

# MEASURING ENVIRONMENTAL SUCCESS:

## THE DEVELOPMENT AND USE OF MATERIAL INDICATORS

### A GREEN PAPER BY THE ENVIRONMENTAL SERVICES ASSOCIATION

#### 1 introduction

Environmental awareness has developed in recent years. Most people now want to recycle. Producers must increasingly respond to demand for environmentally sound products. At both EU and national level, "sustainable production and consumption" is now advocated.

Debate needs to become better informed. We need sound, transparent and internationally agreed measurements to help us all to align economic and environmental sustainability.

Efforts to sustain the environment are essential to the future well-being of the economy. The process of adapting to more environmentally sustainable lifestyles will however require radical change in patterns of employment and consumption. To counter both demagogues and "greenwashing", responsible political leaders need a clear and credible basis for explaining that necessary hard choices are made for good reasons.

Carbon trading and sustained publicity about climate change have raised awareness of environmental accounting, although important work to develop effective market based instruments is also potentially compromised by the lack of transparency or common basis of assessment in the proliferating international offset market in traded permits.

With inadequate inter-governmental agreement, many entities - including those in the waste and recycling sector - are taking initiatives to measure environmental performance.

This short paper summarises international efforts – notably the excellent work of the OECD's Secretariat – to secure consensus on material flow ("MF") measurements and also summarises the longstanding leadership given by the UK's waste and recycling industry which manages huge volumes of material, including carbon.

Multinational organisations have developed a range of indicators which can be used to monitor MFs, calculate resource productivity ("RP": the physical resources needed to produce a unit of economic output) and assess policy effectiveness. These remain underused, often because the necessary data is not gathered.

The power of MF and RP indicators can be greatly enhanced when coupled with life cycle analyses to highlight environmental pressures in different sectors and economic processes.

Policy makers are faced with two challenges:

- a they must put data collection systems in place to capture information needed to measure environmental pressures. To manage it is necessary to measure;  
and then
- b they must align economic incentives and environmental outcomes.

The waste and recycling industry is a vital part of the solution. Re-using more recycled materials offers instant wins, improving Britain's material balance and environmental performance in a context where European studies suggest it takes 20 tonnes of material to produce the 1 tonne of finished product each Briton consumes a year.

In 2006 the Government's Waste and Resources Action Programme ("WRAP") conducted a meta-analysis of life cycle analyses for the treatment and disposal methods for a number of different material streams. While WRAP's work was more narrative than analytical, its conclusion is generally accepted: recycling is often the most environmentally beneficial option for waste management and often leads to potentially significant carbon savings.

## 2 international work

This section summarises the work of multinational organisations like the OECD and EU.

Much of this work has focussed on developing robust and consistent MF indicators including metrics for:

Domestic Extraction Used	Total Material Consumption
Direct Material Input	Physical Trade Balance
Total Material Requirement	Total Domestic Output
Domestic Material Consumption	

Direct Material Indicators illustrating the total material use in an economy or sector could help the recycling sector to reduce the total primary material requirements in the economy. This would require great improvement in the quality of available data on resource use: the Biffaward programme (outlined below) has helped, but the recent Report of the House of Lords Science Committee criticised HMG which shares culpability with many other governments.

Combining such material indicators with measurements, like GDP, of value added by labour and capital indicates RP. Over time, factors influencing RP can be identified and the effectiveness of policy to improve RP monitored.

MF analysis can also benchmark both different sectors and individual facilities and can monitor how technological progress helps to increase RP. The crucial question for policy makes is how best to incentivise improvements in RP across the economy.

If RP grows more slowly than GDP in a growing economy, the economy still uses more material. To decouple economic growth and environmental pressure – i.e. secure sustainable growth - RP must rise faster than growth.

This needs ongoing technological innovation and investment. However, recycling can provide immediate relief to resource pressures in the economy. Moving towards a 'closed loop economy', which uses recycled materials, could radically improve the physical trade balance of the UK economy and reduce consumption of primary resources.

### *Natural capital: as a factor of production*

Natural resources provide a source of capital (often referred to as natural capital) which is exploited through economic activity in the same way as human, man-made or social capital. Economists assess how much substitution between these different resources is feasible. If substitution between natural capital and other resources is difficult or undesirable, increasing focus on RP can still mitigate environmental pressures.

MF and RP indicators help policy makers to understand the productivity of natural capital in economic processes. This should enable them to include RP as part of any productivity analysis.

It is not feasible to consider RP in isolation. Total productivity encompassing all forms of capital will usually be the basis of forming an overall economic perspective.

Judgments about trade offs between material inputs, energy inputs, labour inputs (both in terms of time and number of employees) and other inputs will be based on both the political and environmental context of the decision maker.

### *Natural capital: renewable and non-renewable resources*

Generally, economists consider the most efficient method for managing natural resources to be through applying market principles. For this to work, however, property rights need to be properly defined and appropriate incentives must prevent overexploitation.

That said, management of renewable and non-renewable resources should be carefully distinguished: environmental and economic issues associated with each tend to differ.

In the case of renewable resources, such as forestries or fisheries, the harvest or catch should not exceed the maximum sustainable yield where the natural resource can replenish itself to the full extent of the harvest taken. The EU's Common Fisheries Policy is one of many global examples of failure to disincentivise overexploitation.

In the case of non-renewable resources, it is more generally considered that market principles should deliver the optimal rate of extraction. Price rises should incentivise people to find substitutes for resources in short supply. Artificially reducing energy costs, for example, leads to inefficient allocation of resources and could potentially create unexpected transfer costs from the taxed poor to the wealthy.

### *Life cycle analysis*

An important aspect of MF analysis is assessing environmental impacts associated with the flows of different materials through the economy. MF indicators can be combined with life cycle analysis to give a comprehensive picture of environmental pressures through the economy. This combination can help policy makers address specific problems and assess the effectiveness of different policies over time.

### *Material accounts usage: Information gaps*

In resource markets, market failures often arise through a lack of information: this could also be mitigated with MF and RP indicators. MF indicators could inform market participants, enabling more people to anticipate potential scarcities and promoting long term investments in renewable energy or recycling infrastructure.

Agreed and robust MF and RP indicators would also allow policy makers to target environmental problems more effectively and monitor effectiveness of policy over time.

### *Issues for the adoption of MF and RP indicators*

Indicators must be coherent, internationally accepted and relevant both for decision makers and the wider public who could be helped to make better informed purchases. The largest obstacle to introducing reliable MF accounts is the lack of consistent data, itself a symptom of insufficient investment by governments, and a particular problem when reliance is placed on tradeable permits where accurate pricing depends on data.

Comprehensive MF accounts would inform market participants seeking to invest in alternatives to virgin resources and improvements in RP. Analysis of life cycle environmental impacts could more effectively focus environmental policies such as resource taxes on vulnerable virgin materials. RP indicators could then measure and assess the effectiveness of such policies.

### A way forward

MF and RP indicators are a necessary tool for policy makers in a world constrained by limited resources. With more systematic data capture, indicators outlined in this paper could be more robustly and consistently adopted, allowing more effective monitoring of environmental pressures and helping policy to target improved resource efficiency.

Recycling has an important role to play. Life cycle analyses have shown that, in many cases, recycling optimises carbon savings associated with waste management. Also, re-use of materials reduces pressure on resources and makes economic growth more sustainable.

### 3 the waste and recycling industry's early leadership: the Mass Balance Movement

In the UK the 'Mass Balance Movement', funded by Biffaward, published a comprehensive reference on resource flows within the British economy. This programme was consistently hampered by poor official data - a problem recently highlighted in the House of Lords report into the Government's performance on improving material recovery rates from the commercial and industrial sectors – but sought to:

- a map flows of several materials - including carbon, glass, iron, steel, aluminium and packaging - throughout the economy in separate studies. Each study mapped the mass flows through the economy and highlighted potential gaps in analysis - for example, primitive and inaccurate techniques for measuring carbon flows - before suggesting policy recommendations;
- b identify mass flows through the UK in economic sectors including agriculture, chemicals, electricity and government;
- c estimate the UK's 'ecological footprint' on a geographical basis;
- d identify problems in measuring different materials and the quality of the data in material consumption and MF. With standardised and detailed metrics in place, it will become possible more directly to target and apply a market price to the environmental costs of using resources. Proxies - like energy usage for carbon emissions - are an intermediate step but increasingly more precision will be needed to inform massive investment decisions in, for example, new recycling and energy recovery technologies.

### 4 current work by the waste and recycling industry

The waste management sector across the EU-15 reduced its greenhouse gas emissions by 32% from 1990-2003 and the UK's waste and recycling industry – which both manages carbon on behalf of waste producers and is subject to many regulatory regimes - is now developing coherent and robust carbon metrics for consistent monitoring of greenhouse gas emissions arising from the sector's activities.

This should help to inform investment decisions and it is anticipated that this work will help the sector to identify carbon efficiency whether at an individual facility or in the sector as a whole. Benchmarking will further improve performance and cut emissions.

The development of a mass and energy balance for the waste and recycling sector would also help policy makers to improve alignment of economic and environmental outcomes: i.e. improve the environment while strengthening the economy.



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