Sustainability and Energy
The role of Chemistry

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The worldwide crisis

Environment
Energy
Economy

⇨ Demographic increase
Social disequilibria
Ethics aspects

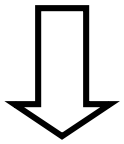
⇩

Economical costs and Ecological costs
(different scales)

Direct and Undirect Saving of Energy

Ecological Footprint: statistical index relating human consumption of natural resources (food, energy) to the capacity of soil to be regenerated:

41500 square meters for each citizen in Italy



8 “Italies” should be needed

CO_2 8000 Kg/year for citizen in Italy

~ 600 billion tonn/year

⇩

Services 20%

Trasport 30%

Industry 20%

Thermoelectric 30%

4000 as general central services

4000 as single uses

⇩

goal → 2500

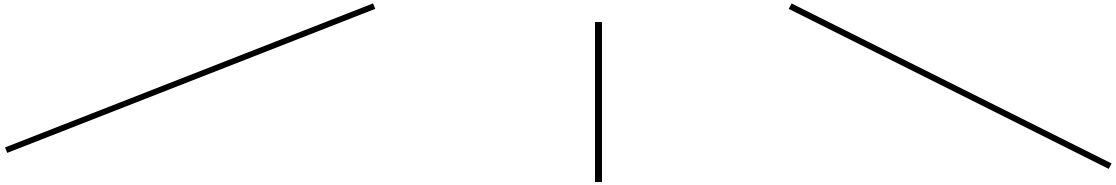
Savings in terms of Kg of CO_2

intelligent taps	- 470 Kg
TV standby	- 8
Washer and Freezer Machines	- 80
Ecolamps	- 35
Recycle of cans	- 20
Use of paper sheets on double faces	- 85
Eco Trasport (car sharing, cyclable runs)	- 350
Virtuous cars	- 250

Italian Chemical Society

Project:

Zero Emission City as Lab



Scientific aspects

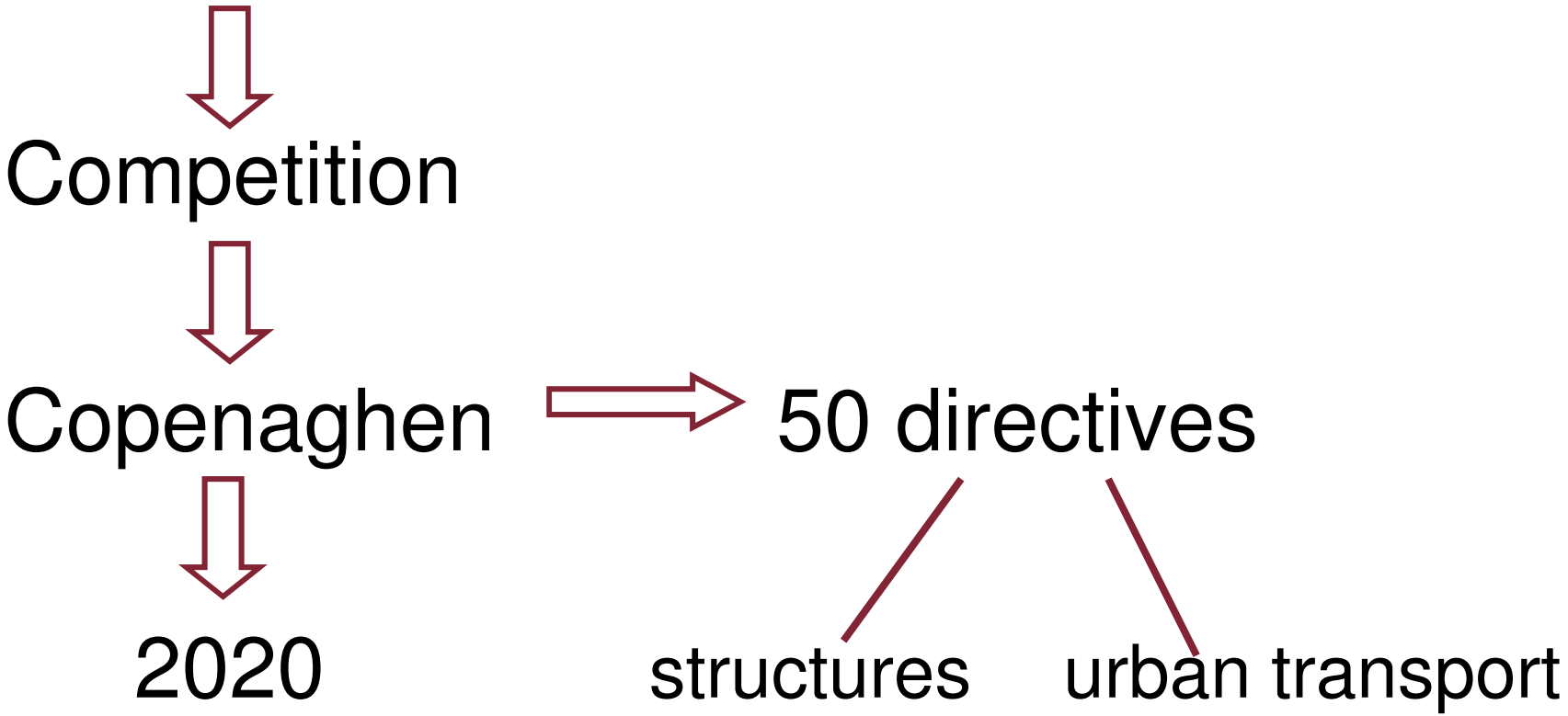
Technical aspects

Civil and social aspects

(education of citizens)

Integrated system

Which city will be the first one at zero emissions?



Vancouver (2030)

Ecodensity Chart

(limits to respected)

Leed Certificate

(Leadership in Energy and Environment)

Stockolm

Zurigh

New ecological cities

Bolzano in Italy

Limit of CO_2 emissions

even by compensation approach

Energy efficiency and thermal Insulation of Buildings

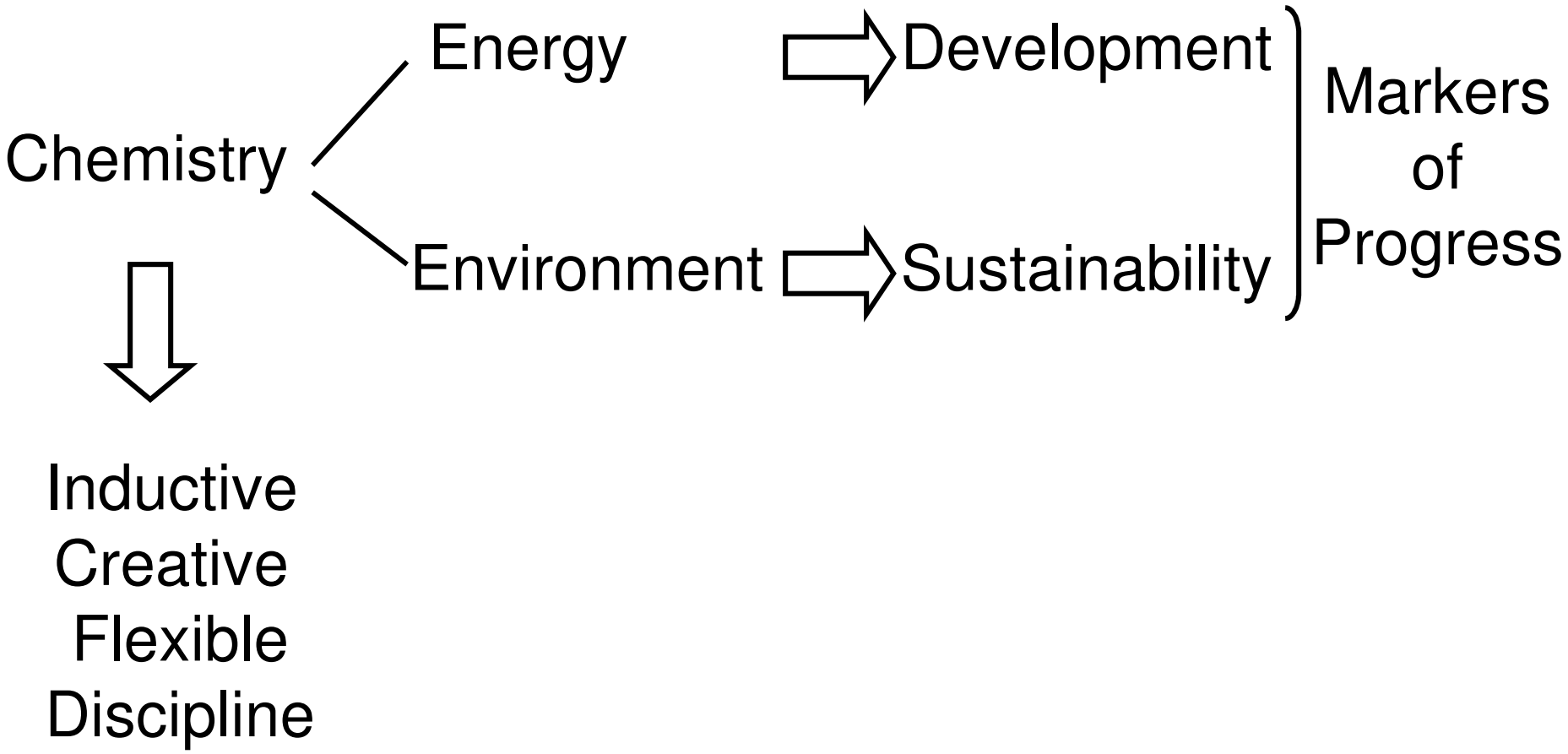
Different Degrees of Houses (B, A, Gold)

Central Heating

Movement by cycles

Civil uses of Energy

Urban Transport


Chemistry
Energy
Development
Environment
Sustainability
Markers
of
Progress
Inductive
Creative
Flexible
Discipline

Climate Change

Greenhouse effect

Chemical aspects: photosynthetic enzymatic inhibition

natural photodegradation (enthalpy?)

soil activity

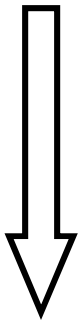
effect of water on heating by irradiation

melting of ices ⇨ dilution effects

lignin/cellulose ratio

ECOCEMENT

Cement added with TiO_2



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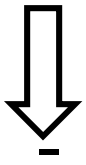
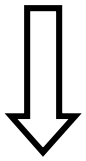
Degradation of urban pollutants

Economy of CO_2



adsorbed produced

(Renewable fuels, woods, cellulose, biomass)

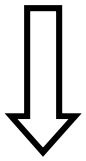


Sequestering of carbon

$H_2O + CO_2 \rightleftharpoons$ Storage of great amounts of CO_2 in geological systems

pressure to extract fuel gas

Atomic Economy in Industrial Process



Decrease of waste and residue amounts

Energy from Biomass

1) biochemical process

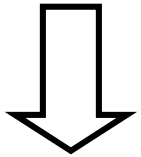
2) thermal process

Chemistry

Optimization of the energy production procedures (materials, reagents, processes)

Energy form as capacity to perform or to be based on a work able to produce a change of state or of composition in a system (living or not)

Energy from Condensed Matter



1) Chemical State of the raw material
2) Chemical State of electrochemical interphase

The nuclear options

Significant Chemical Contribution

- Technologies
- Sites
- Stockage of wastes
- Environmental Control
- Safety criteria

New perspectives of “Chemical help”

Sequestration of CO2 (care of oceans)

Splitting of H2O (hydrogen)

New batteries

Organics as materials for photovoltaic

New catalysts (silencers)

Nuclei of D and T must be

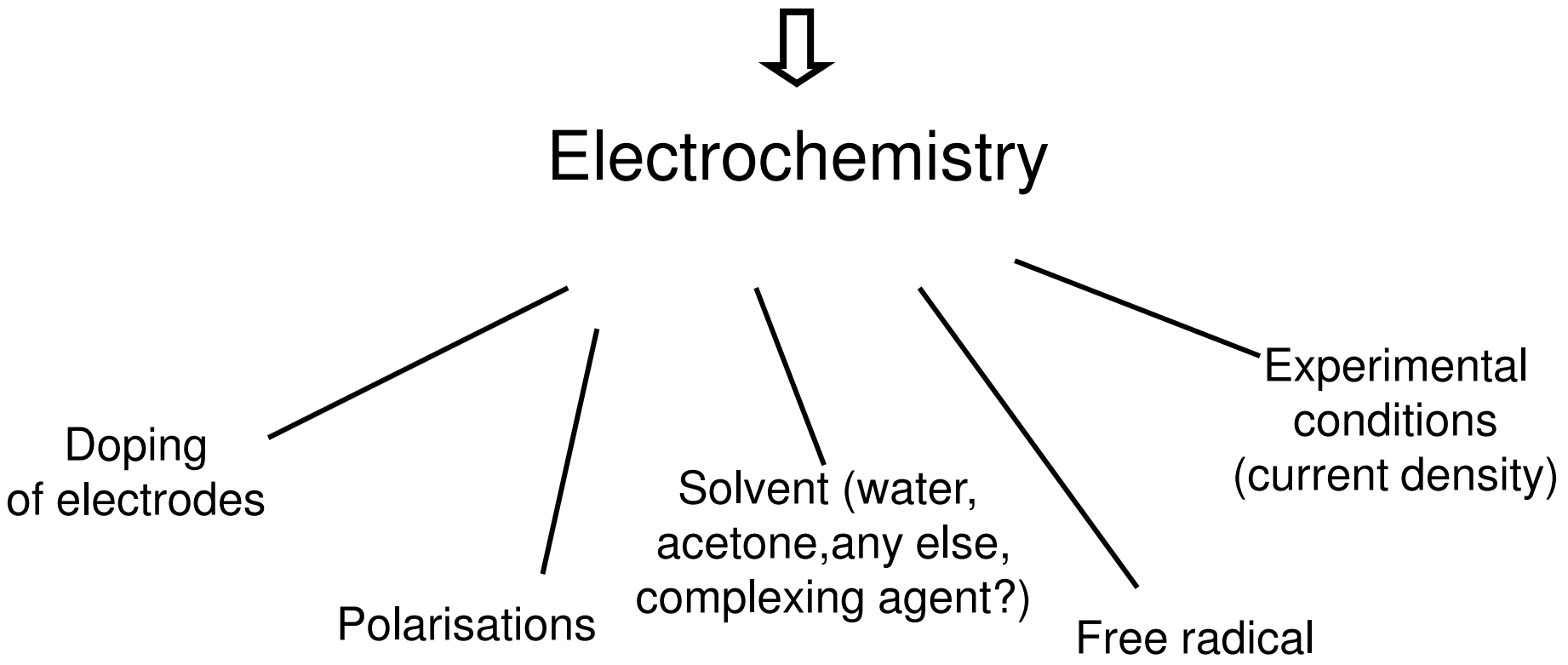
so near to allow fusion.

Catalysts are able to fasten the conditions of thermodynamics equilibrium.

Pd works well but how?

How do the phase changes occur due to saturation of Pd from hydrogen (metal hydride formed)? Which is the effect of defects (if any) in the metal structure?

Cold Fusion


Electrochemistry
Doping of electrodes
Polarisations
Solvent (water, acetone,any else, complexing agent?)
Free radical
Experimental conditions (current density)