THE CASH THAT CAME FROM THRASH

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It is easy or impossible
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The monetization of diseconomies is nothing more than a much prettier expression for making money with garbage.

According to data from the International Energy Agency, World Bank and the US Energy Information Administration, in 2014 humans utilized 215EJ (two hundred and fifteen exajoules or two hundred and fifteen quintillion joules) of energy, to produce 3.4 trillion tons of 1962 elements, fossil fuels, ores, aromatic and non-aromatic halogenated hydrocarbons, aromatic and non-aromatic compounds, pesticides, metals, inorganic compounds, PAH (polycyclic aromatic hydrocarbons) and radioactive elements/compounds.

So what? These are the products that result in the physical basis of the economy. However, each of the cycles that results in the amount of products described above generates an environmental liability.

Let's say that this environmental liability is the "Diseconomy".

When the oil industry began at the end of the nineteenth century, the only product of economic value at the time was kerosene, a substitute for whale oil in lighting. The production of kerosene originates, as a side product, gasoline. Since there was no use for gasoline in the 1800s, it was considered waste and dumped into the rivers. That is, 160 years ago, gasoline was a "diseconomy."

But the question is: how to put all diseconomies under a same standard?

We take the diseconomy in question and see what types of impacts it causes: air, water, soil, human health and what their consequences are: land use; climate change; depletion of ore reserves, hydrocarbons, ozone layer; human, water, soil toxicity; etc. Once all the possible impacts of this diseconomy have been established, we apply the rules of the ZerO2Nature standard and turn trash into cash.

For example, let's see how we turn plastic bottles of water and soft drinks into currency.

The bottles for soft drinks and mineral waters are composed mainly of polyethylene terephthalate (PET). The caps are made of high density polyethylene (HDPE) and labels, polypropylene (BOPP) or linear low density polyethylene (LLDPE).

In 2016, more than 800,000 tons of PET bottles have been produced in Brazil, which means another 50,000 tons in caps and labels. From these, about 50% were recycled. That is, 400,000 tons of PET, in the form of bottles go to waste, compromising the use of soil; to the sea and fresh water, compromising the water reserves and consequently, human health. Which means that plastic bottles thrown into nature negatively impact air, soil (landfills/dumps), water and human health. As a unifying agent for the measurement of negative emissions, we adopt the Environmental Impact Potential (EIP). In order not to cut the dynamics of the text with numbers, we publish at the end of this article the adopted scenarios and respective EIPs.

Statistics from US and European environmental agencies point to the following destination for plastic bottles deposited in Nature, for non-OECD countries:

- 60% dumps/landfills;
- 10% freshwater reserves;
- 30% marine waters.

Going back to our initial proposal, we know that 400,000 tons of PET and 25,000 tons of PE in the form of plastic bottles were improperly discarded in Brazil in 2016. So we can calculate their environmental impact:

PET:

- 400,000t related to transportation. Based on the environmental impact potential of PET in relation to global warming, **2,316,000 teq of CO_2**, representing **2,316,000 F-DTUs**, which are ecological credits of the ZerO2Nature system linked to global warming;
- 400,000t related to human toxicity. Based on the environmental impact potential of PET in relation to human health, **1,688,000 teq of 1-4 dichlorobenzene** representing **1,688,000 B-DTUs**, which are ecological credits of the ZerO2Nature system linked to human toxicity;
- 240.000t disposed in dumps/landfills. Based on the environmental impact potential of PET in relation to soil, **986,4 teq of 1-4 dichlorobenzene**, representing **986 B-DTUs**, which are ecological credits of the ZerO2Nature system linked to terrestrial ecotoxicity;
- 40.000t disposed in rivers/lakes. Based on the environmental impact potential of PET in relation to freshwater reserves, **56,400 teq of 1-4 dichlorobenzene** and **436 teq of phosphate**, representing **56,400 B-DTUs**, which are ecological credits of the ZerO2Nature system linked to ecotoxicity of freshwater reserves and **436 H-DTUs**, which are ecological credits of the ZerO2Nature system linked to freshwater reserves' preservation;
- 120.000t disposed in the sea. Based on the environmental impact potential of PET in relation to marine reserves, **924,000 teq of 1-4 dichlorobenzene** and **6,900 teq of sulfur dioxide**, representing **924,000 B-DTUs**, which are ecological credits of the ZerO2Nature system linked to ecotoxicity of marine reserves and **6,900 H-DTUs**, which are ecological credits of the ZerO2Nature system linked to marine reserves' preservation.

PE:

- 25,000t related to human toxicity. Based on the environmental impact potential of PE in relation to human health, **118,000 teq of 1-4 dichlorobenzene**, representing **118,000 B-DTUs**, which are ecological credits of the ZerO2Nature system linked to human health;
- 15,000t disposed in dumps/landfills. Based on the environmental impact potential of PE in relation to soil, **90 teq of 1-4 dichlorobenzene**, representing **90**

B-DTUs, which are ecological credits of the ZerO2Nature system linked to terrestrial ecotoxicity;

- 2,500t disposed in rivers/lakes. Based on the environmental impact potential of PE in relation to freshwater reserves, **4,125 teq of 1-4 dichlorobenzene** and **35 teq of phosphate**, representing **4,125 B-DTUs**, which are ecological credits of the ZerO2Nature system linked to freshwater reserves ecotoxicity and **35 H-DTUs**, which are ecological credits of the ZerO2Nature system linked to freshwater reserves' preservation;

- 7,500t disposed in the sea. Based on the environmental impact potential of PE in relation to marine reserves, **59,250 teq of1-4 dichlorobenzene** and **510 teq of sulfur dioxide**, representing **59,250 B-DTUs**, which are ecological credits of the ZerO2Nature system linked to marine water reserves ecotoxicity and **510 H-DTUs**, which are ecological credits of the ZerO2Nature system linked marine water reserves' preservation.

And finally we get to the point. We know that the environmental liability or diseconomy caused by the disposal of plastic bottles in Brazil in 2016 generated an impact that, if taken from Nature and properly recycled, would generate 2,850,851 B-DTUs and 7,971 H-DTUs. But we need to consider the transport-related emissions of 2,316,000 teq of CO_2, which implies the retirement of 2,316,000 F-DTU. The F-DTU conversion value is currently € 10; of the B-DTU is € 15 and the H-DTU is € 50.

That is, if instead of causing pollution, the plastic bottles had been properly recycled, they would have generated revenues of €20 million related to the generation of ecological credits.

To generate green credits, recycled PET can be used in fabric manufacturing; ropes; office supplies; water tanks, pipes and fittings; taps, swimming pools, tiles; carpets; synthetic marble; paints and varnishes; lining and plastic parts of cars and trucks; banks of bus, train and subway; sports equipment, telephone sets, appliances, etc.

Monetization of diseconomy: ZerO2Nature turning trash into cash.

SCENARIOS ADOPTED AND RESPECTIVE EIP

PET:

In the air, we can measure the negative emissions of 1t of PET in the following scenario:

- Problem oriented approach: baseline (CML, 1999) – Global warming GWP100 – GWP100 (IPCC, 2007). In this scenario, the EIP of 1t of PET is equal to 5.79t equivalent (teq) of CO_2.

In freshwater reserves, we can measure the negative emissions of 1t of PET in the following scenarios:

- Problem oriented approach: baseline (CML, 1999) – Freshwater reserves ecotoxicity (FAETP inf) – FAETP inf. (Huijbregts, 1999&2000). In this scenario, the EIP of 1t of PET is equal to 1.41t equivalent (teq) of 1-4 dichlorobenzene. In this case, 1-4 dichlorobenzene is adopted as an equivalent factor, analogously to what occurs with CO_2, adopted as a reference in the global warming scenario;

- Problem oriented approach: baseline (CML, 1999) – Eutrophication EP (Heijungs et al. 1992). In this scenario, the EIP of 1t of PET is equal to 0.0109t equivalent (teq) of phosphate. In this case, phosphate is adopted as an equivalent factor, analogously to what occurs with CO_2, adopted as a reference in the global warming scenario.

In marine water reserves, we can measure the negative emissions of 1t of PET in the following scenarios:

- Problem oriented approach: baseline (CML, 1999) – Marine water reserves ecotoxicity (MAETP inf) – MAETP inf. (Huijbregts, 1999&2000). In this scenario, the EIP of 1t of PET is equal to 7.7t equivalent (teq) de 1-4 dichlorobenzene. In this case, 1-4 dichlorobenzene is adopted as an equivalent factor, analogously to what occurs with CO_2, adopted as a reference in the global warming scenario;

- Problem oriented approach: baseline (CML, 1999) – Acidification AP (Huijbregts, 1999; average Europe total, A&B). In this scenario, the EIP of 1t of PET is equal to 0.0575t equivalent (teq) of sulfur dioxide. In this case, sulfur dioxide is adopted as an equivalent factor, analogously to what occurs with CO_2, adopted as a reference in the global warming scenario.

In the soil, we can measure the negative emissions of 1t of PET in the following scenario:

- Problem oriented approach: baseline (CML, 1999) – Terrestrial ecotoxicity (TETP inf) – TETP inf. (Huijbregts, 1999&2000). In this scenario, the EIP of 1t of PET is equal to 0.00411t equivalent (teq) of 1-4 dichlorobenzene. In this case, 1-4 dichlorobenzene is adopted as an equivalent factor, analogously to what occurs with CO_2, adopted as a reference in the global warming scenario.

PE:

As we already considered the transport of plastic bottles in the calculation of negative emissions of PET and the bottle is transported with label and cap, we can affirm that **in the air**, negative emissions of 1t of PE have already been computed.

In freshwater reserves, we can measure the negative emissions of 1t of PE in the following scenarios:

- Problem oriented approach: baseline (CML, 1999) – Freshwater reserves ecotoxicity (FAETP inf) – FAETP inf. (Huijbregts, 1999&2000). In this scenario, the EIP of 1t of PE is equal to 1.65t equivalent (teq) of 1-4 dichlorobenzene. In this case, 1-4 dichlorobenzene is adopted as an equivalent factor, analogously to what occurs with CO_2, adopted as a reference in the global warming scenario;

- Problem oriented approach: baseline (CML, 1999) – Eutrophication EP (Heijungs et al. 1992). In this scenario, the EIP of 1t of PE is equal to 0.014t equivalent (teq) of phosphate. In this case, phosphate is adopted as an equivalent factor, analogously to what occurs with CO_2, adopted as a reference in the global warming scenario.

- **In marine water reserves**, we can measure the negative emissions of 1t of PE in the following scenarios:

- Problem oriented approach: baseline (CML, 1999) – Marine water reserves ecotoxicity (MAETP inf) – MAETP inf. (Huijbregts, 1999&2000). In this scenario, the EIP of 1t of PE is equal to 7.9t equivalent (teq) of 1-4 dichlorobenzene. In this case, 1-4 dichlorobenzene is adopted as an equivalent factor, analogously to what occurs with CO_2, adopted as a reference in the global warming scenario;

- Problem oriented approach: baseline (CML, 1999) – Acidification. AP (Huijbregts, 1999; average Europe total, A&B). In this scenario, the EIP of 1t of PE is equal to 0.068t equivalent (teq) of sulfur dioxide. In this case, sulfur dioxide is adopted as an equivalent factor, analogously to what occurs with CO_2, adopted as a reference in the global warming scenario.

In the soil, we can measure the negative emissions of 1t of PE in the following scenario:

- Problem oriented approach: baseline (CML, 1999) – Terrestrial ecotoxicity (TETP inf) – TETP inf. (Huijbregts, 1999&2000). In this scenario, the EIP of 1t of PE is equal to 0.006t equivalent (teq) of 1-4 dichlorobenzene. In this case, 1-4 dichlorobenzene is adopted as an equivalent factor, analogously to what occurs with CO_2, adopted as a reference in the global warming scenario.

It is very important to note that in addition to the negative impacts caused directly to the environment in terms of contamination of soil, air and water reserves (fresh and maritime), decomposition of the plastic bottle has a significant potential for impairment of human health.

With regard to human health, we can measure negative PET emissions in the following scenario:

- Problem oriented approach: baseline (CML, 1999) – Human toxicity (HTP inf) – HTP inf. (Huijbregts, 1999&2000). In this scenario, the EIP of 1t of PET is equal to 4.22t equivalent (teq) of 1-4 dichlorobenzene. In this case, 1-4 dichlorobenzene is adopted as an equivalent factor, analogously to what occurs with CO_2, adopted as a reference in the global warming scenario.

With regard to human health, we can measure negative PE emissions in the following scenario:

- Problem oriented approach: baseline (CML, 1999) – Human toxicity (HTP inf) – HTP inf. (Huijbregts, 1999&2000). In this scenario, the EIP of 1t of PET is equal to 4.72t equivalent (teq) of 1-4 dichlorobenzene. In this case, 1-4 dichlorobenzene is adopted as an equivalent factor, analogously to what occurs with CO_2, adopted as a reference in the global warming scenario.