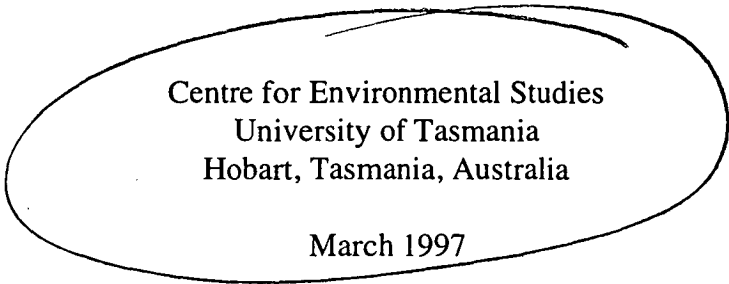


**PAPER RECYCLING AND EDUCATION:  
A COMPARISON OF PROGRAMS IN BANGKOK,  
THAILAND AND HOBART, TASMANIA**

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Submitted in partial fulfilment of the requirements for the degree of  
Master of Environmental Studies



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March 1997

## DECLARATION

I, the undersigned, hereby declare that this thesis contains no material which has been accepted for the award of any higher degree or graduate diploma in any tertiary institution and that, to the best of my knowledge and belief, this thesis contains no material previously published or written by another person, except when due reference is made in the text of the thesis.



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March 1997

## ABSTRACT

The aim of this study was to examine the paper recycling programs undertaken in schools and the role of other organisations involved in these programs in Bangkok, Thailand and Hobart, Tasmania. The strategies used in both places were compared to determine whether those employed in one place could be usefully applied in another. In addition, because schools do not function in isolation from their broader communities, the thesis also considered some aspects of wider recycling education.

Surveys were conducted by interviewing two groups: representatives from government, private and non-government organisations involved in paper recycling education programs, whether for schools or for the wider community, and school Principals, teachers and students. The results demonstrated that, in Bangkok, the organisations involved in paper recycling had a major role in the implementation of the programs in schools. In addition, two factors crucially affected the programs: support from the Principals and from the teachers who carried out the programs and the relationship between the organisations involved and the schools. On the other hand, in Hobart, the Principals and teachers played a major role in developing paper recycling education programs in schools. The relationship between the organisations involved in waste management and recycling and the schools was not likely to be as important as it was in Bangkok. However, there were no significant differences in the strategies employed in schools in both cities. Strategies used were the provision of recycling bins and student monitors.

To educate people in the community, public campaigns about recycling in both Bangkok and Hobart were run through publications (for example, booklets and pamphlets) and through mass media (such as television). However, television advertising on recycling in Bangkok required improvement.

The thesis recommended that, in Bangkok schools, paper recycling bins could be provided in every classroom to increase the effectiveness of the programs. In Hobart, study tours at recycling plants and at dump sites, and school competitions could be conducted to encourage the implementation of the paper recycling program in every school. To achieve wider community education in Bangkok, recycling information to households (for example, using refrigerator calendars) and recycling bins for households

could be provided. In Hobart, more co-operation is needed among organisations to create recycling education programs both for schools and for the community in general. Financial support is a major need and was found to be a similar obstacle to the production of materials and the implementation of recycling education programs both within and outside schools in Bangkok and Hobart.



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## **LIST OF ACRONYMS**

ANM	Australian Newsprint Mills Limited
AP	Australian Paper
APM	Australian Paper Manufacturers
APPM	Associated Pulp and Paper Mills (Australia)
BMA	Bangkok Metropolitan Administration
DELM	Department of Environment and Land Management (Tasmania)
DPC	Department of Public Cleansing (Thailand)
LRRA	Litter and Recycling Research Association (Tasmania)
OECD	Organisation for Economic Co-operation and Development
PNEB	Publishers National Environment Bureau (Australia)
TEC	Tasmanian Environment Centre
TECDA	Thai Environment and Community Development Association
TEI	Thailand Environment Institute
TPPIA	Thai Pulp and Paper Industries Association
TRALAC	Tasmanian Recycling and Litter Awareness Council

# 1 INTRODUCTION

## 1.1 BACKGROUND

For many years, people have been aware of the depletion of natural resources, waste accumulation, and the effects on the environment. Consequently, waste management has been the subject of increasing global concern. To tackle this problem, different strategies have been used, such as dumping, burning, reusing, or minimising the waste from primary products (such as reducing fuel in the production process and reducing packaging of products). Recycling can be seen as a form of waste minimisation.

The recycling of materials, such as paper, plastic, glass and cans, has been prompted by both an awareness of environmental impact and economic concern. Old clothes, papers, rags, bottles and scrap metals have been recycled for a long time. For example, before the 1960s it was common for people to use a 'deposit' method with drink bottles (Jones 1990). After buying a drink, consumers received some money back when they returned the bottle. Since the 1960s this practice has declined but now other forms of recycling has been recognised in waste minimisation strategies in several countries. For example, in 1989, solid waste management in the United States comprised 10 per cent recycling (with 80 per cent landfill and 10 per cent incineration). In Australia in 1990 solid waste management consisted of 3 per cent recycling (96 per cent landfill and 1 per cent incineration and other methods) (Hubick 1991).

This study examines paper recycling, focusing particularly on paper recycling education as discussed below in Section 1.3. Humans have used paper and paper products for a long time. However, the growing population and demand for paper has placed increasing stress upon the world's forests. The depletion of forests has ramifications for biodiversity, and also for indigenous peoples reliant upon forests for their way of life. These problems also provide impetus for the development of waste minimisation and paper recycling strategies, in an attempt to address the social and ecological impacts of paper consumption.



## 1.2 HISTORICAL ASPECTS OF PAPER USAGE AND RECYCLING

Paper has been produced, in various forms, since 3000 B.C., when the earliest records of paper-like writing-surfaces can be traced back to the ancient Egyptians when papyrus was used (Mann 1952). Paper made by operations similar to some of those we know today has been attributed to Tsai Lun in China in A.D.105 (Gilmour 1955). Prior to the invention of paper, the Chinese used silk as a recording medium (Mann 1952). The Chinese produced paper of varying quality and size and their paper was strong. They used rags, fish-nets and hemp ropes to make up the bulk of the raw material needed. Other fibres were sometimes used as an alternative when the supply of rags was inadequate. Papermaking techniques passed from China to Japan about AD 625, while the Arabs, Spaniards, and Italians developed them in the eleventh and thirteenth centuries (Mann 1952). In Europe, paper was used long before the invention of printing. Paper was made by hand until the end of the eighteenth century (Pausacker 1975).

An increasing demand for paper, which resulted in a shortage of rag as well as an increase in the proportion of waste paper, became critical after the Industrial Revolution when a search for alternative materials began. In North America and Europe, pulp for papermaking was sourced from firs and pines from forests. In the 1860s papermaking in Australia developed using imported wood pulp and waste paper or rags from local sources. It was not until the 1930s and 1940s that the manufacture of paper products from hardwoods (eucalypt species) started (Pausacker 1975).

The increasing use of paper products led to an enormous amount of waste paper being produced. In the United States, interest in re-using waste paper occurred in 1913, a time when the nation imported 123,000 tonnes of rags and 380,000 tonnes of waste paper to meet the increasing needs of paper production. This also led to an awareness of deforestation in the country (Gray & Thomas 1984). By the late 1940s, methods for recycling waste paper were being developed. These processes have since been refined to the extent that paper industries in Australia and the United States require specific types of waste paper, such as 'segregated clean grades' rather than mixed paper (Pausacker 1975: 15).

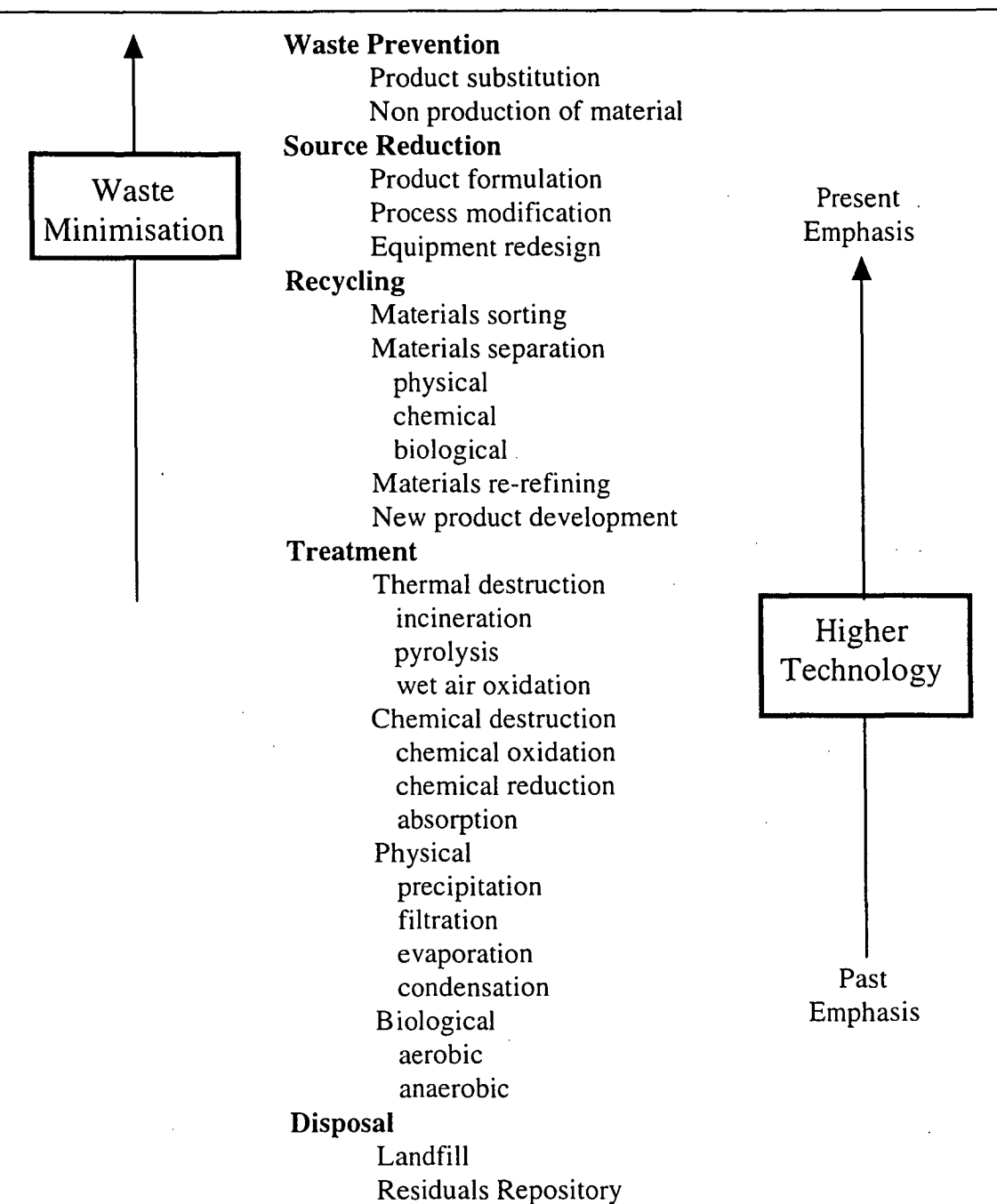
The historical trends discussed above indicate that when there was a shortage of raw material, alternative sources would be used. For example, the Chinese used fibres instead of rags. There has been a corresponding technological development within waste management strategies, where it is now recognised that the concept of waste management also needs to address social, ecological, economic and political concerns. Although waste management was primarily concerned with the fate of final products it was also concerned with the whole process, from the initial manufacturing process to disposal, re-use or recycling. The emphasis is now on minimising waste from the initial production stages, instead of relying on disposal methods like burning or dumping. Figure 1.1 illustrates this trend, presenting a hierarchy of preferred strategies for waste management minimisation, from a recent report for the Department of Industry, Technology and Commerce in Australia.

### **1.3 PAPER RECYCLING IN THE THESIS**

Despite the interest in recycling and waste minimisation, environmental problems associated with the supply of resources for the paper industry are still severe. For example, in Australia there have been long-standing debates about the harvesting and woodchipping of native forests, particularly for export for the manufacture of paper products elsewhere. Because of such conservation debates and moves in society to be more careful with resources, paper recycling has been seen increasingly as a necessity.

The thesis author is a Thai national studying in Tasmania, Australia. This has presented an opportunity to research aspects of paper recycling in Australia and Thailand. Education for paper recycling was chosen as a particularly important issue because it aims directly at waste minimisation. Education can focus on both reducing the demand for paper overall, and on reducing demand for raw materials newly sourced from forests. The demand for paper should ultimately be reduced by encouraging people to make maximum use of paper, such as using writing paper on both sides before disposal and employing used paper for art and craft in schools. Raw materials depletion and waste management problems can be addressed by encouraging people to separate paper from other waste and send it for recycling, thus reducing the amount of waste paper going to disposal. In addition, education creates public awareness of the need to carefully manage resources, and is a good way to encourage people to directly participate in such

Figure 1.1: A Suggested Strategy for Waste Management in Australia



Source: Hubick 1991

initiatives. Knowledge of the strengths and weaknesses of education programs both in Tasmania and Bangkok might also assist the authorities concerned to improve their programs on recycling.

#### 1.4 AIMS AND OBJECTIVES

The main aim of this thesis was to assess the current contribution of methods used in primary schools to educate and encourage people to contribute to paper recycling

programs. Aspects of wider recycling education in the general community were also addressed.

The main aim is achieved through the following objectives:

- (1) to examine the paper recycling education programs in primary schools (a case study) run by governments, private and non-government organisations in Bangkok;
- (2) to examine the paper recycling education programs in selected primary schools in the Hobart area;
- (3) to compare and assess the strengths and weaknesses of the above paper recycling programs in Bangkok and Hobart; and
- (4) to make recommendations that may assist authorities concerning the further development of such paper recycling programs or projects.

This thesis also discusses the background and development of paper use and paper recycling to provide a context. It examines paper recycling practices in Australia, with particular emphasis on Tasmania.

## **1.5 METHODS IN GENERAL AND THESIS OUTLINE**

A literature review of selected aspects of paper recycling was undertaken. Interviews with both government and non-government officers involved in paper recycling in Bangkok and Hobart were conducted. Questions related to both recycling education in general and in schools. Eleven primary schools, under the Bangkok Metropolitan Administration (BMA), in Phranakorn District, were chosen as a case study to examine the methods undertaken in each school, including teacher and student attitudes towards paper recycling education programs in schools. More detail regarding these results is provided in Chapter 3. Interviews with teachers and students in three primary schools in the Hobart area were conducted (Bagdad Primary School, New Town Primary School, Sorell Primary School) to examine their attitudes towards paper recycling programs. The results of the interviews are presented in Chapter 4.

Chapter 2 details the definitions of paper recycling, paper production processes and the benefits and problems associated with paper recycling. In addition, this chapter provides an overview of paper recycling in Australia and in selected developing countries, and assesses community factors in paper recycling programs. The role of education in paper recycling programs is also included in this chapter. Chapter 3 concentrates on paper recycling in Bangkok and presents the findings of the interviews conducted as well as a literature review. Chapter 4 demonstrates a broad overview of the development of paper recycling in Tasmania by describing the legislative framework for environmental responsibilities, and the paper recycling program in Hobart. The results of interviews with teachers and students in three primary schools in the Hobart area are presented. The chapter then discusses the strengths and weaknesses of the program in Hobart. Chapter 5 discusses the strengths and weaknesses of education in paper recycling in Bangkok and Hobart together with recommendations which may be useful for decision-makers. Chapter 6 presents conclusions of the study, discusses the implications of the findings for policy development, and provides suggestions for further study.

## **2 EDUCATION AND PAPER RECYCLING**

### **2.1 INTRODUCTION**

To gain an understanding of the special role education plays in the process of paper recycling, it is first useful to provide a context by discussing the characteristics of paper recycling and identifying the issues involved. This chapter defines paper recycling then discusses both the process of making paper from virgin raw materials and of using waste paper in the manufacturing process. As waste paper is the most important raw material in the production of new products in the paper recycling process, its sources, types and uses are identified. The benefits and problems associated with paper recycling are discussed, highlighting the issues which are most important for consideration in the decision-making process when developing paper recycling programs.

The conduct of paper recycling in Australia as compared with that in developing countries is also briefly discussed. The chapter culminates with sections on factors relevant to the community and on education programs.

### **2.2 DEFINING PAPER RECYCLING**

'Recycling' is a modern word and should not be confused with the terms re-use and re-processing. In re-use, a product is used again in its original form, for example, glass bottles which are washed and used again. Re-processing is the use of waste material for making a different product (McGregor undated).

A variety of definitions for recycling have been advanced. For example, Gilpin (1976: 134) defines recycling as:

the return of discarded or waste materials to the production system for utilization in the manufacture of goods, with a view to the conservation as far as practicable of non-renewable and scarce resources. Recycling goes beyond the re-use of a product (such as glass milk bottles) and involves the return of salvaged materials, such as paper or metals or broken glass, to an early stage (pulping or melting stage) of the manufacturing process.

For Thomas (1987: 3-4) the focus of recycling is the 'recovery of products from domestic sources, either for re-use in their original form, or for re-processing into the same or similar products'. Flenady (1991: 95) has defined 'recycling paper' as 'using

waste paper over and over again to make more paper without having to cut down extra trees’.

From the above selection of definitions, ‘paper recycling’ in this thesis can be defined as the use of waste paper as a raw material in the manufacture of paper no matter how many times it is re-used or re-processed. An example of paper recycling is the recycling of newspaper and office paper to make cardboard, tissue or other paper products. This thesis, being concerned with education, is also focused on the maximum use of paper before it is recycled.

## **2.3 PAPER PRODUCTION PROCESSES**

The Department of Administrative Services (DAS), Australia (1990: 16) identified paper as ‘an organic material usually produced from natural plant fibres which are cellulose based’. The cellulose fibres used for paper making are from diverse sources including wood fibres, both hardwoods (eucalypt species, oak and maple) and softwoods (pine and aspen); seed hairs (cotton and cotton linters); bast fibres (kenaf and hemp); grass fibres (straw and bamboo); and leaf fibres (sisal and manila) (DAS 1990). Wood replaced rags, the source of fibres until the mid-nineteenth century, because the demand for paper exceeded the supply of fibre sources at that time. In addition, wood was chosen as an economical, ready and versatile source.

In the most basic process of production in a paper mill, a large number of trees are cut down and chemicals used for soaking woodchips. The woodchips are then boiled at about 175°C for three or four hours and the pulp mixed with water. Then, the pulp is swirled and squeezed until flat and left to dry. Finally, the pulp is rolled into paper with metal rollers and cut to size (Flenady 1991).

In the paper recycling process, by contrast, waste paper is used instead of trees. After being collected and sorted, waste paper is mixed with water to make paper pulp. All impurities are removed. The paper pulp is then drained, after which it is pressed, drained and cut (Visy Recycling undated (a)).

### **2.3.1 Raw Materials and Products**

Paper recycling programs involve separating paper from other solid waste, processing into the new product, and marketing the product. The demand for waste paper varies according to its quality.

#### **2.3.1.1 Sources of Waste Paper**

Waste paper can be collected from offices, shops, newspaper presses, households, factories, refuse dumps and schools. Sources of waste paper are classified by DAS (1990: 29) as:

- used paper and paper products from imported pulp;
- rejected or unused stock, excess or spoiled packaging or printing materials;
- waste paper generated from the manufacture of paper products made from finished paper and paperboard;
- residues and fibrous by-products from primary industry production; and
- 'post-consumer waste', for example, paper used in industry, houses and offices and material from retail outlets such as supermarkets.

#### **2.3.1.2 Types of Waste Paper**

Vogler & Sarjeant (1986) classify waste paper into three types: printing and writing papers, packaging, and mixed waste paper. These three are described below.

- (1) Printing and writing papers are considered the highest quality. The high cost of this paper group means that the waste paper price is also high. They are made from sulphite pulp and bleached kraft. Some examples of printing and writing papers are office paper, school paper, pamphlets and magazines, and newspapers.
- (2) Packaging serves many purposes, for example, it protects the product, provides consumer information, facilitates transportation and storage, can influence customers in their purchases, prevents loss due to theft and helps dealers to sell a certain fixed quantity (Jones 1990). However, paper packaging can form a large



part of domestic waste. Much modern packaging mixes paper with plastics, metals and other materials which are difficult to separate. However, many types of paper packaging can be collected and recycled. Examples of packaging are kraft paper, corrugated cardboard and wrapping paper.

- (3) Mixed waste paper contains low grade and high grade paper. Mixed waste paper can be collected from warehouses, households, refuse dumps, offices and factories.

### **2.3.1.3 Uses of Waste Paper**

These three types of waste paper can be made into other types of paper and other products. Office papers, such as ledgers, invoices, letters, record cards, envelopes and printing or writing paper, are made into high quality board and printing paper. School papers especially exercise books, and letter paper can be made into printing and writing papers. Pamphlets and magazines are used to make low quality board. Telephone directories and some magazines are made from newsprint.

Kraft paper is recognised by its strength and brown colour. Kraft is re-used as sacks or made into board or returned to kraft paper mills for pulping. Corrugated board is used to make packing boxes and cartons.

Mixed paper can be used to make asphalted roofing sheets which are low-quality, low-cost roofing sheets. The uses of waste paper for paper and related products are summarised in Table 2.1. The wide variety of waste paper types supports a number of alternative uses. Not all re-processing involves the pulping process, for example, shredded paper from government organisations and banks is used for animal bedding in the United Kingdom. In the United States and Canada, shredded paper is used as a thermal insulation material in houses (Vogler & Sarjeant 1986).

Egg and fruit boxes can be made from old cartons. Old cartons are cut, then refolded and stapled to be egg and fruit containers. Fruit and egg cartons are also made from waste paper pulp. Waste paper is soaked, pulped and refined.

In addition, waste paper is also used to construct low cost housing. As a building material, it is cheap and can offer protection from wind and sun, but it does not resist

Table 2.1: The Uses of Waste Paper for Paper and Related Products

Types of Waste Paper	New Paper and Related Products made from Waste Paper
<ul style="list-style-type: none"> <li>• Office paper (such as ledgers, invoices, letters, record cards, envelopes)</li> </ul>	<ul style="list-style-type: none"> <li>• High quality board</li> <li>• Printing paper</li> </ul>
<ul style="list-style-type: none"> <li>• School papers, letters</li> </ul>	<ul style="list-style-type: none"> <li>• Printing and writing paper</li> </ul>
<ul style="list-style-type: none"> <li>• Pamphlets, magazines</li> </ul>	<ul style="list-style-type: none"> <li>• Low quality board</li> <li>• Newsprint</li> </ul>
<ul style="list-style-type: none"> <li>• Newsprint</li> </ul>	<ul style="list-style-type: none"> <li>• Telephone directories</li> <li>• Cardboard</li> <li>• Magazines</li> </ul>
<ul style="list-style-type: none"> <li>• Corrugated board</li> </ul>	<ul style="list-style-type: none"> <li>• Packing boxes</li> <li>• Cartons</li> </ul>
<ul style="list-style-type: none"> <li>• Mixed paper</li> </ul>	<ul style="list-style-type: none"> <li>• Asphalted roofing sheets</li> </ul>

water, is flammable, sometimes eaten by rats and is also weak, rots and is brittle (Vogler & Sarjeant 1986).

Pulped waste paper can be also compressed into briquettes, which are sun-dried and burned as fuel. But these briquettes give out low heat, can burn poorly, and produce sooty smoke which makes them less popular for cooking or using in the house.

## **2.4 BENEFITS AND PROBLEMS ASSOCIATED WITH PAPER RECYCLING**

### **2.4.1 Major Advantages**

Paper recycling can reduce the amount of waste. In the United States, for instance, one person generates 0.8 tonnes of solid waste per year and an average household generates 2.5 tonnes per year. In 1990, the amount of paper and paperboard generated was 71.8 million tonnes (40 per cent of total waste generated) and the amount of paper and paperboard recycled was 18.4 million tonnes (10.24 per cent of total waste recycled) (Erdogan 1992). Paper and paper products comprised approximately 40 per cent of the

total solid waste generated in developed countries like Japan and Western European countries. In the United Kingdom, over a quarter of paper is recycled (James 1991).

Reducing the amount of waste saves on disposal costs and space for landfill. Landfill space is limited. High land values and the need to locate tips at appropriate sites make landfill expensive.

Paper recycling programs help government and business to reduce waste disposal costs. Recycling reduces the amount of waste, which has to be collected and disposed of, and also reduces management costs. The economic advantages of recycling will be seen in the long term.

Paper recycling programs help to conserve the world's non-renewable materials and energy because fewer raw materials need to be used. Forest harvesting can cause nutrient depletion in the soil, can lead to soil erosion and disturb the ecological balance. Recycling paper can reduce the rate of logging for woodchips. The countries with the highest waste paper recovery rates have limited forests and they preserve waste paper more than other countries (Erdogan 1992). Examples are Japan, the Netherlands, Mexico, South Korea and Portugal. The forests of Western Europe and Japan are protected due to environmental concern (Erdogan 1992). In Australia, it has been estimated that approximately 53 kg of paper used per person per year can be recycled and if 40 per cent of all paper used each year can be recycled, it will save around 5 million trees (Jones 1990). The recycling process also conserves electricity as it does not require as much energy as transforming raw resources into new materials (Jones 1990). For example, electricity required to produce a tonne of pulp from paper resources would be 400 kWh compared with producing pulp from wood, which would require 2400 kWh (Bakker, Niuatui & Rees 1993). Another example is in the recycling process used by the Australian Newsprint Mills (ANM). The electricity used in recycling old newspapers and magazines to newsprint is approximately one-sixth of that required for making virgin mechanical wood pulp (Publishers National Environment Bureau undated). An example of the potential to save energy indirectly by paper recycling is shown by a case study in Kanata, Canada, where in 1978, waste paper was used to produce cellulose insulation material. In this study, it was shown that an estimated 298 tonnes of waste paper could be collected per year, and this could be used

to produce insulation materials for 884 houses. A saving of approximately 2,700 barrels of oil per year could be achieved (Organisation for Economic Co-operation and Development 1983). In addition, to produce a tonne of pulp from virgin fibre, approximately 5 cubic metres of water is required, but about 3 cubic metres of water is required to produce a tonne of recycled pulp (Bakker, Niuatui & Rees 1993).

Paper recycling programs alleviate global pollution, particularly air pollution. Massive quantities of carbon dioxide in the atmosphere contribute to the greenhouse effect (Jones 1990). Less carbon dioxide is produced in the manufacture of paper from recycled waste than in the process of making paper from raw materials. Burning one tonne of paper generates 680 kilograms of carbon dioxide. If trees are cut down to produce paper (17 trees to produce a tonne of paper) the amount of carbon dioxide which is absorbed by those trees is also reduced (about 113 kilograms per year) (Erdogan 1992). Another Canadian study, conducted in Ottawa in 1978, illustrated that using waste paper in the production of industrial towels could reduce particulate emissions by 85 per cent and sulphur oxides by 46 per cent. It was shown that water pollution from paper production process wastes could also be reduced, for example BOD (Biological Oxygen Demand) by 51 per cent and total suspended solids by 54 per cent (OECD 1983: 111).

Paper recycling has the potential to create new jobs and businesses for communities. In Australia, there are about 1,100 workers in newsprint manufacturing and the newsprint recycling industry (PNEB undated). Opportunities exist to use recycled paper in the manufacture of other products for export. For instance, in the United States, recycled paper is used to make paperboard, tissue, newsprint, insulation and packaging. Total consumption of paper and related products in 1988 was 85.5 million tonnes of which 20.1 million tonnes was recycled domestically and a further 3.7 million tonnes was recovered and exported to many countries, such as Taiwan, Mexico and Japan (Erdogan 1992).

Another advantage to be derived from paper recycling is that the cost of raw materials used by paperboard mills can be reduced. In the United States, for instance, waste paper materials, such as mixed papers, newspapers and old corrugated containers save raw material costs in the manufacture of paper and paperboard. Raw material costs

accounted for 35% to 45% of the operating costs of paperboard mills (Pausacker 1975). The substitution of waste paper for raw material represents a considerable saving. Moreover, recycled fibres have some advantages over virgin fibres in certain grades of paper and paperboard. They form better and need less refining, for example, leading to a reduction in power consumption and overall production costs (Pausacker 1975).

In addition, paper recycling programs have created wider participation in community activities, and increased the community's awareness of the environment. Public participation also assists governments to reduce the operation costs in paper recycling schemes, such as collection and promotion activities. Better awareness of the environment can lead to environmental improvement in society.

#### **2.4.2 Problems and Challenges Associated with Paper Recycling**

Paper recycling programs provide various benefits for society but inappropriate methods in the schemes can create many problems. Technical problems can also occur. For example, old newspapers can be used to make cardboard or newsprint but few factories are able to recycle newspaper into newsprint (Jones 1990). Some technological advances (in adhesives) makes certain materials, such as printing ink and polymer coating, difficult to remove from paper, again hindering further recycling. The British Waste Paper Utilization Council has noted that polymer bonded and waxed papers were examples of the problems (Pausacker 1975).

Paper recycling processes may cause water pollution. Clean water can be polluted by ink and contaminants. These create problems with colour, high BOD, high suspended and dissolved solid content (from 200 to 400 kg per tonne) (Pausacker 1975). In the United States, for example, water treatment plants have been developed to solve this problem.

The quality of recycled paper is normally inferior to that of new paper. Paper can lose its strength and quality each time it is recycled. Current technology cannot produce recycled paper of the same quality as the original product (Gray & Thomas 1984). It is also difficult to control the quality of product made from waste paper.

Some people complain that recycled paper is 'unhealthy' as well as inferior. The chemical polychlorobiphenyl (PCB), introduced into the process as a waterproofing

agent, has proved hazardous for birds and marine life, and has been banned in Great Britain (Pausacker 1975).

There are some economic problems in paper recycling programs. Research indicates that paper made from (a percentage of) waste paper is more expensive to buy than virgin paper (Pausacker 1975). Manufacturing costs from secondary materials are often as high as, or higher than, these from virgin materials (Gray & Thomas 1984). Transportation costs, such as for door-to-door collection and freight cost (from collection sites to the recycling plants) can be high. The consequent high price of products made from recycled materials can reduce public demand on those products (McGregor undated). The market has normally favoured virgin materials (Gray & Thomas 1984). If quantities of waste paper within countries are insufficient, imported waste paper is costly for manufacturers. In addition, the different structure of markets in different countries can also affect paper recycling programs. Some types of recycled paper are required at certain times in some countries. Supply factors include the demand for waste paper by manufacturers, depending on the types, or grades, of paper required at the time, and any conflict existing between consumers and manufacturers.

Public awareness is a challenge in paper recycling programs. As Hill (in Gray & Thomas 1984:41) notes, 'recycling is a way of changing domestic practices'. It is therefore necessary to change public attitudes in order to assist governments to achieve the goal of waste minimisation. One method to encourage people is by providing education about, and facilities for, paper recycling, such as the provision of sorting bins. Inconvenient collection systems have discouraged public co-operation. However, education takes time and is an ongoing process. Therefore, it generally needs government support.

## **2.5 OVERVIEW OF PAPER RECYCLING IN AUSTRALIA AND DEVELOPING COUNTRIES**

Recycling has been an increasingly significant issue in the last decade in Australia because of social awareness of environmental problems (Bureau of Industry Economics 1993). Recycling schemes are used as a strategy to reduce the amount of waste going to landfill and conserve natural resources, such as raw materials used in manufacture and energy used to make products (PNEB undated). The level of recycling of materials in Australia varies widely. For instance, approximately 64 per cent of all paper and

paperboard packaging consumed in Australia is produced using recycled materials (Bakker, Niuatui & Rees 1993). A vital consideration for recycling schemes is economic viability, such as a ready and stable market for recycled products and an affordable cost of management. Australia is ranked sixth in the world in the use of recycled paper per capita for fine paper and packaging ahead of Canada and the United States (Associated Pulp and Paper Mills undated).

Recycling rate is a consequence of the interaction of economic, technological, and social values (McGregor undated). Economic aspects include the cost of collecting, recycling processing, and the cost of raw materials. Changing values on the environment can increase the recycling rate. Education plays a significant role in increasing the level of recycling. One recycling specialist notes that only greater consumer education will lead to change in levels of domestic recycling in Australia (McGregor undated). An increasing rate of recycling can be achieved by the improvement of community awareness in the basic principles and constraints involved. More understanding of recycling principles brings about a better chance of success in changing community attitudes. In some communities, local councils have a role in collection services as well as in encouraging paper recycling schemes.

Recycling is an important issue concerned by authorities from national to local levels. The Commonwealth Government attempts to encourage the production of recycled paper products by providing tax exemptions for 100 per cent recycled paper (Bakker, Niuatui & Rees 1993). In addition, State Governments have formed a policy framework and have provided facilities for the treatment of special waste. Local government is the major organisation providing waste management services. The *National Waste Minimisation and Recycling Strategy (NWMRS)* and the *National Kerbside Recycling Strategy (NKRS)* have set the scene to increase the importance of recycling and waste minimisation (Bureau of Industry Economics 1993).

The Australian *National Waste Minimisation Strategy* of 1992 is aimed at reducing by about 50 per cent the solid waste going to landfill by the year 2000 (Bureau of Industry Economics 1993). The *Kerbside Strategy* was also released in 1992. One aim of this strategy is to introduce regular kerbside recycling for more than 90 per cent of urban households by June 1994 (Bureau of Industry Economics 1993).

The concept of recycling has been wide-spread throughout the world but it has been implemented in different ways. Practical problems occurring in recycling schemes differ in each circumstance. For instance, developing countries have been confronted by financial problems for waste management (Gotoh 1989). This can affect recycling management. However, recycling in developing countries is considered to be a strategy to solve with waste management problems, such as waste disposal cost and the scarcity of landfill sites (Gotoh 1989). Recycling activities in developing countries have often been conducted in informal ways, by scavengers at dump sites, by municipal crews when they collect waste, or by small groups who may be called 'middlemen'. Poor people living near dump sites in some areas can earn money by separating materials from waste. 'Waste-picking families may earn as much or more than unskilled workers' (Furedy 1989), but they have to spend a great deal of time working. In Seoul, Korea and Mexico City scavengers are allowed to work at dump sites at certain specified times and in certain areas (Gotoh 1989). In China, however, shops for recyclable materials are open to the public, so relatively few scavengers are found compared with other countries (Gotoh 1989). However, it is important to understand these informal groups, because there are a large number who work with urban waste. Although they risk health problems, such as respiratory and parasitic infestation, women and children commonly work at dump sites (Furedy 1989).

Apart from the cost of waste management, the rapidly increasing rate of population, the use of inappropriate technologies and the role of operating agencies, public education and participation are significant factors in consideration of paper recycling in developing countries (Gotoh 1989). To enhance social awareness, and thus to improve the efficiency of paper recycling programs in developing countries, education can be provided through the mass media, for example, newspapers, television, and exhibitions.

To improve paper recycling programs in developing countries, careful studies of these factors combined with plans for development are necessary for policy-makers. Policy-makers should identify relevant factors, such as possible constraints on implementation in their plans, whether immediate, short-term plans, or long-term. To follow up, monitoring and revision programs would also be required.



More details on paper recycling in Australia and its companies, including paper recycling in developing countries, are given in Appendix 1.

## **2.6 COMMUNITY FACTORS OF IMPORTANCE FOR PAPER RECYCLING PROGRAMS**

A wide variety of factors have been described as relevant to paper recycling. Some are crucial to the success of the schemes, for instance, collection systems, markets and education programs. A number of variables identified in the literature as affecting the community, and thus as important for education programs, are discussed below.

Opinions amongst people are likely to influence outcomes from the programs. Thomas (1987) classified people involved with recycling into three groups:

- (1) social recyclers who participate in recycling programs and recognise that recycling is desirable socially;
- (2) economic recyclers who participate in recycling programs due to financial concerns, such as potential reductions in disposal costs; and
- (3) ecological recyclers who participate due to concern for such factors as energy saving, natural resources depletion, and native forest conservation.

The operating agency is influential in paper recycling programs. Agencies operating recycling schemes can be government authorities (local or central), private, or voluntary groups. In some communities, a private agency is seen as more suitable because of its flexibility. Voluntary groups, such as charities, can undertake collection operations if they are encouraged by local and central government authorities, as occurs in the Netherlands and the United Kingdom (OECD 1983). Collection by volunteers can save labour costs.

Various types of paper collections are undertaken. In the United States, householders are encouraged to separate recyclable materials into different containers and place them at the kerbside for collection. Multicompartment trucks or trailers are used to collect materials. In order to increase the participation rate, recyclable materials are collected once a week or fortnightly on the same day as refuse collection (Erdogan 1992). Householders may also separate waste such as newspapers and glass and drop them at a drop-off centre. This method is the most common and economical type of recycling

scheme (Erdogan 1992). The most important decision for this system is choosing the best location for the centre.

Some authorities use a centralised recovery system. When refuse is collected and taken to a centre (which may be landfills or transfer stations), a municipal crew will separate recyclable materials. However, Erdogan (1992) comments that this procedure is costly, and is therefore not accepted in some locations.

A material recovery facility is another method of recycling. In this case residents do not have to sort recyclable materials. The recyclable materials are put in one container and the mixed materials are taken to material recovery facilities for mechanical sorting and processing. This method can increase participation rates (Erdogan 1992).

Householders' income and education have been found to influence the public participation rate (OECD 1983). For instance, a case study in Konstanz, Germany, revealed that single-family residential areas with high average household incomes and high levels of education have higher participation rates (OECD 1983). However, other factors such as environmental conditions and people's awareness also influence participation rates.

Education programs are effective in increasing participation rates (OECD 1983). These programs can reach households in the form of leaflets, stickers, calendars, and via media such as televisions, radios, newspapers, posters and local meetings.

It can be concluded that the basic factors to the success of recycling programs are both economic and social. Education programs and government policies are significant contributors. The characteristics of local situations needed to be taken into account when developing programs.

## **2.7 THE ROLE OF EDUCATION IN PAPER RECYCLING PROGRAMS**

The value of education in paper recycling has been shown in countries such as the United States, Australia and Canada, where the public are encouraged to separate items such as paper and glass for recycling, and separate high-hazard materials from domestic waste (Hawkes 1988). Education, however, needs to be continuously implemented if it is to increase public awareness and interest. In turn, public interest and support can

boost recycling schemes to higher levels. Education programs usually have two functions: to describe the benefits of recycling in order to encourage householders to participate, and to give information on how they can participate in recycling programs (OECD 1983).

Public opinion has been shown to be a significant factor in the design and delivery of education programs. Polls conducted in Vienna, Italy and Le Havre, France, showed that householders believed that environmental protection and the saving of energy and raw materials were the most important reasons to recycle materials, while savings on waste disposal costs were less important (OECD 1983).

Education programs may have to be evaluated differently from other programs which use cost-effective analysis because of difficulties with the measurement of input and output of education programs (OECD 1983). Some government programs obtain assistance from other organisations and from volunteers. The financial input in these programs, therefore, may not represent the whole cost. The effectiveness of education programs can be difficult to measure. One measure of effectiveness could be to calculate the cost of each education program per tonne of recycled material recovered. However, it is likely that the longer an education program is run, collection rates will increase. Therefore, the difficulty is setting a time-frame for the evaluation (OECD 1983).

One vital component which relates to the effectiveness of education programs is the provision of information about recycling schemes. This can be undertaken by means of a variety of techniques.

- Brochures or leaflets. This method is commonly used to inform households of the needs and benefits of recycling schemes, and encourage participation.
- Letters. This method is more expensive than leaflets because letters are posted to target groups. Experience from the cases in the United States showed that the impact of letters was greater when they were addressed to individual householders (OECD 1983).

- Calendars. These explain to householders how they can participate in recycling schemes and give details about the time of collection. Calendars can assist in reminding householders about recycling schemes but the method can be expensive.
- Telephone information services are useful for providing information and answering queries or problems that may occur, such as a service set up in Bordeaux, France and in Somerville and Marblehead, in the United States (OECD 1983).
- Mass media. Instead of informing each household, this method disseminates recycling information through the community as a whole. The cost may be lower than the above-mentioned methods and it can be conducted more attractively. Methods include the use of television, radio, newspapers, journals, posters and meetings with local community.
- Some municipalities, such as in Lyons, France, and Geneva, Switzerland, have produced a regular newsletter about recycling activities (OECD 1983).
- Stickers or logos. Stickers on collection containers not only provide convenience for the crews when they pick up materials for recycling, but can also remind householders about recycling and provide a recognisable image for programs.
- Exhibitions and displays are selected as alternatives in many areas. In addition, local schools can be coopted to inform the public about recycling on special days, such as those organised in Parma, Italy and Somerville, the United States (OECD 1983).

Public awareness of paper recycling schemes can be encouraged by both government and non-government organisations. In Australia, local government is the main organiser of recycling schemes. In some cases, the recycling activities conducted by non-government organisations or volunteers are likely to be more flexible. However, government intervention is a strong factor in encouraging the public to participate in paper recycling programs. In Japan, the government stimulated private entrepreneurs to collect paper for recycling by paying them a percentage of the fee which is charged when people dispose of paper in landfill sites. The government relies on non-profit organisations for promoting recycling schemes and it intervenes in the market place. In

the Netherlands, a waste exchange has been established by the government for waste paper buyers and sellers (Erdogan 1992).

The methods for ensuring participation in recycling may be broadly divided into two kinds: mandatory and voluntary (Erdogan 1992). Mandatory recycling programs can be enforced by law. However, use of the law does not assure a high participation rate because education about the benefits of recycling is one factor in the success of mandatory programs according to Erdogan (1992). Thus, local, state and federal governments have been involved in education programs for communities about the necessity and benefits of recycling.

Encouraging public participation is the key to voluntary recycling (Erdogan 1992). It can be conducted through the media by describing landfill problems and emphasising the benefits of recycling. Moreover, providing handouts of recyclable materials and tours at recycling plants can increase public participation in recycling schemes.

The role of education in paper recycling programs can be an indicator of their success. Schools are likely to be important, not only for their direct contribution to recycling, but perhaps even more significantly for their effects on the younger generation.

### **3 PAPER RECYCLING EDUCATION IN BANGKOK, THAILAND**

#### **3.1 INTRODUCTION**

Before paper recycling education in Bangkok is described, it is essential to understand important background elements in Thailand. Some details of Thai economic, social and educational circumstances, are briefly provided. Information on the paper industry is also presented as it relates to paper recycling education programs. Recycling is stated to be an important issue in the National Plan and policies. Organisations involved in waste management and recycling, such as the Department of Public Cleansing (DPC) and the Pollution Control Department, have significant roles in the success of paper recycling programs. Public participation is seen as necessary for success in program implementation and education is seen as an effective strategy in increasing public participation. The roles of organisations involved and the education programs of those organisations are discussed.

A literature review and surveys have been used to examine paper recycling education programs in Bangkok. Interviews were conducted with the officers who are involved in the paper recycling education programs, and in schools where recycling education programs were undertaken. The officers were from government, private and non-government organisations. The recycling education program in a district in Bangkok was examined as a case study. Phranakorn District was chosen because it is the only district where a pilot recycling education program is being implemented in every primary school (11 schools) under the Bangkok Metropolitan Administration (BMA). The BMA wants to extend the program to other Districts as they are ready.

#### **3.2 CONDITIONS IN THAILAND**

Thailand, located in Southeast Asia, shares borders with Myanmar, Laos, Cambodia and Malaysia, and has a total area of 513,115 square kilometres and 76 provinces. The population is approximately 59,095,419 (density 115 person per square kilometre) (BMA 1995). Most Thais live in rural areas and earn their living by agricultural activities. Thailand once had forests covering about 60 per cent of its total area in 1959, but now this figure has been reduced to 18.4 per cent (Vongkul 1994). This reduction is

mainly due to logging (which was banned in 1989) and encroachment by farmers for agriculture, house construction and firewood collection. Moreover, infrastructure development (such as the construction of roads and embankments), and the tourist trade has increased the rate of deforestation.

Due to rapid population growth and economic development over several decades, Thailand now has a large investment in industry and infrastructure. It has been transformed from an agricultural to an industrial society. However, one of the consequences of these developments has been environmental degradation. Inadequate planning and the use of inappropriate technologies are two major reasons for the resulting environmental problems, especially the accumulation of solid waste.

The environment is now considered to be a significant issue. Its quality figures in one of the three major aims established in order to achieve the Thailand Seventh National Economic and Social Development Plan (1992-1996) (Sirikulwattana undated). The three aims stated in this national plan (herein referred to as the Seventh Plan) are:

- (1) economic growth should only continue at a rate which will retain sustainability and stability;
- (2) development and income distribution will receive greater attention in rural areas than in the past; and
- (3) development of human resources, quality of life, the environment, and natural resources will be increasingly undertaken.

The improvement of human resources, the quality of life, and the environment involve the development of four main areas: human resources, education and public health; culture and society; the quality of the environment as well as national economic and social development; and the improvement of administrative and natural resource management.

The Seventh Plan states that the natural environment will be protected and rehabilitated in accordance with national economic and social development by improving the management of waste, air pollution, water pollution, and hazardous substances. The Plan states that to fulfill the objectives of environmental development for the quality of

life, the amount of waste will be reduced, especially in Bangkok and other large cities. It is proposed that this amount will be decreased to less than 0.8 kg/person/day. The Plan also states that waste collection and disposal systems will be examined.

Possible strategies outlined in the Plan include the 'polluter pays' principle and the encouragement of the participation of local organisations in waste management. Other strategies are encouraging investment in the reduction and control of pollution, such as government support for public water treatment systems. Co-operation amongst government, private organisations and the public will be created in order to prevent and cope with environmental problems. Strategies for the improvement of administrative and natural resources management include the encouragement of public involvement in natural conservation, an increase in public awareness, the establishment of reliable information systems, and the development of legislation.

The Eighth National Economic and Social Development Plan (herein referred to as the Eighth Plan) is the current national plan which commenced in October 1996 and will end in September 2001 (Nontichan 1996). The Plan focuses on human development. Past experience has demonstrated that the consequences of economic development without cautious regard for national resources creates long term problems. The success of the Eighth Plan will be measured by the extent of improvements in the skills base and educational standards of the population. However, economic development can be one strategy to assist in fulfilling human potential.

The aims of the Eighth Plan concerning the environment are to achieve natural resource utilisation and conservation so that Thailand can sustain economic and social development, and an improved quality of life. The Eighth Plan also has strategies for developing the country in the long term. In this Plan, economic and social development are not divided and are considered equally. The follow-up and monitoring of the success of the strategy will consist of information collection, a survey of public attitudes towards the Eighth Plan, and projects which include measurement of the efficiency of each sector or organisation.

Economic and social development are significant issues in the National Plan. The two issues, including Thai education, are briefly discussed. An introduction to the pulp and paper industry is also given.



### **3.2.1 The Economic and Social Background**

Since Thailand announced its first national plan in 1981, its economy has dramatically improved. The average income per annum was about A\$140 in 1961 compared to approximately A\$3700 at the beginning of 1996 (Nontichan 1996). Basic infrastructure and services, such as roads, electricity, telecommunications, hospitals and schools, are wide-spread in rural areas. People in the country, who mainly depend on agriculture, now have more facilities, including agricultural machinery. The way of life of urban people has also undergone great change. Improved communication has influenced the Thai style of living. Knowledge is disseminated in both formal and informal education by means of advanced technology. For example, people in remote areas receive education through satellites.

### **3.2.2 Thai Education in Brief**

Although the Constitution of Education in Thailand was established by the 13th century, early education was limited, mainly to the aristocracy and the clergy (Samitamana & Pleansri undated). Temples were the major source of public education until the Department of Education was established in 1887, which has since been responsible for education and religious affairs throughout the country. State involvement in modern education is in accordance with the Constitution of 1978. Section 60 of the constitution states that the State shall promote and support education and professional training according to suitability and demand. Compulsory education in the educational establishments of the State is provided without charge (Samitamana & Pleansri undated).

Formal education now consists of six years at primary level, three years in the lower secondary level, three years in the upper secondary level, and four years in the tertiary level. Pre-school education is also provided to encourage children's physical, mental, intellectual and social development. Subjects in the primary curriculum are grouped into four areas: basic skills (Thai, mathematics); life experience (science, social studies, health); character development (ethics, morals, art, music, physical education); and work orientation (industrial arts, home, economics, agriculture, labour legislature) (Samitamana & Pleansri undated).

The Ministry of Education is responsible for the management of education from kindergarten to high school level throughout the country including technical and vocational education. The management of primary education in the municipality of each province is the responsibility of the Office for Local Education, Ministry of Interior; however, the BMA is responsible for the management of primary education in the Bangkok Metropolitan Area with financial support from the Ministry of Interior.

### **3.2.3 The Pulp and Paper Industry**

The growth rate of the paper industry in 1987 was about 20.4% while GDP (Gross Domestic Product) grew by 9.5% (Thai Pulp and Paper Industries Association undated). GDP decreased from 9.5% in 1987 to 8.6% in 1995 while the growth rate of the paper industry declined from 20.4% in 1987 to 10.0% in 1995. Table 3.1 shows the growth rate of GDP, agriculture, manufacturing, and exports compared with that of the paper industry during the period of the Sixth National Economic Plan (from 1987 to 1991), and the Seventh National Economic Plan (from 1992 until 1995).

Table 3.1: The Growth Rate of GDP, Agriculture Manufacturing and Exports Compared with the Growth Rate of the Paper Industry in Thailand

Growth Rate (%)	6th National Plan					Average 1987-1991	7th National Plan			
	1987	1988	1989	1990	1991		1992	1993	1994	1995
GDP	9.5	13.2	12.0	11.5	7.9	10.8	8.1	8.3	8.7	8.6
Agriculture	(0.2)	10.2	6.6	(3.7)	4.4	3.4	6.0	-1.9	5.5	3.0
Manufacturing	12.8	17.4	16.2	15.9	11.9	13.9	11.3	11.1	9.3	11.0
Exports	28.8	33.9	27.7	14.4	23.5	24.6	13.2	13.0	21.3	22.5
Pulp & Paper Industry	20.4	18.1	5.5	21.8	12.4	15.5	14.1	14.9	15.3	10.0

Source: TPPIA undated and 1996

The growth rate of the pulp and paper industry declined from 15.3 per cent in 1994 to 10.0 per cent in 1995. This was the result of the increase in world pulp and paper prices. In addition, vast flooding in the fourth quarter of 1995 in Thailand reduced the demand for pulp and paper. Nevertheless, the growth rate of the pulp and paper industry in 1995 was 1.2 times that of the GDP growth rate.

Total demand for fibre raw material in 1993 was 1,398,900 tonnes per year, a 13.7 per cent increase on 1992. About 172,600 tonnes (12.3 per cent ) was long-fibre pulp,

242,400 tonnes (17.3 per cent) was short-fibre pulp, and the rest of the 983,900 tonnes was waste paper (TPPIA undated).

### **3.2.3.1 The Pulp Industry**

The total demand for fibre raw material in 1995 was 2,083,600 tonnes. About 211,000 tonnes (10 per cent) was long-fibre pulp, 356,000 tonnes (17 per cent) was short-fibre pulp and the remainder, 1,516,000 tonnes, was waste paper (TPPIA 1996). The price of pulp in the world market, both short-fibre and long-fibre, has increased since the beginning of 1994. The pulp price rose before 1995 but began to decline at the end of 1995. The price of waste paper also increased in 1995 (TPPIA 1996). In 1993, the total production capacity for short-fibre pulp increased from 191,000 to 209,000 air dry tonnes per annum (TPPIA undated). In 1995, the capacity increased by 21 per cent from 273,000 to 331,000 air dry tonnes per annum (TPPIA 1996).

In the first half of 1993, Thailand imported 139,800 tonnes of short-fibre and long-fibre pulp, mainly from the United States, Canada, Brazil, Chile and Indonesia. The main import (37 per cent of total imported pulp) was non-coniferous bleached chemical wood pulp. In the same period, 164,500 tonnes of waste paper was imported from the United States, Germany, the Netherlands, Malaysia and Hong Kong. Unbleached kraft paper, paperboard made from corrugated paper, and paperboard were the major kinds of imported wastepaper. These represented about 52 per cent of the total imported amount (TPPIA undated). In 1995, Thailand imported 350,000 tonnes of short-fibre and long-fibre pulp, mainly from the United States, Canada, Sudan, Chile, New Zealand, Portugal and Brazil (TPPIA 1996). Non-coniferous bleached chemical wood pulp was the major import (about 32 per cent of the total imported pulp). In the same period, Thailand also imported 607,000 tonnes of waste paper from the United States, Germany, Singapore, Hong Kong and Malaysia. The major kinds of imported waste paper were unbleached kraft paper, paperboard made from corrugated paper, and paperboards. Waste paper comprised about 63 per cent of the total imports in the paper industry.

In the first half of 1993, Thailand exported 21,700 tonnes of pulp, mainly to South Korea, India, Malaysia and Indonesia (TPPIA undated). In 1995, about 99,000 tonnes of pulp were exported, mainly to Asian countries, such as Indonesia, India, South Korea, and Vietnam, but also to Kuwait and Italy (TPPIA 1996).

### **3.2.3.2 The Paper Industry**

On average, the amount of paper used per person in Thailand is 34 kg per year (DPC 1996a). The demand for paper increased from 1,485,800 tonnes in 1992 to 1,668,800 tonnes in 1993 (TPPIA undated). The economic worth of paper consumed in 1993 was A\$1,670 million (a five per cent increase on 1992). The demand climbed from 2,069,300 tonnes in 1994 to 2,226,300 tonnes in 1995 (or an average consumption about 37.7 kg/per year). Paper consumption in 1995 was valued at about A\$270.5 million (an increase of 38 per cent on 1994).

There were 40 paper mills in 1992 and this number increased to 47 in 1995. The production capacity of these mills increased from 1,578,500 tonnes in 1992 to 2,396,800 tonnes in 1995.

In the first half of 1993, Thailand imported 268,400 tonnes of paper and paperboard. Newsprint paper was the major type (51 per cent). In 1995, Thailand imported 518,800 tonnes of paper and paperboard. The major import was still newsprint paper (49 per cent) (TPPIA 1996). At the same time Thailand exported 34,300 tonnes of kraft paper (52 per cent), compared with about 239,600 tonnes of kraft paper exported in 1995 (51 per cent).

Domestic pulp consumption is expected to increase from 415,000 tonnes in 1993 to 740,000 tonnes in 1998 (TPPIA undated). This average growth rate is about 12 per cent per year. The total demand for paper and paperboard is expected to increase from 1.7 million tonnes in 1993 to 3 million tonnes in 1998. The average growth rate is 12 per cent per annum. The demand for paper and the capacity of paper production from 1993 to 1998 is shown in Table 3.2.

### **3.3 LEGISLATION ON WASTE MANAGEMENT IN THAILAND**

The Enhancement and Conservation of National Environmental Quality Act (ECNEQ Act) B.E. 2535 (1992) is the core law addressing environmental concerns in Thailand. Under the Act, the National Environment Board was established. The nation's Prime Minister is the Chairman. The Board is responsible for making recommendations to the Cabinet in respect of financial, fiscal, taxation and investment promotion measures for the implementation of the Act. In order to enhance and conserve national environmental

Table 3.2: Demand for Paper and Capacity of Paper Production ('000 tonnes/year)  
Compared with Population in Thailand

	1993	1994	1995	1996	1997	1998
Demand	1,669	1,876	2,104	2,361	2,649	2,970
Capacity	1,842	2,473	2,565	2,765	3,103	3,154
Population (‘000,000 persons)	58.9	59.6	60.3	61.0	61.7	62.5
Per capita consumption (kg/head)	28.3	31.5	34.9	38.7	42.9	47.5

Source: TPPIA undated

quality, the Board can specify measures for the strengthening and fostering of co-operation among government agencies, state enterprises and the private sector.

In Section 7 of the Act, it is stated that:

in order to encourage public participation in the promotion and conservation of environmental quality, non-governmental organisations (NGOs) having the status of a juristic person under Thai law or foreign law which are directly engaged in activities concerning environmental protection or conservation of natural resources without any objective to be involved in politics or to make profits from the engagement in such activities, shall be entitled to register with the Ministry of Science, Technology and Environment as the NGOs for environmental protection and conservation of natural resources in accordance with the rules, procedures and conditions prescribed by ministerial regulation.

NGOs may request that the government assists or supports public relation campaigns and the dissemination of information or data to promote public awareness and proper understanding of environmental protection and conservation issues.

The Act established a fund called the Environmental Fund in the Ministry of Finance. The money and properties of the fund come from occasional grants from the government, service fees and penalties collected by virtue of the Act, donation by private sectors, both domestic and foreign, by foreign governments, or by international organisations. This fund can be disbursed as loans to local administrations or state enterprises for waste disposal facilities, or as grants or aid to support any activities concerning the promotion and conservation of environmental quality with the approval of the National Environment Board. This Act also states that the collection, transport

and other arrangements for the treatment and disposal of garbage and other waste shall be in accordance with the governing laws related thereto.

The Ministry of Science, Technology and Environment proclaimed the Environmental Quality Management Plan in 1993 as the action plan to achieve the aims and objectives of the Enhancement and Conservation of National Environmental Quality Act 1992. The aims of this action plan are to explore problems and propose solutions as a framework for an environmental quality management plan at the province level (Thai Government Gazette 1993).

Short-term plans have already been formulated, but the long-term plan is not complete. The aims of the short-term plan for environmental management are to explore environmental problems and propose solutions, to stimulate public awareness, to encourage public participation, and to be a framework for the Province Action Plan. The National Resources and Environment Office, Ministry of Interior, is the centre at the province level. Two important issues in the short-term plan are waste management and public relations. These issues are described below.

### **3.3.1 Waste Management**

The Plan states that appropriate strategies for waste management will be set up, especially in the Bangkok Metropolitan Area, other big cities, and tourist cities through both short-term and long-term plans. The regulations and legislation involved will be revised or new specific laws will be introduced to increase the efficiency of activities, for instance, the laws governing the separation of waste and the eradication of hazardous waste. Government and private organisations will attempt to influence public attitudes and participation by providing information.

### **3.3.2 Public Relations**

Government policies regarding public relations on environmental issues aim to increase child and youth awareness of the importance of natural resource conservation, and to increase the role of local organisations in decision-making which effects natural resource management. To implement government policies, both government and private organisations in central and regional areas will play a public relations role. Private groups and NGOs will be supported in carrying out their environmental

conservation activities. Environmental education will be addressed at every level through appropriate materials and activities.

Potential plans and projects which support the government's policies include environmental rehabilitation, environmental conservation, and environmental information development.

The Ministry of Science, Technology and Environment also prepares long-term plans and policies for environment enhancement and conservation in accordance with the ECNEQ Act 1992. The draft of the Enhancement and Conservation of National Environmental Quality Plan and Policy (1997-2016) is presently being revised.

The purpose of the above plan is to manage natural resources, enhance and conserve the quality of the national environment along with social and economic development for national sustainable development, and to enhance the quality of life. The Plan and Policy consists of six main policies including education and public relations for the environment.

The strategies for achieving the aims of the policies include a possible 'buy-back system' and the encouragement of the private sector to co-operate in environmentally friendly activities. Government support for research, technology development, training for officials, and regulation revision are recognised as being necessary.

### **3.4 EDUCATION IN PAPER RECYCLING IN BANGKOK**

Waste management is a vital issue which relates to paper recycling education in Bangkok. Bangkok, the capital of Thailand, has an area of 1,568.74 square kilometres. This city is an essential economic, social and administrative centre. It faces rapid population expansion and suffers from various problems, for example, housing shortages, unemployment, and environmental problems. Bangkok had a population of 5,584,226 in 1994, in 38 districts and 2 sub-districts (BMA 1995).

Waste management is considered to be a means to reduce pollution, to enhance the quality of life, and to encourage investment and tourist business which will support Thailand's economic growth. Nevertheless, inappropriate and unplanned waste management can be a critical problem for the country. The main causes of waste

management problems are the lack of long-term actions, financial support, personnel skills, insufficient recovery of waste, inadequate public participation, and inappropriate regulations. In 1994, the amount of waste increased to 33,000 tonnes per day. Only approximately 42 per cent of the total amount could be collected (Pollution Control Department 1995).

The amount of waste in Bangkok increased from 1,173,097 tonnes in 1985 (average 3,259 tonnes/day) to 2,421,302 tonnes in 1995 (average 6,726 tonnes/day). It is estimated that the daily average waste will increase to 12,920 tonnes and 18,750 tonnes in 2005 and in 2015 respectively (DPC, 1996a). Table 3.3 shows the average amount of waste in Bangkok in 1985 and a prediction of the expected increase over the next 20 years.

Table 3.3: The Average Amount of Waste in Bangkok in 1985 and the Expectation of Waste for the next 20 years

Year	1985	1995	2005	2015
Total waste (tonnes per day)	3,258.60	6,725.84	12,920	18,750

Source: DPC 1996a

Approximately 7,000 tonnes of waste (21 per cent of total waste) were produced in Bangkok. The average amount of waste that the BMA can collect each day is 6,500 tonnes (93 per cent of the total waste in Bangkok). About 77 per cent (5,000 tonnes) of this collected waste goes to landfill, 17 per cent (1,100 tonnes) is composted, and the rest, infectious waste from hospitals, is incinerated.

The BMA is the local administrative agency for the capital under local constitutional controls and government regulations. The body consists of the BMA Assembly and the Governor of Bangkok (who are elected by the people, and who oversee the daily operation of regular civil servants, teachers and employers of the BMA) (DPC undated (a)). The BMA has at least twenty-six principal functions, for instance, city planning, environmental development and conservation, and the provision of compulsory education. The BMA has also released regulations and laws about public and city cleansing. For example, the Cleansing Act, B.E.2535 (1992) stipulates fines for illegal disposal. The disposal of waste in public places will incur fines up to A\$100; the



disposal of waste on the roads or in waterways up to A\$500. One important duty of the BMA is the maintenance of cleanliness and order in the city. Waste problems must be quickly solved and waste can not be allowed to accumulate. The importance of the Department of Public Cleansing, under the BMA, is demonstrated by the fact that its collection system deals with the solid waste produced by about 6 million people.

In 1995, the BMA had 5,328 workers sweeping roads, 5,227 workers collecting waste and 1,641 drivers, totalling 12,196. The total number of collection vehicles in February 1996 was 2,001 trucks and 52 boats (8 metres and 6 metres long) (DPC 1996b).

The BMA runs two waste collection strategies. The direct collection system is run by solid waste collection vehicles and crew which collect waste from households and other places, or the householders carry waste to the collection vehicles. Indirect collection is where the BMA provides containers at roadside locations and close to areas with large amounts of waste, such as markets and department stores. When the containers are full, they are hauled to disposal sites.

The three methods of waste disposal in Bangkok are composting, sanitary landfill and disposal of hospital waste. There are three disposal sites in Bangkok: On-Nut, Nong-Khaem, and Tha-Raeng (DPC undated (a)). The BMA plans to construct an incinerator which can burn waste up to a rate of about 1,000 tonnes per day and a feasibility study is currently being conducted. In the 1995 fiscal year (October 1994-September 1995) the BMA collected waste 6,674 tonnes of waste per day (DPC 1996b).

It is estimated that approximately 40 per cent of the total waste can be recycled (DPC undated (b)). During 1986-1995, paper was found to be 15.21 per cent of the total waste. Table 3.4 presents a breakdown of waste into the main components.

The BMA, therefore, has initiated projects which will encourage people to participate in waste reduction by separating waste at its source. Waste is separated into groups: wet solid waste (easy to decay, such as organic waste), and dry solid waste (such as paper, plastic, glass and metal). The BMA also produces brochures, pamphlets, and information sheets to inform the public and provides recycling programs for schools.

The Department of Public Cleansing, under the BMA, is responsible for planning and implementing the work of public sanitation and the disposal of garbage including the

Table 3.4: Waste Components for Bangkok in 1986-1995

Waste component	Average weight (%)	Note
Paper*	15.21	* materials of this kind are currently being recycled
Plastic*	14.85	
Vegetable and fruit	13.06	
Leaves and wood	7.62	
Glass*	5.64	
Cloth and textiles	4.95	
Rock and ceramics	4.05	
Bones and shells	3.23	
Metals*	3.04	
Rubber	1.62	
Other waste	26.75	
Total	100	

Source: DPC 1996a

provision and maintenance of mobile lavatories. Solid waste generated in Bangkok is collected by the Cleansing Section of 38 district offices and the Public Cleansing Service, Division of the Department of Public Cleansing (DPC undated (a)).

The Technical and Planning Division, under the DPC, is responsible for the collection of data used for planning and co-ordinating with districts and related offices (DPC, undated (a)). Planning Projects and Data Sub-division is responsible for planning, and evaluating and reporting data from survey and research. It also provides educational programs for students, the public, and other government sectors.

Various materials are utilised in campaigns and promotions of solid waste management, such as advertising on the sides of buses and on television. The policy on solid waste management was started under the Fourth Development Plan (1992-1996) of the BMA. The activities and projects are divided into solid waste collection, solid waste disposal, and public relation activities. To promote the advantages of recycled materials and to reduce the amount of waste disposal are the objectives of solid waste collection. Secondary objectives of the solid waste management policy are to enhance other agencies' educational programs for dealing with environmental problems and to use

mass media, posters, stickers and leaflets to stimulate and persuade public in co-operating with the BMA (DPC undated (a)).

Each District Office is responsible for collecting waste from households, markets, shops, factories, public areas and for sweeping roads (manual labour) in their districts, while the DPC is responsible for collecting waste from hospitals, markets, government offices and cleaning and sweeping roads and streets (mechanically) (DPC 1996b). District Offices can request the DPC for assistance with waste collection and cleaning in their area of responsibility.

Under the main plan, the DPC provides technical infrastructure (information and vehicles, for example) to support recycling activities. The District Officers produce plans for the use of those resources. Both DPC and District Offices provide information, budget for and produce activities about recycling, such as mobile exhibitions, seminars, and training courses. They also co-ordinate with the private sector on those issues. Private organisations may create their own recycling projects and provide financial support for communities or for the government in recycling activities.

All schools under the BMA are primary schools and there are 429 schools in Bangkok. The Department of Education, under the BMA, is responsible for education management for schools, and supervision of school activities (BMA 1992).

There are several paper recycling projects undertaken in Bangkok by both government and NGOs. Those projects and organisations involved are summarised in Table 3.5. The details of those projects along with the organisations involved are described below.

#### **3.4.1 The Pollution Control Department, Ministry of Science, Technology and Environment**

This Department is responsible for environmental management plans in regard to control, prevention and development strategies. This Department also examines and advises the government on environmental management and policies for a national plan.

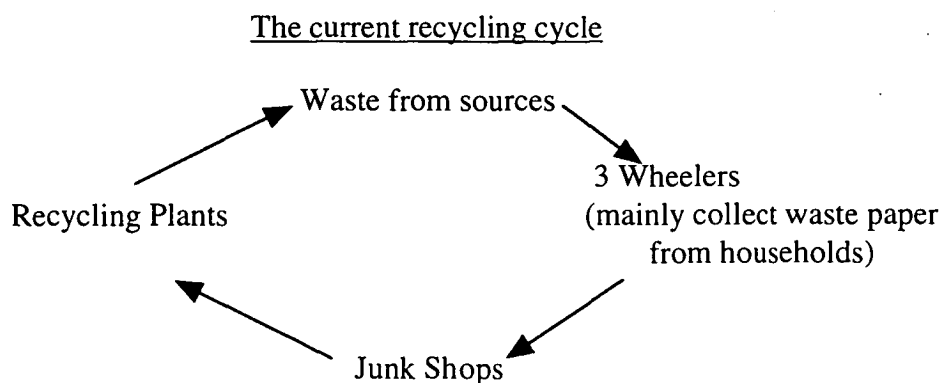
The objective of the Pollution Control Department in recycling is to increase the rate of recycling of materials in the community to 10 per cent of total waste by the year 2001.

Table 3.5: Organisations and Paper Recycling Projects

Organisation	Project
1. The Pollution Control Department	<ul style="list-style-type: none"> <li>• Waste Reduction by Recycling</li> <li>• Milk Carton for Waste Reduction</li> <li>• Information Transfer</li> </ul>
2. TECDA	<ul style="list-style-type: none"> <li>• Recycled Paper with Magic Eyes</li> </ul>
3. Media Centre for Development	<ul style="list-style-type: none"> <li>• Recycled Paper for Trees</li> </ul>
4. National Housing Authority	<ul style="list-style-type: none"> <li>• Waste Separation in Communities</li> </ul>
5. The BMA	<ul style="list-style-type: none"> <li>• Separating Waste at Source and Hazardous Waste Management</li> <li>• Recycling Project (A Pilot Project)</li> <li>• Recycling Project in 1997</li> </ul>
6. The TEI, the Thai Modern Plastic Industry Ltd and Phranakorn District	<ul style="list-style-type: none"> <li>• Waste Separation for Recycling in Educational Institutes</li> </ul>

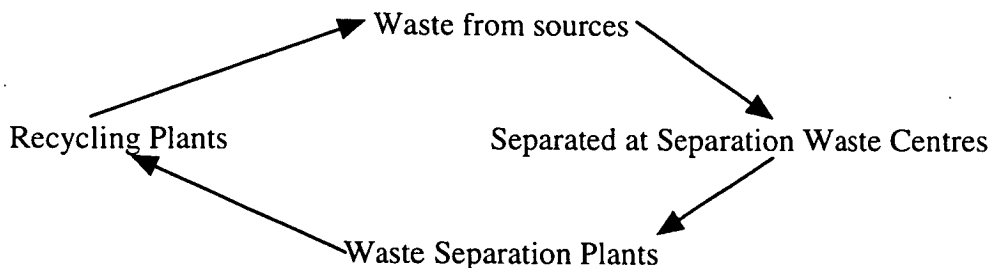
It is expected that this rate will increase to 15 per cent in 2006. The target group is the general public. The mass media (television, radio and newspapers) and information sheets including education are the modes of delivery (Rangson Pintong, Chief of Waste Utilisation Section, personal communication).

The Pollution Control Department also has a policy to support recycling activities. The Department identifies four strategies as its framework. The first strategy is investment in recycling and waste separation plants in order to improve the current situation.



If the waste separating plant has been established, waste from large producers (such as schools and department stores) would have been collected and separated at Waste Separating Centres before going to the recycling plants. The Waste Separation Plants

will separate waste before it is delivered to the recycling plants. This process will assist recycling plants to reduce their expenditure and pollution. The new cycle may be as shown below.



The second strategy to increase recycling schemes in society is government support, such as markets for recycled materials and tax exemptions. Government offices are encouraged to support the use of recycling materials. Already many government offices order paper from the Bang-Pa-In Paper Industry Ltd which uses waste paper as its raw material.

Regulations and laws about recycling are to be released at both national and local levels. One-way products may be taxed more than recycled products.

Finally, public education campaigns, for instance information sheets, seminars and training courses, will be implemented along with other strategies.

The Information Exchange Centre was established in 1993. The Centre is implemented by staff from the Waste Utilisation Section of the Pollution Control Department. This Centre provides recycling information, guest speakers, and consultants for government, private organisations and the public about recycling schemes.

The Pollution Control Department has three current projects concerning recycling: Waste Reduction by Recycling, Milk Cartons for Waste Reduction and Information Transfer. These projects are described below.

#### **3.4.1.1 Waste Reduction by Recycling**

The Pollution Control Department has employed a private company to study the feasibility of waste reduction by recycling. This project aims to search for strategies to establish waste separation centres and waste separating plants; to promote recycling products; and to educate the public about recycling. This project was conducted over 13

months (starting October 1995) with A\$1 million in funding. Videos, posters and leaflets were produced for government offices, and schools interested in recycling programs.

#### **3.4.1.2 Milk Cartons for Waste Reduction**

From the analysis of the milk carton component, it was found that the paper used for milk cartons is a larger component than plastic and foil. In 715 million milk cartons, there are 3,983 tonnes of paper, 747 tonnes of plastic, and 249 tonnes of foil (Pollution Control Department 1996). Therefore, a strategy to reduce waste paper from milk cartons was considered. This project aims to reduce waste in communities, to conserve natural resources, and to create student awareness and participation in solving environmental problems, particularly the waste issue. The project has been implemented since October 1995 with funding from the Pollution Control Department and the private sector.

#### **3.4.1.3 Information Transfer**

Recycling information is to be disseminated through the Internet to government and industry organisations. The network is in process. This project will increase the efficiency of the Information Exchange Centre.

In 1997, the Pollution Control Department will implement the 'Public Campaign to Enhance Public Awareness Project'. The aim of this project is to change public attitudes towards recycling. The strategies will use the provision of videos, information sheets and advertising. If this one-year pilot project is found to be successful, it will be fully implemented in the following year.

The Pollution Control Department also collaborates with government and private organisations as well as NGOs in undertaking recycling activities, such as providing technical assistance to support paper recycling education programs undertaken by the Thai Environment and Community Development Association (TECDA). Officers and experts are invited to give information in seminars and to educate students at schools. The budget for recycling activities of this Department is stated by Mr Pintong, Chief of Waste Utilisation Section, to be sufficient.

### **3.4.2 Thai Environment and Community Development Association (TECDA)**

TECDA, an NGO, was established in 1984 with the aim of increasing public awareness of environmental problems and their responsibility to society. TECDA plays the role of co-ordinator in brainstorming and co-operation among government and private sectors, communities and the public. TECDA had 36 members in 1995 and it uses the 'Magic Eyes' as its symbol.

TECDA has three main activities: management of waste, water and trees. Activities concerning waste emphasise disposal behaviour and waste reduction by separating waste and recycling. Strategies used to achieve its aims are public campaigns, educating the public about the environment, and operating activities with government and private agencies and communities. Educational schemes are undertaken by presenting information to increase awareness of environmental problems and to find solutions for those problems. The consequences from past activities of waste management are demonstrated by the change in public behaviour towards waste disposal and various recycling activities in communities.

TECDA initiated the 'Clean Up Thailand Project' in 1993 to support the 'Clean Up the World' campaign which aimed to increase environmental awareness and actions. The Clean Up Thailand Project focused on changing the disposal behaviour of people in Bangkok. Information was given through mass media. Children were the target groups. When this project was undertaken, it received interest from the public. However, the amount of waste still increases because of increased consumption. Also the consumption of recycled products is not generally accepted (Muttana Tanormpun, Secretary General, personal communication).

A study of waste reduction began in 1990. In 1992, TECDA conducted a pilot project in 19 schools in Bangkok. Students practised separating waste before disposal. Among the results of this project between December 1992 to February 1993 were students' awareness of environmental protection and co-operation among people in schools. The amount of waste collected during that time was about 6,986 kg (average 368 kg per school). The waste consisted of 4,557 kg of paper (65%), 1,214 kg of glass (17%), 911 kg of plastic (13%), and 304 kg of metal (4%) (TECDA undated). It was found that education is an important method of increasing awareness. Therefore, TECDA re-

initiated education programs in schools in 1995. This organisation also produces public advertising about recycling, such as posters and television advertising. However, advertising through television was restricted because of the costs.

In 1995, TECDA launched the 'Recycle Paper with Magic Eyes Project' to develop national awareness of recycling. This project is supported by the Ministry of Science, Technology and Environment, the Ministry of Interior, and the Ministry of Education. The project is an extension of pilot projects initiated since 1992 which introduced recycling knowledge to schools. The public were also encouraged. For example, they were urged to bring used paper to exchange one kilogram for one toilet roll at the Robinson Department Stores and the Central Department Stores. About 42 tonnes of paper was collected within three weeks (TECDA 1995).

The objectives of the 'Recycle Paper with Magic Eyes Project' are to reduce the amount of waste destined for landfill, to reduce energy consumption and to reduce consumption. In addition, the need to import waste paper is reduced and co-operation among government, private agencies and the public is generated.

Funding for this project was from the Environment Fund, Ministry of Science, Technology and Environment, with contributions from the US Agency for International Development (USAID), Siam Cement Group PLC., Bangkok Bank Ltd PLC., and Thai Farmers Bank Ltd PLC. Activities were supported by the Ministry of the Interior and Ministry of Education to start a pilot project of a paper recycling program in one school from every district throughout the country (about 940 schools) (TECDA 1995). Magic Eyes Boxes, for separating waste paper, were distributed to schools to place in each classroom. Other strategies provided were posters, leaflets, television advertising, radio advertising, seminars, and waste separation activities throughout the country. Seminars were arranged in many provinces, such as Chaieng Rai (in the north of the country) and Samutphrakarn (near Bangkok).

The evaluation of this project was by means of surveys conducted by other organisations and self-assessment by TECDA staff. The results of the evaluation are in process. Some examples of feedback from this project until March 1996 were reports about waste separation activities from 38 government organisations, schools in 33 provinces, 8 public enterprises and 4 private organisations throughout the country. Occasional



activities were also supported from the public, for example, in the 'Environmental Exhibition 1995' at Thammasat University from 1-3 December 1995. People were encouraged to bring waste paper for recycling. About 4,297 kg of waste paper was collected (TECDA 1996).

### **3.4.3 Media Centre for Development**

This non-government organisation was established in 1987, and currently employs 18 officers. The Centre aims to increase community ability in sustainable development and to enhance community potential through mass media. Journals, training courses and study tours are examples of activities of the Centre. The four current projects of the Centre are Alternatives for Agriculture, Gather Funds for Development, Rural Environment Improvement, and Training.

'Recycle Paper for Trees', one project under the Gather Funds for Development Project, has been undertaken since June 1994. The project was established because of the awareness of waste paper problems in Bangkok which affect the forests in the country. The members of the 'Recycle Paper for Trees Project' are government organisations, educational institutes, but mainly private companies. There were approximately 1,400 members in 1996 (Angkana Saengthong, Project Co-ordinator, personal communication).

The aims of the 'Recycle Paper for Trees Project' are to educate people to separate waste paper for recycling in order to reduce the amount of waste, to save trees and to save energy utilisation. Another aim of this project is to gather funding to support environmental activities in rural areas. Funding is raised from donations and from selling waste paper collected and donated from members (Media Centre for Development undated).

Members of the project were given information about recycling and containers (boxes and plastic bags) to separate waste paper. The paper was collected by teams from the Centre and sold to paper recycling plants. Posters and leaflets were produced to advertise the project. From June 1994 to June 1996, approximately 289,553 kg of waste paper was collected and the Centre received A\$55,488 from selling this paper. In addition, the Centre received A\$5,179 from donations (Media Centre for Development

1996). However, Ms Saengthong, Project Co-ordinator, commented to the author that further financial support is still required for project implementation, for example, for producing posters and leaflets and for collecting waste paper (such as vehicles and petrol).

An evaluation of this project was completed by surveys of the member groups. Members are divided into three groups: large, medium and small waste paper donors. One survey conducted showed that members were satisfied with the implementation of the project. They commented that the project benefited society and was easily implemented. However, due to a small organisation with five officers in this project, a lack of communication sometimes occurred amongst the Centre, its members and the public. The Centre therefore produced an annual report and is going to produce three-monthly newsletters and activities to communicate with its members.

In addition, the Centre supports and co-operates with other organisations in paper recycling education programs. For example, the Director of the Centre is on the committee of the 'Recycle Paper with Magic Eyes Project'. The Centre produced mobile displays for the 'No Time to Waste Project' undertaken by Earth Care Company and also informs government, private organisations, and educational institutes in Bangkok and other provinces, about paper recycling.

#### **3.4.4 The National Housing Authority**

This organisation is responsible for the improvement of the environment, such as land in communities. 'Waste Separation in Communities' is a project to create tidiness in communities. People are educated on waste separation for recycling. This project was in the National Housing Authority Annual Plan (1996) and was conducted during October 1995-September 1996. The aims of this project were to reduce the amount of waste, to educate people about recycling and waste eradication and to encourage public participation in waste separation (National Housing Authority 1995).

The committee from 26 communities (130 people) in 4 districts (Lad Krabang, Phayathai, Bang Sue and Pasi Charoen) were educated about waste separation and community benefits by experts from the National Housing Authority and other organisations, for instance, the TECDA, the BMA, National Petrochemical Ltd, and the

Ministry of Science, Technology and Environment. A study tour about the waste separation process was also provided.

The expected outcomes were waste reduction, community participation, job creation, and that the project would be a model for other communities to follow. A survey was undertaken to explore householders' disposal behaviour and their attitudes towards separating waste. The results of the survey is currently being processed.

### **3.4.5 The Bangkok Metropolitan Administration**

Three education projects concerning recycling were undertaken by the BMA. The 'Separating Waste at Source and Hazardous Waste Management Project' was undertaken by the DPC. This project was first conducted as a pilot project in 1991 and was re-initiated during October 1993-September 1996. The 'Recycling Project' (a pilot project) was produced by the Department of Public Cleansing and Districts in Bangkok. This project was implemented from 1 July to 31 December 1996. The 'Recycling Project' is also to be implemented in the 1997 plan (five year project).

#### **3.4.5.1 The Separating Waste at Source and Hazardous Waste Management Project**

Recognising that there are critical waste problems in Bangkok, the Department of Public Cleansing produced a project for public relations about separating waste at source in 1991. This project is contained in the Fourth Development Plan of the BMA and was designed as a pilot project to inform the public about recycling activities. The BMA provided bins for separating garbage, such as paper, plastic and other materials in its offices, schools, districts offices and hospitals. The Separating Waste at Source Project was repeated during the fiscal year 1994-1996 (October 1993-September 1996). This project aims to educate people and enhance their participation in reducing the amount of waste by separation (DPC 1993).

The objective of this project was to encourage public awareness and co-operation. Materials used in this project included 10,000 posters, 100,000 leaflets, and 100,000 booklets. Some 17,120 bins (60 litre capacity) were provided to 429 schools under the BMA. Exhibitions, videos, training courses, and experts to give public seminars were also arranged.

In 1994, one village from each district in Bangkok was chosen as a pilot area and was supplied with two types of rubbish bins: one for wet solid waste and one for dry solid waste. There were 760 bins provided for all districts and 1,140 bins provided for hospitals and Health Service Centres. The previous collection and disposal system was revised.

The total cost of all materials and activities was about A\$783,880. The expected outcomes from this project were waste reduction, collection convenience and an increase in public participation. The efficiency and effectiveness of collection and disposal systems and saving in natural resources were included in the project. The follow-up and monitoring of the project were undertaken by measuring the amount of waste reduced and waste components. The results of this project are in the process of being analysed.

#### **3.4.5.2 The Recycling Project (A Pilot Project)**

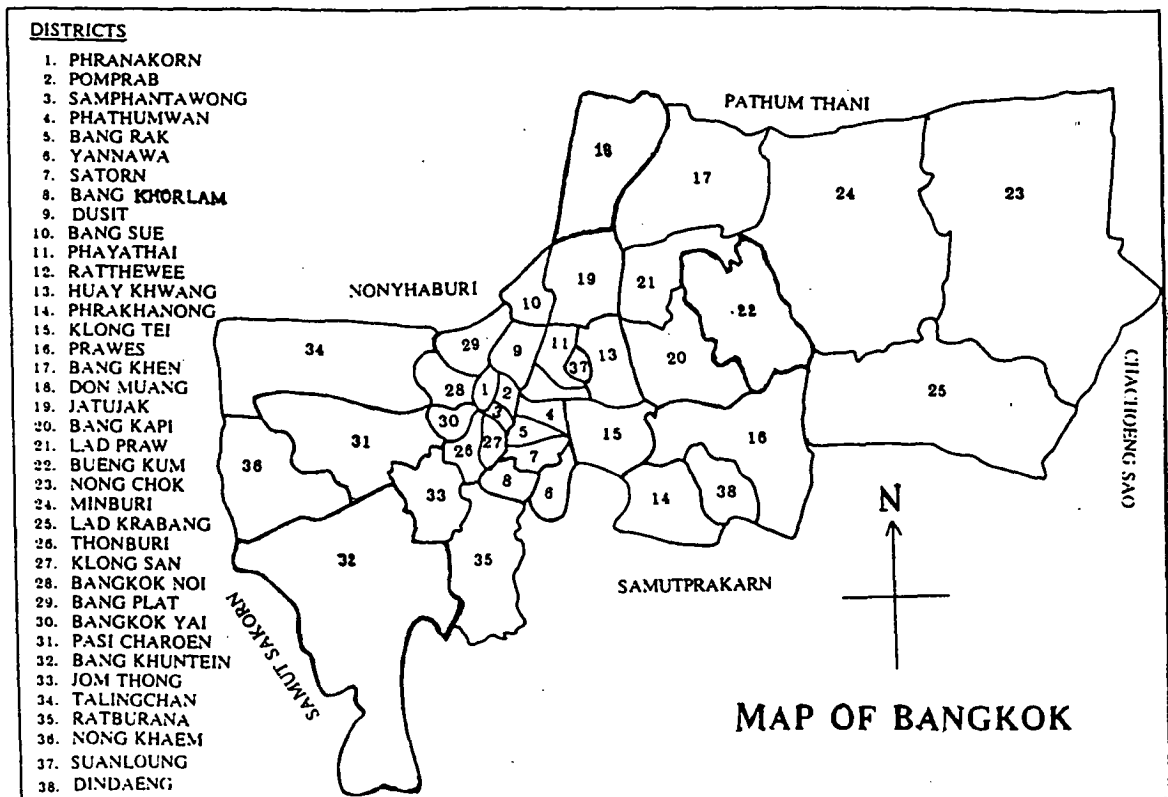
The DPC, in collaboration with district offices, is responsible for this pilot project. The aims of this project were to enhance public attitudes towards recycling, and increase their participation. As a result, the amount of waste and pollution was reduced. This project was conducted between 1 July and 31 December 1996.

The Waste management policy of the DPC is addressed in the Fifth Development Plan of the BMA (1997-2001). The rate of increase in waste by volume in Bangkok each year will be reduced from eight to six per cent. The DPC will arrange 42 recycling trucks (DPC 1995). Six pilot districts were selected by the DPC in order to determine appropriate methods for other districts. The location of six pilot districts are shown in Figure 2.

The target groups were schools, villages, government offices, department stores, sacred places, and communities. Funding for its implementation was from the fiscal budget of the Cleansing Division and the District Office. The DPC arranges for recycling trucks and bins. Table 3.6 shows the number of recycling trucks and bins provided for each pilot district. Photo 1 in Appendix 8 (p. 142) shows one of the vehicles.

The monitoring and evaluation of this project was undertaken by an analysis of the waste component report from each district. Activities undertaken in this project were to

Figure 2: Map of Bangkok



Source: DPC (undated (a))

Table 3.6: The Number of Recycling Trucks and Bins Provided for Each Pilot District

Name of the district	No. of recycling trucks	No. of recycling bins	
		240 litres	60 litres
Bang Kapi	1	-	243
Lad Praw	3	345	109
Bueng Kum	1	-	178
Suanloun	4	-	97
Klong Tei	3	245	95
Huay Khwang	1	-	18
Total	13	590	740

Source: DPC 1995

be divided into 7 stages during May 1996-January 1997. Table 3.7 shows the activities of the DPC Recycling Project.

Table 3.7: Activities of the DPC Recycling Project

Activities	1996								1997
	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.
1.Design of project	★								
2.Material preparation	↔								
3.Opening of program		12							
4.Campaign		↔							
5.Implementation			←					→	
6.Evaluation								★	
7.Report									★

Source: DPC 1995

### 3.4.5.3 The Recycling Project in 1997

The Recycling Project was re-conducted and included in the Fifth Development Plan of the BMA. This project emphasises co-ordination among the public, government and private organisations. The DPC arranged a seminar on 14-15 September 1996 to design strategies for this project. Some strategies discussed in the seminar included re-using, repairing, reducing and recycling.

The aims of this plan are to reduce the amount of waste, to support recycling activities, to reduce the use of natural resources, and to deal with waste problems. The objective of this plan is to reduce the increase in waste from eight per cent per year to six per cent (DPC 1996c). This plan is a five-year plan (from 1997-2001). The rate of inclusion of target groups is shown in Table 3.8.

Table 3.8: The Number of Target Groups in the Recycling Project

Year	The number of target groups
1997	15%
1998-1999	30%
2000-2001	50%

Source: DPC 1996c

Target groups are people in schools, both under the BMA and under the Ministry of Education, people in universities, factories and department stores. Each district office will classify the number of target groups and design appropriate action plans in their areas.

The DPC will launch public campaigns through mass media, journals, posters, stickers and videos while public campaigns implemented by district offices can include mobile-exhibitions, pamphlets, seminars, group meeting, door-to-door approach and information centres (DPC 1996c).

Financial sources are the DPC, District Offices and private organisations. The DPC will allocate about 50 per cent of its total recycling budget to campaigns; 40 per cent to seminars, meetings, training courses, and study tours; and 10 per cent to other support activities. Each District Office will give 70 per cent of its total recycling budget for community activities, and 30 per cent for other support activities (DPC 1996c).

Surveys to examine public attitudes and participation will be conducted for project evaluation. Other methods are the comparison of waste quantity as well as a comparison of waste components of each district.

#### **3.4.6 The TEI, the Thai Modern Plastic Industry Ltd and Phranakorn District**

The Thailand Environment Institute (TEI) was established in February 1993. The TEI is an independent organisation and acts as a central environmental organisation between government and private sectors including media. Giving environmental information including training courses to members and the public are the main aims of the institute. The Environment Training Centre was established to create public awareness of the environment. The TEI has undertaken the 'Green Label Project' which is concerned with producing products which have less effect on the environment than similar products. The organisation also produced a journal to provide environmental knowledge for students in schools and other interested groups (TEI undated).

The TEI, the Thai Modern Plastic Industry Ltd. and Phranakorn District designed a 'Waste Separation for Recycling in Educational Institutes Project'. This project was conducted during May-December 1995 and aimed to educate the students, teachers and staff of educational institutes about recycling to increase their participation and to decrease the amount of waste (Phranakorn District 1994).

The target groups of this project were the students and teachers of 24 educational institutes (about 24,000 people). After this project was evaluated, the project was adjusted for other groups. The implementation of this project involved the provision of

training courses about recycling to teachers and students in schools and universities as well as information sheets, posters, stickers, leaflets and recycling bins to institutes. The Thai Modern Plastic Industry Ltd and the TEI provided financial support (A\$36,574) for materials, such as booklets (A\$15,385), posters (A\$2,565), and T-shirts (A\$2,615) while the district office arranged for 200 bins and 10,000 plastic bags (Phranakorn District 1994).

The expected outcomes from this project were waste reduction, collection convenience, school participation and environmental improvement. Statistical data on the number of recyclable materials separated were recorded by district officers and attitude surveys were conducted as the follow-up and the evaluation for this project.

When the project was conducted in eleven primary schools, under the BMA, in Phranakorn District, it was called the 'Bangkok Co-operates in Recycling'. The TEI in co-operation with the Thai Modern Plastic Industry Ltd and Phranakorn District conducted the Bangkok Co-operates in Recycling Project which aimed to encourage students in Bangkok to separate waste. Dr Lohsomboon, Project Manager from the TEI, designed the program. The TEI was a co-ordinator and produced campaigns with financial support from the Thai Modern Plastic Industry Ltd and Phranakorn District. Each school designed their own activities.

The project started in January 1995 and ended in March 1996. The aims of the 'Bangkok Co-operates in Recycling Project' were to educate students on resource utilisation and to increase their awareness of environmental problems. This project was also a pilot project for other districts throughout Bangkok. Children were the target group. Training courses, posters and recycling bins were provided. Six recycling bins (60 litre capacity) were distributed to each school for separating waste paper, glass, plastic, metal, wet solid waste (such as food) and other waste (See Photo 2, Appendix 8, p. 142).

The project was evaluated by using a questionnaire. It was found that some schools could operate activities at a satisfactory level (Pongvipa Lohsomboon, personal communication). Activities began on 1 July 1995 by educating students and teacher representatives of each school about waste management and recycling. Study tours were conducted at the Thai Modern Plastic Factory and at the dump site. District



workers collect waste every week (every Tuesday in six schools and every Friday in five schools). Furthermore, the district office arranges for slide and video shows, posters and leaflets. To encourage student and teacher participation, Thai Modern Plastic Industry Ltd and district office provided rewards for schools by considering the amount of waste separation and recycling activities in schools. This successful pilot project has resulted in continuing activities in every school. School Principals, teachers and students of eleven primary schools in Phranakorn District were interviewed by the thesis author to seek their opinions upon this project. The results of interview are shown in Section 3.5.2.

Apart from the above-mentioned organisations, the Robinson Department Store Public Company Ltd co-operated with the BMA and the TECDA in undertaking paper recycling education programs. The Department of Environmental Quality Promotion produced educational materials to promote public awareness of the environment including recycling. The details of these two organisations are shown below.

#### **3.4.7 The Robinson Department Store Public Company Limited**

This company has a policy to assist society by improving the environment and has started educational strategies by producing advertising and plastic disposal bags for educational institutes in Bangkok. Staff of the department store are also educated about recycling by the staff of the Ministry of Science, Technology and Environment.

The department store joined with the TECDA and the BMA to undertake a pilot project (The Separating Waste at Source Project) in 1991. The success of this project was evaluated by the amount of waste collected from schools in the project. Ms Sirijitkasame, Deputy General Manager, commented that the success of this project was about 80-90 per cent.

In 1995, a seminar on the topic of a 'Recycling Art Camp' was arranged by this department store and Chulalongkorn University in order to stimulate students' initiatives on recycling and re-use schemes. Fifty schools co-operated in this seminar which the department store supported financially (Orapin Sirijitkasame, personal communication).

The Department Store has spent about A\$0.6 million for education in recycling programs over five years. Some of this budget was spent to produce leaflets, posters, displays and recycling bins. The bins were located at hospitals and schools near the department store (Orapin Sirijitkasame personal communication).

### **3.4.8 The Department of Environmental Quality Promotion, Ministry of Science, Technology and Environment**

Part of this Department's responsibilities are to educate the public on environmental protection through the media and to provide basic environmental knowledge to other government agencies, private organisations and the public. The Public Education and Extension Division is responsible for an increase in public awareness of environmental matters and encouraging public participation in the management of environment and natural resources. The Department also develops materials used for supporting environmental promotional activities (Department of Environmental Quality Promotion undated).

Examples of promotional materials used by the Department of Environmental Quality Promotion in their action plan in 1996 are shown in Table 3.9.

Table 3.9: Examples of Materials Used by the Department of Environmental Quality Promotion in 1996

Materials Used	Detail
• 25 minute-long feature articles (on television)	30 segments
• 5 minute long article (on radio)	200 segments
• Highway billboards	250
• Stickers	8 subjects
• Posters	4 subjects
• Leaflets	4 subjects
• Booklets for children	2 subjects

## **3.5 RESULTS OF INTERVIEWS**

Government, private and non-government organisations who are involved in paper recycling education programs in Bangkok were interviewed from 26 August to 27

September 1996, mostly face-to-face. Interview questions are shown in Appendix 2. These were prepared by the author in Hobart before leaving for Bangkok. During that time, the school Principals, and some teachers and students from eleven primary schools under the BMA were also interviewed in order to examine their attitudes towards education in paper recycling programs undertaken in their schools and outside schools.

### **3.5.1 Results of Interviews with Officers from Government, Private and Non-government Organisations**

The most significant results from the interviews were the comments on the strengths and the weaknesses of paper recycling education programs. Suggestions were also provided for the programs. Ten officers from different organisations were interviewed. Table 3.10 shows the names, positions and organisations of interviewees including the dates of interview.

#### **3.5.1.1 Comments on the Strengths of Paper Recycling Education Programs**

Various strengths of paper recycling education programs were mentioned by nine of the interviewees. Those mentioned most often are summarised in Table 3.11 below.

Mr Thraisri commented that students were encouraged to bring waste paper from their houses to school in order to encourage parents to sort waste. Both Ms Sirijitkasame and Dr Lohsomboon said that providing recycling education to students may benefit them as adults because they can take this behaviour with them in their later lives. Mr Sakultab also stated this point and added that in his opinion education in recycling should be in the high school curriculum.

On the point of public co-operation, Mr Kootkum added that public co-operation in recycling activities indicated the success of the programs. Mr. Pintong also commented that co-operation between government and private sectors was one significant factor in the success of recycling programs. Currently, government organisations co-operate in many areas. For instance, the Ministry of Science, Technology and Environment co-operated with the Ministry of Industry and the Ministry of Finance in considering funding and customs rates for imported recycling machines. Private organisations, industries and NGOs produce recycling products and support recycling activities. Ms

Table 3.10: The Names, Positions and Organisations of the Interviewees and the Dates of Interview in Bangkok

Name	Position	Organisation	Date of Interview
1. Mr Suriya Thraisri	Chief of Public Cleansing Section	Phranakorn District	27 August 1996
2. Dr Chantarat Kootkum	Planning and Policy Analysis	Office of Planning and Policy, Ministry of Education	28 August 1996
3. Mr Rangson Pintong	Chief of Waste Utilisation Section	Pollution Control Department	4 September 1996
4. Ms Muttana Tanormpun	Secretary General	TECDA	5 September 1996
5. Ms Orapin Sirijitkasame	Deputy General Management	Robinson Department Store Public Company Ltd	11 September 1996 (By telephone)
6. Ms Angkana Saengthong	Project Co-ordinator	Media Centre for Development	12 September 1996
7. Ms Sarinporn Leemaharoung-ruang	Chief of Planning Project and Data	Department of Public Cleansing	18 September 1996
8. Dr Orapin Eaemsiri	Lecturer in Faculty of Environment and Resource Studies	Mahidol University	19 September 1996
9. Dr Pongvipa Lohsomboon	Project Manager	TEI	19 September 1996 (By telephone)
10. Mr Weera Sakultab	Director of Public Education and Extension Division	Department of Environmental Quality Promotion	23 September 1996

Tanormpun stated that the education programs increased co-operation among organisations.

Another advantage of paper recycling education programs is a reduction in the demand for imported waste paper (Ms Sirijitkasame). In addition, four benefits of paper recycling education programs were mentioned by representatives from four organisations. These are summarised in Table 3.12.

Table 3.11: Most Often-mentioned Strengths in Paper Recycling Education Programs

Organisation	Increase public awareness	Increase public co-operation	Reduce waste
• Phranakorn District			√
• Ministry of Education	√	√	
• Pollution Control Department	√		√
• TECDA	√		
• Robinson Department Store			√
• Department of Public Cleansing			√
• Mahidol University	√	√	
• TEI			√
• Department of Environmental Quality Promotion	√	√	

Table 3.12: Four Additional Strengths of Paper Recycling Education Programs

Organisation	Save resources	Save cost	Collection convenience	Schools can earn money
• Phranakorn District		√	√	√
• Robinson Department Store	√			
• Department of Public Cleansing	√	√	√	
• TEI	√			√

Paper recycling education programs can assist in decreasing natural resources utilisation, waste management costs, and provide collection convenience for collection workers. In addition, officers from Phranakorn District and TEI noted that schools can

earn money from selling the waste paper collected to Three-wheelers and collection workers. The Three-wheelers are groups of people who buy recyclable materials from households. The main types of waste paper bought are writing paper, newspaper, magazines and cardboard. The money adds to the budget for schools activities.

### 3.5.1.2 Comments on the Weaknesses of Paper Recycling Education Programs

Mr Kootkum, from the Ministry of Education, and Mr Pintong, from the Pollution Control Department, thought that paper recycling education programs had no weaknesses. However, Mr Kootkum added that recycling activities should be carried out in rural areas. He said that education in paper recycling was not widespread possibly due to the lack of financial support. In his opinion, some strategies used, such as displays were at a satisfactory level.

Some weaknesses of the paper recycling education programs were mentioned. Table 3.13 shows those named most often.

Table 3.13: Some Weaknesses of Paper Recycling Education Programs

Organisation	Lack of public participation	Lack of regulation	Lack of skilled personnel
<ul style="list-style-type: none"> <li>Ministry of Education</li> </ul>			√
<ul style="list-style-type: none"> <li>Robinson Department Store</li> </ul>	√		
<ul style="list-style-type: none"> <li>Department of Public Cleansing</li> </ul>	√	√	
<ul style="list-style-type: none"> <li>Department of Environmental Quality Promotion</li> </ul>		√	√

Ms Leemaharoungruang said that financial support for producing campaigns, such as posters, videos and leaflets, was insufficient. On the lack of regulations, she added that there has been no regulation to force people to separate waste, whereas Mr Sakultab commented that there should be laws to control pollution which may be produced by recycling processes.

Other weaknesses found were the lack of co-operation between government and private organisations, especially information exchange (Mr Pintong), and advertising on television about recycling, which was not attractive (Mr Pintong and Ms Leemaharounguang). Dr Lohsomboon found that the weakness of the 'Bangkok Co-operates in Recycling Project' was the lack of co-operation, especially from some school Principals. Ms. Tanormpun, Secretary General of TECDA, commented that the success of the programs depends upon co-operation among organisations. She also said that while public interest in separating waste was at a satisfactory level, co-operation was insufficient. Education is a social process and requires government funding, and incentives for producers. According to past activities, TECDA found that co-operation among government, private organisations and consumers is vital but the consumer is one important factor in coping with waste problems.

Mr Sakultab commented that the current paper recycling education programs were not sufficient. For instance, the Department of Environmental Quality Promotion has no office in other provinces to educate or produce recycling programs outside Bangkok. However, the Department has a policy to establish a Provincial Environmental Education Centre as a co-ordinator organisation among provinces and other organisations.

Ms Sirijitkasame commented that the efficiency and effectiveness of the education programs may be measured by the co-operation between schools and the organisations involved. Another indicator may be the continuing implementation of the programs. Mr Sakultab believed that it was difficult to assess environmental activities. However, the assessment could be carried out by examining participation, such as the number of students participating in school activities.

Mr Pintong suggested that government should conduct surveys to examine current public attitudes and should also provide resources to support recycling activities, such as recycling trucks. He noted that recycling activities should be evaluated by means of public attitude surveys and waste component analysis.

According to Mr Sakultab, education was one method to deal with environmental problems, apart from technology, finance, and regulation. He noted that there were many factors involved in increasing awareness, such as government support and skilled

persons. However, Mr Sakultab and Mr Thraisri commented that although the budget for implementing education programs was sufficient, skilled persons were still required.

In addition, representatives from the Ministry of Education, the Robinson Department Store, the TEI, and the Department of Environmental Quality Promotion felt strongly that knowledge about the environment in general should be taught as a separate unit in the school curriculum. They made a major point that this was not the case at present.

### **3.5.1.3 Comments on Government and NGO Paper Recycling Education Programs**

Mr. Pintong noted that the advantages of education in paper recycling programs undertaken by NGOs were the small target groups and short programs. NGOs can evaluate recycling activities after the programs are completed and explore the response of target groups. However, due to the small sample size, some information collected by NGOs is insufficiently reliable. Information collected by government officers is more reliable but takes longer.

Some weaknesses were discovered in paper recycling education programs undertaken by TECDA. TECDA's programs were conducted at the micro-level (small groups). Support from government and private sectors was required, such as providing recycling trucks, big bins for large communities, waste transfer stations and waste sorting stations. Ms Tanormpun commented that government education programs were limited in budget, skilled people and regulations, but to their advantage, government programs could be flexible and were of longer duration.

Ms. Saengthong commented that government education programs in paper recycling, such as undertaken by the Department of Environmental Quality Promotion, created public awareness. However, NGO education programs, such as TECDA programs, were more well-known. Government programs emphasised recycling in general more than paper recycling.

Ms Leemaharoungruang commented that NGO education programs assisted government programs in encouraging public participation, waste reduction and the decrease of natural resource utilisation. She also believed that the education programs produced by NGOs were good if NGOs were more concerned with social benefits than organisational



benefits. Dr Eaemsiri noted that the education programs produced by NGOs showed responsibility to society. Dr Lohsomboon commented that NGO education programs were short programs which may have some constraints, such as financial support.

Mr. Sakultab commented that private and NGO education programs were good. Government should support private organisations by reducing taxes on recycling machines and encouraging the establishment of recycling plants in other regions throughout the country. Mr Thraisri commented that paper recycling education programs produced by NGOs assisted in alleviating waste problems in society.

### **3.5.2 Results of Interviewing Eleven Primary Schools in Phranakorn District**

Phranakorn district is 5.536 square kilometres in area and has a population of 82,000 and 20,173 households (Suriya Thraisri, Chief of Public Cleansing Section, personal communication). The eleven primary schools under the BMA in Phranakorn District are Wat Suthud School, Wat Mahatat School, Wat Ratchanadda School, Wat Mahun School, Ratchabopit School, Wat Ratchaburana School, Wat Cheatupon School, Wat Mai-ammatarod School, Wat Makutkasattrariyaram School, Wat Intharawiharn School, and Wat Threetodsathap School.

Ten school Principals and thirty teachers in total from the 11 schools were interviewed. The structured interview forms, designed to elicit information and opinions on paper recycling education programs undertaken in the school and outside the school, are given in Appendix 3. All interviews were face-to-face. The number of teachers involved in the paper recycling education programs were 20, and 10 teachers were not involved. All of the school Principals could describe the implementation of the programs in their schools. The recycling education program was incorporated within the Life Experience Group Subject in three schools and it was part of the Work Orientation Group Subject in two schools. In one school, the recycling program was incorporated into the Life Experience Group Subject and Character Development. It was part of the Life Experience Group Subject but had also become classroom behaviour in two schools. Although the program was not part of the curriculum in three schools, it was taught as part of classroom behaviour.

In 1995, every class in every school implemented the program, except kindergarten at Wat Mahun School. The paper recycling education program is still running in every school and part of the program has been to encourage people to fully use paper before disposal, which all Principals agreed was effective.

None of schools has kept records of the amount of waste paper collected. The Principal of Wat Mahun School noted that this is mainly because the program is aimed at creating awareness and the program is part of the recycling process. The Principal of Wat Ratchaburana School also stated that records were not kept because there were not many students. It was felt unnecessary to record the quantity of waste paper collected. However, one teacher from Wat Mahun School said that there was about 40-50 kg of waste paper collected each month. One teacher from Wat Ratchaburana School said that there was about 12-18 kg of waste paper per day in her school. The teacher from Wat Threetodsathap School observed that in 1995, there was about 8.5 kg of waste paper in first semester and 6 kg in second semester.

### **3.5.2.1 Comments on the Paper Recycling Education Programs Undertaken in Schools**

The interview responses show that the main outcomes expected from the paper recycling education programs are: to change students' behaviour in separating waste (four Principals and 11 teachers); to educate students about recycling (four Principals and nine teachers); and to reduce waste in schools (one Principal and four teachers). Other expected outcomes mentioned were that if paper was used fully before disposal, schools could save money and also that natural resources could be saved.

The major strengths of the paper recycling education programs mentioned by the Principals and teachers were to practise good behaviour with respect to waste separation by students and to reduce waste in schools. Furthermore, students were educated about recycling and natural resources were saved. Table 3.14 summarises the perceived strengths of the paper recycling education programs in schools.

However, teachers in two schools commented that there were weaknesses in the paper recycling education programs in their schools. A teacher at Ratchabopit School noted that there was a lack of time in which to monitor students' behaviour. The teachers

Table 3.14: Main Strengths of Paper Recycling Education Programs as Described by Principals and Teachers

The Strengths of the Program	Number of Principals	Number of teachers
• Practise good disposal behaviour	6	14
• Reduce waste in school	5	12
• Educate about recycling	3	3
• Save natural resources	1	4

from Wat Intharawithan School commented that the weaknesses of the program were the lack of co-operation from parents and that students' awareness about waste problems did not increase. Students had knowledge about recycling but some of them did not implement the activities. Only 10 per cent of students were interested in the program. One teacher added that children's behaviour needed to be monitored. They sometimes forgot to separate waste before disposal. This teacher added that in 1995, the program was not successful because some students did not co-operate in the program. The teacher of Wat Threetodsathap School stated that the construction of a school canteen negatively affected the location of the recycling bin and that proved to be an obstacle to the success of the recycling programs.

All of the 20 teachers who were involved in the paper recycling programs commented that the program was good and they participated in the program by giving advice to students and sorting waste before disposal. Only one teacher interviewed did not know that there was a program in her school. The other nine teachers, not involved directly in the program, knew that there was a program, mainly from seeing recycling activities carried out in their schools. All of these thought the program was good.

### 3.5.2.2 Comments on the Paper Recycling Education Programs Undertaken Outside Schools

Four Principals and ten teachers commented that the paper recycling education programs outside schools, such as those produced by the government, industry and NGOs, were effective. Six teachers mentioned the programs undertaken by the

TECDA. They said the TECDA's activities could encourage children to participate in the programs. In addition, TECDA's programs created public awareness of tidiness in the community. Advertising on television of TECDA's program was also attractive. Two other Principals and one teacher also commented that advertising on television about recycling education programs outside schools was good.

However, two Principals and two teachers said that the paper recycling education programs outside schools were not effective. One teacher noted that the education programs outside schools should be increasingly promoted. For instance, the BMA should provide recycling trucks for every community. Another teacher believed that only 30-40 per cent of the education programs outside schools were effective because some strategies used, such as booklets, were not attractive enough. The government should promote organisations to produce recycling programs. One Principal commented that the organisations who produced education programs outside schools should be more concerned with social benefits than organisation benefits. One teacher pointed out that waste separation was in the private interest rather than government interest. One teacher noticed that currently there were not many paper recycling education programs produced outside schools because air pollution is perceived to be a more pressing and critical issue than the waste problem.

### **3.5.2.3 Other Comments on Paper Recycling Education Programs**

There were other issues mentioned by the Principals and teachers. For example, one teacher noticed that, sometimes when householders separated waste, collection workers put all waste together anyway. He also stated that there should be more advertising about separating waste and recycling, and more recycling bins.

- A few teachers said that students' behaviour needed to be followed because as they were at school for only six hours it was too short a time for changing behaviour. However, many teachers were satisfied with students' behaviour in separating waste at schools.
- One teacher suggested that government and private sectors should support education programs by providing rewards for children, while another teacher said that rewards should be provided for classrooms which separated waste correctly.

- One teacher noted that schools could earn money from selling waste paper to the Three-wheelers. She also suggested that there should be a centre to demonstrate re-use products, especially for foreigners.
- Three schools had student councils to monitor and advise other students about separating waste. Two schools provided one paper recycling bin and another bin in each class and one school provided a paper box (36 litres) in every class.
- One Principal and one teacher expected that paper recycling education programs should be implemented in high schools. One school was going to produce information sheets and booklets for parents.
- There were no recycling activities in one school in 1996. The Principal of this school said that because the school had a small number of teachers and that they were responsible for many activities, the extra workload involved prohibited the implementation of a paper recycling program.

#### **3.5.2.4 The Results of Student Interviews about the Paper Recycling Education Programs Undertaken in their Schools**

Students were interviewed by the author about the paper recycling education programs in their schools. The interview questions are shown in Appendix 4. The total number of students interviewed in 11 schools, both in class and outside class, was 572 students.

In the classes, the teachers allowed the author to distribute the questionnaires to the students (see Appendix 4 for the questionnaire). For Grade 3 students, the author read the questions aloud as well. Other, higher level classes were simply asked to answer the questions, but they were invited to raise queries if they wanted to (See Photo 3, Appendix 8, p. 143). Grades and numbers of students in each school questioned are given in Appendix 5. In addition, the author solicited responses to the questions from random children at lunchtime. Older children filled out the forms themselves, some younger ones were read the questions. Children were first asked whether they had already participated in the class questionnaire process so they would not participate twice. Numbers and grades of children involved in this process are shown in Appendix 5. In the same Appendix, results of the interviews are also given.

Almost all students (average 97%) knew that there was a paper recycling program in their school. Every student interviewed in five schools knew there was a program in their school. There were three main ways that students knew of the programs. These were: from teachers (average 63%), from seeing recycling activities (average 14%), and from seeing recycling bins (average 8%).

Almost all students interviewed (average 95%) said they participated in the paper recycling programs. All students interviewed in 5 schools participated in the program. Three main ways that students participated in the programs were by separating waste before disposal (average 73%), by using waste paper for craft (average 19%), and by attending recycling activities (average 4%). Examples of student craft work are in Photo 4, Appendix 8, p. 143. In one school, the percentages of students participating in the program by using waste paper for craft was the same percentage as those who used paper fully before disposal.

Students were asked to present their comments on whether they thought that the paper recycling program in their schools was good or not. The majority of students (average 84%) commented that the programs were good while 10% (average) of students said they did not know whether the programs were good or not. Only 3% (average) of students said that the programs were not good. They believed this to be true because there were some students who did not separate waste paper before disposal. Students who commented that the programs were good then gave reasons why they said so. Three major reasons mentioned were because waste paper was used for recycling (average 26%), waste was reduced (average 17%), and co-operation among students was created (average 4%).

There were other comments by students interviewed. About 43 students commented that they wanted everyone in society to co-operate in recycling programs. Some students suggested that recycling programs should be more widespread in the community. Some students suggested that there should be recycling programs in every school because they liked recycling activities and that the programs were useful. Many students noted that the recycling program should be continuously implemented in schools.

### 3.6 THE STRENGTHS AND WEAKNESSES OF EDUCATION IN PAPER RECYCLING PROGRAMS IN BANGKOK

Education in recycling has become a significant strategy to alleviate waste problems as it is stated in the plans and policies of government and non-government organisations. Many education recycling projects have been established in Bangkok where the increasing amount of waste has become a critical issue. Awareness of waste paper issues increased when pilot projects on separating waste were undertaken. Many government organisations have attempted to deal with waste paper problems through producing recycling projects in the community. For instance, the Department of Public Cleansing has attempted to increase public awareness and co-operation in coping with waste problems. The Pollution Control Department produced the Milk Carton for Waste Reduction Project. This Department also has a plan to establish a Waste Separation Centre. Many programs in paper recycling education are produced by non-government organisations. For example, the TECDA launched 'Recycle Paper with Magic Eyes Project' in 1995. The Media Centre for Development has run the 'Recycle Paper for Trees' since 1993.

The waste paper separating programs produced by government and non-government organisations benefit everyone from local communities to the national level. The obvious benefit of recycling is the reduction of waste paper. Many of the officers, Principals, teachers and students interviewed also mentioned this issue. Some of them said that the amount of waste paper has been reduced because it was collected for recycling.

Co-operation between government and non-government organisations has also been created. For instance, the 'Bangkok Co-operates in Recycling Project' was produced by the Phranakorn District, the Thai Modern Plastic Industry Ltd, and the TEI. However, most government officers and NGO representatives interviewed agreed that education programs produced by private companies and NGOs were likely to be more attractive and encourage students to participate in the programs more than the government programs. NGO programs tended to be more innovative and flamboyant. Private companies and NGOs provide study-tours and financial support for materials and rewards. Students could understand the concept of recycling. Students were trained to

separate waste before disposal. From the results of interview, almost all of the Principals and teachers commented that student behaviour in separating waste was at a very satisfactory level. Some students also used paper fully before disposal and some students used waste paper for craft.

In addition, the results of interview show that the majority of students interviewed in each school thought that the paper recycling program in their school was good. Almost all of them noted that this was because waste paper could be used for recycling. Students were educated directly by teachers and indirectly through activities in schools. Furthermore, students could transfer their knowledge on recycling and practise separating waste behaviour at home. Students could also give advice to others. Students have an awareness of waste problems and this may be carried through to their later lives. They also want everybody in society to alleviate waste problems by participating in recycling programs. Students commented that more recycling programs should be produced. In addition co-operation among students was created through recycling activities. Students were encouraged to present their initiatives, such as through information boards.

The recycling programs result in waste reduction in schools and society. It appears from the comments of the Principals and teachers in schools that the recycling education programs alleviated the amount of waste in school because paper was used fully before disposal and waste paper was used for craft. Separating waste in school also provided collection convenience for district workers. People in society were educated about recycling through various paper recycling education programs, such as the Recycling Project undertaken by the Department of Public Cleansing, and recycling information materials produced by the Department of Environmental Quality Promotion. The TECDA provided recycling knowledge through television and in schools. The Media Centre for Development facilitates organisations by collecting waste paper from the member offices. Another benefit of paper recycling education programs is that organisations can produce new projects by choosing successful projects as a model. In turn, organisations can learn mistakes from the past experience.

Natural resources are saved because waste paper is used as a raw material for making new paper. Using paper fully before disposal reduces the demand for new paper.



Schools and organisations could reduce the budget for buying new paper. In addition, schools can earn money from selling waste paper to the Three-wheelers. Schools could spend this money on other activities.

On the other hand, there are various weaknesses in paper recycling education programs. While some of these weaknesses are minor, some issues present obstacles to their successful implementation. For example, there is no legislation to support the recycling issue, such as tax exemption for recycled products and reduced tax for recycling machinery. Education programs require public co-operation which depends upon awareness and continuous implementation of the programs. Co-operation and support from organisations is essential in the recycling education programs' continuation. For example, the 'Bangkok Co-operates in Recycling Project', a one-year project, required support from school Principals, government and private organisations. Many officers interviewed commented that they wanted government support for the paper recycling education programs, especially funding to produce recycling education materials, such as information pamphlets, television advertising and more recycling bins for schools and the community.

Students' behaviour in separating waste required follow-up. As a few teachers commented that students are in school for only six hours per day, they may forget to separate waste outside school hours. Monitoring (such as surveys) to evaluate public awareness and attitudes towards recycling is also required.

Persons skilled in recycling are required in schools because recycling is a new concept in schools. Government organisations also need skilled persons in the recycling area.

Moreover, more co-operation between government and private organisations involved in recycling activities needs to be created. As Mr Pintong from the Pollution Control Department mentioned, information exchange in recycling should be increased. Bureaucracy is likely to be one obstacle to encouraging private companies to co-ordinate the paper recycling education programs. However, private organisations, especially industries require technical assistance from government organisations. Funding for long-term implementation is required for the programs both produced by government and private organisations. Short programs may not be as effective in creating awareness as long-term programs.

## **4 PAPER RECYCLING EDUCATION PROGRAMS IN HOBART, TASMANIA**

### **4.1 INTRODUCTION**

Paper recycling education programs provide knowledge about paper recycling, including information on the paper recycling industry. An overview of the paper recycling industry in Tasmania, is first provided here. Policies and legislation concerning paper recycling in Tasmania are discussed. The roles of government and private organisations including NGOs in education in paper recycling are the major influence on public participation. Thus, organisational involvement in paper recycling education programs was explored. This was done through consulting published sources and promotional and educational materials, and by interviews with government and NGO officers. Officers from three government authorities, two non-government organisations and also one private company were interviewed to compare their opinions and strategies used in education programs. The interview questions for government and NGOs in Hobart were the same as those used with the officers in Bangkok. Opinions from these officers indicate the strengths and weaknesses of the education programs. Opinions of the Principals, teachers and students in schools undertaking paper recycling programs can be beneficial for organisations regarding development of their education programs. The results of interviews with the officers involved and the schools in Hobart are presented below. The strengths and weaknesses of paper recycling education programs are discussed.

A letter was sent to the Secretary of the Department of Education, Community and Cultural Development on 3 December 1996 to ask whether there were official policies or programs for paper recycling in primary and/or secondary schools in Tasmania, as people in government and in NGOs were not sure whether these existed or not. However, there was no reply from the Department. A fax survey was then sent to about 151 primary schools throughout Tasmania (with an assistance of Ms Nel Smit from the Department of Education, Community and Cultural Development) to find out the number of primary schools undertaking paper recycling programs. The replies from 77 schools showed that currently, 57 primary schools are implementing paper recycling

programs and 20 schools do not undertake paper recycling programs. The fax survey and a letter to the Secretary of the Department of Education, Community and Cultural Development are shown in Appendix 6.

Previously, three schools in the Hobart area were investigated in detail for the thesis with respect to their paper recycling programs. These were Bagdad Primary School, New Town Primary School and Sorell Primary School. They were selected on the advice of staff of the Department of Education, Community and Cultural Development as being schools in the region known to have programs. The Department, as apparently confirmed by the lack of response to the above-mentioned letter, apparently held no records on recycling programs in the schools. The Principals, teachers and students were interviewed to present their opinions of paper recycling programs undertaken in their schools. The teachers interviewed were divided into two groups: teachers involved in the programs and teachers not involved in the programs. Students, both in class and outside class were interviewed. Students from two classes in each school and students outside classes were selected randomly. The interview questions for the Principals, teachers and students were the same as those used in Bangkok schools, given in Appendix 3.

## **4.2 OVERVIEW OF PAPER RECYCLING IN TASMANIA**

Some 0.5 million tonnes of waste in Tasmania is disposed of in landfill each year. Recycling is considered to be an alternative option to disposal. Unlike densely-populated areas in some Asian countries, Tasmania's objection to being reliant upon landfills as a method of waste disposal is not based on the sole consideration of space. More environmentally-friendly disposal methods, such as recycling, are increasingly being sought, as evidenced by release of a solid waste reduction policy in 1994 (discussed in 4.3 below).

Recycling in Tasmania can assist in saving raw materials, and saving about A\$6 million in waste disposal each year (Tasmanian Recycling and Litter Awareness Council [TRALAC] undated). Approximately 24,500 tonnes of office paper and cardboard, and 11,000 tonnes of newsprint in Tasmania are disposed of, when compared with 3,500 tonnes of ferrous metals and 2,500 tonnes of domestic plastic (TRALAC undated).

High quality waste paper, such as from offices, can be used to make new printing and writing paper. Cardboard may be collected from factories and warehouses.

The collection is undertaken in the major population centres, such as Hobart, Launceston, and Central North West coast. Waste paper collected in Tasmania is shipped to the mainland market.

Local governments in the Hobart region have been responsible for waste management financed, with revenue collected from local residents and businesses. Recycling is seen as a vital Council policy for the development and implementation of the change in people's attitudes and practices towards waste minimisation (Bakker, Niuatui & Rees 1993).

In Hobart, unlike other Australian capital cities, the lack of space for landfill is considered to be an increasing though not currently critical problem. Waste management problems in the Hobart region are reviewed by the Hobart City Council and other municipalities in the area through the Hobart Metropolitan Council Association (HMCA) (Bakker, Niuatui & Rees 1993). Other municipal representatives of HMCA are Clarence City Council, Glenorchy City Council, the Municipality of Kingborough and the Municipality of Brighton (Hobart City Council 1995). The Tasmanian Government encourages industry to develop new markets for paper and plastics (TRALAC undated).

In Tasmania, the main sources of used writing and printing quality paper for recycling are the State and Commonwealth offices in Hobart and Launceston, but they also make use of recycled paper themselves (Bakker, Niuatui & Rees 1993).

In the metropolitan area of Hobart there is a recycling centre at McRobies Gully. The recycling centre receives white office paper, newspapers, and cardboard packaging. The Hobart City Council runs the Recycling Centre and its staff are responsible for the sorting of deposited recyclables, the administration of the site, and the co-ordination of the collection timetable with various contractors. Problems incurred at this site are the position of the Centre which can detrimentally affect traffic in the area, and the lack of basic sorting technology at the site, such as conveyor belts (Bakker, Niuatui & Rees 1993). In addition, despite the HMCA, the local government authorities have their own

independent policies on waste management. This may be an obstacle to providing consistent education material to the public and industry.

The Tasman Pulp and Paper Limited is Australia's largest supplier of import newsprint (PNEB undated). It has plans to build a de-inking facility at its plant at Kawerau, New Zealand. More than 60,000 tonnes of wastepaper will be sent to Kawerau for de-inking and recycling. The new newsprint will have a recycled content up to 25 per cent (PNEB undated).

In Tasmania, Australian Paper (AP) receives waste paper through its network which provides services to offices, schools, printers, retail outlets, commercial premises and kerbside collections. AP reduces the volume of waste and exports products made from recycled fibre.

AP also collaborated with the Association of Liquidpaperboard Carton Manufactures (ALC) to recover liquid paperboard cartons. About 140 tonnes of liquid paperboard (12.5 per cent) was recovered in Tasmania in 1994 (AP 1995). The Tasmanian Recycling Company in Launceston, an agent of AP, receives AP support for equipment, promotion and advertisement. AP spent about A\$280,000 to improve facilities at the Tasmanian Recycling Company and created waste paper depots in Hobart and Devonport. Approximately A\$50,000 will be provided by AP to promote and advertise the facility in Tasmania from 1995 to 1997 (AP 1995). The costs include material for education and information to communities, such as brochures about services arranged by AP's agents (AP 1995).

The objective of AP is to increase the recovery rates of waste paper in Australia within a beneficial economic framework. In Tasmania, this will be achieved by arranging for equipment and supporting programs which increase the awareness of AP's services. More agents will be established to provide services in other parts of Tasmania. AP expects to collect at least 8,000 tonnes of waste paper per year by the end of 1997 (AP 1995). Table 4.1 shows waste paper collected in Tasmania by the paper industry in 1991, 1994, and the expected collection in 1997.

Total consumption of newsprint in Tasmania is approximately 10,000 tonnes per year (ANM 1995). ANM recycles about 1,000 tonne of waste paper each year and aims to

increase this to 4,000-5,000 tonnes by 1997. This amount will included about 1,200 tonnes of printed waste generated from three Tasmanian newspaper companies, the publishers of *The Mercury*, *The Examiner* and *The Advocate*.

Table 4.1: Waste Paper Collections in Tasmania in 1991, 1994 and Estimated Collection in 1997 (tonnes/annum)

	1991	1994	1997
<i>Potential Supply</i>	<i>60,700</i>	<i>63,900</i>	<i>70,200</i>
Waste Paper recovery:			
-Packaging/Industrial	6,500	9,500	15,500
-Newsprint/Magazine	3,500	4,600	9,000
-Printing/Writing	1,200	2,000	-
Total	11,200	16,100	-
Recovery Rate (%)	18.5	25.2	-

Source: AP 1995

Tasmania supplies waste paper for export markets and to Australia's eastern States which require secondary fibre as the major raw material in their paper making processes. Local, national, and export markets for Tasmania rely upon the quality and cost of waste (AP 1995).

In Tasmania, the State Government has a policy to buy recycled paper, to encourage paper conservation, and to collect of waste paper in government offices. The demand for recycled paper in Tasmania increases with technological developments in the products as well as markets. However, paper recycling facilities in Hobart still require improvement. For example, there could be more storage facilities in some waste disposal sites, such as at Glenorchy. Separation schemes in suburban areas could be improved. The production and marketing of products made from waste paper could also be encouraged.

#### **4.3 OVERVIEW OF THE LEGISLATIVE AND POLICY FRAMEWORK RELEVANT TO PAPER RECYCLING IN TASMANIA**

The Commonwealth Environment Protection Agency (CEPA) in consultation with the Australian and New Zealand Environment and Conservation Council (ANZECC) released the *National Waste Minimisation and Recycling Strategy* in June 1992. The

aim of this national strategy is to reduce waste by 50 per cent by the year 2000, measured as weight per capita (Australia, Parliament of 1994). Recycling is in the waste management hierarchy of this strategy and it has been considered with regard to economic and environmental benefits. However, the lack of demand for recyclable materials, the lack of end use markets, industry attitudes towards secondary resources, consumer attitudes towards the purchase of recyclable products, and contamination of recycled materials are obstacles to achieve the aims of the National Strategy (Australia, Parliament of 1994).

Although waste management is likely to be a municipal issue, it is also of Federal and State concern. The general aim of the CEPA is to introduce a national coordinated approach for environment protection. It aims to determine clear national standards, develop well defined processes for decision making, and agree on effective consultative arrangements (Hobart City Council 1995:11). This organisation will examine regulatory mechanisms to increase the nation's recycling rate together with promoting relevant research. The Tasmanian State Government administers waste management through the Department of Environment and Land Management (DELM). DELM has two major roles: to manage the operation of landfill sites, and to control and regulate the generation, storage, transport, reclamation, and disposal of industrial waste (Hobart City Council 1995).

*Towards Modernisation of Solid Waste Management: Principles and Strategies* was released in 1991 and was then developed in to the *Tasmanian Solid Waste Management Policy Position Paper* in June 1992. The policy of this paper comprises a waste management approach which focuses upon waste minimisation, recycling, re-use, and environmentally acceptable disposal. The goals of the policy are to promote waste minimisation and recovery of materials and to protect the environment from the negative effects arising from the amount of waste from domestic, commercial and industrial sources sent to landfills. A key objective of this policy is to reduce by 50 per cent of the amount of waste going to the State's landfills by the year 2000 (DELM 1993).

The *Tasmanian Solid Waste Management Policy Position Paper* (1992) was reviewed and released in final form as the *Tasmanian Solid Waste Management Policy 1994*.

This policy has two goals: to promote environmentally and economically feasible waste minimisation and resources recovery; and to protect the environment from effects arising from landfills, and municipal and hazardous waste (DELM 1994: 1).

Tasmanian Industry Waste Minimisation and Recycling Plans will be developed to help establish markets for recyclable materials, kerbside recycling programs (such as location, and rates of participation), to specify depot location, provide assistance with capital equipment, assistance with freight costs, and to appoint industry liaison officers and authorised collectors. The 50 per cent reduction in waste going to landfill by 2000 target is to be achieved by a combination of reduction in packaging, recycling of domestic and commercial waste, composting, recycling of building and garden waste and possibly modern waste conversion plants (DELM 1994: 14).

An increase in the promotion of public education recycling programs is required in order to achieve both national and State goals. The Tasmanian State Government is committed to provide a framework for improving waste minimisation, and the re-use and recycling of materials. Industry aims to create waste minimisation programs and infrastructure for recyclable material process. State Government, municipalities, and industry have accepted responsibilities for providing public education and information.

An increase in public awareness of waste problems and the need for recycling will be needed. In the *Tasmanian Solid Waste Policy 1994*, the costs and responsibility for implementing and developing effective communication, education and information dissemination strategies are expected to be borne by contributions from Federal, State and local governments and industry.

The State Government is to play a major role in coordinating and providing a framework for the recovery of recyclable materials by establishing uniformity, performance targets, monitoring mechanisms and incentive programs. The State role includes encouraging industry and local government in recovering waste materials and achieving material waste reduction targets. Local communication tools, such as newsletters and advertising sponsored by local industries, are said to be appropriate strategies. Regional municipal groups are encouraged to show responsibility for implementation of incentive programs by providing information through media.



Regular surveys of domestic waste and surveys undertaken by municipal councils are stated to be one method to evaluate the success of implementation.

A *Solid Waste Minimisation Strategy* has been released by Hobart City Council (Hobart City Council 1995). This plan forms part of the *Council's Environmental Protection Strategy* and complies with the *Council's Strategic Plan*. One major aspect of this plan is to investigate levels of community awareness of waste minimisation. Two out of the five aims of the *Solid Waste Minimisation Strategy* are aimed at promoting waste reduction practices and collecting recyclable materials, and the promotion of a 'waste minimisation ethic' in the community, which can be undertaken by the implementation of a comprehensive awareness and education program. This plan includes aims and targets over three years and recommends actions to achieve its targets.

Targets to be implemented by 1995/96 are to undertake community consultation on the *Solid Waste Minimisation Strategy* in association with waste reduction awareness campaigns, and to increase and promote domestic kerbside collection. To increase office paper recycling to 50 tonnes per month is one of the 1995/96 targets. This number is expected to increase to 55 tonnes and 60 tonnes in 1996/97 and 1997/98, respectively (Hobart City Council 1995). A specific target is to prepare a regional education package for schools in southern Tasmania in association with relevant councils and State Government Departments. In addition, Hobart City Council provides consultation with schools in the municipality to generate recycling programs.

Public education campaigns on waste reduction continue to be one of the 1995/96 and 1997/98 targets. The actions which will assist the Council to achieve its 'reduce and recycle' targets include the development of materials which support a comprehensive education/awareness campaign on recycling and waste reduction, using mobile displays, multi-lingual literature, face-to-face presentations, and education games. The comprehensive education/awareness campaign on recycling includes publicising both local council and private recycling facilities through co-operation with DELM and a program called 'Recycle Tasmania', established by the Tasmanian Division of the Litter and Recycling Research Association (LRRRA: discussed further in Section 4.4.3). The campaign also emphasises reduction and recycling initiatives as well as improving appropriate consultation strategies.

A recent plan for education and promotion of recycling in Tasmania is the *Strategic Plan for Education and Promotion of Waste Minimisation and Recycling* released in February 1995. This plan has been developed by the Recycling Co-ordination Committee which consists of representatives from the Division of Environmental Management, under DELM, the Local Government Association of Tasmania (LGAT), the Litter and Recycling Research Association programs, Recycle Tasmania, and Joint Venture Recycling (DELM 1995).

The waste minimisation and recycling promotional strategies discussed in the above strategy plan are intended to be pro-active, with a well planned approach and clearly identified outcomes. This education and promotion plan has two goals: to achieve effective state-wide co-ordination of education programs and promotion activities; and to increase the level of awareness, understanding and involvement in the identified target groups. The target groups are State Government, local government, industry, recycling contractors, the general community, and schools.

State Government agencies and industry will be encouraged and provided with assistance to establish waste minimisation and recycling programs. Councils will be encouraged and supported in the planning and provision of recycling services, such as support for kerbside collection and promotion campaigns. The *Strategic Plan for Education and Promotion of Waste Minimisation and Recycling* aims to assist recycling contractors by providing support for training and professional development and providing advice, information and resources for recycling promotion, while encouraging recycling contractors to become involved in school and community education. The objective for schools is to increase awareness and understanding of 'reduce, re-use and recycle' amongst students and teachers through practical activities. This is to be expressed in providing advice and consultation for establishing recycling programs, and providing education material for teachers. The wider community is also to be given information about recycling programs, such as the benefits of recycling. The practical implementations of the strategy plan were still being developed in 1996, however (Jocelyn Phillips, DELM, personal communication).

#### 4.4 THE ROLE OF EDUCATION IN PAPER RECYCLING IN TASMANIA

Apart from local governments, which play an important role in waste management, there are many organisations involved in education programs for paper recycling in Tasmania. Various programs and materials are planned to achieve the goals and objectives of the *Strategic Plan for Education and Promotion of Waste Minimisation and Recycling*. Some examples are: a Local Government Recycling Promotion Kit, Regional Recycling Forums for Schools, 3R Legends Campaign, School Visitation Program, Regional Guides for Household Recycling, Public Promotion, a Community Liaison Service, and Training for Local Government Officers.

The Local Government Recycling Kit is produced by the LRRRA (see 4.4.3 below) as a guide to assist councils to promote recycling activities. This item consists of background information about recycling in Tasmania, material to assist with the development of recycling promotion strategies, and information on State Government and industry.

Support for schools in providing resources and information about paper recycling will be established through the Regional Recycling Forum for Schools conducted by local councils and DELM. Examples of assistance for teachers include slide-talks on school programs, school tours, visiting speakers, and demonstrations of practical activities.

The '3R Legends' campaign aims to promote an understanding and awareness of 'reduce, re-use and recycle' in schools and special activities in state. Two information booklets 'Waste Minimisation in Schools' (TRALAC and DELM 1992) and 'Recycling in Schools' (DELM 1992) are examples of available promotional materials.

The School Visitation Program is a service provided by the education officer and the recycling officer of DELM, staff of the LRRRA, Recycle Tasmania and Joint Venture Recycling. These bodies have the responsibility for providing relevant information.

Regional Guides for Household Recycling are a set of brochures which provide information about recycling for different regions in Tasmania. They provide information regarding the materials which can be recycled, the location of recycling depots, and how to prepare materials for recycling.

Public promotions have been conducted with a variety of materials, for example displays, posters and character costumes at shopping centres and schools. The Community Liaison Service is a program which provides advice, consultation and encouragement for the broader community. 'Training for Local Government Officers' is a training program for council staff in the development and implementation of recycling programs.

The details of education programs in paper recycling provided by some organisations are discussed below.

#### **4.4.1 The Department of Environment and Land Management**

DELM produces the booklet 'A Guide to Recycling in Schools' (DELM 1992). The guide provides an overall strategy for programs for recyclable materials. A direct benefit gained by schools could be financial. In the State education system, an overall budget is allocated to schools for the collection and disposal of waste which is the responsibility of each individual school. When the volume of waste decreases, the collection cost will be saved for other purposes. In addition, students have the opportunity to practise and develop their initiative, experience, cooperation and financial management skills. School recycling schemes could benefit local communities by operating a community recycling service. School activities may also increase community awareness and help improve attitudes and behaviour towards recycling.

#### **4.4.2 Environmental Organisations**

Some non-government environmental organisations produce educational resources and promotional material on recycling, for example, the Tasmanian Environment Centre. The Tasmanian Environment Centre (TEC) was established in 1972. The aims of this organisation are to promote and encourage environmental education within the community, encourage and assist scientific research on the environment, and provide a community resource centre.

This organisation provides an education service about recycling schemes through its resource library, by providing seminars for teachers, community seminars, workshops, conferences, children's vacation activities, publications and environmental research (TEC undated). Materials for providing education in paper recycling available in the

environment resource library are books, journals, videos, slides, posters, and pamphlets. The TEC arranges various activities for schools, for example teacher education courses and holidays for children aged between 14-16 years where they practice using recyclable materials.

#### **4.4.3 Recycle Tasmania**

The LRRA was a national organisation established in 1978. It comprised major companies involved in the beverage and associated packaging industries, and changed its name in December 1996 to the Beverage Industry Environment Council. It aims to improve recycling and solid waste management throughout Australia. In Tasmania, it has its own recycling programs intended to reduce waste. It provides recycling education material to communities as well as supporting government campaigns (LRRA undated). The Council has a major role in encouraging recycling activities undertaken in Tasmania. It produces 'A Local Government Recycling Promotion Kit', and provides promotional activities through television, radio and newspapers. It also participates in local council efforts, such as conducting surveys to explore participation rates in recycling. Surveying is one method to measure the effectiveness of education programs. The LRRA set up a new initiative to promote the establishment of recycling in Tasmania entitled 'Recycle Tasmania'. Its role is to bring the recycling objectives of industry, local government and the broader community together. Recycle Tasmania produces 'Tasmanian Recycle News', pamphlets, leaflets, and refrigerator calendars, all of which outline recyclable products and explain recycling services.

#### **4.4.4 Recycling Industries**

The companies involved in recycling provide support for school recycling programs by providing collection equipment, teaching resources, promotional material and incentives for participation. For example, the Tasmanian Recycling Company, AP's agent, supplies brochures, pamphlets, calendars and instructions about recycling.

### **4.5 THE TASMANIAN INTERVIEWS WITH OFFICIALS AND SCHOOLS**

Government and non-government officers involved in paper recycling education programs in Hobart were interviewed. Three primary schools in Hobart were selected to examine the strategies and the attitudes towards paper recycling: Bagdad Primary

School, New Town Primary School and Sorell Primary School. The results of the interviews are shown below.

#### **4.5.1 Government and Non-government Officers**

Six officers from different organisation were interviewed. Table 4.2 shows the lists of officers, their position and organisations.

Table 4.2: The Lists of Officers Interviewed in Tasmania, their Positions and Organisations

Name	Position	Organisation	Date of Interview
1. Mr Andrew Thiele	State Co-ordinator	LRRA	2 August 1996
2. Ms Jocelyn Phillips	Education Publication Officer	DELM	6 August 1996
3. Ms Susannah van Essen	Co-ordinator	TEC	8 August 1996
4. Ms Nel Smit	Senior Landcare Curriculum Officer	Department of Education, Community and Cultural Development	13 August 1996
5. Mr David Peet	Managing Director	Phoenix Recyclers	14 August 1996
6. Mr Chee Liew	Director of Environmental Services Division	Hobart City Council	14 August 1996

Mr Andrew Thiele, the State Co-ordinator of LRRA, noted that the target group of education programs is the general community. LRRA produces brochures, pamphlets, newsletters and videos about kerbside collection. He stated that LRRA's emphasis is on the introduction of kerbside collection, not on paper recycling. However, kerbside collection is a significant process for recycling because it includes general information on recycling, such as what materials can be recycled. LRRA also advises the councils about mechanisms for undertaking recycling programs, for instance appropriate practical methods used in each area. In addition, LRRA produces recycling kits which councils can use in their promotion programs. Mr Thiele pointed out that measurement of the success of the program is by means of a the Customer Satisfaction Survey and analysis

of materials collected. LRRA, in conjunction with local councils, conducted the Customer Satisfaction Survey to ensure that communities are given enough information about recycling and to explore public opinion on the services.

Ms Jocelyn Phillips stated that the target groups of education in recycling are the public and schools. The materials used are brochures, pamphlets, stickers, slides, displays, videos, talks and puppets. Currently, there is no evaluation of the effectiveness of recycling education programs. About 70 per cent of households co-operate in part of the recycling process, such as sorting recyclable materials. Most councils have adopted recycling over the last 2 years. Communities undertaking recycling can earn money from selling recyclable materials. However, lack of funding is the major obstacle to the government education programs.

Ms Susannah van Essen noted that the target groups of paper recycling education are children and the public in general. Examples of TEC activities in paper recycling education are adult education courses, teacher education courses and children holiday activities. Adult education course will be undertaken in 1997 and the course will provide recycling information in practice. Ms van Essen commented that people are more aware of recycling but there is not enough education on paper re-use, for example, using both sides of paper for photocopying. Insufficient funding for undertaking education programs is another weakness. In 1995, TEC was provided with only A\$50,000 from the Federal Government to support three workers and the entire organisation's activities.

Ms Nel Smit stated that the Department of Education, Community and Cultural Development is not involved in education any specific programs for paper recycling but they support school Landcare programs in which recycling can be a part. The Department provides consultation with other organisations about strategies for paper recycling and is involved in recycling activities, such as on World Environment Day. Each school has a responsibility to promote environmental practice. A paper recycling education program could be part of a Landcare program or part of the 'Studies of Society and the Environment' unit. Some schools produce pamphlets on recycling which include paper recycling, such as at Sorell District High School. Ms Smit noted that a lot of schools have paper recycling programs. More schools in the city undertake

paper recycling programs than in the country. One reason for this is that the facilities are provided by councils. For example, Hobart City Council provides a paper collection service. Ms Smit said that children have a sense of responsibility and they can easily change their behaviour. She also commented that reducing waste by re-using materials is another important issue. She noticed that recycled paper is not used in her office. She has been informed that recycled paper is more expensive than non-recycled paper, therefore, the Department cannot afford to buy recycled paper. Ms Smit commented that apart from children and communities, government officers should be informed about the benefits of recycling in order to increase their awareness.

Mr Peet is the Managing Director of Phoenix Recyclers which was formed in 1988 and is the Tasmanian agent for Visy Recycling. Mr Peet noted that in 1983, around 80 tonnes per month of cardboard and paper were recycled. Currently, Phoenix Recyclers generates approximately 900-1,000 tonnes per month of cardboard and paper. Other operators collect about 7,200-8,400 tonnes per year bringing the Tasmanian total to about 18,000-20,000 tonnes per year. Mr Peet stated that the target groups of education programs range from schools to communities. Phoenix Recyclers produces videos, brochures, information sheets and pamphlets about recycling. In the education display room advice is provided and presentations made to interested groups. For instance, the company consults with councils about kerbside recycling. School groups come to see the whole operation of sorting recyclable materials. Mr Peet commented that government decision-making can affect the paper recycling industry. For example, the facilities and resources (such as funding and personnel) may be provided if politicians pay attention to paper recycling. He noted that an analysis of the volume of paper collected could provide an indication of public participation in recycling and, therefore, the effectiveness of education programs.

Mr Chee Liew noted that presently about 60 tonnes of paper per month is recycled in Hobart. Hobart City Council does not have an education program but it co-operates with LRRA in promoting recycling through public advertisements, such as by television and newspapers. Hobart City Council also co-ordinates with DELM in educating people in schools by providing talks about Hobart City Council's recycling operations. In addition, this organisation produces brochures and consults with business people, such as bank officers, who use more paper than in households. Although Hobart City



Council does not have an educational program, it provides information about recycling to the public. Mr Liew added that it is difficult to evaluate the effectiveness of the program. However, he noted that it could be undertaken through the volume of waste paper collected.

#### **4.5.2 Schools Interviews**

##### **4.5.2.1 The Results of Interviews with the Principals and Teachers**

###### **4.5.2.1.1 Bagdad Primary School**

This school has 150 students and 12 teachers. Classroom teaching programs focus on the traditional areas of learning and social change in society. Mr. Rod Headlam, the principal, believes it is important for children to develop an awareness about the environment given that Western society is wasteful. 'It is critical to demonstrate to children that they have a personal role in caring for the environment and resources', he said, adding that, 'it is part of their natural education'. In his opinion, paper is an easy starting point for education about recycling. The paper recycling education program used in this school was initiated and developed by the Principal and some members of staff. Hobart City Council cardboard boxes and standard rubbish bins are used in the classrooms and children are encouraged to use these boxes and bins (see Photo 5, Appendix 8, p. 144). There are eight recycling boxes which are located in classrooms (seven classes) and in the office (near the photocopier). Monitors empty the used paper from the classroom recycling boxes once a week, transferring them to the larger bins (240 litres) provided by the Hobart City Council who collect the paper for recycling from the school once a month. It is part of the paper recycling program to encourage people to use paper fully before disposal for recycling. All classes implement the program. The program is incorporated within the general education program and has been promoted by the Principal over the last three years.

The intended outcomes of the paper recycling program are to increase children's personal responsibility for the environment, and to encourage them to use paper fully before disposal. The Principal thought that the paper recycling programs outside schools are not effective. However, there are signs that it has improved with curbside recycling.

The Principal noted that the strengths of the paper recycling education program undertaken in this school are that students learn the importance of recycling and they are, in turn, good role models for other children and their parents. Hobart City Council, which provides the service, is crucial to the success of the program because it would not work otherwise. The Principal stated that the main weakness of the program is that students and teachers are not as active in the recycling program as they should be due to factors such as a lack of time.

Two teachers were interviewed: one teacher has her own class of Grade 2/3, and another teacher has Grade 5/6 students (see Photo 6, Appendix 8, p. 144). Ms Gabrielle Hill has taught in this school for three years. She said that her class (with 24 students) started paper recycling because the school had a paper recycling program. Children have been taught to put white paper in boxes located in the classrooms. In addition, students in Grade 5/6 showed younger children how to sort paper into boxes. Monitors check and empty paper boxes from all classrooms. The paper recycling education program has become part of the classroom behaviour. So while it is part of the broader recycling program of the school, it is not taught as a separate unit or topic. This teacher noted that the school/class does not collect data about waste paper and paper for recycling but paper usage is partly monitored by the photocopy counter. She thought that it may be the Hobart City Council who collects paper for recycling from the school once a fortnight. Ms Hill is involved in the program by monitoring the student participation and she attempts to recycle white paper as much as possible including using both sides of paper, reducing copying, and re-using paper for other activities.

Ms Hill hopes that the program will result in better use of paper and a greater use of paper before recycling. She pointed out that children use a large amount of paper, and therefore it is important to reduce waste by re-using. She believes that it is good to focus on reducing waste and that more government support in education would help to reduce paper use.

In her opinion, the paper recycling education programs outside school could be more actively promoted by the government. However, there is now more awareness of environmental issues in general, such as woodchipping.

This teacher commented that the strengths of the paper recycling program undertaken in the school are that children are aware of sorting and have regularly recycled. Children have learnt to make paper from recycled materials which helps them to understand the process of recycling. Magazines are used for spelling. Newspapers, tissue, cardboard, and scraps are used for various activities in art. Ms Hill commented that one of the weaknesses of the program is that photocopies of text book exercises tend to be used by teachers in this school, increasing their paper use. Worksheets tend to get pasted into exercise books, doubling paper consumption. The school council wants to reduce photocopying but, again, the economic situation is such that books are often unaffordable.

#### 4.5.2.1.2 New Town Primary School

This school has 210 students and 14 teachers. Students from Grade 6 collect paper from the recycling bins in each classroom. Two teachers, Mr Shannon Davey and Ms Peta Miley, were interviewed. Mr Davey has taught in this school for three years. He teaches 27 students in Grade 6. Education on the environment and waste reduction awareness is in his teaching program. The recycling education program is a part of the Studies of Society and the Environment unit. According to Mr Davey, about 95% of the recyclable paper used (that which falls within the Hobart City Council Collection guidelines) is recycled. The rest tends to be disposed of in normal rubbish bins. Hobart City Council collects paper on a fortnightly basis. The paper goes to Albury/Wodonga, Victoria. There are 11 recycling bins in the school and a paper recycling program has been produced for the class. The students are taught about recycling in a two week unit about environmental sustainability. Activities in the program have included making paper from scraps mixed with colour.

Mr Davey pointed out that paper recycling education programs outside the school have become more common. In addition, five years ago, the school could not get anyone to take the paper. The program is now viable because Hobart City Council collects the paper. The strength of the paper recycling education program is that children regularly recycle paper. Problems encountered in the program include contaminants getting in the bins, such as plastic and non-recyclable paper. Further, collection by Hobart City Council is too infrequent. Another weakness of the program is that the definitions of

allowable paper are not clear which cause confusion over what can be included in the bins for recycling. In addition, the paper types given as examples do not cover all the sorts of paper products used in schools.

Ms Miley has taught in this school for two years. She has a Grade 2/3 class with 24 students. She noted that paper recycling was already operating when she arrived at this school. The recycling education program is primarily part of school policy and classroom behaviour. The outcome of the program is that children become aware of recycling and the need to conserve resources. Ms Miley commented that the paper recycling education programs outside school are moderately effective. She noted that the strength of the program undertaken in this school is the increase in the children's awareness of recycling through the use of bins in the classrooms. She commented that the program is generally successful.

#### 4.5.2.1.3 Sorell Primary School

This school has 400 students and 15 teachers. The school started a recycling depot in March 1992. School recycling program pamphlets were produced. In addition to paper, the depot is used for bottles, cans, plastic meat trays, milk cartons, and compostables (see Photo 7, Appendix 8, p. 145). Two teachers were interviewed. Ms Moya Sharpe has taught at the school for 18 years. She noted that the paper recycling was started because there was a lot of waste at the school. The recycling education program is part of the school's Landcare program and has since become part of normal classroom behaviour. There are re-use and recycling bins in each classroom (see Photo 8, Appendix 8, p. 145). One 240 litre ( $0.24 \text{ m}^3$ ) bin was filled each week. There are 37 weeks in the school year, bringing the amount recycled to 8,880 litres ( $8.88 \text{ m}^3$ ) per year. Since the program has been running for five years (1992-1996), the estimated total of paper recycled in the school is 44,400 litres ( $44.4 \text{ m}^3$ ).

Ms Sharpe stated that Hobart City Council collects paper for recycling from this school once a week. There are a total 18 recycling bins. Every class, from Kindergarten to Grade 5, implements the program. The outcomes hoped from the program are that children do not waste paper and re-use it as much as possible and, thereby, natural resources will not be wasted. She said that initially the program was not efficient. In the early stages, people tended not to collect paper but, under the current program, more

paper is collected and transferred to the recycling bins. In her judgment, paper recycling education programs outside school undertaken by the State government are not given enough funding in order to be set up properly. For example, communication to the public is poor (such as what types of paper, and other materials can be recycled), and there is no evidence of end products to encourage participation. The Government does not support small business to operate recycling collection.

Ms Sharpe commented that one of the strengths of the program undertaken in this school is that children have a sense of looking after their world, and of not being wasteful which, she hopes, will be carried into their later lives. Children are part of the program. Grade 3/4 students are responsible for running the program. For example, they contact the Council and other operators to organise collection, as well as emptying classroom bins and policing their use. The program also increases teachers' awareness of recycling. She pointed out that there are no significant weaknesses of the paper recycling program in this school. However, there is a concern that the program and the behaviour of children does not extend to high school.

Ms Susannah Davey was also interviewed. She has taught in this school for six years. She has 23 students in a Grade 1. She stated that the paper recycling program started because the whole school developed a policy and teachers initiated the program in their class. She noted that Ms Sharpe produced the paper recycling program used in this school. The program is incorporated within part of the curriculum. Students re-use old paper and make bookmarks, for example. They also collect paper from classes to send to the Recycling Depot every week. Every class implements the program. The outcomes hoped from the program are that children can make materials without waste, and the environment is protected. She commented that everyone, not only students, should be educated about recycling. In her opinion, recycling education programs outside the school, such as that undertaken by Clarence City Council are good. For instance, Council collects recyclable materials once a fortnight, and there are recycling bins for magazines, glass and plastic. In addition, Council promotes recycling by sending pamphlets to householders, and advertises on televisions and in newspapers.

Ms Davey commented that the strengths of the paper recycling education program undertaken in this school are that the school has a special co-ordinator for recycling and

special facilities, such as big bins for everyone to separate materials. However, she pointed out that glass bottles, magazines, and cardboard are not collected.

**4.5.2.2 The Results of Student Interviews**

A total of 167 students were interviewed in the three primary schools. Some important results of the interviews in these schools are summarised below. About 97% (average) knew that there were paper recycling programs in their schools. Table 4.3 shows the number of students interviewed and the percentages of students who knew that there were paper recycling programs in their schools.

Table 4.3: Total Students Interviewed and the Percentages of Students who Knew there were Paper Recycling Programs in their Schools

Name of school	Total students interviewed	Students who knew that there were programs (%)
1. Bagdad Primary School	57	93
2. New Town Primary School	48	98
3. Sorell Primary School	62	100
Total	167	(Average) 97

Students knew about paper recycling programs in their schools from three main sources: they saw recycling bins in their classes, they were told by the teachers; and they saw people collecting the paper from the classroom. Table 4.4 summarises the percentages of students who mentioned those three sources. In addition, 44% of students from the Sorell Primary School (27 students from Grade 3/4) knew about recycling because their class operated the program. About 4% of students from Bagdad Primary School said that they knew about paper recycling from the announcements at the general school assembly. Almost all students interviewed participated in the paper recycling program. Table 4.5 shows the percentages of student participation in the programs and three main methods of their participation in the programs.

Almost all of the students interviewed commented that the paper recycling program in their schools was good. No one said the programs were not good. Table 4.6 shows the

Table 4.4: The Percentages of Students and the Three Main Sources where the Students Received Information on Recycling

Name of school	From seeing recycling bins (%)	From teachers (%)	From seeing people collecting paper (%)
1. Bagdad Primary School	57	21	9
2. New Town Primary School	43	43	9
3. Sorell Primary School	35	15	6
Average (%)	45	26	8

Table 4.5: The Percentages of Students' Participation and Three Main Methods of their Participation in Paper Recycling Programs

Name of school	Student participation (%)	By putting paper in recycling bins (%)	By using both sides of paper (%)	By collecting paper from classes (%)
1. Bagdad Primary School	91	87	13	-
2. New Town Primary School	100	77	-	23
3. Sorell Primary School	100	32	-	18
Average (%)	97	65	4	14

percentages of students who commented that the program were good and the percentages of students who said that they did not know whether the programs were good or not.

Table 4.6: The Percentages of Students Commenting about Paper Recycling Programs in their Schools

Name of school	Paper recycling programs are good (%)	Don't know (%)
1. Bagdad Primary School	86	14
2. New Town Primary School	69	31*
3. Sorell Primary School	84	-
Average (%)	80	15

\* including 13 students from Grade 2/3.

The students gave three reasons why they thought the program was good: paper could be used for recycling; waste could be reduced; and the environment could be saved. Table 4.7 shows the percentages of students giving these three reasons.

Table 4.7: The Percentages of Students and Three Major Reasons why the Paper Recycling Programs are successful

Name of school	Paper is used for recycling (%)	Waste is reduced (%)	The environment is saved (%)
1. Bagdad Primary School	33	22	14
2. New Town Primary School	48	-	24
3. Sorell Primary School	33	-	35
Average (%)	38	7	24

More details of the students interviews in these three schools are shown in Appendix 7.



#### 4.6 THE STRENGTHS AND WEAKNESSES OF EDUCATION IN PAPER RECYCLING PROGRAMS IN HOBART

Recycling is an important strategy in waste minimisation as outlined in the National Strategy and in the plans and policies of government and private organisations. The State Government administers waste management through the Department of Environment and Land Management. Recycling is included in the Tasmanian Solid Waste Management Policy Position Paper. The Solid Waste Minimisation Strategy released by Hobart City Council aims to promote recycled products and waste reduction practice. Education is implemented to increase people's awareness. Public education campaigns on waste reduction are set in the 1995/96 and 1997/98 plans. Recycling promotional strategies are set out in the *Strategic Plan for Education and Promotion of Waste Minimisation and Recycling* (February 1995), which was developed by both government and private organisations. The consequence of co-operation and support from organisations leads to materials produced for recycling education in schools and for the public. For instance, mobile displays, seminars, videos, publications (such as books, journals, posters and pamphlets), including holiday programs for children and teacher education courses are produced. In addition, regular surveys undertaken by the councils and by LRRA are undertaken on the attitude of the public towards recycling.

Furthermore, in the three schools studied, recycling education is incorporated in the Studies of Society and the Environment subject, and is part of classroom behaviour. Awareness and understanding on recycling is increased through practical activities. As seen from the results of the interviews, the majority of students in the three schools know that there is a paper recycling program from seeing paper recycling bins in the classrooms and students have become habitual in their use of those bins. Some students collect and empty paper recycling boxes from classrooms, which facilitates the co-operation of other students and gives them increased responsibility. Almost all of the students interviewed realise the benefits of recycling. No one said that the program is not good. Students can transfer sorting waste behaviour practiced from schools to their houses, and this will hopefully continue later in life. More awareness of protecting the environment (such as reducing deforestation), and using paper economically (such as re-use and using both sides of paper) is developed amongst students and teachers.

The reduction of waste in society is another beneficial result of the recycling program. Some waste paper is used for recycling, and some re-used for art. There are economic benefits for schools as a result of re-using and recycling paper. In addition, the use of natural resources is decreased.

However, the paper recycling programs in schools need government support. For example, the teacher of Bagdad Primary School requires financial support for textbooks to reduce paper from photocopying worksheets. Support from the Principal is another significant factor in the operation of education programs. For example, the program undertaken in Bagdad Primary School is supported by the Principal. Support for recycling by the Principal is also important, such as the recycling depot created at Sorell Primary School. Lack of support leads to the lack of materials provided. In addition, paper recycling programs could be developed in high schools in order to continue the education and practical activities on recycling.

Although many students noted that the paper recycling program in schools is good, it is noticed that the majority of students (13 students of total 20 students) in one class (Grade 2/3) of New Town Primary School said that they did not know if the program is good or not. When compared with students in the same grade of Bagdad Primary School, 19 students of a total 21 students said that the program is good. These results show that the education and practical activities in paper recycling in some schools need to be improved.

From 77 responses from the fax survey, it appears that 57 primary schools have a paper recycling program in their school and 20 schools do not. The replies from 36 schools said that the program was produced by teachers, and 13 schools said that the Principal produced the recycling program. In some schools, both teachers and the Principals produced the programs. A few schools said that school committee produced the program and a few schools noted that the program was produced by student councils. Forty schools noted that the recycling program is part of classroom behaviour only, while 17 schools noted that the program is incorporated within the curriculum. A recycling program is part of the school curriculum and classroom behaviour in six schools.

#### 4.7 CONCLUSION

Tasmania has low-density population and landfills for waste disposal are not critical, but recycling is considered as an important strategy for waste reduction. The State Government administers waste management through DELM. Strategies for waste management have been developed. The *Strategic Plan for Education and Promotion of Waste Minimisation and Recycling* is a recent plan for recycling education in Tasmania. Apart from this plan, public education campaigns are part of Hobart City Council plans. In addition, other private and non-government organisations are produced education strategies, such as LRRA's Local Government Recycling Promotion Kit.

A significant issue mentioned from the interviews with government, private and non-government officers is funding for recycling education programs. Increased political interest in recycling can also affect both the education programs and the recycling operations.

The results of interviews with the Principals and teachers in the three schools show that paper recycling programs undertaken in those schools are efficient. Many classes have paper recycling bins and almost all students interviewed participate in the programs. The students also commented that the programs are good. The main reason the students gave was that waste paper can be used for recycling. However, the schools were apparently not supported in their programs by the State Department of Education, Community and Cultural Development.

## 5 DISCUSSION AND CONCLUSION

This chapter discusses the paper recycling education programs undertaken in Bangkok and Hobart in three sections: recycling policy; the recycling programs outside schools implemented by government, private and non-government organisations; and paper recycling programs implemented in schools (in Phranakorn District and in Hobart).

### 5.1 LEGISLATION

In Australia, a statement on recycling was produced in the *National Waste Minimisation and Recycling Strategy 1992*. The aim was to reduce by 50 per cent the amount of waste going to landfill by the year 2000. At a Tasmanian State level, recycling was considered in the *Tasmanian Solid Waste Management Policy*, developed in 1991. In Hobart city, the Council *Solid Waste Minimisation Strategy* aims at promoting waste reduction practices and removing recyclable materials to reduce the amount of waste in the community. The strategy also flags an intention to prepare a regional education package for schools in the Southern Tasmanian area and to improve consultation with schools to generate recycling programs. Public education campaigns on waste reduction, such as mobile displays and face-to-face presentation, have also been produced.

The Tasmanian Strategic Plan for Education and Recycling, released in 1995, was developed by government and private organisations. Schools were a target group to increase the level of awareness and the involvement in education programs. Recycling contractors would be encouraged to involve themselves in school and community education. Teachers and students would be made increasingly aware of the catchphrase 'reduce, re-use and recycle' through various activities.

In Thailand, an environmental improvement program was outlined in the National Plan (the Seventh Plan 1992-1996). Recycling was not addressed in this plan. The Plan stated that the amount of waste, especially in Bangkok and other large cities, would be reduced. It was proposed that waste would be reduced to less than 0.8 kg/person/day. Possible strategies used to solve environmental problems included the encouragement of public involvement in waste management, and the encouragement of co-operation

amongst government and private organisations, including the public. Although there was no legislation on recycling, the Seventh National Plan had a strategy to develop legislation regarding waste management.

The short-term plan of the Ministry of Science, Technology and Environment was to revise the regulations involved in waste management or to introduce new specific laws, such as laws governing waste separation, to increase the efficiency of activities. The policy of the short-term plan concerning public relations was to increase child and youth awareness of the importance of natural resource conservation. Environmental education would be addressed at every level (primary, secondary and high school) through appropriate materials and activities. Education and public relations for the environment were also included in long-term plans.

The recycling objective of the Pollution Control Department was to increase the rate of recycling materials in the community to 10 per cent of total waste by the year 2001. This rate was also expected to increase to 15 per cent in 2006. The waste management policy of the Department of Public Cleansing proposed that the yearly rate of waste by volume in Bangkok would be reduced from 8 per cent to 6 per cent. A five-year plan (1997-2001) released by the Department also included a number of target groups for the 'Recycling Project'.

There is no specific legislation on recycling, either in Thailand or in Australia, but recycling commitments have been made in policies regarding waste reduction. Environmental education has become an important issue and has been addressed in the policies and plans of government organisations in both countries. Plans and policies regarding recycling in Bangkok have been more specific than those in Tasmania.

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## **5.2 THE RECYCLING PROGRAMS OUTSIDE SCHOOLS**

Although co-operation amongst organisations (government, private and non-government) was created through recycling operations in both cities, it seems that in Bangkok there was more co-operation to produce paper recycling schemes than in Hobart. In the Hobart region, the LRRA assisted councils to conduct surveys to explore public attitudes towards waste management only after particular councils asked for help.

But in Bangkok, an awareness by organisations of recycling led them to produce pilot projects both within and outside the schools co-operatively.

The public was the main target group in both places but it seems that NGOs in Thailand focused on children more than NGOs in Tasmania. The reasons could be the relative newness of the concept of recycling in Bangkok and because the pilot education programs undertaken by NGOs in Bangkok were of a shorter duration than those of government organisations. NGOs could afford short-term projects, and could evaluate the success of the programs in a short time. Various organisations focused on providing education program in schools rather than on the public because children could easily change their disposal behaviour and they would carry good habits into their later lives. In addition, recycling was not emphasised in the school curriculum. Short programs efficiently introduced the concept of recycling to schools and the public in general.

In Tasmania, government, private and non-government organisations produced educational materials on recycling. For instance, Phoenix Recyclers produces an education display room for students and interested groups. The TEC produced school holiday programs for students and was going to produce adult courses in 1997 which showed an attempt to promote the benefits of recycling to the public. However, there were no programs, produced by these organisations in schools. More promotion of recycling by government was required amongst various organisations.

Public campaigns undertaken in Bangkok and Hobart have some similarities, for example, the distribution of booklets and pamphlets, and advertising through the mass media. However, refrigerator calendars could be introduced in Bangkok. These are easily recognisable and could be distributed widely to households. However, regular collection of recyclable materials should be made and facilities provided in the community.

Television advertising seems to be an effective strategy to increase the public's awareness of recycling schemes. However, television advertising in Bangkok was less attractive and was broadcast at an inappropriate time. One reason could be that this advertising was treated as a non-profit exercise. Greater frequency and more attractive television advertising in Bangkok would be required.

Evaluation of the recycling programs undertaken outside schools in Bangkok and Hobart incorporated similar methods involving the analysis of the waste components and surveys. Waste component analysis should be an official measurement. The surveys demonstrated public attitudes towards the programs. The strengths and weaknesses of the programs were also discovered. Such surveys could be conducted at regular times. In Bangkok, more promotion of recycling programs should be produced both within and outside schools. It was found from the interviews that it was widely perceived that recycling programs benefit society because public awareness and co-operation was increased, and waste was reduced.

It was found from the interviews with officers in both cities that financial support for implementing and producing materials for education programs would be required in both government and non-government organisations. From the interviews in Hobart, it was found that consideration by high level people, such as politicians, of environmental management has influenced recycling operations. Education in re-using paper needs more promotion. Lack of skilled people was one obstacle to recycling operations in Bangkok.

Although wet solid waste bins and dry solid waste bins have been provided, kerbside collection should also be conducted in Bangkok. A pilot operation may be initiated in selected areas. Although the results of pilot programs were satisfactory, further recycling implementation in Bangkok needs support from both government and private sectors. Government may facilitate recycling operations through tax reduction for recycling machinery or tax exemptions for fully recycled products. The use of recycled materials, particularly recycled paper, required promotion to expand its market. This would encourage companies to be involved in recycling and would promote recycling. Organisational concerns about paper recycling through the education programs and related programs, such as the 'Milk Carton for Waste Reduction Project', demonstrate a keen attempt to cope with the waste problem and an attempt to encourage the public to participate in recycling. From the success of the pilot education programs, the evidence is that recycling is an appropriate strategy for waste minimisation in Bangkok. However, to achieve more widely successful programs, paper recycling education and recycling in Bangkok require more resources.

### **5.3 PAPER RECYCLING EDUCATION PROGRAMS UNDERTAKEN IN SCHOOLS**

In this section, paper recycling programs undertaken in schools are discussed, specifically the initiation, implementation and evaluation of the programs.

#### **5.3.1 The Introduction of the Programs**

Paper recycling education programs in Bangkok began differently from those in Hobart. In Bangkok, pilot recycling programs were initiated in many areas by the BMA and education programs in schools were generated by both government and private organisations. For instance, the recycling education program produced by the TECDA in 1992 was undertaken in 19 schools where the school Principals perceived its advantages. The outcomes of this program were considered satisfactory by the TECDA, the Principals and teachers. Students were taught the concept of recycling and they participated in recycling activities, such as separating waste before disposal.

The recycling education program undertaken in Phranakorn District was produced by the awareness and co-operation of government authorities and private companies. District officers provided technical assistance while private agencies arranged for materials such as recycling bins and rewards. Study tours of the recycling plant and the dump site were also arranged for school representatives in order to provide information and increase awareness. Since each school has to design its own strategies and activities, teachers who carry out the program have been the core of the program. However, in some schools, the Principals also have a strong concern about waste problems and recycling. Support from the Principals, therefore, was a significant factor in the success of education programs.

On the other hand, from the results of surveys conducted in three schools in Hobart, most paper recycling education programs were initiated by the Principal and in some schools by the teachers with the Principal's support. Seventy-seven responses from the fax survey showed that a paper recycling program was undertaken in fifty-seven schools. The program was developed mainly by teachers and the program was generally part of both the school curriculum and classroom behaviour.

In Thailand, recycling is a new concept, especially in schools. Facilities such as bins for recyclable materials have been required. Conversely, recycling in Australia has been



operating for over ten years. People have been educated about recycling and facilities have been provided by local councils. For example, councils collect crates (plastic recycling boxes) at allocated times. Although beginning later, the initiatives in recycling education programs in Bangkok schools demonstrate the willingness of many groups to solve waste problems with recycling. The co-operation amongst government, private and non-government organisations was evidence of an attempt to encourage people in society to participate in recycling schemes. The study tours provided by companies in Bangkok encouraged an awareness amongst teachers and students of waste problems and the benefits of recycling. Respondents to the interviews, people both inside and outside schools, said that students awareness would increase as a result of their experience of study tours.

The relationships between organisations and schools through the recycling program in Phranakorn District provides benefits for organisations involved in recycling and for schools. The weaknesses of past programs could be used to improve further programs. Teachers consulted with officers involved and exchanged information and experience with other teachers in order to improve the programs in their schools. Resources needed for program operation were provided. For instance, recycling bins and funding for implementing the programs were arranged between private companies and the government.

On the other hand, in Hobart, government, private and non-government organisations involved in waste management and recycling have targeted the general public in their education programs. Agencies such as DELM and LRRA produced booklets about recycling for schools and recycling programs in schools were initiated and developed by the Principals and teachers.

### **5.3.2 Implementation of the Paper Recycling Programs in Schools**

Strategies operated in education programs in schools in Bangkok and Hobart had some similarities. In both places, teachers impart knowledge about recycling in class through the school curriculum and classroom behaviour. However, in Bangkok, recycling is part of the social studies and science curriculum, which in turn is part of the Life Experience unit. In some schools recycling is part of the Work Orientation unit, whereas in Hobart, recycling is included in the Studies of Society and the Environment unit. It seems that

when incorporated in the environment unit, the concern for recycling was increased amongst the teachers and students. However, if a recycling or environmental subject was a separate curriculum unit, it could increase awareness of environmental problems. The results of interviews showed that four officers from different organisations in Bangkok agreed that the environment should be a separate curriculum unit. One Principal and one teacher also commented that paper recycling education programs should be implemented in high schools. A teacher from Sorell Primary School, in Hobart, also noted that the major concerns about the recycling program were that the benefits of the program and changes in children's behaviour did not extend to high school.

The surveys showed that in three primary schools in Hobart there were paper recycling bins, provided by Hobart City Council, in every classroom; students also re-use old paper for craft. Sorell Primary School started a recycling depot in 1992. This depot was used for paper, milk cartons, plastic meat trays, cans and compostable materials. This school also produces school recycling program pamphlets and provides a re-use bin for each classroom.

Teachers who carry out the recycling programs had a major role in these programs. They designed recycling activities and advised students about separating waste. The surveys in Bangkok showed that 97 per cent of students interviewed knew that there was a recycling program in their school, mainly from teachers and associated recycling activities. Exhibitions and competitions, such as craft made from waste paper, were run in some schools in Bangkok. One school plans to produce booklets for parents to encourage them to participate in recycling activities. In addition, some students said they knew that there was a program from seeing the recycling bins in the school. However, only two schools in Phranakorn District provided paper recycling bins (plastic bins) in every classroom and one school provided a paper recycling box (36 litre paper box) in every classroom. Recycling bins provided in the classroom have been an effective method to increase students' awareness. Thus, there should be recycling bins arranged for every classroom in Bangkok. Each of the three schools in Hobart had paper recycling bins in every classroom. Students could practise separating waste as part of their classroom behaviour.

In both cities, students monitors assisted teachers to conduct the recycling program. Monitors in Bangkok schools checked student disposal behaviour and gave advice to other students, whereas monitors in the Hobart schools collected and emptied waste paper from classrooms. The methods used in both places train students to act responsibly and to co-operate in school waste management.

Competition both within the school and amongst schools could further promote students' awareness of recycling and associated initiatives. Students in some schools in Bangkok said in the interviews that they liked recycling activities and the recycling program in general because rewards were provided. Therefore, this strategy could be implemented in schools in Hobart where paper recycling programs were not undertaken.

One benefit which schools in Bangkok obtained from the recycling program was that schools could earn money from selling waste paper. This money could be used for school activities and facilities.

With practice, students could encourage family members to separate recyclable materials. However, the number and location of containers for recyclable materials affected public participation. It appears that the number of recycling bins in Bangkok was insufficient. This could affect students' behaviour as their awareness may decrease if there was no waste separation conducted outside the school.

The duration of the recycling program was another difference between Bangkok and Hobart. The recycling program in Phranakorn District was undertaken for one year as a pilot program, but the program was still being implemented in every school afterwards. All Principals and teachers said that this was because the program benefits the school and the students so much.

Students interviewed in both places (average 97 per cent) knew that there was a recycling program in their school. The majority of students interviewed in Bangkok said that they knew about the recycling program from teachers whereas the majority of students in Hobart said that they knew about the programs from seeing recycling bins in their classrooms. One possible explanation was that the recycling bins in schools in Bangkok were located in other school areas, such as the playground and school canteen. Only in three schools out of 11 were recycling bins provided in every classroom.

Therefore, a recycling bin should be placed in every classroom to encourage student participation in the programs. More students said that they knew about recycling programs from seeing recycling activities than from seeing the recycling bins. This shows that recycling activity can encourage student participation. In Hobart, the surveys found that, apart from classroom behaviour and the use of paper for craft, there was no school-wide recycling activity outside the classroom, such as competitions. To enhance the efficiency of the paper recycling education programs, such activities may be a good strategy for schools in Hobart.

Almost all students interviewed in both cities participated in the programs by sorting waste paper and they commented that the program was good. The main reason given was that waste paper could be recycled. This shows that students have an understanding of the concept of recycling in general.

In Hobart, paper recycling programs in schools had no stated duration. It seems that the programs will be conducted so long as the Principal and teachers in schools have an environmental concern, and that services and facilities such as recycling bins are provided by councils. No evaluation has been made of the current paper recycling program undertaken in schools in Hobart.

### **5.3.3 Evaluation of Paper Recycling Education Programs Undertaken in Schools**

Evaluation of paper recycling education programs needs to be conducted at regular intervals, not only to measure the success of the programs, but also to discover obstacles to the programs. The paper recycling programs could be assessed by the amount of waste paper collected and by the full use of paper. Paper should be used on both sides before disposal or be used for craft. From the surveys in Bangkok and Hobart, it was found that paper was in fact used for craft and people were encouraged to use paper fully before disposal.

The pilot program undertaken in Phranakorn District was evaluated by the amount of recyclable materials collected. The amount of waste paper collected from each school was recorded by district workers who collected this paper. Rewards were provided for recycling activities, such as exhibitions in schools, and for the largest amount of waste paper collected.

As noted, there has been no evaluation of paper recycling programs in Hobart. The strengths and weaknesses of the recycling programs were evaluated mostly subjectively by the Principals and teachers. Students were encouraged to separate waste in various bins in the classroom. However, the Principal from Bagdad School noticed that the main weakness of the program in the school was that teachers and students were not active in the program because they did not pay attention to sorting waste out. This caused problems in the contamination of the paper. Another weakness found was that photocopies of text book exercises increased paper use. The teacher in New Town Primary School noted that contaminants could enter the recycling bins and that the collection from Hobart City Council was too infrequent. The cause of the problems concerning text book exercises and collection was the lack of communication between schools and organisations involved in recycling operations. However, teachers in Sorell Primary School noted no weakness in the program.

No schools had recorded the amount of waste paper collected before the paper recycling programs were conducted. The teachers in three schools in Phranakorn District and two schools in Hobart were able to estimate the amount of waste paper collected after the programs began. However, the Principals and teachers in both places commented that students' disposal behaviour was at a satisfactory level. It can be said that the recycling program undertaken in schools in the Phranakorn District was successful. Lack of time to monitor students' behaviour and a lack of co-operation from parents were weaknesses of the recycling programs. One teacher found that some students had knowledge about separating waste but they did not act upon it. A few teachers said that kindergarten was a group which needed to have their disposal behaviour monitored and should be advised about separating waste. Some teachers in Bangkok used samples of paper, a milk carton and a plastic bottle on each of the recycling bins as an example, to provide clear directions for kindergarten children. This strategy could be applied in other schools. However, the amount of waste paper collected should be recorded as an official method to measure the success of the recycling programs and could encourage other students to participate in the program.

A similar strength identified by the schools in both cities was that students practise sorting paper and use paper fully before disposal. This encouraged them to understand

the concept of recycling. It was noticed that waste reduction was another benefit found in Phranakorn District schools but this issue was not mentioned in Hobart.

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## APPENDIX 1

### PAPER RECYCLING COMPANIES IN AUSTRALIA

Many industrialised countries have been interested in waste management over the last two decades (Bureau of Industry Economics 1993). The particular issues are how and where to dispose of the waste which these countries generate. Among the considerations of waste minimisation, recycling is one alternative to assist in reducing large amounts of waste.

Over 14 million tonnes of solid domestic, commercial and industrial waste each year are disposed of in landfill in Australia. The largest proportion of waste (35-40 per cent) comes from industrial and commercial waste and about 15 per cent from building and demolition waste (Bureau of Industry Economics 1993). Around 2.4 million tonnes of paper per annum were consumed by householders and businesses in the early 1990s (Bakker, Niuatui & Rees 1993).

Australia has a low population density and has lower waste disposal charges (AP 1995). For instance, waste disposal charges in the United States are approximately A\$270 per tonne. In some parts of Germany they are about A\$400 per tonne whilst the charges in Australia are \$A50 per tonne or less. AP, the Australian branch of Amcor Paper's pulp and paper business, notes that the higher the waste disposal charges, the greater the encouragement to separate waste paper for recycling. Waste disposal charges include the maintenance and replacement of facilities in the long-term.

Recycling rate is a consequence of the interaction of economic, technological, and social values (McGregor undated). Economic aspects include the cost of collecting, recycling processing, and the cost of raw materials. Changing values on the environment can increase the recycling rate. Education plays a significant role in increasing the level of recycling. One recycling specialist notes that only greater consumer education will lead to change in levels of domestic recycling in Australia (McGregor undated). An increasing rate of recycling can be achieved by the improvement of community awareness in the basic principles and constraints involved. More understanding of recycling principles brings about a better chance of success in changing community

attitudes. In some communities, local councils have a role in collection services as well as in encouraging paper recycling schemes.

Approximately 71 per cent of all the paper and paperboard packaging consumed is made from recycled materials (McGregor undated). In 1988, there was about 36 per cent recycled fibre in new paper products. More than 73 per cent of fibrous raw material in packaging paper and paperboards comes from waste paper (APPM undated). There is little waste paper used in tissue products and in the manufacture of newsprint.

Paper recycling companies in Australia include Visy Recycling, Australian Paper Manufacturers (APM), the APPM and ANM. Visy Recycling is one of the three operating divisions of Pratt Industries, Australia's largest manufacturer of cardboard boxes which are made from 100 per cent recycled paper (Visy Recycling undated (b)). Visy Recycling collects waste paper and cardboard and has six paper recycling mills in Australia, three in New South Wales and three in Victoria (Visy Recycling undated (b)). APM operates through Statewide Paper Collectors in Launceston in Tasmania, and has teaching resource kits on recycling operations in Victoria (DELM 1992).

APPM on the South Coast of New South Wales is an example of a manufacturer which uses recycled waste fibre. APPM has collected and recycled waste paper for 25 years (APPM undated). APPM operates through municipal authority collection agents in Tasmania for their recycling operations on the mainland (DELM 1992). In the mid 1970s, APPM produced bond writing paper from 100 per cent fibre but there was no interest in the products in the market at that time (APPM undated).

ANM, the only Australia newsprint manufacturer in Australia, is located in New South Wales and has operated since 1993 (PNEB undated). In Australia, about 25 million newspapers are sold every week (PNEB 1990). The newspaper industry uses 640,000 tonnes of newsprint a year. About 374,000 tonnes is made in Australia, the remainder is imported, mainly from New Zealand, Canada and Finland. ANM produces 374,000 tonnes of newsprint annually; about 85 per cent is produced from Radiata pine plantations and 15 per cent from regrowth eucalypt forests. Currently ANM has the capacity to recycle about 65,000 tonnes of newspapers and magazines per year while in the whole country, over 300,000 tonnes of newspapers are recycled every year. The rate of newspaper recycling has increased from 28 per cent in 1990 to more than 50 per cent

in 1994. It is estimated that newspaper recycling rate will be 60 per cent by the end of 1996 (PNEB undated).

Two main considerations for recycling newsprint are the supply of old newspapers and magazines for recycling, and technical problems. Recycled paper is difficult to print and read, and it lacks strength. These two problems can be solved with improved technology. However, it is still difficult to produce quality newsprint from 100 per cent recycled old newsprint. The fibre deteriorates when it is recycled. Therefore, recycled pulp is mixed with virgin wood pulp to make newsprint. PNEB (undated) estimates that about 90 per cent of all newsprint used in Australia have a recycled content of up to 45 per cent.

ANM at Albury in New South Wales has a water treatment process. Treated water from the mill can be used for plantation irrigation (PNEB undated). The recycling of newspapers and magazines is designed not only to reduce waste but to decrease the amount of waste going to landfill by 50 per cent at the end of 1996 (PNEB undated). Newsprint can be burnt, buried or composted. There are other alternatives for paper which cannot be recycled into newspapers. For instance, approximately 100,000 tonnes of waste paper were used in cardboard packaging and paperboard manufacture, and more than 130,000 tonnes were exported to Asia (PNEB undated). ANM in Tasmania also provides information on production processes, school tours of the Boyer Mill which arrange for children age up to 11, and provides staff to visit schools to demonstrate paper making (DELM 1992).

AP is a merger of APM and APPM. AP recycles about 620,000 tonnes of waste paper throughout Australia (AP 1995). AP classifies paper into four groups: newsprint and magazines; printing and writing papers; packaging and industrial papers; and tissues. AP does not produce newsprint or tissues. Tissues are not available for recycling because of the nature of their use (AP 1995). AP produces printing and writing paper and packaging and industrial papers.

AP identifies the factors which influence the greater use of paper recycling as:

- technological development to raise the percentage of recycled fibre used in industry;

- improvement of Australia paper packaging in order to compete with the producers in other countries;
- the reduction of tariff and non-tariff barriers to other countries; and
- increased demand for paperboard packaging.

In addition, AP has made an attempt to increase the recovery rate of waste paper from 25 per cent to approximately 40 per cent by the end of 1997.

The PNEB, another organisation involved in paper recycling, was established by Australia's leading newspaper and magazine publishers in response to public concerns about the newsprint and newspaper industry, forest preservation, waste minimisation, and the potential of recycling. PNEB has developed strategies for reducing waste in industry, gathered information on the environmental impact of the industry, and organised about A\$6 million in research support funding in recycling of old newspapers and magazines (PNEB undated). The PNEB has created a national kerbside collection scheme, in which local councils undertake the collection and sorting of recyclable materials.

## **PAPER RECYCLING IN DEVELOPING COUNTRIES**

Waste management in developing countries has typically been given less attention than economic development (Gotoh 1989). Since the problems of waste management and public sanitation are increasing, policy-makers and administrators are searching for ways to improve the current situation, particularly in urban areas.

Apart from the usual problems related to population density in big cities, unemployed or poor people are of concern. A proportion of the increasing amount of waste is caused by these groups who normally settle in low cost housing areas where basic services are difficult to provide, such as rubbish bins and collection services.

However, waste collection in some areas, such as in Shanghai and other large cities in China, is generally efficient (Gotoh 1989). Collections of municipal solid waste from household, commercial and construction sources to rural dump sites are frequently and properly collected.



A summary list of factors important in paper recycling in developing countries follows. It is mainly from Gotoh (1989) in the context of Asian metropolises.

- (1) The cost of waste management is a major problem in developing countries. This problem affects recycling activities which are concerned with social benefits rather than business. The processing of waste materials usually costs more than profits gained from selling recycling materials. Financial assistance from governments is therefore indispensable. Privatisation may be another solution to financial problems.
- (2) The rapid increase of urban populations due to the migration of rural people to urban areas has increased the types and amount of waste. Data on waste composition and population densities are required for municipal governments to analyse the cost of management and facilities. These data are very important for recycling programs, especially for paper, which needs to be sorted at the source.
- (3) The use of inappropriate technology is a major problem as well as a major mechanism for paper recycling schemes in developing countries. Appropriate technology has become a key concept for planning in developing countries (Furedy 1989). The cost of machinery imported from developed countries, its applicability, and the social benefits are key concern.
- (4) Public education and participation are significant elements. The efficiency of paper recycling programs in developing countries is improved to encourage social awareness, education can be provided through the mass media, for example, newspapers and television.

The role of operating agencies influences the effectiveness and efficiency of paper recycling programs. Training and education for officers in organisations is necessary. In Shanghai, for example, the Bureau of Environmental Sanitation, which has more than 30,000 workers, has two training centres (Gotoh 1989).

## APPENDIX 2

### INTERVIEW QUESTIONS FOR GOVERNMENT AND NON-GOVERNMENT OFFICERS (BANGKOK AND HOBART)

#### For government officers

Name: .....

Position: .....

Organisation: .....

Date of interview: .....

1. Does your organisation have its own paper recycling education programs?

.....

If yes, go ahead with other questions

If no, please tell me more.

- Do you have general recycling education programs?

.....

- Do these include paper?

.....

-Then go on to other questions, framing them in terms of recycling in general.

2. How many paper recycling education programs do you have?

.....

3. What is your definition of paper recycling education programs?

.....

4. Do you distinguish between education programs for recycling and giving out information on recycling?

.....

5. What paper recycling education programs do you have?

.....

6. What is the time period over which they are carried out?

.....

7. What are the objectives of the programs?

.....

8. What are the expected outcomes of the programs?

.....

9. Does your organisation cooperate with other organisations (e.g., government, industry, NGOs) in paper recycling education?  
.....
10. How is your organisation involved when cooperating with other organisations (e.g., provide funding)?  
.....
11. Who are the target groups?  
.....
12. Does your organisation provide training courses for the teachers in schools?  
.....
13. Do you provide educational materials?  
.....
14. Do you provide recycling facilities (e.g., bins)?  
.....
15. Where do the funds come from to support the program?  
.....
16. (a) What is the budget?  
.....  
(b) Is it sufficient?  
.....
17. What are the strengths of your education programs in paper recycling?  
.....
18. What are the weaknesses of these programs?  
.....
19. How do you address the problems you see with your programs?  
.....
20. How do you monitor or evaluate the effectiveness of your education programs in paper recycling?  
.....
21. What are the strengths of NGO education programs in paper recycling?  
.....
22. What are the weaknesses of NGO education programs?  
.....

For NGO officers

Name: .....

Position: .....

Organisation: .....

Date of interview: .....

1. Does your organisation have its own paper recycling education programs?

.....

If yes, go ahead with other questions

If no, please tell me more.

- Do you have general recycling education programs?

.....

- Do these include paper?

.....

- Then go on to other questions, framing them in terms of recycling in general.

2. How many paper recycling education programs do you have?

.....

3. How do you define education for paper recycling programs?

.....

4. Do you distinguish between education programs for recycling and giving out information on recycling?

.....

5. What paper recycling education programs do you have?

.....

6. What is the time period over which they are carried out?

.....

7. What are the objectives of the programs?

.....

8. What are the expected outcomes of the programs?

.....

9. Does your organisation co-operate with other organisations (e.g., government, industry, or NGOs) in paper recycling education?

.....

10. How is your organisation involved when cooperating with other organisations (e.g. provide funding)?

.....

11. Who are the target groups?  
.....
12. Does your organisation provide training courses for the teachers in schools?  
.....
13. Do you provide educational materials?  
.....
14. Do you provide recycling facilities (e.g., bins)?  
.....
15. Where do the funds come from to support the program?  
.....
16. (a) What is the budget?  
.....  
(b) Is it sufficient?  
.....
17. What are the strengths of your education programs in paper recycling?  
.....
18. What are the weaknesses of these programs?  
.....
19. How do you address the problems you see with your programs?  
.....
20. How do you monitor or evaluate the effectiveness of your education programs in paper recycling?  
.....
21. What are the strengths of government education programs in paper recycling?  
.....
22. What are the weaknesses of government education programs in paper recycling?  
.....

### APPENDIX 3

#### INTERVIEW QUESTIONS FOR SCHOOL PRINCIPALS AND TEACHERS (BANGKOK AND HOBART)

##### For school principals

Name: .....

Name of school: .....

Number of teachers: .....

Number of students: .....

Number of classes: .....

Date of interview: .....

How long have you been in this school? .....

1. Could you describe the paper recycling program in your school?  
.....
2. Why did your school start a paper recycling education program?  
.....
3. How much paper was recycled before the education program began?  
.....
4. How much paper is being recycled since the program began?  
.....
5. Who collects paper for recycling from your school?  
.....
6. How often is paper for recycling collected?  
.....
7. Where does this paper go to?  
.....
8. How much waste paper is collected from school?  
.....
9. How many recycling bins are there in your school?  
.....
10. Where is the location of recycling bins?  
.....
11. Is it part of your paper recycling program to encourage people to use paper fully before disposal for recycling?  
.....

- Do they do this? (How effective is it?)

12. Who produced the paper recycling education program used in your schools?

13. How many programs are there?

14. Which classes implement the program?

15. What is the duration of the education program?

16. What outcomes do you hope for as a result of the paper recycling education program?

17. In your judgement, are the paper recycling education programs outside your school (e.g., undertaken by government, industry, or NGOs) effective?

- Please give me more details.

18. What are the strengths of the paper recycling education program undertaken in your school?

19. What are the weaknesses of the paper recycling education program undertaken in your school?

For teachers who are involved in the recycling education program

Name:.....

Name of school: .....

Position: .....

How long have you taught in this school? .....

Do you have your own class? (specify class) .....

If yes, how many students in your class? .....

Date of interview: .....

1. Why did your class start paper recycling?

.....

2. Is your recycling education program

a) incorporated within one or more parts of your wider curriculum?

.....

b) a curriculum unit in its own right?

.....

c) not a curriculum unit or part of the curriculum, but part of classroom organisation and behaviour?

.....

3. Does your school and/or class collect data about waste paper and paper for recycling?

.....

4. How do you collect the data?

.....

5. How much paper was recycled before the education program began?

.....

6. How much paper is being recycled since the program began?

.....

7. Who collects paper for recycling from your school?

.....

8. How often is this paper collected?

.....

9. Where does this paper go to?

.....

10. How many recycling bins in your school?

.....



11. Who produced the paper recycling education program used in your schools?  
.....
12. How many programs are there?  
.....
13. Which classes that you teach receive the program?  
.....
14. What is the duration of the education program?  
.....
15. Tell me more about how you are involved in the paper recycling education program in your school?  
.....
16. What outcomes do you hope for as a result of the paper recycling education program?  
.....
17. What resources do you feel you needed but were not available?  
.....
18. In your judgement, are the paper recycling education programs outside your school (e.g., undertaken by government, industry, or NGOs) effective?  
.....  
- Please give me more details.  
.....
19. What are the strengths of the paper recycling education program undertaken in your school?  
.....
20. What are the weaknesses of the paper recycling education program undertaken in your school?  
.....

For teachers who are not involved in the official school recycling education program

Name:.....

Name of school: .....

Position: .....

How long have you taught in this school? .....

Do you have your own class? (specify class) .....

If yes, how many students in your class? .....

Date of interview: .....

1. Do you know that there is a paper recycling program in your school?

Yes ☐ No ☐

If yes, how did you find out?

.....

2. Do you participate in paper recycling?

Yes ☐ No ☐

If yes, how do you participate?

.....

3. Does your class participate in paper recycling?

.....

4. Does your class collect data about waste paper and paper for recycling?

.....

5. How do you collect the data?

.....

6. When did your class start paper recycling?

.....

7. Why did your class start paper recycling?

.....

8. Is the official paper recycling program in your school good?

Yes ☐ No ☐ Don't know ☐

If yes, why do you think it is good?

.....

If no, why isn't it good?

.....

9. If there are any other comments you would like to make, please do so.

.....

## APPENDIX 4

### INTERVIEW QUESTIONS FOR STUDENTS (BANGKOK AND HOBART)

Date: .....

School: .....

Is this class in a paper recycling program?      Yes ☐      No ☐

For students in class

Class number: .....

Age: .....

Sex: Male ☐      Female ☐

1.      Do you know that there is a paper recycling program in your school?

Yes ☐      No ☐

If yes, how did you find out?

.....

2.      Is there a paper recycling program in your class?

Yes ☐      No ☐

3.      Do you participate in paper recycling?

Yes ☐      No ☐

If yes, how do you participate?

.....

If no, why not?

.....

4.      Is the paper recycling program in your school good?

Yes ☐      No ☐      Don't know ☐

If yes, why do you think it is good?

.....

If no, why isn't it good?

.....

5.      If there are any other comments you would like to make, please do so.

.....

Date: .....

School: .....

For students outside the class

Class number: .....

Age: .....

Sex: Male ☐ Female ☐

1. Do you know that there is a paper recycling program in your school?

Yes ☐ No ☐

If yes, how did you find out?

.....

2. Is there a paper recycling program in your class?

Yes ☐ No ☐

3. Do you participate in paper recycling?

Yes ☐ No ☐

If yes, how do you participate?

.....

If no, why not?

.....

4. Is the paper recycling program in your school good?

Yes ☐ No ☐ Don't know ☐

If yes, why do you think it is good?

.....

If no, why isn't it good?

.....

5. If there are any other comments you would like to make, please do so.

.....

## APPENDIX 5

### INTERVIEW RESULTS FOR STUDENTS OF ELEVEN SCHOOLS IN PHRANAKORN DISTRICT, THAILAND

The Total Number and Percentages of Students Interviewed and the Percentages of Students who Knew about the Program

The name of school	The total number of students interviewed (persons)	The number of students who knew about the program (%)
1. Wat Suthud School	44	95
2. Wat Mahatat School	51	96
3. Wat Ratchanadda School	48	100
4. Wat Mahun School	62	94
5. Ratchabopit School	57	100
6. Wat Ratchaburana School	44	100
7. Wat Cheatupon School	56	93
8. Wat Mai-ammatarod School	32	100
9. Wat Makutkasadrariyaram School	61	97
10.Wat Inthrarawiharn School	58	88
11.Wat Threetodsathap School	59	100
Total	572	(Average) 97

Percentages of Students According to the Three Most Often-mentioned Sources from  
Which they Received Information on Recycling

School	Teachers (%)	Recycling bins (%)	Recycling activities (%)
1	76	14	-
2	47	12	31
3	77	6	13
4	47	-	41
5	67	2	12
6	82	-	11
7	75	13	6
8	28	13	16
9	51	15	-
10	75	6	16
11	63	5	5
Average	63	8	14

The Percentages of Students who Participated in the Recycling Programs and Three  
Main Methods of their Participation

School	Students Participation (%)	Separating waste (%)	Using paper for craft (%)	Attending activities that promote recycling(%)
1	91	98	2	-
2	96	86	-	8
3	100	83	6	-
4	81	40	50	8
5	100	70	14	-
6	100	34	45	21
7	91	84	10	-
8	100	66	34	-
9	84	90	10	-
10	98	58	35	5
11	100	92	8	-
Average	95	73	19	4

### Students' Comments on the Recycling Program in their School

(Note: Some students not included because they had no knowledge of a program)

School	The program is good (%)	The program is not good (%)	Don't know (%)
1	80	-	20
2	80	-	-
3	81	-	19
4	76	11	13
5	84	4	12
6	84	-	16
7	84	4	-
8	97	-	3
9	77	2	21
10	98	-	2
11	85	8	7
Average	84	3	10



### Three Main Reasons Why the Recycling Program is Successful

School	Waste paper was used for recycling (%)	Waste was reduced (%)	Co-operation was created (%)
1	34	31	-
2	29	-	12
3	8	-	6
4	30	-	-
5	19	-	13
6	24	35	-
7	38	23	-
8	19	39	-
9	30	28	-
10	22	22	-
11	32	14	14
Average	26	17	4

### INTERVIEW DETAILS OF STUDENTS IN EACH SCHOOL

#### 1. Wat Suthud School

Forty-four students were interviewed: 15 students from Grade 6, 17 students from Grade 3, and 12 students outside the classroom. Forty-two students (95%) knew that there was a paper recycling program in their school. Thirty-two students (76%) knew from the teachers, and six students (14%) knew from seeing the recycling bins. Eight of 32 students questioned in classrooms said that there was a paper recycling program in their class. Forty students (91%) interviewed participated in the program by separating waste (39 students or 98%), and by using waste paper for craft (one student or 2%). Thirty-five students (80%) said that the program in their school was good, mainly because waste paper could be used for recycling (12 students or 34%), and waste was reduced

(11 students or 31%). Nine students (20%) said they did not know whether the program was good or not. Some students commented that everyone should co-operate in the waste program. Some students required more recycling bins and that recycling programs were more widely promoted in the community.

## **2. Wat Mahatat School**

Fifty-one students were interviewed: 21 students from Grade 6, 19 students from Grade 4, and 11 students outside the classroom. Forty-nine students (96%) knew that there was a paper recycling program in their school. Twenty-three students (47%) knew from teachers, 15 students (31%) knew because they saw recycling activities, and six students (12%) knew from seeing the recycling bins. Students in Grade 6 said that there was no program in their class and school this year but they wanted the program to start soon. One student classroom said there was a program in their class. Forty-nine students (96%) interviewed participated in the program, mainly by separating waste (42 students or 86%), four students (8%) attended recycling activities, and one student said he used paper fully before disposal. Two students (4%) did not participate in the program because they did not know that there was a paper recycling program in the school. Forty-one students (80%) said the program was good, mainly because waste paper could be used for recycling (12 students or 29%), waste was reduced and trees were saved (six students or 15%), and the program created co-operation in school (five students or 12%). Some students commented that they liked recycling activities.

## **3. Wat Ratchanadda School**

Forty-eight students in this school were interviewed: 20 students from Grade 6, 16 students from Grade 4, and 12 students outside the class. All students interviewed knew that there was a paper recycling program in the school. Thirty-seven students (77%) knew from teachers, 6 students (13%) knew from seeing recycling activities, three students (6%) knew from seeing recycling bins, and two students (4%) knew from teachers and from seeing recycling activities. Forty-three students (90%) said there was a paper recycling program in their class. Forty-eight students interviewed (100%) participated in the program, mainly by separating waste (40 students or 83%), by using paper fully before disposal (three students or 6%), and by using waste paper for craft (three students or 6%). Thirty-nine students (81%) said that the program was good

while nine students (19%) said they did not know that the program existed. Students said the program was good because it created good habits (eight students or 21%), and created co-operation in the school (three students or 6%). Three students (8%) said that because waste paper could be used for recycling. Three students (8%) said that the recycling program was good because waste was reduced and there were rewards for good recycling activities.

#### **4. Wat Mahun School**

Sixty-two students were interviewed: 22 students from Grade 6, 28 students from Grade 4, and 12 students outside the class. Fifty-eight students (94%) knew that there was a paper recycling program in their school, mainly from teachers (27 students or 47%), and from seeing recycling activities (24 students or 41%). Fifty students (81%) participated in the program, mainly with used paper for their craft (25 students or 50%), by separating waste (20 students or 40%), and attending recycling activities (four students or 8%). A few students did not participate in the program because they did not want to. Five students (8%) said they did not know that there was a paper recycling program in the school. Forty-seven students (76%) said the program was good, mainly because waste paper could be recycled (14 students or 30%), and waste was reduced and trees were saved (four students or 8%). Seven students (11%) said the program was not good because some students did not separate waste before disposal. Eight students (13%) did not know whether the program was good or not. Seven students (11%) commented that they wanted everyone to recycle paper. Three students (5%) said they wanted a separating waste competition in the school every week and two students (3%) said they wanted every school to have a recycling program.

#### **5. Ratchabopit School**

Fifty-seven students were interviewed: 15 students from Grade 6, 27 students from Grade 4, and 15 students outside the classroom. All of them knew that there was a paper recycling program in their school, mainly from teachers (38 students or 67%). Seven students (12%) knew from seeing recycling activities, two students (4%) knew from teachers, two students (4%) knew from seeing other students monitor waste separation in class, and one student (2%) knew from seeing recycling bins. All of students interviewed participated in the recycling program, mainly by separating waste

(40 students or 70%). Eight students (14%) used paper fully before disposal and eight students (14%) used waste paper for their craft. Thirty-nine students (68%) said there was a paper recycling program in their class. Forty-eight students (84%) commented that the paper recycling program in the school was good, only two students (4%) said it was not good, and seven students (12%) said they did not know whether the program was good or not. Students mentioned that the program was good because waste was separated in the correct bins (nine students or 19%), natural resources were saved (six students or 13%), and the recycling program created co-operation in school (six students or 13%). Seven students (12%) commented that they wanted everyone in society to co-operate in paper recycling program.

## **6. Wat Ratchaburana School**

Forty-four students were interviewed: 18 students from Grade 6, 14 students from Grade 4, and 12 students from outside the class. All of them knew that there was a paper recycling program in their school, mainly from teachers (36 students or 82%) and from seeing recycling activities (five students or 11%). Forty-four students interviewed (100%) participated in the program, mainly by using waste paper for craft (20 students or 45%), and by separating waste (15 students or 34%). Nine students (21%) participated by attending recycling activities. Thirty-seven students (84%) said the program was good, mainly because waste was reduced (13 students or 35%), and waste paper could be used for recycling (nine students or 24%). Seven students (16%) did not know that the program was good or not.

## **7. Wat Cheatupon School**

Fifty-six students were interviewed: 23 students from Grade 6, 19 students from Grade 4, and 14 students outside the class. Fifty-two students (93%) knew that there was a paper recycling program in the school, mainly from teachers (39 students). Seven students (13%) knew from seeing the recycling bins, and three students (6%) knew from seeing recycling activities. Fifty-one students (91%) participated in the program, mainly by separating waste (43 students or 84%). Five students (10%) used waste paper for craft and three students said they used paper fully before disposal. Five students (9%) did not participate because they did not know that there was a program in the school. Forty-seven students (84%) said the program was good, mainly because waste paper

could be used for recycling (18 students or 38%), and waste was reduced (11 students or 23%). Only two students (4%) said that the program was not good because they saw that some students did not separate waste before disposal. Nine students (16%) commented that they wanted everyone in the community to separate waste. Four students (7%) required more recycling bins in the classrooms.

#### **8. Wat Mai-ammatarod School**

Thirty-two students were interviewed: 8 students from Grade 6, 12 students from Grade 4, and 12 students outside the class. All of them knew that there was a recycling program in the school, mainly from the teachers (nine students or 28%), from seeing activities (five students or 16%), and from seeing the recycling bins (four students or 13%). Some students found out from both teachers and from seeing recycling activities. All of students interviewed participated in the paper recycling program by separating waste (21 students or 66%), or used waste paper for craft (11 students or 34%). Thirty-one students (97%) said that the program was good, mainly because waste was reduced (12 students or 39%), and waste paper could be used for recycling (six students or 19%). Only one student (3%) said he did not know that the program was good or not. Three students (9%) commented that they wanted everyone in the community to separate waste before disposal.

#### **9. Wat Makutkasadtrariyaram School**

Sixty-one students were interviewed: 30 students from Grade 6, 20 students from Grade 4, and 11 students outside the class. Fifty-nine students (97%) knew that there was a recycling program in the school, mainly from teachers (30 students or 51%), from seeing collecting trucks (10 students or 20%), and from seeing the recycling bins (nine students or 15%). Fifty-two students (84%) participated in the program by separating waste (47 students or 90%), and by using waste paper for craft (five students or 10%). Forty-seven students (77%) commented that the program was good, mainly because waste paper could be used for recycling (14 students or 30%), and waste was reduced (13 students or 28%). Thirteen students (21%) did not know that the program was good or not. One student (2%) said that the program was not good because he saw some students did not separate waste. Eleven students (18%) commented that they wanted everyone in society to separate waste before disposal.

## **10. Wat Inthrarawiharn School**

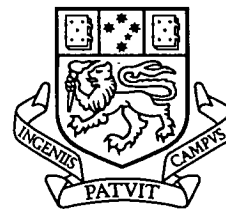
Fifty-eight students were interviewed: 19 students from Grade 6, 28 students from Grade 3, and 11 students outside the class. Fifty-one students (88%) knew that there was a recycling program in the school, mainly from teachers (38 students or 75%), and from seeing recycling activities (8 students or 16%). Three students (6%) found out about the program from seeing the recycling bins. Fifty-seven students (98%) participated in the program, mainly by separating waste (33 students or 58%), and by using waste paper for craft (20 students or 35%). Three students (5%) participated by attending recycling activities. One student (2%) said he used paper fully before disposal. Fifty-seven students (98%) said the program in the school was good, mainly because waste paper could be used for recycling (12 students or 22%), and waste was reduced (12 students or 22%). Only one student (2%) said he did not know that the program existed. Five students (9%) wanted the school to continuously implement a recycling program. Two students (3%) said they wanted every school to have a recycling program.

## **11. Wat Threetodsathap School**

Fifty-nine students were interviewed: 27 students from Grade 6, 20 students from Grade 4, and 12 students outside the class. All of them knew that there was a recycling program in the school, mainly from teachers (37 students or 63%), from seeing teachers and recycling boxes in classrooms (6 students or 10%). Three students (5%) knew from seeing the recycling bins and three students knew from seeing recycling activities. Fifty-nine students (100%) participated in the program by separating waste (54 students or 92%), and by using waste paper for craft (five students or 8%). Fifty students (85%) commented that the program was good, mainly because waste paper could be recycled (16 students or 32%), the program created co-operation in the school (seven students or 14%), and waste was reduced (seven students or 14%). Five students (8%) said the program was not good because they saw that some students did not separate waste before disposal. Four students (7%) said they did not know that the program was good or not. Six students (10%) commented that they wanted everyone in the community to separate waste before disposal.

## APPENDIX 6

### (I) FAX SURVEY IN TASMANIA (A LETTER TO PRIMARY SCHOOLS)



UNIVERSITY OF TASMANIA

*Centre for Environmental Studies*

11 December 1996

Dear Principal,

I am studying for a Masters Degree at the University of Tasmania. I am doing my thesis on "Education in Paper Recycling: A Comparison of Programs in Bangkok, Thailand, and Hobart, Tasmania".

For my research, I need your co-operation for a few minutes to answer the following questions about paper recycling in your school. The purpose is to simply give me a general indication of the numbers of schools involved. Your answers as an individual school will be completely confidential. Please tick the appropriate boxes.

1. Name of School .....
2. Does your school recycle paper?  
☐ Yes                      ☐ No
3. How many classes are involved in paper recycling? Please give the number of classes recycling and the total number of classes in the school.  
.....
4. Who was responsible for introducing paper recycling in the school?  
Principal ☐              Teachers ☐              School committee ☐  
Other (please specify) .....
5. How do you describe the paper recycling education in your school?  
☐ a) It is incorporated within one or more parts of your wider curriculum.  
☐ b) It is a curriculum unit in its own right.  
☐ c) It is not a curriculum unit or part of the curriculum, but it is part of classroom organisation and behaviour.  
☐ d) Other (please specify) .....

6. Are there any problems in paper recycling in your school?

.....

I would appreciate it greatly if you could send this form with your replies on it to me by mail or Fax as soon as possible. Fax No.(03) 6226 2989.

Yours sincerely,

Numtip Buachaiboon



**(II) LETTER TO THE  
DEPARTMENT OF EDUCATION,  
COMMUNITY AND CULTURAL  
DEVELOPMENT**



**UNIVERSITY OF TASMANIA**  
Department of Geography & Environmental Studies

3 December 1996

The Secretary  
Department of Education, Community and  
Cultural Development  
GPO Box 169B  
Hobart, 7001

Dear Sir/Madam,

I am studying for a Masters Degree at the University of Tasmania. I am doing my thesis on "Education in Paper Recycling: A Comparison of the Programs in Bangkok, Thailand, and Hobart, Tasmania".

Through discussions with various people, I have established that some Tasmanian classes and/or schools are involved in education for paper recycling (as well as its practice). For my research I need to know, however, whether the Department of Education, Community and Culture Development has an official policy or program for paper recycling in primary and/or secondary schools. If so, any further information on the communication of policies/programs in schools would be useful.

I would appreciate it if you could reply as soon as possible. If there are any policy/program documents, I would dearly like to have a copy or know how to obtain them.

Yours sincerely,

Numtip Buachaiboon

## **APPENDIX 7**

### **INTERVIEW DETAILS OF STUDENTS OF THREE SCHOOLS IN HOBART**

#### **1. Bagdad Primary School**

Fifty-seven students were interviewed: 24 students from Grade 5/6, 21 students from Grade 2/3, and 12 students outside the classroom. Fifty-three students (93%) knew that there was a paper recycling program in the school while four students (7%) said that they did not know. Thirty students (57%) knew that there was a program in the school from seeing recycling bins in their classrooms. Eleven students (21%) said that they knew from being told by the Principal, teachers, friends, and the student council. Five students (9%) knew from seeing people come to collect paper from the bins in the classrooms. Five students (9%) said that they emptied recycling bins from each class into the large bins. Two students (4%) knew from assembly. Fifty-six students (98%) said that there was a paper recycling program in their class. Fifty-two students participated in paper recycling. Forty-five students (87%) put paper in the recycling bins, and seven students (13%) used both sides of the paper. Five students (9%) did not participate in the program. Three students said that because they did not know that the program existed. One student said because she did not take the bins out and one student said she did not have time. Forty-nine students (86%) commented that the paper recycling program in the school was good, mainly because paper could be used for recycling (16 students or 33%), waste was reduced (11 students or 22%), and trees and the environment could be saved (eight students or 14%). Eight students (14%) said that they did not know whether the program was good or not. Three students commented that recycling was a good activity.

#### **2. New Town Primary School**

Forty-eight students were interviewed: 18 from Grade 6, 20 students from Grade 2/3, and 10 students outside the class. Forty-seven students (98%) knew that there was a paper recycling program in the school, mainly from teachers (20 students or 43%), from seeing recycling bins in their classrooms (20 students or 43%), and from seeing people collect paper from their class (four students or 9%). All of the students interviewed said that there was a paper recycling program in their class. All participated in the program

by putting paper in the recycling bins (37 students or 77%), and collecting paper from classes (11 students or 23%). Thirty-three students (69%) commented that the paper recycling program in the school was good, mainly because waste paper could be used for recycling (16 students or 48%), and trees and the environment could be saved (eight students or 24%). Fifteen students (31%), including 13 students from Grade 2/3, said that they did not know whether the program was good or not. One student commented that there should always be recycling.

### **3. Sorell Primary School**

Sixty-two students were interviewed: 27 students from Grade 4/5, 27 students from Grade 3/4, and eight students outside the class. All knew that there was a paper recycling program in their school. Twenty-seven students (from Grade 3/4) said that they knew because their class operated the program. Twenty-two students (35%) knew from seeing the recycling bins in their classrooms, nine students (15%) knew from teachers, and four students (6%) knew from seeing people collect paper from their classes. Every student interviewed said that there was a paper recycling program in their class and that they all participated in the program. Forty-seven students (26%) put paper in recycling bins, eleven students (18%) collected paper from classrooms and emptied recycling bins, four students (6%) said that they put paper in both re-use and recycling bins. Fifty-two students (84%) said that the paper recycling program in the school was good, mainly because trees and the environment could be saved (18 students or 35%), and because waste paper could be used for recycling (17 students or 33%).

## **APPENDIX 8**

### **PHOTOS ILLUSTRATING ASPECTS OF PAPER RECYCLING IN BANGKOK AND HOBART**



Photo 1: One of the recycling trucks in 'The Recycling Project' in Bangkok provided by the DPC



Photo 2: The recycling bins provided for each school in Phranakorn District under the 'Bangkok Co-operates in Recycling Project'





Photo 3: Younger class at Wat Mahun School in a Phranakorn District  
School shortly after the author's questionnaire session



Photo 4: Examples of craft made from waste paper  
at Wat Makutkasadtrariyaram School





Photo 5: Example of a recycling box in a Hobart area classroom



Photo 6: Grade 5/6 at Bagdad Primary School, north of Hobart





Photo 7: The recycling depot at Sorell Primary school



Photo 8: A re-use and a recycling bin in a classroom  
at Sorell Primary School