BUILDING DESIGN AND ASSESSMENT TOOL

USER MANUAL

CONTENTS

1. INTRODUCTION

The purpose of this document is to describe how to use the Building Design and Assessment Tool software. The software is divided into nine steps / tabs. Each tab / step has its goal. These nine tabs / steps are described below:

- Tab1→Building Assessment Tool
- Tab2→Ecodesign Criteria Group
- Tab3→Land Use & Sitting
- Tab4→Energy & Atmospheric Pollution
- Tab5→Health & Safety
- Tab6→Material Resource Efficiency
- Tab7→Water Conservation
- Tab8→Economic Performance
- Tab9→Environmental Performance Chart

2. The Building Assessment Tool (Tab1)

This tab / step informs the user about the purpose of the software. By following each tab / step the user can successfully create the environmental performance chart, which is the desired main output from this tool.

This software tool is designed in a way that it can be easily adapted to the specific environmental and socioeconomic status of the area in which the assessed building or construction occurs. The evaluator can define the significance of each assessment parameter in relevance to the local or national conditions and the specific environmental or economic goals which have been set. The software is a decision making tool that can assist the evaluator grossly estimate the performance of a construction. **In Fig. 1**, there is a screenshot of tab1:

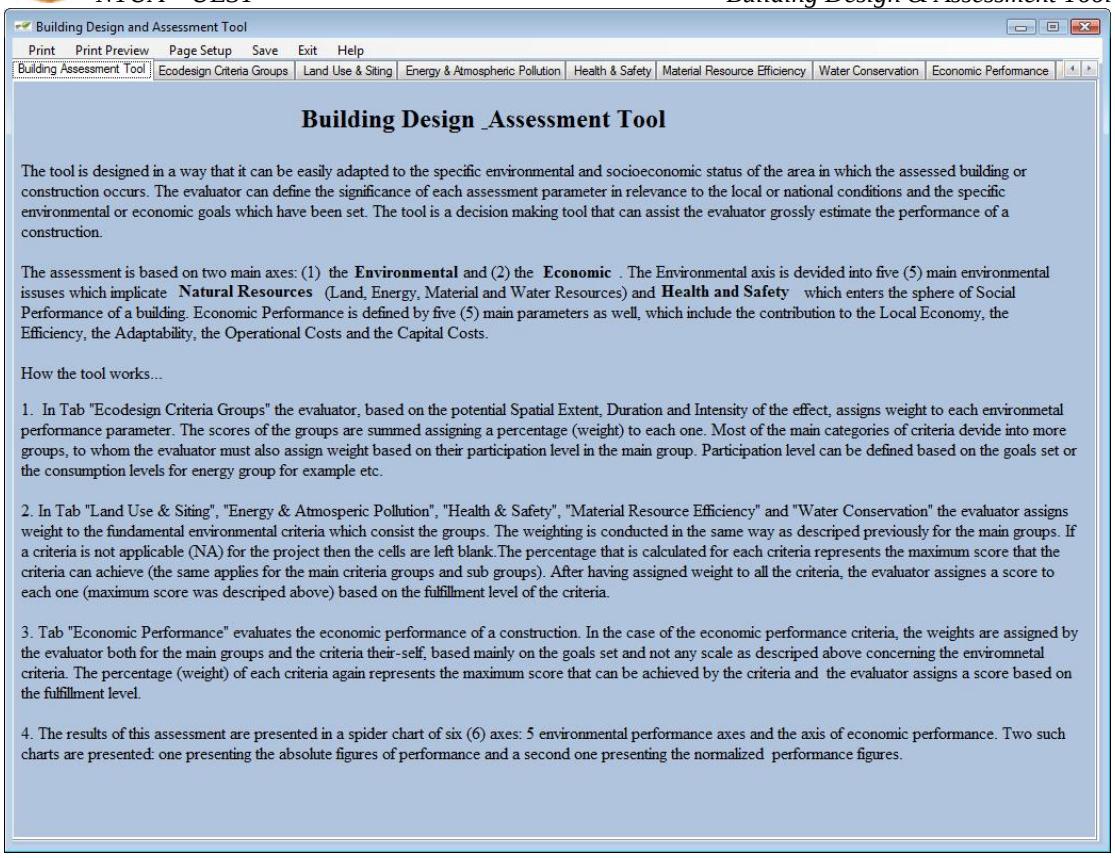


Figure 1: Building Assessment Tool (Tab1)

3. Ecodesign Criteria Groups (Tab2)

In Tab2 "Ecodesign Criteria Groups" the evaluator, based on the potential Spatial Extent, Duration and Intensity of the effect, assigns weight to each environmental performance parameter. The scores of the groups are summed assigning a percentage (weight) to each one. Most of the main categories of criteria divide into more groups, to whom the evaluator must also assign weight based on their participation level in the main group. Participation level can be defined based on the goals set or the consumption levels for energy group for example etc.

In Fig. 2, there is a screenshot of tab2 where on the left side the user must choose from each of the three drop down lists (Spatial extent of effect, Intensity of effect, Duration of effect) a value from 1 to 3. When the user's mouse is on top of one of the three drop down lists a message will appear (see Fig. 2) informing him on what each value stands for:

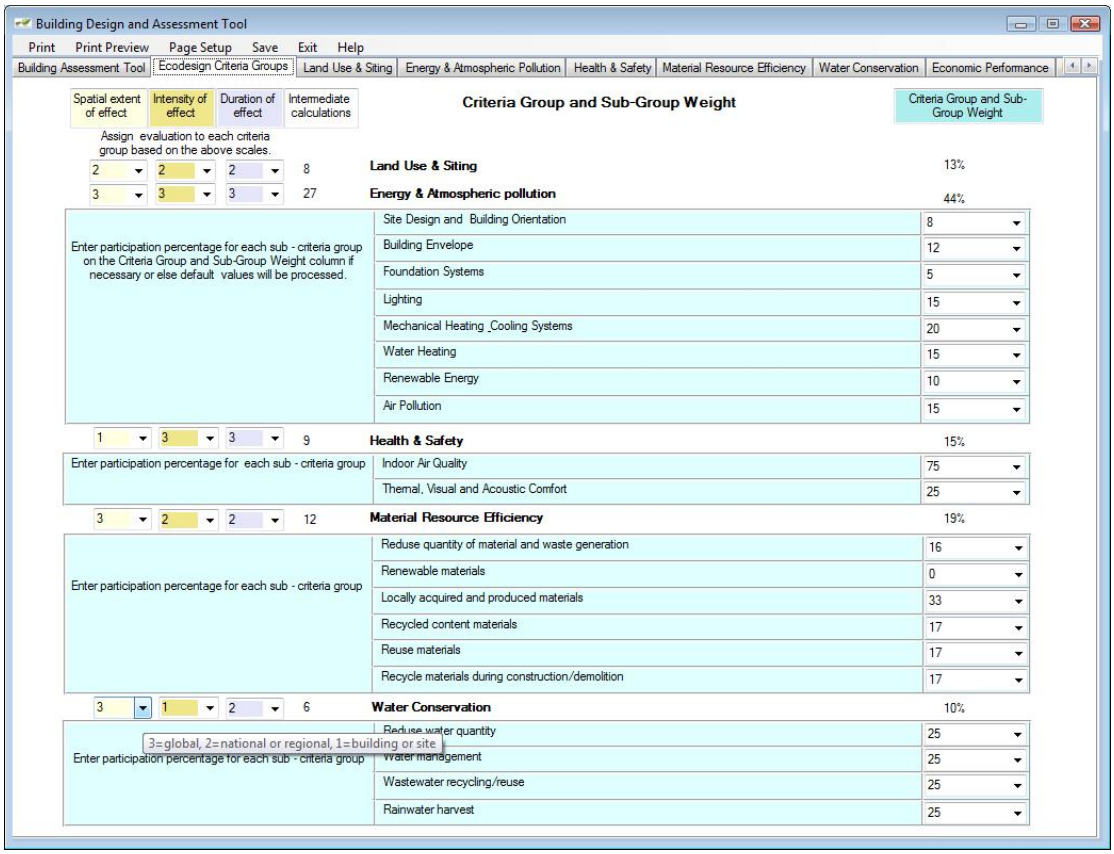


Figure 2: Ecodesign Criteria Groups (Tab2)

4. Land Use & Sitting (Tab3)

In Tab3 "Land Use & Sitting", the evaluator assigns weight to the fundamental environmental criteria which consist this group. The weighting is conducted in the same way as described previously for the main groups. The percentage that is calculated for each criteria represents the maximum score that the criteria can achieve (the same applies for the main criteria groups and sub groups).

After having assigned weight to all the criteria, the evaluator assigns a score to each one (maximum score was descriped above) based on the fulfillment level of the criteria. If the user assigns a score greater than the maximum score a red warning label will appear next to the drop down list. The warning will disappear only if the user chooses an appropriate value (less or equal than the maximum score). **In Fig. 3**, there is a screen shot of tab3:

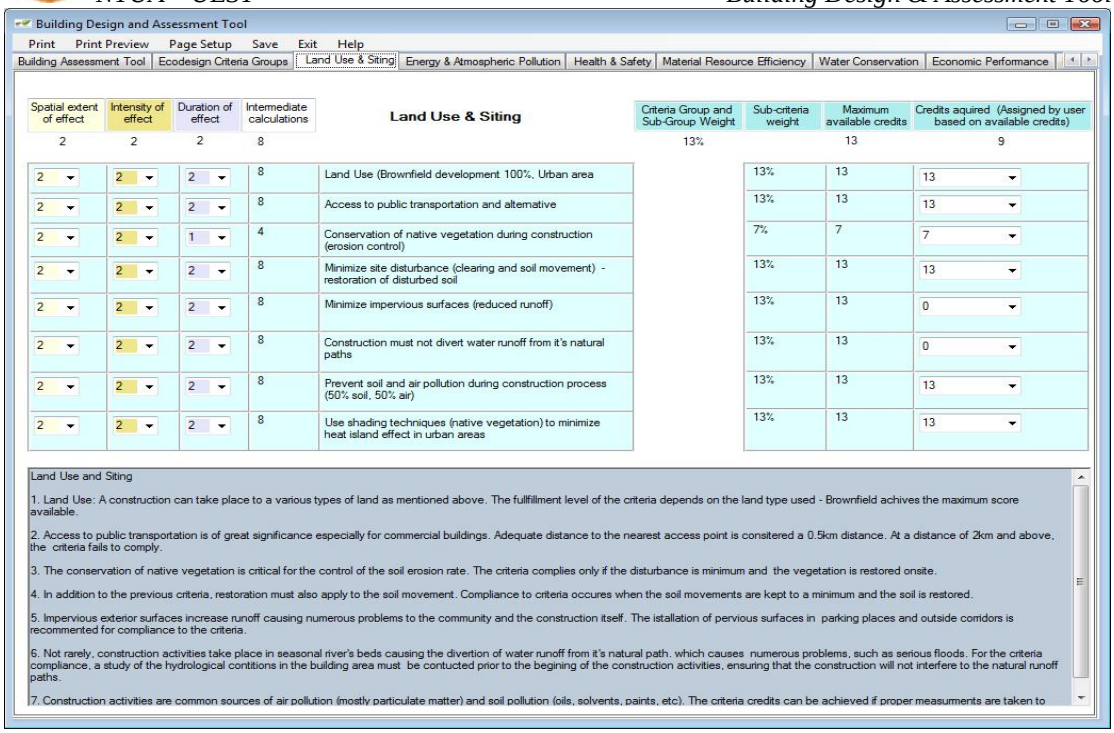


Figure 3: Land Use & Sitting (Tab3)

5. Energy & Atmospheric Pollution (Tab4)

In Tab4 "Land Energy & Atmospheric Pollution", the evaluator assigns weight to the environmental criteria which consists this group. The user fills in the criteria as he did on tab3 “Land Use & Sitting”. **In Fig 4**, there is a screenshot of tab4:

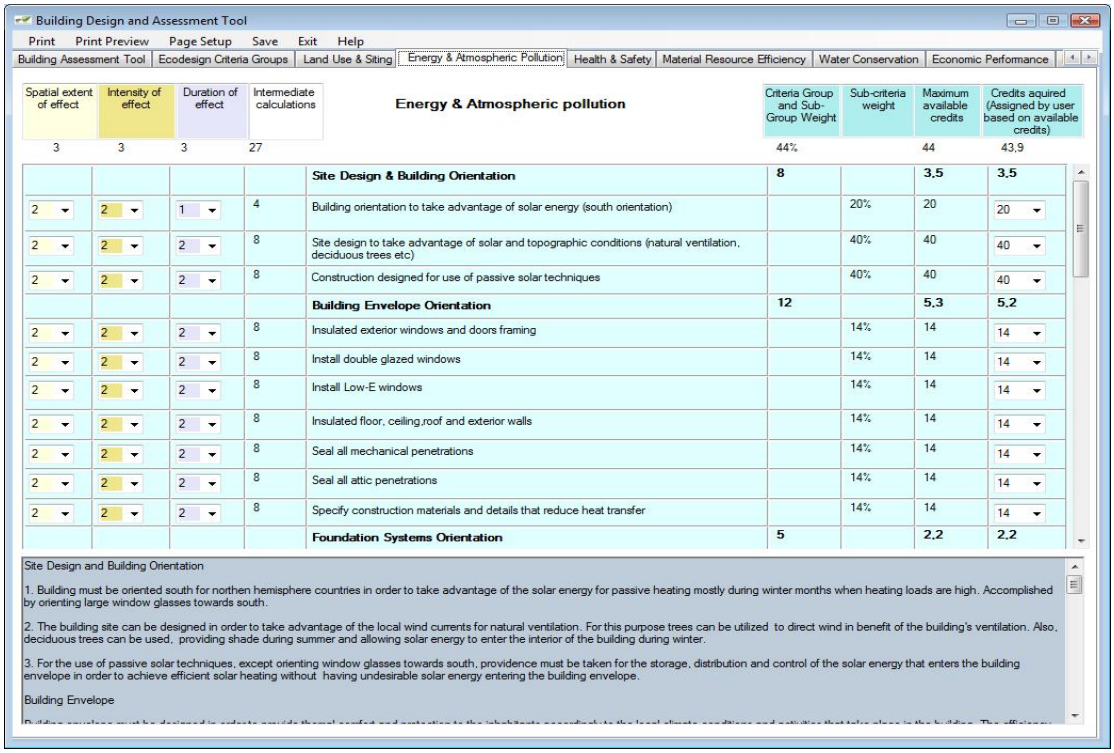


Figure 4: Energy & Atmospheric Pollution (Tab4)

6. Health & Safety (Tab5)

In Tab5 "Health & Safety", the evaluator assigns weight to the environmental criteria which consists this group. The user fills in the criteria as he did on tab3 and tab4. **In Fig 5**, there is a screenshot of tab5:

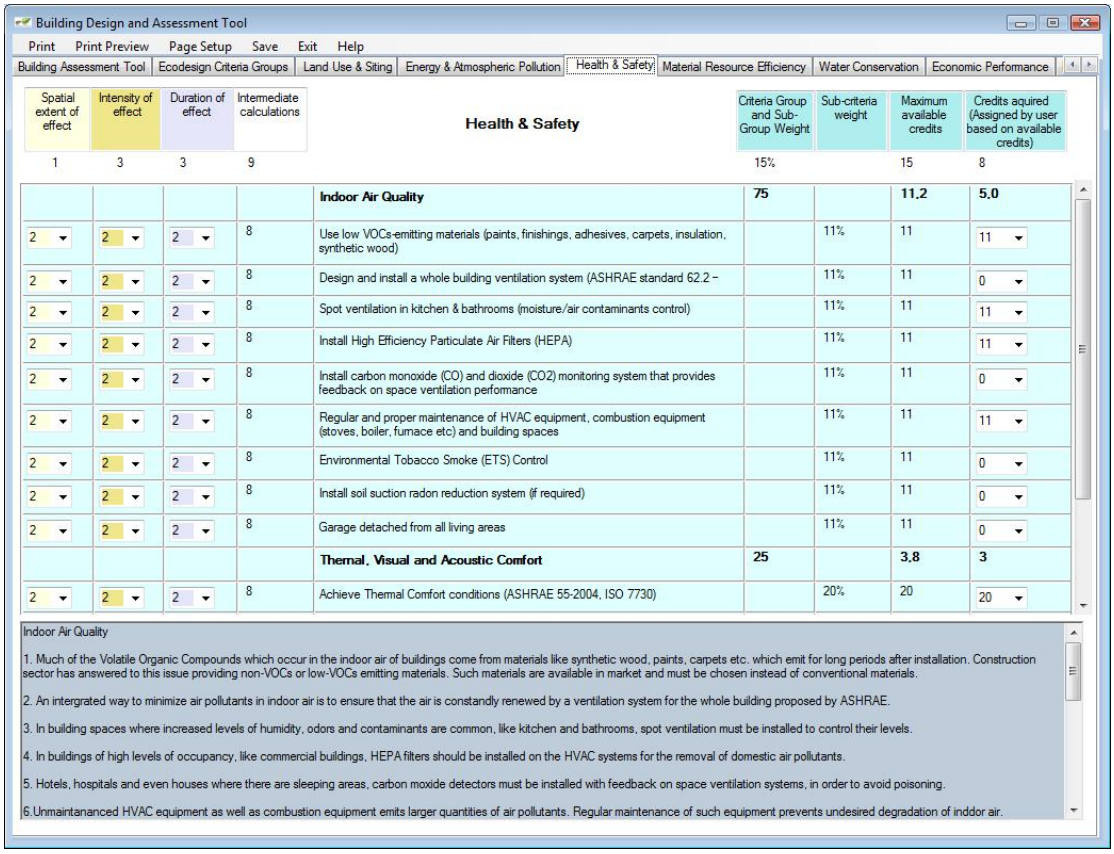


Figure 5: Health & Safety (Tab5)

7. Material Resource Efficiency (Tab6)

In Tab6 "Material Resource Efficiency", the evaluator assigns weight to the environmental criteria which consists this group. The user fills in the criteria as he did on tab3, tab4 and tab5. **In Fig 6**, there is a screenshot of tab6:

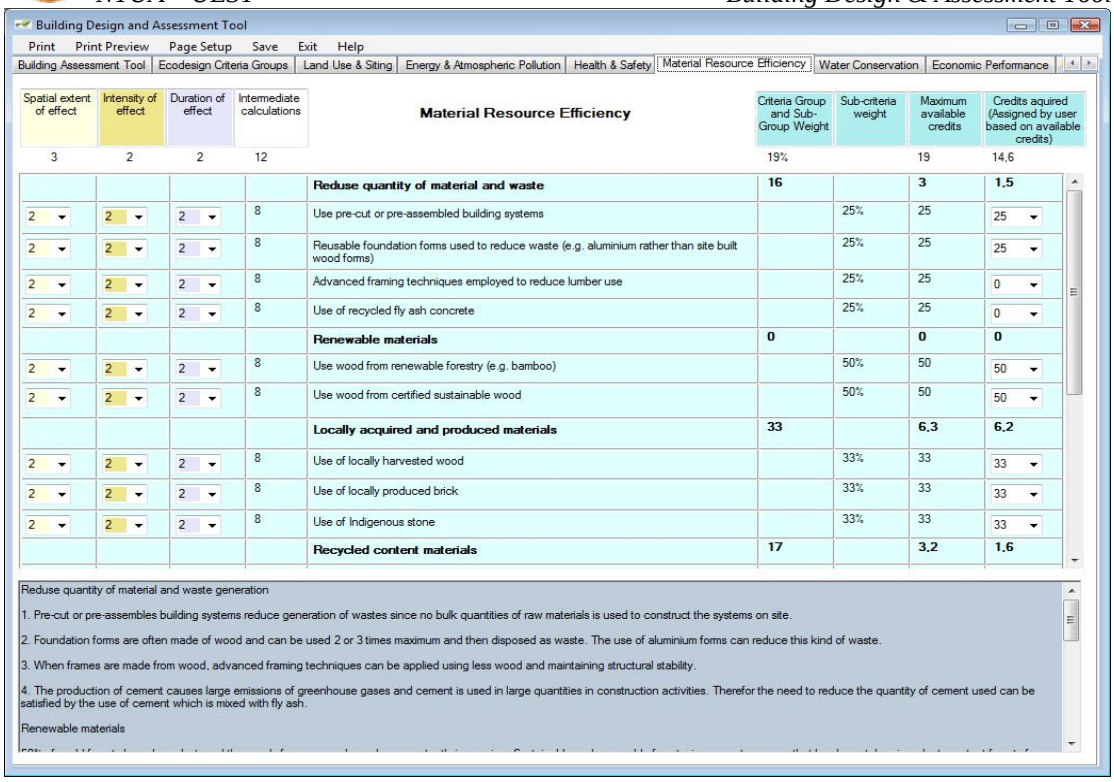


Figure 6: Material Resource Efficiency (Tab6)

8. Water Conservation (Tab7)

In Tab7 "Water Conservation", the evaluator assigns weight to the environmental criteria which consists this group. The user fills in the criteria as he did on tab3, tab4, tab5 and tab6. **In Fig 7**, there is a screenshot of tab7:

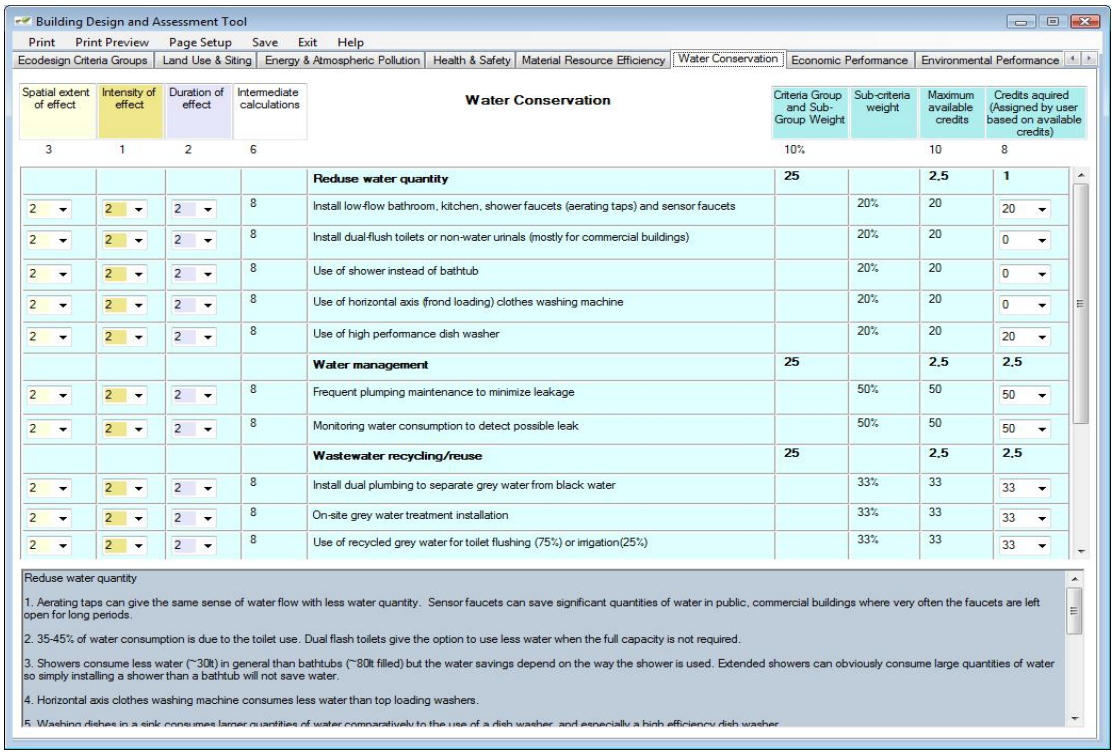


Figure 7: Water Conservation (Tab7)

9. Economic Performance (Tab8)

Tab8 "Economic Performance" evaluates the economic performance of a construction. In the case of the economic performance criteria, the weights are assigned by the evaluator both for the main groups and the criteria their-self, based mainly on the goals set and not any scale as descriped above concerning the environmental criteria. The percentage (weight) of each criterion again represents the maximum score that can be achieved by the criteria and the evaluator assigns a score based on the fulfillment level. **In Fig. 8**, there is a screenshot of tab8:

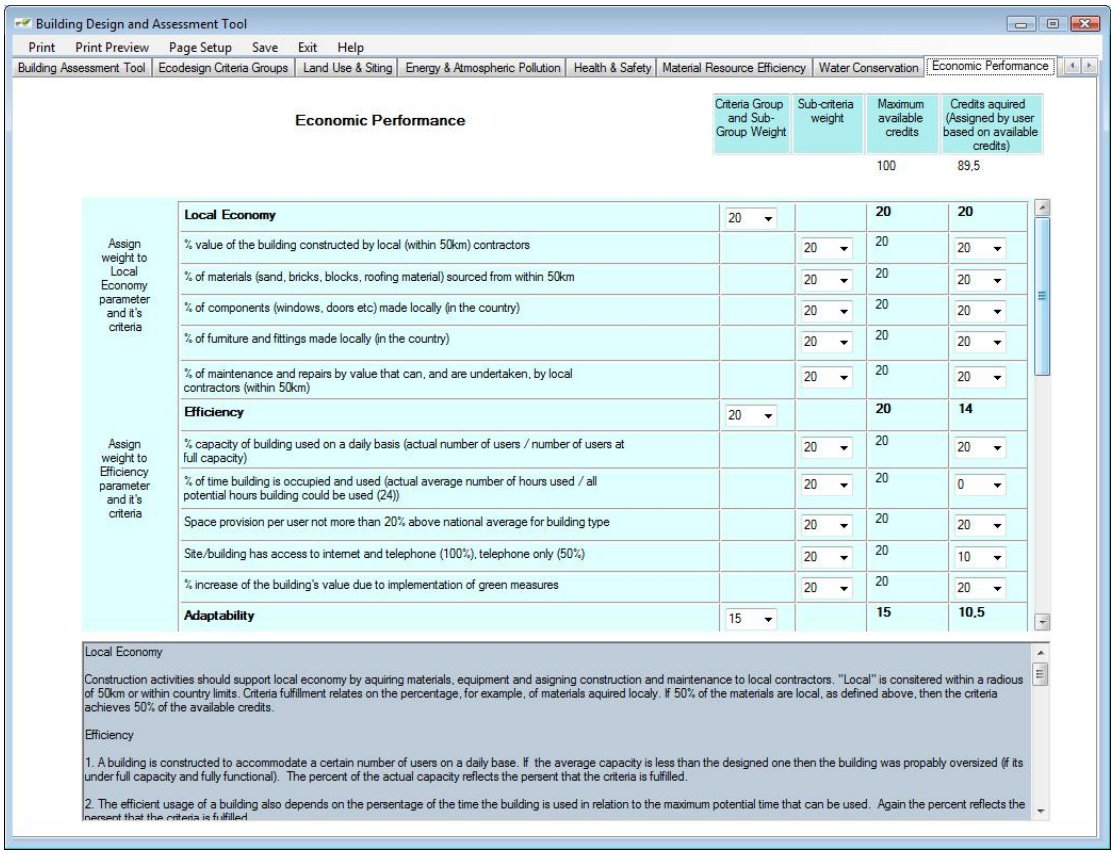


Figure 8: Economic Performance (Tab8)

10. Environmental Performance Chart (Tab9)

The results of this assessment are presented in a spider chart of six (6) axes: 5 environmental performance axes and the axis of economic performance. Two such charts are presented: one presenting the absolute figures of performance and a second

one presenting the normalized performance figures. **In Fig. 9**, there is a screenshot of tab9:

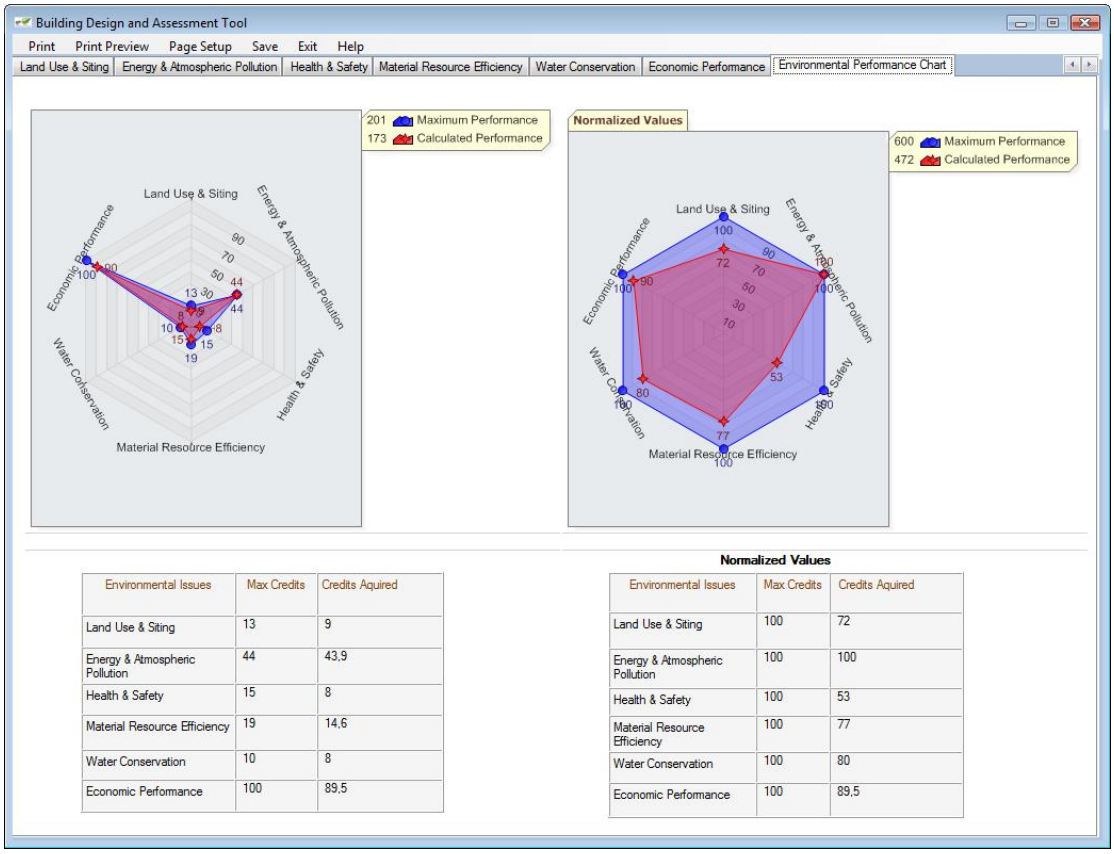


Figure 9: Environmental Performance Chart (Tab9)

These two environmental charts are the main outputs from this software tool.

11. Software menu toolbar

On the left top corner of the window software there are six menus:

- Print
- Print Preview
- Page Setup
- Save
- Exit
- Help

If the user clicks on the **"Print"** menu; a print window will show up asking the user to choose the printer where the current tab will be printed or make any other changes on the printing preferences.

If the user clicks on the **"Print Preview"** menu; a print preview windows will pop up showing us how the current tab will be printed.

If the user clicks on the **"Page Setup"** menu; a window will pop up prompting the user to choose the desired page layout, for example landscape instead of portrait.

If the user clicks on the **"Save"** menu; a window will show up asking the user for a filename and location for the current tab. The current tab will be saved as an image (in jpeg format).

If the user clicks on the **"Exit"** menu; a message box will show up asking for confirmation for exiting the software.

If the user clicks on the **"Help"** menu; the original file Ecodesign_Criteria_matrix.xls will open in case the user wants to check some extra information for the tool.

ANNEX I: Software Figures Enlarged

Building Design and Assessment Tool

Print | Print Preview | Page Setup | Save | Exit | Help

Building Assessment Tool | Ecodesign Criteria Groups | Land Use & Siting | Energy & Atmospheric Pollution | Health & Safety | Material Resource Efficiency | Water Conservation | Economic Performance

Building Design _Assessment Tool

The tool is designed in a way that it can be easily adapted to the specific environmental and socioeconomic status of the area in which the assessed building or construction occurs. The evaluator can define the significance of each assessment parameter in relevance to the local or national conditions and the specific environmental or economic goals which have been set. The tool is a decision making tool that can assist the evaluator grossly estimate the performance of a construction.

The assessment is based on two main axes: (1) the **Environmental** and (2) the **Economic** . The Environmental axis is devided into five (5) main environmental issues which implicate **Natural Resources** (Land, Energy, Material and Water Resources) and **Health and Safety** which enters the sphere of Social Performance of a building. Economic Performance is defined by five (5) main parameters as well, which include the contribution to the Local Economy, the Efficiency, the Adaptability, the Operational Costs and the Capital Costs.

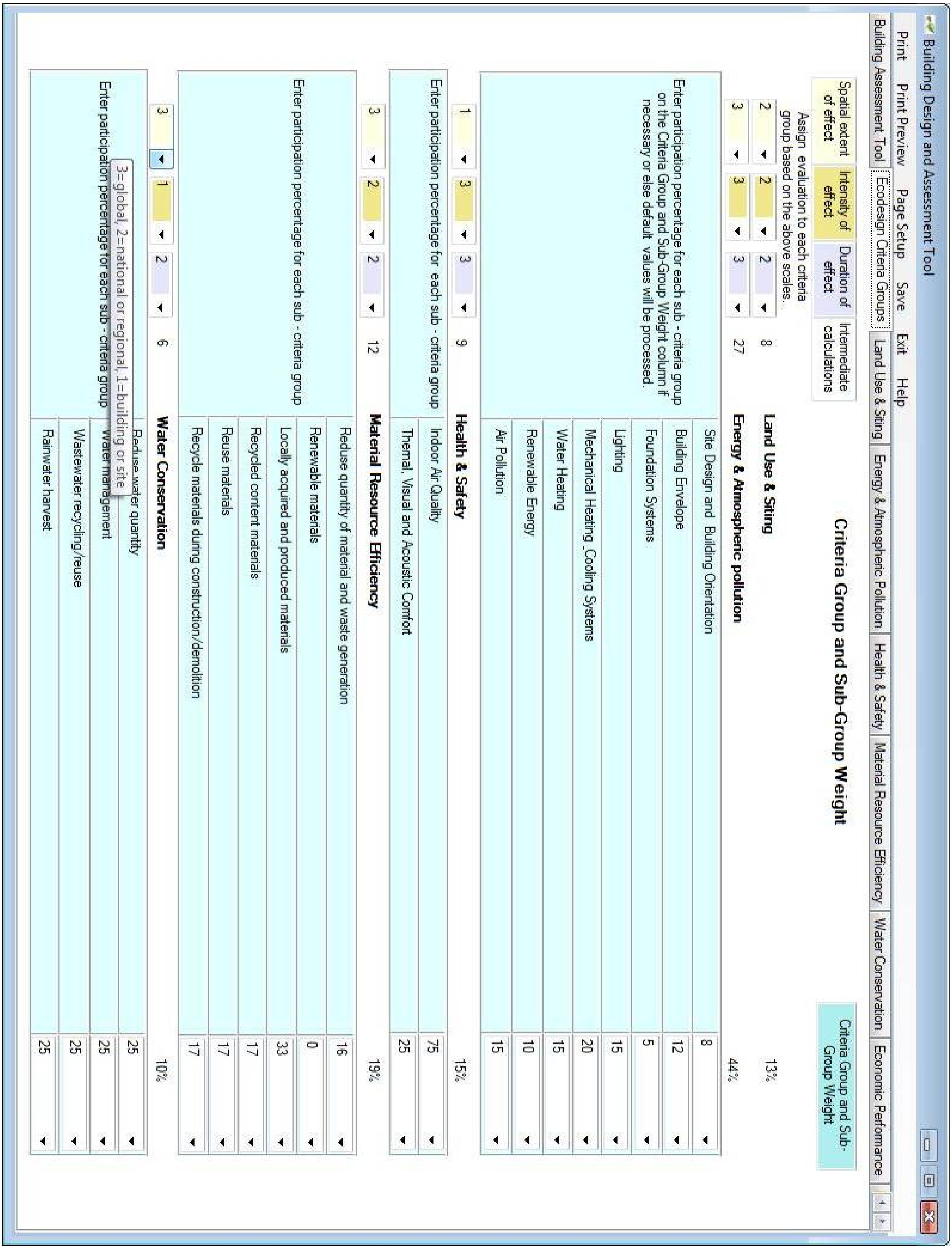
How the tool works...

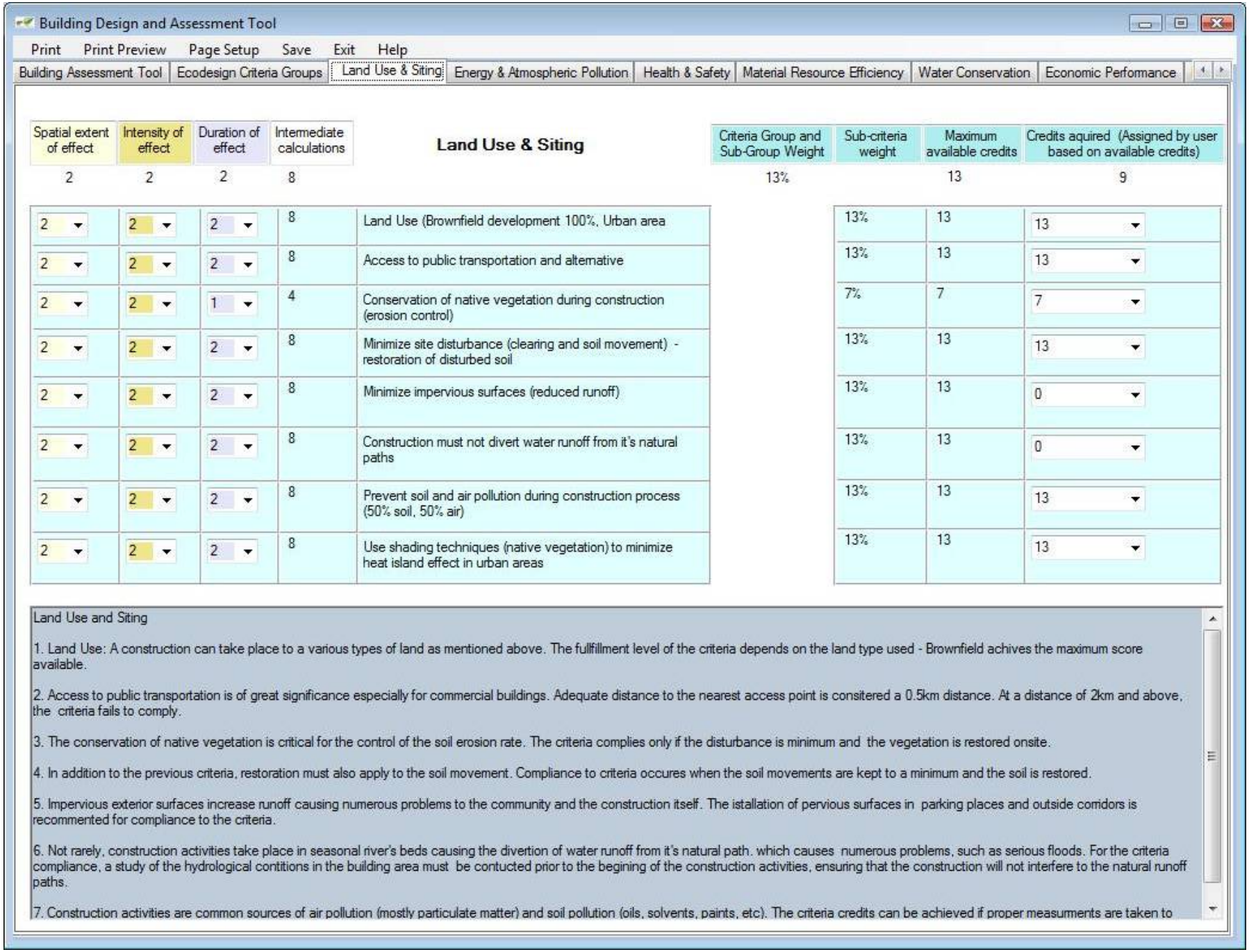
1. In Tab "Ecodesign Criteria Groups" the evaluator, based on the potential Spatial Extent, Duration and Intensity of the effect, assigns weight to each environmetal performance parameter. The scores of the groups are summed assigning a percentage (weight) to each one. Most of the main categories of criteria devide into more groups, to whom the evaluator must also assign weight based on their participation level in the main group. Participation level can be defined based on the goals set or the consumption levels for energy group for example etc.

2. In Tab "Land Use & Siting", "Energy & Atmosperic Pollution", "Health & Safety", "Material Resource Efficiency" and "Water Conservation" the evaluator assigns weight to the fundamental environmental criteria which consist the groups. The weighting is conducted in the same way as descriped previously for the main groups. If a criteria is not applicable (NA) for the project then the cells are left blank.The percentage that is calculated for each criteria represents the maximum score that the criteria can achieve (the same applies for the main criteria groups and sub groups). After having assigned weight to all the criteria, the evaluator assignes a score to each one (maximum score was descriped above) based on the fulfillment level of the criteria.

3. Tab "Economic Performance" evaluates the economic performance of a construction. In the case of the economic performance criteria, the weights are assigned by the evaluator both for the main groups and the criteria their-self, based mainly on the goals set and not any scale as descriped above concerning the environmetal criteria. The percentage (weight) of each criteria again represents the maximum score that can be achieved by the criteria and the evaluator assigns a score based on the fulfillment level.

4. The results of this assessment are presented in a spider chart of six (6) axes: 5 environmental performance axes and the axis of economic performance. Two such charts are presented: one presenting the absolute figures of performance and a second one presenting the normalized performance figures.


Building Design and Assessment Tool
Print Print Preview Page Setup Save Exit Help
Building Assessment Tool
Ecodesign Criteria Groups
Land Use & Siting
Energy & Atmospheric Pollution
Health & Safety
Material Resource Efficiency
Water Conservation
Economic Performance
Criteria Group and Sub-Group Weight
Criteria Group and Sub-Group Weight
Spatial extent of effect
Intensity of effect
Duration of effect
Intermediate calculations
Assign evaluation to each criteria group based on the above scales.
Enter participation percentage for each sub - criteria group on the Criteria Group and Sub-Group Weight column if necessary or else default values will be processed.
Land Use & Siting 13%
Site Design and Building Orientation 8
Energy & Atmospheric pollution 44%
Building Envelope 12
Foundation Systems 5
Lighting 15
Mechanical Heating_Cooling Systems 20
Water Heating 15
Renewable Energy 10
Air Pollution 15
Enter participation percentage for each sub - criteria group
Health & Safety 15%
Indoor Air Quality 75
Themal, Visual and Acoustic Comfort 25
Material Resource Efficiency 19%
Reduse quantity of material and waste generation 16
Renewable materials 0
Locally acquired and produced materials 33
Recycled content materials 17
Reuse materials 17
Recycle materials during construction/demolition 17
Water Conservation 10%
Reduse water quantity 25
Water management 25
Wastewater recycling/reuse 25
Rainwater harvest 25
3=global, 2=national or regional, 1=building or site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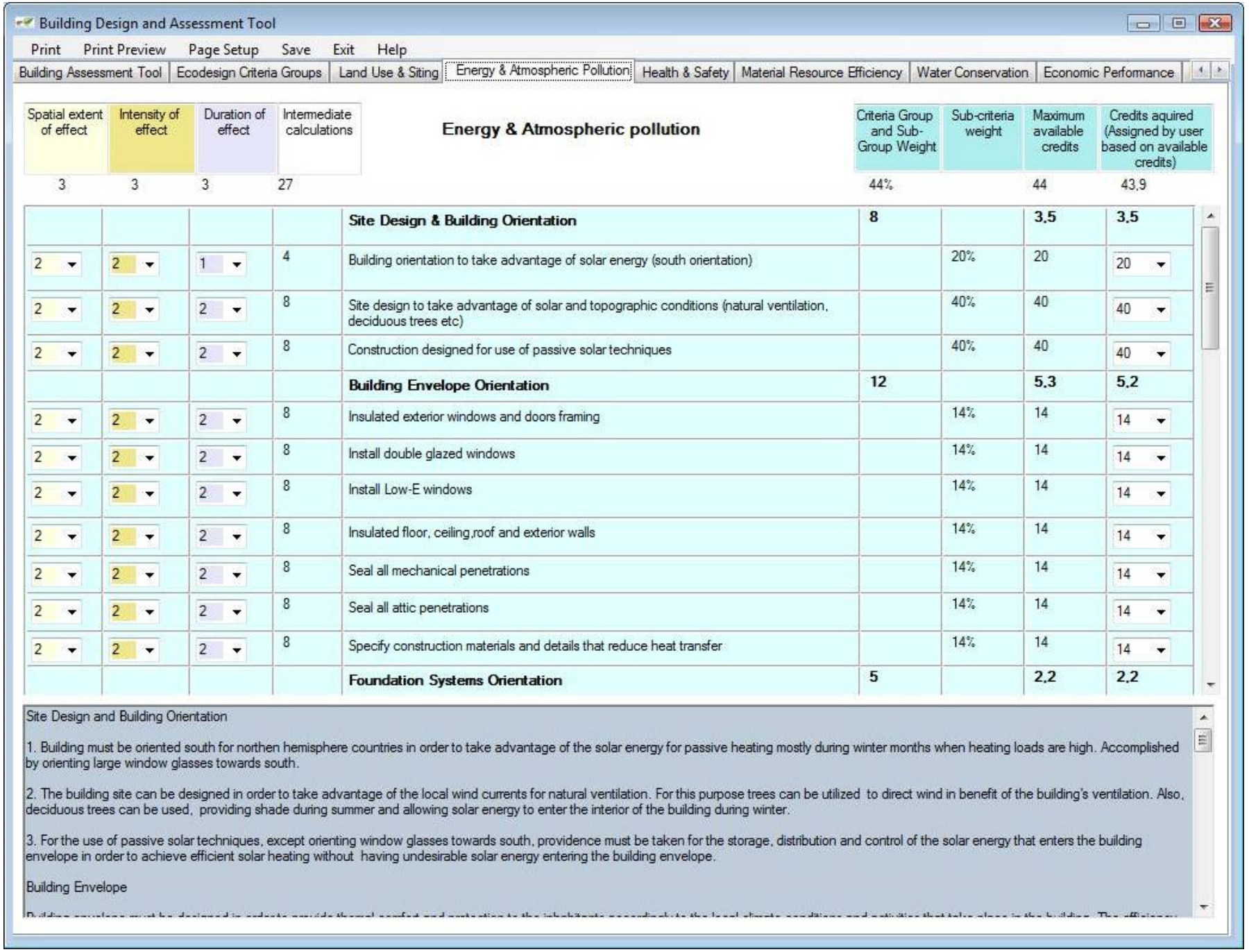
Spatial extent of effect
Intensity of effect
Duration of effect
Intermediate calculations
Criteria Group and Sub-Group Weight
Sub-criteria weight
Maximum available credits
Credits aquired (Assigned by user based on available credits)
2
2
2
8
13%
13
9
Land Use (Brownfield development 100%, Urban area
Access to public transportation and alternative
Conservation of native vegetation during construction (erosion control)
Minimize site disturbance (clearing and soil movement) - restoration of disturbed soil
Minimize impervious surfaces (reduced runoff)
Construction must not divert water runoff from it's natural paths
Prevent soil and air pollution during construction process (50% soil, 50% air)
Use shading techniques (native vegetation) to minimize heat island effect in urban areas
Land Use and Siting
1. Land Use: A construction can take place to a various types of land as mentioned above. The fullfillment level of the criteria depends on the land type used - Brownfield achives the maximum score available.
2. Access to public transportation is of great significance especially for commercial buildings. Adequate distance to the nearest access point is consitered a 0.5km distance. At a distance of 2km and above, the criteria fails to comply.
3. The conservation of native vegetation is critical for the control of the soil erosion rate. The criteria complies only if the disturbance is minimum and the vegetation is restored onsite.
4. In addition to the previous criteria, restoration must also apply to the soil movement. Compliance to criteria occures when the soil movements are kept to a minimum and the soil is restored.
5. Impervious exterior surfaces increase runoff causing numerous problems to the community and the construction itself. The istallation of pervious surfaces in parking places and outside corridors is recommented for compliance to the criteria.
6. Not rarely, construction activities take place in seasonal river's beds causing the divertion of water runoff from it's natural path. which causes numerous problems, such as serious floods. For the criteria compliance, a study of the hydrological contitions in the building area must be contucted prior to the begining of the construction activities, ensuring that the construction will not interfere to the natural runoff paths.
7. Construction activities are common sources of air pollution (mostly particulate matter) and soil pollution (oils, solvents, paints, etc). The criteria credits can be achieved if proper measurments are taken to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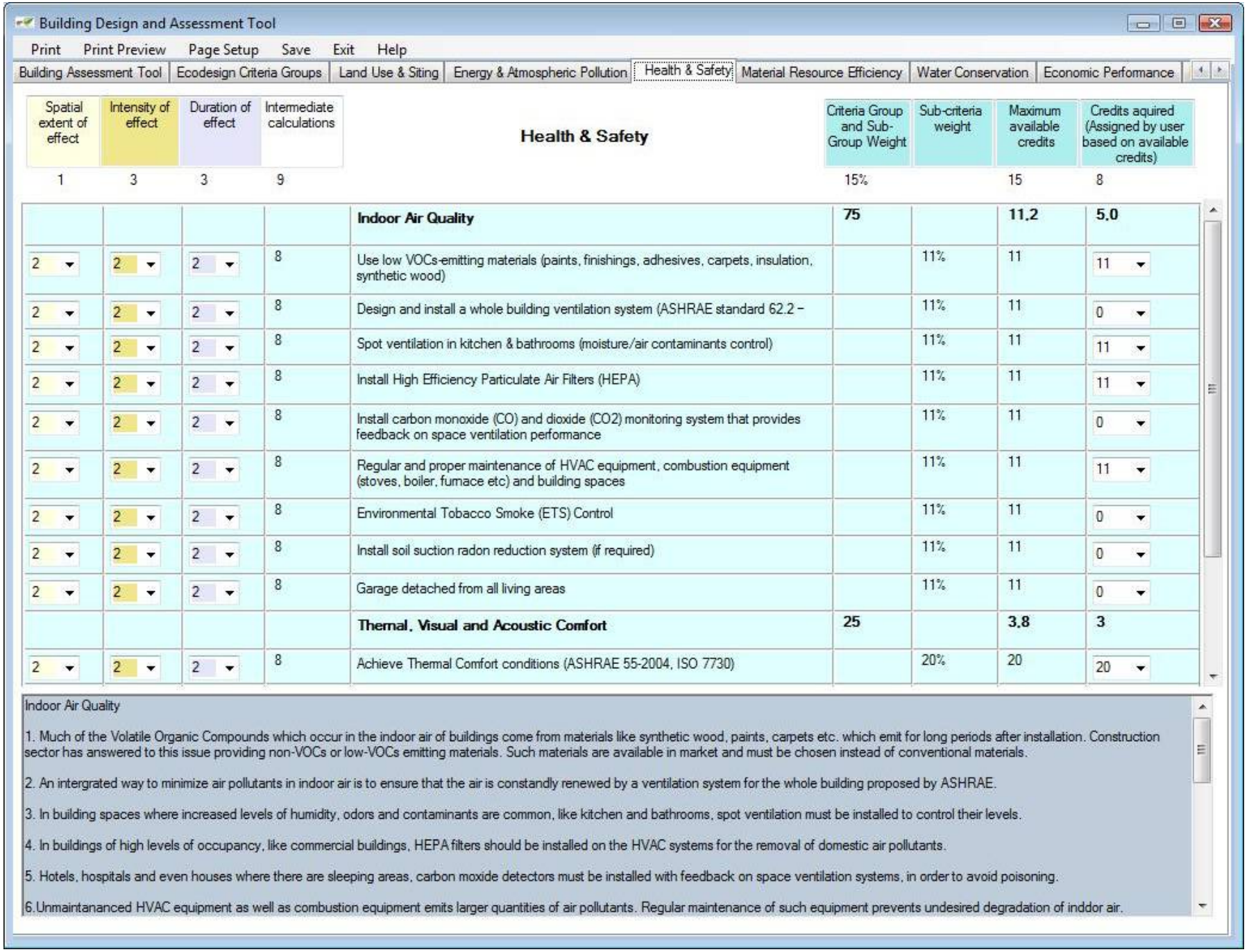
Material Resource Efficiency
Water Conservation
Economic Performance
Spatial extent of effect
Intensity of effect
Duration of effect
Intermediate calculations
Energy & Atmospheric pollution
Criteria Group and Sub-Group Weight
Sub-criteria weight
Maximum available credits
Credits aquired (Assigned by user based on available credits)
3 3 3 27
44% 44 43,9
Site Design & Building Orientation 8 3,5 3,5
2 2 1 4 Building orientation to take advantage of solar energy (south orientation) 20% 20 20
2 2 2 8 Site design to take advantage of solar and topographic conditions (natural ventilation, deciduous trees etc) 40% 40 40
2 2 2 8 Construction designed for use of passive solar techniques 40% 40 40
Building Envelope Orientation 12 5,3 5,2
2 2 2 8 Insulated exterior windows and doors framing 14% 14 14
2 2 2 8 Install double glazed windows 14% 14 14
2 2 2 8 Install Low-E windows 14% 14 14
2 2 2 8 Insulated floor, ceiling,roof and exterior walls 14% 14 14
2 2 2 8 Seal all mechanical penetrations 14% 14 14
2 2 2 8 Seal all attic penetrations 14% 14 14
2 2 2 8 Specify construction materials and details that reduce heat transfer 14% 14 14
Foundation Systems Orientation 5 2,2 2,2
Site Design and Building Orientation
1. Building must be oriented south for northen hemisphere countries in order to take advantage of the solar energy for passive heating mostly during winter months when heating loads are high. Accomplished by orienting large window glasses towards south.
2. The building site can be designed in order to take advantage of the local wind currents for natural ventilation. For this purpose trees can be utilized to direct wind in benefit of the building's ventilation. Also, deciduous trees can be used, providing shade during summer and allowing solar energy to enter the interior of the building during winter.
3. For the use of passive solar techniques, except orienting window glasses towards south, providence must be taken for the storage, distribution and control of the solar energy that enters the building envelope in order to achieve efficient solar heating without having undesirable solar energy entering the building envelope.
Building Envelope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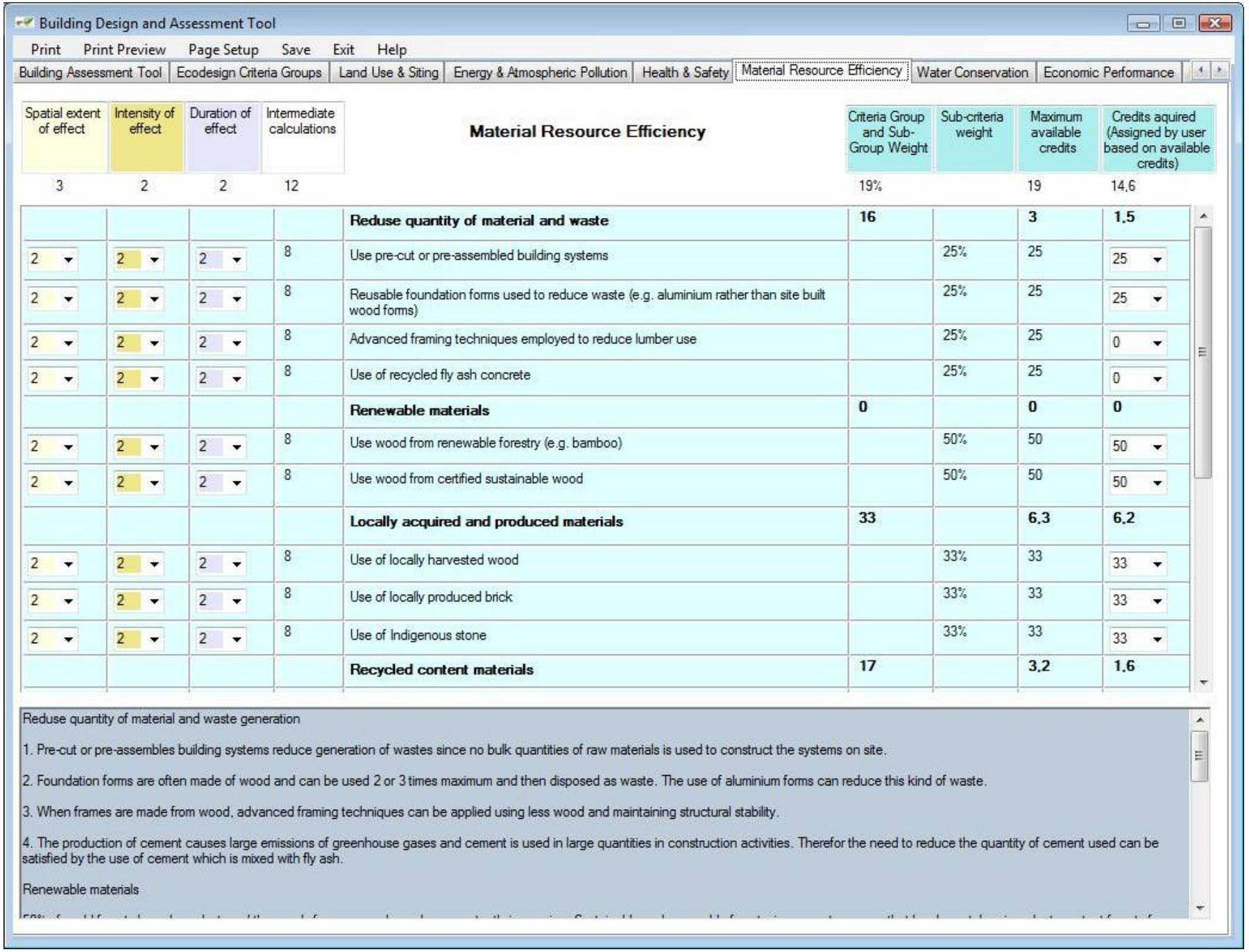
Intermediate calculations
Health & Safety
Criteria Group and Sub-Group Weight
Sub-criteria weight
Maximum available credits
Credits aquired (Assigned by user based on available credits)
1
3
3
9
15%
15
8
Indoor Air Quality
75
11,2
5,0
Use low VOCs-emitting materials (paints, finishings, adhesives, carpets, insulation, synthetic wood)
Design and install a whole building ventilation system (ASHRAE standard 62.2 –
Spot ventilation in kitchen & bathrooms (moisture/air contaminants control)
Install High Efficiency Particulate Air Filters (HEPA)
Install carbon monoxide (CO) and dioxide (CO2) monitoring system that provides feedback on space ventilation performance
Regular and proper maintenance of HVAC equipment, combustion equipment (stoves, boiler, furnace etc) and building spaces
Environmental Tobacco Smoke (ETS) Control
Install soil suction radon reduction system (if required)
Garage detached from all living areas
Thermal, Visual and Acoustic Comfort
25
3,8
3
Achieve Thermal Comfort conditions (ASHRAE 55-2004, ISO 7730)
Indoor Air Quality
1. Much of the Volatile Organic Compounds which occur in the indoor air of buildings come from materials like synthetic wood, paints, carpets etc. which emit for long periods after installation. Construction sector has answered to this issue providing non-VOCs or low-VOCs emitting materials. Such materials are available in market and must be chosen instead of conventional materials.
2. An intergrated way to minimize air pollutants in indoor air is to ensure that the air is constandly renewed by a ventilation system for the whole building proposed by ASHRAE.
3. In building spaces where increased levels of humidity, odors and contaminants are common, like kitchen and bathrooms, spot ventilation must be installed to control their levels.
4. In buildings of high levels of occupancy, like commercial buildings, HEPA filters should be installed on the HVAC systems for the removal of domestic air pollutants.
5. Hotels, hospitals and even houses where there are sleeping areas, carbon moxide detectors must be installed with feedback on space ventilation systems, in order to avoid poisoning.
6.Unmaintananced HVAC equipment as well as combustion equipment emits larger quantities of air pollutants. Regular maintenance of such equipment prevents undesired degradation of inddor air.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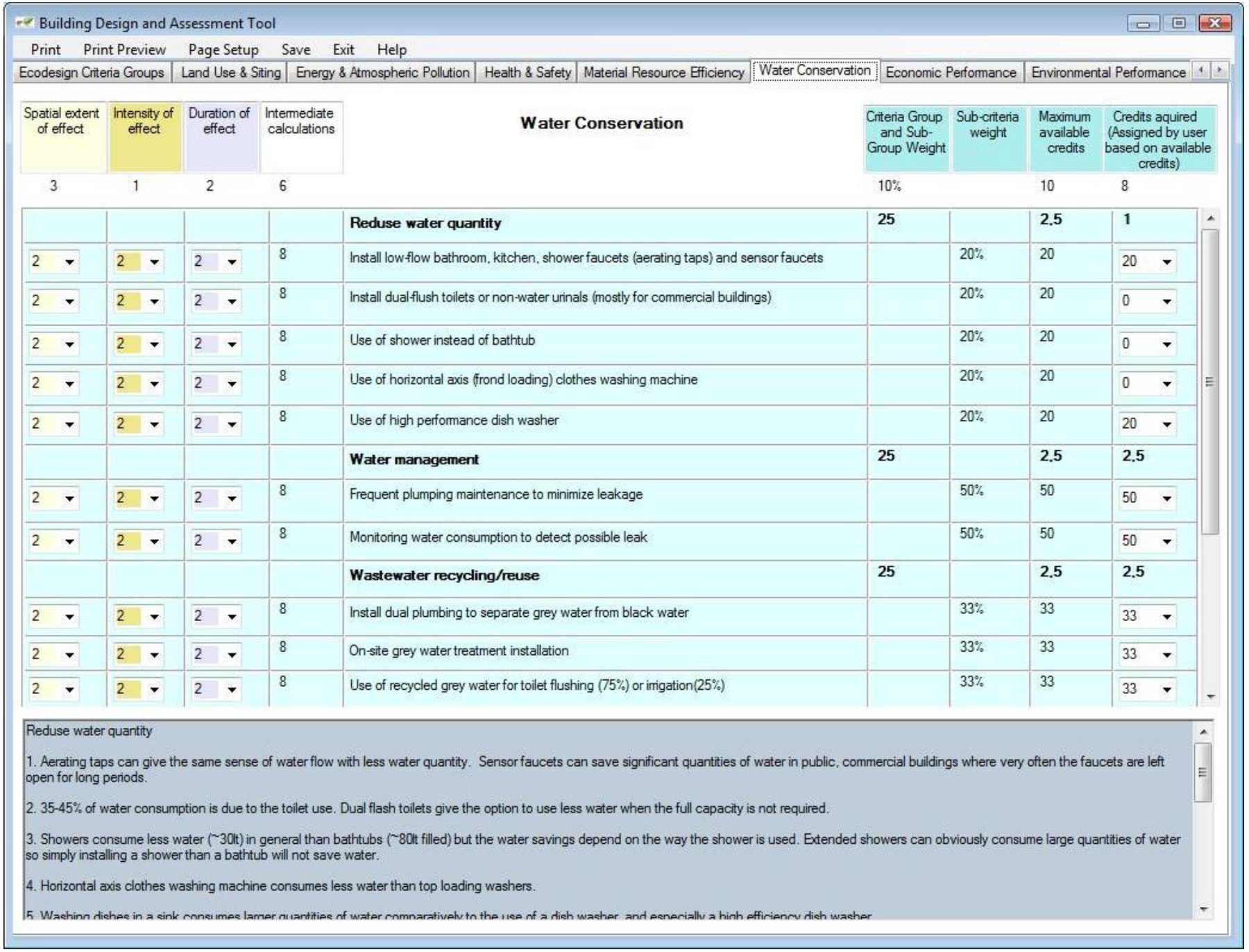
Intermediate calculations
Material Resource Efficiency
Criteria Group and Sub-Group Weight
Sub-criteria weight
Maximum available credits
Credits aquired (Assigned by user based on available credits)
3
2
2
12
19%
19
14,6
Reduse quantity of material and waste
16
3
1,5
Use pre-cut or pre-assembled building systems
25%
25
Reusable foundation forms used to reduce waste (e.g. aluminium rather than site built wood forms)
25%
25
Advanced framing techniques employed to reduce lumber use
25%
25
0
Use of recycled fly ash concrete
25%
25
0
Renewable materials
0
0
0
Use wood from renewable forestry (e.g. bamboo)
50%
50
Use wood from certified sustainable wood
50%
50
Locally acquired and produced materials
33
6,3
6,2
Use of locally harvested wood
33%
33
Use of locally produced brick
33%
33
Use of Indigenous stone
33%
33
Recycled content materials
17
3,2
1,6
Reduse quantity of material and waste generation
1. Pre-cut or pre-assembles building systems reduce generation of wastes since no bulk quantities of raw materials is used to construct the systems on site.
2. Foundation forms are often made of wood and can be used 2 or 3 times maximum and then disposed as waste. The use of aluminium forms can reduce this kind of waste.
3. When frames are made from wood, advanced framing techniques can be applied using less wood and maintaining structural stability.
4. The production of cement causes large emissions of greenhouse gases and cement is used in large quantities in construction activities. Therefor the need to reduce the quantity of cement used can be satisfied by the use of cement which is mixed with fly ash.
Renewable materials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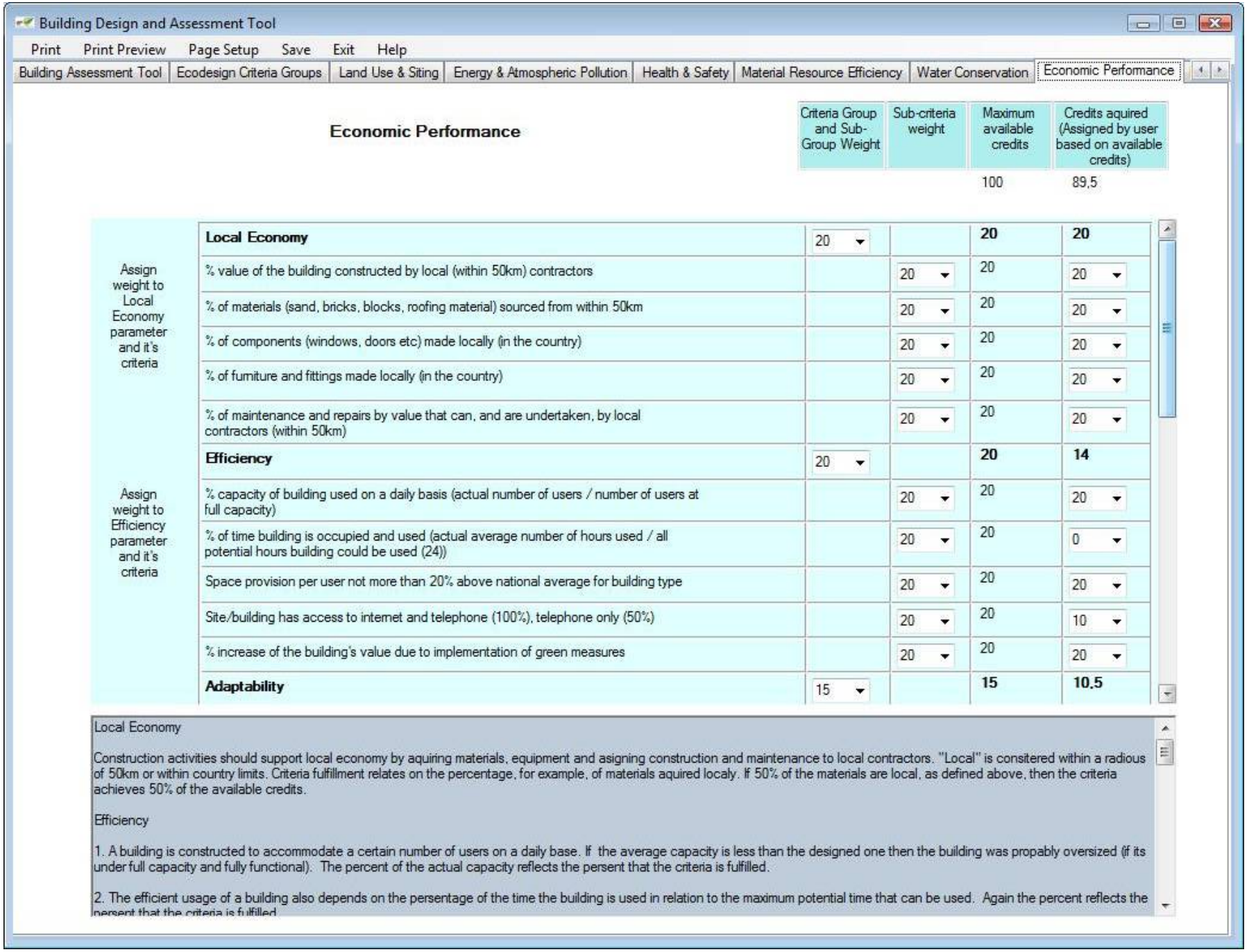
Sub-criteria weight
Maximum available credits
Credits aquired (Assigned by user based on available credits)
3
1
2
6
10%
10
8
Reduse water quantity
25
2,5
1
Install low-flow bathroom, kitchen, shower faucets (aerating taps) and sensor faucets
20%
20
20
Install dual-flush toilets or non-water urinals (mostly for commercial buildings)
20%
20
0
Use of shower instead of bathtub
20%
20
0
Use of horizontal axis (frond loading) clothes washing machine
20%
20
0
Use of high performance dish washer
20%
20
20
Water management
25
2,5
2,5
Frequent plumping maintenance to minimize leakage
50%
50
50
Monitoring water consumption to detect possible leak
50%
50
50
Wastewater recycling/reuse
25
2,5
2,5
Install dual plumbing to separate grey water from black water
33%
33
33
On-site grey water treatment installation
33%
33
33
Use of recycled grey water for toilet flushing (75%) or irrigation(25%)
33%
33
33
Reduse water quantity
1. Aerating taps can give the same sense of water flow with less water quantity. Sensor faucets can save significant quantities of water in public, commercial buildings where very often the faucets are left open for long periods.
2. 35-45% of water consumption is due to the toilet use. Dual flash toilets give the option to use less water when the full capacity is not required.
3. Showers consume less water (~30lt) in general than bathtubs (~80lt filled) but the water savings depend on the way the shower is used. Extended showers can obviously consume large quantities of water so simply installing a shower than a bathtub will not save water.
4. Horizontal axis clothes washing machine consumes less water than top loading washers.
5. Washing dishes in a sink consumes larger quantities of water comparatively to the use of a dish washer, and especially a high efficiency dish washer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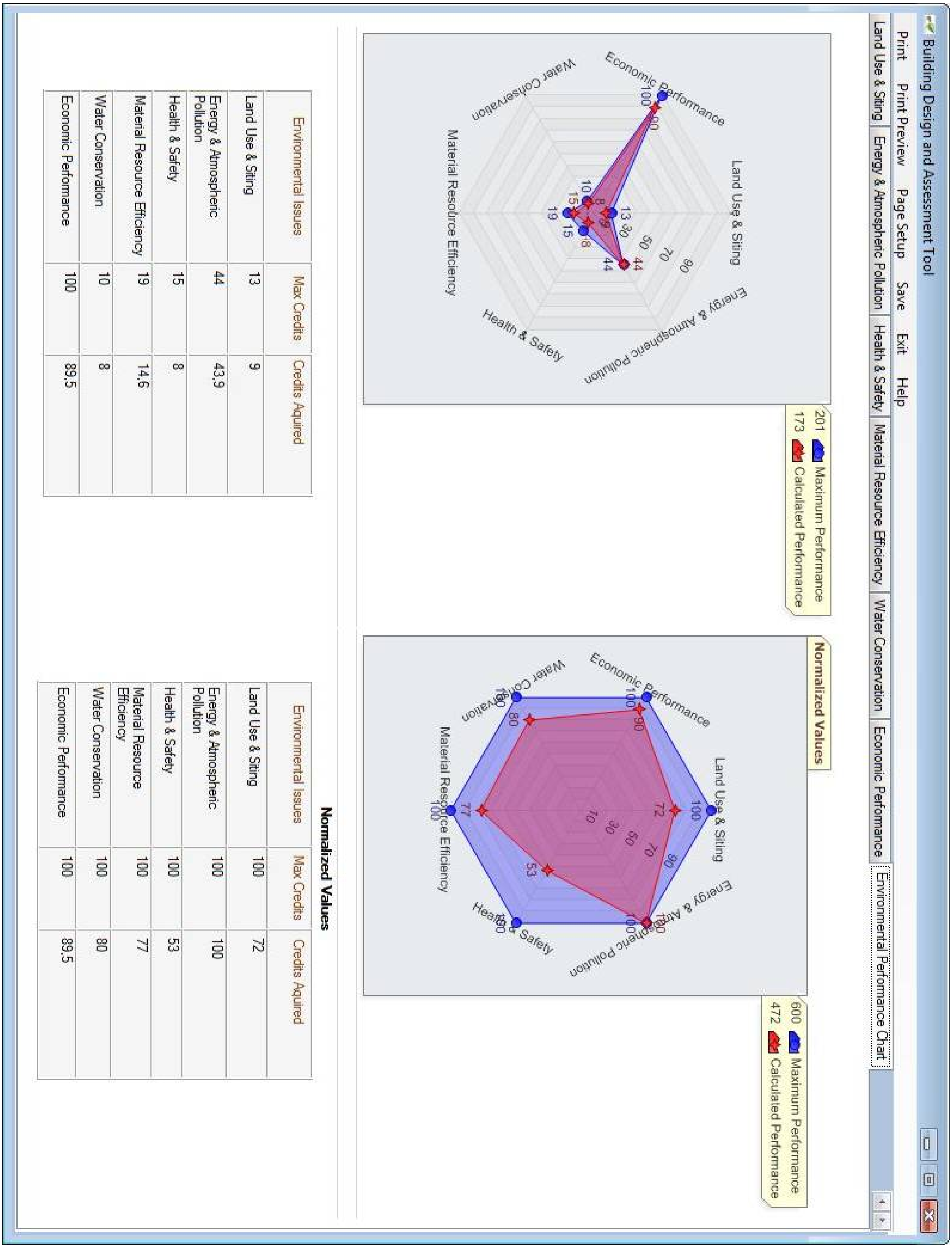
Health & Safety
Material Resource Efficiency
Water Conservation
Economic Performance
Economic Performance
Criteria Group and Sub-Group Weight
Sub-criteria weight
Maximum available credits
Credits aquired (Assigned by user based on available credits)
100
89,5
Assign weight to Local Economy parameter and it's criteria
Local Economy
20
20
20
% value of the building constructed by local (within 50km) contractors
% of materials (sand, bricks, blocks, roofing material) sourced from within 50km
% of components (windows, doors etc) made locally (in the country)
% of furniture and fittings made locally (in the country)
% of maintenance and repairs by value that can, and are undertaken, by local contractors (within 50km)
Efficiency
20
20
14
Assign weight to Efficiency parameter and it's criteria
% capacity of building used on a daily basis (actual number of users / number of users at full capacity)
% of time building is occupied and used (actual average number of hours used / all potential hours building could be used (24))
Space provision per user not more than 20% above national average for building type
Site/building has access to internet and telephone (100%), telephone only (50%)
% increase of the building's value due to implementation of green measures
Adaptability
15
15
10.5
Local Economy
Construction activities should support local economy by aquiring materials, equipment and asigning construction and maintenance to local contractors. "Local" is consitered within a radious of 50km or within country limits. Criteria fulfillment relates on the percentage, for example, of materials aquired localy. If 50% of the materials are local, as defined above, then the criteria achieves 50% of the available credits.
Efficiency
1. A building is constructed to accommodate a certain number of users on a daily base. If the average capacity is less than the designed one then the building was propably oversized (if its under full capacity and fully functional). The percent of the actual capacity reflects the persent that the criteria is fulfilled.
2. The efficient usage of a building also depends on the persentage of the time the building is used in relation to the maximum potential time that can be used. Again the percent reflects the



Environmental Issues	Max Credits	Credits Aquired
Land Use & Siting	13	9
Energy & Atmospheric Pollution	44	43.9
Health & Safety	15	8
Material Resource Efficiency	19	14.6
Water Conservation	10	8
Economic Perfomance	100	89.5

Normalized Values

Environmental Issues	Max Credits	Credits Aquired
Land Use & Siting	100	72
Energy & Atmospheric Pollution	100	100
Health & Safety	100	53
Material Resource Efficiency	100	77
Water Conservation	100	80
Economic Perfomance	100	89.5