

Lighting systems and retrofit potentials based on a detailed assessment of 25 existing buildings

- Preliminary Results -

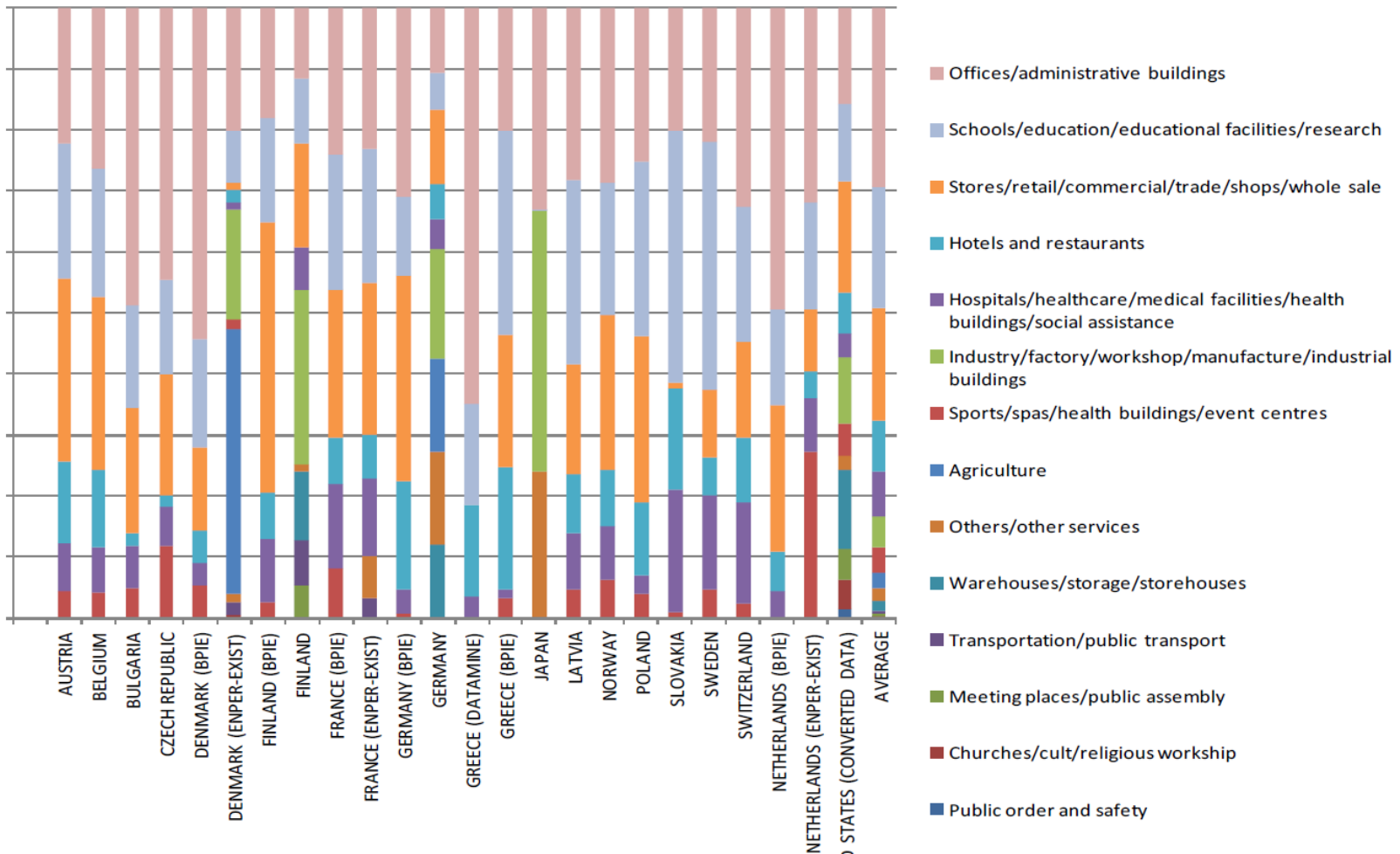
Anna Hoier, Fraunhofer Institute for Building Physics, Stuttgart, Germany
Industry Workshop Innsbruck, March 10, 2014



Lighting Situation and Retrofit

**Knowing where you stand
to
See where you can go**

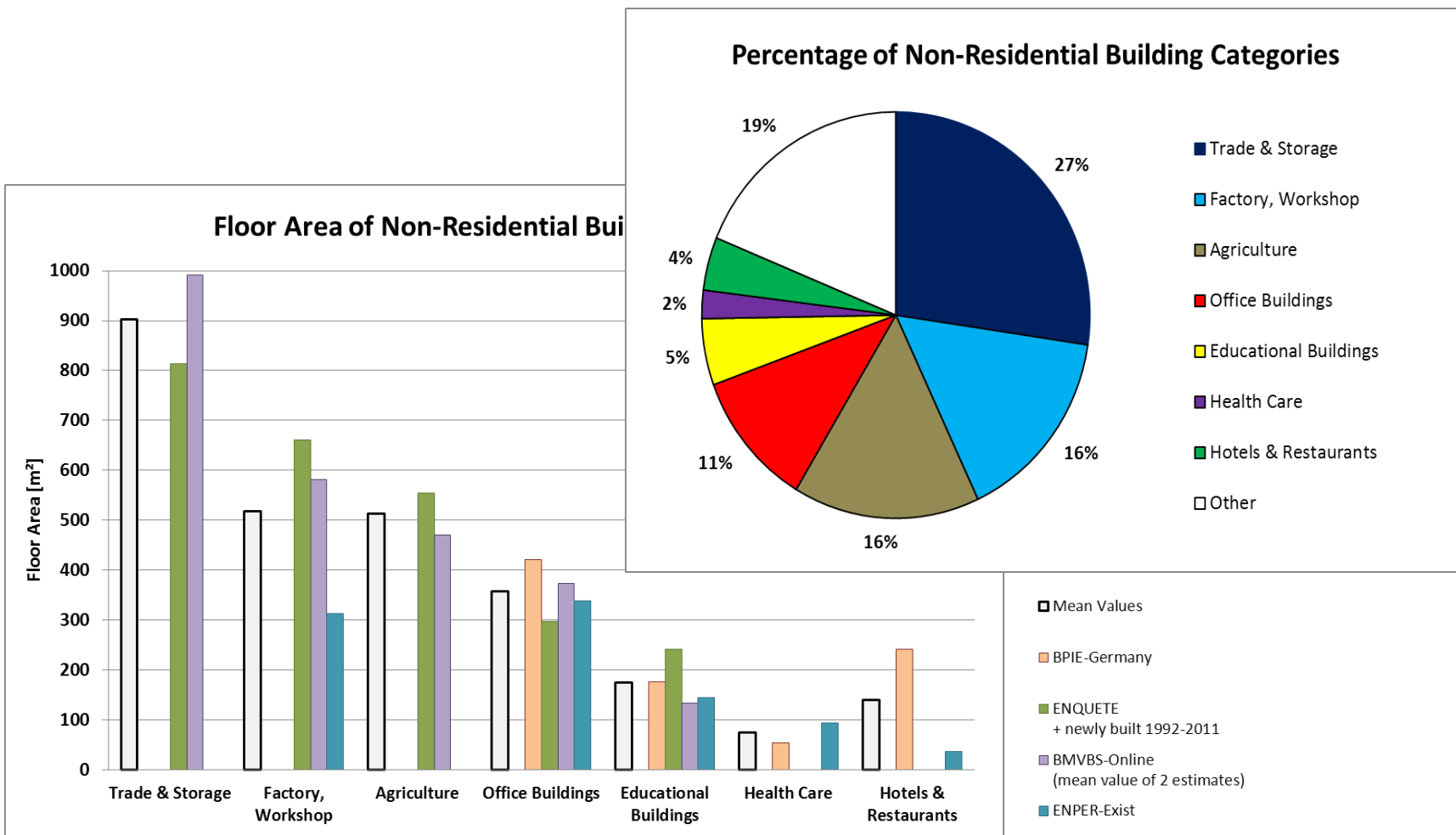
Building Stock Distribution



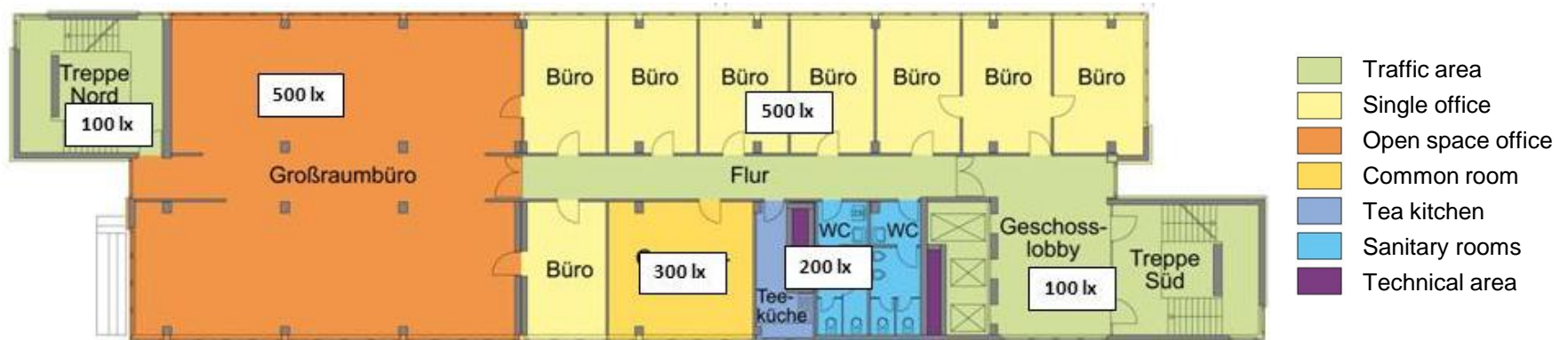
© Marie-Claude Dubois, Technical Report T50.D1 „Building Stock Distribution and Electricity Use for Lighting“, to be published in 2014

IEA SHC Task 50: “Advanced Lighting Solutions for Retrofitting Buildings”

Building Typology (Germany)



Building Typology ↔ Zone Typology



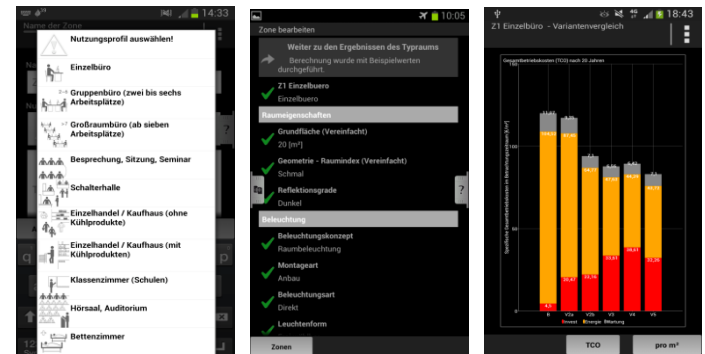
Data collection by on-site inspections

- Variety of buildings from different types
- Assessing rooms/lighting areas, classified in zones

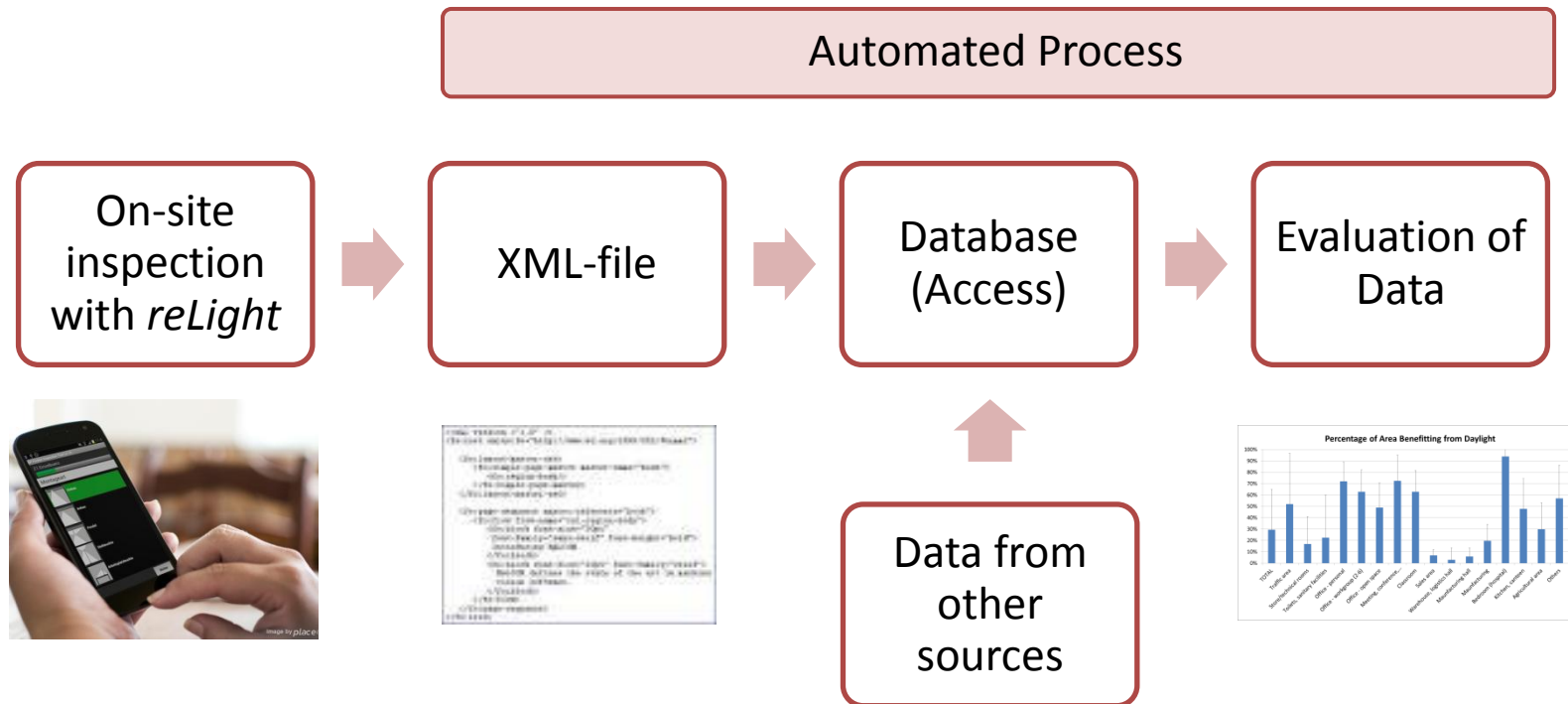
- Using „reLight“

Android based mobile application for smartphones and tablet-pc's:

- Digital data recording on site
- Simplified energetic and ergonomic calculations



Evaluation approach



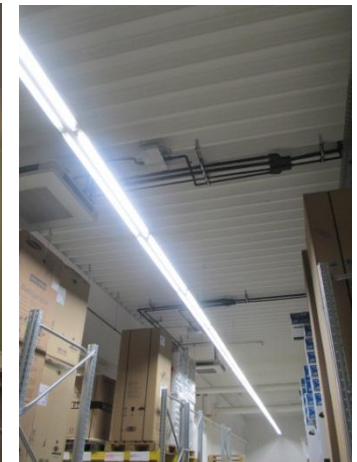
Buildings inspected

Building category	Building type	#	Total net floor area
Trade & Storage	Trade	2	9.360 m ²
	Storage	3	21.189 m ²
Industrial buildings		3	14.498 m ²
Agricultural buildings		3	6.115 m ²
Office buildings		3	4.196 m ²
Educational buildings	School	3	7.897 m ²
	Children day care	3	4.036 m ²
Health Care	Care home	5	12.353 m ²
TOTAL		25	79645 m ²

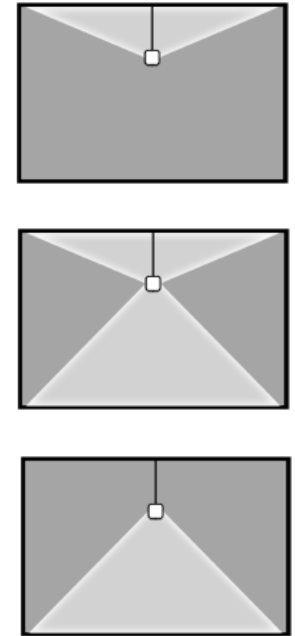
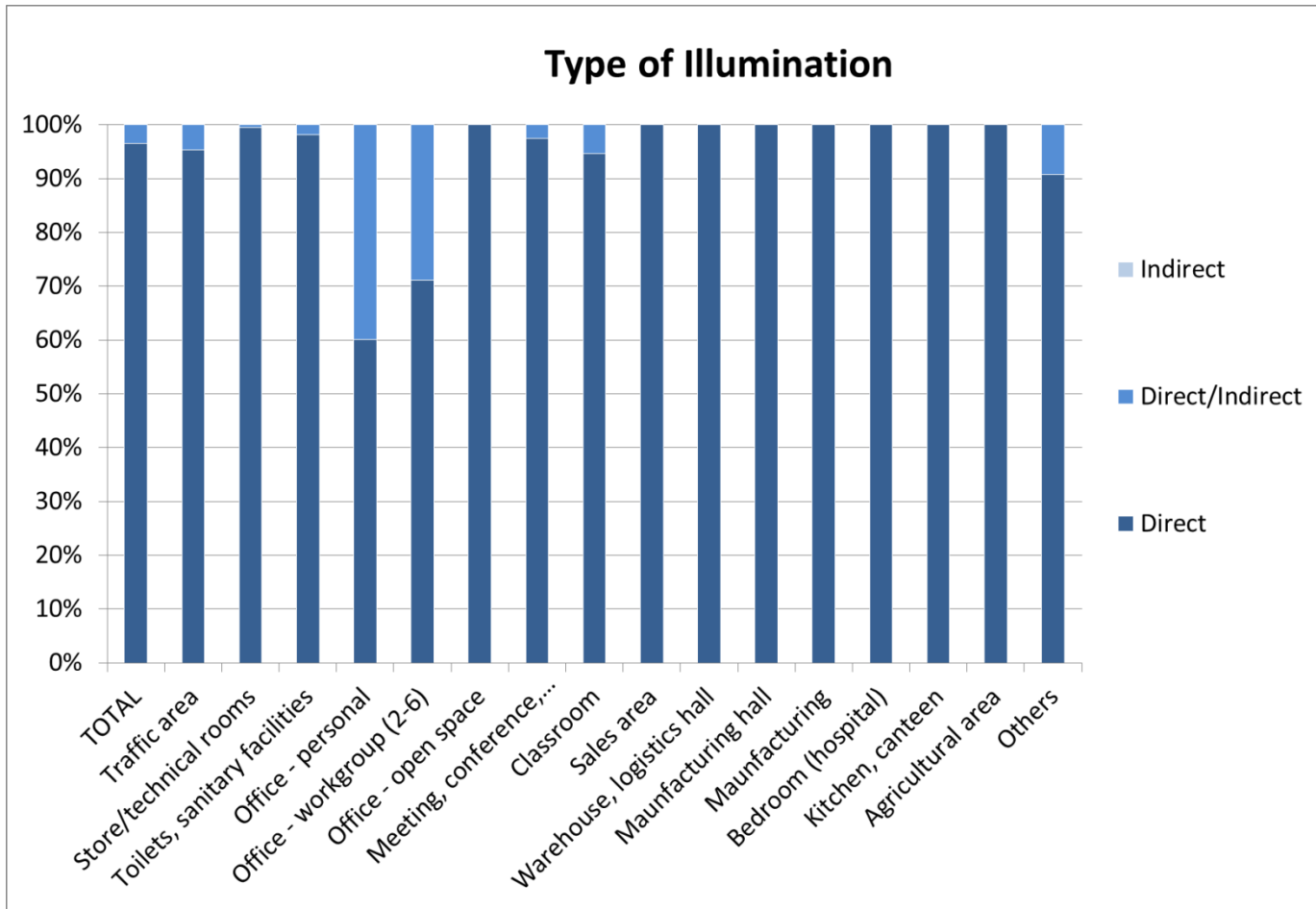


Relevant Zones

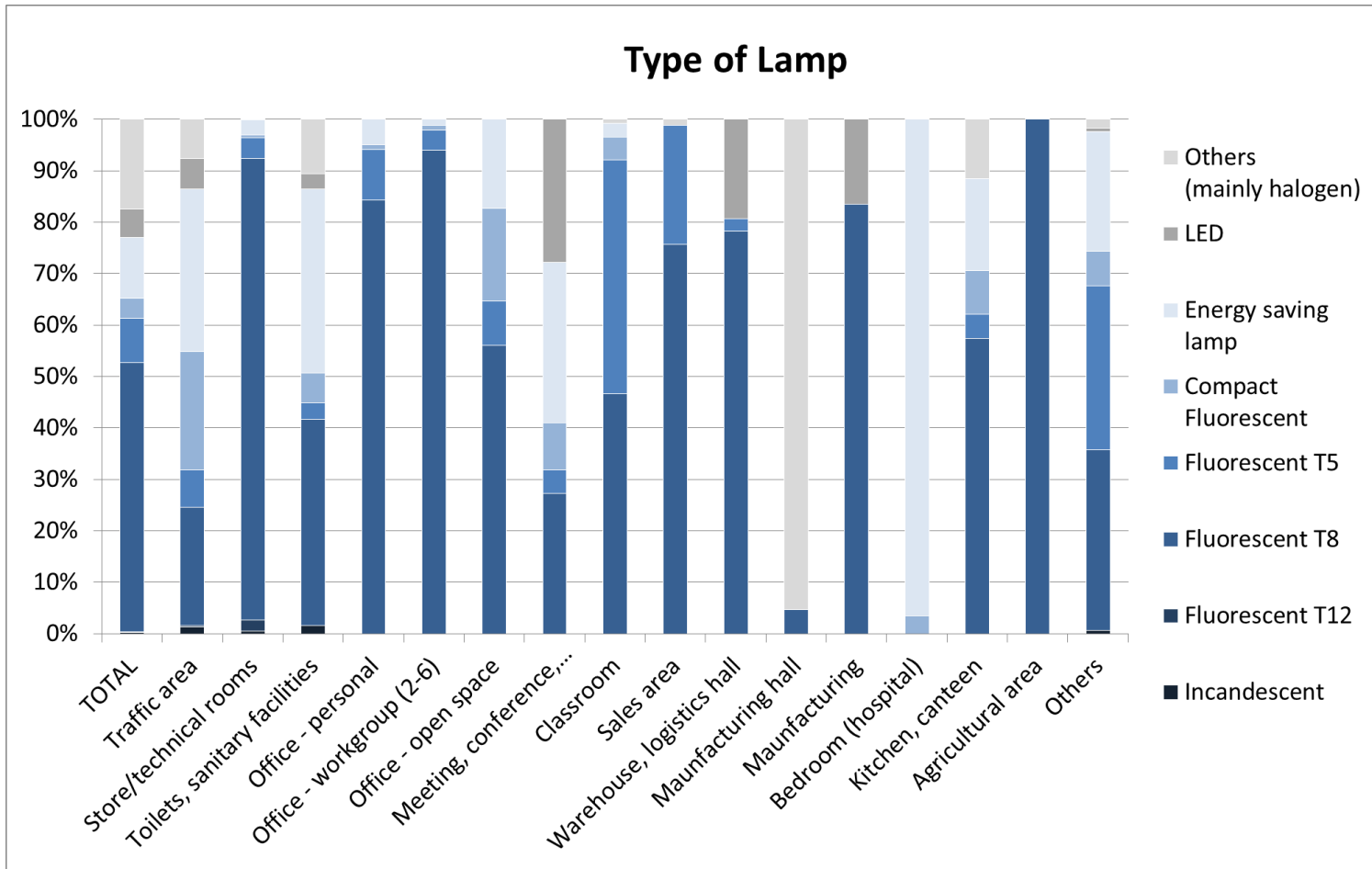
Zones	Number of rooms	Net floor area [m ²]
TOTAL	1.210	79.645
Traffic area	108	9.153
Store/technical rooms	94	3.711
Toilets, sanitary facilities	314	2.138
Office - personal	123	2.376
Office - workgroup (2-6)	72	2.673
Office - open space	6	465
Meeting, conference, seminar	19	677
Classroom	107	5.471
Sales area	5	7.679
Warehouse, logistics hall	17	16.394
Manufacturing hall	5	13.246
Manufacturing	8	2.335
Bedroom (hospital)	212	4.427
Kitchen, canteen	29	1.382
Agricultural area	10	4.913
Others	81	2.598



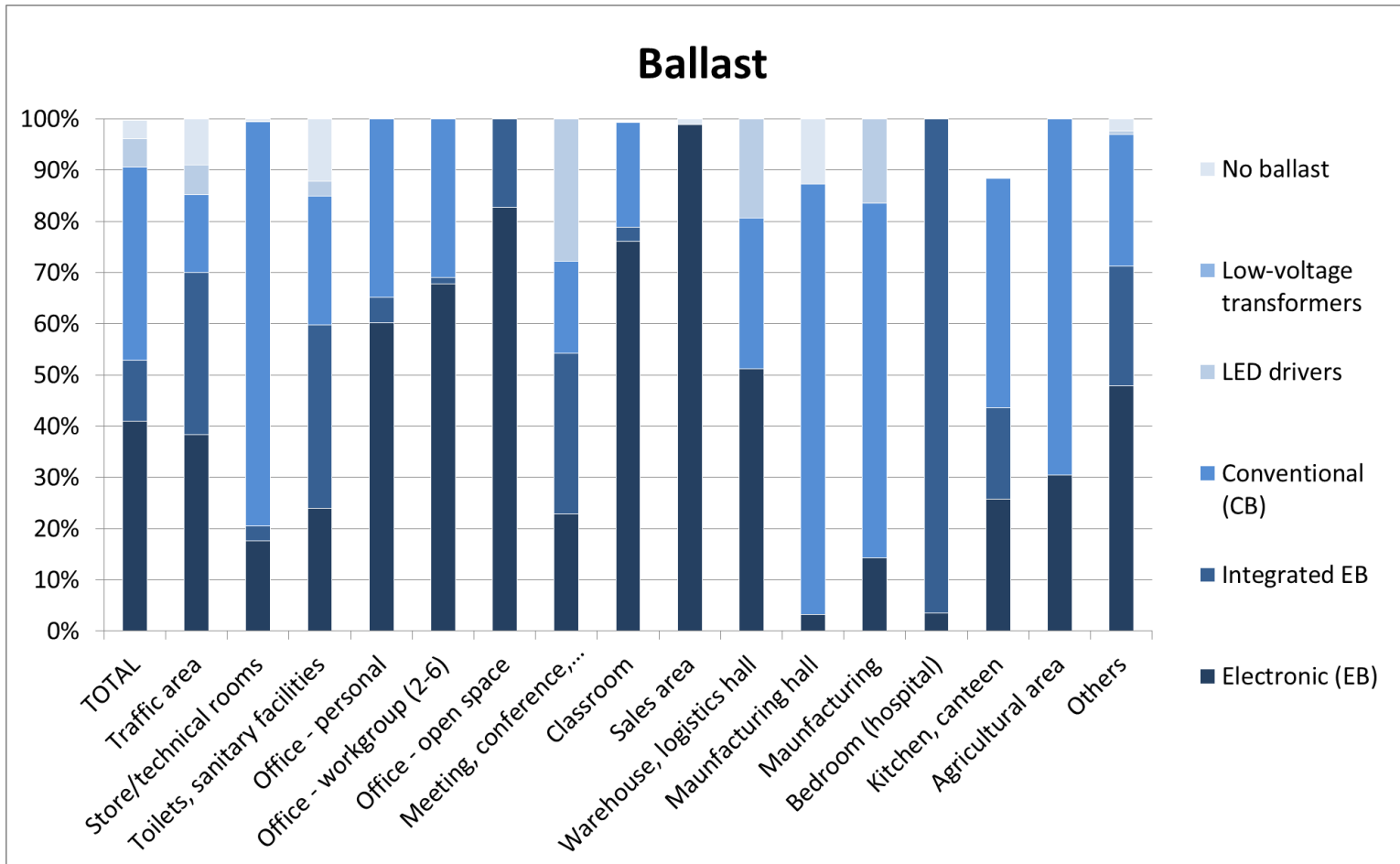
Evaluation - Electric Light: Type of Illumination



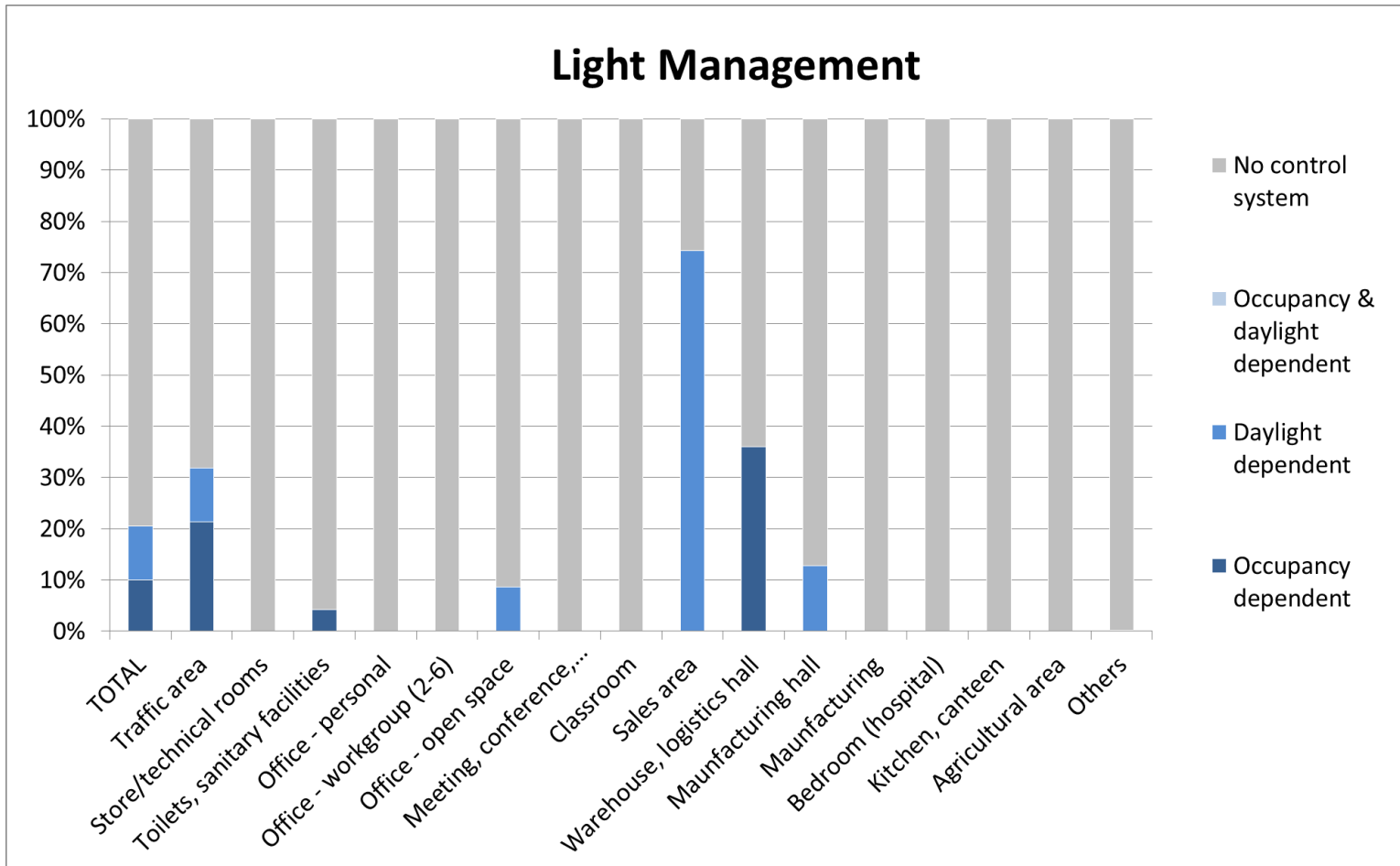
Evaluation - Electric Light: Type of Lamp



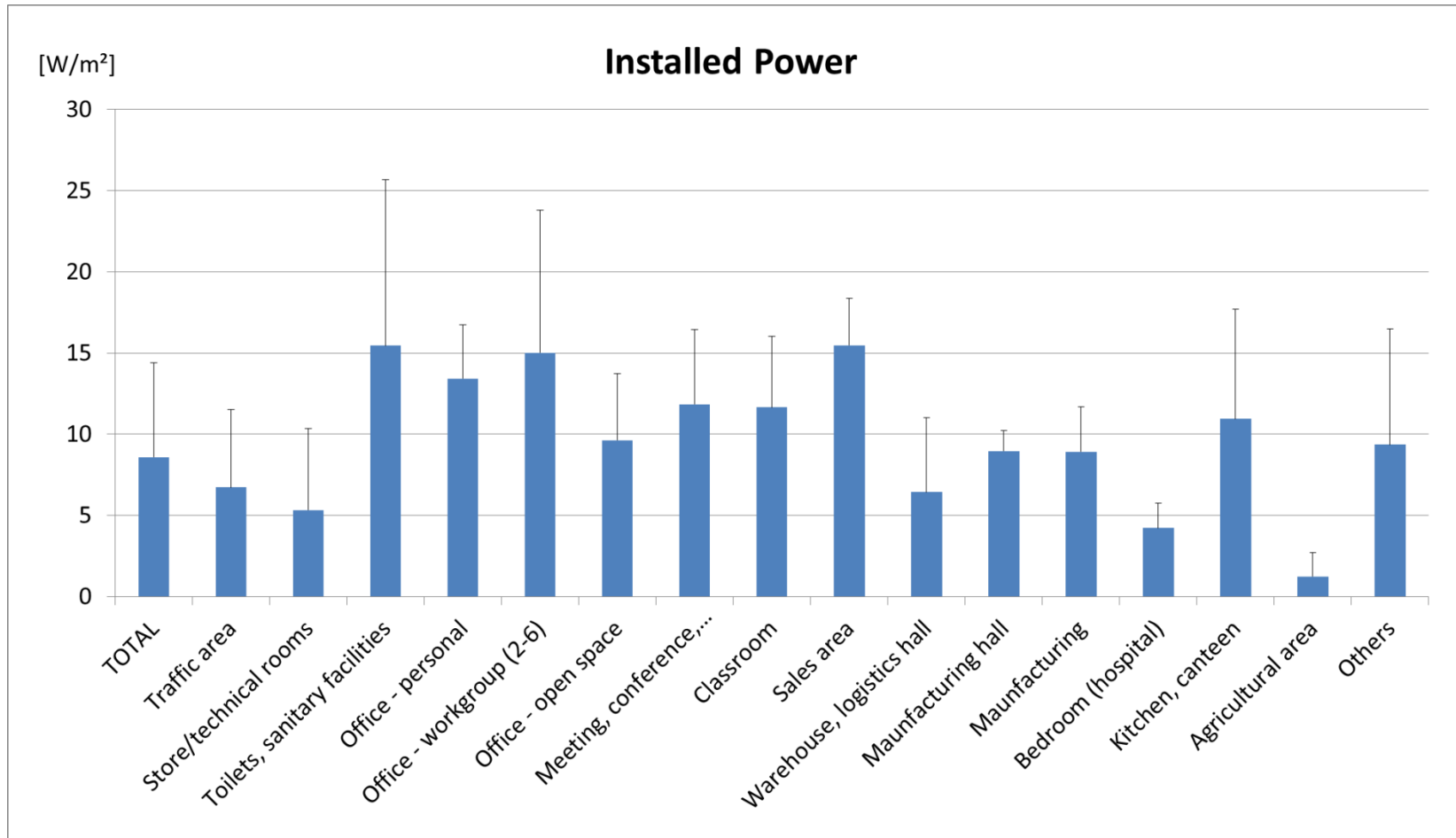
Evaluation - Electric Light: Ballast



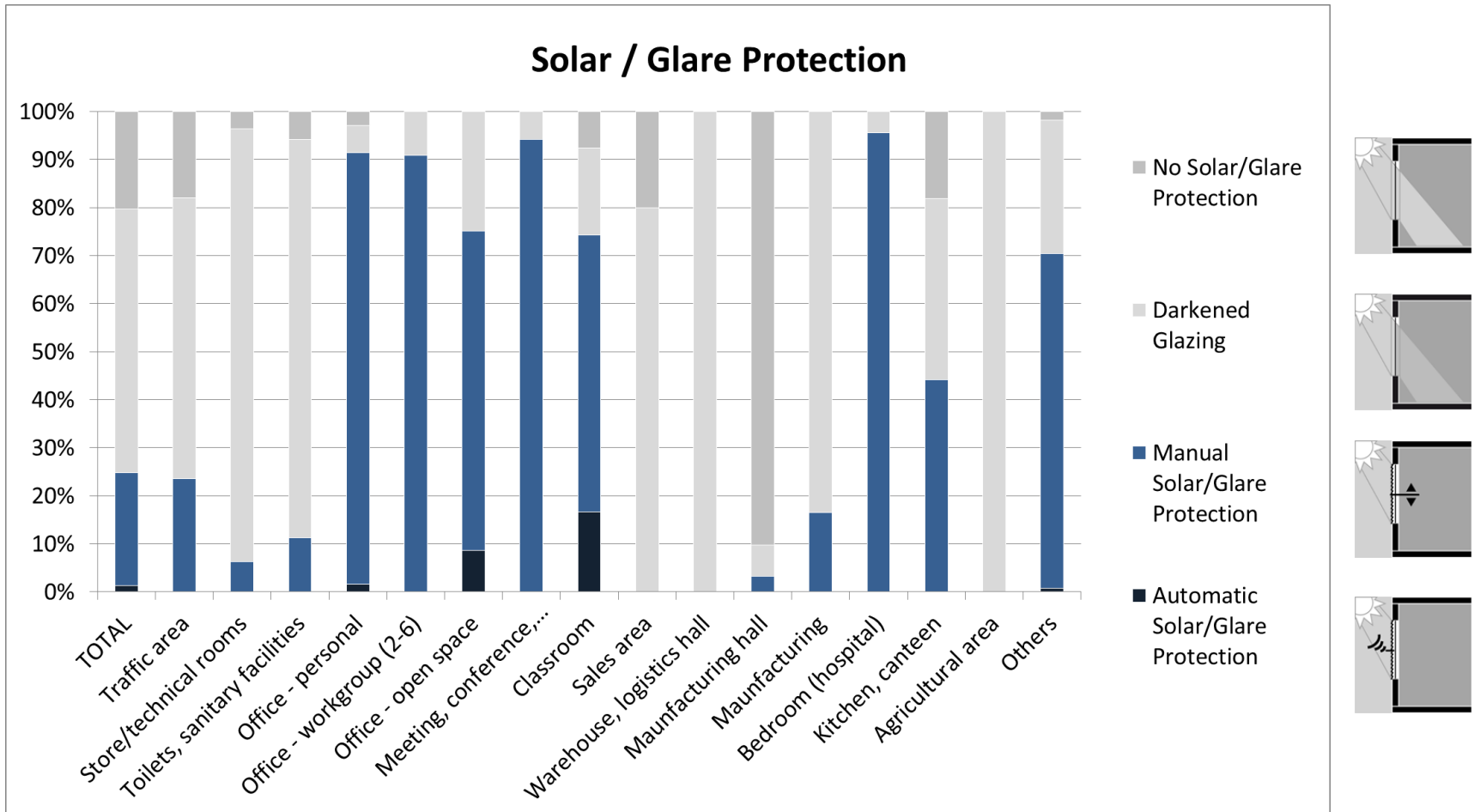
Evaluation - Electric Light: Light Management



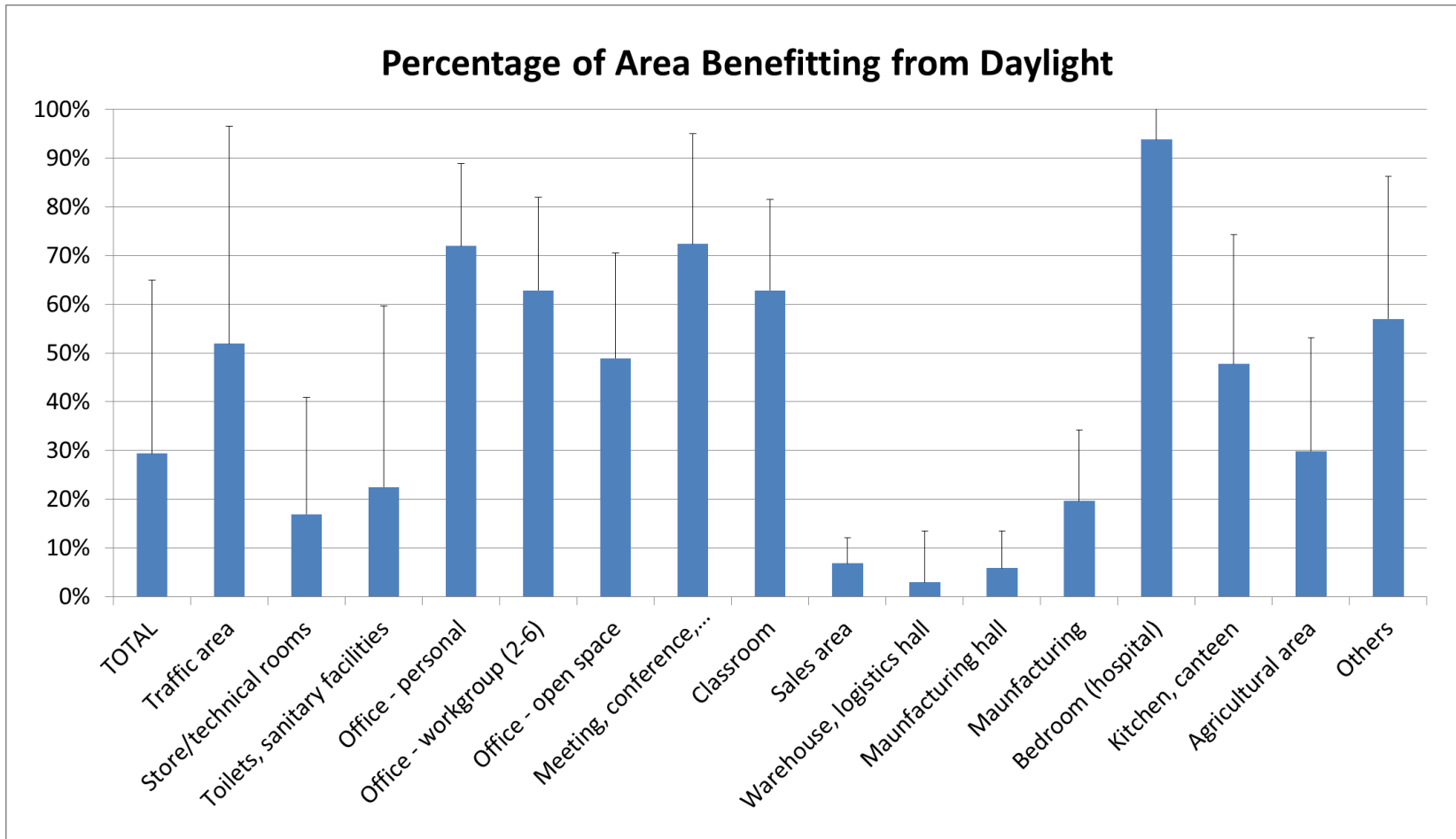
Evaluation - Electric Light: Installed Power



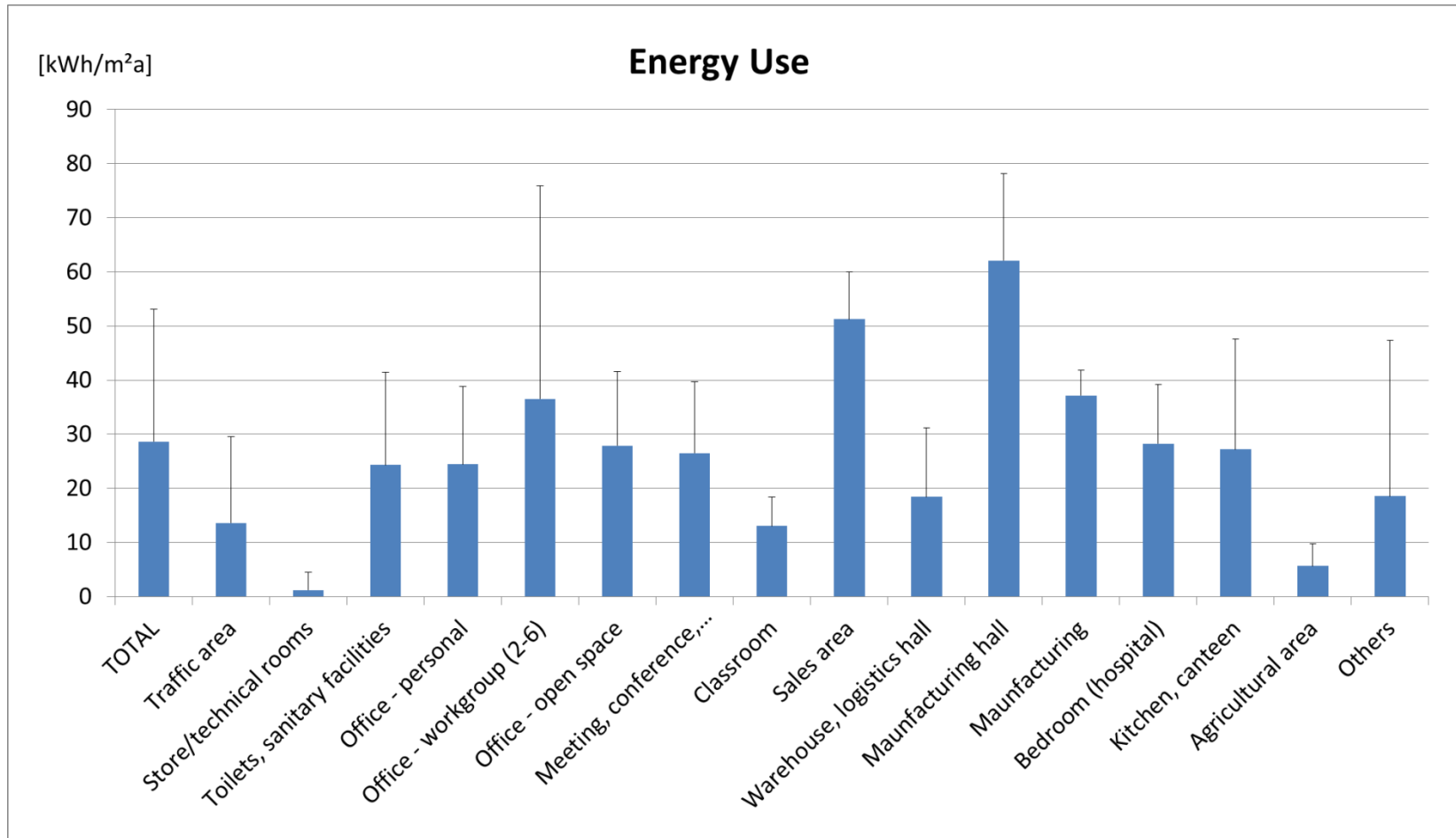
Evaluation - Daylight: Solar/Glare Protection



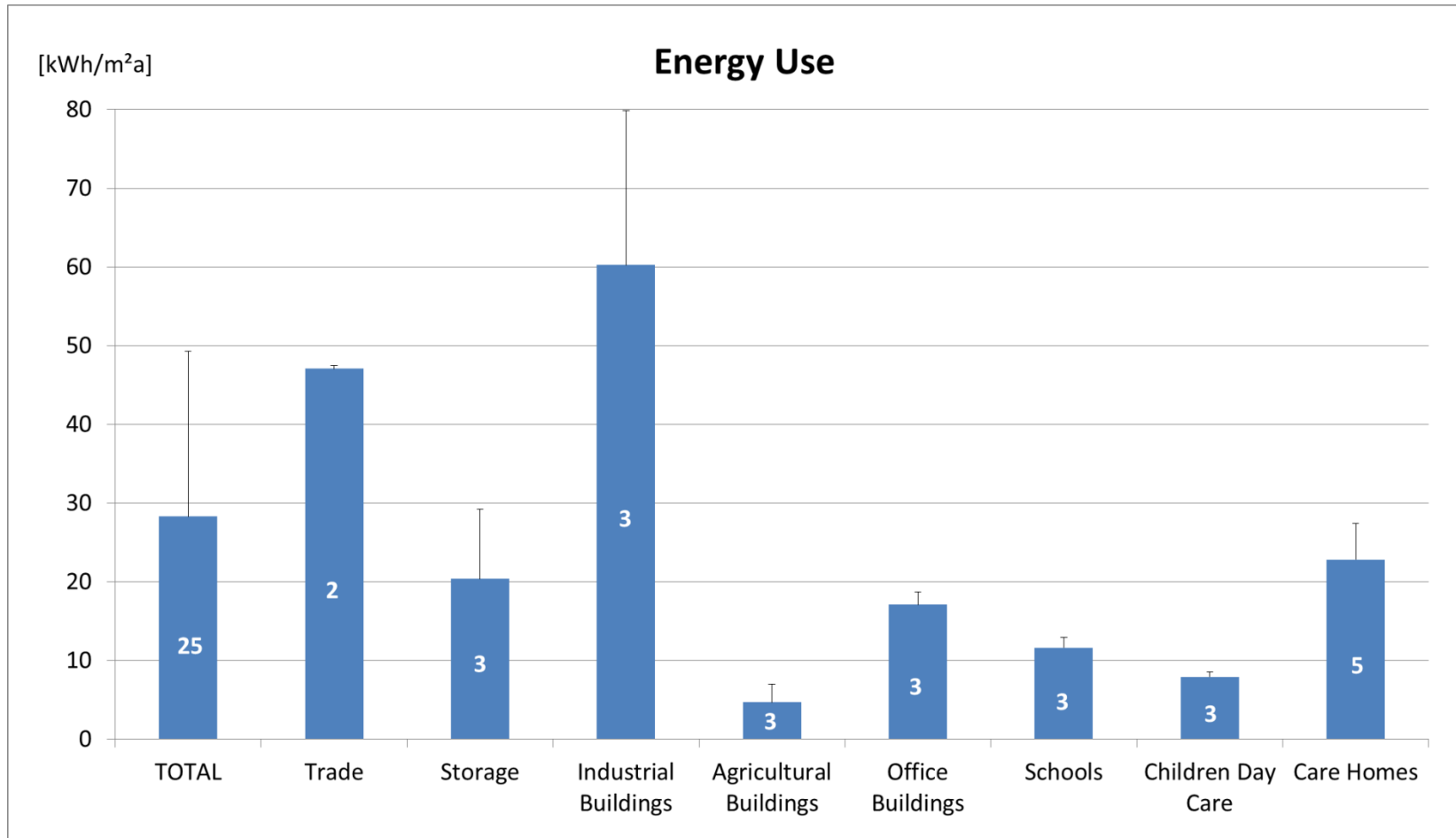
Evaluation - Daylight: Daylight Availability



Evaluation - Energy Use (Zones)

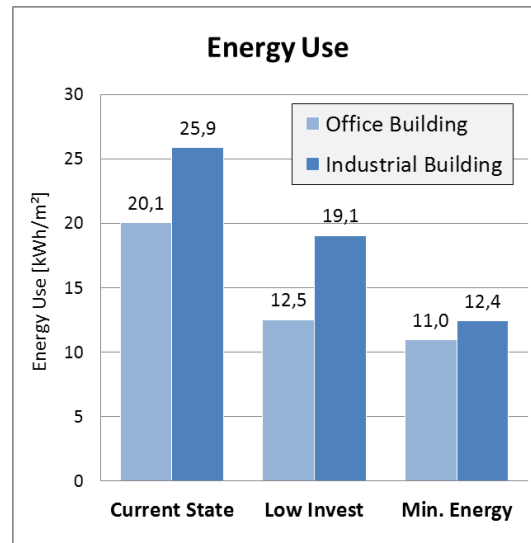
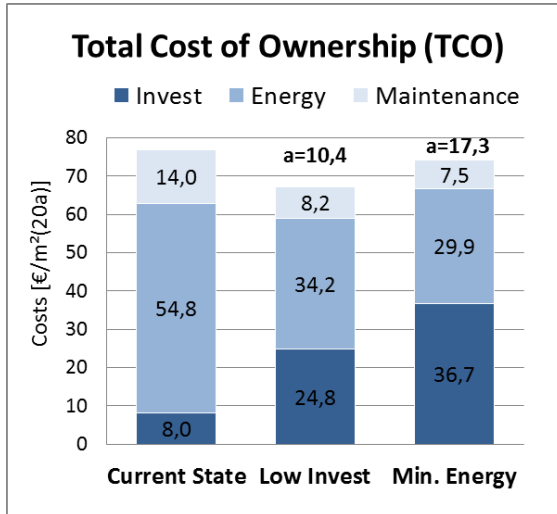


Evaluation - Energy Use (Building Types)



Evaluation – Costs and Saving Potential (2 Ex.)

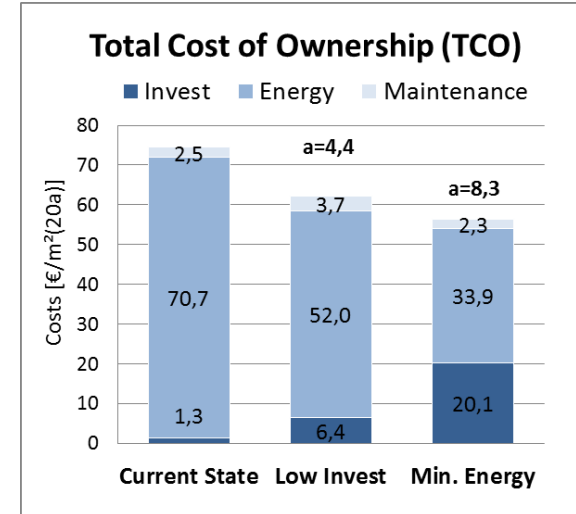
Office Building



Assumptions

Electricity rate: 20 ct/kWh
 Rise in price: 4 %
 Time period: 20 years

Industrial Building



Conclusion and Perspective

- Systematic investigation of building stock
Building typology, zone approach
- Evaluation of 25 varying buildings
 - Typical lighting installation:
direct, fluorescent (T8), no control system
 - Dependencies on usage, daylight etc.
- Next Steps
 - Further analysis and data collection
 - Use of data:
 - Basis for benchmarks in Lighting Retrofit Adviser of Task 50
 - Evaluation of standards