



# DGENTR LOT 6: Task 3

## V-systems, User Requirements

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## General estimate 1: Per person

### Per person

#### 1) non-residential

- ✓ At IDA3: 4 l/s/p + 25-30% infiltration → 20 m<sup>3</sup>/h pp.
- ✓ Workforce 250 mln. (incl. pupils, prisoners, etc.), 2000 h/a
- ✓ Best case (occupancy based, correct flow): **10 Tm<sup>3</sup>/a**
- ✓ Real case (5600 h/a, 15% extra flow): **32 Tm<sup>3</sup>/a**

#### 2) collective residential

- ✓ EU-27 Inhabitants 500 mln., 7000 h/a occupancy
- ✓ Best case (occupancy based, correct flow): 70 Tm<sup>3</sup>/a,  
of which multi-family 44% = **31 Tm<sup>3</sup>/a**
- ✓ Real case (8760 h/a, 15% extra flow): 100 Tm<sup>3</sup>/a,  
of which multi-family 44% = **44 Tm<sup>3</sup>/a**

#### 3) Total

- ✓ Best Case: **41 Tm<sup>3</sup>/a**      Real case: **76 Tm<sup>3</sup>/a**



## General estimate 2: By building

### Ventilation heat loss as % of total space heating

- 1) ENER Lot 1: 110 bln. m<sup>3</sup>
- 2) ventilation (110 x 5000 h/a x 0,75 m<sup>3</sup>/m<sup>3</sup>h) →  
412 Tm<sup>3</sup>/heating season  
723 Tm<sup>3</sup>/a  
In scope Lot 6 (70%): **500 Tm<sup>3</sup>/a**
- 3) **factor 6,5 higher** than estimate by person
- 4) building space : personal space = 6,5 : 1  
(e.g. 20m<sup>3</sup> : 3m<sup>3</sup>)

Estimates to be made more robust

General requirements

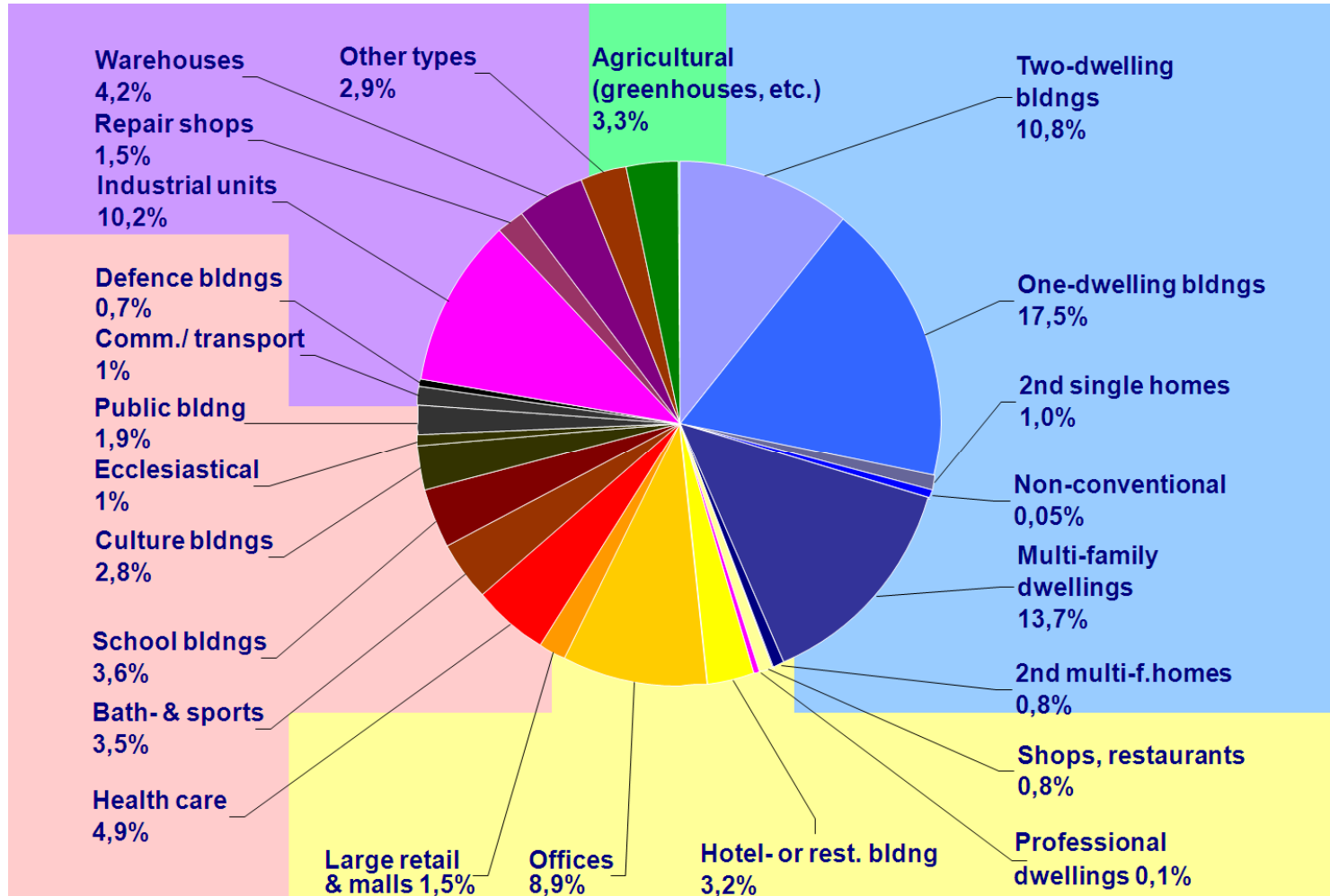
Demand per sector

Misc.



# General estimate 2: By building

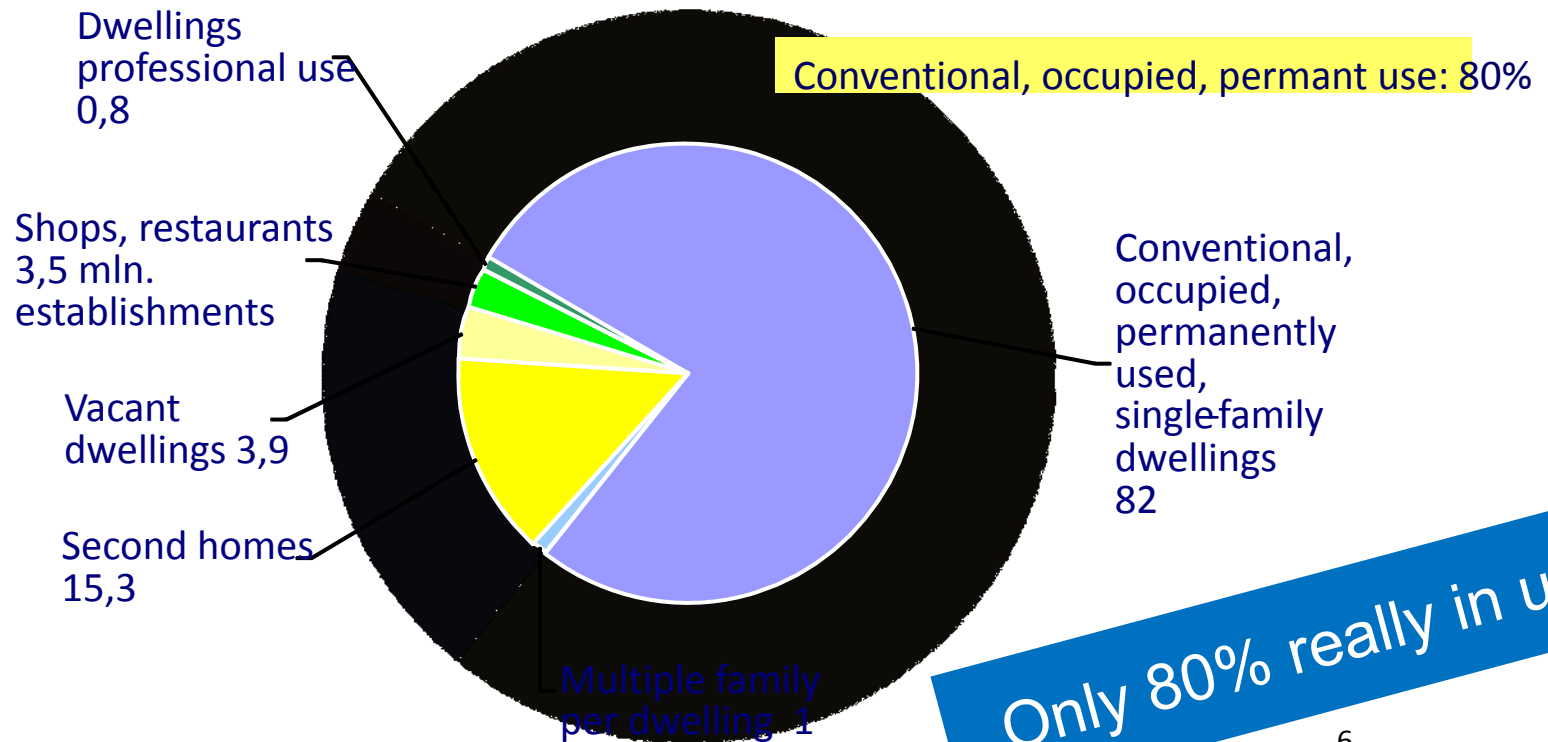
ENER Lot 1





# Sector demand: collective residential

106 mln. dwellings (103) and establishments (3)  
in 12,8 mln. multi-family buildings

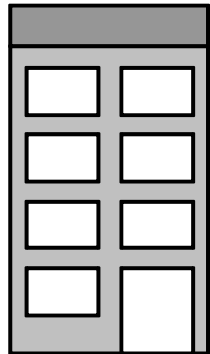


**Only 80% really in use**



# Sector demand: collective residential

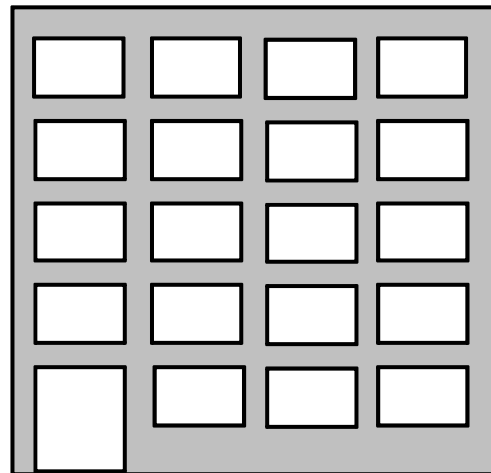
Average EU-25 multi-family building: 8 flats/ building



### low-rise

≤ 4 storeys  
6 flats/ building  
**54 mln.** (64%)  
**9 mln.** (86%)

70% natural V.



### high-rise

>4 storeys  
20 flats/ building  
**30 mln.** (36%) **dwelling**  
**1,5 mln.** (14%) **buildings**

50% natural V.

### Operational:

5 mln. local fans + natural  
11,2 mln. rooftop/boxed  
0,35 mln. CHRV/ AHU

Low rise 10,5 Gm<sup>3</sup>  
High rise 5,9 Gm<sup>3</sup>

General requirements

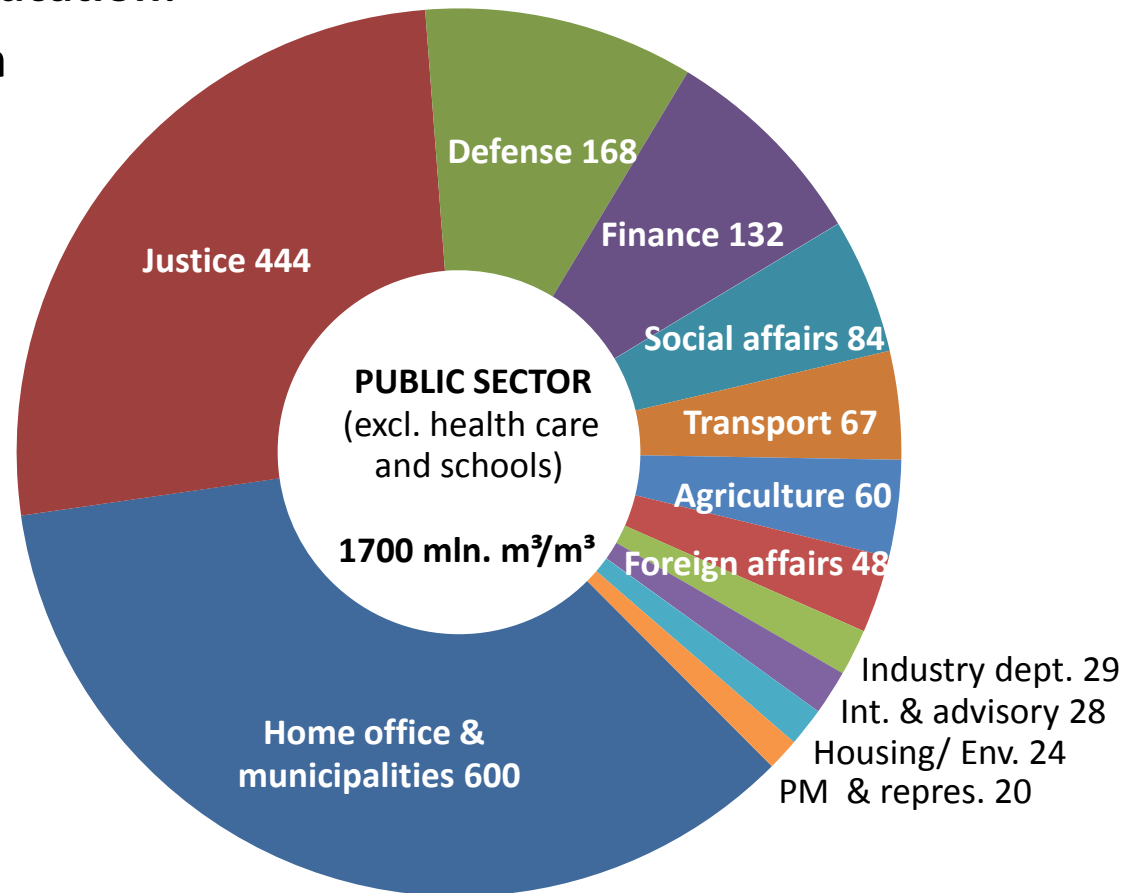
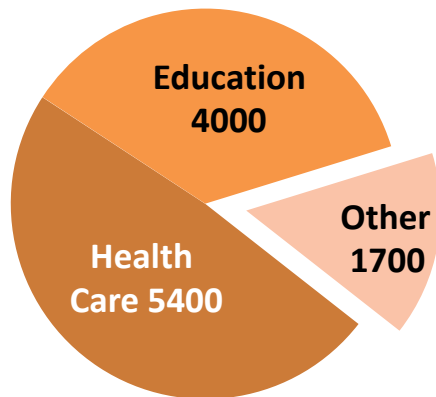
Demand per sector

Misc.



## Sector demand: Public sector

**Public sector, health care & education:  
ventilation demand in  $m^3/m^3.h$**



**Public 11,1  $Gm^3$**

General requirements

Demand per sector

Misc.



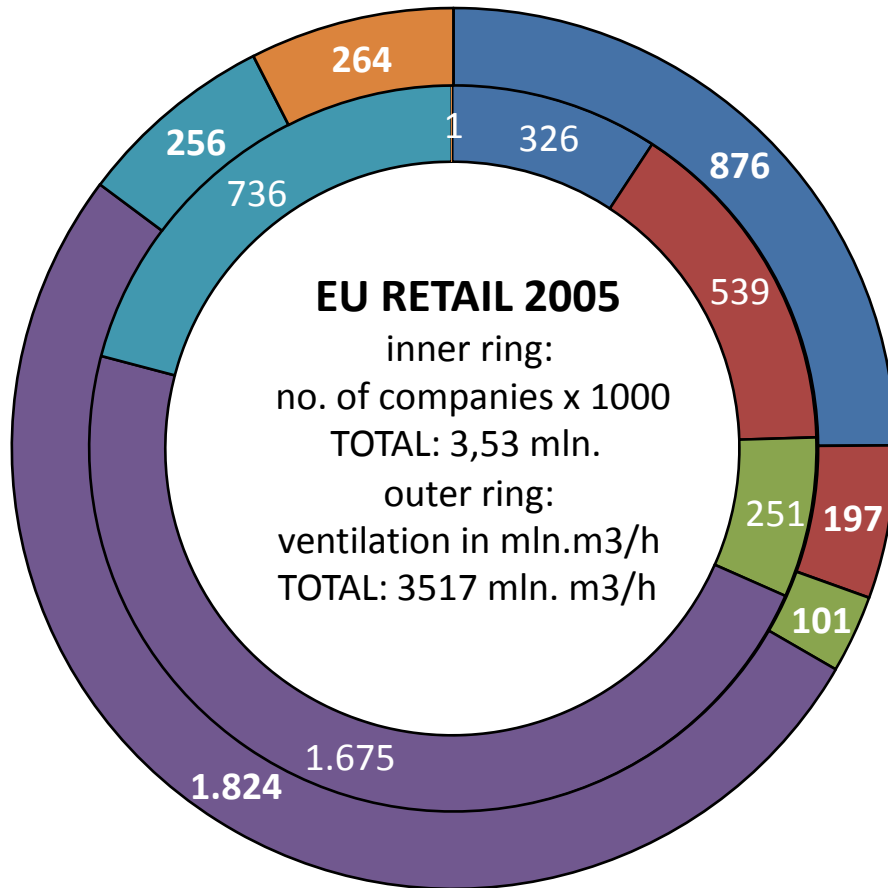
## Sector demand: Sports, Culture, Religion



Sports etc. 3,7 Gm<sup>3</sup>



# Sector demand: Retail

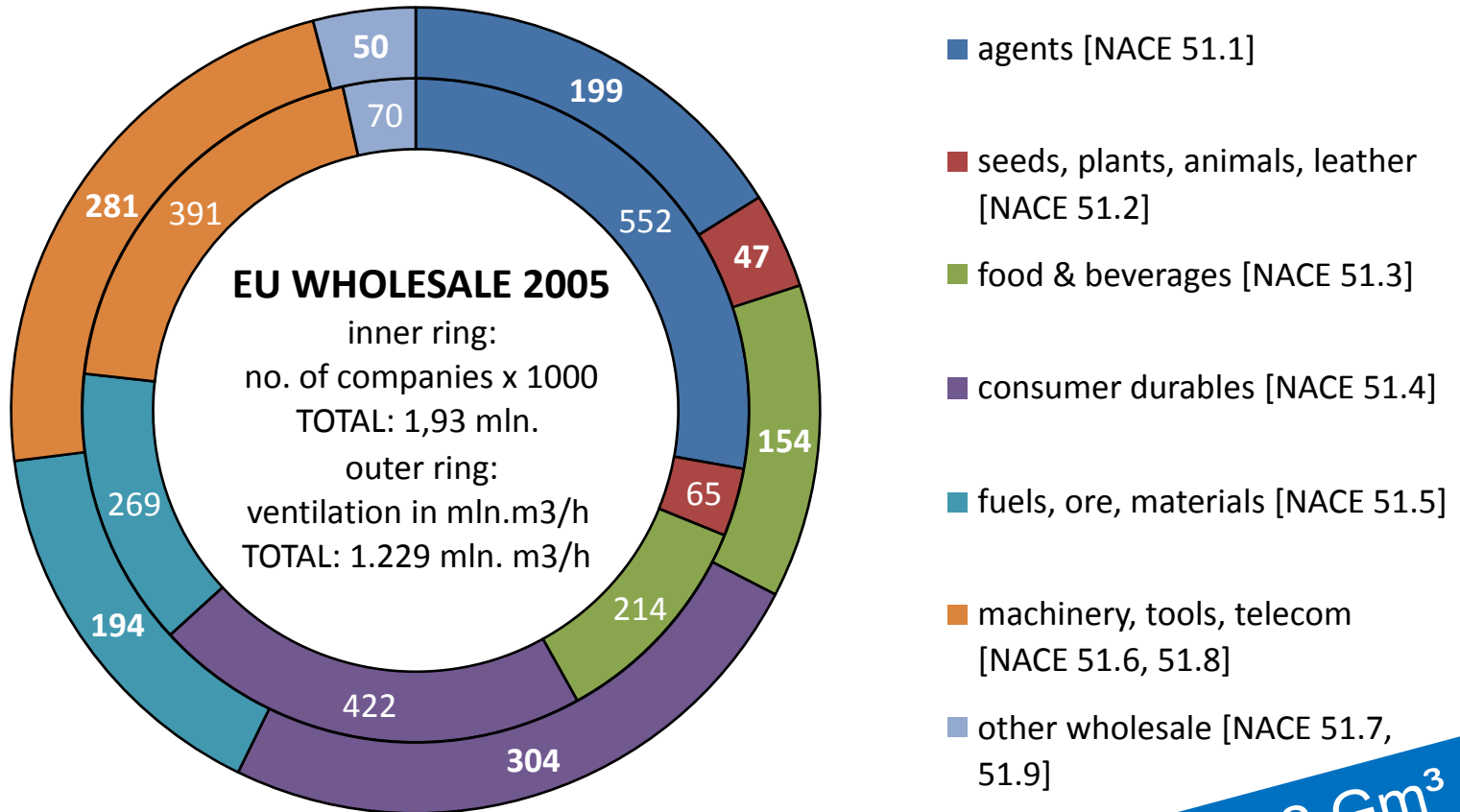


- supermarkets and department stores [52.1]
- food & tobacco specialized [52.2]
- chemists, pharmacists, textiles [52.3]
- clothing, furniture, appliances [52.4]
- mail order, repairs, other [52.5 & 52.6]
- shopping malls (general space)

**Retail 3,5 Gm<sup>3</sup>**



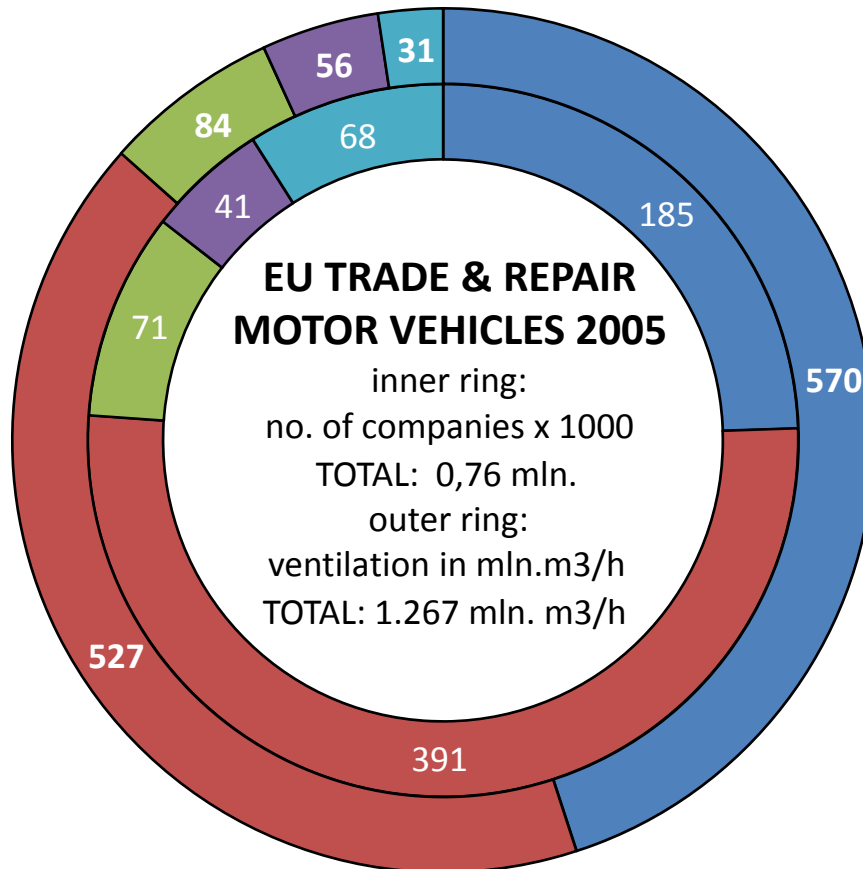
# Sector demand: Wholesale



**Wholesale 1,2 Gm<sup>3</sup>**



# Sector demand: Vehicle trade

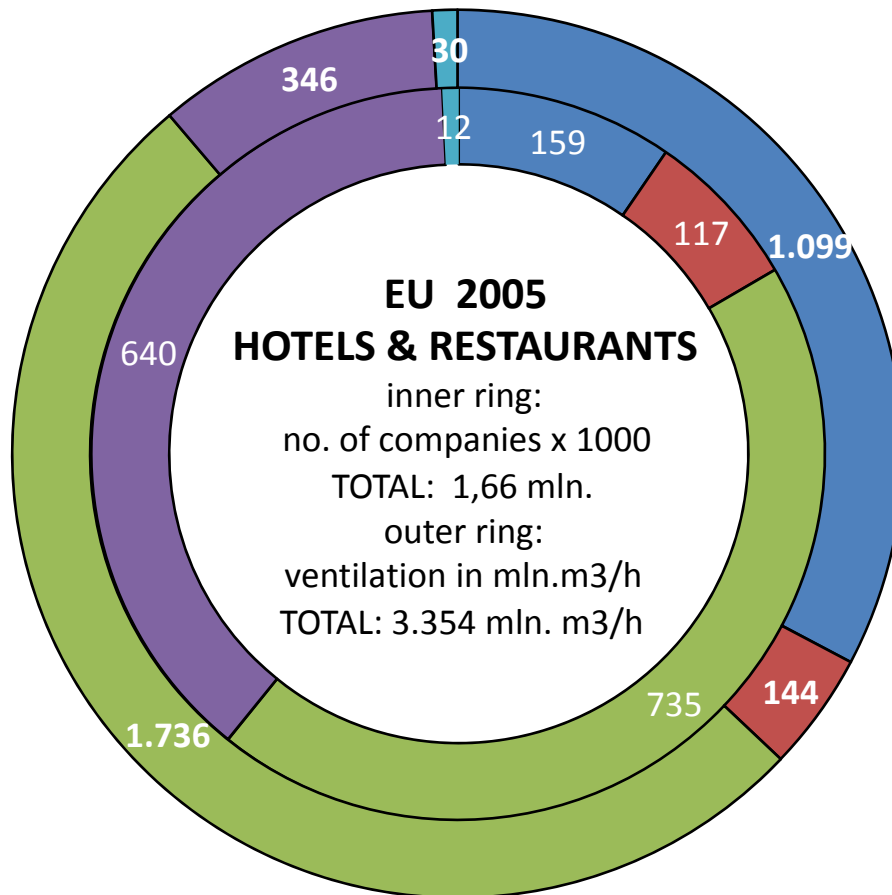


- sales [NACE 50.1]
- maintenance & repairs [NACE 50.2]
- wholesale [NACE 50.3]
- sales & repairs motorcycles [NACE 50.4]
- petrol stations [NACE 50.5]

Vehicle trade 1,3 Gm<sup>3</sup>



# Sector demand: Hotels & Restaurants



- hotels, motels, conference centres [NACE 55.1]
- hostels, campings, other tourist lodgings [NACE 55.2]
- restaurants incl. fast-food [NACE 55.3]
- coffee store, bar, discotheque [NACE 55.4]
- canteens and catering [NACE 55.5]

**HoReCa 3,4 Gm<sup>3</sup>**

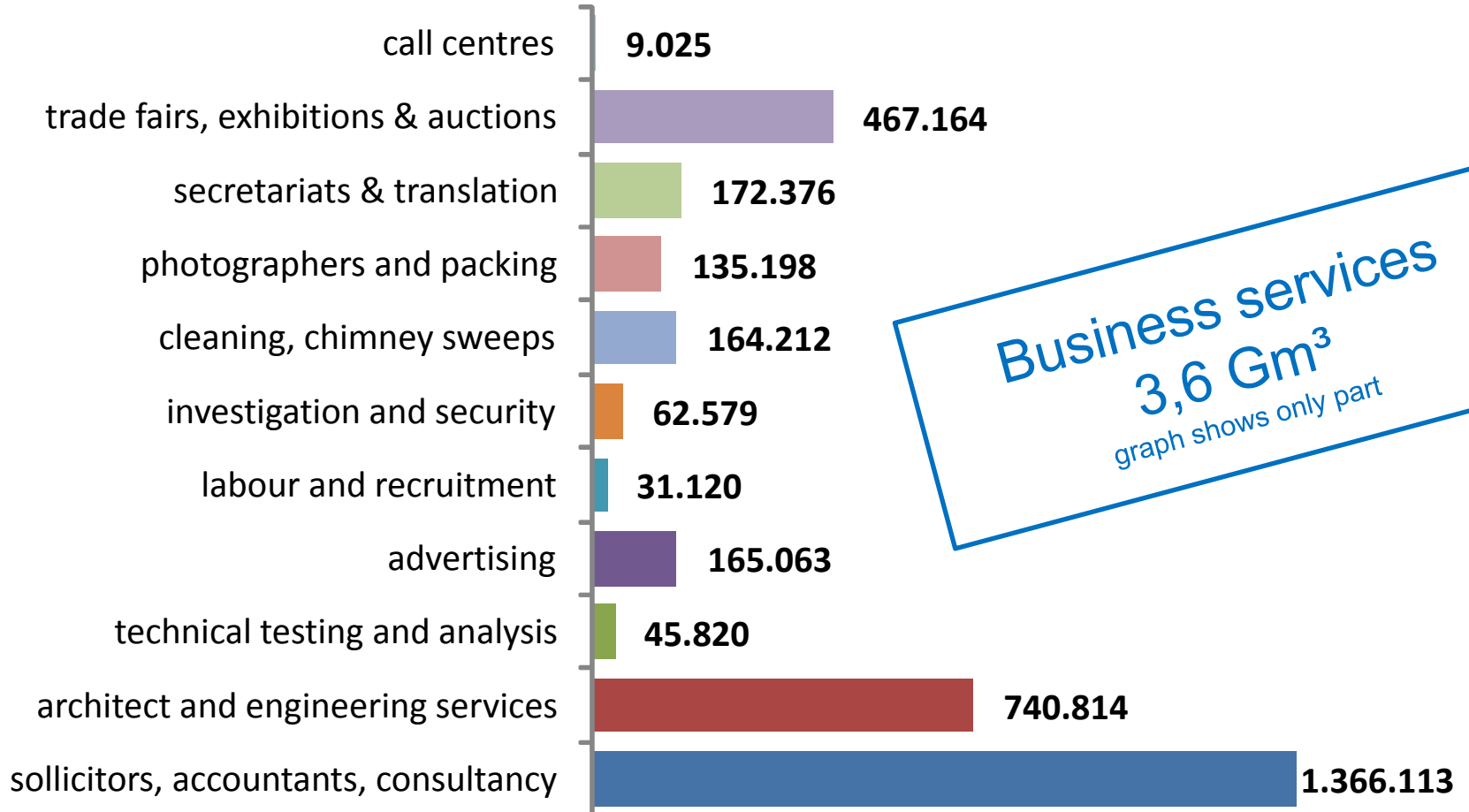
General requirements

Demand per sector

Misc.



# Sector demand: Business Services





# Sector demand: Transport, Communication



3.396 airfields (2009), by runway type and length (graph)



100 heliports (2007)



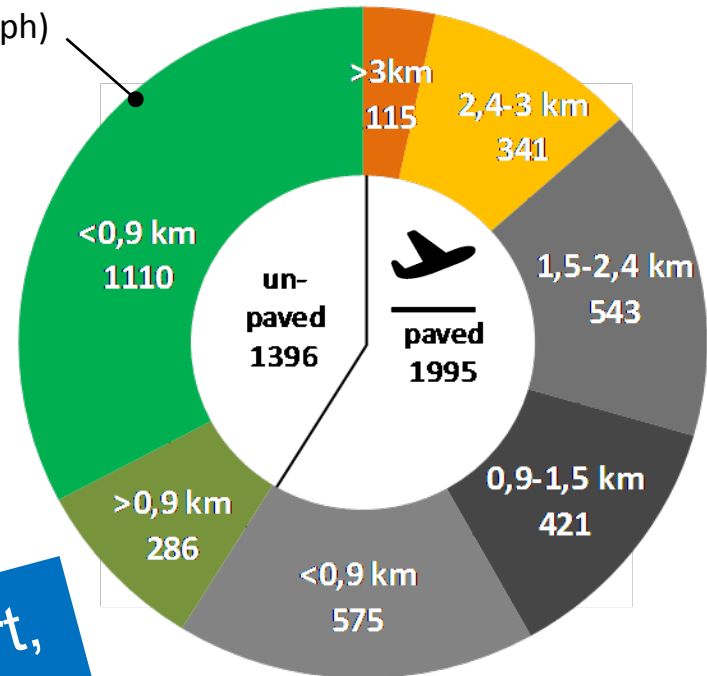
5.454.446 km roadways (2008)



229.450 km railways (2008)



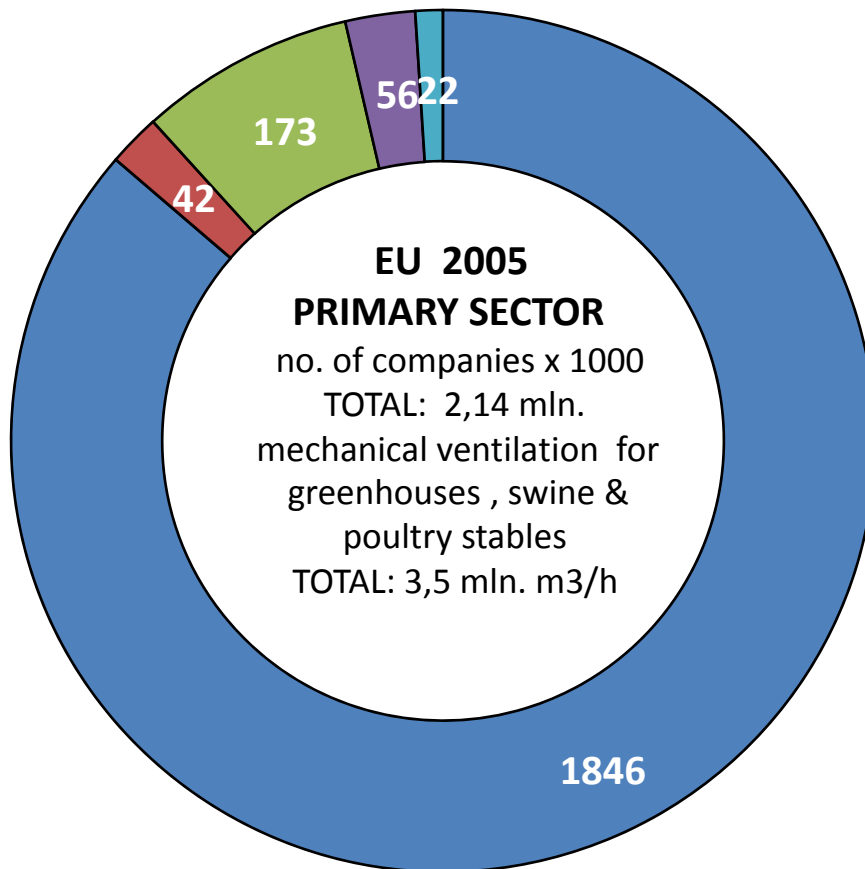
52.332 km waterways (2006)



Communication, Transport,  
Banks 0,28 Gm<sup>3</sup>



# Sector demand: Agriculture

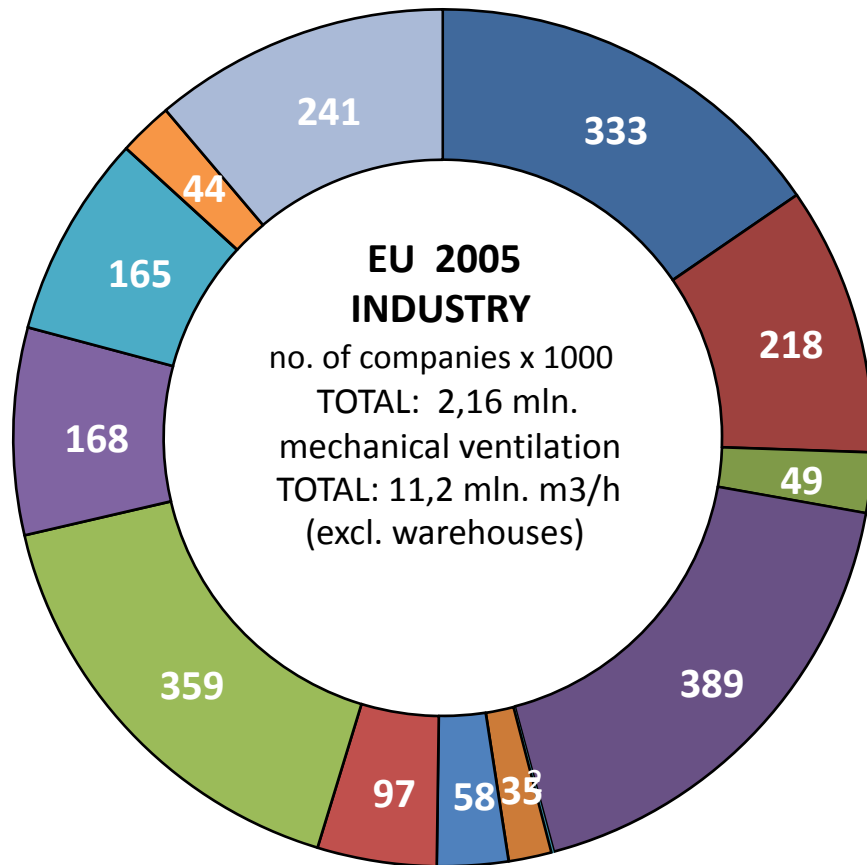


- agriculture [NACE A; codes 1.1-1.4]
- hunting [NACE A; codes 1.5]
- forestry [NACE A; codes 2]
- fishing [NACE B; codes 5]
- mining & quarrying [NACE C; codes 10-14]

Primary sector 3,5 Gm<sup>3</sup>



# Sector demand: Industry



- food & tobacco industry [NACE 15 & 16]
- textile & textile products [NACE 17, 18]
- leather, shoes [NACE 19]
- wood, pulp, paper, publishing & printing [NACE 20 & 21]
- coke, refineries, nuclear fuel [NACE 23]
- chemicals & pharmaceuticals, man-made fibres [NACE 24]
- rubber (tyres) & plastic products [NACE 25]

Industry 11,2 Gm<sup>3</sup>



## Ventilation demand (in scope): Total

in Gm <sup>3</sup> /h operational (nominal= x 1,66)	TOTAL	natural vent.	exhaust or supply	balanced	
				no HR	HR
collective residential	16,4	10,4	5,8	0,2	0,2
public sector	14,8	7,1	3,3	3,5	1,7
services	14,0	4,5	1,8	5,4	2,3
industry & agricultural**	22,6	18,9	1,7	1,2	0,8
Total heated	<b>67,7</b>	<b>40,8</b>	12,5	<b>10,2</b>	<b>4,9</b>
Total unheated (in scope)*		p.m.	8		
Total			<b>20,5</b>		

\*= rooftop/boxed fans for primary and secondary sector (5-10 Gm<sup>3</sup>/h?), unheated dwellings and rooftop/boxed fans in individual dwellings (15-20 Gm<sup>3</sup>/h?)

\*\*=not in scope but added for coherence

Operational 68 Gm<sup>3</sup>/h heated

General requirements

Demand per sector

Misc.



Miscellaneous

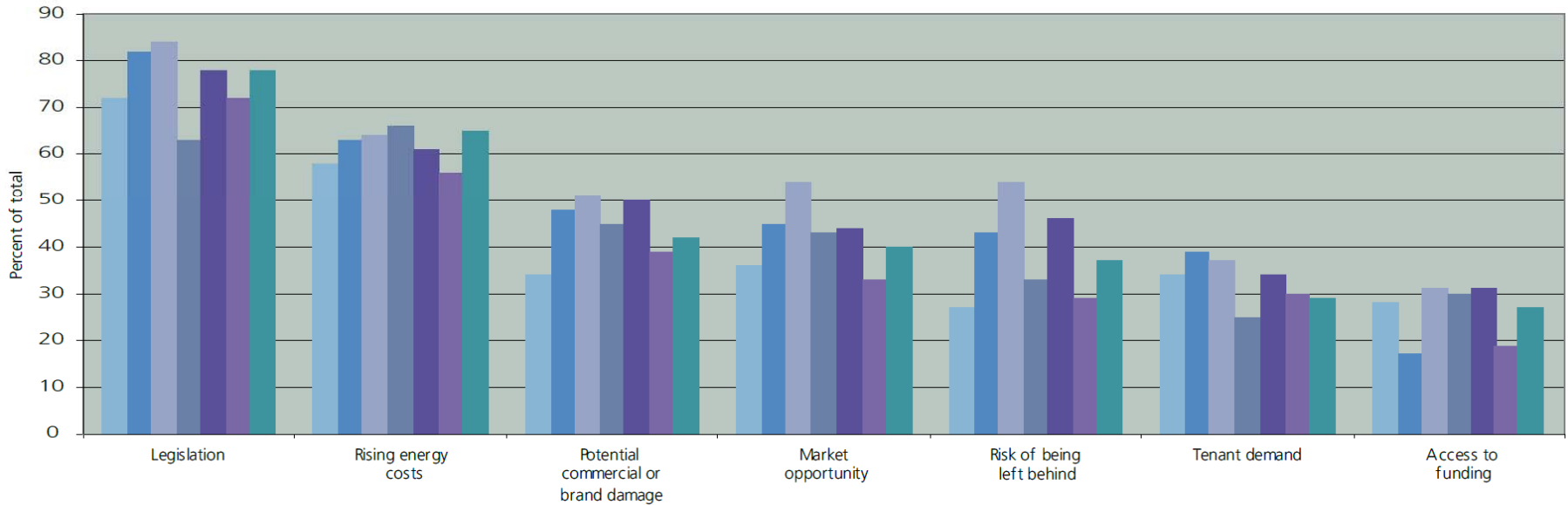
*Miscellaneous*



# Drivers & Barriers Ecodesign

What factors are driving the sustainability agenda forward?

- Investor
- Developer
- Contractor
- End user
- Architect / Planner
- Specialist adviser
- Industry as a whole



***The major driver is legislation.***

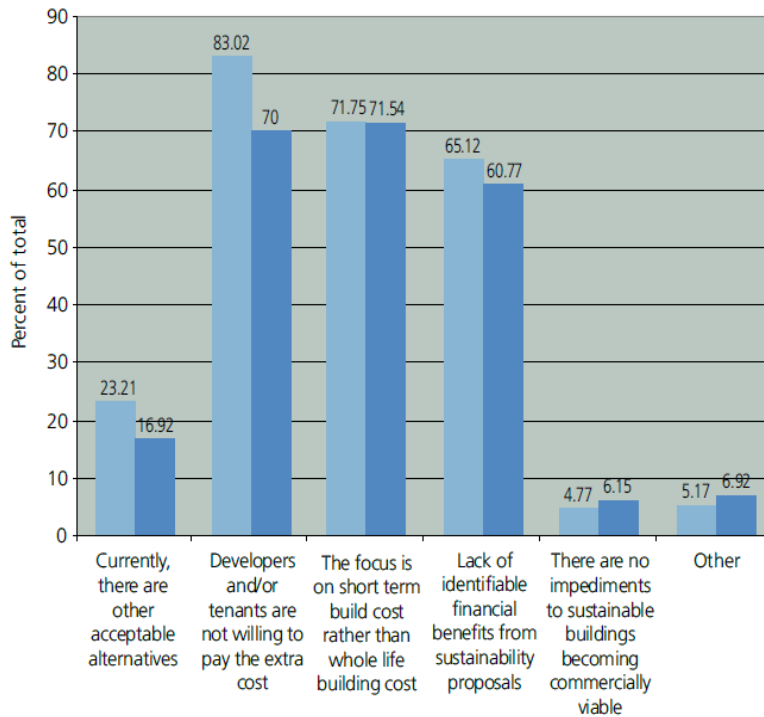
From: Taylor-Wessing, "Behind the green façade", 2009. Survey amongst 800 professionals in the UK construction industry of non-residential buildings.



# Drivers & Barriers Ecodesign

What are the impediments preventing the development of sustainable buildings from becoming a commercially viable proposition?

■ All  
■ End users



The report also quotes the *“vicious circle of blame”*. That is a self-perpetuating cycle, when:  
 a) end users claim that not enough sustainable buildings are available;  
 b) designers and constructors say that developers don't ask for sustainable buildings;  
 c) developers assert investors won't pay for them; and  
 d) investors claim they would respond, if only there was demand from end users.

## The major barrier : investment costs.

From: Taylor-Wessing, “Behind the green façade”, 2009. Survey amongst 800 professionals in the UK construction industry of non-residential buildings.

General requirements

Demand per sector

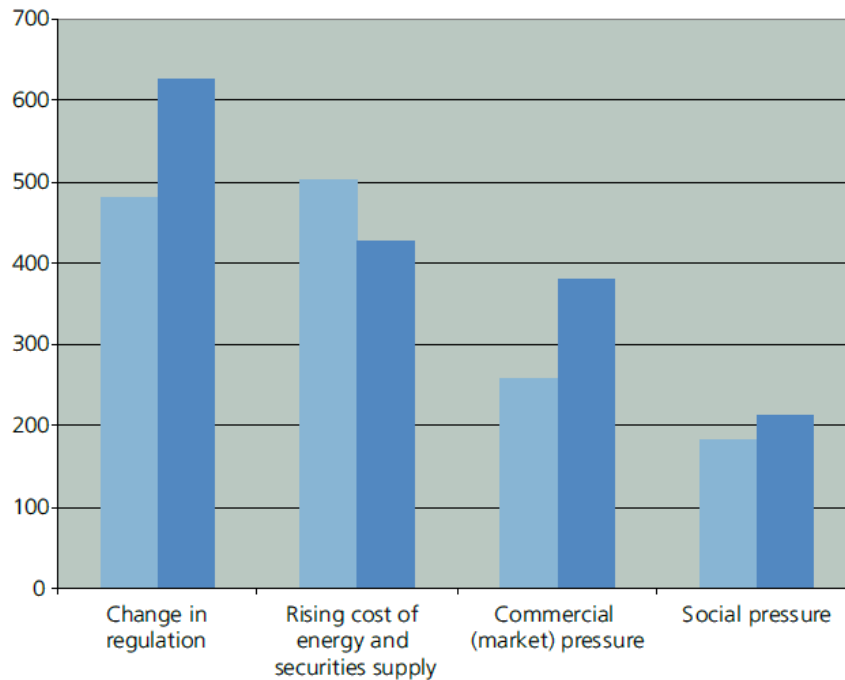
Misc.



# Drivers & Barriers Ecodesign

What type of approach is most likely to be effective in driving the change to improve performance in:

Existing building stock?  
New building developments?



***For existing building stock, rising energy costs may be the major driver***

From: Taylor-Wessing, "Behind the green façade", 2009. Survey amongst 800 professionals in the UK construction industry of non-residential buildings.

General requirements

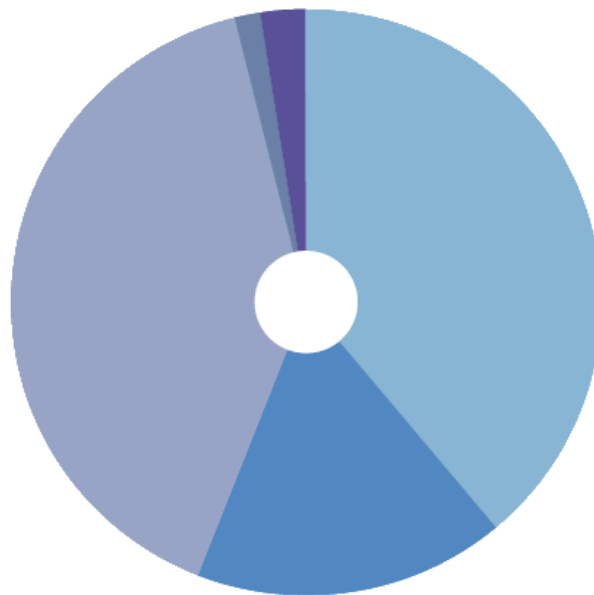
Demand per sector

Misc.



# Drivers & Barriers Ecodesign

What type of government strategy will be most effective?



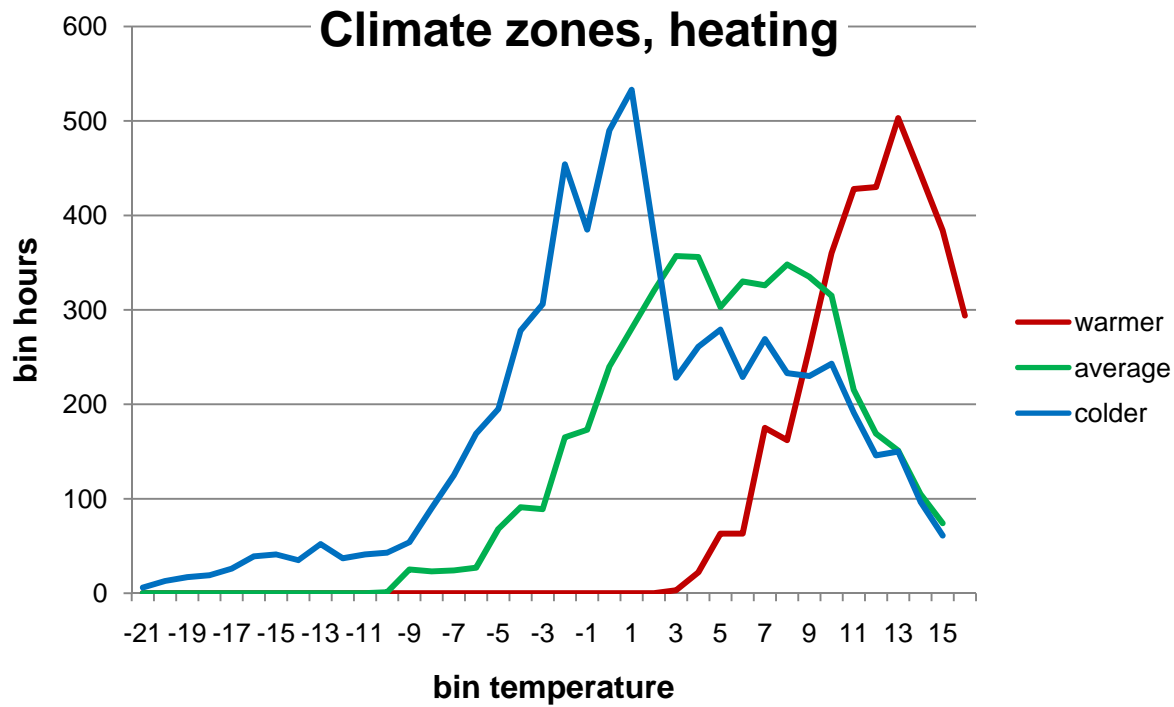
- Regulatory control - 39%
- Grants or aid - 17%
- Tax relief - 40%
- PR / Image - 2%
- Other - 2%

***Government regulatory control and tax relief believed to be most effective***

From: Taylor-Wessing, "Behind the green façade", 2009. Survey amongst 800 professionals in the UK construction industry of non-residential buildings.



# HR: Climate zones heating



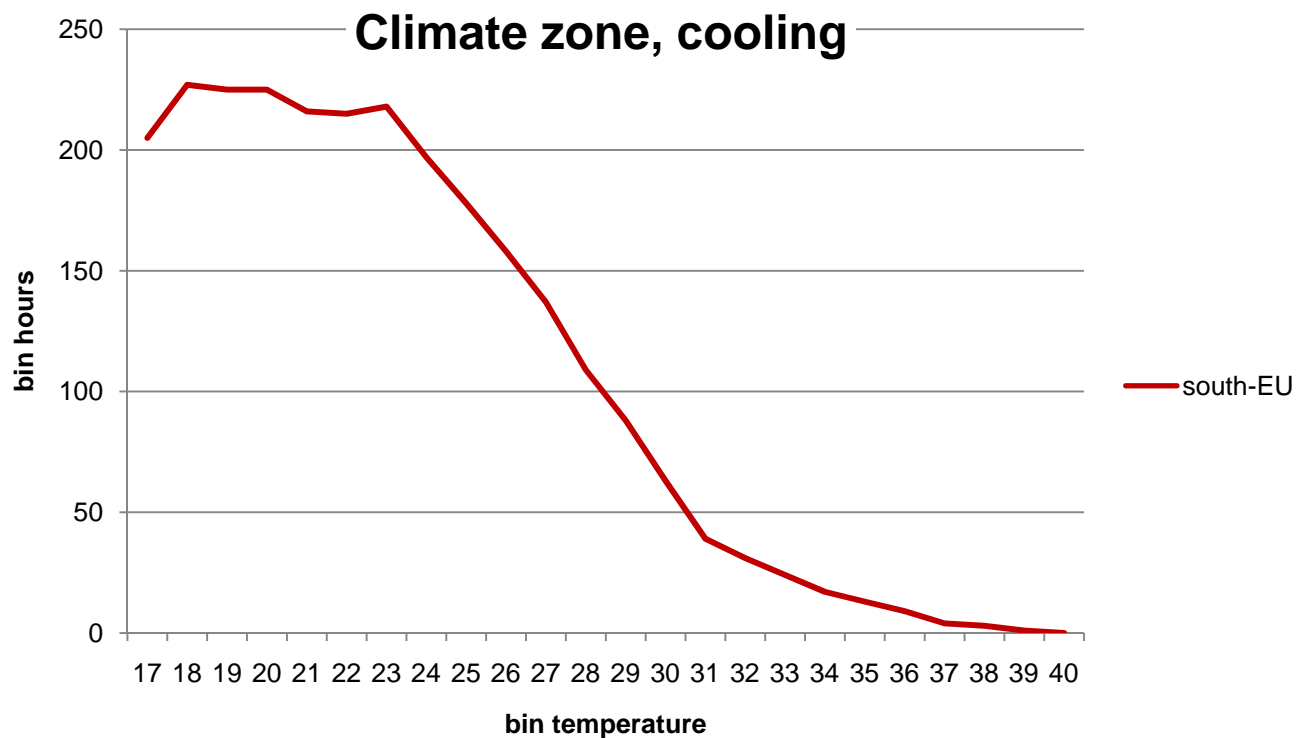
General requirements

Demand per sector

Misc.



# HR: Climate zones heating





## V-control settings

### Current state of the art

- 1) smaller systems: year-round at 60%
- 2) larger systems: 12h@100% + 12h@50% load
- 3) building automation rare
- 4) demand-side ventilation rare but growing)

### Control classification exists (example FRC1 to FRC6)

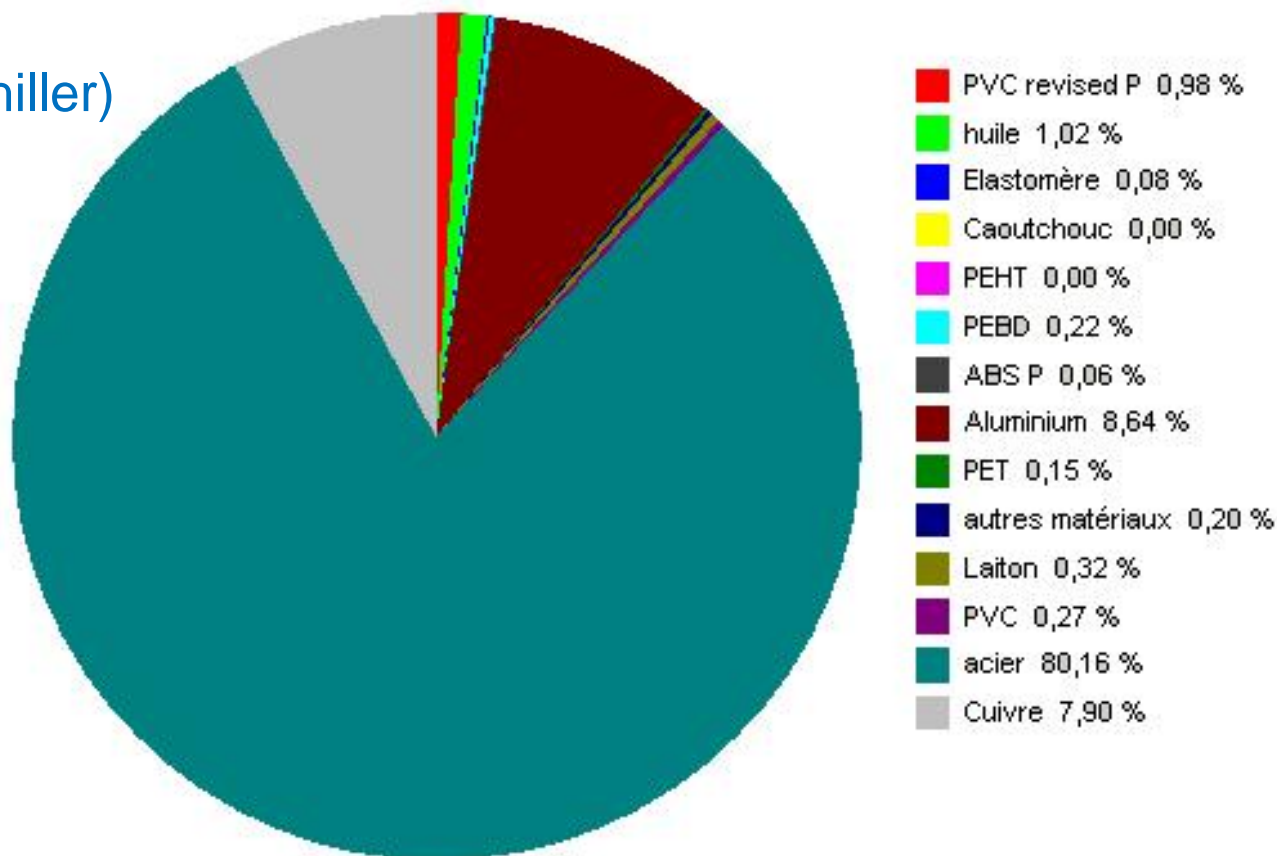
- 1) none
- 2) manual
- 3) timer
- 4) occupancy (y/n)
- 5) presence (no. of people)
- 6) IAQ sensor (CO<sub>2</sub>, VOC, RV)



# End of Life

les matériaux

Carrier (chiller)



General requirements

Demand per sector

Misc.



## Ductwork/ Filters

Eurovent, Svensk Ventilation AB

Ductwork should be part of Lot 6, or separate lot;

Filters are important ErP: should be part of Lot 6, or separate Lot

Filter classification exists (G1-G4, F1-F7)

Filter indicator type classification

Filter bypass test exists