

Madrid Declaration,  
civil engineers,  
solar thermal energy  
- logical sequence of concepts  
of major importance for our  
environment.

*The speech at the 64<sup>th</sup> General Assembly of The European Council of Civil Engineers  
Athens, October 2016*

*March, 2016, Madrid*

## **World Summit of Civil Engineers:**

- ▶ 5<sup>th</sup> Ibero-American Congress of Civil Engineers,
- ▶ 7<sup>th</sup> General Assembly of the Organization of Professional Engineers from Portuguese and Spanish-speaking countries,
- ▶ 63<sup>rd</sup> General Assembly of the European Council of Civil Engineers.

During this Summit  
**The Madrid Declaration**  
was solemnly signed  
by six Presidents of the European  
and World engineering organizations.

## **Madrid Declaration**

is one of the most important documents,  
which was created in recent years by the  
community of civil engineers.

# The Madrid Declaration

- ▶ Defines the fundamental challenges now faced by the inhabitants of the Earth:
  - prudent management of global natural resources,
  - climate change,
  - unstoppable process of urbanization
  - the growth of the world's population.

- ▶ Proclaims the need to take a joint, well-targeted and well-coordinated action by governments, professionals and society as a whole.
- ▶ Strongly emphasizes the leading role and importance of **professional engineering organizations**
- ▶ Speaks of **the responsibility of civil engineers** to society.

How great is the responsibility that we have to bear?

Let me illustrate this on just one example:

I would like to speak about **CO<sub>2</sub> EMISSIONS**.

Presentation of the NASA film:

*A Year in the Life of Earth's CO<sub>2</sub>*

**CO<sub>2</sub>** - is the main component (over 90%) of greenhouse gases, which are responsible for catastrophic climate change on Earth.

Any kind of human activities is causing CO<sub>2</sub> emissions to the earth's atmosphere at the level of 29-35 billion tones per year.

Given the current state of the population, it gives 5000 kg/person/year.

The border of security with regard to CO<sub>2</sub> emissions is 1000 kg/person/year.

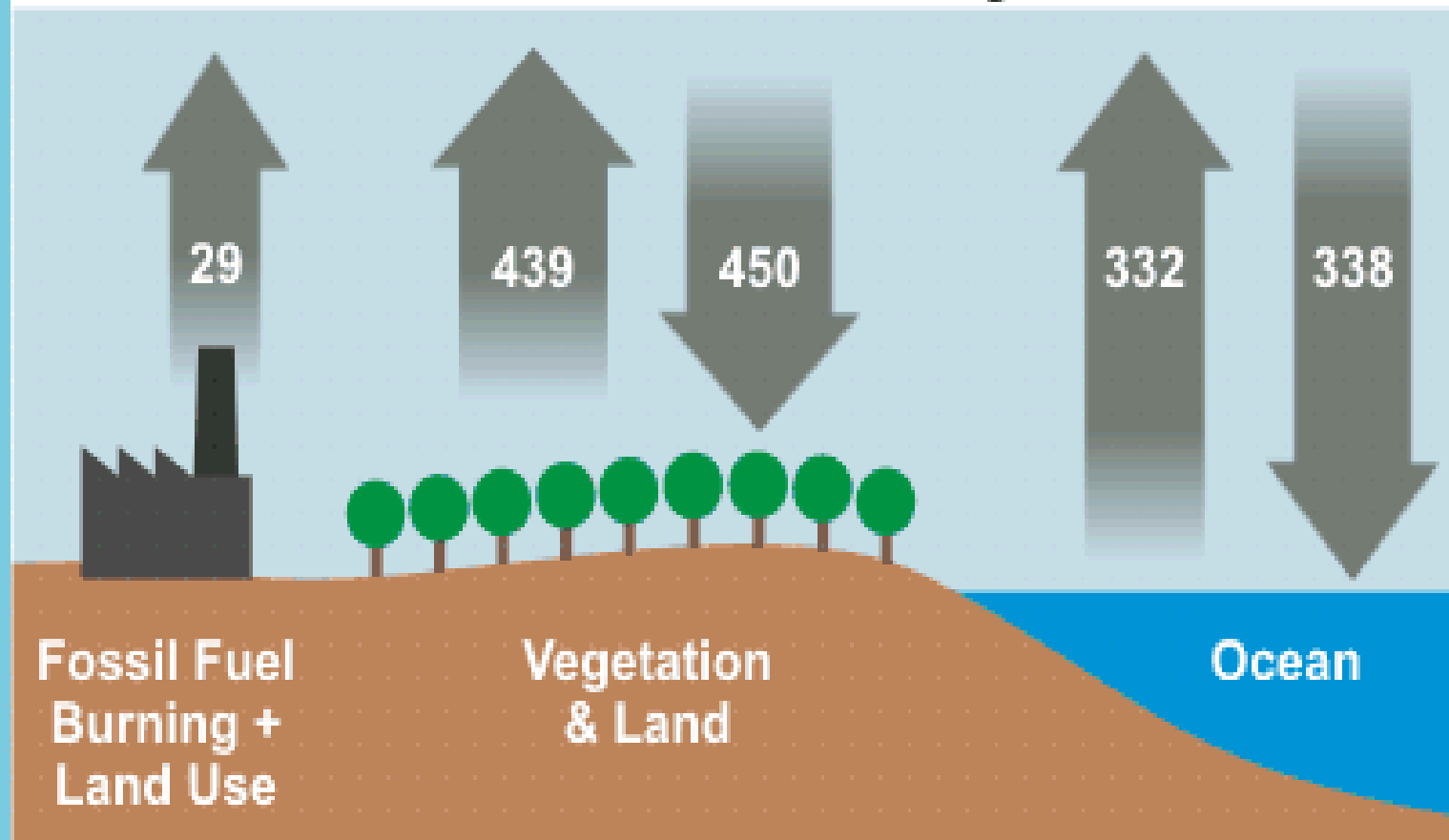
**By crossing this border we enter the road to disaster.**



Every year in the natural cycle of producing and removing CO<sub>2</sub>, in our ecosystem circulate near 800 billion tones of this gas, so human-made CO<sub>2</sub> emissions is only less than 4% of this amount.

However the essence of the problem lies in the fact, that the natural cycle was keeping the system in balance for thousands of years adding and removing CO<sub>2</sub> in the same quantities before humans started the process of adding extra CO<sub>2</sub> without removing any of it.

# The Global Carbon Cycle



*Figure 1: Global carbon cycle. Numbers represent flux of carbon dioxide in gigatons (Source: Figure 7.3, [IPCC AR4](#)).*

From where does this additional, man-made amount of CO<sub>2</sub> come?

- It comes from combustion of fossil fuels.

What for we burn this natural fossil fuels?

- Because in this process we obtain **The Energy - the goods of crucial meaning for Humanity.**

More than half of the energy consumed in the European Union goes to the heating/cooling of buildings.

**75%** of the energy used for heating/cooling of buildings **comes from fossil fuels.**

If we want to achieve a significant success with reducing CO<sub>2</sub> emissions, a coordinated, well planned action in a few areas is needed.

## **We have to :**

- make the existing power plants far more innovative and efficient,
- limit the losses in each place of the energy supply chain (producer, transportation and final consumer),
- gradually replace conventional fossil fuel sources of energy by sources based on renewable energy.

Where we ought to start and focus on with our efforts?

The heating/cooling of buildings is the most promising and effective area due to the enormous amount of energy currently consumed for this reason. We already have very mature technologies which are perfect for this purpose and which can easily replace the conventional sources of energy.

I mean **Solar Thermal Energy**.

Modern Solar Thermal Energy systems are technologically advanced.

- They are very efficient (some of solar thermal collectors have efficiency over 90%) and they are over six times more efficient than photovoltaic panels.
- They can be also an integrated part of building facade.
- They can be recycled in 100% in regular recycling plants.

- The initial input of energy needed to manufacture solar thermal collectors is 8 times smaller than energy needed to manufacture PV panels.

Using computers with special software to control the operation of the whole system, we are able to incredibly reduce the amount of energy necessary for pumping a fluid circulating in the system.



Finally, **The Solar Thermal Energy Systems** completely eliminate combustion process, so they produce and distribute energy without any emission of CO<sub>2</sub>.



In the past there was only one weak point in this technology - **storage of thermal energy.**

According to my best knowledge, today this problem is resolved but still there is space for further improvement.

The reasoning carried out in this presentation is based on the following steps:

- A. Identification of the problem (greenhouse gas emissions and their disastrous impact on changes in the Earth's climate) 
- B. Defining the objective to be achieved to solve the problem (significant reduction of CO<sub>2</sub> emissions - the main component of greenhouse gases) 
- C. Providing the most effective methods to achieve this purpose (maximum reduction of combustion of fossil fuels in favor of strong increase in the use of solar thermal energy mostly for heating/cooling buildings).

**The Madrid Declaration** states, that "climate change is one of the biggest challenges of our time and its adverse effects undermine the potential of all countries to achieve sustainable development. Such situation requires well targeted and sustained **ACTION** in time, not subject to political cycles, with the joint commitment of governments, professionals and society as a whole."

We have a big problem, but we have also available solutions of this problem and now we have to take **ACTION !**

Thank you for your attention.

*Włodzimierz Szymczak*

*President of The European Council of Civil Engineers*