Certification In The Hotel Sector: Is it *actually* reducing CO_2 emissions?

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Sunwing and Sungarden Resorts, Rhodes

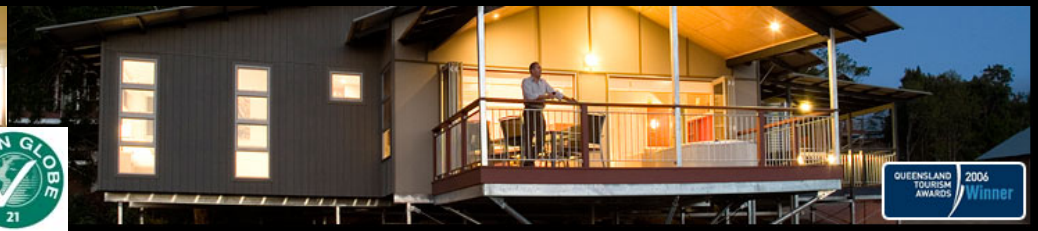
Hotel Tigaiga, Tenerife

Radisson SAS, Oslo

Hotel Hellnar, Iceland

Sheraton Miramar, Egypt

The Boat Landing, Loas



O’Reilly’s Mountain Resort, Australia

Green hotel?

Certification

A process of assessing compliance with pre-established criteria. A logo is awarded upon successful completion.

	earthcheck	Indicator Measure (Benchmark)
1	Sustainability policy	Policy is produced and in place
2	Energy Consumption	Energy used (MJ / Guest Night)
		Renewable energy used (%) [A]
3	Water Consumption	Water used (L / Guest Night)
		% of total water used is that is recycled/captured (%) [A]
		Water saving (Checklist rating)
4	Waste Production	Waste landfilled (L / Guest Night)
		% of total waste that is recycled/reused (%) [A]
		Waste recycling (Checklist rating)
5	Community Commitment	Local employment (Employees living within 20 km of operation / Total employees)
		Community contributions (Checklist Rating)
6	Paper Products	Paper product types used (Checklist Rating)
7	Cleaning Products	Cleaning product types used (Checklist rating)
8	Pesticide Products	Pesticide product types used (Checklist Rating)

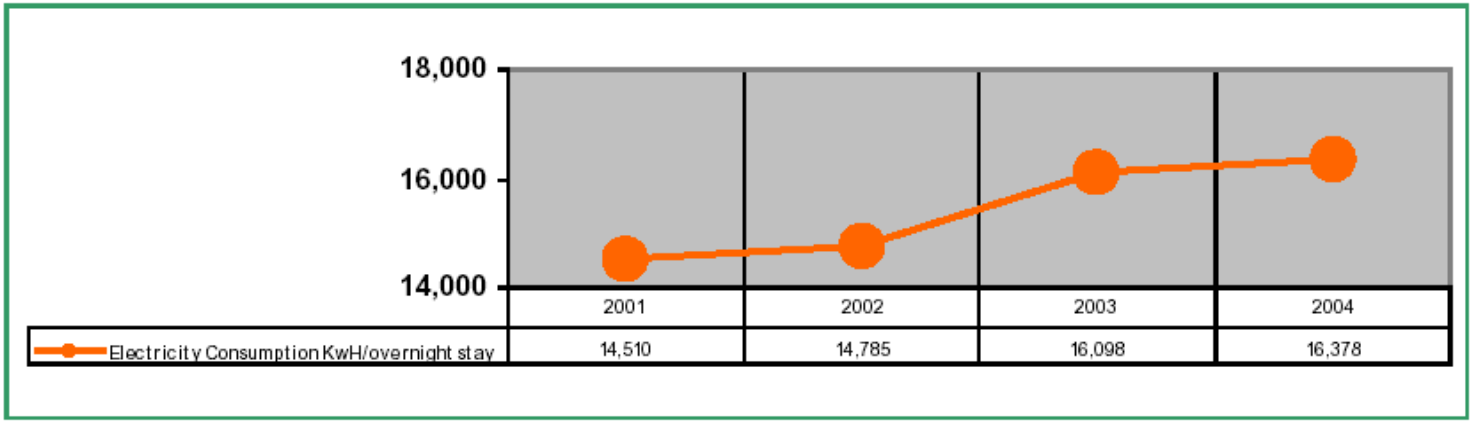
[A] These indicators are for guidance only and do not affect the overall benchmarking evaluation

Process Based

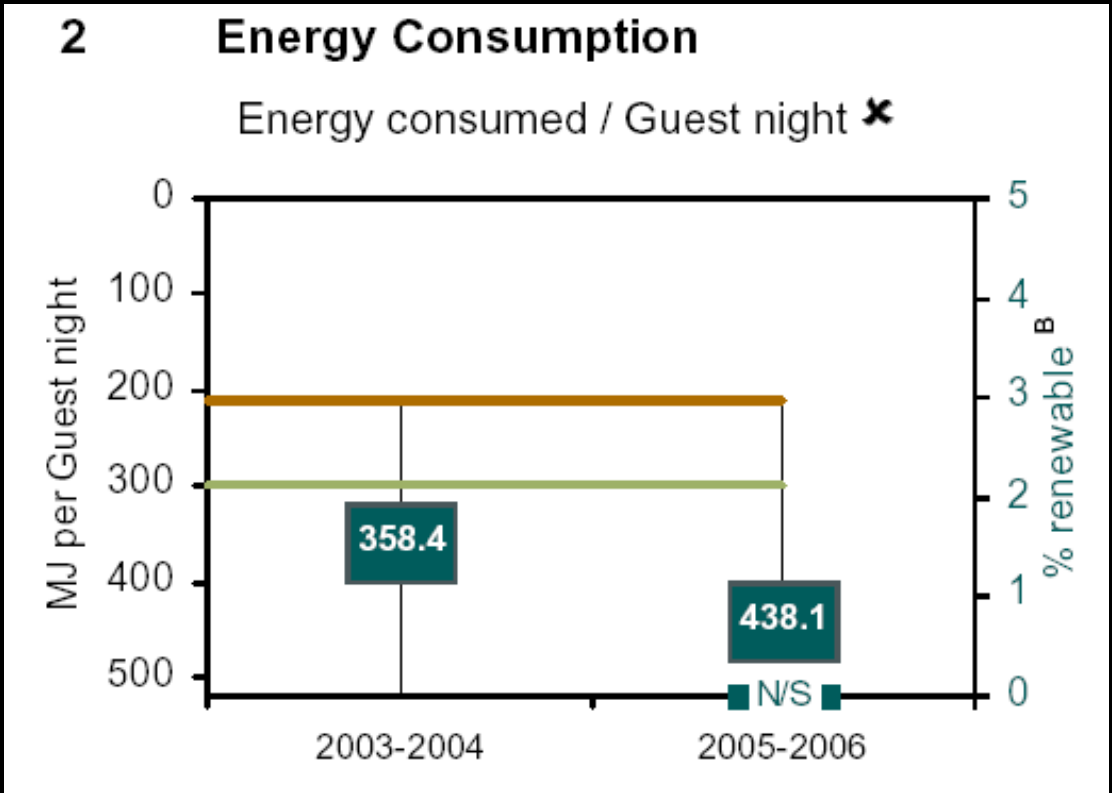
Indicator	2001	2002	2003	2004
Electricity consumption per overnight stay	14,510 kwH per overnight stay	14,785 kwH per overnight stay	16,098 kwH per overnight stay	16,378 kwH per overnight stay

Note: the main causes for the increase in electricity consumption are explained on page 20

Source: Electricity Company Invoices and Internal Tigaiga Hotel Register



Performance Based



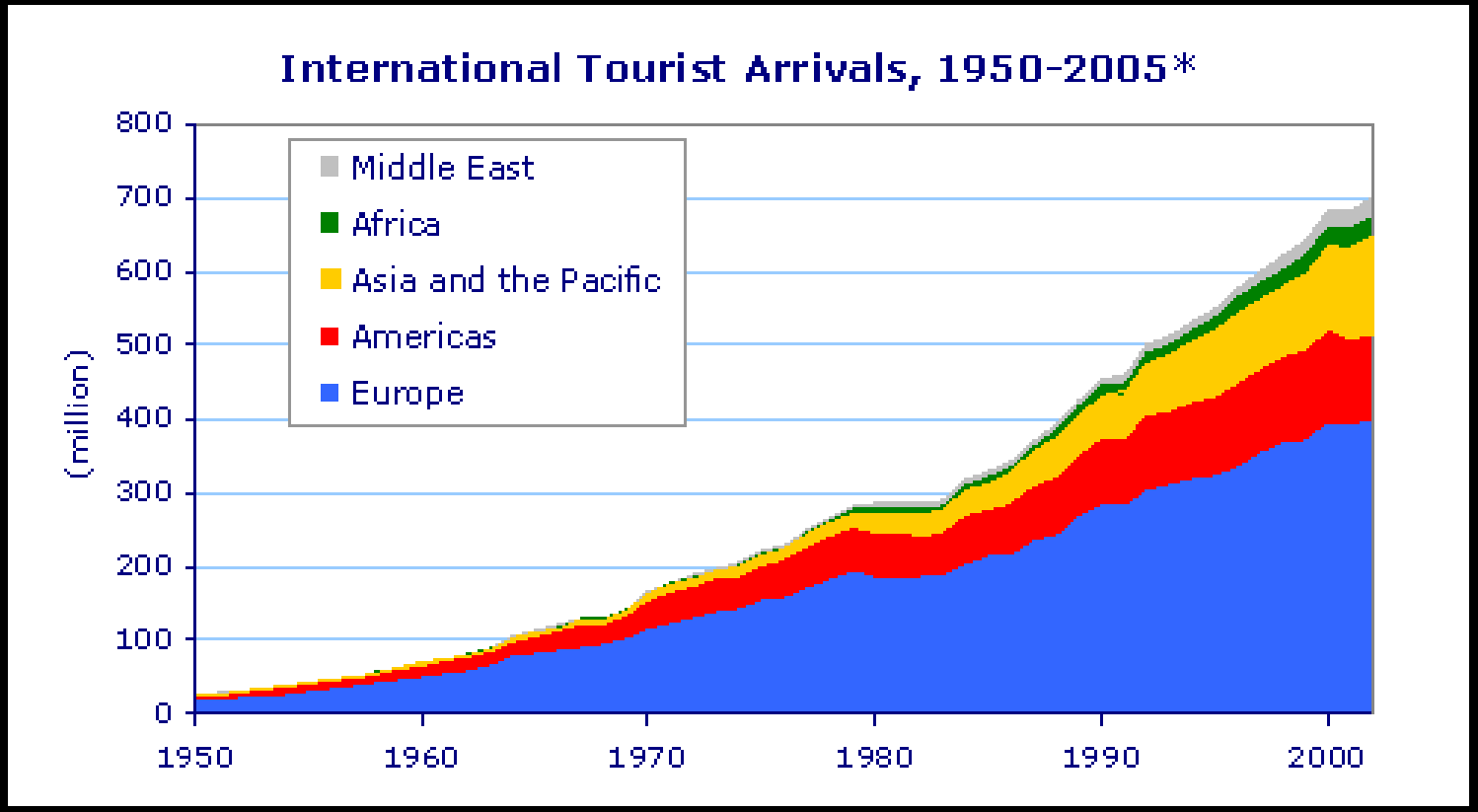
Performance level:	*Baseline* ——	*Best Practice* ——	
Current result:	*Below Baseline* ✖	*At or above Baseline* ✓	*At or above Best Practice* ★

[A] Each benchmark has been assessed on a per annum (12 months) basis
[B] Indicator is for guidance only and does not affect the overall benchmarking evaluation
[C] Represented in litres (L), where 1000 L = 1 cubic metre (m^3) or 1 kilolitre (kL)
N/S = Not submitted


104 Certification Schemes Worldwide
60 Europe Alone
Confusing proliferation of schemes
with varying criteria & benchmarks.

Why Tourism? Why Hotels?

Tourism Growth



- World's 2nd largest economy and largest employer
- Growing fastest in developing countries
- Growing 9% globally / year - 825 million 2005 from 25 million 1950

Source: *World Tourism Organisation, 2006*

Climate change & Global tourism CO_2 emissions

	CO2 (Mt)
Air transport	517
Other transport	468
Accommodation	274
Activities	45
TOTAL	1,304
Total world	**26,400**
Share (%)	4.94

Table 1: Emissions from Global Tourism 2005 [1]
(*including same day visitors*)

[1] Advanced Summary, Davos Report, 2007.

The results show hotels are between **five to seven times** more CO_2 intensive than people living at home……..

	Hotel	Home
KgCO_2 per Guest/Occupant night	25[1]	3.6[2]

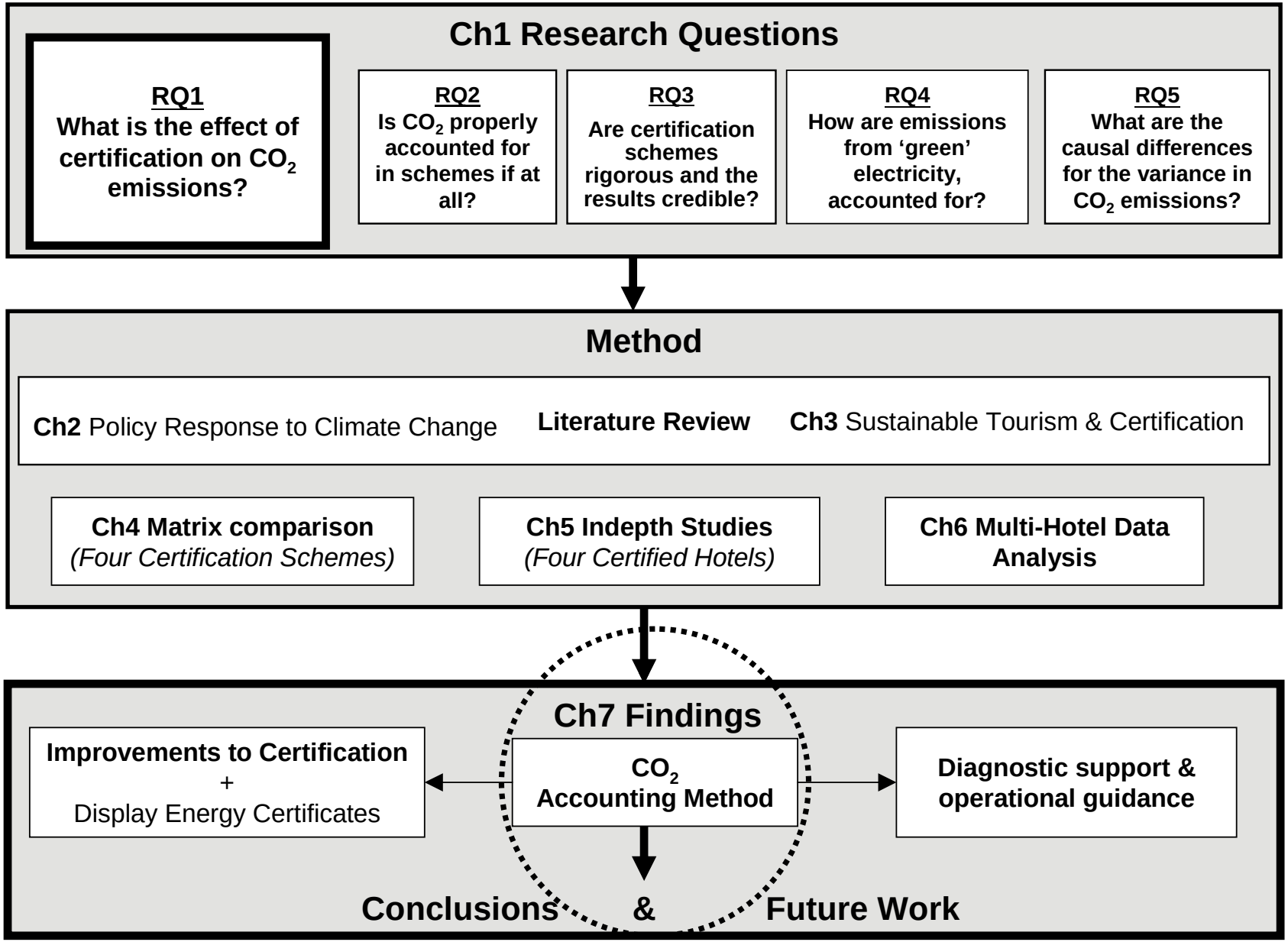
……..yet CO_2 emissions are not accounted for in audits and are not included as a mandatory category in certification.

1 *Authors calculations based on author own data and from European energy data from Project TourBench & Project SUTOUR (2006)*

2 *Authors calculation from data from DEFRA (2007)*

Research Questions

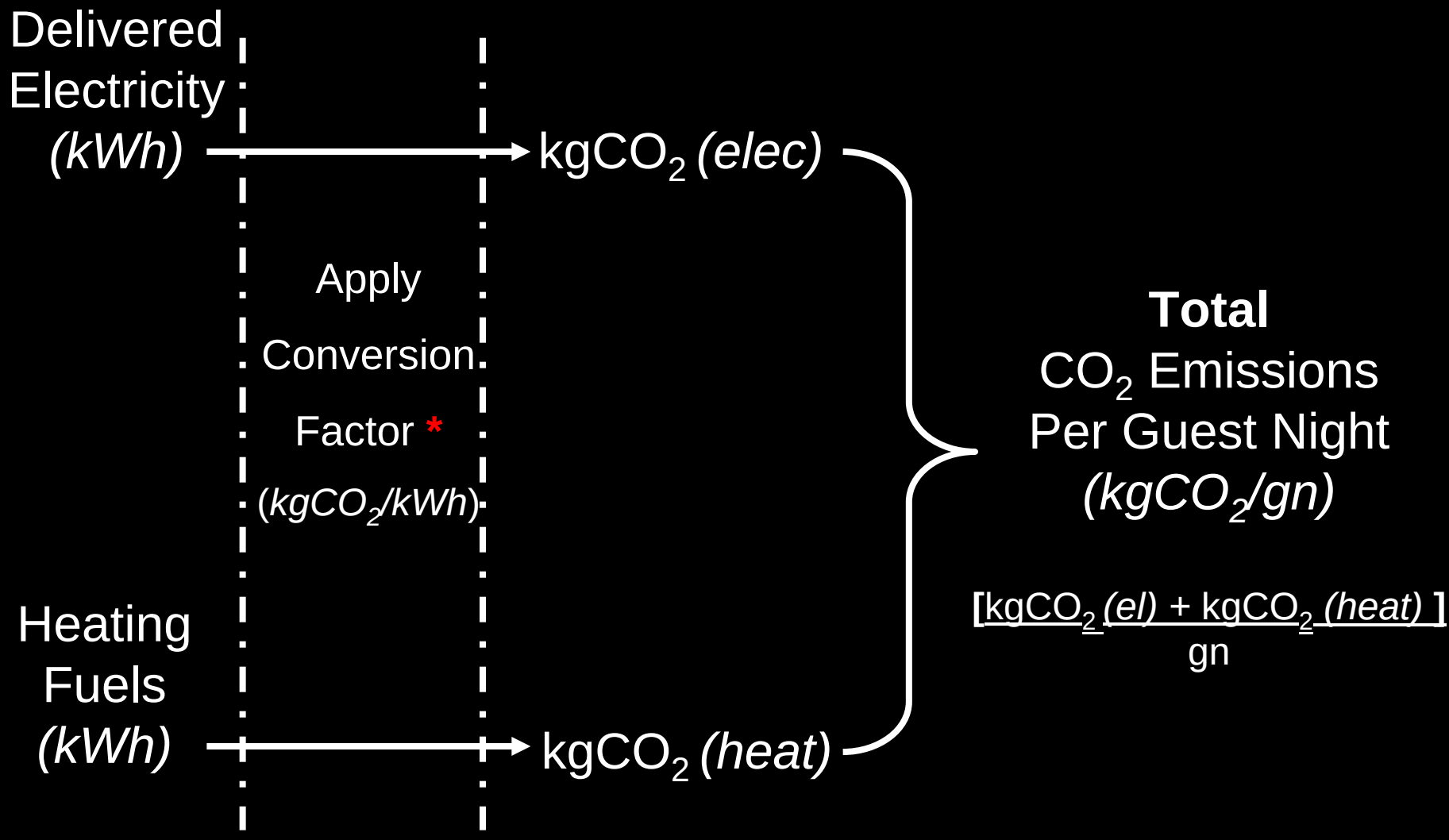
Is certification resulting in ‘greener’ hotels?


Ch1 Research Questions
RQ1
What is the effect of certification on CO_2 emissions?
RQ2
Is CO_2 properly accounted for in schemes if at all?
RQ3
Are certification schemes rigorous and the results credible?
RQ4
How are emissions from 'green' electricity, accounted for?
RQ5
What are the causal differences for the variance in CO_2 emissions?
Method
Ch2 Policy Response to Climate Change
Literature Review
Ch3 Sustainable Tourism & Certification
Ch4 Matrix comparison
(Four Certification Schemes)
Ch5 Indepth Studies
(Four Certified Hotels)
Ch6 Multi-Hotel Data Analysis
Ch7 Findings
Improvements to Certification
+
Display Energy Certificates
CO_2 Accounting Method
Diagnostic support & operational guidance
Conclusions & Future Work

CO_2 Accounting Method

CO_2 Accounting Method

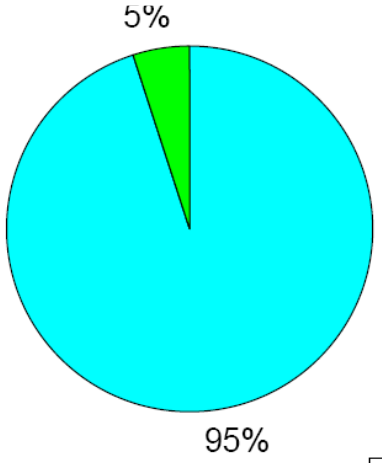
For Delivered Electricity & Heating Fuels



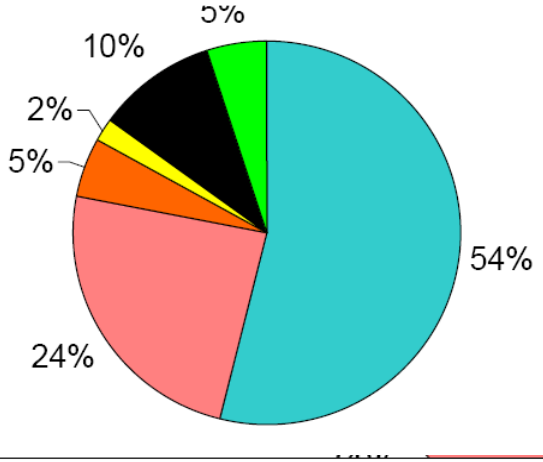
* *Conversion Factors to be continuously reviewed.*

CO_2 Accounting Method
For Delivered Electricity

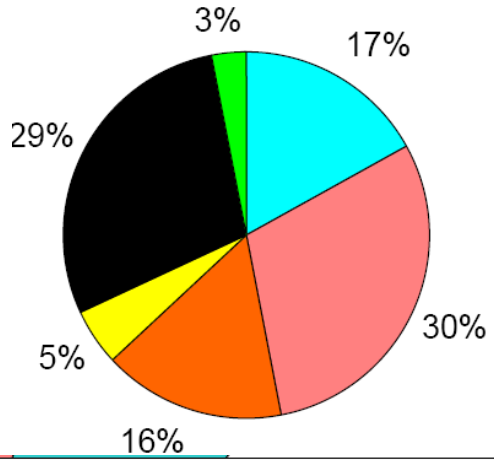
Av. Sweden 'Green'



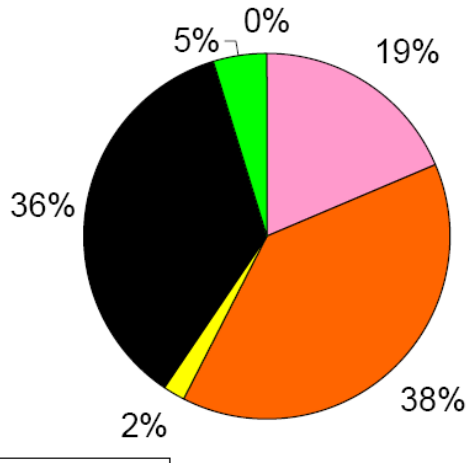
Av. Nordic

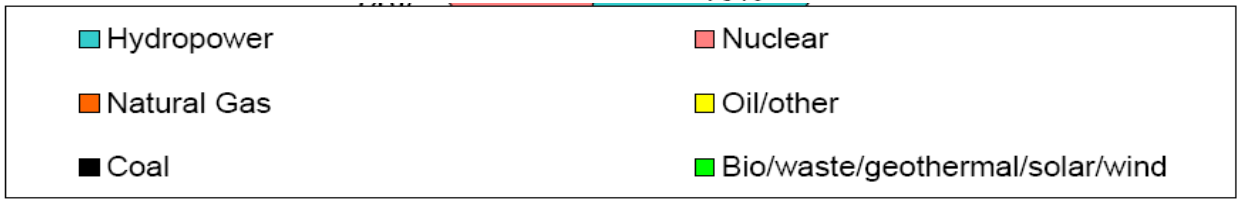


Av. European



Av. UK





	Electricity Mix Conversion Factor ***($kgCO_2/kWh$)***
Av. Australia	1.000
Av. US	0.619
Av. UK	0.480
Av. European	0.475
Av. Nordic	0.101
Av. Sweden ('Green')	0.004

CO_2 Accounting Method
For Delivered Heating Fuels

	Published* Heating Fuels Conversion Factor *($kgCO_2/kWh$)
Natural Gas	0.19
LPG	0. 21
Oil	0. 28
Diesel	0. 26
Coal	0. 31
Charcoal	0. 35

Particular Rules for CO_2 accounting:

1) Combined Heat & Power (CHP): CO_2 already accounted for in electricity and heat is considered CO_2 free.

2) District Heating (DH): If not produced by CHP only, then published conversion factors will be applied for the specific combination of heating technology used.

Results

Study Hotel 1
Stockholm, Sweden

Description of Hotel

Study hotel 1 is a modern waterfront hotel located outside Stockholm city centre. The building comprises of one 18 floor accommodation block 62m high and two five storey office blocks around a central atrium.

Facilities

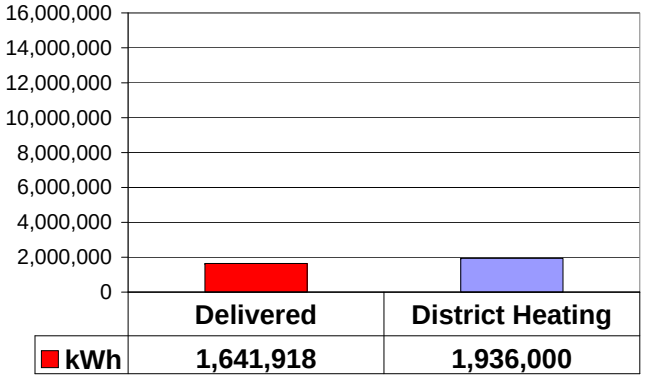
- Atrium
- 17 meeting rooms
  (10>10 people, 7<10 people)
- 1 restaurant (600 covers: buffet & a la carte)
- Atrium bar (light meals), Sky Bar
- Sauna department

Key Features

- 'Green' Electricity Certificate
- District Heating (CHP Plant)
- Sea-water Cooling System
- 'Eco' Room: 97% recyclable and/or biodegradable

Key Performance Indicator	
$kgCO_2$ per guest night	6.8
$kgCO_2$	738,863

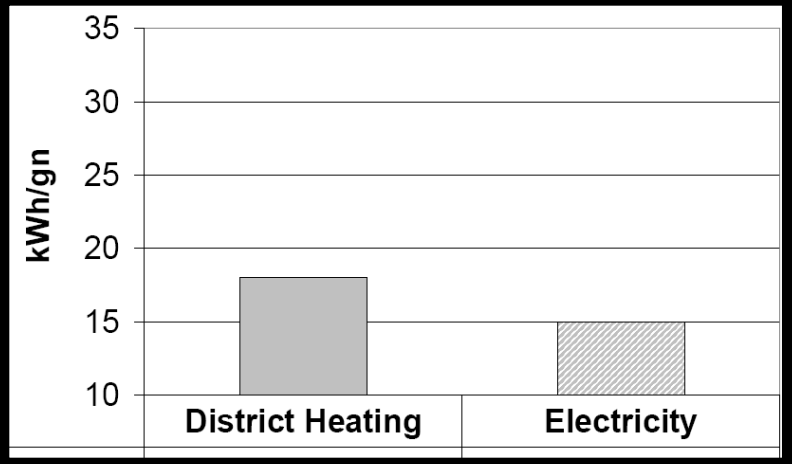
Delivered Energy Supply (kWh)



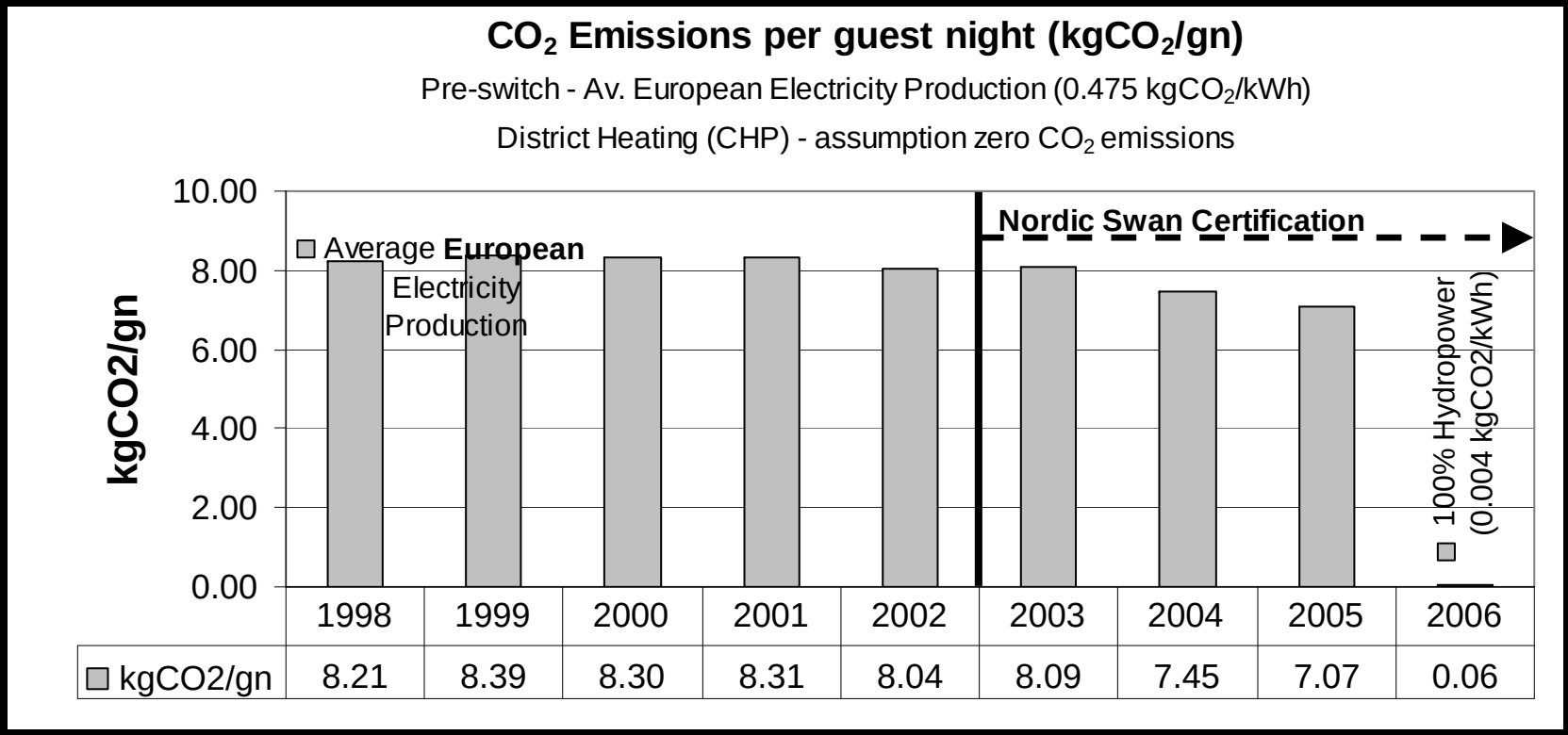
Key Facts	
Logo	
Certification	Nordic Swan
Date of Certification	October 2003
Surface/ Bed	57
Hotel Type	Business
Location	Waterfront
Year Built	1989
Hotel Area (m^2)	16,000
Number floors	18
Bedrooms	283
Restaurant	1 (*See Facilities*)
Conference	Yes (*See Facilities*)
Swimming Pool	No
Jacuzzi	No
Laundry	Out Sourced







Time series analysis of CO_2 emissions per guest night '*before-and after*' certification, for a selected chain hotel in **Stockholm, Sweden**.

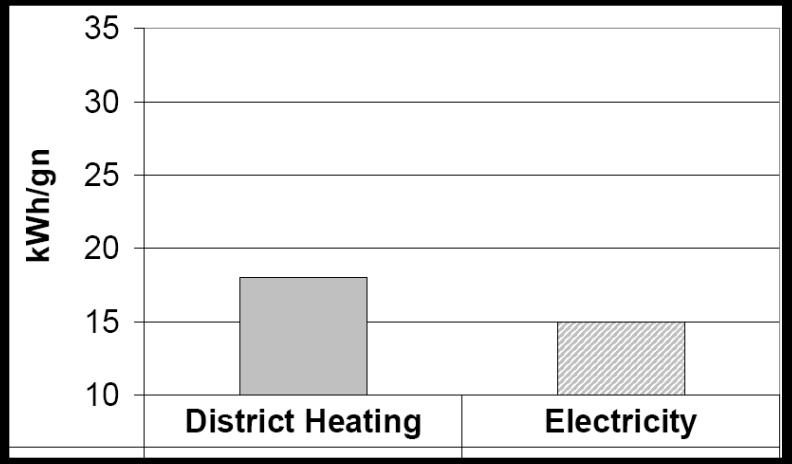


‘Green’ Electricity

Green power consumption → *Prove* *‘Additionality’* → Low or zero carbon power production

The Eugene Standard

Only **2** out of 110 European Energy Labels Accredited!

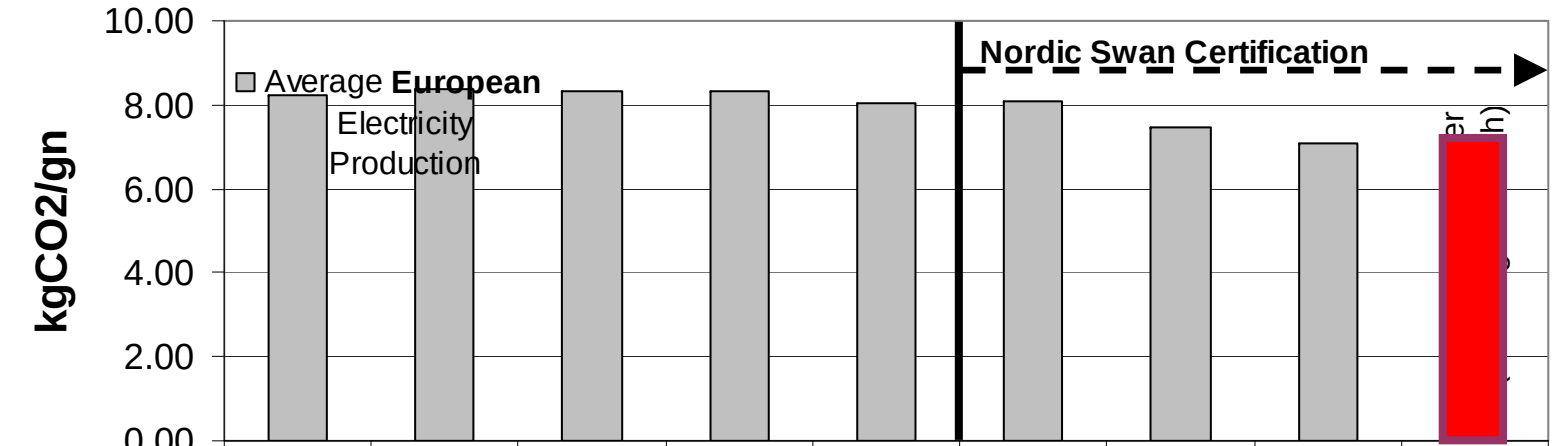


Time series analysis of CO_2 emissions per guest night '*before-and after*' certification, for a selected chain hotel in **Stockholm, Sweden**.

CO_2 Emissions per guest night ($kgCO_2$/gn)

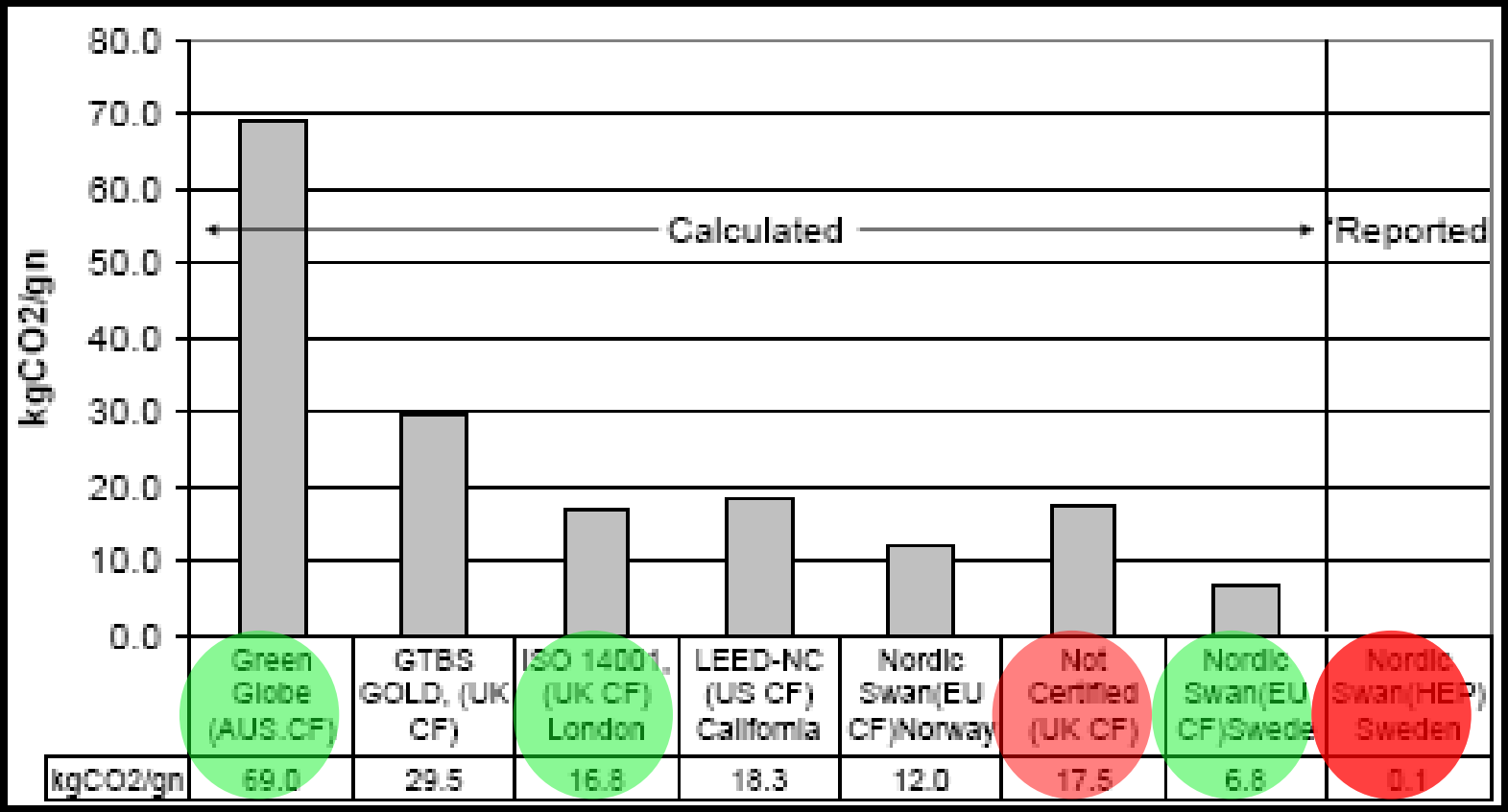
Pre-switch - Av. European Electricity Production (0.475 $kgCO_2$/kWh)

District Heating (CHP) - assumption zero CO_2 emissions

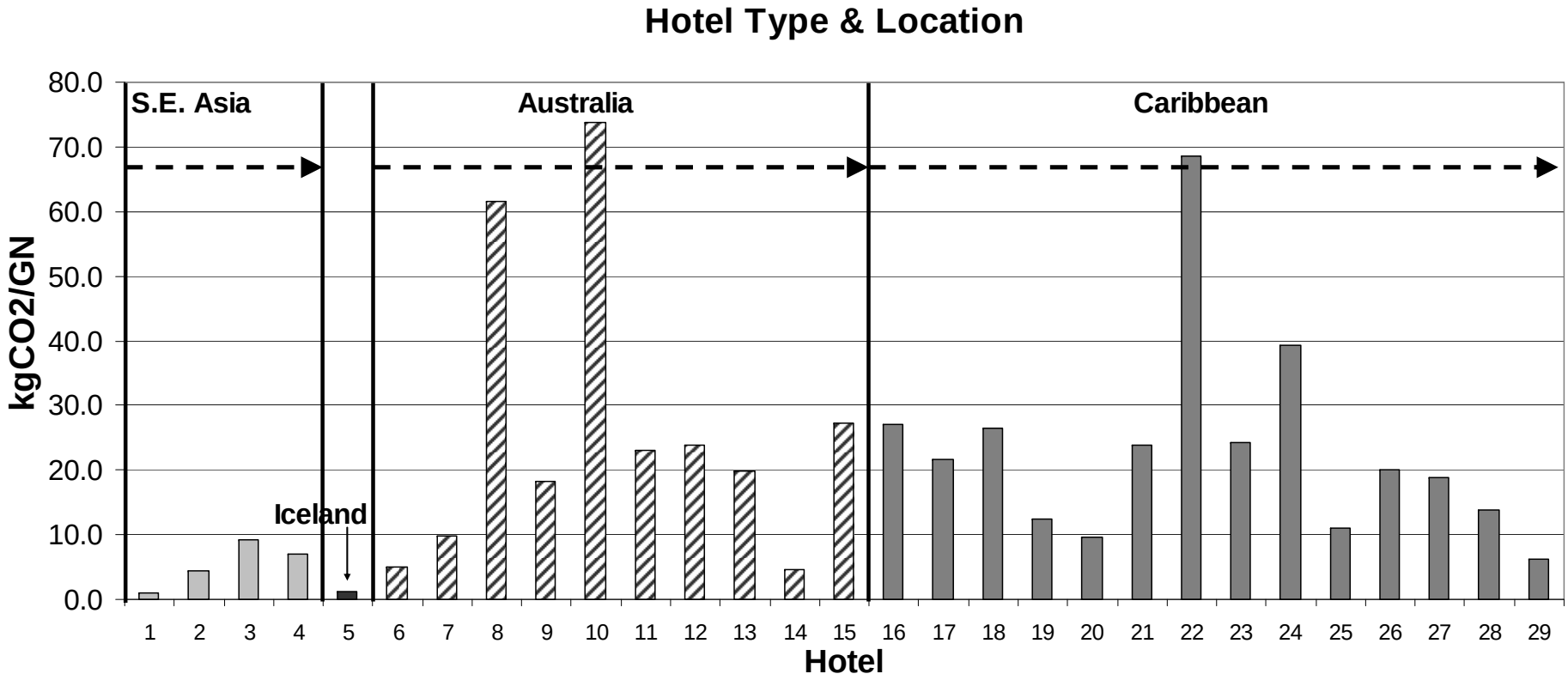


	1998	1999	2000	2001	2002	2003	2004	2005	2006
kgCO2/gn	8.21	8.39	8.30	8.31	8.04	8.09	7.45	7.07	7.0

Example of Range Of Calculated CO_2 Emissions Awarded To *Individual* Hotels Within Different Schemes in 2006 .



A Range Of Reported CO_2 Emissions Awarded The Same Certification Level Within The Same Scheme in 2006



Key Overall Findings

- No benchmarking of CO_2 emissions in schemes (*except one*)
- Incorrect accounting for CO_2

  - Adding different types of energy together *i.e. delivered electricity and heating fuels*

  - Numerical errors in calculations

- Weighting of categories in the awarding of credits for certification
- Confusing proliferation of schemes with varying criteria / benchmarks
- False Claims of CO_2 emissions – 'green' electricity & carbon offsetting
- Lack of transparency
- No mention of lifestyle or human behaviour on energy consumption
- EU Flower; Only 1 optional point awarded in for bioclimatic or passive design features – what is the motivation for designers, clients?

Recommendations

1. Compulsory sub-metering, to monitor consumption in energy intensive facilities *i.e. kitchens, laundries, swimming pools.*

2. An independent assessor would be party to decisions on the specification of monitoring points and specify or install the sub-meters on site.

3. Two levels of assessment could be made;
   a) Calculation of CO_2 emissions based on fuel bills
   b) Separation of energy end use categories and associated fuel use e.g. *space heating/cooling, lighting* and e.g. *hot water, laundry*.

1. **Simple, accurate method of CO_2 emissions calculation**:

- Adopted universally
- Transparent and standardized.
- A compulsory requirement of any performance analysis.
- Calculate CO_2 emissions per guest night ($kgCO_2/gn$)

2. **Individual CO_2 benchmarks** should be set for particular functions in different parts of the hotel *i.e. bedrooms, kitchens, public areas etc.*

CO_2 Certificate for Hotels

CO_2 Performance Rating

The figures in the bands represent *actual* CO_2 emissions per guest night for a hotel. ($kgCO_2$ per guest night)

Zero Carbon

A 0 - 5

Typical Hotel Emissions 2050

B 6 - 10

C 11 - 15

D 16 - 20

Typical Hotel Emissions 2009

E 21 - 25

F 26 - 30

G 31 – 35

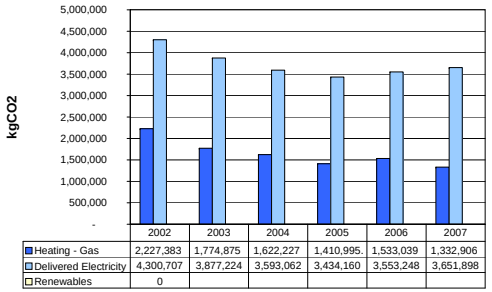
High CO_2 intensive

Technical Information

Main heating fuel	Gas
Building Environment	Air-conditioned (Public Spaces)
Total Useful Floor Area(m^2)	7,000
Energy from Renewables	0%

Previous CO_2 Emissions ($kgCO_2$)

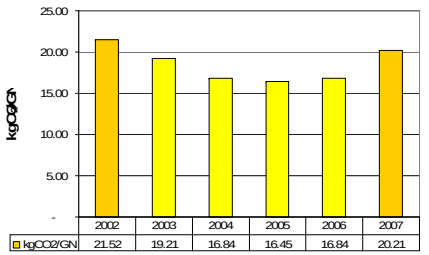
Delivered Electricity & Gas (*$kgCO_2$*)



	2002	2003	2004	2005	2006	2007
Heating - Gas	2,227,383	1,774,875	1,622,227	1,410,995.	1,533,039	1,332,906
Delivered Electricity	4,300,707	3,877,224	3,593,062	3,434,160	3,553,248	3,651,898
Renewables	0					

Previous CO_2 Emissions ($kgCO_2$/gn)

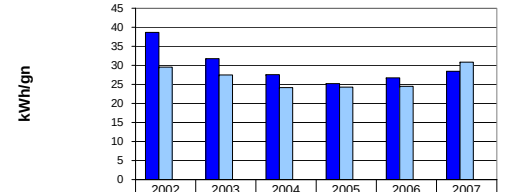
CO_2 Emissions per guest night



	2002	2003	2004	2005	2006	2007
kgCO2/GN	21.52	19.21	16.84	16.45	16.84	20.21

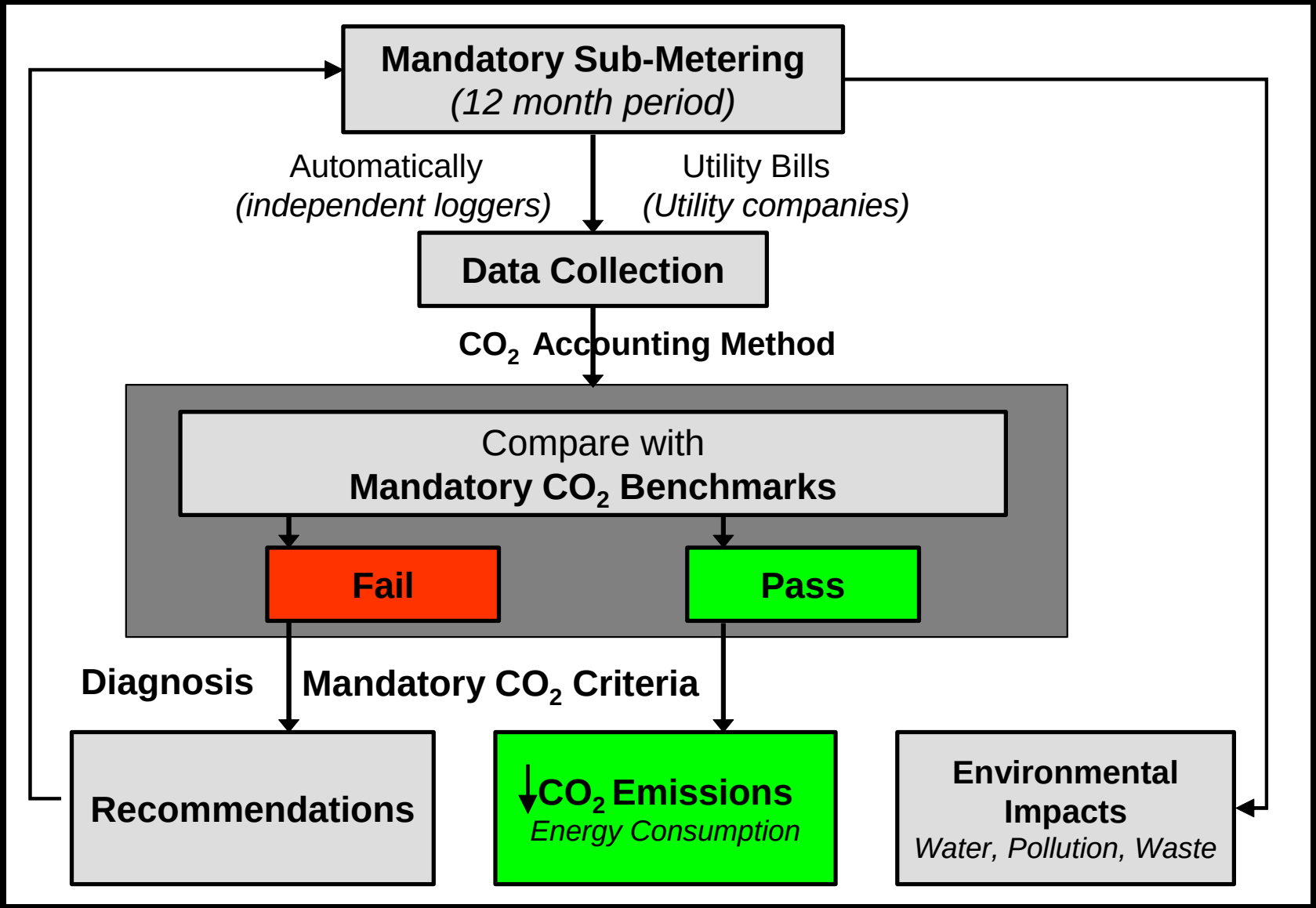
Delivered Energy Consumption (kWh/gn)

Delivered Energy Consumption per guest night (*kWh/gn*)



	2002	2003	2004	2005	2006	2007
Heating - Gas	39	32	28	25	27	28
Delivered Electricity	30	27	24	24	25	31
Renewables	0					

Proposed example of mandatory CO_2 certificate for hotels


Mandatory Sub-Metering
(12 month period)
Automatically
(independent loggers)
Utility Bills
(Utility companies)
Data Collection
CO_2 Accounting Method
Compare with
Mandatory CO_2 Benchmarks
Fail
Pass
Diagnosis
Mandatory CO_2 Criteria
Recommendations
CO_2 Emissions
Energy Consumption
Environmental Impacts
Water, Pollution, Waste

‘Green’ hotel vs Conventional Hotel

53 kgCO_2/gn

High Carbon Energy Supply
High Energy Demand
Low Energy Efficiency

7 kgCO_2/gn

Low Carbon Energy Supply
High Energy Demand
High Energy Efficiency

Study Hotel 2
Kunfunadhoo Island Maldives

Description of Hotel

Study hotel 2 is a luxury 6 star island resort built in vernacular style. The resort comprises 65 guest villas, some with private pools and gym. Other facilities include: Conference Room, Gym and Spa.

Facilities

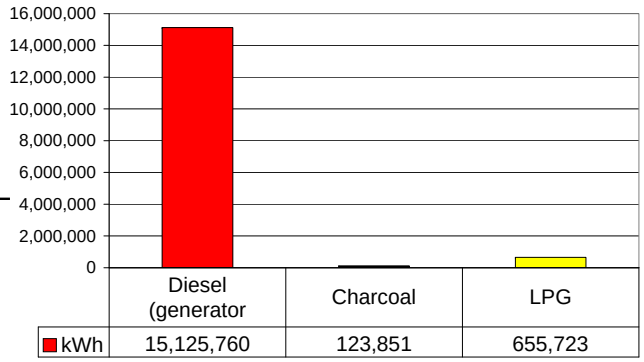
- 65 Guest Villas (all A/C)
- 38 Private Pools
- 1 restaurant and bar
- Spa and gym
- Library, conference room
- Dive Centre

Key Features

- Proposed Zero Emission Plan
- Deep sea water cooling system for air-conditioning.

Key Performance Indicator	
$kgCO_2$ per *guest* *+staff* night	**96** ***(+staff 22)***
$kgCO_2$	**3,962,488**

Delivered Energy Supply (kWh)



Key Facts	
Logo	
Certification	Green Globe
Date of Certification	
Surface/ Bed	287
Hotel Type	Vacation, resort
Location	Waterfront
Year Built	
Hotel Area (m^2)	18,650
Number floors	Single storey
Bedrooms	65 (villas)
Restaurant	Yes
Conference	Yes (1 room)
Swimming Pool	38 (private)
Jacuzzi or Spa	Yes
Laundry	Yes
A/C	Yes

Some Considerations

Use Of Normalization Factors

Are they simply compensating hotels for their increased energy usage and provides a license to have a greater environmental impact?

- By making all hotels accountable for their energy use and emissions, hotels could compensate for any factors that affect their energy use through good design and operation instead.

Low Carbon Electricity

Should a hotel be allowed to use large amounts of energy just because it’s low or zero carbon?

Exceptions - if a hotel built over a hot spring wanted to have a heated outdoor swimming pool operating all the winter, then clearly it should be able to without penalty.

kWh/m^2 ?

An energy benchmark is measurable and widely understood and a CO_2 benchmark involves a calculation related to fuel mix using the appropriate published conversion factor.

A focus on $kgCO_2/gn$ ensures that the efficiency of providing the service i.e. accommodation is credited, rather than simply providing space, which may be over provided due to poor planning and design, or serviced unnecessarily due to poor controls and management.

Some thoughts

Environmental Diversity

Increase morphological possibilities of architectural form

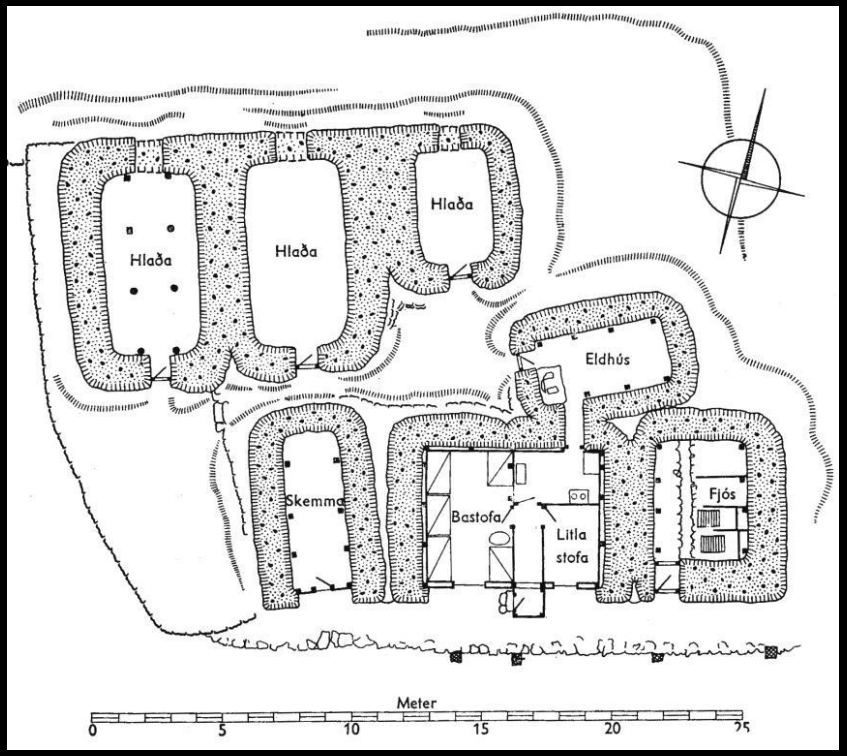
Embrace ’real nature’

Naturally, ventilated, daylit buildings with user controls set in an accessible, naturalised landscape into which nature is welcomed.’

(Baker in Steemers and Steane, 2004)

Interior view of Dining Hall, Blackwell designed by Baillie Scott, 1897.

Evolutionary background important to our response to the built environment



Iceland, 18th C farmstead
(Courtesy of Professor Dag Nilsen)

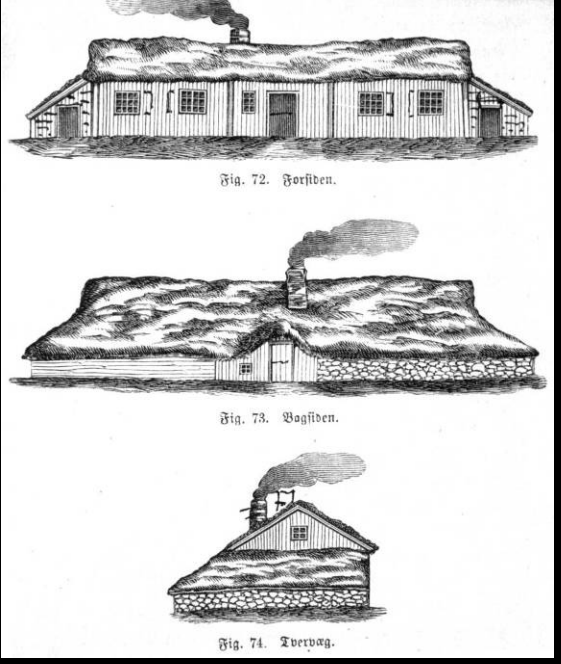
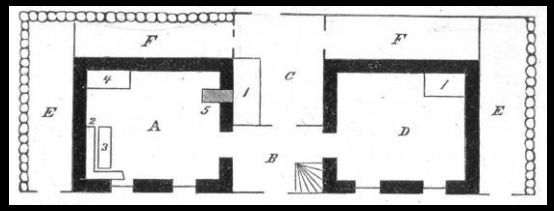


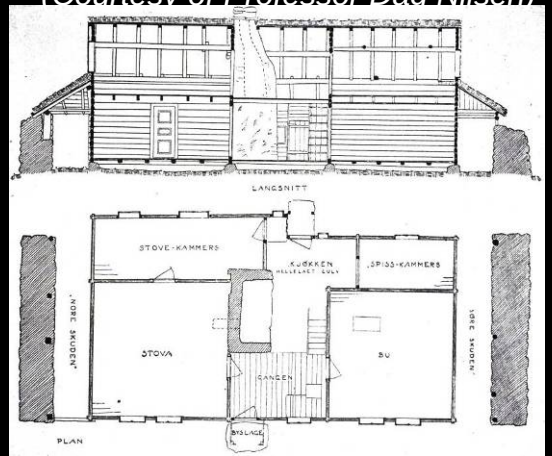
Fig. 72. Forsiden.

Fig. 73. Bagsiden.

Fig. 74. Tværvæg.



The typical dwelling house of Jæren, after Eilert Sundt 1862
(Courtesy of Professor Dag Nilsen)



Jæren, South West Norway

Some thoughts

Is PassivHaus the only approach? In order to meet performance benchmarks are we forgetting human's relationship with nature? Is the future of sustainability about passing benchmarks?

Evoluntionary background important to our response to the built environment

Human Instinct: Do we as humans want to work/live in controlled, deterministic environments?

(*Skellig Michael* is) *"an incredible, impossible, mad place. I tell you the thing does not belong to any world that you and I have lived and worked in; it is part of our dream world."*
-George Bernard Shaw

Hermit's 'Bee-Hive' stone huts, Skellig Michael, Ireland

Tusen Takk.
Go raibh *míle* maith agat.
Thank you.