



CUI BONO?

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The guy is only sincerely atheist when he is in very good health.
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Going back to the topic of monetization of diseconomies or how to make money from trash, let's look at the possibilities of wealth generation with one of the most complicated and frightening types of refuse: hospital waste.

According to the World Health Organization, most hospital waste (75-90%) is a non-infectious waste, which means it can be treated as general municipal solid waste. The remaining 10-25% are considered hazardous because they are radioactive, toxic or infectious.

In the mid-1980s, a number of reports related to the illegal disposal of hospital waste were made public, but it was in the early 1990s with the AIDS epidemic, that authorities

were forced to take stricter measures, with higher fines and greater control, aiming to calm the population.

Because of this situation, hospitals today tend to extrapolate safely, treating as hazardous waste about 50% of the total production.

According to Brazilian legislation, hospital waste obeys the following classification:

GROUP A: Residues with the possible presence of biological agents that, due to their characteristics of greater virulence or concentration, may present a risk of infection.

GROUP B: Waste containing chemicals that may pose a risk to public health or the environment, depending on their flammability, corrosivity, reactivity and toxicity characteristics.

GROUP C: Any materials resulting from human activities containing radioactive nuclides exceeding the disposal limits specified in the standards of the National Nuclear Energy Commission (CNEN) for which the use is improper or unplanned.

GROUP D: Wastes that do not present biological, chemical or radiological risks to health or the environment, and can be assimilated to household waste.

GROUP E: Sharpening or scarifying materials such as razor blades, needles, scalpels, glass ampules, drills, endodontic files, diamond tips, scalpel blades, lancets, capillaries, micro pipettes, blades and coverslips, spatulas, and all glass utensils broken in the laboratory (pipettes, blood collection tubes and petri dishes) and the like.

According to the WHO, a hospital generates 7 to 10 kg of waste per bed per day. In other words, a hospital with 345 beds generates about 1,100t of refuse per year and about 183t (in an ideal scenario) refers to hazardous waste.

Let us consider this total liability as the "diseconomy" and calculate what types of impacts it causes in air, water, soil, human health and their consequences: soil use; climate changes; depletion of ore reserves, hydrocarbon reserves, ozone layer; human, water, soil toxicity, etc.; always within the strictest observation of the law. Once all the possible impacts of this diseconomy have been established, we apply the rules of the ZerO2Nature standard and turn this scary waste into cash. As a unifying agent for the measurement of negative emissions, we adopt the Environmental Impact Potential (EIP). In order to avoid cutting the dynamics of this text with numbers, we present the scenarios and values of the adopted EIP at the end of this article.

According to statistics from US and US health surveillance agencies in non-OECD countries the following destination is given to hospital waste:

↳ 62% is properly deposited in landfills;

- ↳ 35% treated at high temperatures;
- ↳ 3% is improperly deposited in landfills/dumps.

Returning to our initial example, 1,100t of hospital waste per year, of which about 183t (in an ideal scenario) refer to hazardous waste, the calculation of the environmental impact is as follows:

- ↳ Based on the potential environmental impact of hospital waste related to global warming we have **3,371 teq of CO₂**, that represents **3,371 F-DTUs**, which are ecological credits of the ZerO2Nature system linked to global warming;
- ↳ Based on the potential environmental impact of hospital waste in the soil we have **5,984.55 teq of 1-4 dichlorobenzene** that represents **5,984 B-DTUs**, which are ecological credits of the ZerO2Nature system linked to terrestrial ecotoxicity and **1,471 teq of petroleum** that represents **1,471 C-DTUs**, which are ecological credits of the ZerO2Nature system linked to the abiotic depletion of fossil fuels;
- ↳ Based on the potential environmental impact of hospital waste on human health we have **227,835 teq of 1-4 dichlorobenzene** that represents **227,835 B-DTUs**, which are ecological credits of the ZerO2Nature system linked to human toxicity.

It is clear that these calculations refer to a theoretical approach. When we elaborate a project, all the negative emissions have to be computed through objective evidences and discounted from the volume of generated credits.

Another very important factor to consider is the baseline. To be a credit generator, a project must meet two conditions: to withdraw a volume of negative emissions that would not occur in the absence of the project and be additional.

The additionality of the project is established through the breaking of economic, technological or social barriers; always relative to the baseline.

But, what is a baseline? It is the “business as usual” scenario, or how that type of activity is commonly performed.

So the proper collection and recycling of hospital waste generates ecological credits? Yes. The baseline is to remove refuse from the hospital, transport it to the treatment site, treat 35% at high temperatures and dispose 62% of the waste in landfills/dumps; with a remaining 3% of the total amount of hospital waste, illegally deposited in Nature.

This being the baseline scenario, what would be the condition of additionality of a project? If the waste is treated *in situ*, instead of being transported, additionality refers to the fuel saved, both within the global warming scenario and in the scenario of abiotic depletion of fossil fuels. If we ensure, through objective evidence, that all class A, B and E

material is properly disinfected and used as feedstock for another cycle, we also prove additionality and, finally, if this process generates some kind of energy, there is the possibility of obtaining credits related to renewable energy, with the application of the appropriate methodology.

- ↳ Within the proposed situation, the only credits that would not be obtained would be those related to terrestrial toxicity, since this situation is already contemplated by the baseline.
- ↳ And finally we get to the point. We know that the environmental liability or diseconomy caused by hospital waste in the cited example is:
 - ↳ 3,371 teq of CO₂ related to global warming;
 - ↳ 5,984.55 teq of I-4 dichlorobenzene, related to terrestrial ecotoxicity;
 - ↳ 1,471 teq of petroleum, related to abiotic depletion of fossil fuels;
 - ↳ 227,835 teq of I-4 dichlorobenzene, related to human toxicity.
- ↳ Since terrestrial ecotoxicity is already contemplated in the baseline, the following ecological credits are generated within this example:
 - ↳ 3,371 F-DTU;
 - ↳ 1,471 C-DTU;
 - ↳ 227,835 B-DTU.

The current conversion value of the F-DTU is € 10; of the B-DTU is € 15 and the C-DTU is € 25.

Therefore, the adequate treatment of 1,100t/year of hospital waste, can generate an additional income to hospitals in the order of €3,656,920.00 related to the generation of ecological credits.

In time: cui bono? means "who benefits?". In this case all of us, when we invest in the health of the Earth.

ZerO2Nature turning trash into cash.

ADOPTED SCENARIOS AND RESPECTIVE EIP

In the air, we can measure the negative emissions of It of hospital waste in the following scenarios:

- ♣ Problem oriented approach: baseline (CML, 1999) – Global warming GWPI00 – GWPI00 (IPCC, 2007). In this scenario, the EIP of It of hospital waste transported (from the hospital to the treatment site estimated at 60km/day) is equal to 18,42t equivalent (teq) of CO₂;
- ♣ Problem oriented approach: baseline (CML, 1999) – Global warming GWPI00 – GWPI00 (IPCC, 2007). In this scenario, the EIP of It of hospital waste treated at high temperature (autoclaving/incineration) is equal to 13,18t equivalent (teq) of CO₂;
- ♣ Problem oriented approach: baseline (CML, 1999) – Global warming GWPI00 – GWPI00 (IPCC, 2007). In this scenario, the EIP of It of hospital waste deposited (landfills/dumps) is equal to 0,57t equivalent (teq) of CO₂.

In the soil, we can measure the negative emissions of It of hospital waste in the following scenarios:

- ♣ Problem oriented approach: baseline (CML, 1999) – Terrestrial ecotoxicity (TETP inf) – TETP inf. (Huijbregts, 1999&2000). In this scenario, the EIP of It of hospital waste transported (from the hospital to the treatment site) is equal to 2,53t equivalent (teq) of 1-4 dichlorobenzene. In this case, 1-4 dichlorobenzene is adopted as an equivalent factor, analogously to what occurs with CO₂, adopted as a reference in the global warming scenario;
- ♣ Problem oriented approach: baseline (CML, 1999) – Terrestrial ecotoxicity (TETP inf) – TETP inf. (Huijbregts, 1999&2000). In this scenario, the EIP of It of hospital waste treated at high temperature (autoclaving/incineration) is equal to 1,15t equivalent (teq) de 1-4 dichlorobenzene. In this case, 1-4 dichlorobenzene is adopted as an equivalent factor, analogously to what occurs with CO₂, adopted as a reference in the global warming scenario;
- ♣ Problem oriented approach: baseline (CML, 1999) – Terrestrial ecotoxicity (TETP inf) – TETP inf. (Huijbregts, 1999&2000) In this scenario, the EIP of It of hospital waste deposited (landfills/dumps) is equal to 4,18t equivalent (teq) de 1-4 dichlorobenzene. In this case, 1-4 dichlorobenzene is adopted as an equivalent factor, analogously to what occurs with CO₂, adopted as a reference in the global warming scenario;

- ♣ Problem oriented approach: baseline (CML, 1999) – Abiotic depletion – ADP fossil fuels (after Guinee et al. 2001). In this scenario, the EIP of It of hospital waste transported (from the hospital to the treatment site) is equal to 5,42t equivalent of petroleum (tep). In this case, It of petroleum is adopted as an equivalent factor, similar to CO₂, adopted as a reference for the global warming scenario;
- ♣ Problem oriented approach: baseline (CML, 1999) – Abiotic depletion – ADP fossil fuels (after Guinee et al. 2001). In this scenario, the EIP of It of hospital waste treated at high temperature (autoclaving/incineration) is equal to 1,80t equivalent of petroleum (tep). In this case, It of petroleum is adopted as an equivalent factor, similar to CO₂, adopted as a reference for the global warming scenario;
- ♣ Problem oriented approach: baseline (CML, 1999) – Abiotic depletion – ADP fossil fuels (after Guinee et al. 2001). In this scenario, the EIP of It of hospital waste deposited (landfills/dumps) is equal to 20,80t equivalent of petroleum (tep). In this case, It of petroleum is adopted as an equivalent factor, similar to CO₂, adopted as a reference for the global warming scenario.

It is very important to note that in addition to the negative impacts directly caused to the environment in terms of soil and air contamination, hospital waste has a significant potential for impairment of human health.

With regard to human health, we can measure the negative emissions of It of hospital waste in the following scenarios:

- ♣ Problem oriented approach: baseline (CML, 1999) – Human toxicity (HTP inf) – HTP inf. (Huijbregts, 1999&2000). In this scenario, the EIP of It of hospital waste transported (from the hospital to the treatment) is equal to 66,52t equivalent (teq) of 1-4 dichlorobenzene. In this case, 1-4 dichlorobenzene is adopted as an equivalent factor, analogously to what occurs with CO₂, adopted as a reference in the global warming scenario;
- ♣ Problem oriented approach: baseline (CML, 1999) – Human toxicity (HTP inf) – HTP inf. (Huijbregts, 1999&2000). In this scenario, the EIP of It of hospital waste treated at high temperature (autoclaving/incineration) is equal to 2,28t equivalent (teq) of 1-4 dichlorobenzene. In this case, 1-4 dichlorobenzene is adopted as an equivalent factor, analogously to what occurs with CO₂, adopted as a reference in the global warming scenario;
- ♣ Problem oriented approach: baseline (CML, 1999) – Human toxicity (HTP inf) – HTP inf. (Huijbregts, 1999&2000). In this scenario, the EIP of It of hospital waste deposited (landfills/dumps) is equal to 41.500t equivalent (teq) of 1-4

dichlorobenzene. In this case, 1-4 dichlorobenzene is adopted as an equivalent factor, analogously to what occurs with CO₂, adopted as a reference in the global warming scenario.