World Future Council

10 YEARS OF IMPACT

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EVALUATING THE MONETARY COST OF THE NON-USE OF RENEWABLE ENERGIES

- STUDY SUMMARY -

WHY YET ANOTHER 'COST OF' STUDY?

Previous studies to assess the costs of the non-use of renewable energies consist mostly of attempts to ascertain the costs arising from expected climate damage caused by burning fossil fuels. By internalising these costs the apparent competitive advantage of fossil fuels often disappears. However, the question of how to monetise future damages is challenging. Therefore, previous studies would often be criticised for their methodology. This study raises a different, hitherto ignored issue. Externalised costs from burning fossil fuels are incurred not only through damages from climate change but also through the lack of future availability of fossil raw materials consumed to meet our current energy demands, although alternatives exist. This study is a first attempt to calculate the costs of this loss.

USING RENEWABLE ENERGIES IS NOT ONLY GOOD FOR THE CLIMATE, BUT WOULD ALSO SAVE OUR FINITE RAW MATERIALS FOR NON-ENERGETIC PURPOSES

The unused solar and wind energies potential of today is lost forever tomorrow. Every day during which potential renewable energy sources are not utilised, but exhaustible fossil fuels are burnt instead speeds up the depletion of these non-renewable fuels. These fossil fuels can't be used for non-energy related purposes (e.g. in the petrochemical industry). **Thus, their burning is costly capital destruction.** In contrast a non-energetic use could maintain the value of the fossil raw materials e.g. through an application in a circular flow economy.
By remodelling our energy-systems, fossil fuels can be substituted by renewables. Every entity of fossil raw material that can be replaced by renewable energy retains its value as a raw material to be used in the future for non-energetic uses. The lost value of under- or unutilised renewable energy therefore consists of the future lost value of burnt **fossil fuel raw material, which is no longer available for non-energetic uses**.

HOW TO MEASURE THE VALUE OF A COMMODITY WHOSE USAGE IS FREE AND INEXHAUSTIBLE?

The sun and the winds are free. Thus, the costs of renewable energy are almost exclusively fixed extraction costs, whilst the use of fossil fuels incurs significant variable costs (reflecting the value of the fuels burnt). The difference between renewables and fossil fuels is not only the zero cost of renewables but also that **they will never be exhausted**. How can the value of a commodity be measure, whose usage is free and inexhaustible? This can only be done indirectly through calculating the costs incurred when the use of a free and never-ending commodity is supplanted by the use of a finite commodity, which is destroyed, and thus unusable in the future, through its one-time use as energy. In contrast, it is the wind which blows and sun which shines but is not used today which is lost forever. The renewable energy not used today thus cannot replace **fossil fuel raw materials that, having been burnt as energy, are lost forever.** This means that the use these raw materials could have had in the future is lost and additional costs will be incurred to replace them. To calculate the loss incurred, the alternative use value of the burnt fossil fuels must be estimated.

THE METHODOLOGY TO MEASURE NON-USAGE

The aim of this introductory study is not to make a full cost comparison between current renewable energies and fossil fuels in which all external benefits of renewable energies are internalised. **Our aim is to estimate the future lost usage value of burnt fossil raw materials in order to be able to establish the costs of the current under-usage of available renewable energy potential.**

As costs equal benefits in a market economy, the costs equal the monetary losses that are created through future usage loss. What is the price of the fossil raw materials used for non-energetic production? It is the same as the standard global market prices of oil, gas and coal, because every company which buys a fossil raw material for a non-energetic use pays the similar price as an energy company which wants to run a fossil power plant.

A reference price deriving from the five-year average (2006-2010) of the observation period was proposed for the initial study from 2011. **Since the actual benefit loss is a loss of the quantity of burned fossil fuels and not of current energy prices, this study is based on the consumed quantities of fossil raw materials**, assessed at the reference price determined in the initial study. The prices determined are constant because the aim is to focus on the material quantity changes. It can be assumed that the demand for fossil fuel raw materials for non-energetic uses reacts very in-elastically to price changes, because the fossil raw material is only a small part of the end product. A price change would thus have very little effect on the use of fossil raw materials for non-energy purposes.

THE VALUATION MODEL

What we need first is the **amount of the burned fossil fuel of oil, natural gas and coal**. Second the **determined reference price** for the fossil raw materials, because the study wants to evaluate the amount of the burned raw materials and not the fluctuating prices. (The used figures based on the BP Statistical Review of World Energy from June 2016.)
In a further step it is necessary to subtract an estimated amount of current non-energetic use, because it is assumed that the value of the raw material could be maintained (e.g.) throw a use in circular economy. In this study we used for the estimation the figures from Germany as a representative mature industrial country. This leads to the following results:

OIL:
The total consumption of oil averaged over the years 2011-2015 (2006-2010):
4,113 (3,977) million tonnes or 32,668 (29,032) million barrels of oil.
At the reference price (2006-2010 average) of US $ 75.2 per barrel, the annual total value is:
US $ 2,457 billion (2,183). Subtracted by an estimated non-energetic use of US $ 332 billion: US $ 2,125 billion

NATURAL GAS:
The total consumption of natural gas averaged 2011-2015 (2006-2010):
3,190 (2,987) billion m3, and BTU 120,8 (113,1) billion respectively.
At a reference price (2006-2010 average) of US $ 8.79 per million BTU, the total value was US $ 1062 (994) billion. Subtracted by an estimated non-energetic use of US $ 44 billion: US $ 1,018 billion

COAL:
The annual production of hard coal in 2011-2015 averaged 6940 (5,704) million tonnes.
At an average price of US $ 83.6 (2006-2010 average), the total value was US $ 580 (477) billion. Subtracted by an estimated non-energetic use of US $ 4 billion:
US $ 576 billion

Summarized result: <u>US $ 3,719 billion</u>

CONCLUSION

The total future usage loss caused by the current energy use of oil, gas and coal in one year, based on the average market prices of the reference period, can therefore be calculated at c. **US $ 3.7 trillion**. Preserving increasingly valuable fossil raw materials for future use is possible by maximizing the use of renewables for energy production. **Every day that this is delayed and fossil raw materials are burnt as one-time energy causes a future usage loss of c. US $ 10 billion.** An honest cost-comparison of non-renewable and renewable energies needs to also include these costs of not using renewables.

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