



Did it work: Evaluating the multiple benefits of energy efficiency

Buildings: Session 8

*Buildings energy
efficiency sessions
in partnership with:*



INDO-SWISS BUILDING
ENERGY EFFICIENCY PROJECT

UCL **ENERGY**
INSTITUTE



1. **Where to start:** Understanding energy use in buildings
2. **Where to start:** Energy efficiency potential in buildings
3. **Toolkit:** Energy efficient building design
4. **Toolkit:** Energy efficient building technologies

Where do I get help? IEA's Technology Collaboration Programmes

5. **Toolkit:** Enabling investment with energy efficiency policies
6. **What are the steps :** Building energy codes and standards

Site Visit: Schneider Electric

7. **What are the steps:** Set targets and develop policies
8. **Did it work:** Evaluating the multiple benefits of energy efficiency
9. **Did it work:** Tracking progress with energy efficiency indicators

Where do I get help? International and regional energy efficiency initiatives

10. **Energy Efficiency Quiz:** Understanding energy efficiency in buildings

8. Did it work: Evaluating the multiple benefits of energy efficiency

Trainers: Brian Dean and John Dulac

Session: 1 hour

Purpose: To teach the fundamentals of how to evaluate both energy and non-energy benefits (the multiple benefits) of energy efficiency for buildings. This course will use work that has been completed to evaluate the monetised value of energy efficiency measures using numerous categories for multiple benefits.

Scenario: You understand that there are more benefits to energy efficiency beyond just the energy savings. *How do you determine the benefits of your policies and programmes?*

Multiple Benefits of Energy Efficiency

The publication

Energy Efficient Prosperity



Multiple Benefits of Energy Efficiency

International

- Energy price reduction
- Greenhouse gas emissions reduction

National

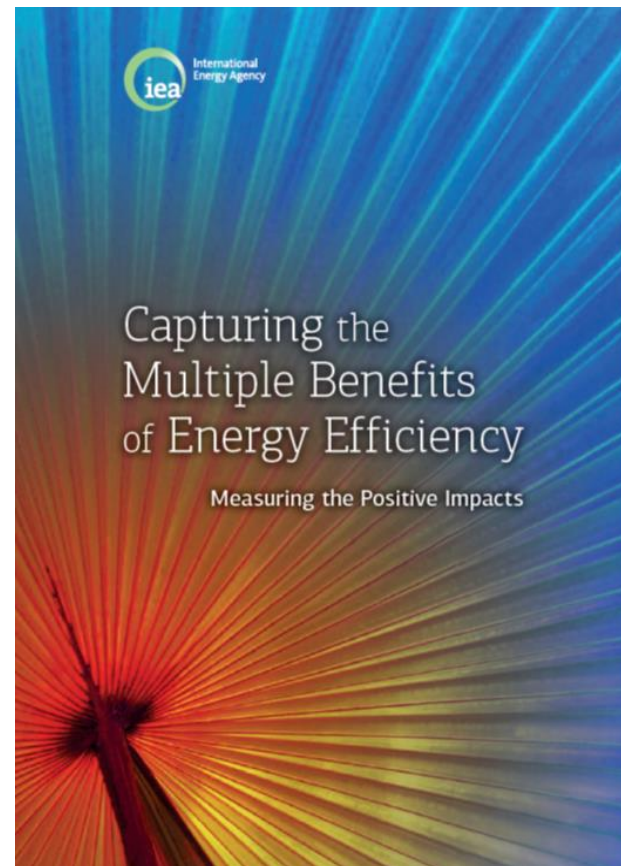
- Reduced energy demand and local price reduction
- Reduced public health spending
- Energy security
- Potential net increase in employment

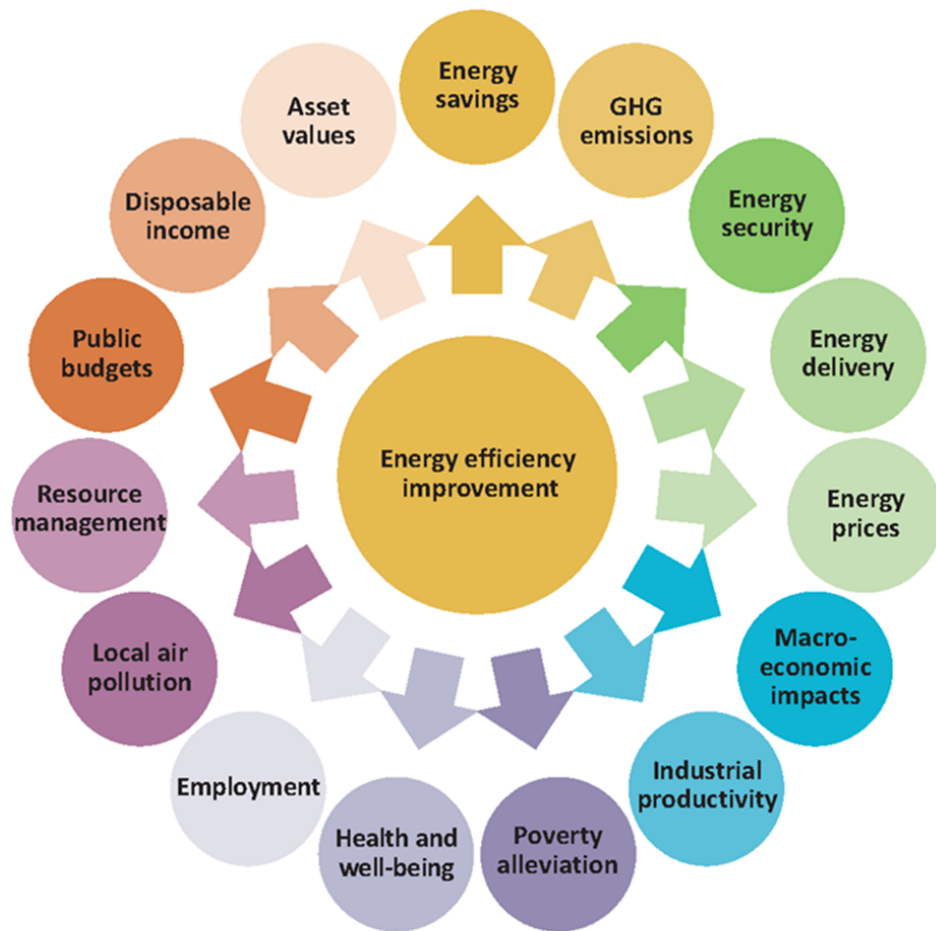
Sectoral

- Increase in re-sale value of home
- Improved bill payments for energy providers
- Jobs in installation and production of insulation materials

Individual

- Lower energy bills (discretionary)
- Increased disposable income
- Warmer, drier, more comfortable home
- Improved health and well-being potential





Energy Efficient Prosperity

Energy efficiency as
a means to support
economic and social
development.

The benefits by perspective

Owner and occupant

Societal / macroeconomic

City and national / public budgets

Industry / energy provider



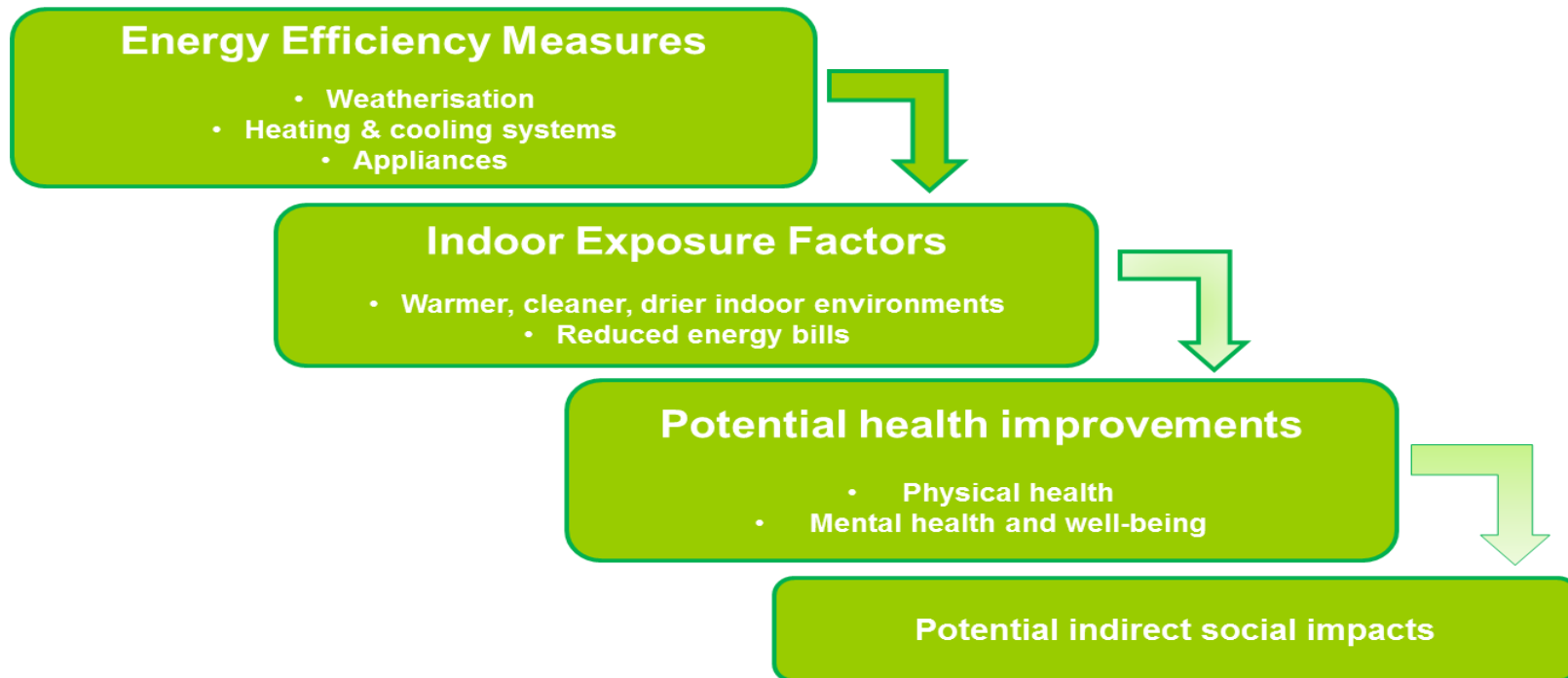
Multiple Benefits of Energy Efficiency: owner and occupant perspective



Comfort	Improved lighting comfort, thermal comfort and noise comfort
Health	Improved physical and mental health from indoor air quality and comfort.
Operations and maintenance	Improved building and systems durability with reduced need for maintenance.
Safety	Improved safety through lighting, controls and reduced chance of fire from gas leaks.
Property Value	Increased rental income, reduced tenant turnover, increased habitable floor area.

Benefits for owners: increased quality & property value

Benefits for occupants: increased health, comfort, safety and affordability



Example: Carefully executed energy efficiency can deliver USD 99 billion in annual savings for Europe's public health sector by 2020

Multiple Benefits of Energy Efficiency: lighting

Poor visibility



More energy use

Better light quality



Less energy use

Improved lighting has **improved safety** in Nova Scotia, Canada

Based on existing studies and best estimates:

- **Increased** lighting levels by **up to double** has limited effect – best estimate 5% reduction but not statistically significant
- **Increased** lighting levels **two and five times** the original level – number of accidents occurring in the dark is reduced by 10%
- **Increased** lighting levels **by more than five times** the original level, the effect on accidents is as great as when an unlit road is lit, reduction in the number of accidents involving personal injury in the dark of around 30%

At the building level, lighting can improve safety, increase security and improve the value of the building.

Lighting controls and sensors can further increase security while reducing energy use and light pollution

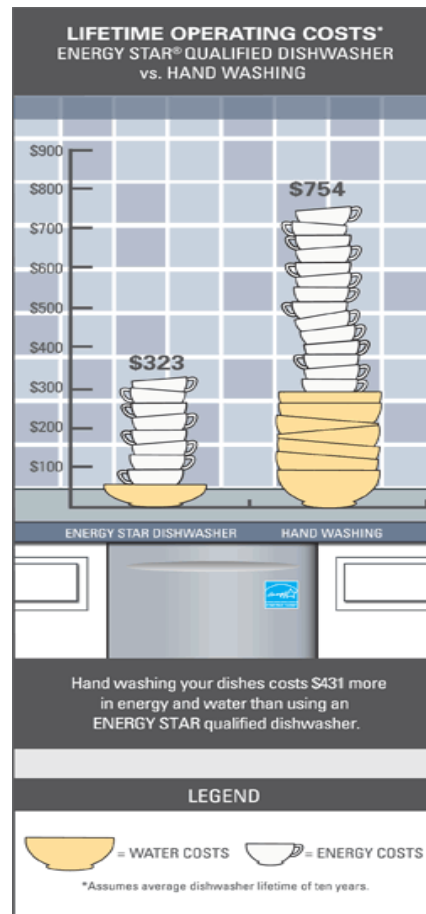
Multiple Benefits of Energy Efficiency: washing equipment



Energy efficient clothes and dishwashers can be better than hand washing...

Others Benefits:

- Reduction in electricity and water consumption
- Reduction in energy and time required for drying
- Extending clothes lifetime
- Higher capacity = saves time



- **labor productivity:** increase by 6–16%
- **students' test scores:** shows ~20–26% faster learning
- **Influenza and cold rates:** can decrease by as much as 20%, resulting in a USD10 bln/yr savings in US alone
 - reduced respiratory disease;
 - reduced allergies and asthma;
 - reduced sick building syndrome;
 - direct improvements in worker performance unrelated to health
- **Employment (local job creation):** Danish trade union study finds 100% increase in employment intensity than for other mitigation options

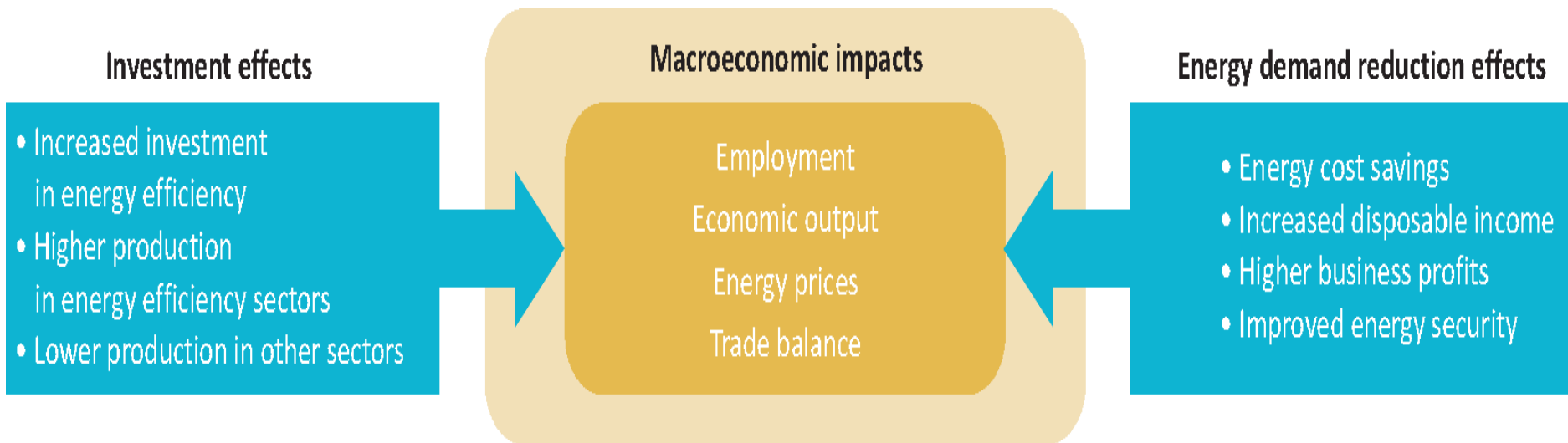
Multiple Benefits of Energy Efficiency: societal perspective



Jobs	Shifting from global to local jobs and from polluting to green jobs
Economic	Investment that provides economic benefit for many years.
Emissions	Reduced direct and indirect emissions from efficiency, refrigerants and reduced product size / quantity.
Energy	Energy use benefit from improved efficiency and reduced embodied energy from increased durability
Environmental	Air pollution, solid waste, wastewater, and reduced input materials

Benefits: broader benefits that last for many years.

Multiple Benefits of Energy Efficiency: macroeconomic impacts



Moving away from the traditional view that economic performance is always linked to increased energy consumption – the reverse can also be true!

Multiple Benefits of Energy Efficiency: cities and national perspective



Energy access	Expand access to supply power to more people through the existing energy infrastructure.
Economic development	Supporting economic growth including through industrial productivity and reducing fuel import bills.
Poverty alleviation	Increasing the affordability by reducing the per-unit cost of lighting, heating, refrigeration, etc.
Combatting local pollution	Reducing direct and indirect emissions through energy efficiency on supply side and demand side.
Climate change resilience	Reducing vulnerable energy infrastructure and improving the durability of buildings.

Benefits for cities and nations: supporting key government goals

Multiple Benefits of Energy Efficiency: impacts on public budgets



Sales tax revenue from sales of energy efficient products and services

Income



Sales tax revenue from other goods when crowded out by energy efficiency

Income



Initial costs of public investment in energy efficiency products and services

Expense



Expenditures on health, social welfare and unemployment benefits

Expense



Revenues from real estate transactions if properties become more valuable

Income



Energy efficiency can be both a expense and income for public budgets

Multiple Benefits of Energy Efficiency: impacts on public budgets



Expenditures on public sector energy consumption

Expense



Energy subsidies to final consumers

Expense



Energy excise duty, emissions trading, and carbon tax revenues

Income



Sales and income tax revenues from sales of goods and services

Income



Public investment in energy supply infrastructure and subsidies

Expense



Energy efficiency can be both a expense and income for public budgets

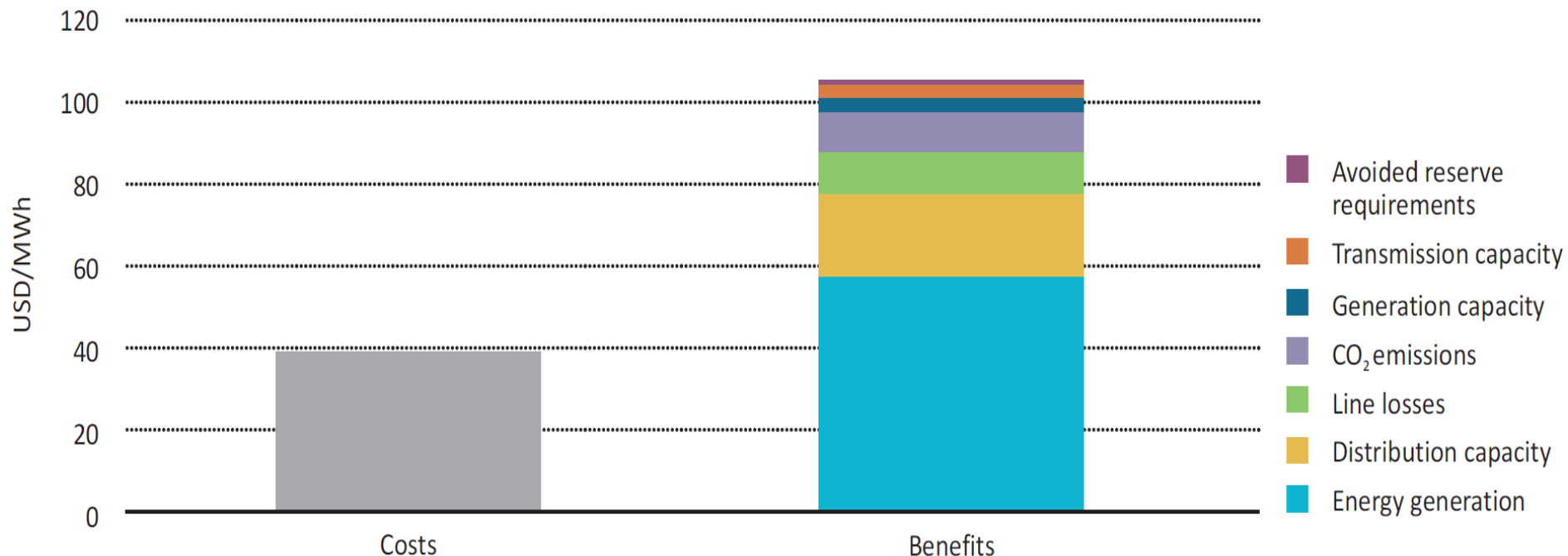
Multiple Benefits of Energy Efficiency: industry perspective

Competitiveness	Ability to enter new markets, reduced production costs, etc.
Production	Capacity utilisation, improved product quality, etc.
Operations and maintenance	Improved industrial and commercial operation; reduced need for maintenance, etc.
Working environment	Site environmental quality, worker health and safety, etc.
Environment	Air pollution, solid waste, wastewater, reduced input materials, etc.

Benefits for industry: increased productivity & value creation

Benefits for consumers/indirect benefits for industry: increased affordability and access to products and services

Multiple Benefits of Energy Efficiency: energy provider perspective



Benefits for utilities: cost and operational benefits in a resource constrained operating context
Benefits for consumers/indirect benefits for utilities: increased affordability reduces customer default

Scenario:

You understand that there are more benefits to energy efficiency beyond just the energy savings.

How do you determine the benefits of your policies and programmes?



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