

creative policy packages for waste:

Denmark

overview

Denmark has expanded its recycling of total wastes and of household waste over the last ten years, although for household waste this has not been to the extent achieved by some of the other countries in this study. It has maintained and slightly expanded a large incineration sector. It has employed a mixture of waste and packaging taxes, mandatory separation and landfill bans, with a deposit return system. The powers of local authorities to direct all wastes within their boundaries has given them a way of keeping waste out of landfill, but has also been a way of expanding incineration capacity in pursuit of renewable energy objectives.

who did we interview?

- Lone Lykke Nielsen, Head of Section in the Household Waste Division of the Danish Environmental Protection Agency
- Henrik Wejding, Dakofa, The Danish Waste Management Association - a cross-sectoral forum for discussion of waste issues with members from the waste management industry and local and national government
- Jacob Hartman, Greenpeace Denmark

what kind of country is Denmark?

Denmark has a land area of 43,094 square kilometres and a population of 5.3 million people, giving a moderate population density of 124 inhabitants per square kilometre. It has relatively scarce landfill capacity – the estimate in 2000 was around eight to nine years capacity¹.

All landfill sites and the majority of incinerators are publicly owned, although the electricity industry is increasing its participation in the building of incinerators. The majority of recycling facilities are in private ownership except composting plants which are mainly publicly owned and some biogas plants. Collection is generally contracted out by local authorities.

¹ Estimation based on remaining landfill capacity of 24.7Mt in 1994 (Warner Bulletin, July 2001) reduced for landfill filled between 1994 and 1999 and assuming further landfilling at same rate as 1999 (1.5Mt per year).

what has been achieved?

In 1999 Denmark had already achieved its 64 per cent recycling target and 12 per cent landfill target for total waste, set for 2004². Construction and demolition waste made a significant contribution to the total recycling figure. Growth in recycling of other waste streams has slowed since 1996, with household waste³ at around 29 per cent (1999), and waste from the service sector⁴, around 37 per cent (1999). Overall municipal waste recycling⁵ was estimated at around 31 per cent in 1999.

Household waste arisings show a three per cent average yearly increase between 1985 and 1999; total waste arisings have grown by an average of two per cent although between 1998 and 1999 there was a drop in total waste arisings. This was mainly because of a decrease in ash from power plants due to less electricity export and more electricity being generated from wind and natural gas. From 1999 to 2000 there has been a new increase (eight per cent) in the amount of waste – mostly from industry and services.

what were the motivations behind the strategy?

Lone Lykke Nielsen sees the high environmental awareness of the Danish population as a driver, manifested as problems in siting new landfills in the mid 1980s, especially in the Greater Copenhagen area: “Waste transporters were demonstrating in front of the Parliament that they had nowhere to take their waste”. There was also a debate about dioxin emissions from incineration plants, in the wake of the Seveso accident in 1976, and political consensus on the need for action.

Henrik Wejdling also identifies lack of space for landfill as a motivation, and agrees that there is high environmental awareness: “the new waste strategy was one of the ways for the Government to answer people’s desire to be more directly involved with environmental matters and to get them to do their bit for the environment”. He also cites Denmark’s energy policy, which encourages district heating using waste as a fuel, and is seen by policy-makers as having a low cost and low environmental impact.

Jacob Hartman sees the strategy as driven by committed politicians as well as the public: “When people realised that waste was a serious environmental problem, committed politicians moved to organise waste and waste prevention strategies.”

2 Total waste includes household waste, waste from the service sector (institutions, trade and offices), industrial waste, construction and demolition waste, waste from wastewater treatment plants, and waste from energy production.

3 Household waste includes domestic waste, bulky waste and garden waste.

4 Waste from institutions, trade and offices.

5 There is no such category in Denmark; the figure is derived from the sum of household waste and waste from the service sector and is very comparable to the UK definition of municipal waste.

what are the principal instruments?

tax on landfill and incineration

The most important means has been a waste tax on landfill and incineration, which has been in place since 1987. Initially, the tax was the same for landfill and incineration – 40DKK per tonne. It has been increased every year and has now reached 375DKK (£50) for landfill, 330DKK (£44) for incineration.

Being weight-based, the landfill tax has had a dramatic effect on building and construction waste. Soon after its introduction more than 80 per cent was being recycled. It had less dramatic effects on other industrial waste and little effect on household waste. Municipalities did not pass on the increased costs of disposal to householders in ways that would stimulate recycling, although some have now started to introduce pay-as-you-throw schemes to put a higher price on waste that is not recycled.

The effects of the incineration tax have been complemented by tighter emission standards. Lone Lykke Nielsen: “the cost [before the tax] of incineration of household waste is not very high because of the income generated for municipalities from recovering energy for electricity and heating. However, stricter emission standards had the effect of increasing incineration costs, which, together with the tax, helped to make recycling economic”.

Jacob Hartman adds: “the waste tax is a main instrument because it clearly differentiated costs, making landfill most expensive, incineration second most expensive, and recycling cheapest”.

mandatory separation of wastes

Municipalities are required to provide separate collection of paper, glass, and hazardous waste from households. If paper collection targets are not met by ‘bring systems’, new regulations require doorstep collection to be introduced – although these powers have yet to be used. Trade and services (including larger scale industry) have to separate paper, cardboard, and plastic transport packaging. Yet in Copenhagen, for example, separate collection of paper from offices is still not mandatory. There is, however, mandatory separation for specific waste streams from industry, eg steel drums, plastics, PVC, impregnated wood.

landfill ban and separation of combustible waste

There is a ban on the landfill of waste suitable for incineration, implemented in 1997, so all authorities have to require separation of combustible and non-combustible waste. The effect of this has been a decrease in the amount of waste going to landfill.

reuse and deposit-return systems

Lone Lykke Nielsen admits that recycling is still the main focus of the waste strategy “but reuse of beer and soft drink bottles – which we regard as waste prevention – still has a high priority. We estimate that reuse and deposit-return systems have resulted in 375,000 tonnes less waste”. The present Danish government lifted the ban on the use of aluminium drinks cans and a deposit return system has been introduced instead.

what were some of the factors in success?

taking control

Jacob Hartman: “a crucial factor is taking control. The Environment Ministry took control and directed waste streams towards the right kind of treatment, for instance the various waste fractions that are now declared unsuitable for incineration, like PVC waste”. The state-level policy of control is mirrored at local level, as shown below.

local authorities’ planning and management responsibilities

Alongside the disposal taxes and bans there is a comprehensive waste management planning system which requires a local waste plan to be produced every fourth year, for the short term (four years) and for the longer term (12 years). The local waste management plans include schemes for recycling of waste, the collection system for household waste, as well as capacity planning for landfill and incineration.

A key part of being able to implement these plans is the fact that municipalities are responsible for all the waste generated within their boundaries, including industrial wastes. Companies get an environmental licence from the municipality and, as part of this must list the different kinds of waste generated. At the same time, all landfills and many incinerators are owned by local authorities, or by 34 inter-municipal regional waste utilities formed by groups of local authorities. Municipalities can thus plan capacity and invest in incineration plants, knowing what wastes are available to direct to them. Henrik Wejdling adds: “this also allowed new waste streams to be collected by these companies at little extra cost because the collection infrastructure was in place. This was very helpful in terms of financing the recycling structure and effectively allowed cross subsidy between waste streams, in a way that individual and parallel producer responsibility schemes would not have”.

information

Lone Lykke Nielson: “information from the national level on environmental issues to the public has been an important factor in involving and motivating people for development of new waste management solutions. Information to the public on the benefits and results of the recycling system in which they participate is an important factor in order to keep up the motivation”.

what were the major problems for the strategy?

poor capture rates for some household waste streams

The major problem is that household waste recycling at 29 per cent is far short of the 2000 target of 49 per cent. Our interviewees attributed this to poor capture rates for paper and for organic waste⁶ primarily. Despite mandatory separation of recyclable materials including paper, collection has relied mainly on 'bring systems' rather than doorstep collection. On organic domestic waste, Lone Lykke Nielson comments: "Systems are needed but many municipalities are reluctant to act and the collection of organic household waste has not been made mandatory". Only four per cent of organic domestic waste is being recovered in biogas plants. Henrik Wejdling suggests, that a part of the problem could be the organisation of municipalities into inter-municipal companies, resulting in loss of contact with the population and creation of systems in which people are not willing to participate. In addition, they already have incineration plants to feed and not much money to put into alternatives.

Markets have also been a limit to the expansion of recycling rates. Lone Lykke Nielsen: "Municipalities at one time had trouble getting good prices, but then they created a trading company to negotiate prices of recyclable paper and cardboard on behalf of all local authorities. They have now broadened the trade system to selling glass, plastic, and metals". Denmark is a small country and the domestic market is not large. For some streams, recyclable materials are not generated in sufficient quantities to justify investment in reprocessing (plastic is one example) so there is high reliance on exports.

what are some of the issues for the future?

recycling rates stalled

Interviewees agreed that it will be difficult to increase recycling rates, but also agreed that there are some markets that are not being fully exploited, with plastics given as an example. Henrik Wejdling sees it as a broader issue: "rather than having a simplistic goal for recycling of total waste, we should instead focus on the quality of the waste being collected for recycling and make sure these recyclates are being reused and processed in a really sustainable way – construction waste reused for construction, for instance".

taxes not high enough to stimulate waste reduction

There was also a general view that the taxes on disposal were not high enough to stimulate waste reduction. Jacob Hartman: "there are lots of papers written about a product-orientated environmental strategy – but little action. No company wants to produce products with a longer lifetime. What has produced results is the cleaner technology projects, which have led to a certain amount of waste minimisation".

⁶ Refers to kitchen waste, unlike kitchen waste, garden waste - a specific category within household waste - enjoys high recycling/composting rates.

possible expansion of incineration

If both reduction and further recycling are difficult, this points to a possible expansion of incineration. The Danish government is considering how to ensure a more efficient waste sector by, for example, liberalising the incineration market.

According to Lone Lykke Nielson, “incineration is seen as an environmentally sound solution because of recovery of heat and power at all incineration plants in Denmark”. Denmark has a long-standing infrastructure for district heating derived from incineration plants. Henrik Wejdling: “on average, ten per cent of all district heating in Denmark is enabled by waste incineration. In some cities, this can go up to 50-90 per cent. Waste incineration constitutes around two per cent of all energy capacity, electricity as well as district heating”.

Public opposition has to an extent been answered with stricter requirements on emissions from incineration plants and landfills, combined with supervision and control. Lone Lykke Nielsen: “the environmental authorities were able to persuade people that incineration plants were able to limit dioxin emissions”. The public has now accepted incineration: “people know we use the energy from incineration”. Jacob Hartman comments: “Denmark is not leading on incineration standards – it is probably behind Germany and Sweden. But incineration is a horribly convenient solution, despite the fact that it is a polluting and wasteful practice. Unfortunately there is not a wide debate in Denmark – certain local groups oppose it – but the environment authorities have been successful in green-washing incinerators”.

improving the quality of waste

Jacob Hartman sees Danish waste policy as focussing less on the amounts of waste and more on quality of waste streams, for instance less hazardous flue gas treatment residues, usable slags, getting heavy metals out of incinerator ash. He looks forward to a Danish solution to the problem of ash from the scrubbing technique used on incinerators, which is currently exported to Norway. A Danish virgin materials tax⁷ levied on PVC from 2000, was designed to obviate the expensive scrubbing techniques necessary when it is incinerated. The results of the tax are not yet published.

⁷ There are also raw material taxes on gravel, stone, clay and chalk, the only raw materials which are actually extracted in Denmark. There are also taxes on packaging correlated to the environmental impacts of the different packaging materials (based on LCAs) with glass as index 1, and aluminium in the top as index 18.

what are the lessons for the UK?

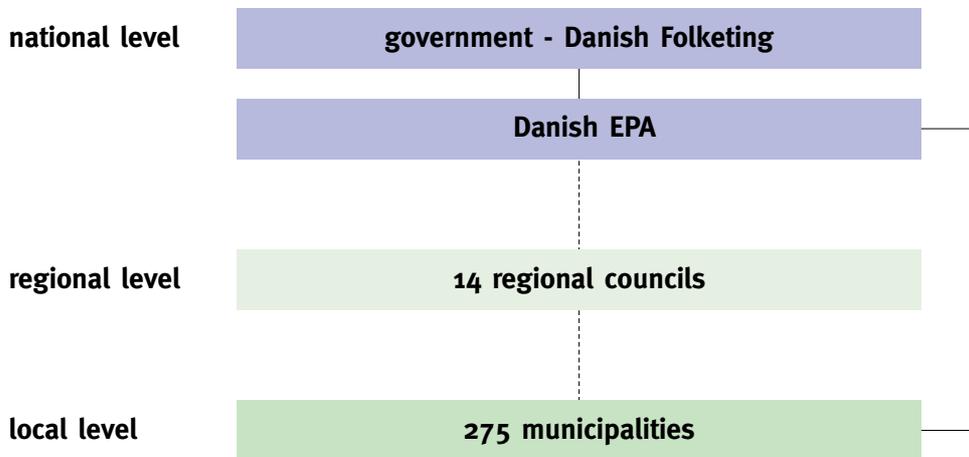
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Lone Lykke Nielsen highlights the need for public awareness of the problems in order to generate political pressure for solutions. At the same time, “Industry responds to increasing costs of waste management, for instance through significant waste taxes, if they are aware of the possibilities of lowering these costs”.

Henrik Wejdling broadly agrees – his prescription: “Involvement of people, integrated planning, and economic instruments”.

Jacob Hartman sees the UK as having a golden opportunity to put the right package in place: “Waste policy must facilitate the right choice – you have to make it easy, and make it clear that it saves money. Establishing a collecting and sorting system is primary – a waste system is only as good as the sorting”.

Denmark - competent authorities



- The Danish Folketing (Parliament) decides on the organisation and legislation in the area of waste
- The supreme authority in waste matters is given to the Danish EPA
- Under the provisions of the Danish Environmental Protection Act, municipalities are responsible for all waste generated within their boundaries. Their main duties include:
 - The preparation of short-term and long-term waste management plans (respectively four and 12 year plans)
 - The preparation of the waste regulations detailing the schemes established in their municipality
 - Ensuring the availability of capacity for landfilling and incineration of the waste generated in their municipality
- The municipality cannot delegate responsibility for waste management, but can confer the task to an inter-municipal waste company or contract the operation to private companies
- Regional councils are environmental authorities which grant permits for landfills and incineration plants. They supervised the municipalities through approval of local waste management plans until 1990. Their role is now limited to preparation of overall regional plans
- Collection schemes for household waste are operated by both municipal and private waste companies, whereas management of industrial and commercial waste is normally assumed by private companies alone

Denmark - waste management plans

	action plan for waste and recycling 1993-1997	Waste 21 - National Waste Management Plan 1998-2004
type of waste	<ul style="list-style-type: none"> All waste streams covered 	
general objectives	<ul style="list-style-type: none"> Increase of recycling Reduction of landfilling 	<ul style="list-style-type: none"> Limitation of waste arisings Shift waste from incineration to recycling Ensure quality of waste treatment: utilisation of resources in waste, quality in treatment, and greater efforts for environmental contaminants
targets	<ul style="list-style-type: none"> Overall targets for waste treatment for 2000: 54% recycling, 21% landfilling and 25% incineration Household waste: min. 49% recycling, max. 7% landfilling (Domestic waste: 45-50% recycling; bulky waste: 25% recycling; garden waste: 85% recycling) Service sector waste: 50-60% recycling, 30-40% incineration Industrial waste: 50-60% recycling, 30-40% incineration 	<ul style="list-style-type: none"> Overall targets for 2004: 64% recycling, 24% incineration, 12% landfilling with specific targets for each waste category: <ul style="list-style-type: none"> Domestic waste: 30% recycling and 70% incineration Bulky waste: 25% recycling C&D waste: 90% recycling Service sector waste: 50% recycling and 45% incineration Industrial waste: 65% recycling, max. 15% landfilling Residues from coal-fired power plants: 90% recycling Residues from incineration plants: 70% recycling Recycling targets for packaging in the year 2001: <ul style="list-style-type: none"> 55% for paper and cardboard; 15% for plastic packaging; 15% for metal packaging; 65% for glass packaging Total waste arisings to be stabilised by 2004.
results	<ul style="list-style-type: none"> Denmark has reached the overall objectives laid down in the action plans in the 1990's However specific targets on certain waste streams were not achieved: household waste and waste from the service sector 	<p>Overall 2004 targets for waste treatment achieved in 1999</p> <p>Specific targets achieved for C&D waste, coal-fired power plants and sludge but not complied with for industrial waste, domestic waste, waste from the service sector</p>

Denmark - definitions

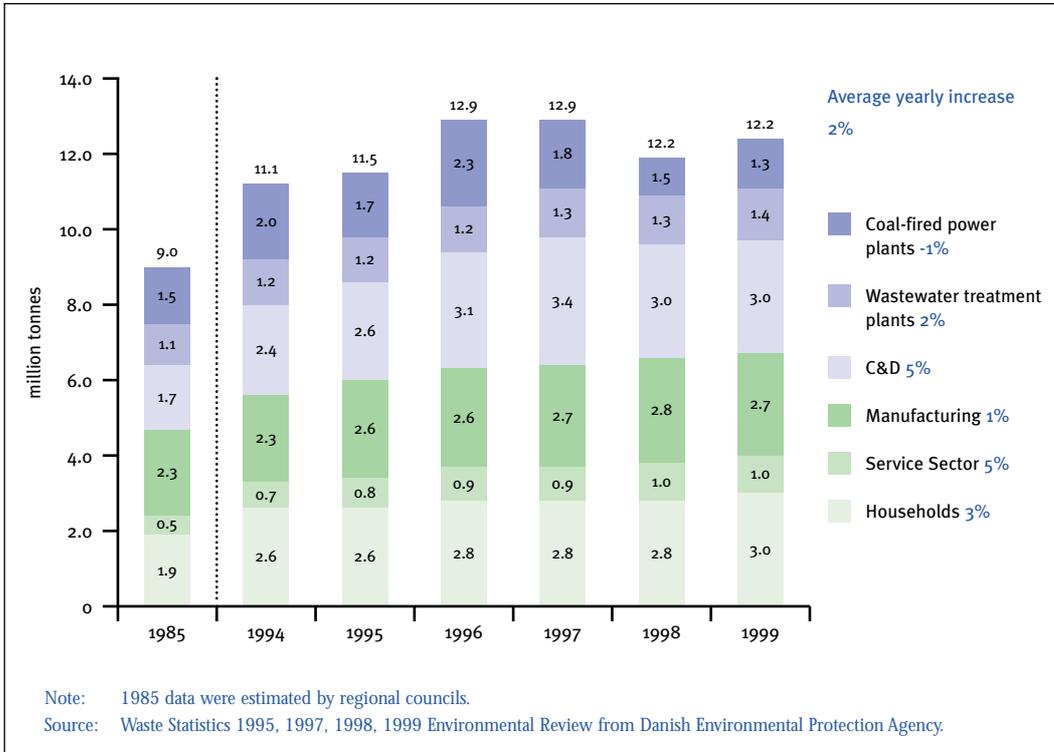
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waste categories	waste treatment	measurement
<p>waste streams considered in waste management policy</p> <p>Includes non hazardous and hazardous waste</p> <p>Household waste: domestic waste, bulky waste and garden waste</p> <p>Waste from institutions, trade and offices: organic waste (food waste from catering centres), waste electrical and electronic equipment, tyres, paper, cardboard, glass and plastic</p> <p>Industrial waste</p> <p>Construction and demolition waste: mainly concrete, asphalt, stone and wood</p> <p>Waste from wastewater treatment plants: sludge</p> <p>Waste from energy production: Slag (treated as secondary waste when coming from waste incineration), fly-ash etc (mainly from coal-fired power plants)</p>	<p>waste disposal</p> <p>Landfill</p> <p>Incineration without energy recovery (does not exist in Denmark)</p>	<ul style="list-style-type: none"> Waste treatment facilities (landfilling sites, waste incinerator plants, composting & biogas plants, processing plants) need to keep a record of the origin, quantity, type of waste and treatment, including recycled waste and report this information once a year to the Danish EPA The Danish EPA's Information System for Waste and Recycling (ISAG) has been in use since 1993
	<p>waste recovery</p> <p>Incineration with energy recovery</p> <p>Recycling / Composting</p> <p><u>Bio-gasification</u></p>	
	<p>waste prevention</p> <p>Reuse</p>	
	<p>special treatment</p> <p>Specific treatment required for hazardous / special waste</p>	
<p>other waste streams</p> <p>Agricultural waste: excess manure, other</p> <p>Mining and quarrying</p> <p>Contaminated soil (now regulated and part of industrial waste)</p>		

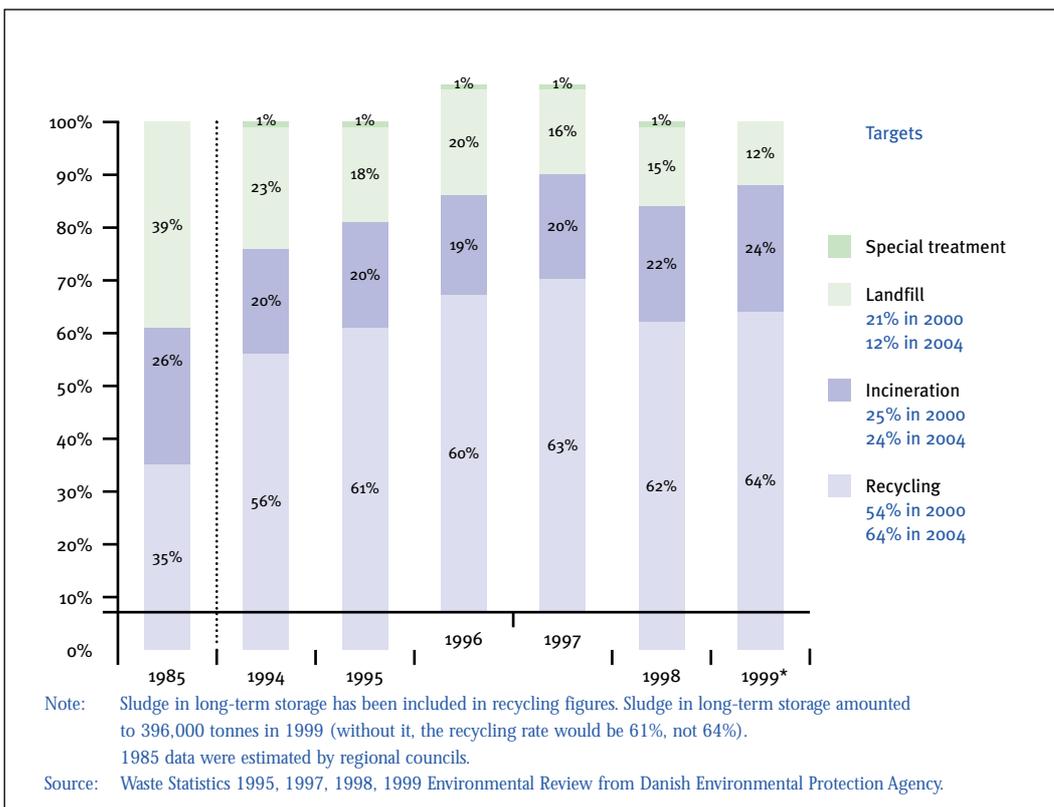
Denmark - solid waste arisings and treatment

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total waste arisings and source - absolute terms



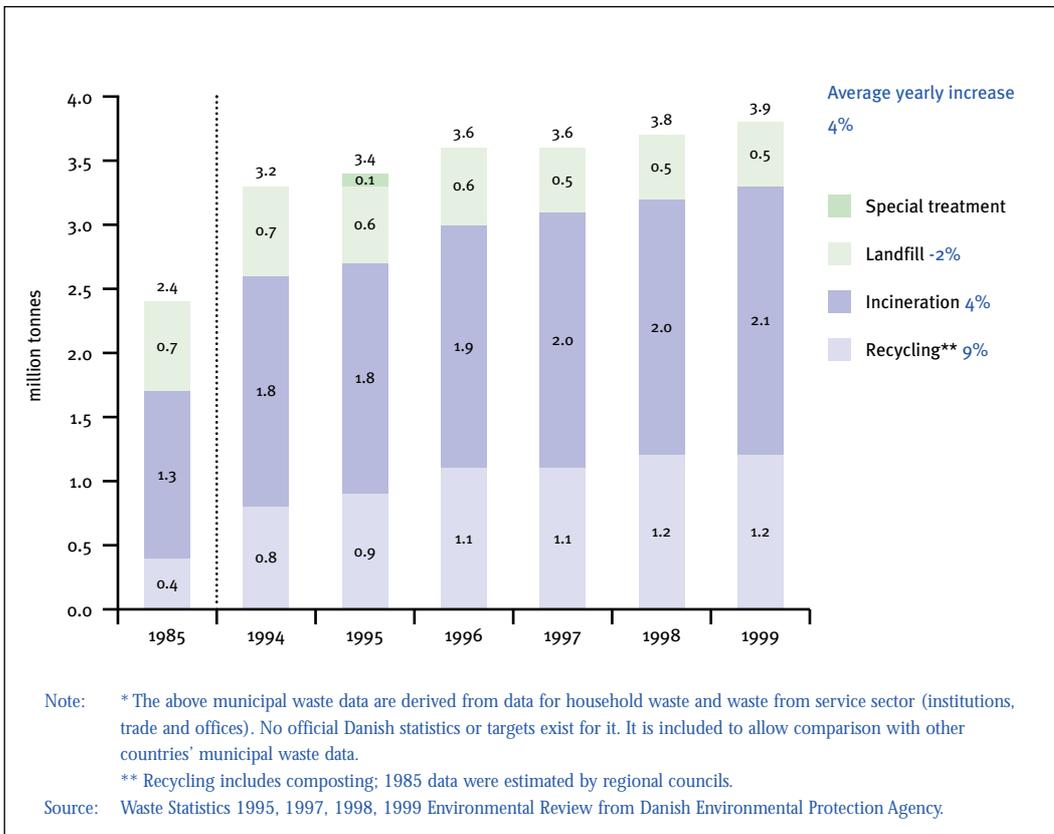
total waste arisings and treatment - relative terms



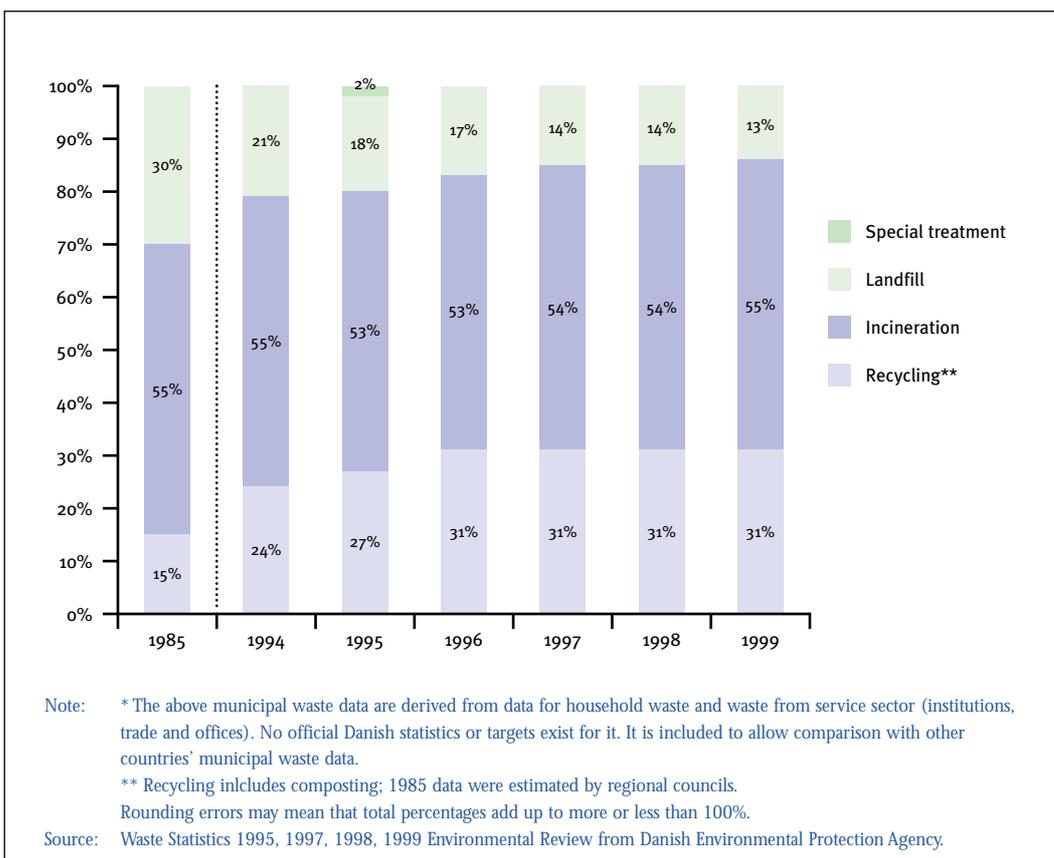
Denmark - municipal waste arisings and treatment

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municipal waste arisings and treatment* - absolute terms



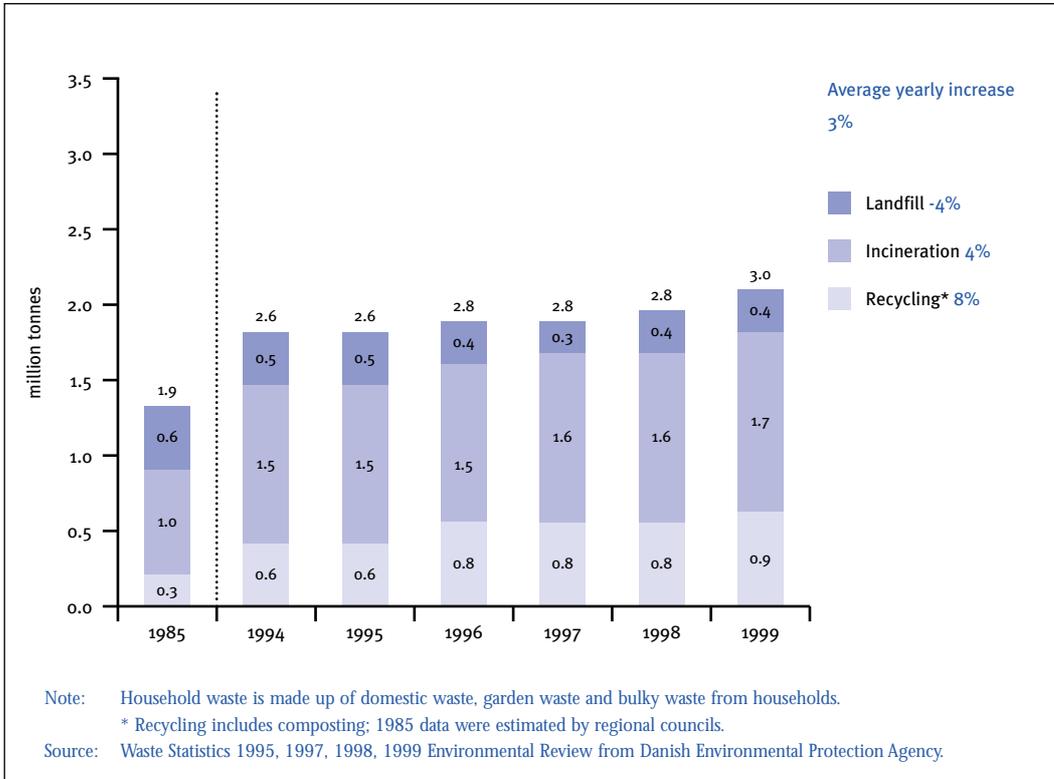
municipal waste arisings and treatment* - relative terms



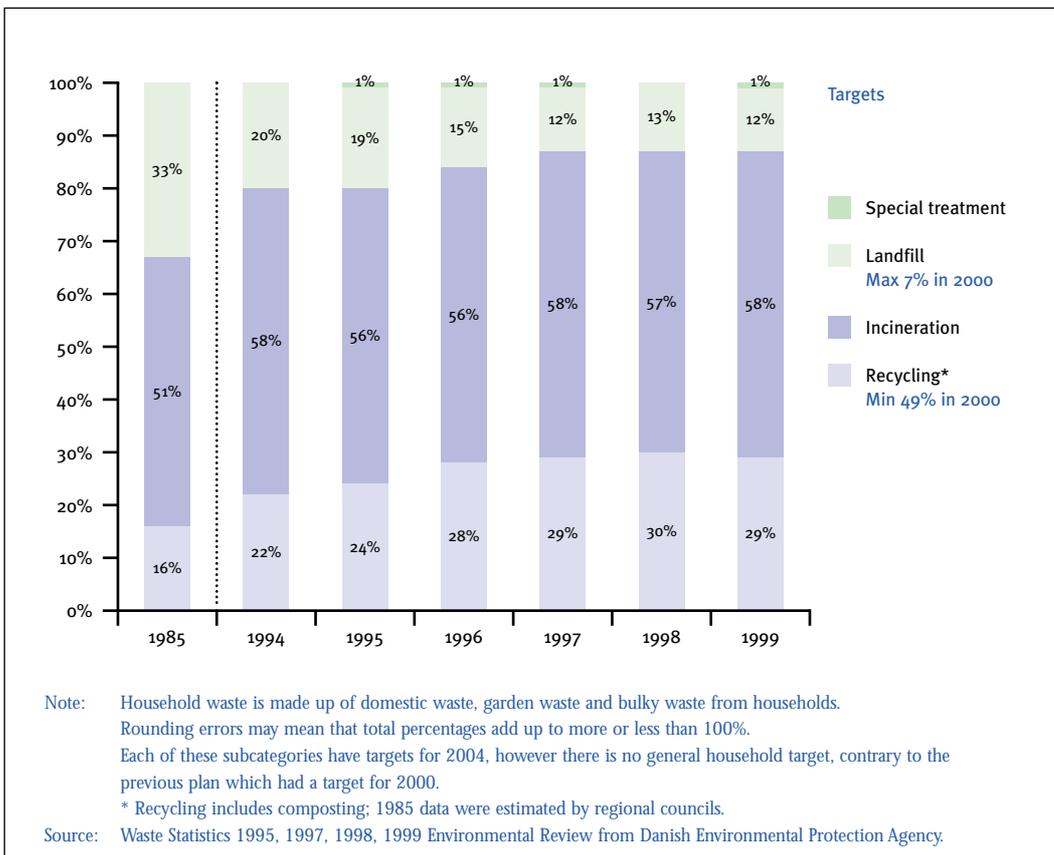
Denmark - household waste arisings and treatment

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household waste arisings and treatment - absolute terms



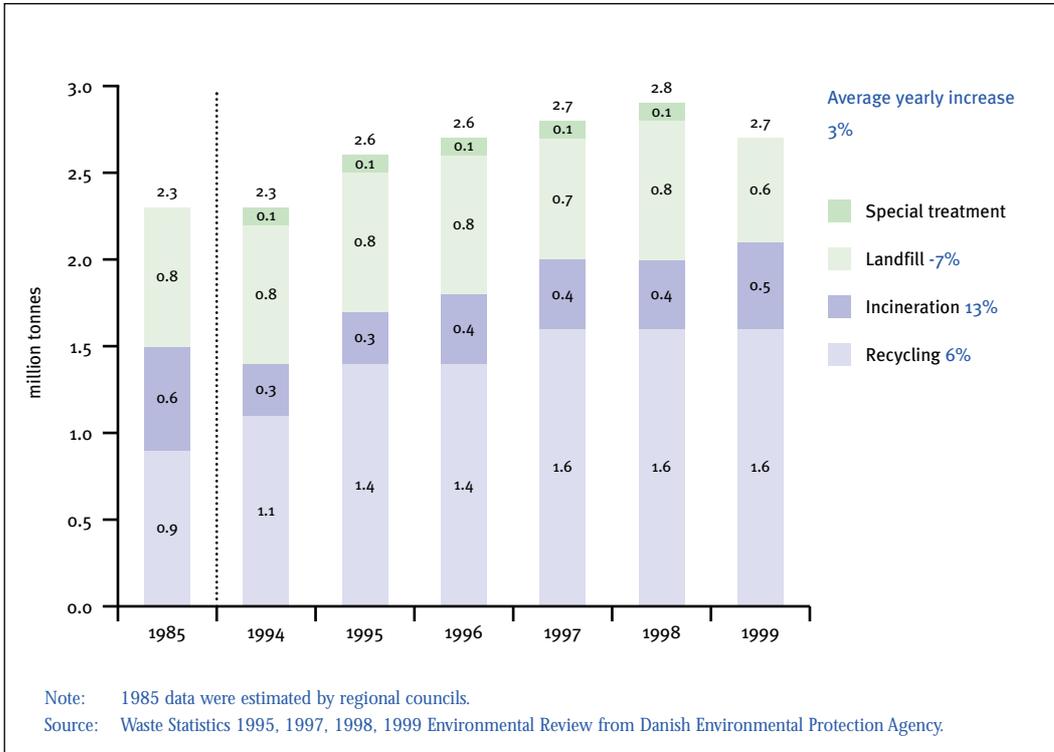
household waste arisings and treatment - relative terms



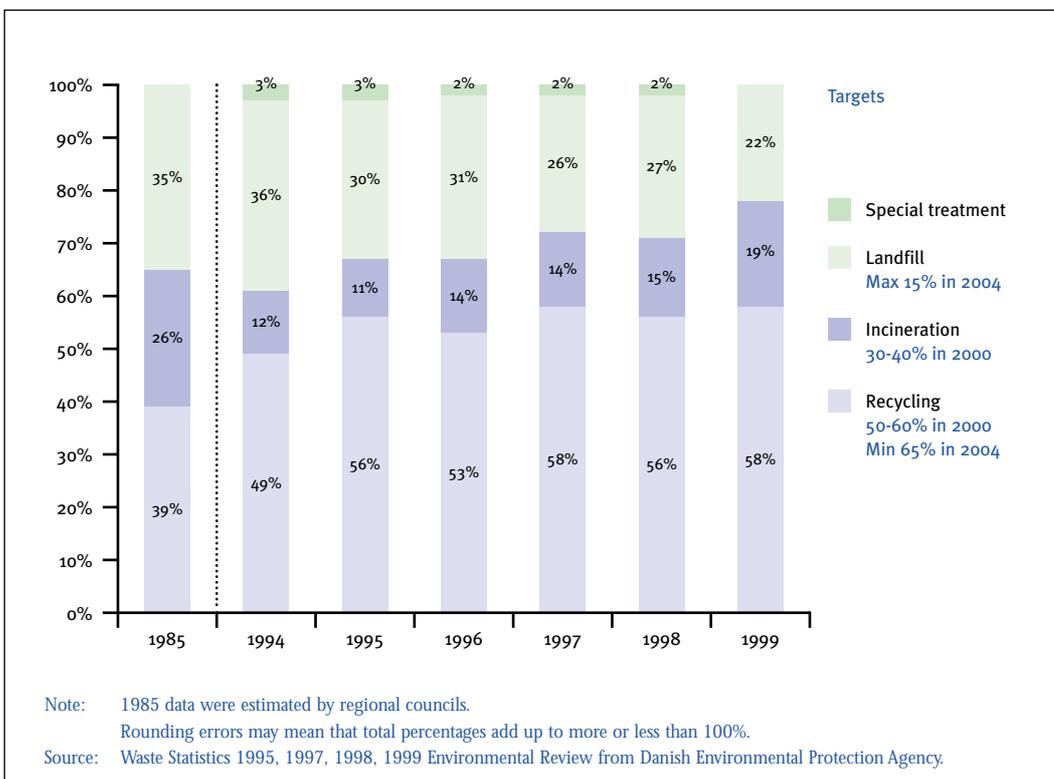
Denmark - industrial waste arisings and treatment

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industrial waste arisings and treatment - absolute terms



industrial waste arisings and treatment - relative terms



Denmark - overview of policy packages

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creative policy packages for waste: lessons for the UK

tool ▼	target ▶	consumers	businesses	municipalities
legislative			<ul style="list-style-type: none"> Ban on landfilling of waste suitable for incineration (01/1997) All waste incineration facilities have to be designed for energy recovery Mandatory separation of construction and demolition waste with a view to recycling (1997) 	
			<ul style="list-style-type: none"> Mandatory separation of paper, cardboard, carton, steel drums, and plastic transport packaging for recycling (to be extended to PVC, impregnated wood, and waste electrical and electronic equipment) Mandatory separation of organic food waste for catering services Take-back scheme for discarded tyres (1995) with a 80% take-back rate target Collection agreement (Returbat) for discarded lead accumulators (subsidies paid for collection) 	<ul style="list-style-type: none"> Mandatory separate collection of certain materials (paper and card, glass and hazardous waste) Agreement with municipal councils on CFC-containing refrigerators
economic		<ul style="list-style-type: none"> Waste tax (1/1987): differentiated so that it is most expensive to landfill waste, cheaper to incinerate it and tax exempt to recycle it (hazardous waste and contaminated soil exempted) 		
		<ul style="list-style-type: none"> Deposit-refund system for beer and carbonated soft drinks containers Variable charging for household waste in some municipalities Green taxes on containers (beverage and others), paper/plastic bags, packaging, disposable tableware, nickel-cadmium batteries, Environmental fee on tyres and Ni-Cad batteries for financing of collection and recycling 	<ul style="list-style-type: none"> Subsidies for projects aimed at solving waste problems by, for example, developing new forms of treatment (eg anaerobic digestion of organic domestic waste) 	<ul style="list-style-type: none"> State subsidy schemes for projects on cleaner technology aimed at a reduction of environmental impacts from products over whole life cycle
agreements			<ul style="list-style-type: none"> Voluntary agreement on recycling of transport packaging (1994) 	
information		<ul style="list-style-type: none"> National information campaign 		