



Mining of Biowealth through Use of Clean and Green Technologies

Introduction

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Humankind is dependent upon energy resources that fuel its cultural, socio-economic and technological advancement through decade after decade. The last century was exemplified as the era of *black* gold. In its first decade this century has witnessed efforts to tap the benefits of investing in *green* gold; economic misgivings and ethical skepticisms concerning policies focusing on food versus energy production. Using the toolbox colours of Mother Nature, black gold is today often recognized as a *grey* technology¹ that has left in its wake a virtually uncontrollable and undoable fall out as was evident in the neglect of surveillance signs and symptoms in the last quarter of the twentieth century. These are climate change; global warming, emergence of new diseases, and socio-cultural afflictions of non-microbial origin. Black gold and its newly-discovered natural occurrence worldwide whilst fuelling the dreams and hopes of a continent² long forgotten is forging new political inter-relationships³ with Asia and the Far East, while in the Middle East and South America⁴, it is redefining the geopolitics of oil and foreign policy orientation especially in the northern hemisphere. The political *puissance du robinet* that distributes oil and other fossil-fuel derivatives determines the degrees of comfort and discomfort of offices and homes in wealthy cities and towns lacking dependent supplies of oil and natural gas⁵ in harsh winters. As a consequence new regional security alliances such as the Shanghai Cooperation Organisation (SCO) ⁶ are emerging that are likely to force a review of

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international financial governance and institutions such as the International Monetary Fund (IMF) and the World Bank (WB). Notwithstanding the occurrence and use of oil in ancient times⁷ the era of easy and inexpensive oil is over.⁸

It's incredible, isn't it, when you stop to consider the scale of the society we have created, and to also ponder how things could have been if we had taken an alternate path - if we had recognized that there is no such thing as oil 'production', as we continually refer to it (in the sense that we cannot create oil any more than we can create gold), but only oil extraction. We do not manufacture oil, we mine it.⁹

On the other hand, the benefits of green gold are evident. Petrorefineries are giving way to biorefineries. R&D is *a la mode* in these contemporary times. Biofuels are redrawing the map of world agriculture.¹⁰ A strategy built around first- and second-generation biofuels aims to reduce the overdependency of the European Union and developing countries fossil-fuel use especially in the transport sector.¹¹ In the Pacific islands of Fiji, New Caledonia, Papua New Guinea, Vanuatu, and the island of Savai'i in Western Samoa research and feasibility studies are underway to tap coconut oil as a biofuel for electricity generation and as biodiesel in the transport sector.¹²

In Asia the emerging two powerhouses of green biotechnology, namely China and India are putting their stamp on the world's bioeconomy-based markets that influence global agricultural and biofuels trade. The Asian Development Bank (ADB) is apparently investing US\$ 900 million into "clean energy development projects in 2007, with priority given to China, India, Indonesia, Pakistan, the Philippines and Vietnam".¹³ The issues of eradication of poverty and gender equality have not been glossed over as is evident from the 'Pro-Poor Biofuels Initiative' of the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT)¹⁴ in India. Targeted areas of the initiative are: food security, energy and provision of opportunities for small and marginal farmers in the drylands and for their participation in the "global biofuels revolution".¹⁵

However, though the clean and green biorefineries that range in scale from the rural to the bioindustrial sector have been widely promoted and accepted there are still concerns and negative impacts that have been voiced in various fora. Ethical issues are reminiscent of the concerns and debates expressed some three decades ago when Gasohol was first proposed as a transport fuel. At that time the emphasis was on loss of

land and thus food production and fuel production as ethanol for the transportation sector. In current times the issues are many. These include for example ensuring energy security through provision of uninterrupted supplies; reducing greenhouse gas emissions; reclamation and protection of soil use of residual cakes of inedible oil plants; enhancing rural economies; providing opportunities for development of new rural markets; and redressing gender inequality in rural and urban employment markets. A recent UN report¹⁶ draws attention to several potential and probable negative aspects of biofuels production and use. These *en bref* are:

- use of arable land for development of bioenergy plantations instead of use for food production;
- replacement of tropical rain forestation with that of biofuel plantations;
- large-scale biofuel monocropping that contributes to soil erosion and nutrient leaching and above all loss of biodiversity; and endangering the livelihoods of small-scale rural and village farmers who are constantly being confronted with mechanized large-scale biofuel plantations and refineries.

Through promotion of a worldwide dialogue between businesses and consumers in the context of the *Business of Green*¹⁷ attention is now being focused on issues such as 'Crops for biofuels vs. food supplies'. This not only informs the public and private sectors but also helps to educate decision- and policy-makers in sustainable development of the possible use of biotech solutions to secure an aesthetic and clean environment. This is apparent in the combination in the use of renewable energy with that of urban design based upon the principle of zero carbon, zero waste cities and villages that is the building of cities and villages in consonance with nature. Examples of ecocities and ecovillages or *green* cities and villages are: Bedzed, London, U.K. (ecovillage); Dongtan, near Shanghai, China; and the Masdar initiative in Abu Dhabi.

The contributors to this special volume have addressed many of the above issues that are of significance to using biorefineries in clean, green and environmentally technologies.

Professor Ohara (Japan) describes a model for zero emission biotechnology in Asian countries. The ultimate goal is the construction of biorefineries that are fully integrated with nature in contributing to the sustenance of economic development and a safe

and unpolluted environment. This in essence is another expression of the 'zero carbon, zero waste' concept of development linked to ecovillages and ecocities.

Dr. Robert Armstrong (USA) in a visionary contribution indicates with conviction that the world's economic foundation is already shifting out of necessity from a system based on petroleum to another based on biologically derived raw materials. The basic unit of commerce is changing from the hydrocarbon molecule to the gene. This shift enhances the profile of agriculture as the source of not only food, feed and fibre, but also of energy, materials and chemicals.

Professor Kamaruddin Abdullah (Indonesia) emphasises that despite the multiple benefits offered by bioconversion technology there are still obstacles that have to be overcome in several ASEAN countries in deploying biomass as a valuable bioresource in bioeconomical development.

Professors Indrani Karunasagar and Iddya Karunasagar draw attention to the bioresources of the deep ocean once considered to be a 'biological desert'. Given that four-fifths of all life forms inhabit this ecological niche, the importance of marine organisms as a biorefinery technology resource is overwhelming.

Professor Aldo Iacomelli (Italy) focuses on decentralised cooperation in the implementation of programmes and their real (positive or negative) impact on local communities, which is inclusive of adaptation and the mitigation of global warming and climate change due to Greenhouse Gas (GHG) emissions. This strict connection with local investors also suggests different financial instruments that can define and record the evidence and relevance of environmental and social implication rather than financial results. The enunciation of the Kyoto Bond shows the interaction between non financial performance and market performance.

Finally, Professors Horst Doelle (Australia) and Edgar DaSilva (France) in an overview address several important issues that indicate that the challenges for the future are to be found in a combination of the biological, physical and chemical sciences in replicating an 'oil refinery' with a 'bio-refinery' thus replacing finite non-renewable fossil resources with biorenewable biomass resources for the production of food, feed, fertiliser, fuel, energy, industrial chemicals and related consumer products. The use of clean and green bioprocess technologies is indisputable.

Endnotes

- ¹ DaSilva (2004).
- ² Africa's Oil dreams [with reports re: Angola, (the Cape Verde Islands –especially) São Tomé, Gabon, Nigeria], TIME, June 11, 2007, pp. 22-29; See also Ghazvinian (2007) and Shaxson (2007).
- ³ Pan (2007).
- ⁴ Bartley and O'Briain (2003). See also the 'Politics of Oil in Digital History' (<http://www.digitalhistory.uh.edu/historyonline/oil.cfm>) in site update: June 10, 2007.
- ⁵ Walsh (2006).
- ⁶ The Shanghai Cooperation Organisation (SCO) an intergovernmental organisation was founded on 15 June, 2001 at a summit meeting in Shanghai of the leaders of the People's Republic of China, Russia, Kazakhstan, Kyrgyzstan, Tajikistan and Uzbekistan.
- ⁷ 'Case Study: Petroleum Origins of the Industry', (http://www.pafko.com/history/h_petro.html#End); 'The History of Petroleum Use', Encyclopedia Britannica Online Edition (<http://www.britannica.com/ebi/article-206351>); see also article on Petroleum in Encyclopedia Britannica, (www.halfvalue.com/wiki.jsp?topic=Petroleum).
- ⁸ "The Era of Easy Oil is Over", May 28, 2007, Filed under 'Peak Oil' by Craig Mackintosh (<http://www.celsias.com/blog/2007/05/28/the-era-of-easy-oil-is-over>); Heinberg (2003); Oil Depletion and the Fate of the World. A Synopsis of Richard Heinberg's: The Party's Over: Oil, War and the Fate of Industrial Societies (http://www.postcarbon.org/files/EndOfOilBooklet_0.pdf).
- ⁹ "The Era of Easy Oil is Over", May 28, 2007 • Filed under 'Peak Oil' by Craig Mackintosh (<http://www.celsias.com/blog/2007/05/28/the-era-of-easy-oil-is-over>).
- ¹⁰ Les biocarburants redessinent la carte de l'agriculture mondiale LeMone Economie, Tuesday April 3, 2007, pp. I – III.
- ¹¹ Commission of the European Communities. 2006. Communication from the Commission - An European Strategy for Biofuels, Brussels, 8.2.2006; COM (éàà-) 34final, [SEC(2006°142)]. (http://ec.europa.eu/agriculture/biomass/biofuel/com2006_34_en.pdf). Also see UNCTAD (2006) and UNU (2006).
- ¹² Coconut Oil as a Biofuel in the Pacific Islands – J. Cloin, South Pacific Applied GeoScience Commission (http://www.unesco.org/csi/smis/siv/Forum/CoconutOilFuelPacific_JanCloin.pdf); Sokhansanj et al. (2003).
- ¹³ ADB to invest 900 min USD in clean energy (<http://www.agbiotech.com.vn/en/?mnu=category&cate=1&rs=1>); (VNA 07th May 2007).
- ¹⁴ Please refer to special ABDR issue on Biofuels in South Asia (ABDR Vol. 8 No.2, March 2006).
- ¹⁵ ICRISAT's pro-poor Biofuels Initiative in Drylands and Marginally Productive Areas (<http://www.icrisat.org/investors/biofuel;pdf>).
- ¹⁶ 'Sustainable Bioenergy: A Framework for Decision Makers', 8 May 2007, New York/Rome (<http://esa.un.org/un-energy/pdf/susdev.Biofuels.FAO.pdf>).
- ¹⁷ Kanter and Rosenthal (2007).

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