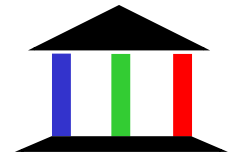


Cost efficiency of PVC products will speed up sustainable development (SD)

Making use of economical advantages!

- 1. SD: Taking economical cost into account!**
- 2. Achieving environmental (social) gains!**
- 3. Summary**



Cost efficiency of PVC products will speed up sustainable development (SD)

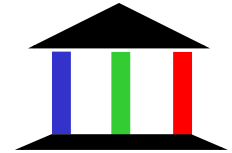
Making use of economical advantages!

1. SD: Taking economical cost into account!

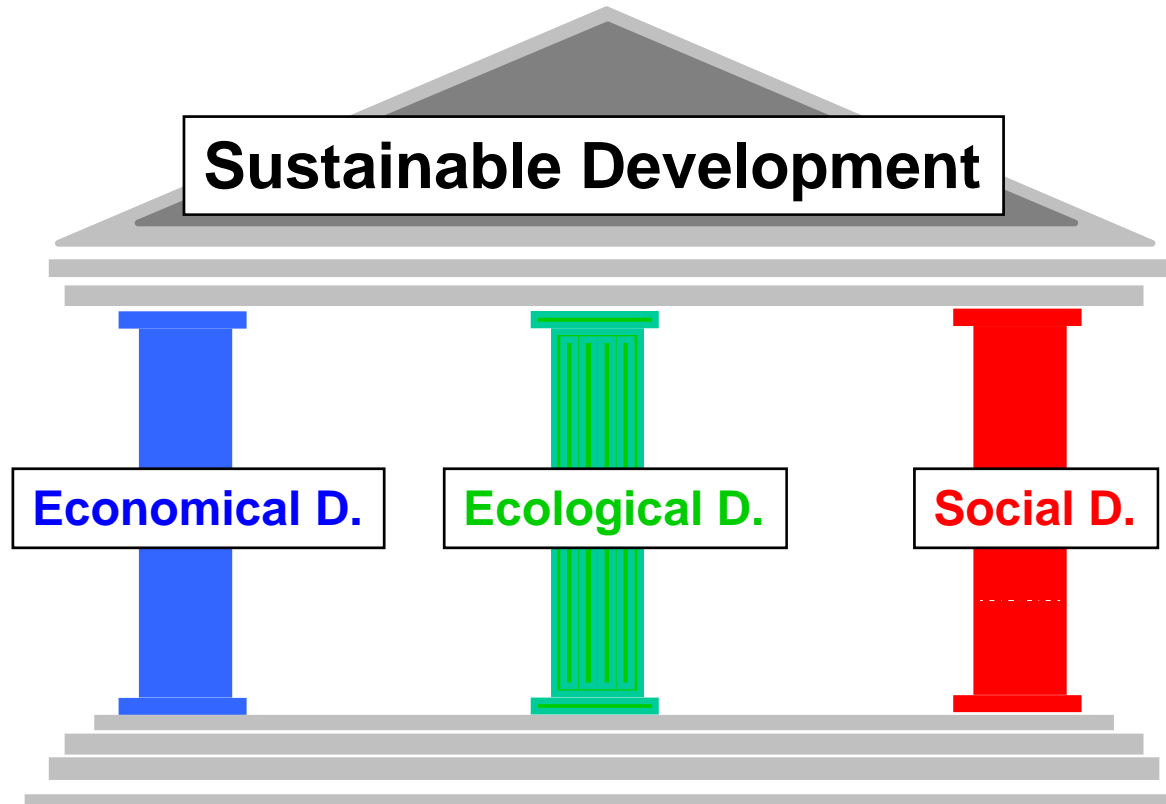
“Three Pillar Model” of Sustainable Development (SD)

Environmental cost: How to quantify it?

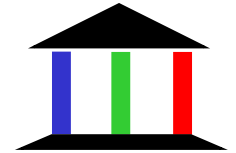
Highest efficiency for SD with low cost (PVC-)products!



1.1 “Three Pillar Model” of Sustainable Development (SD)

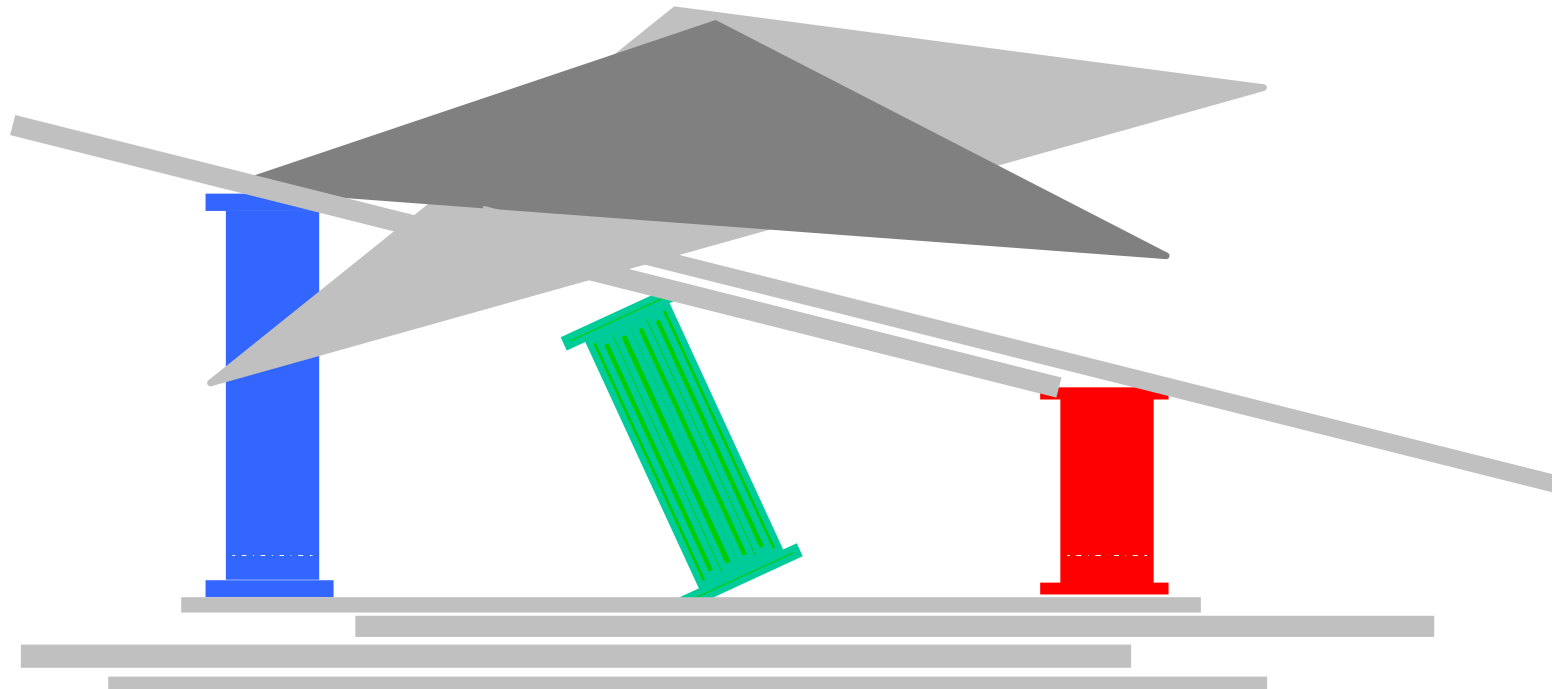


Three pillars support SD!

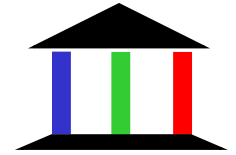


1.1 “Three Pillar Model” of Sustainable Development (SD)

“Implicit fourth pillar”: Technical, functional sustainability



**Technical, functional sustainability
implicitly taken as ok.!**



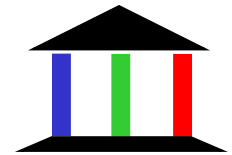
1.2 Environmental cost: How to quantify it?

Economical cost (price) is not difficult to quantify (take care of subventions etc.)

But: “True cost?”

Cost of environmental impacts is not included (external cost)

¿How can we quantify environmental impacts? (e.g. climate effect?)



1.2 Environmental cost: How to quantify it?

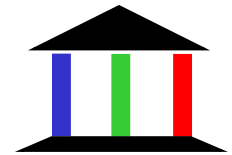
The most simple answer:

Avoid e.g. greenhouse gases and account for the cost to avoid it!
(avoidance cost)

Different possibilities to avoid emissions, to avoid use of energy, etc.:

- **Save energy for heating/cooling** – better thermal insulation of houses...
- **Higher efficiency in production of electricity, heat, mobility** – cogeneration of heat and electricity, light cars...
- **Use of renewable energy/material resources** – solar power/PVC from bio-ethylene
- **More modest life-style**
-

Choose the least expensive, most efficient ones!



1.3 Highest efficiency for SD with low cost (PVC-)products (a potential)

Renewable resources to produce PVC (“only 44% of bio-ethylene necessary”):

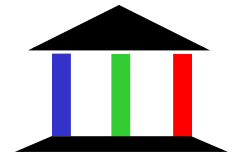
- **Bio-ethylene from 1st generation bio-ethanole** (Solvay Indupa-Brazil etc.; sugar, starch)
- **Bio-ethylene from 2nd generation bio-ethanole** (“whole plant”)

PVC: A low cost material:

- **Save money and use it for environmental (social) optimisation!** (society, government, ...!)

Cost efficiency of PVC products will speed up sustainable development

Making use of economical advantages!



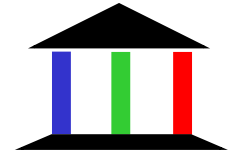
2. Achieving environmental (social) gains!

Optimising SD: Saving climate (and social) effect

Huge environmental optimisation potential of low cost products

After optimization? Compensation!

Climate neutral services, products (PVC-pipes, cars)



2.1 Optimising SD: Saving climate effect, examples

Saving climate effect

- * **Many small and big optimisation steps** (better heat insulation (hot and cold climates), mobility (lighter cars), machinery with low energy demand,)
- * **Changing the way of life**

Saving climate effect in the chemical industry

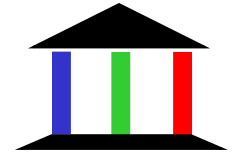
- * **Many small and big optimisation steps** (high efficiency cogeneration of electricity and steam, reuse of waste heat, membrane electrolysis,)
- * **Use of bio-based ethylene, ...**

2.2 Optimising SD: Improving social effects, examples

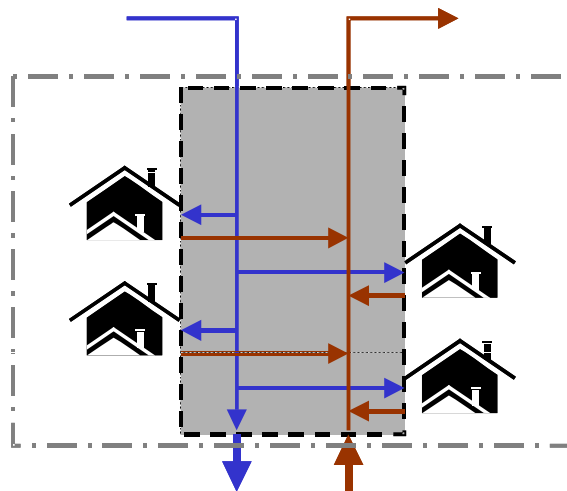
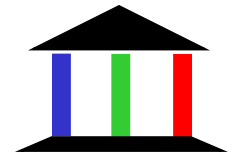
Improving medical care, education, safe water supply etc.

All this costs money!

2.3 Huge environmental optimisation potential of low cost products (e.g. PVC-pipes)



2.3 Huge environmental optimisation potential of low cost products (e.g. PVC-pipes)



Study for pipes: Drinking water and waste water for 21 houses

Ecological impact calculated via LCA (L. Reusser, „Ökobilanz von Rohrleitungssystemen“. EMPA St. Gallen, März 1998),

Economical impact via LCC (VCI cost study together with above LCA-study (1994))



2.3 Huge environmental optimisation potential of low cost products

(e.g. PVC-pipes)

Results:

	Product A PVC pipe system	Product A' + low cost CO2-saving	Product B non PVC pipe systems (stoneware, iron, PE)
Energy demand (GJ)	- 495	+13 000	- 523, ..., 676
Greenhouse (t CO ₂)	- 25	+ 725	- 24, ..., 34
Cost (Euro)	- 68 000	- 83 100	- 83 100, ..., 91 000

Ecological impacts not very different!

Cost advantage of 15 100 €, use for saving CO₂

Most efficient saving of CO₂ cost ~ 20 €/t CO₂, i.e. 15 000 € save ~ **750 t CO₂!**)

2.3 Huge environmental optimisation Potential of low cost Products (e.g. PVC-pipes)



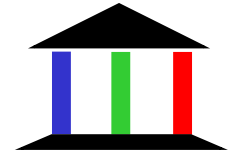
First summary:

- Few % in cost difference can be used (governments, society, individuals) to save huge amounts of greenhouse gas (“CO₂”)!
- No other strategy more efficient!

Our task:

- Communicate this fact!
- Our low cost products are most “eco-efficient”!

- More expensive alternatives are less “eco-efficient”, whatever their ecological footprint!



2.4 After optimisation? Compensation!

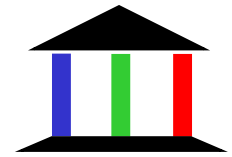
Finance as much greenhouse gas savings as are created by

services (e.g. flight from Germany to Columbia),
products (e.g. PVC pipe)
and increase price by this amount.

This results in

“Climate neutral services“

“Climate neutral products”

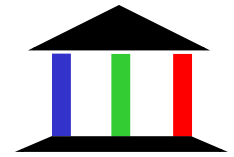


2.4 After optimisation? Compensation!

2.4.1 “Climate neutral Services”

E.g.: “Climate neutral flights”

- * **With flights (to a conference etc.) one creates greenhouse gas emissions**
Example: Flight Munich – Cartagena – Munich creates some 5 to 7 t/p of CO_{2equiv} (effective)
- * **Financing of greenhouse gas saving activities saves greenhouse gas emissions**
Example: A solar heat instead of a Diesel based hot water plant saves greenhouse gas emissions at costs of ~ 20 €/t CO₂ saved
- * **Compensation of flight greenhouse gases with additional surcharge ticket (voluntarily paid)**
Example: In above example this surcharge ticket for a climate neutral flight costs some 130 € (for more information see e.g. www.myclimate.org, www.atmosfair.de ... (Lufthansa, Swiss-Air,))



2.4 After optimisation? Compensation!

2.4.2 “Climate neutral products” (CnP)

E.g.: Comparison of a „normal“ or a „carbon neutral PVC-window“

A „normal“ PVC-window“

= PVC-window (as up to now) →



Production etc.
emits ca. 135 kg CO₂

A „carbon neutral PVC-window“

= PVC-window (as up to now)
+ e.g. solar power plant
A small part is enough!

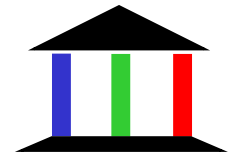


Production etc.
emits ca. 135 kg CO₂



Solar power
saves CO₂

Both together = **0 kg CO₂**
= „Climate neutral PVC-window“!



2.5 Climate neutral PVC-products: (e.g. pipes)

Ecobalance results:

ca. **25 t CO₂**, 495 MWh primary energy demand, ...
(serving 21 houses for waste and drinking water, incl. laying of pipes)

Life Cycle Cost (LCC): ca. **68 000 €**

Cost of CO₂-compensation: ca. **20 €/t CO₂** (efficient saving activities financed e.g. via www.atmosfair.de)

„Normal PVC-Pipes“

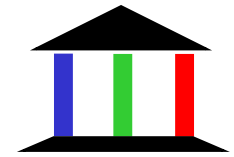
Economic Cost: 68 000 €

Ecobalance: ca. 25 t CO₂, 495 MJ primary energy demand, ...

„Climate saving PVC-pipe system“

Economic Cost: 68 500 € (= 68 000 + 20 * 25)

Ecobalance: 0 t CO₂, ≈ 0 MJ primary energy demand, ...



2.5 Climate neutral products: (cars (e.g. VW Golf A4, 1.4 I, Otto))

Ecobalance results: ca. **30 t CO₂**, 124 MWh primary energy demand, ...

(incl. 150 000 km driving, 180 x washing, 10 x servicing)

(http://www.volkswagen-umwelt.de/_download/sachbilanz_golf_a4_deutsch.pdf)

Life Cycle Cost (LCC): ca. **56 000 €** (ADAC, incl. driving, washing, servicing)

Cost of CO₂-compensation: ca. **20 €/t CO₂** (www.atmosfair.de)

„Normal Car“

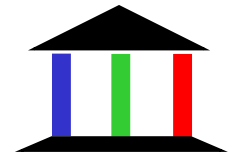
Economic Cost: 56 000 €

Ecobalance: ca. 30 t CO₂, 124 MJ primary energy demand, ...

„Cn Car“

Economic Cost: 56 600 € $(- 56\ 000 + 20 * 30)$

Ecobalance: 0 t CO₂, ca. 0 MJ primary energy demand, ...



2.6 Other environmental impacts compensated parallel with climate

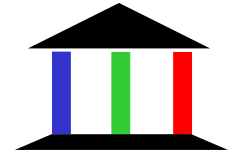
Other environmental (social) impacts compensated!

- * Saving Diesel oil incineration saves greenhouse gas emissions (CO₂),
 - + other emissions like CO, NO_x, ..., incl. carcinogens (PAH, fine particles),
 - + energy resources (non renewables)

- * It also saves environmental risks (oil transport spoiling etc.), social risks (“oil for blood” etc.)

Cost efficiency of PVC products will speed up sustainable development

Making use of economical advantages!

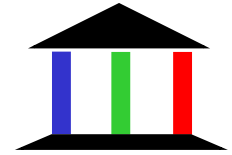


3. Summary

Importance of low cost products in SD

Some results

SD = Sufficiency + Efficiency + Compensation



3. Summary

3.1 Importance of low cost products in SD

Economic advantage is evident (also economic resources are scarce)

Social advantage

Not very rich people can better afford low cost products

Using low cost products saves money which can be invested into social development

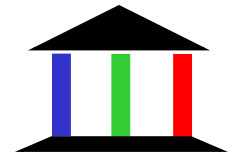
Ecological advantage

Using low cost products saves money which can be invested into ecological development

(Rebound effects?)

Positive rebound effects much higher than negative ones!

Encourage positive and prevent negative rebound effects (e.g. by supporting CnP!)



3. Summary

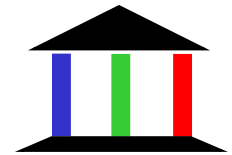
3.2 Some results

Economic pillar, very important for speeding up SD!

1% of economical cost is sufficient to compensate 100% of climate effect, energy demand!

Use low cost products and some part of the cost advantage to speed up SD!

No more efficient way to speed up SD exists!



3. Summary

3.2 Some results

Climate neutral products (CnP) are a huge step to sustainable consumption!

CnP are easy to realise!

Good LCA data on climate effect exist; organisations for CO₂-compensation are active!

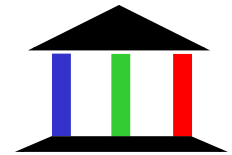
CnP integrate important external cost! - crucial for economical SD assessments!

e.g. climate effect, demand of non renewables, all LCA-results, ecological and social risks

CnP give a quantitative relation between ecological (LCA) and economical cost:

* with 1% of LCC (economic cost) one can compensate 100% of climate effect, 100% demand of non renewables and more

* economic potential to improve ecology is huge!



3. Summary

3.2 Some results

Social aspects can be integrated in a similar way:

“Fair Trade” products are a real example

Monetarian resources are scarce:

low cost products offer - connected with CnP – huge progress along SD

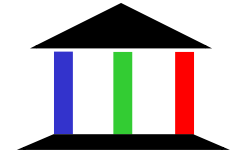
CnP are a big step towards SD at only 1% higher cost,

a solution to overcome the problem of growing consumption,

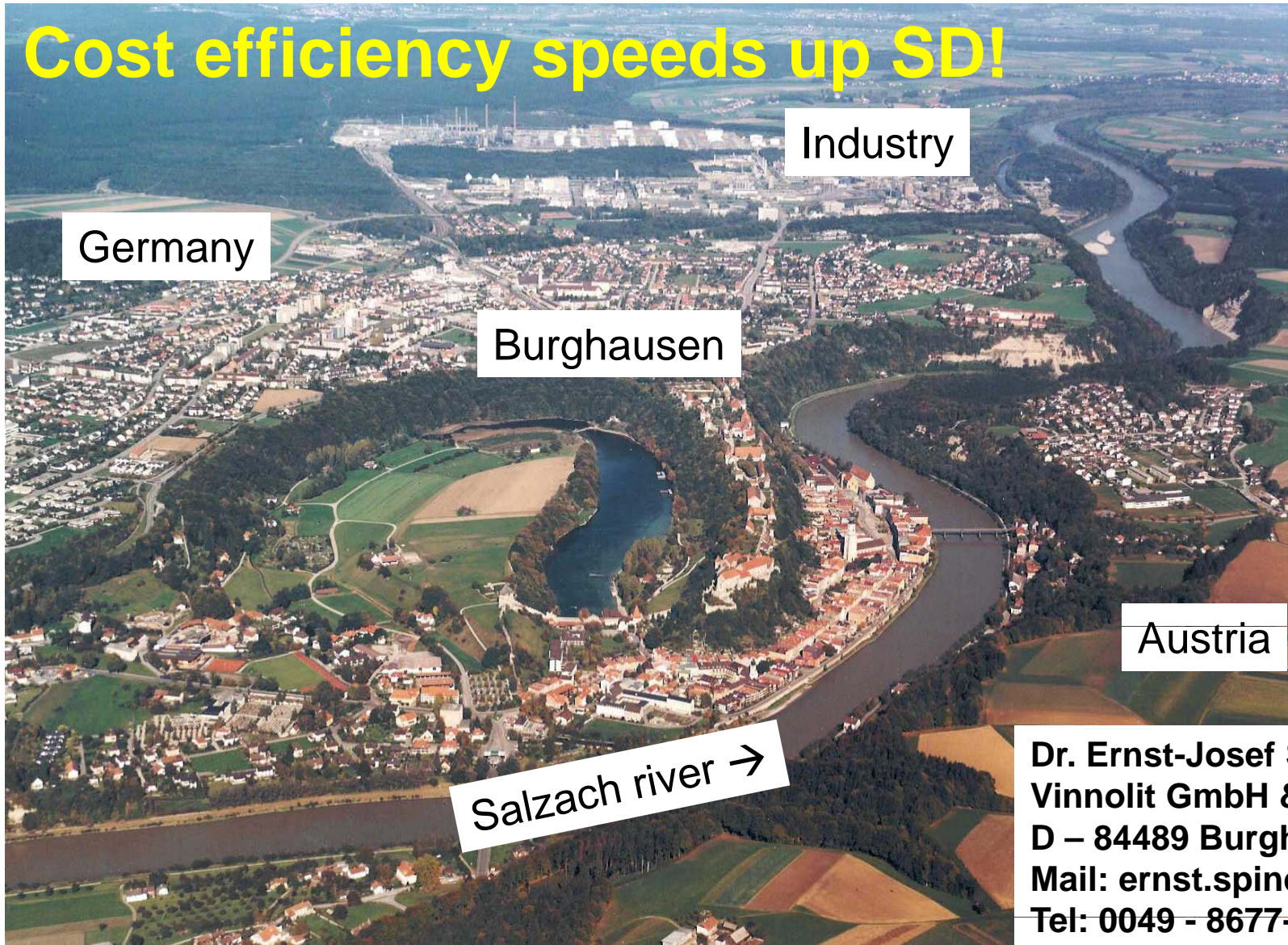
i.e. the limited carrying capacity of earth

Methodology: CnP are type of “monetarisation with avoidance cost”

**SD = sufficiency
+ efficiency
+ compensation**



Cost efficiency speeds up SD!



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