

## Improving Recycling Markets

**How do recycling markets work?**

**How can search and transaction costs be reduced?**

**Can better information help buyers avoid “lemons”?**

**Can consumers be persuaded to buy products manufactured from recycled waste?**

**What is the role of product design in encouraging recycling?**

**How can public authorities ensure competition in recycling markets?**

**How can recycling markets be made more efficient?**

**For further information**

**For further reading**

**Where to contact us?**

### Introduction

Societies produce ever-growing quantities of solid waste, from packaging to abandoned televisions and cars. Disposing of this waste, often by burying it in landfills or burning it, produces significant soil contamination, as well as air and water pollution. It is particularly important to manage hazardous solid waste safely and efficiently.

One way of limiting the scale of the problem is to recycle waste where it is economic to do so. As such, OECD governments are setting recycling targets at increasingly higher levels, and for a growing range of materials. Another reason for recycling for some governments is that it can contribute to “sustainable materials management”, reducing pressures on natural resource stocks – recycling paper and cardboard packaging, for example, not only reduces the number of trees being cut down to produce pulp, but also uses less energy than producing paper using new materials.

Recycling is playing a larger role in our economies, at least partly thanks to government incentives. The Bureau of International Recycling (BIR) has estimated that the recycling industry handles more than 500 million tonnes of waste and employs more than 1.5 million people, with an annual turnover of USD 160 billion.

Recycling only makes sense if it is economically attractive – and that means recycling markets must function properly. What kind of barriers and failures are recycling markets facing and how can they be overcome? This Policy Brief looks at how recycling markets have developed and what government can do to encourage continued growth in recycling and use of recycled materials. ■

**How do recycling markets work?**

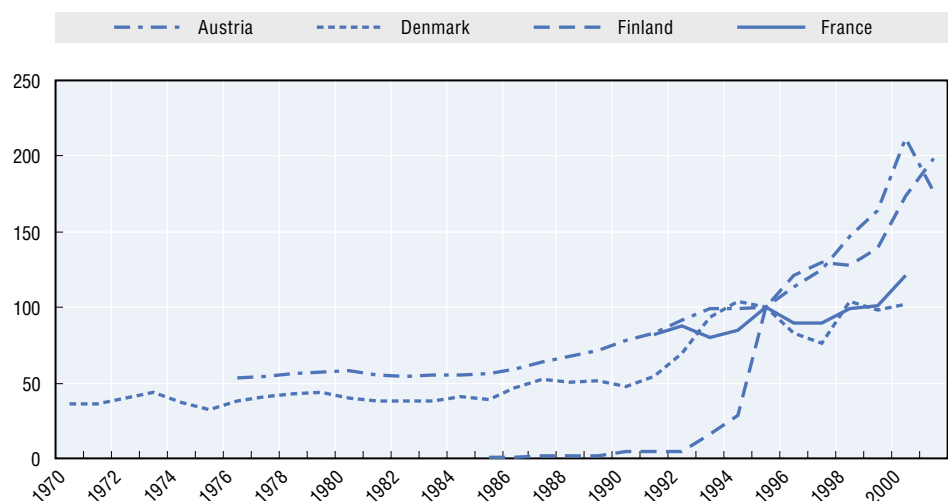
Governments use a wide variety of measures to promote recycling, such as public collection schemes for waste paper, deposit-refund systems for used gas containers, take-back programmes for used batteries, or product standards imposing a minimum level of recycled content. And recycling is clearly on the rise (see Figure 1).

Policy measures to encourage recycling, however, will only meet with limited success if the markets for recycled products are not functioning well. Governments are constantly asking for a greater proportion of goods and materials to be recycled, but the cost of meeting these targets is determined to a large extent by the marketplace.

Unfortunately, there is some evidence that markets for some recyclable materials are subject to important failures and barriers, and this can be costly. For one thing, inefficient markets are frequently subject to price volatility. As Table 1 shows, price volatility for recyclable materials is generally greater – and in some cases five times greater – than price fluctuations for virgin materials which are close substitutes. This price volatility leads to uncertainty, and can discourage investment, thus undermining the financial viability of recycling.

Five issues have been identified as potentially significant barriers and failures in markets for recyclable materials: search and transaction costs; information failures; consumer perceptions and risk aversion; technological externalities; and market power. But what can governments do to overcome the barriers to recycling markets, which in turn may help the markets function better and thus reduce price volatility? ■

**Figure 1.**  
**INDEX OF PRODUCTION (VOLUME) OF THE RECYCLING SECTOR**



Source: OECD STAN Industrial Database.

**How can search and transaction costs be reduced?**

It can be difficult for buyers of recyclable waste to find sellers of waste, and vice versa. These “search” costs are common to all markets, but they may be particularly high in markets for recyclable materials. Unlike most other manufacturing or service sectors, suppliers are not easy to find or grouped in one area or even industry, since recyclable textiles, paper, plastics, etc. are spread across industries, households, and geographical areas. Predicting how much recyclable material will be available, and when, is also difficult, since it is by its very nature the by-product of other decisions. For instance, the amount of scrap metal available from cars depends on how many cars were produced in the first place, and the rate of turnover of the vehicle stock. So recyclers may incur significant costs just in identifying suppliers of recyclable material.

In addition, the quality of material being offered for recycling can vary widely, making it difficult to value and this can result in significant costs for buyers and sellers in agreeing on a price. These “transaction” costs are likely to be even more difficult in cases where the waste is mixed (paper, plastics, etc.) or where the characteristics of the waste are not easily detectable or visible. In such cases, each shipment is unique and buyers and sellers must negotiate a fair price.

Public authorities have often tried to reduce search costs by making it easier for buyers and sellers to find each other. A large number of local authorities in OECD countries publish lists of potential counterparts for both buyers and sellers of recyclable materials. In other cases, public authorities support the use of websites for exchanges – i.e. for construction and demolition waste in Austria and aggregates in the United Kingdom.

**Table 1.**  
**STANDARD DEVIATIONS**  
**OF MONTHLY PRICE**  
**CHANGES FOR SELECTED**  
**PRIMARY AND**  
**SECONDARY MATERIALS**

<i>Textiles</i>	
Processed yarns and threads	0.36
Textile waste	2.08
<i>Rubber</i>	
Natural rubber	6.25
Synthetic rubber	1.66
Reclaimed rubber	1.40
<i>Zinc</i>	
Lead and zinc ore	4.59
Zinc scrap	4.50
<i>Aluminium</i>	
Aluminium ingot	3.68
Aluminium scrap	6.29
<i>Copper</i>	
Copper ore	1.64
Copper scrap	5.57
<i>Iron</i>	
Iron ore	1.64
Iron scrap	5.73
<i>Paper (Jan. 1993-Feb. 2003)</i>	
Pulpwood	1.80
Paper-making woodpulp	3.98
Wastepaper	9.24

Source: United States Bureau of Labour Statistics ([www.bls.gov](http://www.bls.gov)).

Public authorities have also sought to reduce transaction costs once buyers and sellers have been able to contact each other. In Korea, a monthly “Market Survey on Recyclable Materials” provides information to 1 000 subscribers on prices and trends in markets for waste paper, synthetic resins, glass bottles, metal cans, and used tyres. In addition, grading and certification schemes can help to “commodify” heterogeneous waste. Austria’s *Compost Ordinance* specifies three grades of compost, designed to reduce the “space” for negotiation. This is also common for wastepaper and metal scraps.

And finally, dissemination of “standardised” contracts may also help to reduce transaction costs. The Netherlands has recognised the value of this with respect to recyclable construction materials, as has the United Kingdom in the area of wastepaper. ■

### Can better information help buyers avoid “lemons”?

In addition to uncertainties about waste quality which increase transaction costs, buyers may also have difficulty in determining whether waste materials contain contaminants which will have to be removed before recycling. For example, buyers of waste lubricating oils can never be certain that they are free of certain contaminants (heavy metals, polychlorinated biphenyls, halogens or even water), which will make re-refining more difficult. The presence of even a small amount of PVC (polyvinyl chloride) in mixed plastic waste can make an otherwise valuable shipment worthless.

If sellers believe that the contaminant will not be detected, they will not worry about the negative effect on their reputation of selling worthless materials. This can result in a downward spiral in the quality of waste placed on the market. In addition, if buyers have doubts about the quality of the waste they are buying, the waste may not be recycled for its highest potential value-added use. Thus, batches of waste oil may be directed to incineration instead of regeneration. In a review of the wastepaper sector in the United Kingdom, it was found that 25% of “mixed paper” was graded at too low a level resulting in significant missed opportunities for revenue generation. Such information gaps can undermine the market, with adverse economic implications.

It can, of course, be difficult to encourage market participants to reveal the true quality of the wastes being placed on the market. However, public authorities could (and do) support research and development of “testing” equipment and programmes, thus making quality more easily detectable. The growing use of infra-red technologies in plastics sorting may help, as well as testing programmes for waste oils before they are collected. In addition, support for dispute resolution mechanisms, giving buyers recourse to compensation in cases of misrepresentation by sellers, can make markets more efficient. ■

### Can consumers be persuaded to buy products manufactured from recycled waste?

In addition to problems associated with the use of recycled materials as intermediate inputs in the production of final goods, consumers may be reluctant to buy items manufactured from recycled materials because of a lack of accurate information about their reliability and performance. Even the word “waste” has a negative connotation, and may lead potential consumers

to associate terms such as wastepaper or waste oils with risky or inferior products.

However, this mistrust is often unjustified. In many cases goods manufactured from recycled materials have to meet the same standards as goods manufactured from virgin materials, and are therefore perfect substitutes. Nonetheless, myths such as the idea that recycled paper will jam printers and photocopiers can persist for years despite all evidence to the contrary.

Such concerns are particularly important in markets where the goods in question are perceived to be subject to high-cost risks, however low the probability of them arising. In the case of re-treaded tyres the implications of a “blow-out” are particularly significant, including possibly fatal accidents. Although re-treaded tyres are up to 50% less expensive than new tyres, the price difference is still insignificant compared to the potential costs of a blow-out, however small the perceived increase in the risk of one happening. Consumers are often particularly risk averse under such conditions.

Similarly, consumers may be reluctant to risk damaging their vehicle engine or industrial equipment by purchasing re-refined oils. This reluctance can persist even when the quality of re-refined lubricants is equivalent in quality to lubricants manufactured from virgin oil. Typically, re-refined base oil attracts a price 20% to 25% below that which might have been expected for a crude oil product with similar viscosity and related features.

It is, of course, potentially hazardous for public authorities to intervene in markets to try to change such underlying consumer preferences. However, there are three useful roles which public authorities can play in this area:

- They can serve as a “trusted” source of demand by buying recycled products themselves. Unfortunately, governments have often played the opposite role, with procurement contracts specifying the use of products manufactured with primary materials even when this is not strictly necessary.
- They can provide information on the quality of products manufactured from recyclable materials. For instance, both France ([www.marque-nf.com](http://www.marque-nf.com)) and the Slovak Republic ([www.druhasanca.sk](http://www.druhasanca.sk)) have active programmes in this area. In some cases certificates of quality for goods produced from recyclable materials are provided.
- They can develop appropriate product standards and ensure that these standards are based upon appropriate performance criteria, and not on whether the product is made of virgin or recycled material. This would ensure that consumers make decisions based upon product performance in an unbiased manner. ■

### What is the role of product design in encouraging recycling?

The increasing complexity of product design, and of the materials used, has driven up the cost of recovering recyclable material in many markets, and in some cases has made it altogether impossible. Clearly, such changes in product design bring benefits to producers and consumers or they would not be undertaken. But since the cost of any subsequent loss in recycling possibilities is transmitted through the market to designers and

manufacturers, it is possible that the economic benefits in terms of product quality are ultimately less than the economic costs in terms of reduced material recovery possibilities.

Recycling markets of metal composite wastes and post-consumer electronic appliances are typically affected by this problem, since recoverable waste can be difficult to extract. A similar problem applies to markets for waste lubricating oils, which are all the more difficult and costly to recycle because they contain additives such as chlorinated hydrocarbons and dithiocarbamates (containing lead) used as extreme pressure agents.

The use of composite plastics, special additives or mixing of colours also creates problems for recycling. Another example is the modification of standard PET (polyethylene terephthalate) bottles to allow products such as beer to be packaged in them. This new technology brings important commercial benefits, but is incompatible with the existing processes for mechanical recycling.

To overcome such problems, public authorities can support research and development for technologies used in sorting and reprocessing facilities. This may help improve recyclability of goods once they are produced, but it will not necessarily result in improved product design. Indeed, it may have the opposite effect since incentives to design products for ease of recycling will have fallen. There are nonetheless some measures which are likely to provide incentives for improved product design. These include:

- Well-designed extended producer responsibility and deposit-refund schemes, which transmit signals to product designers, manufacturers and retailers concerning the costs that arise from designing products in a manner which limits recyclability; and,
- Providing information on how technological externalities can be overcome. For instance, in Austria, the *Ordinance of End-of-Life Vehicles* makes it easier to recover material and components by applying material and coding standards, as well as information on dismantling. ■

### How can public authorities ensure competition in recycling markets?

One of the few areas in which there has been considerable work on the effects of market failures on recycling markets relates to market power. Some argue that dominance of the market by a limited number of firms in the production of virgin materials has restricted recycling markets because the virgin material producers have the power to undercut more competitive producers of recyclable materials.

How can such market power hamper recycling? In the area of pulp and paper, vertical integration between the forestry sector (and thus pulpwood production) and pulp and paper production, may restrict market penetration of used newsprint in pulping. In the area of aluminium, it has been argued that a price-making aluminium manufacturer had been able to exercise control over the scrap market. In the area of lubricating oil, it has been alleged that manufacturers of virgin lubricating oil use their influence to discourage “switching” by consumers to re-refined oils.



However, there is little empirical evidence that the exercise of market power by virgin material producers has suppressed markets for recyclable materials. Moreover, there are also arguments to support the view that market power in virgin material markets may serve to increase the use of recyclable materials. For instance, in the case of motor vehicle tyres, if firms are able to segment the market between buyers of re-treaded and new tires, they may be able to maximise profits by exploiting differences in demand in these two segments. Where there is market power in virgin material markets, and where this has adverse implications for recycling, there are few tools at the disposal of public authorities beyond the usual application of competition policy. However, few cases have been pursued by competition authorities.

A bigger potential concern is that some market participants within the recycling sector may be restricting the supply of recyclable materials in pursuit of their commercial objectives. For instance, in cases where markets are primarily local in nature (i.e. construction and demolition waste), or when there are significant economies of density (i.e. wastepaper collection), there may be issues of market power in the recycling process itself which need to be addressed. This is particularly true if the buyers of recyclable materials are granted concessions by public authorities which are not subject to competition. ■

### How can recycling markets be made more efficient?

Many OECD governments have introduced recycling targets for a wide variety of materials, as well as dedicated policies to encourage recycling. However, the efficiency of such measures depends not only upon their design, but also on the underlying characteristics of the markets in which they are introduced. Unfortunately, it would appear that markets for at least some recyclable materials are subject to significant failures and barriers.

Some of these, such as transaction and search costs or consumer perceptions about product quality are typical of “new” markets and will become less important as the market matures. This is because over time the market will find efficient strategies to overcome them, such as standards organisations which grade scrap, vertical integration between material recovery and manufacturing stages, or waste brokers which serve as market intermediaries.

However, the market may not always respond, and then policy intervention is necessary to ensure that an efficient market develops. In the absence of such interventions, even an “efficient” environmental policy can be costly due to other failures in the market. Although environmental policy has an important role to play, more general market and industrial policies will also be needed to remove these potential market failures. A thorough understanding of the markets and the means by which different policies interact with each other and impact upon the market will be keys to developing the right mix of policy interventions. This involves coordination between ministries and agencies such as ministries responsible for environmental concerns, competition authorities, and standards bodies. ■

### For further information

For more information on the OECD’s work on recycling markets, please contact Nick Johnstone, e-mail: [nick.johnstone@oecd.org](mailto:nick.johnstone@oecd.org), tel.: + 33 1 45 24 79 22, or Soizick de Tilly, e-mail: [soizick.detilly@oecd.org](mailto:soizick.detilly@oecd.org), tel.: + 33 1 45 24 79 06.



### For further reading

OECD (2006), **Improving Recycling Markets** (Paris: OECD), ISBN 92-64-02957-5, 186 pages, € 35.

OECD (2005), **Environmentally Harmful Subsidies: Challenges for Reform** (Paris: OECD), ISBN 92-64-01205-2, 160 pages, € 35.

OECD (2004), **Addressing the Economics of Waste** (Paris: OECD), ISBN 92-64-10618-9, 208 pages, € 48.

Visit our website at: [www.oecd.org/env/](http://www.oecd.org/env/) or the OECD Online Bookshop at [www.oecd.org/bookshop](http://www.oecd.org/bookshop).

---

OECD publications can be purchased from our online bookshop:  
[www.oecd.org/bookshop](http://www.oecd.org/bookshop)

OECD publications and statistical databases are also available via our online library:  
[www.SourceOECD.org](http://www.SourceOECD.org)

---

### Where to contact us?

#### OECD HEADQUARTERS

2, rue André-Pascal  
75775 PARIS Cedex 16  
Tel.: (33) 01 45 24 81 67  
Fax: (33) 01 45 24 19 50  
E-mail: [sales@oecd.org](mailto:sales@oecd.org)  
Internet: [www.oecd.org](http://www.oecd.org)

#### GERMANY

**OECD Berlin Centre**  
Schumannstrasse 10  
D-10117 BERLIN  
Tel.: (49-30) 288 8353  
Fax: (49-30) 288 83545  
E-mail:  
[berlin.contact@oecd.org](mailto:berlin.contact@oecd.org)  
Internet:  
[www.oecd.org/deutschland](http://www.oecd.org/deutschland)

#### JAPAN

**OECD Tokyo Centre**  
Nippon Press Center Bldg  
2-2-1 Uchisaiwaicho,  
Chiyoda-ku  
TOKYO 100-0011  
Tel.: (81-3) 5532 0021  
Fax: (81-3) 5532 0035  
E-mail: [center@oecdtokyo.org](mailto:center@oecdtokyo.org)  
Internet: [www.oecdtokyo.org](http://www.oecdtokyo.org)

#### MEXICO

**OECD Mexico Centre**  
Av. Presidente Mazaryk 526  
Colonia: Polanco  
C.P. 11560 MEXICO, D.F.  
Tel.: (00.52.55) 9138 6233  
Fax: (00.52.55) 5280 0480  
E-mail:  
[mexico.contact@oecd.org](mailto:mexico.contact@oecd.org)  
Internet:  
[www.oecd.org/centrodemexico](http://www.oecd.org/centrodemexico)

#### UNITED STATES

**OECD Washington Center**  
2001 L Street N.W., Suite 650  
WASHINGTON DC. 20036-4922  
Tel.: (1-202) 785 6323  
Fax: (1-202) 785 0350  
E-mail:  
[washington.contact@oecd.org](mailto:washington.contact@oecd.org)  
Internet: [www.oecdwash.org](http://www.oecdwash.org)  
Toll free: (1-800) 456 6323

The OECD Policy Briefs are prepared by the Public Affairs Division, Public Affairs and Communications Directorate. They are published under the responsibility of the Secretary-General.