interviews during the phase of setting up the tool's first version. The global weighting for the Stormwater category was added during the update phase.

The overall weightings of the five categories can be changed within AY3:AY11 (a in Figure 2, note that some cells are merged).



Figure 2. Modifying the overall weightings within the marked range (a) only.

The element-specific weightings can be modified within columns D, F, H, J and L (a in Figure 3) within the given element table of A1:N46, providing that the categories are not modified.

The average weighting in column M (b in Figure 3) is formula based. Currently the average weighting factors are not calculated as a standard arithmetic average, but as a simple multiplication of global (overall) and element-specific values divided by the number of categories. This is why the weighted average can be higher than the maximum scale of 3. If the user intends to change the calculation, the formulas in column M need to be adjusted (column O contains an example for the arithmetic average calculation).

1	A	8	c	D	t		G	н	1	J	к	L	м	N
1	Element groups	Elements	Ecology	а	Functionality	а	Cityscape		Maintenance	a	Stormwater	a	Weighted average	Weighted area
2		Preserved large (fully grown > 10 m) tree in good condition; at least 3 m (25 m <sup>2</sup> each), preserved growing	Their longevity and large biomass makes them highly significant for carbon sequestration and	3.0	ature trees that are large when fully grown specially coniferous trees) are highly	3.0	The landscape value of mature tre that are large when fully grown is v	8 Ty 3.0	After the construction phase, the maintenance need is once a year of	2.5	Mature trees that are large when Gily grown are highly significant fo	3.0	3.5	346.7
3		Preserved small (fully grown > 10 m) tree in good condition; at least 3 m (15m <sup>3</sup> each), preserved growing madium 16 m <sup>3</sup>	Mature small trees have the same benefits as larg trees, only on a smaller scale. Note: Forest-grown	2.5	ature small trees have the same benefits as rge trees, only on a smaller scale. A tree may	2.5	In terms of landscape value, matur trees that are small when fully gro	3.0	Same maintenance need as with large preserved trees.	2.5	Mature small trees have the same penefits as large trees, only on a	2.5	3.0	91.0
4	Preserved vegetation and	Preserved tree in good condition (1.5–3 m) or a large shrub, 3 m <sup>1</sup> each, preserved growing medium 3 m <sup>1</sup>	Same benefits as with preserved trees taller than m, only on a smaller scale. Shrubs have special	2.0	ame benefits for functionality as with reserved trees tailer than 3 m, only on a	2.0	ame benefits for the landscape value as with preserved trees talle	2.0	Maintenance need is the same as with preserved trees taller than 3	2.0	some benefits as with preserved trees taller than 3 m, only on a	2.0	2.4	0.0
5	soil	Preserved natural meadow or natural ground vegetation	Mature natural meadows or ground vegetation has the same benefits as preserved trees and shrubs,	2.0	ame benefits for functionality as with reserved trees and shrubs, only on a smaller	1.5	reserved meadows or ground regetation have the same benefits	2.0	Mowing the meadow 1-2 times a year; the maintenance need of	2.0	Mature natural meadows or groun regetation have the same benefit	2.0	2.2	88.3
6		Preserved bare rock	Rock areas are highly significant habitats (4). The points scored for ecology are reduced by the negative impact of impermeable surfaces to stormwater management and carbon sequestration	2.0	positive functional aspect is the opportunity recreational use and learning from nature, agative functional aspect is the sensitivity to ear and tear, which may require protection o	1.0	The landscape value of bare rock preas is considerable. The landsca value of rock areas cannot be reproduced artificially afterwards,	3.0	Maintenance need is less than on a year. Potential protection or access control (e.g. stairs) is necessary to limit erosion and	3.0	Can have high degree of mperviousness and therefore ncrease negative impact on stormwater management.	0.0	1.9	0.0
7		Large tree, fully grown \$10 m; 25 m <sup>2</sup> each; depth of growing medium 0.8 m; dimensions of planting pit for visited tree 3 = 2 m	A large planted tree has the same benefits as a corresponding preserved tree, but the benefits are	2.5	large planted tree has the same benefits as a presponding preserved tree, but the benefits	2.0	large planted tree has the same benefits as a corresponding	3.0	Maintenance need 1-2 times a year Fertilising needed once a year; als	2.0	Narge planted tree has the same benefits as a corresponding	2.5	2.8	843.2
8		Small tree, fully grown \$10 m; 15 m <sup>2</sup> each; depth of growing medium 0.6 m; dimensions of planting pit for	Flanted small trees have the same benefits as planted large trees, only on a smaller scale (size of	2.0	arted small trees have the same benefits as tarted large trees, only on a smaller scale	1.5	flanted small trees have the same tenefits as planted large trees, on	2.5	Same maintenance needs as with large trees.	2.0	Nanted small trees have the same senefits as planted large trees, or	y 2.0	2.3	\$15.5
9		Large shrubs, 3 m <sup>8</sup> each; depth of growing medium 0.6 m	Flanted large shrubs have the same benefits as planted trees, only on a smaller scale (size of the	1.5	anted large shrubs have the same benefits a anted trees, only on a smaller scale (plant	1.0	Flanted large shrubs have the sam benefits as planted small trees, or	2.0	Slightly more need for maintenance compared to trees. Estimated	1.5	Planted large shrubs have the sam penefits as planted trees, only on	1.5	1.7	66.4
10		Other shrubs, 1.5 m <sup>8</sup> each; depth of growing medium 0.4 m	Flanted smaller shrubs have the same benefits as planted large shrubs, only on a smaller scale (size of	1.0	arted smaller-sized shrubs have same briefits as large shrubs. Shrubs may also have	1.0	maller-sized planted shrubs have the same benefits as the larger on	1. 2.0	Same maintenance needs as with larger shrubs.	1.5	flanted smaller shrubs have the same benefits as planted large	1.0	1.4	588.5
11	River of ferror and a state	Perennials, depth of growing medium 0.4–0.6 m	Planted perennials have the same benefits as the element "Other shrubs", but they are usually	1.5	anted perennials have the same benefits as maller-sized planted shrubs.	1.0	he landscape value of perennials equal to shrubs: despite being	\$ 2.0	Well-planned vegetation does not require maintenance more than	1.0	Planted perennials have the same penefits as the element "Other	1.5	1.6	0.0
12	Planted/new vegetation	Meadow or dry meadow, depth of growing medium 0.15-0.3 m	Meadows and dry meadows are a more natural option (less need for maintenance) and have a more	2.0	he benefits of meadows to microclimates are emparable to those of perennials. However, a	1.0	he opinion on the perceived Indscape value is divided. Flower	ng 1.5	After taking root (mowed a few time during the summer), needs	2.0	Planted meadows or ground regetation have the same benefit	1.8	1.9	778.1
13		Cultivation plots (depth of growing medium depends on species, at least 0.3 m)	Cultivation plots often comprise annual plant species, meaning that their ecological significance	1.0	ultivation plots are very significant for inctionality due to providing the opportunity	3.0	Sotential flowering, berries and fru increase landscape value and	1.5	Areas suitable for cultivation often require frequent maintenance, but	2.0	Moderate significance for stormwater management.	1.0	2.0	44.2
14		Lawn, depth of growing medium 0.15-0.2 m	Lawns have significance for stormwater management and biodiversity, only on a smaller	0.5	owns provide excellent opportunities for play owever, lawns play a minor role in	1.5	A manicured lawn is tidy; landscap value reduces significantly if	1.0	Maintenance need more than once a month. Lawns typically require	0.5	awns have significance for stormwater management, only on	1.0	1.1	2014.0
15		Perennial vines, depth of growing medium 0.6 m, vertical area (2 m <sup>#</sup> each)	The ecology of perennial vines is comparable to the of other perennial plants. However, when growing	1.0	te benefits of vines to the microclimate and te energy consumption of buildings are simila	1.0	lines add greenery to areas norma overed by impermeable surfaces.	Dy 2.0	The estimated maintenance need corresponds to that of shrubs.	1.5	ess significance for stormwater management than roundcover	0.5	1.3	7.8
16		Green wall, vertical area	The ecological value of a green wall depends on its location and implementation method. A green wal	0.5	ome estimated benefit as from vines.	1.0	A wall-planned green wall has the seme estimated benefit as vines.	2.0	Expaniences with the functionality green walls in Finland are not	0.5	Due to the vertical alignment, only small significance for stormwater	0.3	0.9	17.7
17	Descente	Semipermeable pavements (e.g. grass stones, growing medium 0.3 m)	A semipermeable surface that also contains vegetation capable of transpiration and carbon	0.5	ame functionality as with lawns, with less possibility to regulate the microclimate $\Rightarrow$	1.0	é semipermeable grass stone savement is tidy – its landscape	1.0	Maintenance need more than 3 times a year. The winter	1.0	emipermeable surfaces have a direct impact on reducing the	1.0	1.0	380.6
18	Pavements	Permeable pavements (e.g. gravel and sand surfaces, stone ash)	Better stormwater permeability compared to grass stories, but fewer other ecological benefits.	0.5	ame functionality as with lawns, without the assibility to regulate the microclimate ->	1.0	Fermeable sand, gravel or stone as surfaces look crisp and clean, and	ot 1.0	Maintenance need is less than one a year.	3.0	Senerally high significance for stormwater control.	3.0	1.8	515.1
19		Rain garden (biofiltration area, no permanent pool of water) with a broad range of layered vegetation	Highly significant for stormwater management and the biodiversity of species, well suited to	2.5	prificance for microclimate regulation and arning from nature due to abundant	2.0	A well-planned rain garden can be presentable landscape element	2.5	A well-planned rain garden does no suffer from occasional dryness. The	1.5	Highly significant for stormwater management, as both quantity an	3.0	2.8	0.0
20		Intensive green roof / roof garden, depth of substrate 20 - 100 cm	In stormwater management, green roofs are comparable to low vegetation such as lawns.	1.5	e functionality aspect of green roofs is imparable to low vegetation such as lawns.	1.5	Green roofs have significance for ti ottyscape, because they add green	2.0	Maintenance need more than 3 times a year. Maintenance of the	1.0	Highly significant for stormwater management, as both quantity an	2.5	2.0	0.0
21		Semi-intensive green roof, depth of substrate 15-30 cm	A green roof with a 0.15 - 0.3 m deep growing medium has the same ecological benefits as a gree	1.0	green roof with a 0.15 - 0.3 m deep growing edium has the same functional benefits as a	1.0	we landscape value is the same a with a thicker green roof, only on a	1.5	Maintenance need is slightly smaller than of a thicker green root	1.0	Well significant for stormwater management, but with less	2.0	1.5	0.0
22		Extensive green roof, depth of substrate 6-8 cm	A green roof with a 0.06 - 0.05 m deep growing medium has the same ecological benefits as a gree	1.0	green roof with a 0.06 = 0.05 m deep growing edium has the same functional benefits as a	1.0	he landscape value is the same a with a thicker green roof, only on a	1.5	Maintenance need is smaller than a thicker green roof.	1.0	Well significant for stormwater management, but with less	1.5	1.4	0.0
23	Stormwater management	Infiltration swale covered with vegetation or aggregates (no permanent pool of water, permeable soil)	Highly significant for the quantitative and qualitative management of stormwater (10). Less	2.5	ass significance for microclimate regulation ompared to a rain garden. For the most part,	1.5	endscape value depends on the w the swale is constructed. Typically	1.0	Maintenance need depends on the construction method. Grass surface	1.0	Highly significant for the quantitative and qualitative	3.0	2.3	0.0

Figure 3. Modifying the element-specific weightings within the marked range (a) only.

## 2.5. Runoff coefficients

The runoff coefficients for the existing set of elements can be changed in sheet "Green Factor" within range J2:J29 (a in Figure 4). This should be done only for elements that have an actual surface. For elements like, for instance "Green wall" and "Retention pit", they should be kept as "-" since they do not create any (significant) surface.

c	D	E	F	G	I I	а,
Element group	Element description	Unit	Area or quantity	Weighting	Weighted area, m <sup>2</sup>	Runoff coefficient C
Preserved	Preserved large (fully grown > 10 m) tree in good condition, at least 3 m (25 m <sup>2</sup> each)	pcs	4	3.5	346.7	0.1
vegetation and	Preserved small (fully grown ≤ 10 m) tree in good condition, at least 3 m (15 m² each)	pcs	2	3.0	91.0	0.1
SOIL	Preserved tree in good condition (1.5-3 m) or a large shrub (3 m <sup>2</sup> each)	pcs	0	2.4	0.0	0.15
	Preserved natural meadow or natural ground vegetation	m <sup>2</sup>	40	2.2	88.3	0.1
More info	Preserved natural bare rock area (at least partially bare rock surface, not many trees)	m <sup>2</sup>	0	1.9	0.0	0.7
Planted/new	Large tree species, fully grown > 10 m (25 m² each)	pcs	12	2.8	843.2	0.1
vegetation	Small tree species, fully grown ≤ 10 m (15 m² each)	pcs	15	2.3	515.5	0.1
	Large shrubs (3 m² each)	pcs	13	1.7	66.4	0.1
	Other shrubs	m <sup>2</sup>	415	1.4	588.5	0.15
	Perennials	m <sup>2</sup>	0	1.6	0.0	0.2
	Meadow or dry meadow	m <sup>2</sup>	405	1.9	778.1	0.2
	Cultivation plots	m <sup>2</sup>	22	2.0	44.2	0.3
	Lawn	m <sup>2</sup>	1828	1.1	2014.0	0.25
	Perennial vines (2 m² each)	pcs	3	1.3	7.8	0.15
More info	Green wall, vertical area	m <sup>2</sup>	19	0.9	17.7	
Pavements	Semipermeable pavements (e.g. grass stones, stone ash)	m <sup>2</sup>	373	1.0	380.6	0.6
	Permeable pavements (e.g. gravel and sand surfaces)	m <sup>2</sup>	286	1.8	515.1	0.35
More info	Impermeable surface (calculated automatically)	m <sup>2</sup>	6168	-	-	1
Stormwater	Rain garden (biofiltration area) with a broad range of layered vegetation	m <sup>2</sup>	0	2.8	0.0	0.2
management	Intensive green roof / roof garden, depth of substrate 20 - 100 cm	m <sup>2</sup>	0	2.0	0.0	0.1
solutions	Semi-Intensive green roof, depth of substrate 15-30 cm	m <sup>2</sup>	0	1.5	0.0	0.4
	Extensive green roof, depth of substrate 6-8 cm	m <sup>2</sup>	0	1.4	0.0	0.6
	Infiltration basin or swale covered with vegetation or aggregates (no permanent pool of water, permeable soil)	m <sup>2</sup>	0	2.3	0.0	0.1
	Infiltration pit (underground)	m²	0	1.5	0.0	0.1
	Pond, wetland or water meadow with natural vegetation (permanent water surface at least part of the year; at other times the ground remains moist)	m²	0	2.8	0.0	0.1
	Retention or detention <sup>11</sup> basin or swale covered with vegetation or aggregates (permeable soil)	m <sup>2</sup>	0	2.0	0.0	0.2
	Retention or detention <sup>1)</sup> pit, tank or cistern (underground, notice units: volume!)	m <sup>3</sup>	0	1.4	-	
More info	Biofiltration basin or swale	m <sup>2</sup>	0	2.7	0.0	0.15
Bonus elements,	Capturing stormwater from impermeable surfaces for use in irrigation or directing it in a controlled manner to permeable vegetated	m <sup>2</sup>	440	0.7	292.1	-
max score 1 per	Directing stormwater from impermeable surfaces to constructed water features, such as ponds and streams, with flowing water	m <sup>2</sup>		0.8	0.0	
category	Shading large tree (25 m <sup>2</sup> each) on the south or southwest side of the building (especially deciduous trees)	pcs	6	0.9	134.3	
	Shading small tree (15 m² each) on the south or southwest side of the building (especially deciduous trees)	pcs	10	0.9	134.3	
	Fruit trees or berry bushes suitable for cultivation (10 m <sup>2</sup> each)	pcs	17	1.0	250.9	
	A selection of native species – at least 5 species/100 m <sup>2</sup>	m <sup>2</sup>	0	0.9	0.0	
	Tree species native to Helsinki and flowering trees and shrubs – at least 3 species/100 m <sup>2</sup>	m <sup>2</sup>	0	0.9	0.0	
	Butterfly meadows or plants with pleasant scent or impressive blooming	m²	480	0.8	393.9	
	Boxes for urban farming/cultivation	m²	11	0.6	7.1	
	Permeable surface designated for play or sports (e.g. sand- or gravel-covered playgrounds, sports turf)	m <sup>2</sup>	125	0.7	88.9	
	Communal rooftop gardens or balconies with at least 10% of the total area covered by vegetation	m <sup>2</sup>	120	0.6	73.0	
More info	Structures supporting natural and/or animal living conditions such as preserved dead wood/stumps or birdboxes (5 m² each)	pcs	2	1.2	11.6	

Figure 4. Adjusting the runoff-coefficients within the marked range (a) only.

## **3 MODIFICATIONS WHICH NEED ADJUSTMENTS TO STRUCTURE AND FORMULAS**

#### 3.1. General

This section applies to modifications that require changes in the sheets' structure, e.g. adding/removing cells, rows and columns. This requires ideally a trained Excel expert, who has experience in working with formulas, VBA macros and Excel controls. The following chapters briefly summarise what needs to be adjusted and checked when applying changes to basic objects such as Limitations, Elements and Categories.

#### **3.2.** Limitations

Before applying changes, the user is encouraged to become familiarised with the current formulas and control settings. Modifying limitations should only be done within the cells B9:F20 (limitations section, a in Figure 5). Removing or adding rows should happen only along the full extent of columns A to F. Column F contains controls such as radio buttons and drop down lists that might be affected by structural changes and need to be checked afterwards.

After adding/removing rows within the limitations section, cells A43:D47 (response section, b in Figure 5) have to be updated and checked. These contain the reference cells of the radio buttons (column C) and the resulting comments (column D). After modifying the limitations section, those have to be verified to still work properly. Adding new limitations might result in adding new controls, which have to be added/handled within the response section. The existing ones can be taken as examples.

	í A	В	С	D	E	F		G	н
2	_	Date							
3		21.11.2017							
5									Target level
6									0.3
7	-	Instructions				Nex	t	H	Block ID
	T	Limitations	No.	on	Respo	inse	ħŀ	Lot ID	
10		Linitations			C		111	ABC	
11				Ċ		ilt	Site area, m <sup>2</sup>		
12		Land use	1	Commercial		C		11	9537
13				Industrial/logistics		۲		11	Building footprint, m <sup>2</sup>
14		Yard type	2	Share of rooftop courtyard over 50 %		() Yes	⊖No	1	3602
15	5	Drainage system	3	Can the site be connected to a separate drainage system?		⊖ Yes	⊛No	16	Floor area, m <sup>2</sup>
16	5	Surrounding region	() Yes	€No		13415			
17	,	Soil/groundwater	5	m below the ground level?	() Yes	⊛No		Ratio of building footprint to s	
18	8	<u></u>	6	tention element <sup>2)</sup> ? (Area * Depth = estimated capacity)	0.3			0.4	
19		Stormwater management solutions	7	What is the estimated average/effective depth <sup>1)</sup> of a biofiltration e	element? (Area * Depth = estimated capacity)	0.2			Ratio of floor area to site a
20			8	If it is possible to provide a share of the necessary storm water retention	a capacity outside the block/lot, how big is the share (%)?	20			1.4
22	2	<sup>13</sup> Average/effective depth: ave (03-05 times) smaller than maximum depth. It is re- include the normanger	n significa should no structure.	ot					
23 24 40 41	1 1 1	<sup>2]</sup> Detention: no permanent po Retention: holds permanent Target level		0.5					
<b>b</b> 43	1	Land use	4	_					
44	2	Yard type	1	<ul> <li>Share of rooftop courtyard &gt; 50%, please add a green roof element!</li> </ul>					
45	3	Drainage system	2	- Add at least one stormwater detention system!					
40	5	Soil/groundwater	2	<ul> <li>- wature reserve/body of water/hatural vegetation located within 5 SU</li> <li>- Target level reduced due to groundwater level being close to surface</li> </ul>	e!				

#### Figure 5. Modifying limitations.

Keep in mind that limitation no. 5 (soil/groundwater) influences directly the Target Level in cell H6. If this is changed, also the formula in H6 has to be adjusted.

If the extent of the original limitations section is changed, some of the macros need to be adjusted. Please refer to Chapter 4.

## 3.3. Elements

#### 3.3.1. Simple modification

Modifying elements on the "Green Factor" sheet can be done within the boundaries of the element section (cells C1:V41, Figure 6). The existing rows can be used for modification, as long as the units are preserved (each row contains formulas depending specifically on the row's unit defined in column E). The structure of the section should be kept as it is.



#### Figure 6. Modifying elements.

When modifications are made only by changing existing elements (no rows added, deleted or moved between categories and now rows are left without content) and units are kept as they are, the formulas will continue to work normally without further modification. However, within the element group section (A1:N46) of the sheet "New elements weights" the weightings and comments need to be checked and updated for the modified elements, since they will most likely change. Please refer to Chapter 3.4.1.

#### 3.3.2. Advanced modification

If a modification based on the existing structure within the element section is not possible, any structural changes need to be closely examined concerning their influence on formulas in the same sheet as well as on the sheet "New elements weights". This should be done only by an experienced Excel user with knowledge about the theoretical background of the Green Factor Tool.

Adding or removing rows in "Green Factor" should be done within columns C to V, since also the normally hidden columns K to V contain necessary formulas (Figure 7). The formulas have to be checked after each modification. The existing formulas can be used as examples when adding elements and adding new rows, respectively.

Important formula-containing columns to check are:

- 1. **Green Factor, G:** contains references to the corresponding elements (rows) in sheet "New elements weights"
- 2. Green Factor, H: calculates the areas based on the type of element
- 3. Green Factor, I: calculates the weighted areas based on contents of columns F and G
- 4. Green Factor, K to V: contain calculations for estimating the final runoff-coefficient in cell A17

-14	C	D	E	F	G	н	1	J
	Element			Area or		"TO HIDE"	Weighted	Runoff
	group	Element description	Unit	quantity	Weighting	Pinta-ala, m <sup>2</sup>	area m <sup>2</sup>	coefficient C
1	Broconuod	Processed large (fully grown > 10 m) tree is good condition at least 2 m (25 m <sup>2</sup> each)		quantity		r into uno, in	area, m	coefficiente
2	vegetation and	n eserved raige (diny grown x 10 m) tree in good condition, at least 5 m (25 m least)	pcs	4	3.5	100.0	346.7	0.1
3	soil	Preserved small (fully grown \$10 m) tree in good condition, at least 3 m (15 m² each)	pcs	2	3.0	30.0	91.0	0.1
4		Preserved tree in good condition (1.5-3 m) or a large shrub (3 m <sup>2</sup> each)	pcs	0	2.4	0.0	0.0	0.15
5		Preserved natural meadow or natural ground vegetation	m <sup>2</sup>	40	2.2	40.0	88.3	0.1
6	More info	Preserved natural bare rock area (at least partially bare rock surface, not many trees)	m <sup>2</sup>	0	1.9	0.0	0.0	0.7
7	Planted/new	Large tree species, fully grown > 10 m (25 m² each)	pcs	12	2.8	300.0	843.2	0.1
8	vegetation	Small tree species, fully grown ≤ 10 m (15 m² each)	pcs	15	2.3	225.0	515.5	0.1
9		Large shrubs (3 m² each)	pcs	13	1.7	39.0	66.4	0.1
10		Other shrubs	m <sup>2</sup>	415	1.4	415.0	588.5	0.15
11		Perennials	m <sup>2</sup>	0	1.6	0.0	0.0	0.2
12		Meadow or dry meadow	m <sup>2</sup>	405	1.9	405.0	778.1	0.2
13		Cultivation plots	m <sup>2</sup>	22	2.0	22.0	44.2	0.3
14	1	Lawn	m <sup>2</sup>	1828	1.1	1828.0	2014.0	0.25
15		Perennial vines (2 m² each)	pcs	3	1.3	6.0	7.8	0.15
16	More info	Green wall, vertical area	m <sup>2</sup>	19	0.9	19.0	17.7	-
17	Pavements	Semipermeable pavements (e.g. grass stones, stone ash)	m <sup>2</sup>	373	1.0	373.0	380.6	0.6
18		Permeable pavements (e.g. gravel and sand surfaces)	m <sup>2</sup>	286	1.8	286.0	515.1	0.35
19	More info	Impermeable surface (calculated automatically)	m <sup>2</sup>	6168		6168.0	-	1
20	Stormwater	Rain garden (biofiltration area) with a broad range of layered vegetation	m <sup>2</sup>	0	2.8	0.0	0.0	0.2
21	management	Intensive green roof / roof garden, depth of substrate 20 – 100 cm	m <sup>2</sup>	0	2.0	0.0	0.0	0.1
22	solutions	Semi-intensive green roof, depth of substrate 15 – 30 cm	m <sup>2</sup>	0	1.5	0.0	0.0	0.4
23		Extensive green roof, depth of substrate 6-8 cm	m <sup>2</sup>	0	1.4	0.0	0.0	0.6
24		Infiltration basin or swale covered with vegetation or aggregates (no permanent pool of water, permeable soil)	m <sup>2</sup>	0	2.3	0.0	0.0	0.1
25		Infiltration pit (underground)	m <sup>2</sup>	o	1.5	0.0	0.0	0.1
-		Pond, wetland or water meadow with natural vegetation (permanent water surface at least part of the year; at other times the ground						
26		remains moist)	m	0	2.8	0.0	0.0	0.1
27		Retention or detention <sup>1)</sup> basin or swale covered with vegetation or aggregates (permeable soil)	m <sup>2</sup>	0	2.0	0.0	0.0	0.2
28	-	Retention or detention <sup>1)</sup> pit, tank or cistern (underground, notice units: volume!)	m <sup>3</sup>	0	1.4	0.0	-	-
29	More info	Biofiltration basin or swale	m <sup>2</sup>	0	2.7	0.0	0.0	0.15
30	Bonus elements,	Capturing stormwater from impermeable surfaces for use in irrigation or directing it in a controlled manner to permeable vegetated	m <sup>2</sup>	440	0.7	440.0	292.1	
31	max score 1 per	Directing stormwater from impermeable surfaces to constructed water features, such as ponds and streams, with flowing water	m <sup>2</sup>		0.8	0.0	0.0	
32	category	Shading large tree (25 m² each) on the south or southwest side of the building (especially deciduous trees)	pcs	6	0.9	150.0	134.3	
33		Shading small tree (15 m² each) on the south or southwest side of the building (especially deciduous trees)	pcs	10	0.9	150.0	134.3	
34		Fruit trees or berry bushes suitable for cultivation (10 m² each)	pcs	17	1.0	170.0	250.9	
35	1	A selection of native species – at least 5 species/100 m²	m <sup>2</sup>	0	0.9	0.0	0.0	
36		Tree species native to Helsinki and flowering trees and shrubs – at least 3 species/100 m <sup>2</sup>	m <sup>2</sup>	0	0.9	0.0	0.0	
37	1	Butterfly meadows or plants with pleasant scent or impressive blooming	m <sup>2</sup>	480	0.8	480.0	393.9	
38	1 1	Boxes for urban farming/cultivation	m <sup>2</sup>	11	0.6	11.0	7.1	
39	1 1	Permeable surface designated for play or sports (e.g. sand- or gravel-covered playgrounds, sports turf)	m <sup>2</sup>	125	0.7	125.0	88.9	
40	1	Communal rooftop gardens or balconies with at least 10% of the total area covered by vegetation	m <sup>2</sup>	120	0.6	120.0	73.0	
41	More info	Structures supporting natural and/or animal living conditions such as preserved dead wood/stumps or birdboxes (5 m² each)	pcs	2	1.2	11.6	11.6	

-4	C	D	E	F	G	н		1
	Element	Element description	Unit	Area or quantity	Weighting	"TO HIDE" Pinta-ala, m <sup>2</sup>	Weighted	Runoff coefficient C
4	Dreconued	Prozenied Jaces (fully groups > 10 m) toos is good condition at least 2 m (15 m <sup>2</sup> aach)					urcu, m	
2	vegetation and	rieserved large (univ grown > 20 m) tree in good condicion, acteosco in (25 m) each)	pcs	4	3.5	100.0	346.7	0.1
3	soil	Preserved small (fully grown S 10 m) tree in good condition, at least 3 m (15 m² each)	pcs	2	3.0	30.0	91.0	0.1
4		Preserved tree in good condition (1.5-3 m) or a large shrub (3 m <sup>2</sup> each)	pcs	0	2.4	0.0	0.0	0.15
5		Preserved natural meadow or natural ground vegetation	m <sup>2</sup>	40	2.2	40.0	88.3	0.1
6	More info	Preserved natural bare rock area (at least partially bare rock surface, not many trees)	m <sup>2</sup>	0	1.9	0.0	0.0	0.7
7	Planted/new	Large tree species, fully grown > 10 m (25 m² each)	pcs	12	2.8	300.0	843.2	0.1
8	vegetation	Small tree species, fully grown ≤ 10 m (15 m² each)	pcs	15	2.3	225.0	515.5	0.1
9		Large shrubs (3 m² each)	pcs	13	1.7	39.0	66.4	0.1
10		Othershrubs	m <sup>2</sup>	415	1.4	415.0	588.5	0.15
11		Perennials	m <sup>2</sup>	0	1.6	0.0	0.0	0.2
12		Meadow or dry meadow	m <sup>2</sup>	405	1.9	405.0	778.1	0.2
13		Cultivation plots	m <sup>2</sup>	22	2.0	22.0	44.2	0.3
14		Lawn	m <sup>2</sup>	1828	1.1	1828.0	2014.0	0.25
15		Perennial vines (2 m² each)	pcs	3	1.3	6.0	7.8	0.15
16	More info	Green wall, vertical area	m <sup>2</sup>	19	0.9	19.0	17.7	-
17	Pavements	Semipermeable pavements (e.g. grass stones, stone ash)	m <sup>2</sup>	373	1.0	373.0	380.6	0.6
18		Permeable pavements (e.g. gravel and sand surfaces)	m <sup>2</sup>	286	1.8	286.0	515.1	0.35
19	More info	Impermeable surface (calculated automatically)	m <sup>2</sup>	6168	-	6168.0	-	1
20	Stormwater	Rain garden (biofiltration area) with a broad range of layered vegetation	m <sup>2</sup>	0	2.8	0.0	0.0	0.2
21	management	Intensive green roof / roof garden, depth of substrate 20 – 100 cm	m <sup>2</sup>	0	2.0	0.0	0.0	0.1
22	solutions	Semi-intensive green roof, depth of substrate 15 – 30 cm	m <sup>2</sup>	0	15	0.0	0.0	0.4
23		Extensive green roof, depth of substrate 6-8 cm	m <sup>2</sup>	0	1.4	0.0	0.0	0.6
24		Infiltration basin or swale covered with vesetation or azzrezates (no permanent pool of water, permeable soil)	m <sup>2</sup>	0	2.3	0.0	0.0	0.1
25		Infiltration pit (underground)	2	ő	15	0.0	0.0	0.1
26		Pond, wetland or water meadow with natural vegetation (permanent water surface at least part of the year; at other times the ground remains moist)	m <sup>2</sup>	0	2.8	0.0	0.0	0.1
27		Retention or detention <sup>1)</sup> basin or swale covered with vezetation or azzrezates (permeable soil)	m <sup>2</sup>	0	2.0	0.0	0.0	0.2
28		Retention or detention <sup>31</sup> pit, tank or cistern (underground, notice units; volume!)	m <sup>3</sup>	0	1.4	0.0	-	-
29	More info	Biofiltration basin or swale	m <sup>2</sup>	0	2.7	0.0	0.0	0.15
30	Bonus elements,	Capturing stormwater from impermeable surfaces for use in irrigation or directing it in a controlled manner to permeable vegetated	m <sup>2</sup>	440	0.7	440.0	292.1	
31	max score 1 per	Directing stormwater from impermeable surfaces to constructed water features, such as ponds and streams, with flowing water	m <sup>2</sup>	100000	0.8	0.0	0.0	
32	category	Shading large tree (25 m² each) on the south or southwest side of the building (especially deciduous trees)	pcs	6	0.9	150.0	134.3	
33		Shading small tree (15 m² each) on the south or southwest side of the building (especially deciduous trees)	DCS	10	0.9	150.0	134.3	
34		Fruit trees or berry bushes suitable for cultivation (10 m² each)	pcs	17	1.0	170.0	250.9	
35		A selection of native species – at least 5 species/100 m <sup>2</sup>	m <sup>2</sup>	0	0.9	0.0	0.0	
36		Tree species native to Helsinki and flowering trees and shrubs – at least 3 species/100 m <sup>2</sup>	m <sup>2</sup>	0	0.9	0.0	0.0	
37		Butterfly meadows or plants with pleasant scent or impressive blooming	m <sup>2</sup>	480	0.8	480.0	393.9	
38		Boxes for urban farming/cultivation	m <sup>2</sup>	11	0.6	11.0	71	
30		Permeable surface designated for play or sports (e.g. sand- or gravel-covered playgrounds, sports turf)	2	125	0.7	125.0	88.9	
40		Communal rooftop gardens or balconies with at least 10% of the total area covered by vegetation	m <sup>2</sup>	120	0.6	120.0	73.0	
41	More info	Structures supporting natural and/or animal living conditions such as preserved dead wood/stumps or hirdhoves (5 m <sup>2</sup> each)	n	2	1.2	11.6	11.6	
41		a an	pes	4	1.4	11.0	11.0	1

**Figure 7.** The two parts of the element section: main table with columns C–J (top) and additional calculations within columns K–V (bottom).

When elements are added/removed in sheet "Green Factor", also sheet "New elements weights" needs to be updated. A list of important formulas that need checking are listed in Chapter 3.4.2. If the extent of the original element section is changed, some of the macros need to be adjusted. Please refer to Chapter 4.

## 3.4. Categories

#### 3.4.1. Simple modification

Modifying categories in sheet "New elements weights" can be done within the boundaries of the element group section (A1:N46). The existing rows and columns can be used for modification, as long as element- and category-specific weightings are updated correspondingly. The structure of the section should then be kept as it is.

When modifications are made only by changing existing elements (no columns added or deleted and no columns left without content), the formulas will continue to work normally without further modification. However, if categories are changed, their overall weightings most likely need to be adjusted. This can be done by modifying the contents within the global weightings section (AX2:AZ11, Figure 2), and the weightings in range AY2:AY11 in particular (a in Figure 2, note that some of cells are merged). Also, the weightings and comments within the element group section (A1:N46) should be revised.

#### 3.4.2. Advanced modification

If categories need to be added or removed, this means a structural change of the sheet (adding/deleting columns within the element group section) and requires adjustments to the formulas. The same applies, if elements have been added, removed or shifted.

The "New elements weights" sheet consists of two different sections: the element group section and results calculation section within cell range AJ1:BF46 (Figure 8). Structural changes usually affect both sections and both of their contents need to be revised.

Important formula-containing columns to check are:

- 5. "New elements weights", D, F, H, J, L: contain the element-specific weightings for each category
- 6. **"New elements weights", M:** contains element-specific average weightings (note that in the current version this is not the arithmetic average)
- 7. **"New elements weights", O:** contains alternative element-specific average weightings based on building the arithmetic average for each element, that can be used as a replacement for the formulas in column M
- 8. **"New elements weights", AJ to AV:** contain element-specific calculation of the shares concerning the overall categories. Note: these need to be particularly cross-checked, when adding/removing categories (columns AO and AV should always sum up to 100% or remain stay zero when the element is not in use)
- 9. "New elements weights", BF: contains calculation of the amount of used elements

Additionally, the "Green Factor" sheet needs to be adjusted to match the new categories. Please refer to Section 3.3.2 for advanced modification on this sheet.

	A	B	c	D	E	F	G	н	1	J.	К	L	м	N
,	Element groups	Elements	Ecology		Functionality		Cityscape		Maintenance		Stormwater		Weighted average	Weighted area
2		Preserved large (haly grown > 10 m) tree in good condition; at least 3 m (25 m² each), preserved growing	Their longevity and large biomass makes them highly significant for carbon sequestration and	3.0	Mature trees that are large when fully grown (especially coniferous trees) are highly	3.0	The landscape value of mature trees that are large when fully grown is very	3.0	After the construction phase, the maintenance need is once a year or	2.5	Mature trees that are large when hally grown are highly significant for	3.0	3.5	346.7
2		Preserved small (fully grown > 10 m) tree in good condition; at least 3 m (10m <sup>2</sup> each), preserved growing	Mature small trees have the same benefits as large trees, only on a smaller scale. Note: Forest-grown	2.5	Mature small trees have the same benefits as large trees, only on a smaller scale. A tree may	2.5	In terms of landscape value, mature trees that are small when fully grown	3.0	Same maintenance need as with large preserved trees.	2.5	Mature small trees have the same benefits as large trees, only on a	2.5	3.0	91.0
4	Preserved vegetation	medium (5 m² Preserved tree in good condition (1.5-3 m) or a large shrub, 3 m² each, preserved groving medium 3 m²	Same benefits as with preserved trees taller than 3 m, only on a smaller scale. Shrubs have special	2.0	Same benefits for functionality as with preserved trees taller than 3 m, only on a	2.0	Same benefits for the landscape value as with preserved trees taller	2.0	Maintenance rived is the same as with preserved trees taller than 3 m,	2.0	Same benefits as vith preserved trees taller than 3 m, only on a	2.0	2.4	0.0
	and soil	Preserved natural meadow or natural ground vegetation	Mature natural meadows or ground vegetation have the same benefits as proserved trees and skrubs.	2.0	Same benefits for functionality as with preserved trees and shrubs, only on a smaller	1.5	Preserved meadows or ground vegetation have the same benefits	2.0	Moving the meadow 1-2 times a year, the maintenance need of	2.0	Mature natural meadows or ground vegetation have the same benefits	2.0	2.2	88.3
6		Preserved bare rook	Rock areas are highly significant habitas (4). The points scored for ecology are reduced by the negative impact of impermeable surfaces to stommater management and cabon sequest atom and ensure the management and cabon sequest atom and ensure the second se	2.0	A positive functional aspect is the opportunity for recreational use and learning from nature. A negative functional aspect is the sensitivity to year and tear, which may require protection or version of the first sensitivity in the first	1.0	The landscape value of bare took areas is considerable. The landscape value of took areas cannot be reproduced artificially afterwards,	2.0	Maintenance need is less than once a year. Potential protection or access control (e.g. stars) is necessary to fimit erosion and immension	3.0	Can have high degree of imperviousness and therefore increase negative impact on stormwater management.	0.0	19	0.0
7		Large tree, fully grown ± 10 m; 25 m² each; depth of growing medium 0.8 m; dimensions of planking pit for child have 2 x 2 m.	A large planted tree has the same benefits as a corresponding preserved tree, but the benefits are	2.5	A large planted tree has the same benefits as a corresponding preserved tree, but the benefits	2.0	A large planted tree has the same benefits as a corresponding	3.0	Maintenance need 1-2 times a year. Fertilising needed once a year, also	2.0	A large planted tree has the same benefits as a corresponding	2.5	2.8	843.2
8		Small tree, fully grown s 10 m; 15 m* each; depth of growing medium 0.6 m; dimensions of planting pit for circle tree 15 m 0.6 m;	Planted small trees have the same benefits as planted large trees, only on a smaller scale (size of	2.0	Planted small trees have the same benefits as planted large trees, only on a smaller scale	1.5	Planted small trees have the same benefits as planted large trees, only	2.5	Same maintenance needs as with large trees.	2.0	Planted small trees have the same benefits as planted large trees, only	2.0	2.3	515.5
9		Large strubs, 3 m <sup>*</sup> each; depth of growing medium 0.6 m	Planted large shrubs have the same benefits as planted trees, only on a smaller scale (size of the	1.5	Planted large shrubs have the same benefits as planted trees, only on a smaller scale (plant	1.0	Planted large shrubs have the same benefits as planted small trees, only	2.0	Slightly more need for maintenance compared to trees. Estimated	1.5	Planted large strubs have the same benefits as planted trees, only on a	1.5	17	66.4
90		Other shrubs, 15 m* each, depth of growing medium 0.4 m	Planted smaller skrubs have the same benefits as planted large strubs, only on a smaller scale (size of	1.0	Planted smaller-sized shrubs have same benefits as large shrubs. Shrubs may also have	1.0	Smaller-sized planted shrubs have the same benefits as the larger ones. The	2.8	Same maintenance needs as with larger shrubs.	1.5	Planted smaller shrubs have the same benefits as planted large	1.0	1.4	588.5
35		Shading small tree (to m' each) on the south or southwest side of the building (especially deciduous meet)	Significance for stormvater management, carbon sequestration and biodiversity.	0.5	Shading trees blocking the sunlight reduce the cooling need of buildings in the summer.	1.0	Trees have significance for the oityscape.	1.0	No significant need for maintenance.	1.0	Planted small trees have the same benefits as planted large trees, only	0.5	8.9	134.3
36		Fruit trees or being busikes suitable for sultivation (10 m <sup>+</sup> each)	Perennial link trees are important for biodiversity (polination, acting as food plants), carbon	1.0	Significance for recreational use (e.g. urban farming) and learning from nature.	1.0	Trees that flower at the beginning of the growing season and later produce	1.0	Fruit trees require maintenance at least twice a gear (fertilising, cutting),	0.5	Planted small trees or nuslies have the same benefits as planted large	0.5	1.0	250.9
37		Beny baskes subdic for outivation (7 m² cush)	Perential beny bushes are important for biodiversity (polination, asting as food plants), earborn	+0	Significance for representional use (e.g. urban farming) and is uning from nature.	1.0	Beny producing bushes are highly significant for the altypespo-	+0	Enrybushes require maintenance at least twice a year (fertilizing, outling),	0.6			**	
38		A selection of native species – at least 5 species/100 m <sup>4</sup>	Natural vegetation is important for biodiversity, habitats and the ecological network. Regionally	1.0	Significance for the microclimate and learning from nature.	0.5	Pregionally appropriate species increase the landscape value.	1.0	After taking root, not much need for maintenance. Flegionally suitable	1.0		0.5	8.9	0.0
39	Bonus elements, max	Tree species native to Helsinki and flowering trees and shrubs – at least 3 species/700 m <sup>4</sup>	Important for biodiversity, habitats and the ecological network. Regionally appropriate	1.0	Significance for the microclimate and learning from nature.	0.5	Regionally appropriate species increase the landscape value.	1.0	After taking root, not much need for maintenance. Regionally suitable	1.0		0.5	8.9	0.0
40	score I per category	Butterfly meadows or plants with pleasant scent or impressive blooming	The composition of butterily meadows especially comprises food plants Favoured by butterilies (16, 17), important for biodiversits, habit ats and the	0.8	Significance for learning from nature and nature observations in particular.	1.0	Flowering and colourful plants are especially significant for the cituscape.	1.0	Maintenance 1-2 times a year, or more frequently if perennials are planted in the butterflumeadow.	0.5	Comparably low impact on stormwater control due to the small scale.	0.1	0.821	393.9
41		Plants with pleasant seent or impressive blooming	Flowering and is grant plants often also have cignificance for pollinators (12) - cignificance for	6.6	Significance for learning from nature in particular.	4.0	Flowering and solouriul plants are especially cignificant for the	4.0	Flowering plants often have greates need for maintenance.	0.5			6.7	
42		Boses for urban farming/outhvation	The ecological value of boxes for urban farming/rultivation is estimated to be equal to that of plantings with a planatar corent and impressive blooming. However, the significance of boxes for urban farming/cultivation with regards to stormwater is limited.	0.5	Significance for recreational use (e.g. urban farming) and learning from nature.	1.0	Boses for urban farmingfoultivation can increase the oitgocape's biodiversity e.g. through flowering plants. The seasonal nature of cultivation and potential untidiness due to nedect reduce it.	0.5	Areas suitable for outivation usually have a great need for maintenance, but it is the responsibility of the residents. The housing company probably bears the responsibility for maintaining the bores.	0.5	Comparably low impact on stomwater control due to the small scale.	0.1	0.5	7.1
43		Permeable surface designated for play or sports (e.g. sand or gravel covered plaggrounds, sports turi)	Permeable surfaces are significant for stormwater management.	0.5	Multipurpose surfaces increase functionality.	1.0	No significant landscape value.	0.0	The wear and tear on green surfaces	0.0	Similar significance as of other permeable surfaces.	1.0	8.7	88.5
44		Communal rooftop gardens or baloonies with at least 10% of the total area covered by vegetation	Potential significance for biodiversity and carbon sequestration.	0.5	Significance for urban Farming, communality and learning from nature.	1.0	Landscape value is created by increasing green surfaces.	0.5	Growing plants in pots increases the need for maintenance of vegetation.	0.0	Significane depends on the coverage, but most probably less significant than extensive green	0.3	8.5	73.0
		Göljettövöhuolut mospuulharro (öGm <sup>3</sup> )	A tere-fold to not provide hubbars and nothing to a large position of end angreed doctor sponies. Especially a robust notice time is highly significant for the biodiversity of the species and hubbars and to the biodiversity of the species and hubbars and to the evolution teres (4) (F 8):	40	Functionality is intercaced by the opportunity to learn from nature. Dead wood can also out as a divider (source control or go and the edges of paths) and as play environments.		The funder up wake of a dead tree is very subjective. Exposing a robust tree can be (and is) utilized to a divider at the site, as the other hand, a rolling tree can be precived as unitid, pathways is focused in an environment used for ropes centation.		No maintenance required. Rothing and decaying occur naturaly in dead wood.				**	
45		second supporting natural analog animal long conditions such as preserved dead wood/stumps or	Significance for biodiversity and the ecological network.	1.0	Significance for learning from nature and nature observations.	0.5	No significant landscape value	0.0	No significant need for maintenance	1.0	Does not add any additional significance.	0.0	8.5	11.6

	AJ	AK	AL.	AM	AN	AO	AP AQ	AP	A	S /	AT	AU	AY A	AK	AY	AZ	AB	60	BC	BO BE	BF EG
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**Figure 8.** The two parts of the "New elements weights" sheet: element group section (top) and results calculation section (bottom).

#### 3.5. Results

Modification of the "Results" sheet (Figure 9) should be done with care, because all of the presented values (a), tables (b) and graphs (c) refer to cells or ranges within the other sheets. Since changes theoretically comprise a wide variety, only a very general guideline can be given.

The user is strongly encouraged to become familiarised with the used formulas and cell references before making any adjustments. Most of the results are drawn from the "Green Factor" sheet (values) and the "New elements weights" sheet (graphs, tables). Additionally, some of the cells contain conditional formatting, so they will appear differently depending on their contents.

The upper part of the "Comments" section (cell E15, d in Figure 9) is reserved for automatic comments based on the user's current inputs. If the amount of entries changes, for instance by adding comments based on new limitations, the size of this merged cell can/should be adjusted without changing the original formula.

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**Figure 9.** The two parts of the "New elements weights" sheet: element group section (top) and results calculation section (bottom).

Size and design of the sheet are roughly scaled for an A4 printout, which should be kept in mind when adjusting extent and font sizes.

## 4 MODIFYING MACROS

#### 4.1. General

To modify macros, the "Developer" tab in Excel's Ribbon bar needs to be activated. Open the Visual Basic for Applications window and check the "Modules" folder for "Module2", "Module3" and "Module4" containing all the tool's custom macros (Figure 10). To apply changes the user requires good knowledge about using VBA within Excel.

If adjustment is necessary, it is recommended not to use any country-specific letters/vowels (like the Finnish ö or ä), since this will likely cause problems in systems with different language settings.

For adjustments, it is recommended to open a version of the original Excel tool at the same time and to compare the original and modified structure.

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**Figure 10.** Activating the Developer Toolbar in Excel (top), Visual Basic for Applications (VBA) window showing the sheets and modules included in the tool (bottom).

#### 4.2. Renaming sheets

If sheets are renamed, the corresponding names have to be updated in all macros. This can be done quickly and easily with the built-in Replace feature from the Edit Menu of the VBA window.

#### 4.3. Structural changes to selected sheets

#### 4.3.1. Limitations sheet

The macro "Sheet3\_Next" in "Module2" contains a reference to the share of rooftop area on the lot. In case of structural changes within the sheet, it needs to be checked, if the reference for the variable "kansipiha" (rooftop area) is still pointing to the correct cell.

#### 4.3.2. Green Factor sheet

The macro "Sheet3\_ClearValues" in "Module2" contains a reference to two different cell ranges that will be cleared. If the structure of the elements section has changed, these ranges need to be adjusted to match the new updated range(s).

The macro "Sheet3\_Next" in "Module2" contains references to several cells for calculating sums of green roof area ("viherkatto\_m2") and storage volume ("sailio\_m2") as well as the amount of existing or planted trees ("puita"). If the structure of the elements section has changed, these cell references need to be adjusted.

Executor of the Helsinki Green Area Factor Excel-based tool:



# This manual was developed within the iWater - Integrated Storm Water Management project (2015–2018).

iWater aims at improving the urban planning in the cities of the Baltic Sea Region through development of integrated storm water management system. Project provides new approaches and tools for urban planning – for greener, safer, more sustainable and attractive cities.

For more details please visit project website at www.integrabeds.tormu

#### **Contact expert organization**

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