

CHEMICALLY-BASED COMMODITIES INTO THE TWENTY-FIRST CENTURY

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Summary

In this article the word “commodity” is considered to mean “useful thing,” “article of trade” or something of “convenience.” Six initial sections outline methodologies which are applicable globally; these are followed by case studies detailing examples in Tanzania, Croatia, and Denmark, respectively, and whilst these are derived from data/experiences in these countries they are applicable elsewhere. Examples will include:

- responsible care within the chemical industry;
- landfill versus incineration and consideration of “externalities”; and,

- mineral mining and metals as future commodities.

Case studies include:

- food production;
- land mines;
- fine chemicals, bioethics, and sustainability.

Especially within the chemical industry, “sustainability” has led to the development of responsible care. This means that chemical and allied “commodity” manufacturers adopt a “cradle to grave” approach to the environmental requirements of their products.

In the development of international commodity policies both central governments and industry will need to be far more conscious of waste generation; governments, with the assistance of the United Nations specialist agencies, will need to establish systems for the recycling of waste articles. Waste as a source of energy will be detailed including aspects of “externalities”; and hence disposal of waste should be by incineration with combined heat and power, rather than to landfill.

In the development of these policies it is essential that consideration be given to both the health aspects of workers, to their working environment and to all compartments of the natural environment. In particular, consideration is essential in minimizing all aspects of trans-boundary pollution whether this be to the atmosphere, to rivers, lakes or oceans.

The challenge for the future is to find an acceptable compromise between the interests of humanity and the integrity of the biosphere on which future generations will have to depend.

1. Introduction

1.1 General Comments

In this context the word “commodity” is considered to mean “useful thing,” “article of trade,” or something of “convenience.” An article, which may be of use in a particular circumstance at a particular time, may not be so at a later time. This is particularly true of warfare when, for example, land mines are considered to serve a useful purpose during armed conflict—but when peace is achieved their safe disposal has the potential to cause injury to innocent persons and also to the natural environment (see also section 6).

For the future of all commodities, sustainable development, as defined in *Our Common Future* (Brundtland, 1987), is intended to meet the needs of the present generation without undermining the capacity of future generations to meet their own needs. It is a much-discussed subject by industry, governments and non-governmental organizations.

Making the transition to sustainable development is one of the most demanding challenges facing society in the twenty-first century, the challenge is to deliver rising

real incomes to twice the current world population, without undermining the environmental foundations of the world economy. This will be no easy task. Given the growth in population, no sustainable path to the future can take place without sustained economic growth. Indeed, this was a core message of the Brundtland Report. But this economic growth must now be achieved without putting further pressure on environmental systems, which are already degraded.

In 1996, His Royal Highness the Prince of Wales, in introducing the initiatives of The Prince of Wales Business Leaders Forum, indicated that

The many environmental and social challenges of our time, where economic progress brings both opportunities and treats to the sustainable development of communities all round the world, require a new partnership approach. Business, which is now the key economic motor for development, has particular responsibility to balance profitability with concern for the long-term needs of future generations.

He continued by saying:

It is hoped that through reviewing good practice, visiting examples of sound partnerships in action around the world, sharing experience, making a commitment to continuous improvement in practices, and working on initiatives to scale up experimental projects, all of us concerned with the long-term prosperity of our communities can make a greater impact on the thinking and practice of the managers and leaders of tomorrow.

It is only by means of forging new partnerships both within business and with nature that success and environmentally sustainable new commodities will be generated in the future.

1.2 Environmental Sustainable Chemical Commodities

Within the chemical industry, “sustainability” has led to the development of responsible care. This means that chemical and allied “commodity” manufacturers adopt a “cradle to grave” approach to the environment requirements of their products.

This initiative includes:

- understanding the way in which chemicals interact with animals and the natural environment;
- addressing existing (and emerging) health and environmental issues; and
- enhancing scientific understanding to promote rational policy planning.

The key finding of *Our Common Future* (the 1987 report of the United Nations World Commission on Environment and Development), is that the environmental, economic and social concerns must be integrated if the world’s people are to advance and develop without jeopardizing the natural environment on which all life depends. Although currently one cannot define the needs of future generations, the challenge for today’s

leaders is to pursue policies that will leave available an array of choices for future generations to meet their own needs.

Sustainable development will only occur if three goals are met:

- economic;
- environmental; and,
- society-related.

All of these can be reconciled.

To determine the limits of acceptability and scope for action requires a set of conventions which society at large accepts as valid.

Sustainability in economic terms means the efficient management of scarce resources, in addition to prospering industry and economy. Sustainability in the environmental sense means not placing an intolerable load on the ecosphere and maintaining the natural basis for life. Seen from society's viewpoint, sustainability means that human beings are the center of concern. Particularly in view, of the population increase worldwide, there is a requirement to provide as large a measure of equal opportunities, freedom, social justice and security as possible.

The chemical industry views sustainable development as a challenge put before all parts of society. In the advances made in its own operations, its improved performance and improvements to the human condition made through its products, the chemical industry sees cause for optimism and believes that sustainable development can be the intellectual framework around which the chemical industry, other industries and other sectors of society can reach a consensus on how to improve living standards and the environment.

The main challenges facing the world include:

- optimizing the benefits obtained from developing resources;
- assuring against excessive strains placed on the eco-system;
- the dynamic growth of the world population; and,
- remedying social and economic inequalities.

These are challenges on a global basis. Therefore, it follows that the attainment of sustainable development will call for action on the part of people, governments, businesses and organizations around the world. The global chemical industry has realized this challenge.

1.3 Landfill versus Incineration

In considering environmental sustainability and the ultimate disposal (discarding) of unwanted commodity items, e.g. waste, it is necessary to consider the most appropriate means of such disposal. There are a number of unpriced environmental costs and

benefits often referred to as “externalities” associated with landfill and incineration; the two main waste disposal options.

Whilst it is fairly straight forward to identify the type of externalities associated with landfill and incineration—such as negative amenity criteria including litter, noise, smell, and local disturbance; air and water pollution; global atmospheric and transport effects—they are far more difficult to express in monetary terms.

In 1993, the United Kingdom Department of the Environment assessed from studies (Department of Environment, 1993a; Department of Environment, 1993b) that a levy in the range US\$ 8–12 per ton of controlled waste (primarily household, commercial, and industrial waste) to landfill was justified if the international benefits of air pollution displacement from energy recovery was taken into account; and US\$ 5–9 per ton, if only the UK benefit were included.

This deduction reflects the difference between the externalities of landfill and incineration. It is largely influenced by the costs attributed to the global warming effects of methane leakage from landfill sites; and the environmental benefits of displacing energy from fossil fuel combustion with that recovered from the incineration of waste.

The extent to which these or other elements differing between landfill and incineration externalities might be addressed by other measures, would also have implications for the setting of a levy.

Other factors need to be considered, including: whether landfill sites and incinerators are located in urban or rural areas and whether there is energy recovery from landfill or not. Considerations such as these effect the innovation of new commodities, as their ultimate disposal is a parameter, which needs consideration at their conception.

The implication of a levy, which in turn will lead to stricter controls, needs to be considered with caution:

- Considerable uncertainty attaches to both the measurement and valuation of waste disposal externalities—these are generally expressed in terms of a range of values. The potential costs and impacts of greenhouse gas emissions are particularly uncertain, given the current lack of understanding concerning the likely impacts of global warming. For this reason the response to any threat of global warming has to be based on a precautionary approach.
- Adverse amenity costs are difficult to include in any estimate. Such costs are invariably associated with the presence of a site or a plant rather than the flow of waste; and that such costs do not vary in practice between incineration and landfill costs.

Economic instruments have special attractions in the field of solid waste management and must affect the innovation of new commodities.

Since there are various options for waste disposal—reuse, recycling, treatment, incineration, landfill, are the main ones—and for the reduction of waste at source,

changes in the cost of one disposal route should encourage diversion of waste to other routes.

Governments, and especially those in the Central and Eastern European Region, should begin a process of using price mechanisms to change the flow of waste going to different disposal routes, with a presumption in favor of more waste recycling, through the introduction of recycling credits. Governments should investigate other means to reduce the flow of solid waste and to encourage the remaining flow to the least environmentally damaging disposal routes. Solid wastes charges, especially a landfill levy, are a good candidate.

There is an economic argument that a levy on landfill sites should bear some relationship to the *external costs* associated with landfill. An external effect is any loss of human well-being associated with a process, which is not already allowed for in its price, e.g. the lack of amenity from unsightliness, noise or pollution.

Such external costs might include:

- the reduction in amenity value of landfill and incineration sites;
- the contribution that each disposal option makes to global warming risks through release of carbon dioxide, and the added contribution from methane releases from landfill;
- damage caused by conventional air pollutants (such as sulfur dioxide, nitrogen oxides (NO_x) and particulates from incinerators);
- damage caused by airborne toxic substances from incinerators, in particular TCDDs;
- damage caused by leachate from landfills; or,
- pollution and accidents associated with the transportation of the waste to landfill and incinerator sites—in this connection, additional costs, including road congestion, road maintenance, and noise need to be considered.

1.4 Mineral Mining

The finding, mining, and processing of the Earth's mineral resources in the twenty-first century has to be undertaken with complete regard for environmental sustainability and worker safety. The major mining companies pride themselves in both delivering good returns to their shareholders, taking a long-term and responsible approach to exploring for first class ore bodies and developing large, efficient operations capable of sustaining competitive advantage. In this manner, they assist in meeting the global need for minerals and metals, which in turn form the core of many commodities, all of which have an equally excellent future. These companies contribute to essential improvements in well-being and make a direct contribution to economic development and employment in those countries in which the major mining companies operate.

Wherever they operate, they work as closely as possible with their hosts, respecting laws and customs, minimizing adverse impacts, and ensuring transfer of all benefits and enhancement of opportunities.

Correctly, they believe that their competitiveness and their future success depends on their employees and the quality and diversity of their assets, but also on their record as good neighbors and partners around the world.

1.5 Food Commodities: Tanzania—a Case Study

The United Nations Industrial Development Organization (UNIDO), based in Vienna, has been providing infrastructural and financial support for the development of Small Industrial Development Organizations (SIDO) of Tanzania.

The Program's principle objective is to promote women's (but men are not excluded) entrepreneurship development in the food processing sub-sector through the improvement of existing micro enterprises managed by women, and encouragement of new ventures with a potential to grow into Small Medium Enterprises (SMEs). (Tanzanian Women Enterprises, 1999)

The program addresses major constraints that affect enterprise operation and growth, through skill development and integrated technical, business and managerial assistance in food processing.

In some countries in the sub-Sahara Africa there are abundant supplies of food, but only ~100 km distant people are starving. Many of these problems are related to inadequate infrastructures such as roads and railways. These countries are usually heavily debt burdened resulting from poor use of funding from both the World Aid agencies and bankers in the past. It is essential for these countries to develop a new thinking on "international commodity policies" and so be able to compete in price, quality and above all simplicity, in the goods and articles (commodities) they are able to offer.

The UNIDO program outlined in section 5 indicates that a highly positive outcome was achieved.

1.6 Land Mines: Croatia—A Case Study

One of the largest problems facing a country such as Croatia is associated with warfare and the clearance of land mines and other ordinances.

The comments which follow are as a result of personal observations by the author, following assignments to Croatia in 1993 for UNIDO to assess the effects of warfare of the natural environment caused by the destruction of industry, especially the chemical and allied industry; in 1996 to report on the facilities available to the academic community for environmental and health monitoring; and in 1999 for UNECE to draft a chapter for their Environmental Performance Review: Croatia entitled "The Environmental Consequences of Armed Conflict."

This problem is a growing one worldwide, and is one that is manifest in all war zones including the recent conflict in Kosovo and Serbia.

1.7 Biotechnological Contributions to Sustainable Development: A Case Study

A Danish company is a world leader in recombinant technologies, and is finding that these and other emerging technologies are enabling them to reach their goal in the development of improved ways to fight the burden of disease and provide sustainable biological solutions for industry and agriculture, including an account of the development and use of phytase (see section 7.6)

Their move to sustainable development is in essence a paradigmatic change. Instead of being a threat to a company, they believe it can be an opportunity to create competitive advantage, if successfully integrated into corporate strategy and policy. But it requires a more holistic mind-set that acknowledges that every company, and every single employee, must strive to make a difference. Such companies have to be prepared to enter into dialog with all interested stakeholders in order to understand fully the issues of sustainability. They must be prepared to learn from and influence customers, suppliers and other interested parties who can bring together all new concepts in the development of future commodities.

One of the new topics, they took very seriously was bioethics, which they found needed more focus and concerted action. They did this with the aim of becoming more proactive in their approach and started to work on these issues in a more integrated and methodical way by commissioning an external review.

They now are accountable, ambitious, open and honest—these are the values that everyone should now both believe in, and the values we live by.

1.8 General Considerations

The greatest threat to the future of our planet, Earth, the only place we are currently able to live upon, could well be the lack of responsibility—at a global, national, corporate and, most importantly, at a personal level. The global economy and the world population are expanding. Without a responsible approach to economic growth, the prospects for our planet could be dismal, even devastating. But everyone must take an optimistic approach and believe in one's ability to learn and adjust to changes in the world in which we live, and thereby do business in a more responsible and sustainable manner.

Within Central Europe, and especially so the “accession” countries, it is essential that in reconstruction and development full observance is given to the availability of “commodities.” Such countries may wish to produce certain “commodities” but need to take considerable account of these articles within their Region. They can only succeed with a “commodity” which is already being manufactured in that Region, if they can demonstrate that they can manufacture it at lower costs to a high purity, to recognized international standards, coupled with low emissions to the natural environment, and simultaneously ensuring high levels of occupational health and safety.

It the development of international commodity policies both central governments and industry will need to be far more conscious of waste generation. Governments, with the

assistance of the United Nations specialist agencies, will need to establish systems for recycling of waste articles. Waste as a source of energy will be detailed in section 3, including aspects of “externalities.”

In the development of these policies it will be essential that consideration is given to both the health aspects of workers, to their working environment and to all compartments of the natural environment. In particular, consideration is essential in minimizing all aspects of trans-boundary pollution whether this be to the atmosphere, to rivers, or oceans.

It must be remembered that we are now totally dependent on man-made chemicals and the future of all new commodities will have their core within the chemical industry.

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Biographical Sketch

Mervyn Richardson is a Chartered Biologist, Chartered Chemist, and European Chemist whose early career was in the fine chemical industry, then the food industry, before moving to the British Water industry in 1975. In 1990 he became a free consultant editing books on environmental topics, and a high-level consultant to the United Nations specialist agencies. Most of his missions have been to Central and Eastern European countries, but in addition he has undertaken assignments in the Middle East, China, and Pakistan. One of his main interests is the environmental consequences of armed conflict, largely in Croatia. Most of his work for the United Nations has been for the United Nations Industrial Development Organization (Vienna), extensively in the field of ecotoxicology and chemical safety. He has also undertaken assignments for the World Health Organization (Alexandria, Bilthoven, Copenhagen, and Geneva); United Nations Environmental Programme (Geneva in collaboration with the Center for International Projects, Moscow); United Nations Institute for Training and Research (Geneva); and United Nations Economic Commission for Europe. Additionally, he advises a number of European chemical companies on health, safety, and environmental topics, especially environmental sustainability. He was a National Member of The Council of The Royal Society of Chemistry, London (1998–2000). Mervyn Richardson has published over 80 scientific communications, is a member of the editorial board of four scientific journals, and has presented papers, chaired sessions, or organized scientific meetings in a number of countries; he is also visiting lecturer at a six universities in Europe.