

23 October 2018

# Low-carbon industrial value chains

## Lessons already learned and maybe to be learned

**Stefan P. Schleicher**

Wegener Center for Climate and Global Change  
at the University of Graz

**What we have already learned:**

**Just focusing on  
energy substitution and energy efficiency  
in processes and products  
is not sufficient**

# A lesson from the ongoing H2FUTURE project

## Exploring steel making with hydrogen

- **Potential need for carbon-free electricity**
  - up to half of total current electricity consumption in Austria
  - We obtain similar insights from other energy intensive industries
- **It is inconceivable to replace current volumes of fossils in energy intensive industries with renewables**



**The next step:**

**Putting energy intensive industries  
into an integrated system perspective**

# Learning from the Swiss project NEST at EMPA

## Exploring the future of buildings

The basic structure

A platform for  
innovative  
construction  
technologies



# Light-weight floor elements

- ❑ for self-supporting concrete floors for skyscrapers
- ❑ need no steel reinforcement
- ❑ 70% lighter than conventional floors
- ❑ prefabricated
- ❑ integration of infrastructure for heating and cooling
- ❑ serve as a thermal storage



# Urban mining & recycling unit

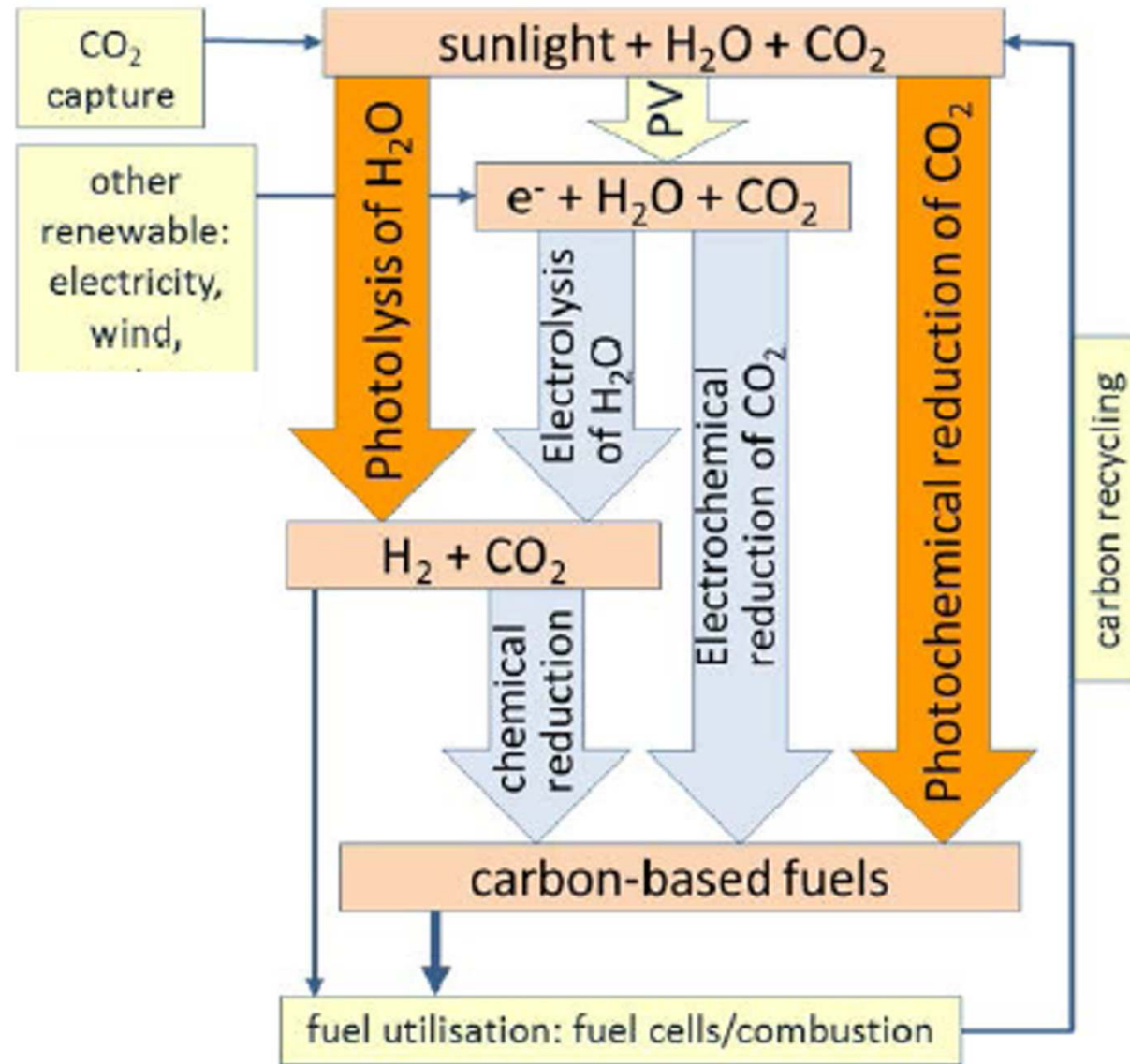
**A residential module fully constructed from reusable, recyclable, and compostable materials.**

**Explores to advance the construction industry's transition to a recycling economy.**



# A Solar Driven Chemistry

White Paper  
by the European Chemical Society





# New perspectives for the energy intensive industries

- **Focus on the ultimately required functionalities**
  - e.g. providing shelter
  - e.g. providing access to persons, goods and locations
  
- **Consider the full value chain for providing these functionalities**
  - from functionalities to products, processes and primary inputs
  
- **Discover the potential for synergies**
  - e.g. by integrating mechanical and thermal functionalities

**The next topics:**

**Restructuring the energy intensive industries  
and their business models  
and changing emissions accounting**

# Responding with integrated business models and integrated emissions accounting

- **Develop business models that integrate the whole value chain for providing specific functionalities**
  - e.g. skyscrapers based on lightweight construction technologies
  - e.g. cars based on lightweight designs that integrate steel, aluminum and carbon enforced fibers
  
- **Net emissions accounting based on functionalities**
  - e.g. emissions for the functionalities of a skyscraper subtract from emissions of products the saved emissions from collecting ambient heat and providing thermal storage

# Thank you.

**Stefan P. Schleicher**

Wegener Center for Climate and Global Change  
at the University of Graz

stefan.schleicher@uni-graz.at  
@SPSchleicher