Exercise 06-T. Technological risk assessment - ANSWERS.

The answers follow the same order of the questions in the text.

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Check the new column; what does the expression produce? What does the code **%K** stand for?

Hazardous = iff(landuse="Ind_hazardous",%K,?)

The expression produces a column "Hazardous" in which, every time the building has the landuse "Ind_Hazardous", the "K column" content is stored. The symbol %K refers to the primary column of the table called "K column"; in the table Building_map_1998 it is the first one on the left without name in gray.

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In RiskCity, there are 50 hazardous buildings. They belong to two building types: 31 buildings in bricks with cement, and 19 ones in reinforced concrete. The most vulnerable type among the two is brick with cement, because less stable and strong than the other.

6E.1 Hazard scenario modeling

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Endpoint distances for the two scenarios:

Scenario 1: 395m
Scenario 2: 1410m

The most affecting variables are…

6E.2 Evaluating the areas affected

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Vuln_Accident_1:=(395-Distance_Accident_1)/395

The distance map represents the distance in meters from the source (0m) to the end points (395m) for the first scenario. The equation creates a map with the distance in the reverse order: 395m at the source and 0m at the end points; then the values are normalized in a scale from 0 to 1 by dividing them by the maximum number (395). The map represents the vulnerability values and the lowest value is 0 at the end of the "distance" area.

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The cross-tables Building_damage_1/2 represent the cross between the map Building_map_1998 and, in turn, the maps Vulnerqability_Accident_1 and _2. The resulting tables show for each building the areas

with different vulnerability values. In the figure below, the three lines highlighted in red represent the building B_2910; each row refers to the area of the building (column: Area) with a different vulnerability value (column: Vulnerability_Accident_2). Through the command "Aggregation" and the function "Predominant", the vulnerability value with the largest area is selected for the entire building (column Vulnerability_Building_2). This is the reason why the two columns slightly differ. The columns Vulnerability_accident1/2 and Vulnerability_building1/2 slightly differ.

	Building_map_1998	Vulnerability_Accident_2	NPix	Area	Vulnerability_Building_2
B_27448 * 0.45	B_27448	0.45	10	10	0.45
B_29210 * 0.70	B_29210	0.70	5310	5310	0.75
B_29210 * 0.75	B_29210	0.75	10591	10591	0.75
B_29210 * 0.80	B_29210	0.80	9962	9962	0.75
B_29210 * 0.85	B_29210	0.85	2715	2715	0.75
B_29211 * 1.00	B_29211	1.00	188	188	1.00

6E.3 Calculating buildings losses

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From ILWIS Help file:"…A two-dimensional table is used to combine or reclassify two raster maps with a class or ID domain. It defines a value for each possible combination of input classes or IDs. A two-dimensional table consists of rows which represent one domain and of columns which represent another domain. In the two-dimensional table, you have to assign a value, class name or ID to the fields which represent the combination of these domains. When you apply the two-dimensional table on the command line of the Main window, you need two input raster maps which have the domains as used by the two-dimensional table, the output raster map then contains the values, classes or IDs that you entered in the fields of the two-dimensional table..." The two domains used to build the 2D table are the Building_type and the Nr_Floors_class. The 2D table represents a matrix in which the different values are stored for all the combinations between the classes or the identifiers of the two domains; in this case the vulnerability values all the combinations between number of floors and building types. When we apply it in the table Building_map_1998, we create a new column (Vuln_building_type) with the corresponding vulnerability value according to the building type and the number of floors of each building.

Table: Technological Risk

Building Type	Scenario 1		Scenario 2	
	Affected Buildings	Buildings Losses	Affected Buildings	Buildings Losses
Adobe	12	4.8	455	79.3
Brick with Cement	324	70.8	5134	1376.6
Brick with Mud	164	44	2721	667.4
Fieldstone	0	0	5	0.3
Reinforced Concrete	227	23.6	1961	414.8
Wood and others	227	23.6	1961	414.8
Total	**729**	**144.3**	**10646**	**2596.4**

6E.4 Evaluating the impact on the population

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	Affected Population		Evacuated buildings	
	Day-time	Night-time	Nr of buildings	Nr of people
Scenario 1	2969	675	120	194
Scenario 2	86766	43886	1775	6168

The explosion occurred in densely built-up area; if we carefully check the use of the buildings (Landuse) we can realize that most of them contain commercial activities, shops, warehouses and workshops, offices. This is the reason why the daytime population is much higher than the nighttime population.