if you were chosen by the Lebanese community to find a solution for the environmental field moving into the post COVID era, what would it be?

Waste-to-Energy power plants: a “two birds one stone” solution for the environmental crisis in Lebanon, Ghassan Abboud

In the midst of the COVID-19 era, photos of cleaned beaches and clear lakes have invaded our social media feeds, reminding us of the positive effects the global lockdown has had on our home. However, the data surrounding the drop in CO2 emissions that resulted from the halt of the international economy has shone a surprisingly pessimistic light on the future of our planet. In fact, despite the 17% drop in daily global emissions, it seems that these changes will have little to no impact on the concentration of greenhouse gases at the end of the year.[1] Hence, the inefficiency of personal daily changes conveyed by this data highlights the need for systematic worldwide change, that can only be implemented by legislative regulations. In Lebanon, this action is more needed than ever, since the consecutive environmental crises (garbage crisis in 2015, acute water and air pollution) have proved to directly affect the well-being of citizens. In this sense, one of the most urgent steps toward a cleaner and safer environment in Lebanon is the revolutionization of the electricity sector, in order to replace the thermal and gas power plants along the coastline that increase the risk of pulmonary diseases and cancer among nearby residents. Waste-to-Energy (WtE) power plants, which technological development has spiked in the last 15 years, constitute an attractive solution, not only because they release less pollutants, but also because they solve another environmental problem in the process: garbage waste disposal.

If there is anything the Darwinian theory of evolution has taught us, it undoubtedly is the remarkable capacity of Nature to adapt to changes in its environment, geared toward survival. Multiple living beings have been observed to thrive in extreme conditions because of their ability to extract usable energy from the most unexpected places![2] Accordingly, us humans should look at energy production with fresh eyes and restrain from using the traditional fossil fuels that destroy our planet but rather opt for less conventional sources like waste. Although the idea of burning waste before burying it was not new, it was not until the late 20th century that the

advancement in this technology made producing electricity from that incineration possible. The process is rather simple: municipal solid waste (MSW) is collected and fed to the plant's chute where it is burned into flue gases with high thermal energy. This energy is converted to usable electricity by a water-steam generator, the like of which you would find in thermal or nuclear power plants.[3] Finally, the flue gases are treated to eliminate toxic substances and extract metal debris whereas the remaining waste, having turned into ash and lost up to 90% of its weight, can be recycled into building materials or disposed of safely.[4] Even though this method is not as energy effective as the use of natural gas and petroleum, its advantages lie in the constant availability of municipal waste to burn and its costlessness. In normal conditions, the net electricity energy produced by one ton of waste is 500 to 600 kWh. Thus, the incineration of the 2.04 million tons of MSW produced annually[5] by the Lebanese community can provide 1000 to 1225 GWh of electricity, which is equivalent to all the electrical energy imported from Syria and Egypt in 2010.[6] Apart from providing thousands of Lebanese households with this basic need, a WtE power plant would have considerable positive repercussions on our environment.

A case study done by the AUB in 2010 highlighted the strong correlation between the increased air pollution in the region of Beirut —with particle concentration reaching 3 times the recommended WHO maximum— and the onset of cardiovascular and pulmonary diseases as well as mental health issues.[7] Therefore, it is essential to adopt cleaner ways of creating energy, like WtE plants. When properly treated, the flue gases emitted by the incineration process are completely harmless. This technology also has negative greenhouse gases (GHG) emissions, mitigating climate change, although it releases more CO2 than gas power plants. In fact, when not incinerated, the MSW is left to rot in open-air landfills like the ones in Burj Hamoud and Jedeideh, which are nearing full capacity according to recent news coverage.[8] This decomposition, catalysed by the sun's heat, releases huge amounts of methane into the atmosphere. By preventing the emission of this gas, which is a far more potent GHG than carbon dioxide, WtE plants are thus labelled climate friendly. Landfilling's destructive effects are not limited to air pollution. Untreated waste sometimes contains heavy metals and plastics that seep into our soil and pollute our groundwater and sea, withholding from the nation important revenues in terms of tourism and sea resources.[9] Incinerating our waste can therefore lead to unexpected improvements on the country's

economic and environmental well-being. On another note, increasing electricity production progressively eliminates the need for private diesel generators or “moteurs”, responsible for 38% of pollutants in our air.[10]

Nonetheless, it is essential to note that this solution does not replace all the initiatives already taken by climate conscious citizens such as recycling and composting but is rather complementary to these efforts. In addition, the biggest barrier to addressing the Lebanese environmental crisis may reside in people’s mindsets: We need to understand that regulating businesses’ pollutant emissions, which may sometimes involve cutting down production, is not an infringement of the free market economy but rather an extension of it, by creating a sustainable circular economic model that will satisfy our needs generations into the future.

To sum up, looking at Nature and its diverse organisms teaches us to extract power from unprecedented sources, thus the development of Waste-to-Energy technology. So far inexistent in the Middle East, it constitutes a perfect fit for the Lebanese community because it would help correct the electricity deficiency as well as lessen air pollution and dispose of our solid waste. The Biomimicry 3.8 methodology is undoubtedly capable of improving upon this flourishing but yet to be expanded field.

N.B: please note that although the submitted word document is 1249 words long, the actual essay text without references and titling does not exceed the limit.

Notes and References

[1] Borunda, Alejandra. “Plunge in Carbon Emissions from Lockdowns Will Not Slow Climate Change.” National Geographic, 20 May 2020, www.nationalgeographic.com/science/2020/05/plunge-in-carbon-emissions-lockdowns-will-not-slow-climate-change/.

[2] If this essay is to be qualified, the next one will include a more detailed analysis of the mechanisms adopted by living organisms to extract energy, with example cases.

[3] Giovanni, Maffeo Felice. “Waste to Energy Technology.” UNDP, CEDRO, Empowering Lebanon with Renewable Energy, June 2015, www.cedro-undp.org/content/uploads/Publication/150609015715272~Wastetoenergy-2.pdf.

[4] “What Is Waste-to-Energy.” Confederation of European Waste-to-Energy Plants, www.cewep.eu/what-is-waste-to-energy/.

[5] “Country Report on the Solid Waste Management in LEBANON.” Ministry of Environment, Deutsche Gesellschaft Für Internationale Zusammenarbeit, Apr. 2014, www.moe.gov.lb/getattachment/-ا.لتوجيه-البيئي/معلومات-ونصايح-بيئية/قطاع-النفايات-المنزلية-الصلبة-في-لبنان/2-LEBANON-COUNTRY-REPORT-ON-SWM-2014.pdf.aspx?lang=ar-LB

[6] “The Electricity Sector in Lebanon.” Council for Development and Reconstruction, www.cdr.gov.lb/eng/progress_reports/pr102017/Eelec.pdf.

[7] / [10] Shihaded, Alan. “How Important Is Air Pollution in Lebanon?” American University of Beirut, Faculty of Engineering and Architecture, 1 Mar. 2017, www.aub.edu.lb/natureconservation/Documents/5ASHIHADEH.pdf.

[8] “Lebanon: No Quick Fixes to Trash Crisis.” Human Rights Watch, 2 June 2020, www.hrw.org/news/2019/08/10/lebanon-no-quick-fixes-trash-crisis.

[9] “Republic of Lebanon Cost Assessment of Environmental Degradation.” Ministry of Environment, World Bank, Feb. 2003, www.moe.gov.lb/abquar/docs/refer-1.pdf.