Approaches for monitoring protocols and their practical relevance

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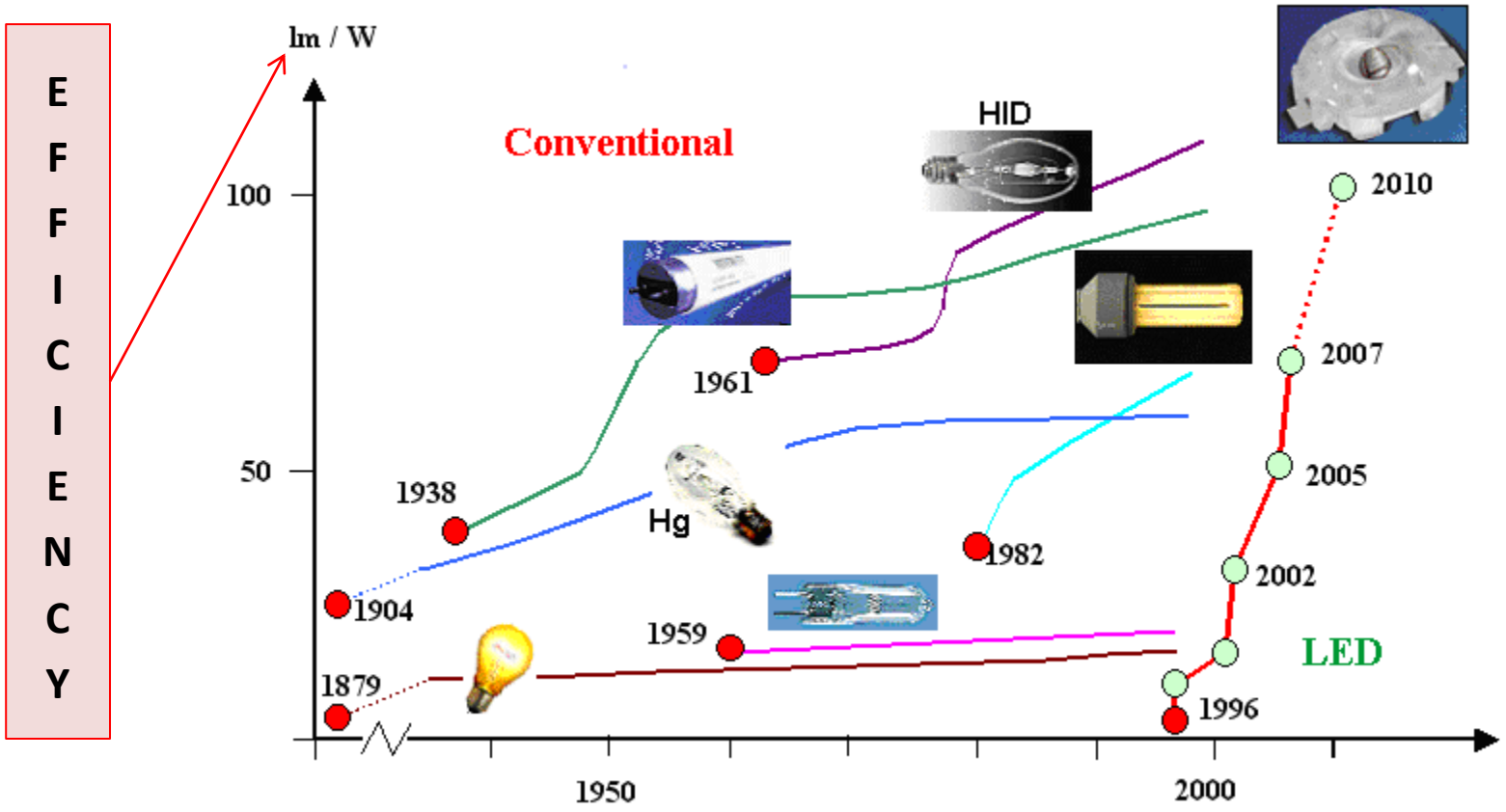
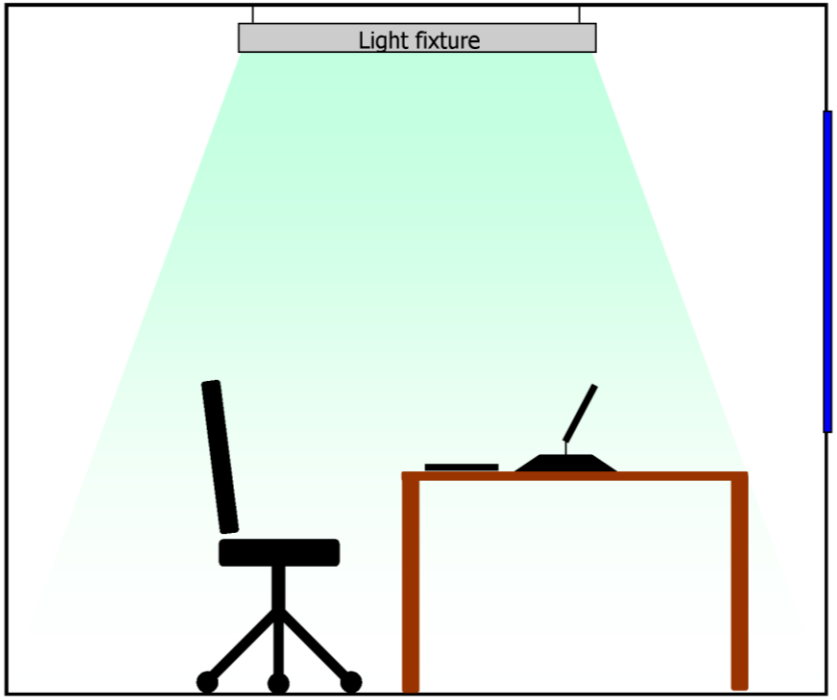
SHC SOLAR HEATING & COOLING PROGRAMME
INTERNATIONAL ENERGY AGENCY

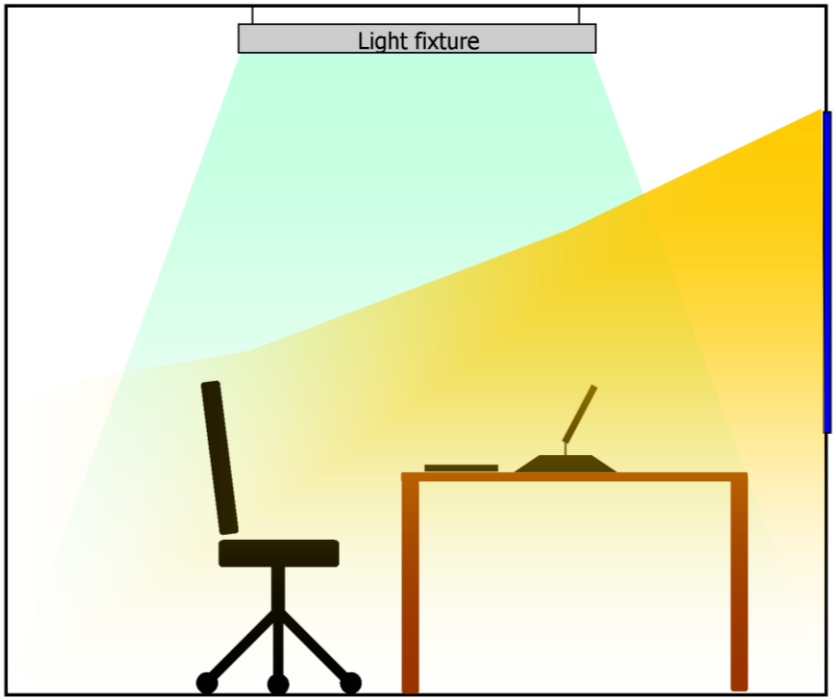
Efficiency Vs. Overall performance



Efficiency Vs. Overall perfomance



EFFICIENCY



~~OVERALL PERFORMANCE~~

Efficiency Vs. Overall performance

EFFICIENCY

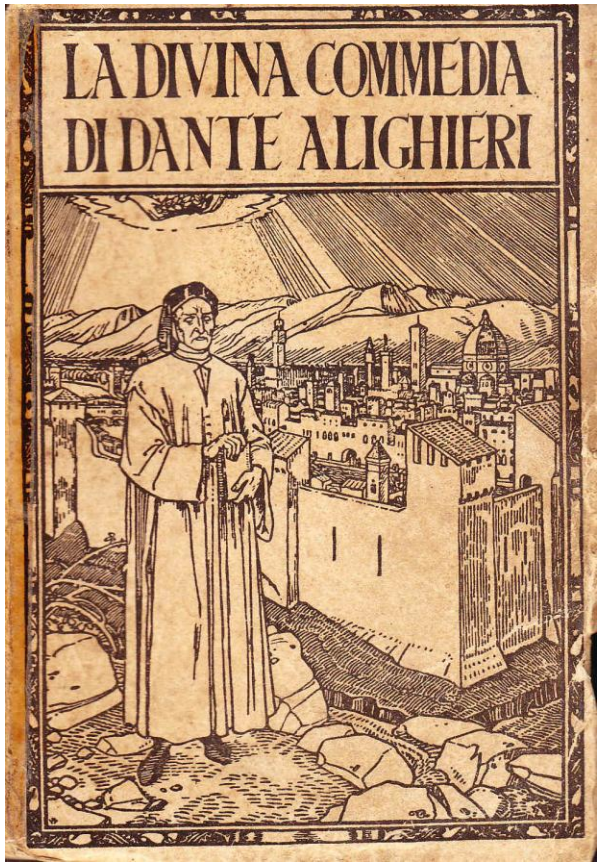
OVERALL PERFORMANCE ?

Hong Kong by night

Defining lighting performance

INTERNATIONAL
YEAR OF LIGHT
2015

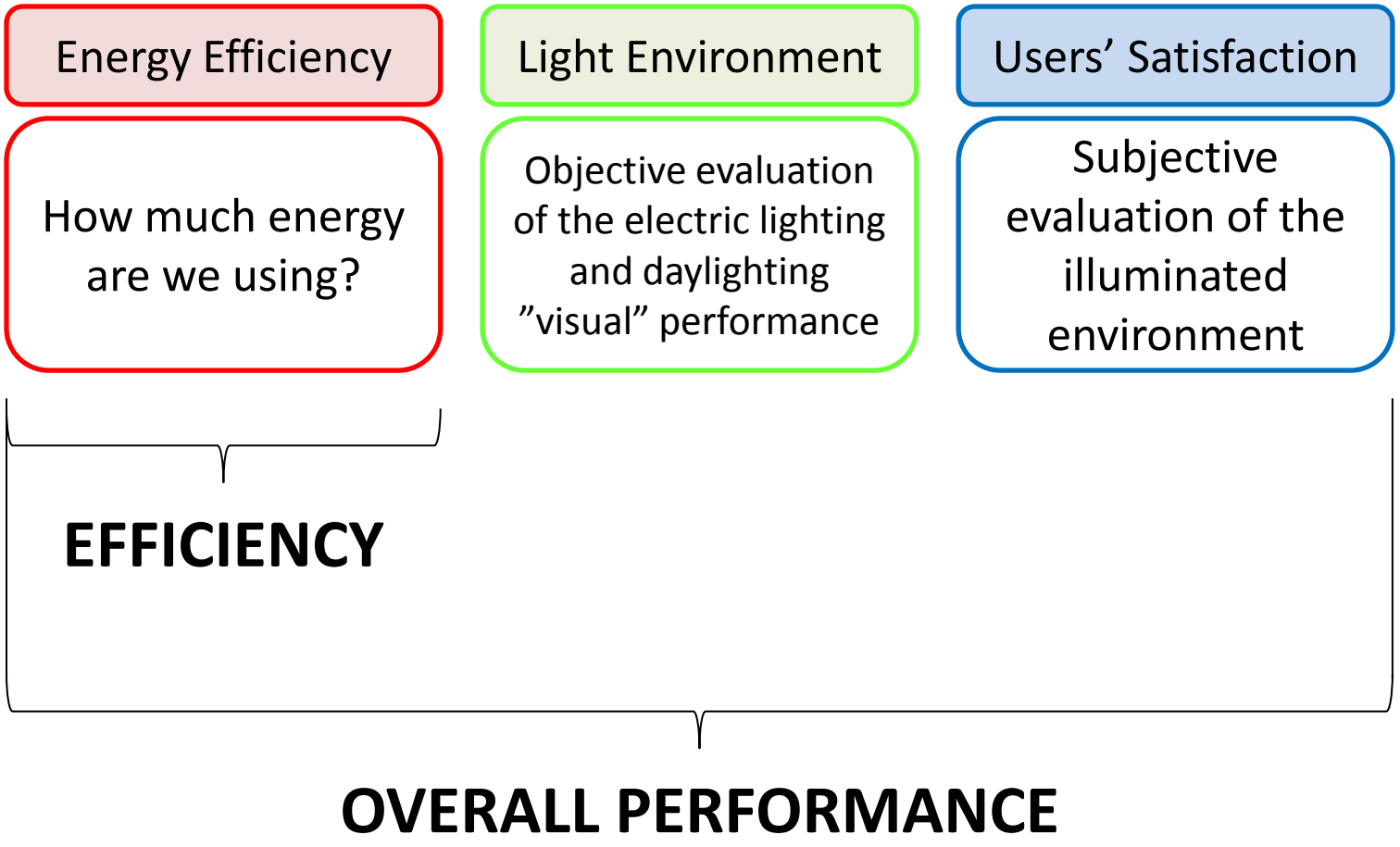
A difficult task



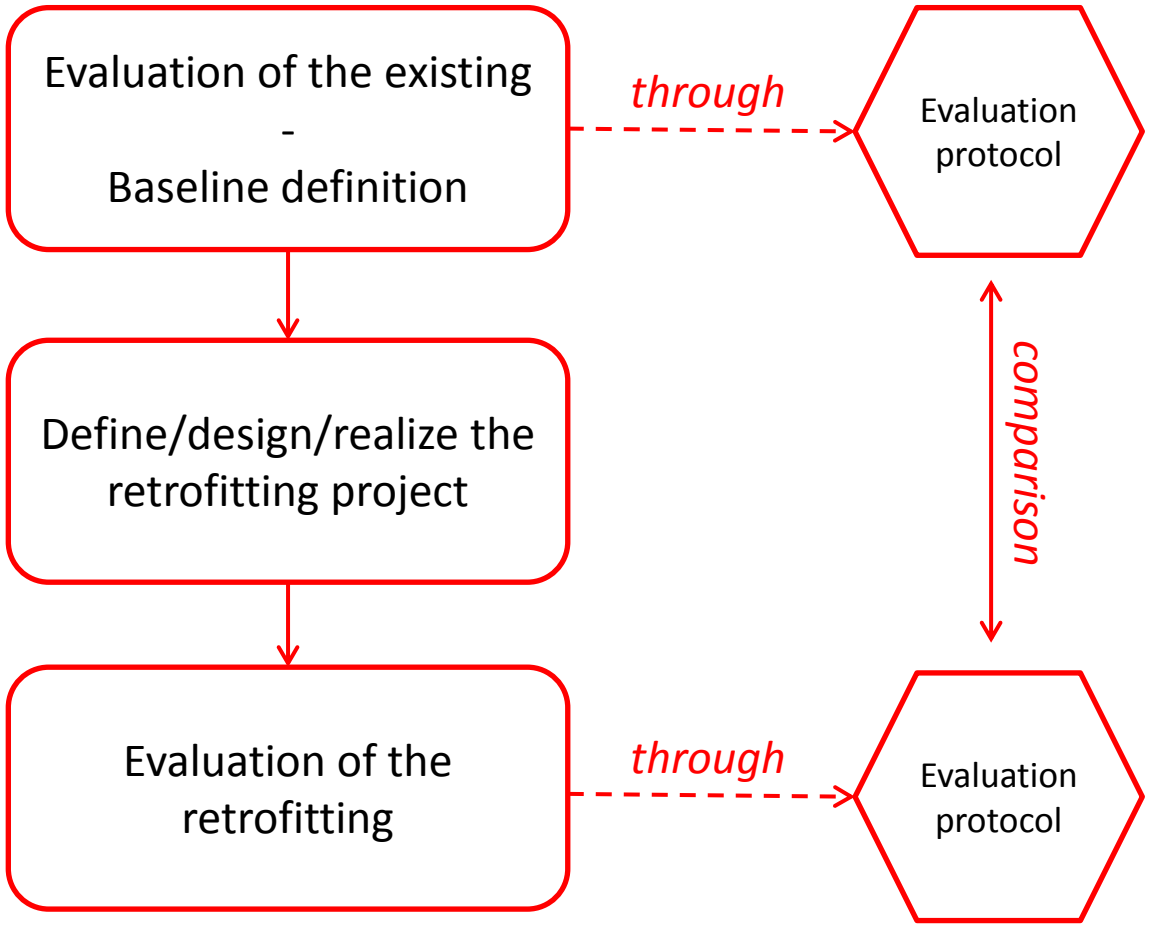
- *INFERNO*
- *PURGATORY*
- *PARADISE*

[[1]source: http://www.libreriamedievale.com/la-divina-commedia-lucchi.html"]

Items


Energy Efficiency
Light Environment
Users' Satisfaction
How much energy are we using?
Objective evaluation of the electric lighting and daylighting "visual" performance
Subjective evaluation of the illuminated environment
EFFICIENCY
OVERALL PERFORMANCE

Phases

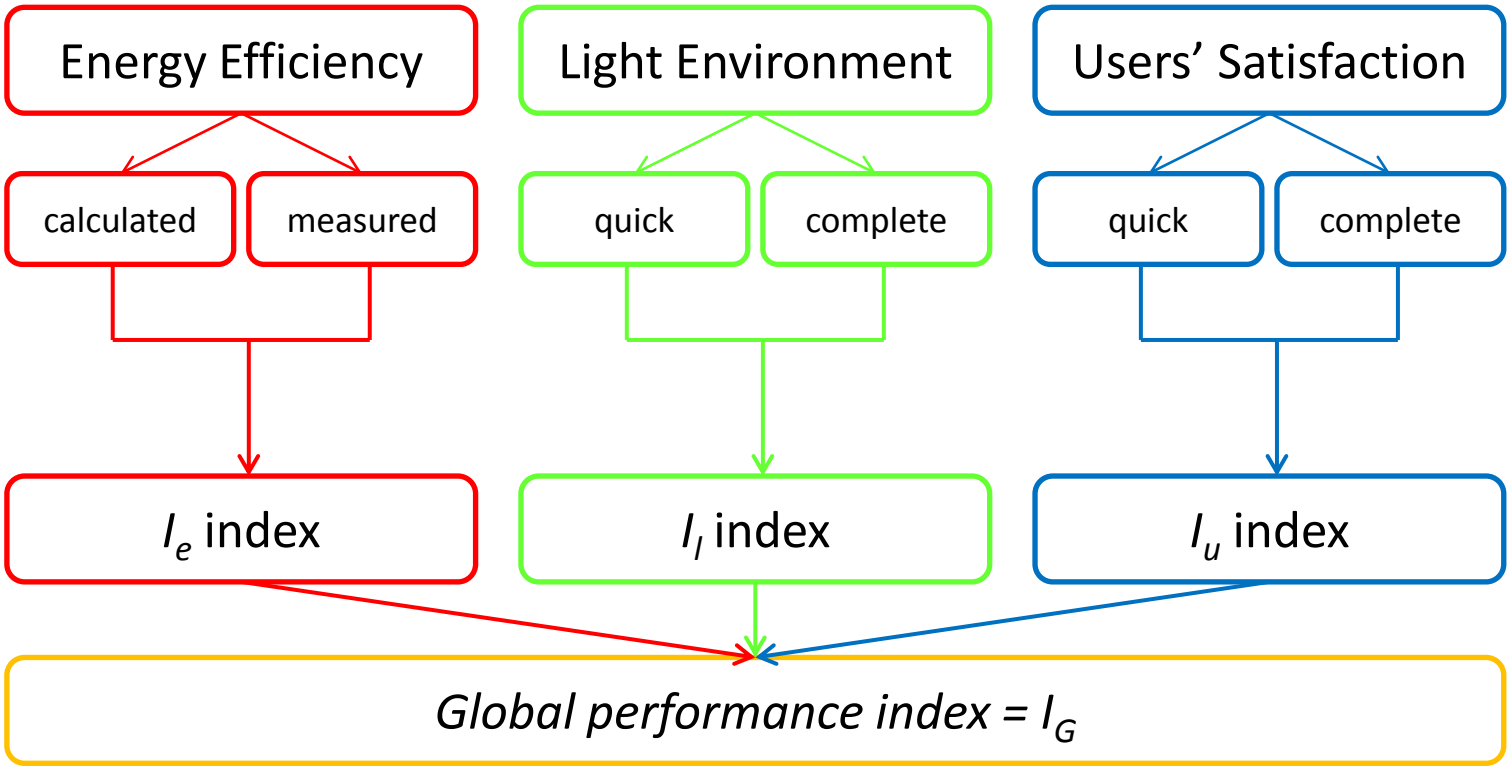

Evaluation of the existing
-
Baseline definition
through
Evaluation protocol
Define/design/realize the retrofitting project
comparison
Evaluation of the retrofitting
through
Evaluation protocol

Evaluation protocol methodology

- 2 different calculation methodologies
  - Quick method
  - Comprehensive method
- 2 different baseline
  - Standard baseline
  - Retrofit specific baseline
- Output: complete report with indexes + database

Calculation methodologies

Different levels of complexity, but comparable results



Phases

Evaluation of the existing
-
Baseline definition

Define/design/realize the retrofitting project

Evaluation of the retrofitting

through

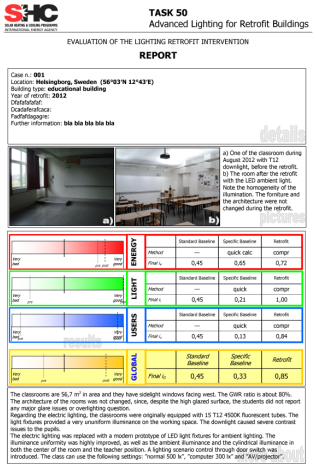
through

$I_{e,pre}$ $I_{l,pre}$
$I_{u,pre}$ $I_{G,pre}$

$I_{e,base}$ $I_{l,base}$
$I_{u,base}$ $I_{G,base}$

comparison

$I_{e,post}$ $I_{l,post}$
$I_{u,post}$ $I_{G,post}$


SHC
TASK 50
Advanced Lighting for Retrofit Buildings
EVALUATION OF THE LIGHTING RETROFIT INTERVENTION
REPORT
ENERGY
LIGHT
USERS
GLOBAL

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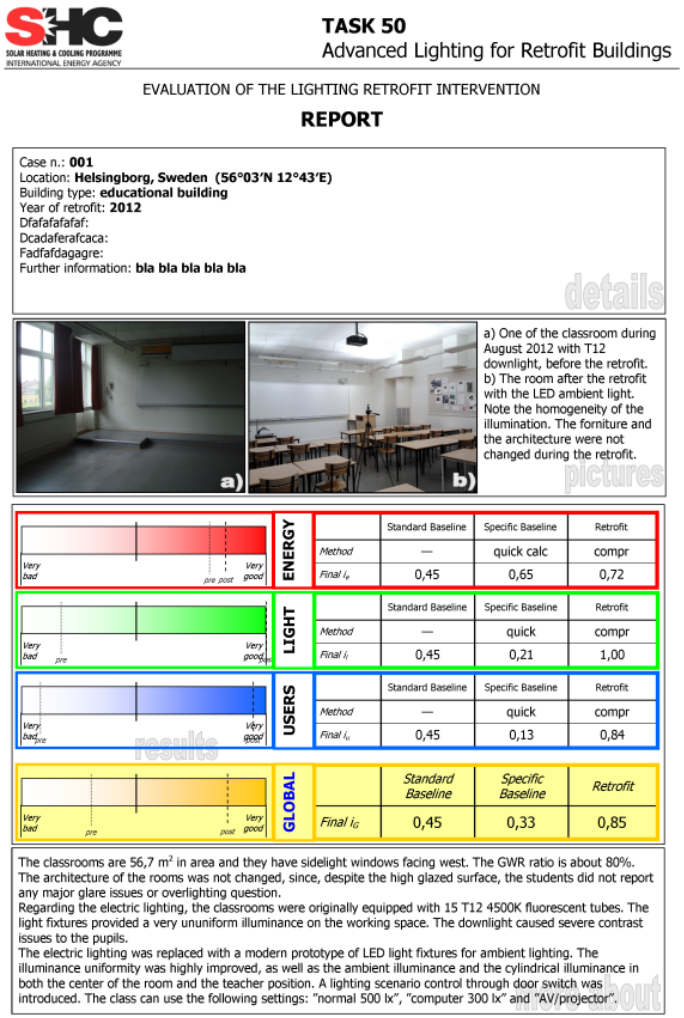
Output: final report



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TASK 50
Advanced Lighting for Retrofit Buildings

EVALUATION OF THE LIGHTING RETROFIT INTERVENTION

REPORT

Case n.: **001**
Location: **Helsingborg, Sweden (56°03'N 12°43'E)**
Building type: **educational building**
Year of retrofit: **2012**
Dfafafafafaf:
Dcadaferafcaca:
Fadfafdagagre:
Further information: **bla bla bla bla bla**

details

a) One of the classroom during August 2012 with T12 downlight, before the retrofit. b) The room after the retrofit with the LED ambient light. Note the homogeneity of the illumination. The forniture and the architecture were not changed during the retrofit.

pictures

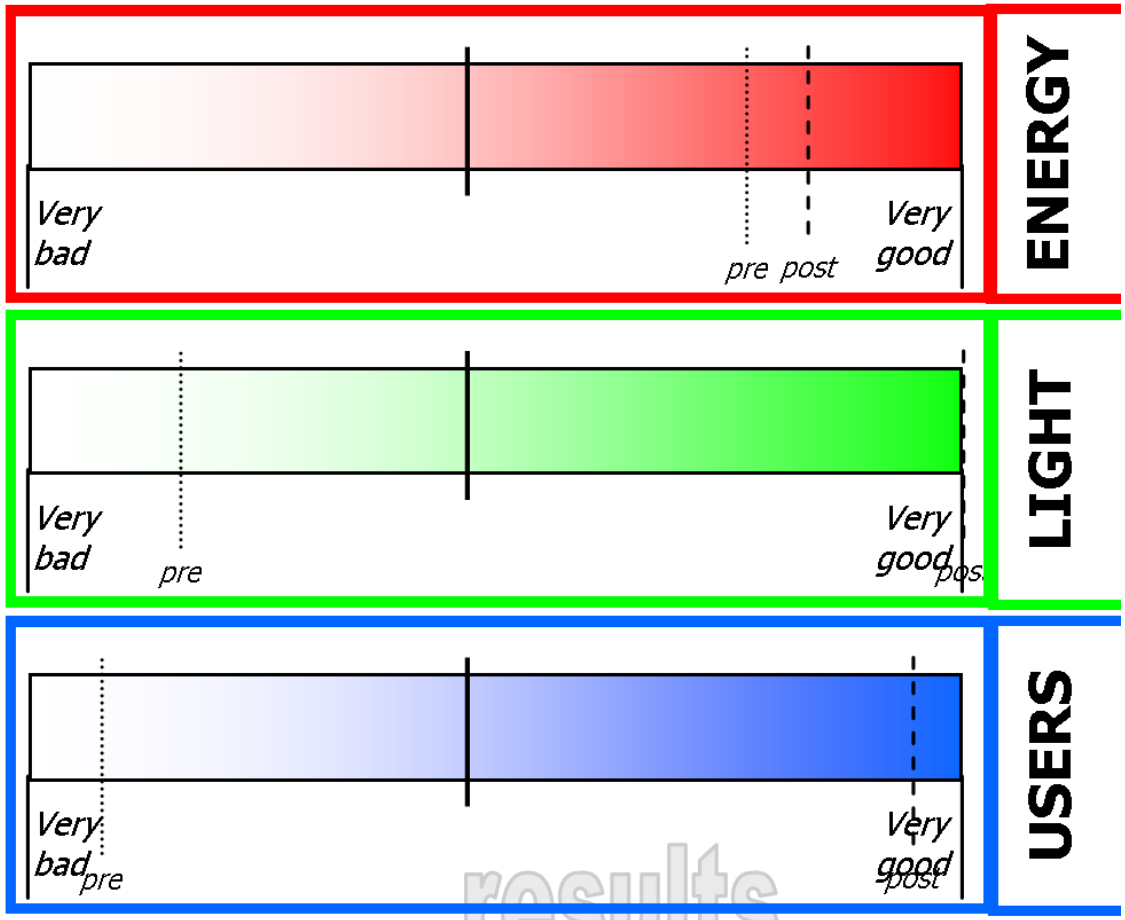
	Standard Baseline	Specific Baseline	Retrofit
ENERGY – Method	—	quick calc	compr
ENERGY – Final i_e	0,45	0,65	0,72
LIGHT – Method	—	quick	compr
LIGHT – Final i_l	0,45	0,21	1,00
USERS – Method	—	quick	compr
USERS – Final i_u	0,45	0,13	0,84
GLOBAL – Final i_G	0,45	0,33	0,85

results

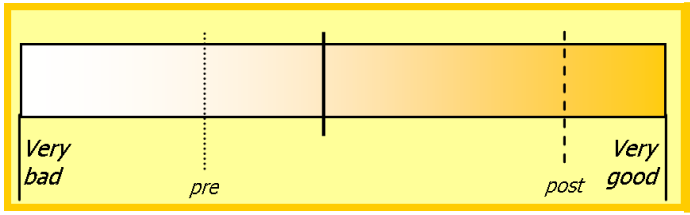
The classrooms are 56,7 m² in area and they have sidelight windows facing west. The GWR ratio is about 80%. The architecture of the rooms was not changed, since, despite the high glazed surface, the students did not report any major glare issues or overlighting question.
Regarding the electric lighting, the classrooms were originally equipped with 15 T12 4500K fluorescent tubes. The light fixtures provided a very ununiform illuminance on the working space. The downlight caused severe contrast issues to the pupils.
The electric lighting was replaced with a modern prototype of LED light fixtures for ambient lighting. The illuminance uniformity was highly improved, as well as the ambient illuminance and the cylindrical illuminance in both the center of the room and the teacher position. A lighting scenario control through door switch was introduced. The class can use the following settings: "normal 500 lx", "computer 300 lx" and "AV/projector".

- Summary
- Performance at a glance
- Does not substitute the results database

Report: item indexes



Output: global index

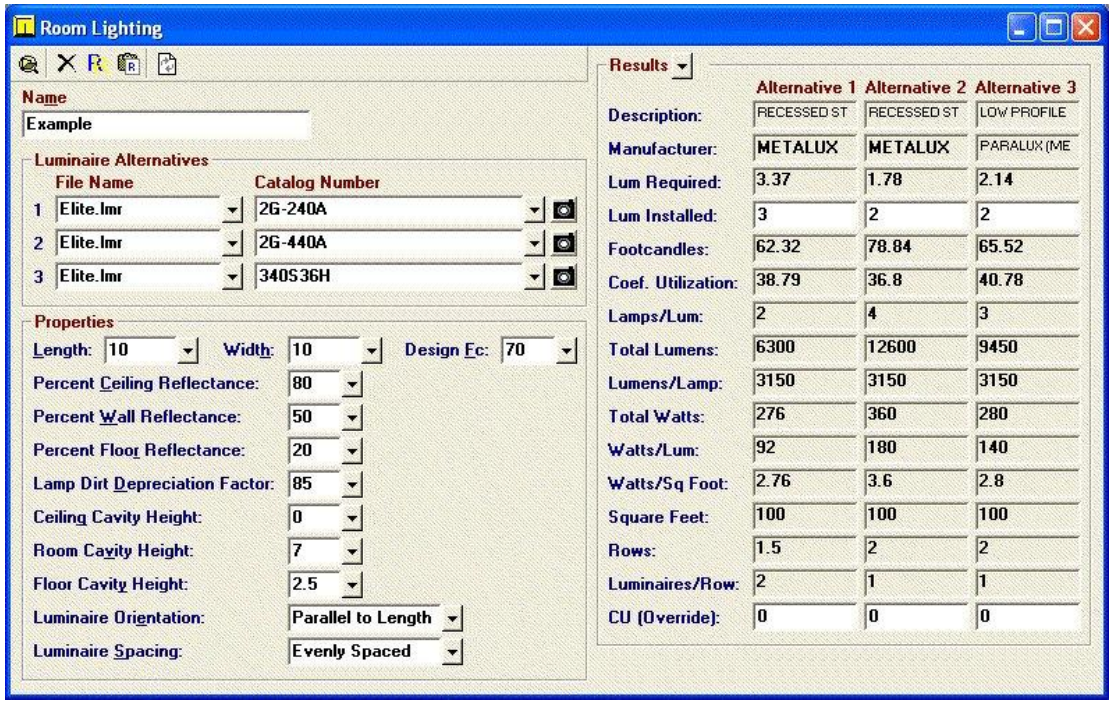


GLOBAL

	Standard Baseline	Specific Baseline	Retrofit
Final i_G	0,45	0,33	0,85

- Each single item index keep the general information
- The global index gives the perfomance at a glance

Output: database



- The database keeps all the information
- Available for „look in deepness“

[source: http://www.elitesoft.com/web/electrical/EtlLight.jpg]

Reference documents

- For the general approach to a Monitoring and Verification Protocol
  - IPMVP Vol I (2012) (http://www.evo-world.org/)
  - IPMVP Vol III (2006) - Applications
- For the calculation methodology
  - Energy – EN 15193:2006
  - Lighting – EN 12464-1:2011, scientific publications
  - Users‘ satisfaction – Semantic scale by R. Küller, IEA-SHC Task 21 questionnaire