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Integrated algal biorefinery and palm oil milling for bioenergy, biomaterials and biopharmaceuticals

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Abstract. The call for greener processes and eco-friendly products has been the essence of the 2030's core agenda on 17 Sustainable Development Goals. The major challenge is in bringing systems thinking and holistic worldview to the planning and strategies to develop the Economics whilst incorporating the Environment, and Socio-cultural diversity dimension as equal components. This means a total revamp of human activities such that the discussion on climate change, famine and poverty, destruction of eco-systems and habitat for wildlife, and the emerging infectious diseases, is as relevant as, if not more important than, discussing about artificial intelligence, robotics, flying and driver-less vehicles, and exploration to Mars. There is an urgent need for resource optimization, better biodiversity management and improved agro-practices for food production and distribution, affordable health care, and cleaner energy, air and water, with strict monitoring, regulation and enforcement to minimize emission, pollution and wastage. The focus of this presentation is to highlight research and development efforts towards the realization of sustainable bioenergy production, environmental remediation and conversion into biomaterials *via* integrated algal biorefinery and palm oil milling processes. Recent development in microalgal research with nanotechnology for biopharmaceuticals and anti-cancer products will be discussed. The image problem and the negative perception surrounding oil palm industries especially with regards to the impact on the environment, and the efforts towards a more sustainable production route will be highlighted. This hopefully could bring forth insights towards partnerships and collaboration among the industrialists, investors, economists, scientists, engineers, and social scientists to tackle the immediate and pressing problems facing the Planet and the People, whilst reaping the Profit, yesterday, today and tomorrow.

1. Introduction

Integrated algal biorefinery and palm oil milling has great potential to achieve the Global Sustainable Development Goals (SDGs) agenda especially with regards to addressing the issues of clean and affordable energy, the development of sustainable cities and the communities within, with responsible consumption and production, and lesser or zero wastage. As the global CO₂ emissions from fossil fuels have also increased 15-fold [1], more effort should be made into the development of green technology and environmentally-

