Table 3. Assessment of Q_h. (Q_h : final energy for heating, $Q_{h,li}$: legal value fixed by the SIA 380/1 norm)

Assessment limits	New buildings	Renovated buildings
Best practice (green)	$Q_h < 0.6\ Q_{h,li}$	$Q_h < 0.8\ Q_{h,li}$
Acceptable (yellow)	$0.6\ Q_{h,li} < Q_h < 0.9\ Q_{h,li}$	$0.8\ Q_{h,li} < Q_h < Q_{h,li}$
Unacceptable (red)	$0.9\ Q_{h,li} < Q_h < Q_{h,li}$	$Q_{h,li} < Q_h < 1.1\ Q_{h,li}$
Veto (black)	$Q_{h,li} < Q_h$	$1.1\ Q_{h,li} < Q_h$

Mobility. The applied method is based on the technical report SIA 2039 "Mobility - Energy Consumption of Buildings according to their Location". The method weights the Swiss average energy consumption for mobility by several correction factors related to the context and facilities. "The correction factors are obtained from a statistical analysis of the federal micro-census of 2005 (OFS & ARE, 2007) and vary depending on the surface uses. They are:

1. Location: located in downtown/business area
2. Access and quality of public transport
3. Distance to a shopping center
4. Availability of a car
5. Availability of parking for cars and bikes
6. Availability of public transportation passes." (Riera Perez & Rey, 2013).

If users are identified, the SIA 2039 recommends a much precise calculation taking into account the distance and means of transport employed by the occupants.

The target values for the surface uses that are not included in the SIA 2040 have been defined by separating energy for employees and for visitors or customers. Employees' mobility is the one defined for economic activities in the SIA 2040. Visitors or customers' mobility have been taken from the mode of mobility (distance and mode of transportation) defined by the federal micro-census of 2005, differentiating mobility for shopping and for leisure. The assumption is that commercial activities generate the shopping type mobility. Restaurants, sport facilities and meeting spaces generate leisure type mobility. Finally hospitals generate the same mobility as an average inhabitant as we assume that patients going to the hospital go from home and return back home. The same energy reduction (energy saving in percentage of the Swiss mean value), is asked for all land use surfaces.

RESULTS

As a decision-making tool dealing with multi-disciplinary assessment, the communication of results is important. Figure 2 shows the graphics presenting the projects toward the 2000 Watts society. On the left side, total NRE and GWP graphs inform the user about the completion of the 2000 Watts target, corresponding to the green line. The two columns differentiate the actual impact with the one for 2050, considering technological improvements of vehicles. On the right side, the contribution of each energy use is detailed in order to help decision-makers focus on the bigger impact.

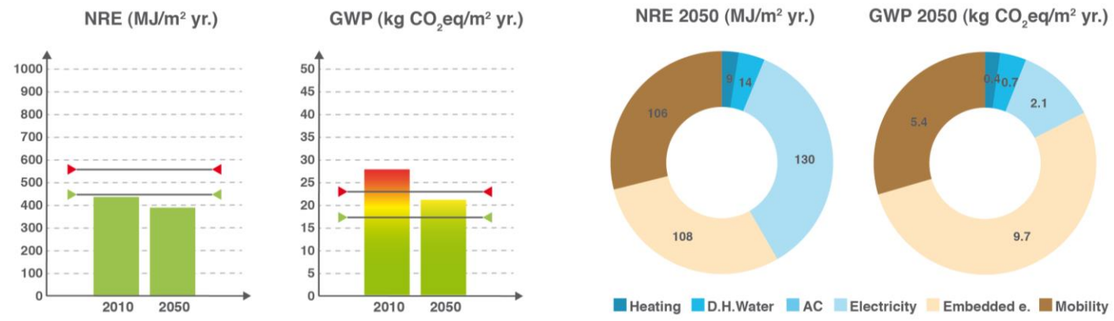

Figure 2 SméO results: 2000 Watts assessment and contribution of each energy use to the whole impact.

CONCLUSIVE DISCUSSION

Because SméO is intended to all project managers, the web page offers documentation presenting the calculation method, references and a user guide. A decision-making tool can be used in very different ways; results highly depend on the input data since no verification is done in comparison to a certification process. Thus, using a tool like SméO is judicious only if the project manager seeks a sustainable building development. Therefore, the tool presented is an instrument to contribute to the 2000 Watts society, but other ways need to be found to implement the energy reduction target such as modifying the energy legislation and urban planning regulations.

In Switzerland, the SIA has an important influence on the normative domain because of its capacity to promote innovative answers for new challenges. Since environmental, cultural and legal aspects change from one country to another, the method would need to be adapted prior to its use in a different context (Singh, Murty, Gupta, & Dikshit, 2012) in order to guide towards appropriate targets. Therefore, identifying the regional specific challenges, standards and solutions would be needed to adjust the tool.

The user of a building can highly influence the energy consumption and some papers have shown that going from 6000 Watts to 2000 Watts cannot be done without the contribution of the occupant behavior. Hence, new developments are necessary to follow the real energy consumption during the lifetime of buildings.

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