Retro fit in perspective

Lessons learnt in Denmark

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Lessons learnt

- Driven by Change
- “Denmark was one of the hardest hit by the 1973 oil crisis and it has bounced back to become one of the exemplars for national energy efficiency and generation”
- “Today Denmark is one of the leaders in energy efficiency in the EU, being virtually self-sufficient in energy, a net exporter of oil and gas, and having the lowest energy intensity among the member countries”

Source: NHBC

DK Housing Stock

- 80% of housing stock is present in 2030
- 2.9 domestic buildings consuming 40% of the national energy production
- Annual spending £40bn to domestic heating
- 11M tonnes of C02
- 1979 first increased demand to insulation (cavity)
- 500,000 houses is built before 1979
- 100,000 more than 100 years old
- Generally houses <1970ies 50-100 mm roof insulation
- Copenhagen (1M) declare carbon neutral city by 2025

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Mile stones

Government subsidise cavity and roof insulation, Gas use and District heating

First legislation to cover the sector

No driving on Sundays

Legislation tightened in particular around insulation

DK independent of oil

Legislation tightened in particular around insulation

1960 1973 1979 1982 1991 1995

Yom Kippur war

Iran revolution

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The waves

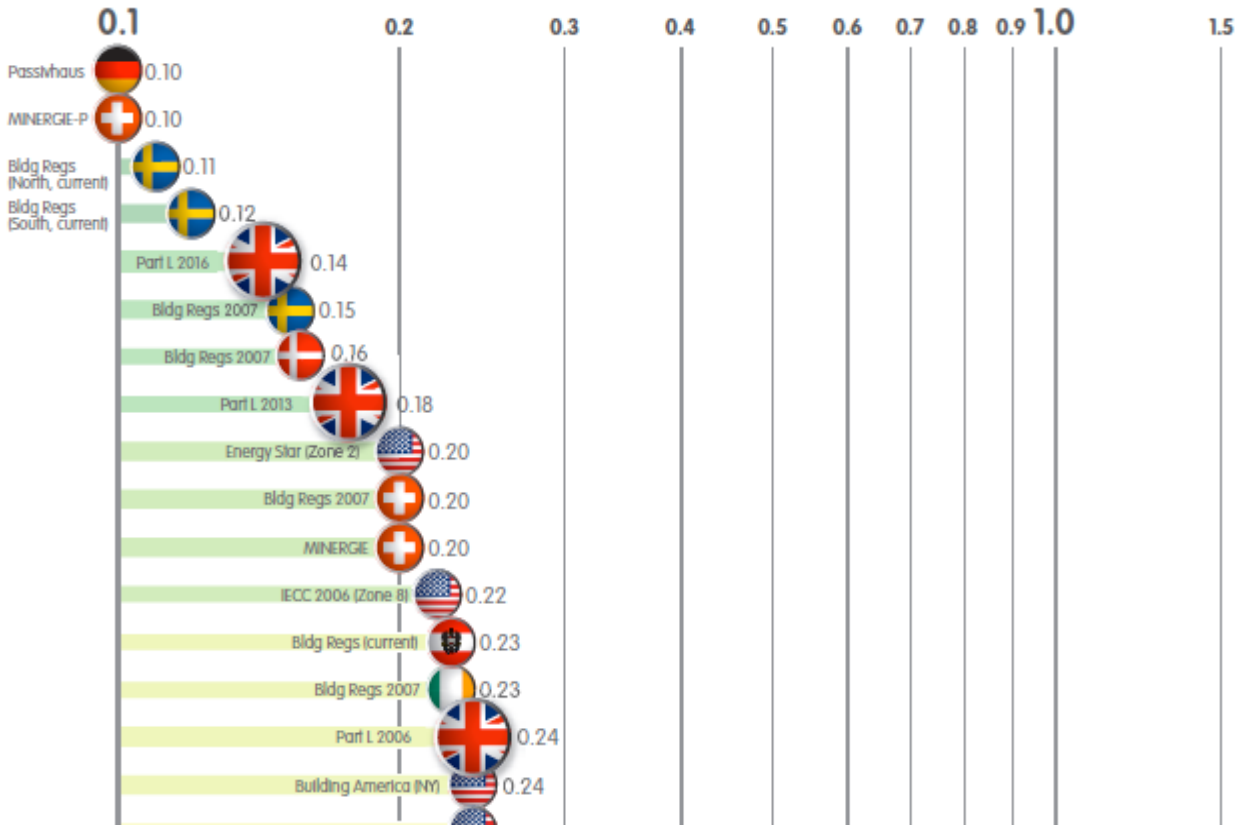
- Denmark have seen 4 waves in upgrading
  - 1960ies houses lofts was insulated with 50mm as building reg. stated demands around fire regulation of ceilings
  - 1970ies subsidising increased insulation to reduce energy consumption e.g. loft with 100mm and cavity to 110mm
  - 1982 Revamp of the whole regulation here came an increase on loft thickness to 200mm. Thermo glass (Double glazing) standard
  - 1995 upgrading regulation - now loft is increased to 300mm and overall building U-value lowered (building seen as a whole, not product by product
  - 1990ies and onwards DIY period

Building regs.

- BRE compared in 2007 Scotland regulations to Denmark, Sweden, Norway including local adjustments
- In all situations was Scotland below the Scandinavian countries

Figure 3

Averaged U-values for floors, roofs and walls (W/m²K)



Retro fit – example 1

- House from 1927 (3 bed room)
  - Annual consumption 332 kwh/m2/yr (building reg. states 55kwh/m2/yr)
  - Upgrading included
    - Increasing loft insulation from 50mm to 300mm
    - Cavity insulation (NB not all houses have cavity walls 1920-1940ies)
    - Secondary glass
    - Thermostats
  - Consumption dropped to 140kwh/m2/yr
    - CO_2 reduction of 8 tonnes
  - Building costs £18,000 (repaid via mortgage at £950 per year)
  - Savings in heating bill £1,500 yearly

Part of Rockwool test projects

Retro fit example 2

- Detached house from 1970
- Annual consumption 233 kwh/m2/yr (building reg. states 55kwh/m2/yr)
- Upgrading included:
    - Insulation of wall, foundation and loft
    - Upgrading certain parts of roof
    - Replacement of windows and external doors
    - Replacement of boiler
    - Installation of heat exchanger

- Consumption dropped to 90kwh/m2/yr
- Building costs £3,000
- Savings in heating bill £2,000 yearly
- Comments from owner “We used to freeze over winter period with draught and cold walls, now we have improved life quality and comfort”

Part of Rockwool test projects

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1920 -1940

1960-1970

1990-2010

internal

internal

Danish lessons learnt

- It shows
  - The last 10 years , 30% of all articles published is about energy, environment and indoor climate
  - Upgrading domestic houses cannot always justify the invested capital
  - The dwelling must be seen as a whole (evaluation of all aspects as a “place of living”)
  - In the present housing stock, where investment is smaller than pay back, 80% of its present energy consumption can be reduced (already on 2035 a reduction of 35% can be expected)
  - Loans for upgrading must be attractive and targeted

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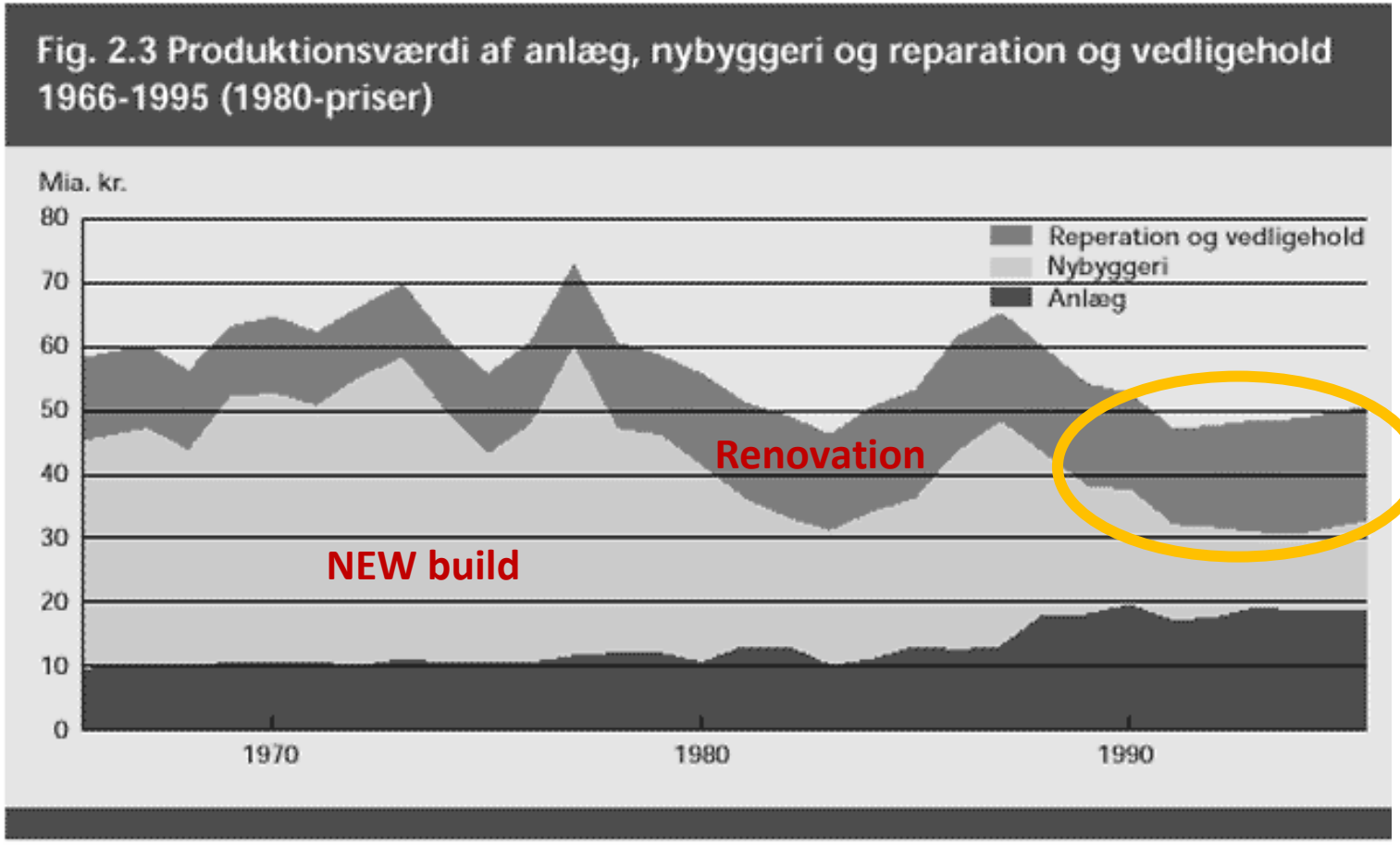
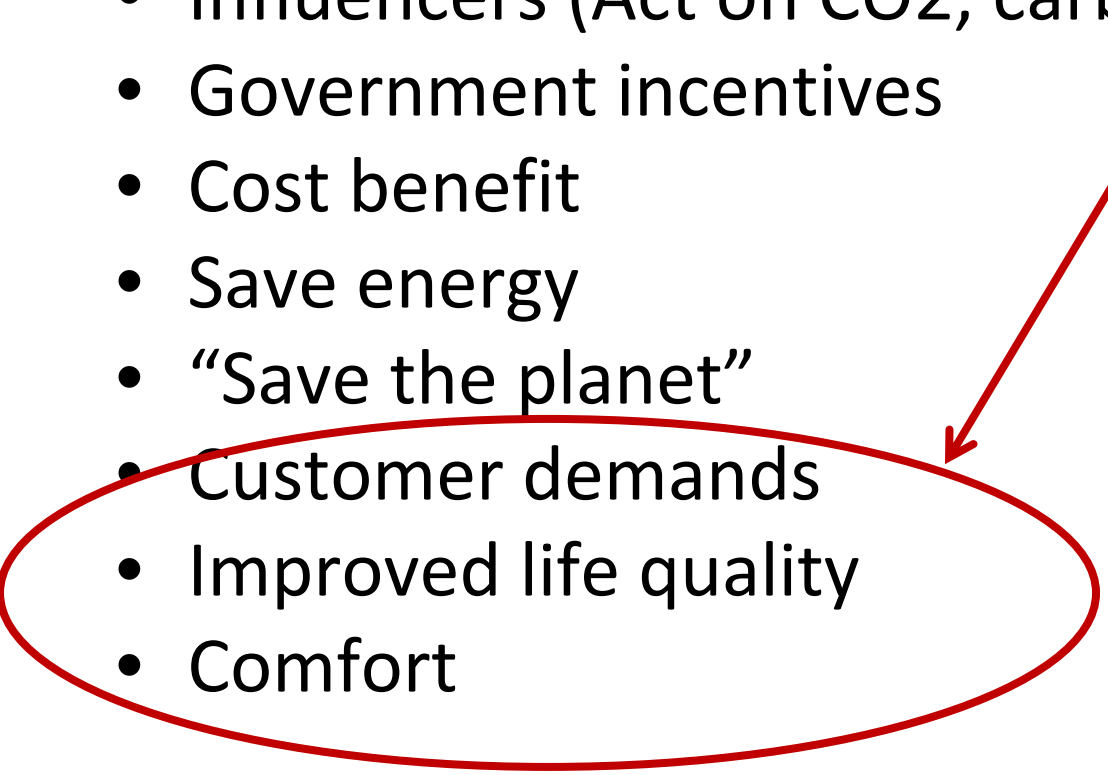
Drivers for Danes



Kilde: Benchmarking af de danske ressourceområder, Erhvervsfremme Styrelsen 2000.

Drivers

- Legislation
- Influencers (Act on CO2, carbon trust etc)
- Government incentives
- Cost benefit
- Save energy
- “Save the planet”
- Customer demands
- Improved life quality
- Comfort



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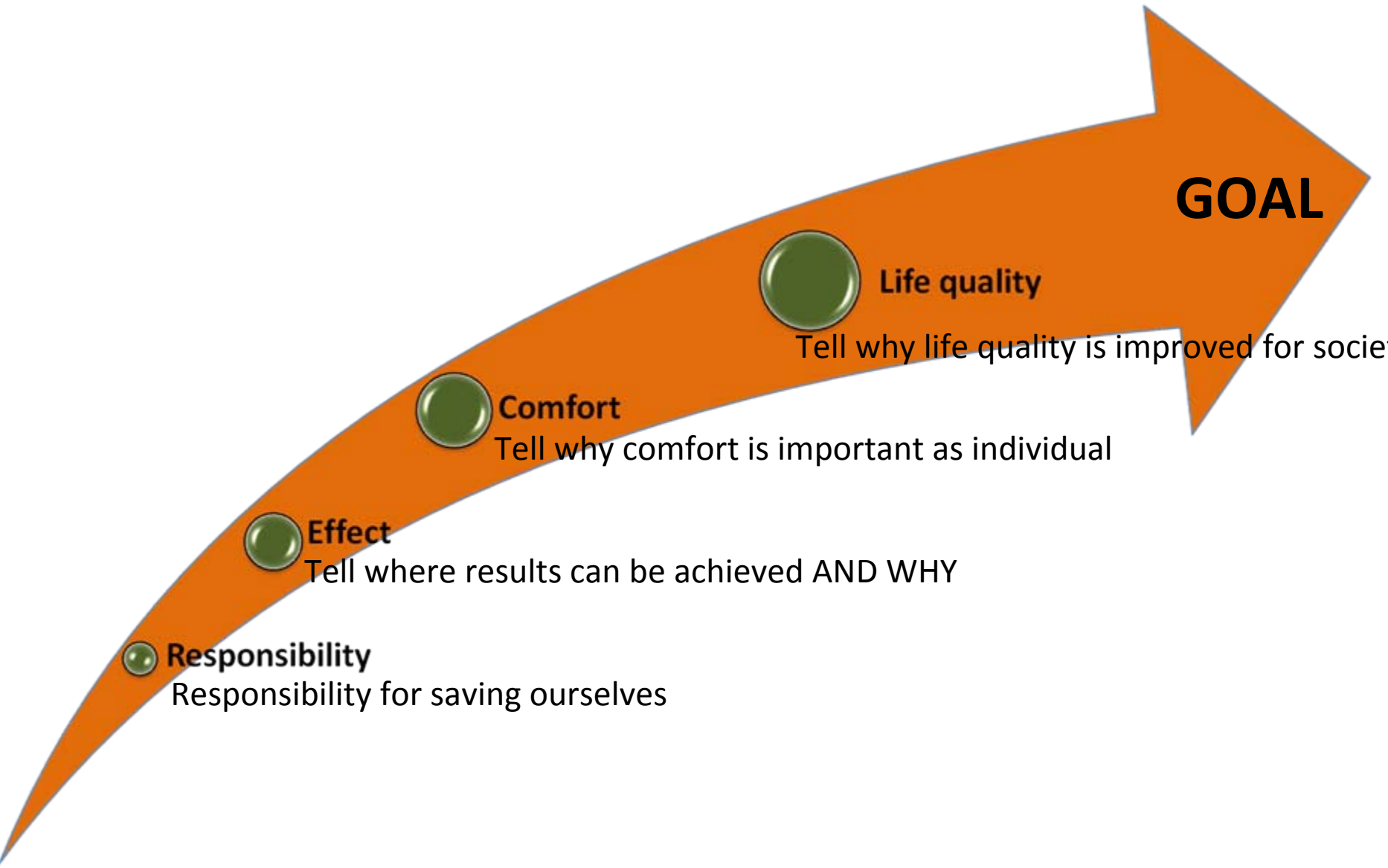

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