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APPENDIX 2A

THE BELGRADE CHARTER
UNESCO-UNEP ENVIRONMENTAL EDUCATION NEWSLETTER
Vol. 1, No. 1 January 1976
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Editor: Joseph Henry

There is no force greater than that of an idea whose time has come.

—Victor Hugo

An historic moment produced an historic document. Adopted unanimously at the close of the 10-day International Environmental Education Workshop at Belgrade, 13-22 October 1975, subject to the evaluation of inevitable change and improvement, the Belgrade Charter has laid down the principles, and established the guidelines for the world-wide environmental education of a generation which spans the earth.

An audience could be more fitting for the first number of Connect, the new medium for the international exchange of information on environmental education.

The Belgrade Charter: A Global Framework for Environmental Education

I. Environmental Situation

Our generation has witnessed unprecedented economic growth and technological progress which, while bringing benefits to many people, have also caused severe social and environmental consequences. Inequality between the poor and the rich among nations and within countries is growing and there is evidence of increasing deterioration of the physical environment in some forms on a worldwide scale. This condition, although primarily caused by a relatively small number of nations, affects all of humanity. 

The recent United Nations Declaration for a New International Economic Order calls for a new concept of development—one which takes into account the satisfaction of the needs and wants of all existing groups, the promotion of justice and of the balance and harmonious place of man within the biosphere and the environment. What is being called for is the eradication of the basic causes of poverty, hunger, illiteracy, pollution, exploitation and injustice. The previous pattern of dealing with these crucial problems on a piecemeal basis is no longer workable.

It is absolutely vital that the world's citizens insist upon measures that will support the kind of economic growth which will not have harmful repercussions on people; that will not in any way diminish their environment and their living conditions. It is necessary to find ways to ensure that no action should grow or develop at the expense of another nation and that the consumption of no individual should be increased at the expense of other individuals. The resources of the world should be developed in ways which will benefit all of humanity and provide the potential for raising the quality of life for everyone.

We need nothing short of a new global ethic—an ethic which espouses attitudes and behaviour for individuals and societies which are consonant with humanity's place within the biosphere; which recognizes and sensitively responds to the complex and ever-changing relationships between humanity and nature and between people. Significant changes must occur in all of the world's nations to assure the kind of rational development which will be guided by this new global ideal—changes which will be directed towards an equitable distribution of the world's resources and more fairly satisfy the needs of all people. This new kind of development will also require the maximum reduction in harmful effects on the environment; the utilization of waste materials for productive purposes, and the design of technologies which will enable such objectives to be achieved. Above all, it will demand the assurance of perpetual peace through cooperation and cooperation among nations with different social systems. Substantial resources for reallocation to meet human needs can be gained through restricting military budgets and reducing competition in the manufacture of arms. Disarmament should be the ultimate goal.

These new approaches in the development and improvement of the environment call for a rethinking of national and regional priorities. Those policies aimed at maximizing economic output without regard to its consequences on society and on the resources available for improving the quality of life must be questioned. Before this changing of priorities can be attained, individuals will themselves need to adjust their own priorities and assume a personal and social commitment to the—both in all of their behavior a commitment to the improvement of the quality of the environment and of life for the world's people.

The reform of educational processes and systems is central to the building of this new development ethic and world economic order. Governments and policymakers can order changes, and new development approaches can begin to improve the world's condition—but all of these are no more than short-term solutions, unless the youth of the world acquires a new kind of education. This will require new and productive relationships between students and teachers, between schools and communities, and between the education system and society at large.

Recommendations 96 of the Stockholm Conference on the Human Environment called for the development of environmental education as one of the most critical elements of an all-out attack on the world's environmental crisis. This new environmental education must be broad based and strongly rooted in the basic problems outlined in the United Nations Declaration on the New International Economic Order.

It is within this context that the foundations must be laid for a world-wide environmental education movement which will make it possible to develop new knowledge and skills, values and attitudes, in a drive towards a better quality of environment and, indeed, towards a higher quality of life for present and future generations living within that environment.

II. Environmental Goal

The goal of environmental education is:

To improve all ecological relationships, including the relationship of humanity with nature and people with each other.

There are, thus, two preliminary objectives:

1. For each nation, according to its culture, to clarify for itself the meaning of such basic concepts as "quality of life" and "human happiness" in the context of the total environment and to develop an extension of the clarification and appreciation to other cultures, beyond one's own national boundaries.

2. To identify which actions will ensure the preservation and improvement of humanity's potentials and develop social and individual well-being in harmony with the biophysical and man-made environment.

C. Environmental Education Goal

The goal of environmental education is:

To develop a world population that is aware of, and concerned about, the environment and its associated social problems, and which has the knowledge, skills, attitudes, motivations and commitment to work individually and collectively toward solutions of current problems and the prevention of new ones.

D. Environmental Education Objectives

The objectives of environmental education are:

1. Awareness: to help individuals and social groups acquire an awareness of and sensitivity to the total environment and its allied problems.

2. Knowledge: to help individuals and social groups acquire basic understanding of the total environment, its associated problems and humanity's critically responsible role in it.

3. Attitudes: to help individuals and social groups acquire social values, certain feeling of concern for the environment and the motivation for actively participating in its protection and improvement.

4. Skills: to help individuals and social groups acquire the skills for solving environmental problems.

5. Evaluation: to help individuals and social groups evaluate environmental measures and education programmes in terms of ecological, political, economic, social, cultural and educational factors.

6. Participation: to help individuals and social groups develop a sense of responsibility and urgency regarding environmental problems to ensure appropriate action to solve them.

E. Audience

The principal audience of environmental education is the general public. Within this frame, the major categories are:

1. The formal education sector: including preschool, primary, secondary and higher education students as well as its teachers and environmental professionals in training and retraining.

2. The non-formal education sector: including youth and adults, individually and collectively, from all segments of the population, such as family, workers, managers and decision-makers, in movement as well as non-environmental fields.

F. Guiding Principles of Environmental Education Programmes

The guiding principles of environmental education are:

1. Environmental education should consider the environment in its entirety—natural and man-made, ecological, political, economic, social, legislative, cultural and ethical.

2. Environmental education should be a continuous life-long process, both in- and out-of-school.

3. Environmental education should be interdisciplinary in its approach.

4. Environmental education should emphasize active participation in the building of an environment.

5. Environmental education should examine major environmental issues from a world point of view, while paying due regard to regional differences.

6. Environmental education should focus on current and future environmental situations.

7. Environmental education should examine all development and growth from an environmental perspective.

8. Environmental education should promote the value and necessity of local, national and international cooperation in the solution of environmental problems.
APPENDIX 4A

A REVIEW OF THE LITERATURE ON SCALING METHODS

Attitude is a psychological variable. The measurement of attitude, therefore, is part of the problem of measurement that exists in the field of psychology. Psychological measurement is usually (but not exclusively) approached through a general class of research methods called scaling. The term 'scaling' refers to procedures for constructing scales for the measurement of psychological variables. Because scales measure attributes that cannot be observed directly, there are two important associated measures - validity, which is a measure of the degree to which the scale measures what it purports to measure, and reliability, which indicates the degree to which a scaling device yields consistent scores. For a more detailed discussion of concepts to do with validity and reliability see Campbell and Fiske (1959) and Oskamp (1977).

The field of psychological measurement is difficult and divided. Several caveats are expressed by major authors to do with the state of the art. Those caveats should be carried into the design and interpretation of any attitude assessment experiment. Dawes (1972) expresses concern about the use of oversimplified methodology.

... simply asking a man whether he supports his president or requiring him to put a check mark on a rating scale does not necessarily result in anything being measured, especially not the man's attitudes.

Scott (1969) points out that when the same attitude is measured by more than one of the many scaling methods
available, correlations of between 0.25 and 0.3 are found. He suggests that this, "reflects acceptable concurrent validity for the measures".

Shaw and Wright (1967) express reservations about the ways in which techniques are being applied.

... far too frequently, the investigator simply asks a few unstandardised (unevaluated) questions and assumes that the attitude has been reliably and validly measured... Scale constructors often seem to ignore the assumptions underlying the scaling method employed and evidence of reliability and validity is frequently lacking and almost always incomplete.

Triandis (1971) concludes;

... in the final analysis it is necessary to employ a variety of methods of measurement, each measuring the same component. In addition some measures at the direct level should be supplemented with measures at the indirect level. It is then possible to employ statistical procedures that separate the effect of the measurement procedure from the content of what is being measured...

These various caveats suggest that there is more to attitude measurement than Likert scales. Attention needs to be given to questions of underlying theory; to the use of more than one method of measurement (and to the correlation between them); and to obtaining measures of validity and reliability.

An attitude is a hypothetical, or latent variable. All attitude measuring techniques involve addressing one or more stimuli to the hypothesised attitude, and measuring the response. Two principal divisions exist in the
field. The first division is methodological; the second is philosophical. The methodological division is between those that advance the so-called direct scaling methods and those that advance the indirect methods. The philosophical division is between those who advocate 'strong' statistics on the grounds that distinction between ordinal and interval data are not significant, and those who use only the 'weak', on the grounds that the distinction is significant.

Indirect methods for the scaling of attitudes were developed first. Most of them derive from two classic papers written by L.L. Thurstone in the late 1920s. They are sometimes called the Thurstonian methods (Thurstone, 1927; Thurstone and Chave, 1929). Their principle is that a limited amount of information is obtained from the respondent—usually just a rank order of stimuli. This information is then subjected to a complex series of mathematical transformations based on assumptions about variability. The resulting scale is 'indirect' because of these transformations. Likert's (1932) 'method of summated ratings' was introduced as a simplification of the Thurstonian methods. Proponents of indirect methods often fail even to consider the existence of direct methods.

There seem to have been few major advances or breakthroughs in techniques of scale construction since the Thurstone and Libert methods were developed (Shaw and Wright, 1967).

The philosophical division in the field of attitude measurement concerns the range of statistical procedures that are permissible with data obtained from scaling experiments. Many scaling procedures (especially
category scales) produce data that is no better than ordinal. According to one argument, this imposes severe limitations upon the manipulations that are permissible, for example, responses may not even be averaged and hence limits the range of inferences that can be drawn from data. Stevens, whose direct scaling methods produce interval scales (or even better – see later), has pointed out the fallacies of using what he considers to be inappropriate statistics (Stevens; 1951, 1959) on ordinal data. He has been answered by arguments that "strong statistics" can handle "weak data" without deformation (see Barker, Hardyck and Petrinovich, 1966) and that even if errors are introduced, they are compensated for by the increased power of parametric methods. Adams, Fagot and Robinson (1965) have taken a middle ground. Their positions, which seem now generally accepted (see Dawes, 1972, p.79) is that all statistical tests are based upon assumptions about the nature of the data – a scale may be transformed in any way that does not change any implication about the empirical system it represents; it may not be transformed in such a way that these implications are changed. Thus, sometimes procedures such as averaging ordinal data will result in semantic nonsense and on other occasions they will not. Each case must be considered on its own logical merits. This paper by Adams et al., will be used to distinguish permissible transformations from nonpermissible transformations throughout the remainder of this study.

A CLASSIFICATION OF SCALING TECHNIQUES
The first problem that faces the would-be attitude measurer is that of finding a rational basis on which to select a scaling method.
Despite the variety of scaling methods, there is no widely recognised classification system. The distinction between direct and indirect methods referred to above is generally accepted, but no widely accepted method of choosing a 'best tool for a given job' exists. However, Coombes (1964) has put forward a useful classification, and this has been extended by Dawes (1972). This classification also serves to introduce the principal scaling methods.

Both Coombes and Dawes draw a basic distinction between what they call representational measurement and index measurement. Both are convinced that there is a fundamental difference. They believe that representational measurement involves establishing a two-way correspondence between some property of the thing being measured and some property of the scale. Representational measurement requires that two conditions be met – first, that the psychological dimension under study is systematic enough for an empirical relational system to be identified, and second, that the person wishing to measure the psychological dimension must develop a numerical system appropriate to the purpose. Representational measurement is therefore rigorous, and it implies a predictive capability in the resulting scale. The scale is derived as a result of observations about the reactions of people to stimuli and it predicts possible future observations either about how similar people will respond to different stimuli or about how different people might respond to similar stimuli. The development of a representational scale will usually involve a methodology that has in-built consistency checks.
Index measurement is the term that Coombes and Dawes use for attitude scales in which present utility, rather than the capacity to predict future judgements, is the key attribute. The relation between the psychological dimension and the scale is a one-way correspondence. Index measurement is clearly less rigorous than representational measurement. The concept of "present utility" requires some expansion. The cost-of-living index is an example of an index measure with "present utility". A measure of cost-of-living changes can be constructed in many different ways (exactly which cost-changes are selected for inclusion; the weightings given to different goods). Our current index has "present utility" in that it is judged by those who must use it to be adequate to the task for which it was constructed. This, in fact, is the essential element in Coombes and Dawes concept of an index measurement.

Their classification system is as follows:

1. REPRESENTATIONAL MEASUREMENT TECHNIQUES
   A) Magnitude techniques
   The magnitude of stimuli is represented by their location on a measurement scale. Both the order of stimuli and the distances between stimuli on the scale reflect judgements about the stimuli.

   (i) Confusion measures (Thurstone and Chave, 1929). These rely on detecting the part of which two stimuli cannot be separated by subject.
   (ii) Direct estimation techniques (Stevens, 1959, 1966, 1968). Compared with the Thurstonian techniques direct estimation is very simple. The methods have in common an approach in which the investigator nominates the property to be studied and specifies this property to the
respondents. He then presents a range of stimuli to his respondents and they assign numbers to the stimuli on the basis of the property.

B) **Proximity techniques**
This group of methods represent psychological proximity as spatial proximity. They do not require that the investigator nominates a particular property of stimulus prior to collecting data. The "type" studies, e.g. Dawes and Cramer (1966) involve explorations of emotional attitudes.

C) **Interlocking techniques**
Interlocking involves the simultaneous ranking of both stimuli and respondents. The basic technique is the Guttman scalogram (Guttman, 1944).

In the development of a scalogram, respondents' reactions to stimuli are used to rank the stimuli hierarchically from most frequently endorsed to least frequently endorsed. The items forming the stimuli are selected and ordered so that individuals who respond positively to a given item will also respond positively to all items of lower rank. The type study (Guttman, 1950) involved measurements of soldiers' fear symptoms in combat situations.

D) **Unfolding techniques**
The purpose of unfolding is again to represent both people and stimuli simultaneously. This time, however, the representation is done in such a way that both are represented in space with the relative distances between various points reflecting the psychological proximity between the various stimuli and people. The technique was developed originally by Coombs (1950).
The term unfolding refers to the concept behind the technique that each person has an 'ideal' position on a stimuli continuum, and that stimuli beyond this ideal position on both sides are less preferred to an equal degree. Unfolding seeks to 'unfold' the less preferred responses, and place the 'not ideal because too much' responses on one side of 'ideal' and the, 'not ideal because too little' responses on the other side. While conceptually simple, the technique is mathematically complex. A type study is that of Golberg and Coombs (1962) on Women's preferences for number of children. The technique has also been extensively used in product development work.

2. TECHNIQUES FOR INDEX MEASUREMENT
A) Rating scales
These methods have in common the fact that the respondent is asked to express an attitude through the selection of one category from a number or through marking a point on a scale. The original scale was that of Likert (1932) which used five categories symmetrical about neutral. Rating scales are the most widely used attitude measuring techniques. According to Dawes (1972, p.96) 60% of the experimental articles published in the Journal of Personality and Social Psychology during 1970 used rating scales. The method has spawned an enormous range of variants.

Analysis of responses on a Likert scale involves the awarding of numbers in some systematic way (e.g. 5, 4, 3, 2, 1); the particular weighting being determined by the 'professional judgement of the researcher'. Rating scale techniques are also referred to as the 'method of summated ratings'.
B) **Semantic differential** (Osgood, Suci and Tannenbaum, 1957)

The semantic differential is also widely used. It is a generalised rating scale that attempts to measure the 'connative meaning' of a concept (i.e. its implied meaning). Studies of the underlying dimensions of attitudes have indicated that most stimuli produce three dimensions: these are evaluation (i.e. good/bad); potency (i.e. strong/weak); and, activity (i.e. active/passive). The typical semantic differential instrument consists of a series of concepts that are each rated on a series of scales reflecting these three psychological dimensions. Its principal advantages are, first, its generality (to a certain extent the same set of scales can be used for almost any concept) and second, the fact that they can be used to evaluate the responses of one person as opposed to a panel (i.e. it can be used in individual as opposed to experimental studies).

C) **The own categories technique** (Sherif and Hovland, 1953)

The own categories technique is similar to Stevens' direct measurement in that most of the scale development work is actually carried out by the respondent. The subject is presented with a number of statements and invited to sort them into a number of piles, such that the statements in each pile 'belong together'. The piles are intended to represent graduations of favourableness or unfavourableness towards a particular issue.

D) **Indirect methods**

In some cases it is possible that any technique devised for assessing an attitude may itself distort the attitude under investigation. The respondent may be conscious of what a particular response reveals about themselves and
bias their answers accordingly. Indirect methods have been developed to glean psychologically meaningful information from responses that the subject is unaware have any meaning. These include measures of pupil-dilation (Hess, 1965); and, error choice (particular answers selected from amongst bogus alternatives in multiple-choice questions) (Hammond, 1948).

THE USE OF CATEGORY SCALES
Rating scales involving the use of several categories are widely used in attitude measurement. One important decision to do with such scales involves the number of categories to be offered. Scales regularly vary from as few, as two to as many as twenty categories. Offering too few limits the use made of respondents powers of discrimination and also reduces the flow of information (Garner and Hake, 1951). Offering too many categories increases variability of responses.

The number of categories
The number of categories that should be included in a rating scale has been investigated in a number of studies. The number of categories has been investigated from two points of view - those of the amount of discrimination provided by the scale and the amount of information transferred through the scale. Garner, 1960, has reviewed these studies and described several experiments aimed at determining the optimum number of scale categories from both points of view. With regard to discrimination, he notes that:

the optimum number of rating categories or at least the number beyond which there will be no further improvement in discrimination, is clearly a function of the discriminability inherent in the
stimuli being rated. Thus there can be no single number of rating categories appropriate to all rating situations.

When investigated from the point of view of information transferred through the rating scale, the optimum number of categories seems to be a function of the immediacy of the stimuli. Bendig and Hughes, 1953, had subjects rate a series of countries for familiarity (the stimuli are remote and in the majority of cases beyond the subjects personal experience). They found no increase in information transfer beyond three categories. Bendig, 1954, had subjects rate preferences for foods (all stimuli were within the subjects past experience, but none were present at the time of rating). Garner, 1960, found that when the task was rating hand-writing samples (which were physically present at the time of rating), that both information transfer and discrimination continued to increase up to one category for each sample.

Thus there is no clear answer to the problem of category number although none of the authors quoted above makes this point about the proximity of stimuli. There does seem to be a rule of thumb apparent in their results. The proximity of stimulus rule of thumb would suggest that a smaller rather than a larger number of categories is appropriate to this study. The proximity of the stimuli in this study varies from the level of those in Bendig and Hughes 1953 study of countries (for which three categories was optimal) to that of Bendigs 1954 study of food (in which no categories were optimal). It should be noted, however, that the difficulty of the task being asked of respondents is somewhat greater in this study. This would suggest a smaller rather than a larger number of categories.
The last word should be given to Garner:

and as a last statement, it is clear that information transmission cannot be lost by increasing the number of rating categories. Therefore it is better to err on the side of having too many categories than err by having too few.
APPENDIX 4B

SOCIAL SURVEY INSTRUMENTS
1. A STATEMENT ON WHAT WE MEAN BY ENVIRONMENTAL EDUCATION

The opinions that you express in this survey will be used during a review of environmental education programs. It is important, therefore, that you begin with an understanding of what we mean by environmental education.

We have decided to base our study on this statement:

"Environmental education aims to produce a society that is knowledgeable concerning the total environment and its associated problems, aware of how to help solve these problems, and motivated to work towards their solution.

The major objectives of environmental education are to lead young people towards:

1. A clear understanding that all people are inseparable parts of a system, consisting of humans, culture, our social system, our economic system, and the total environment (both built and natural).

2. A broad understanding of the environment, both natural and man-made, and the ways in which it contributes to our society.

3. A fundamental understanding of the environmental problems confronting us, how these problems can be solved, and the need for all New Zealanders to work towards their solution.

4. A concern for environmental quality that will motivate people to find solutions for existing problems and to prevent new ones arising."

Before we go on, notice that by this definition we suggest that environmental education:

- involves learning about biological, physical, social, economic, cultural and aesthetic environments; and,

- is centred on practical issues and problems facing students and their society.

WE WANT YOUR HELP IN IDENTIFYING THOSE "PRACTICAL ISSUES AND PROBLEMS" FACING STUDENTS AND THEIR SOCIETY

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2. ISSUES AND PROBLEMS FACING NEW ZEALAND

One important part of environmental education involves introducing students to the environmental issues and problems facing them, and then encouraging the development of the commitment and skills needed to find solutions. Before teachers can do this, they must be given some consensus about what environmental issues face New Zealand.

Here is what we would like you to do:

Please list issues (practical issues and problems facing our society) that concern you and that, in your opinion, both:

- face New Zealand now (or are likely to do so in the lifetime of the next generation); and that,
- fall within the scope of the statement on environmental education written on the last page.

There is space for an optional comment after each issue. Please note that we are seeking your opinions about issues that arise both within New Zealand and also beyond New Zealand.

Example

<table>
<thead>
<tr>
<th>Issue</th>
<th>N.Z. has many endangered species that will require careful management if they are to be protected from extinction.</th>
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<td>Optional Comment</td>
<td>Species should be protected from extinction because they represent irreplaceable genetic diversity. Management of endangered species may require economic sacrifice.</td>
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Explanation of Example

This respondent has offered a statement on endangered species as an issue that he/she believes faces New Zealand now (or will do so within the lifetime of the next generation) and also falls within the scope of the statement on environmental education. The respondent has commented on why this belief is held, and noted that the management of endangered species has economic implications.

Please record your contributions on the pages provided for this purpose.
Please return post this part by Friday 20th June.
3. NAMES OF PEOPLE WHO MIGHT SERVE AS MEMBERS OF A REVIEW PANEL

The second stage of our study will involve placing the collated results of this survey before a larger panel of New Zealand citizens. They will be asked to react to each of the proposed issues.

Please provide the names and addresses of people currently living within New Zealand, who, in your opinion both:

- have shown an interest in, and concern for, the New Zealand environment;
- and,
- are well placed as a result of interest, training or occupation, to make informed judgements about a range of environmental issues.

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(Continue on back of page if necessary)
4. FINALLY....

Thank you for the time and judgement that you have used in completing this survey. You have contributed to a serious attempt to get a clear, consensus view of the range and relative importance of environmental issues facing New Zealand.

We believe that your contribution is an important one.

Please:

- briefly review your lists of issues and people, and record any last thoughts that you might have, then:

- place your responses into the envelope provided and post it before Friday 20th June. This date is important: we are working to a deadline.

Please tick one box below if you would like to take part in the second stage of this study, and the other if you would like a one-page summary of the final results.

YES - I will take part in 2nd stage  ☐ YES - I would like a summary of results ☐

The remainder of this page is available for you to make any general comments about the study or this survey.

Once again, thank you for your co-operation.
This booklet contains a number of statements describing problems that face New Zealand. The booklet was compiled from contributions made by expert New Zealanders throughout the country.

**TASK ONE: NATIONAL IMPORTANCE TO NEXT GENERATION**

I would like you to judge THE NATIONAL IMPORTANCE OF EACH PROBLEM TO THE NEXT GENERATION of New Zealanders.

You make your judgments by giving a number to each statement to indicate how important you believe that problem will be to the next generation. You may use any numbers that you wish, but use numbers so that they are proportional to national importance. For example, if you gave the first problem a score of 10, and if you then judged the second problem to have twice the national importance of the first, you would give it 20. But, if you judged the second problem to have only \( \frac{1}{2} \) as much national importance as the first problem, you would give it 5. Use a zero if you think that a problem is totally without national importance to the next generation.

Once you have scored the first few problems, you will find this scaling method to be both quick and effective.

A few hints before you begin: your answers will be of greatest value if you complete the booklet in one sitting. Get into a rhythm, look neither forward nor back and don't spend too much time on any one issue. Your first reaction is likely to be the best.

Thank you for your valuable help with this research program.

---

The use of both alcohol and drugs continues to increase in New Zealand. A number of problems appear to be strongly associated with alcohol use. These include marriage problems, road accidents, violent crimes and job failures. As the use of alcohol increases, so these problems increase also. Problems caused by the use of alcohol and drugs affect young people and Maoris more than they affect others. The social conditions that promote the use of alcohol and drugs appear to be increasing.

**Subject:** use of alcohol and drugs.

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**Scale 1**

Your rating for this problem

\[ \square \]

\[ \text{GO ON: DON'T LOOK BACK} \]
This booklet contains a number of statements describing problems that face New Zealand. The booklet was compiled from contributions made by expert New Zealanders throughout the country.

**TASK ONE: NATIONAL IMPORTANCE TO NEXT GENERATION**

I would like you to judge the national importance of each problem to the next generation of New Zealanders. You make your judgments by placing a tick in one of the boxes in the scale at the bottom of each page. If you think that a problem is in the "lowest category of national importance", tick box 1. If you think a problem lies in the "highest category of national importance", tick box 9. Remember that you are judging importance to the next generation.

A few hints before you begin: your answers will be of greatest value if you complete the booklet in one sitting. Get into a rhythm, look neither forward nor back and don't spent too much time on any one issue. Your first reaction is likely to be the best.

Thank you for your valuable help with this research program.

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The use of both alcohol and drugs continues to increase in New Zealand. A number of problems appear to be strongly associated with alcohol use. These include marriage problems, road accidents, violent crimes and job failures. As the use of alcohol increases, so these problems increase also. Problems caused by the use of alcohol and drugs affect young people and Maoris more than they affect others. The social conditions that promote the use of alcohol and drugs appear to be increasing.

Subject: use of alcohol and drugs.

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**Scale 1**

| Important | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1
|-----------|---|---|---|---|---|---|---|---|---

[GO ON: DON'T LOOK BACK]
APPENDIX 4C

THE 46 PROBLEM STATEMENTS

Appendix 4C is set out as follows: Each page presents two problem statements as they emerged from content analysis together with the round two responses to them. The graph below each statement provides a visual indication of the variance in round two data.

Numerical results:
RANK ON MAGNITUDE SCALE means rank on a scale of national importance constructed from magnitude scale data.
POSITION ON MAGNITUDE SCALE percentage of distance from bottom of scale.
RANK ON CATEGORY SCALE rank on a scale of national importance constructed from category scale responses.
MEAN CATEGORY SCORE arithmetic mean score awarded to issue on category scale response.
Collecting shellfish and other edible marine species was once a feature of New Zealand life. Shellfish, especially, are traditional foods of our Maori people. Some species such as paua, whitebait, crayfish, tuatua and scallops are now scarce because of over-exploitation. Others, such as mussel beds in some areas, have been polluted by sewage and are no longer fit for consumption.

National importance scales

<table>
<thead>
<tr>
<th></th>
<th>Rank on magnitude scale</th>
<th>Position on magnitude scale</th>
<th>Rank on category scale</th>
<th>Mean category score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Collecting shellfish</td>
<td>39</td>
<td>22.3</td>
<td>42</td>
<td>5.6</td>
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</tbody>
</table>

Seven out of the eleven types of whales that are hunted commercially are now endangered species. The Riscayan Right is extinct, and the Blue Whale is close to extinction. The International Whaling Commission (IWC) was set up to limit exploitation but it has not been effective. Japan and Russia together take 90% of whales caught. Pirate whaling on behalf of Japanese companies is increasing. New Zealand opposes whaling but awards sizeable fish quotas to both Japan and Russia.

National importance scales

<table>
<thead>
<tr>
<th></th>
<th>Rank on magnitude scale</th>
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<tbody>
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<td>Whaling</td>
<td>44</td>
<td>6.27</td>
<td>44</td>
<td>5.54</td>
</tr>
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</table>
Short title: the need for a new philosophy.

Statement:

Like all other developed countries, New Zealand must find new ways of working and thinking that are in harmony with biological and physical processes. The many problems that confront us in the social, resource and environmental areas are symptoms of an increasing degree of failure of the basic philosophy that determines our priorities and actions. These symptoms will not be cured until the underlying weakness of philosophy is recognised and remedied.

National importance scales

<table>
<thead>
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<td>Position on magnitude scale: 82.2</td>
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<tr>
<td>Rank on category scale: 9</td>
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<tr>
<td>Mean category score: 7.26</td>
</tr>
</tbody>
</table>

Computer code: POPCRASH

Short title: world population growth and earth's carrying capacity.

Statement:

The human population continues to grow and may have exceeded already the long-term carrying capacity of the earth. While the rate of increase appears to be slowing, it seems unlikely that our human population will stabilise below 10 billion. As population size increases, the intensity of land-use also increases, and soils become damaged by over-use. Soils are being lost by erosion and desertification, and depleted by excessive cropping. Thus as our population size is increasing, food-growing capacity is declining.

National importance scales

<table>
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<tr>
<td>Rank on category scale: 14</td>
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<tr>
<td>Mean category score: 6.93</td>
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</tbody>
</table>
Short title: depletion of global fossil fuels.

Statement: All societies face the problem of depletion of the world's fossil fuels. While much of the earth's coal remains unused (most of it in Russia), most of the natural gas and much of the high quality, easily-obtained oil has been used. Since energy must be used in the production of all resources, the supplies of all resources will follow the trend in energy availability. The resulting downrun in global resource supplies may limit economic growth, worsen the situation of less developed countries and increase the number of countries opting for nuclear power. Political problems, both within and between nations, may intensify as fuel stocks give out.

National importance scales
Rank on magnitude scale: 10
Position on magnitude scale: 70.5
Rank on category scale: 16
Mean category score: 6.77

Short title: noxious animals.

Statement: New Zealand plants evolved in the absence of grazing mammals. As a result, introduced grazers such as deer, wapiti and opossum have caused much damage. In some areas, certain forest plants have been eaten out. This loss of forest plant types may threaten the long-term survival of forest systems. Some people believe that commercial use of noxious animals makes eradication much more difficult.

National importance scales
Rank on magnitude scale: 45
Position on magnitude scale: 4.48
Rank on category scale: 45
Mean category score: 5.07
Economic values are too widely used in determining goals for our society. The use of economic cost/benefit analysis as the key method of decision-making has under-valued social and environmental goals. There is a need to recognize the values of non-economic goals and, if necessary, to be ready to make economic sacrifices to reach them.

National importance scales

<table>
<thead>
<tr>
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</tr>
</thead>
<tbody>
<tr>
<td>11</td>
<td>70.3</td>
<td>12</td>
<td>7.13</td>
</tr>
</tbody>
</table>

Personal and financial progress in New Zealand society is easiest for people who are both European and male. People who are non-European or non-male find it harder to make progress. Those who are neither European or male find it hardest of all. Much of our society reflects the strengths and weaknesses of the middle-class, middle-aged European male: it is competitive, tightly-regulated, centered around economic pursuits and lacking in social vision.

National importance scales

<table>
<thead>
<tr>
<th>Rank on magnitude scale</th>
<th>Position on magnitude scale</th>
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<tbody>
<tr>
<td>25</td>
<td>38.1</td>
<td>23</td>
<td>6.10</td>
</tr>
</tbody>
</table>
Aesthetic aspects of the New Zealand environment need more attention. In the countryside there has been a loss of natural landscape quality as land has been developed. The poor visual quality of land in private ownership is a particular problem. Subdivision is rarely done according to the limitations and suitabilities of the land. In the urban environment, especially, good aesthetic qualities may be necessary for psychological well-being.

National importance scales

<table>
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The export of non-renewable resources from New Zealand may not be in our best interests. Resource exporting provides only limited economic benefits. The processing of the resource, which provides jobs and adds considerable value, is lost to other societies. By depleting our resource-base, exporting also reduces the number of options open to future generations of New Zealanders.

National importance scales

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</table>
New Zealand planners have not paid enough attention to the design of urban environments. The design and management of cities should take into account the needs of good mental, physical and social health. Some design problems of our cities include: no effective control of noise; lack of aesthetic qualities; lack of character; air pollution; high crime rates; and very high transport-energy demand.

National importance scales

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<thead>
<tr>
<th></th>
<th>Rank on magnitude scale</th>
<th>Position on magnitude scale</th>
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<tbody>
<tr>
<td>Distribution on category scales</td>
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</table>

Computer code: TRANSITN

Like most Western societies, the New Zealand system is not sustainable in its present form. The continuation of our present system depends upon a continuous throughput of resources, most of which are non-renewable and must eventually be used up. Thus all developed nations face a transition to sustainable human systems based on renewable resources and the continuous recycling of non-renewable resources, all powered by renewable energy sources alone.

National importance scales

<table>
<thead>
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<tbody>
<tr>
<td>Distribution on category scales</td>
<td></td>
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<td></td>
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</tbody>
</table>
Statement:

The division of the earth's resources between nations is unequal. Some nations have more than they want, others less than they need. Some human societies exist in perpetual poverty. The unequal division is brought about by a global economic order that channels most of the world's resources to the societies with the most money, thus enabling them to generate the most wealth. This international order does not provide for the satisfaction of the needs of all societies.

National importance scales

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<tr>
<td>Rank on category scale: 13</td>
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<tr>
<td>Mean category score: 7.03</td>
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</tbody>
</table>

Statement:

The towns and villages that service New Zealand's farming areas are suffering a steady population loss. As people leave, services such as schools, hospitals, shops and places of entertainment tend to follow. This loss of people is self-accelerating as impoverished services and lack of job opportunities encourage more people to leave. It may also increase the costs of farming and thereby reduce farm profitability, investment and productivity.

National importance scales

<table>
<thead>
<tr>
<th>National importance scales</th>
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<tr>
<td>Rank on category scale: 31</td>
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</table>
Short title: nuclear war.

Statement:

A nuclear war, should it occur, would have a number of environmental and social consequences for New Zealand and the world. The destruction caused by nuclear weapons would create massive environmental and social damage in targeted countries. Radiation release would affect life-forms, perhaps globally. Even if not targeted, New Zealand would suffer considerable social dislocation due to our high dependence on trade with Northern hemisphere countries. The number of countries with nuclear weapons capability is likely to increase in the future as nuclear power is substituted for fossil fuels.

National importance scales

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<td>4</td>
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<td>Mean category score:</td>
<td>7.54</td>
</tr>
</tbody>
</table>

Short title: spreading global commitment to nuclear energy.

Statement:

The global use of nuclear power is likely to increase considerably as fossil fuels become less available. This increase may cause problems for New Zealand, whether or not we have our own nuclear program. Radiation can be released to the global environment through routine or accidental emission from power stations and through the disposal of nuclear waste. Countries with waste-disposal problems may see the sparsely-inhabited South Pacific-Antarctic regions as the best place to establish an international nuclear waste dump. Nuclear energy brings to a country the technical capacity to build nuclear weapons.

National importance scales

<table>
<thead>
<tr>
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<td>7.44</td>
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</table>
Short title: floods and erosion due to incorrect land use.

Statement:

New Zealand has a history of land developments in which the principles governing the runoff of rainwater have often been ignored. Some forms of land development and use may cause floods to be more severe and occur more often. Lack of attention to hydrology may also contribute to erosion which can limit primary production and result in unwanted debris in downstream rivers.

National importance scales

<table>
<thead>
<tr>
<th>Rank on magnitude scale</th>
<th>Position on magnitude scale</th>
<th>Rank on category scale</th>
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</thead>
<tbody>
<tr>
<td>27</td>
<td>37.5</td>
<td>38</td>
<td>5.81</td>
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Computer code: BADMANGT

Short title: bad decisions on the management of New Zealand's resources

Statement:

Recent New Zealand governments have made a number of bad decisions on matters involving the management of New Zealand's resources. In some cases, these bad decisions have been made despite advice from expert New Zealanders outside Government that the proposed course of action was wrong. Recent examples include: the over-supply of electricity, the ammonia-urea plant, the allocation of electricity to a second aluminium smelter and the Health Department computer.

National importance scales

<table>
<thead>
<tr>
<th>Rank on magnitude scale</th>
<th>Position on magnitude scale</th>
<th>Rank on category scale</th>
<th>Mean category score</th>
</tr>
</thead>
<tbody>
<tr>
<td>9</td>
<td>72.1</td>
<td>7</td>
<td>7.34</td>
</tr>
</tbody>
</table>

345
Short title: wasteful packaging.

Statement:

In a world that is short of resources we should restrain the use of elaborate packages. They often serve only to draw attention to the product. The use of non-biodegradable packages, such as aluminium beverage cans and plastic bottles, is increasing. They cost energy and materials to produce; they increase the price of the goods; and they increase the waste-disposal problem. Simple, recyclable packaging does the same job.

National importance scales

<table>
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<td>Position on magnitude scale:</td>
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<tr>
<td>Rank on category scale:</td>
<td>35</td>
</tr>
<tr>
<td>Mean category score:</td>
<td>5.90</td>
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</tbody>
</table>

Short title: too-rapid development of hydro-electricity.

Statement:

The development of New Zealand's hydro-electric resources has been too rapid. We now have an oversupply of electricity, which represents the investment of $600 million more than was necessary in hydro-electric schemes. This increases the cost of electricity to small industries and domestic users. Other costs are also higher than they need be - the loss of wild river valleys with scenic and recreational potential, and the loss of productive land. Despite the oversupply, the still illegal Clutha scheme continues.

National importance scales

<table>
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<tr>
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<td>36</td>
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</tbody>
</table>
Statement:

The smelting of aluminium in New Zealand represents poor use of our energy and financial resources. The Bluff smelter uses 20% of national electricity production. The financial and environmental costs to New Zealand of providing this electricity are not adequately repaid, either in jobs or money. The building of a second smelter will commit a total of 40% of New Zealand's electricity to aluminium production, which represents an investment of New Zealand capital of more than $2000 million. The second smelter is likely to return benefits no greater than those from the first.

National importance scales

<table>
<thead>
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<td>18</td>
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<tr>
<td>Mean category score:</td>
<td>6.71</td>
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</tbody>
</table>

Statement:

New Zealand has one of the highest petrol-lead levels in the world. We now have evidence suggesting that environmental lead levels affect the health of children. Those with high body lead-levels are aggressive and hyperactive. Atmospheric lead, from the burning of leaded petrol, is a major source of environmental lead.
Computer code: DISEASE

Short title: effect of chemicals in the human environment.

Statement:

Some human diseases may be caused by chemical substances in the human environment. Examples may be cancer and spina bifida. Proof of causality is difficult to find because the disease may not appear until some time after exposure. Also, a number of chemicals may act together to trigger some diseases. Today's young New Zealanders have been exposed to more chemicals, in higher concentrations, than any previous generation.

National importance scales

<table>
<thead>
<tr>
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<tbody>
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<tr>
<td>Mean category score:</td>
<td>6.67</td>
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</table>

Computer code: YUM245T

Short title: use of chemicals in agriculture.

Statement:

New Zealand agriculture and horticulture have developed management practices that involve the use of large quantities of pesticides, herbicides and fertilisers. These practices may not be sustainable in the long-term. They may also have a number of unwanted consequences. They may: leave harmful residues in food; damage soils; add to the eutrophic pollution of lakes and rivers; and destroy the habitat of native species. The use of herbicides in hill-country farm development may reduce watershed protection. All of these effects are potentially more serious when application is by air. Management practices that use fewer chemicals are available.

National importance scales

<table>
<thead>
<tr>
<th>Rank on magnitude scale:</th>
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<td>21</td>
</tr>
<tr>
<td>Mean category score:</td>
<td>6.63</td>
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</tbody>
</table>
Short title: freedom of information

Statement:

Government decisions on social and environmental matters are made on behalf of the public and should be based on information that is available to the public. If the information on which decisions are based is not released to the public, bad decisions may go unchallenged. Freedom of information is necessary if an informed public is to examine and accept government decisions.

National importance scales

- Rank on magnitude scale: 3
- Position on magnitude scale: 93.4
- Rank on category scale: 1
- Mean category score: 7.86

Short title: recycling of urban rubbish

Statement:

Our society uses its rubbish wastefully. Much urban waste is capable of being recycled - paper, plastics, glass and metal can be extracted and re-used. Organic matter can be composted. Because we do not recycle rubbish, our use of energy and resources are high and we have an increasing problem with the disposal of high volumes of urban rubbish.

National importance scales

- Rank on magnitude scale: 31
- Position on magnitude scale: 34.3
- Rank on category scale: 28
- Mean category score: 6.10
Statement:

Procedures for the control of water quality are lacking in New Zealand. As a result, water pollution is a problem in some areas. The dumping of sewage and industrial waste-water are the main causes. Coastal waters and estuaries are the main casualties. Problems include: the fouling of beaches with sewage; infected shellfish; eutrophic pollution of estuaries and rivers; and the spread of human diseases.

National importance scales

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<tr>
<td>Mean category score:</td>
<td>6.5</td>
</tr>
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Computer code: UTROFIC

Short title: eutrophic pollution of central North Island lakes.

Statement:

A number of central North Island lakes are showing the effects of eutrophic pollution. Nutrients from sewage and run-off from fertilised farmland are causing ecological changes in these lakes. These changes include dense growth or water-weed and scums of poisonous algae. Water-weed cast up on the shore creates a nuisance.

National importance scales

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<tr>
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<td>5.61</td>
</tr>
</tbody>
</table>
Short title: lack of self-sufficiency in energy and resources.

Statement:

New Zealand has a narrow resource base. We must buy many raw materials and much of our energy on international markets. The international availability of energy and resources is declining. Some resources are running out. Others are rapidly increasing in price as controlling countries no longer sell them cheaply. At the same time, our international purchasing power is declining. Maintaining supplies of liquid fuels and phosphates, in particular, may prove increasingly difficult in the future.

National importance scales

| Rank on magnitude scale: | 16 |
| Position on magnitude scale: | 63.8 |
| Rank on category scale: | 22 |
| Mean category score: | 6.57 |

Short title: the need for a national conservation policy.

Statement:

New Zealand has no policy of setting aside for permanent protection representative areas of all natural systems. The intensive use of land in New Zealand has caused the removal of much of the original biota. One result of this has been the extinction - or near extinction - of a number of native plants and animals. Some native forests, grasslands and wetlands have been reduced to small pockets. If development of remaining pockets of unused land continues, the cost in lost species and systems may be high.

National importance scales

| Rank on magnitude scale: | 15 |
| Position on magnitude scale: | 65.2 |
| Rank on category scale: | 8 |
| Mean category score: | 7.27 |
Short title: bad management of private land.

Statement:

Private land is sometimes badly managed, and when it is, the result can be the permanent loss of land values. Bad management practices include: the clearing of marginal land for grazing, which results in erosion; over-grazing, which results in loss of long-term productivity; the removal of remaining pockets of native forest; high levels of herbicide and fertiliser use; and a lack of understanding of the important visual qualities of landscapes. Poor management of land can deplete our land resources.

National importance scales

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<th>Rank on magnitude scale</th>
<th>Position on magnitude scale</th>
<th>Rank on category scale</th>
<th>Mean category score</th>
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<tbody>
<tr>
<td>Computer code:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>KEEPOUT</td>
<td>38</td>
<td>26.2</td>
<td>38</td>
<td>5.97</td>
</tr>
</tbody>
</table>

Computer code: RAPIDLOS

Short title: loss of wild and scenic rivers.

Statement:

New Zealand's wild and scenic rivers are steadily disappearing under hydro-electric lakes. The scenic and recreational qualities of wild rivers have not been valued highly in the past. Preserving stretches of wild water for scenery or recreational use will mean restraining some future hydro-electric development plans.

National importance scales

<table>
<thead>
<tr>
<th></th>
<th>Rank on magnitude scale</th>
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<th>Rank on category scale</th>
<th>Mean category score</th>
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<tr>
<td>Computer code:</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>RAPIDLOS</td>
<td>29</td>
<td>35.1</td>
<td>27</td>
<td>6.26</td>
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</tbody>
</table>
New Zealand's wetlands (swamps and estuaries) are rapidly disappearing. They are being drained and converted to (often very productive) farm land. In these conversions other values of wetlands are not being recognised. Wetlands have ecological value in that they are places where many fish must go through early stages of their life-cycles, and where migrating birds must feed for a period of time. Estuaries may also have value for recreation or as natural pollution-absorbing systems.

Maoritanga does not have mana in New Zealand. For Maori people the dominant feature of the social environment is the pakeha culture. Pakeha culture places low value on things that are Maori. Some Maoris accept this and either become "culturally pakeha", or accept the low status that being Maori has in New Zealand. Others reject the pakeha value system, which may bring them into conflict with society.
Computer code: C2H5OH

Short title: use of alcohol and drugs.

Statement:

The use of both alcohol and drugs continues to increase in New Zealand. A number of problems appear to be strongly associated with alcohol use. These include marriage problems, road accidents, violent crimes and job failures. As the use of alcohol increases, so these problems increase also. Problems caused by the use of alcohol and drugs affect young people and Maoris more than they affect others. The social conditions that promote the use of alcohol and drugs appear to be increasing.

National importance scales

<table>
<thead>
<tr>
<th>Issue number</th>
<th>35</th>
</tr>
</thead>
</table>

| Rank on magnitude scale: | 19 |
| Position on magnitude scale: | 50.1 |
| Rank on category scale: | 25 |
| Mean category score: | 6.47 |

Computer code: COASTUSE

Short title: planning for the use of coastal areas.

Statement:

The development of coastal areas for housing is proceeding rapidly in some parts of New Zealand. Our present methods of planning for the use of coastlines are not coping. In some areas unmodified coastline has almost disappeared. In other places, public access to recreational areas has been lost. Sewage pollution is a problem in some areas. There is a lack of understanding of physical processes in coastal systems, especially among planners and developers. Natural coastline movements, or sudden changes caused by thoughtless development, can be very expensive.

National importance scales

<table>
<thead>
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<th>Issue number</th>
<th>36</th>
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</table>

| Rank on magnitude scale: | 21 |
| Position on magnitude scale: | 44.0 |
| Rank on category scale: | 32 |
| Mean category score: | 6.0 |
Tropical forests are being harvested at an increasing rate. In most cases, harvesting is by clearfelling and the forests are replaced by agricultural systems. Some forest species have disappeared before they have been described or their importance determined. Tropical forests are believed to play a key role in maintaining stable carbon dioxide levels in the atmosphere. If this is correct, then tropical forests must be maintained at a level that will preserve the stability of the biosphere.

National importance scales

- Rank on magnitude scale: 18
- Position on magnitude scale: 53.5
- Rank on category scale: 15
- Mean category score: 6.81

The central North Island rainforests of Pureora, Waihaha and Whirinaki are the most endangered of our forest systems. They are valued because the trees are unique to New Zealand; because they are the sole habitat of a number of native birds (including the endangered Kokako), and because of the aesthetic value of individual 1000 year-old tree specimens. They cause concern because only small areas remain; because harvesting continues with selective logging practices that may cause permanent damage; and because the reserve areas may be too small to ensure the survival of the forest system.

National importance scales

- Rank on magnitude scale: 22
- Position on magnitude scale: 44.0
- Rank on category scale: 19
- Mean category score: 6.70
Short title: our lack of identity and purpose.

Statement:

New Zealand society has no clear national identity or sense of purpose. We do not understand and appreciate the things that are uniquely ours, like native plants and animals, and Maori culture. We plant exotic trees rather than native trees for landscaping and erosion control. Our children know more about the Platypus and Koala than they do about Kokako and Takahe and "home" means England to some of us. As a society, we are not yet sure of who we are or where we are going.

National importance scales

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Computer code: EDUCATE

Short title: the need for environmental education.

Statement:

Our education system should prepare young New Zealanders for the problems that their generation will meet. The children now in our schools must take their place as informed citizens in a society that faces increasingly complex decisions in social-resource-environmental areas. Higher levels of understanding and problem-solving skill among citizens will be needed in the future. Education in these areas should aim at producing individuals who are capable of taking action on issues that face their society.

National importance scales

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Computer code: NATPARKS

Short title: protection and extension of national parks.

Statement:

Our national parks need legislative protection from exploitation. New national parks should be created which include outstanding lowland landscapes and biota. National parks are set aside to conserve outstanding areas for future generations. Existing parks are nearly all in mountainous areas, and even they do not have unequivocal legislative protection against mining and other commercial uses under the National Development Act.

National importance scales

| Rank on magnitude scale: 25 |
| Position on magnitude scale: 38.1 |
| Rank on category scale: 23 |
| Mean category score: 6.54 |

Distribution on category scales

---

Computer code: DOLECUE

Short title: unemployment.

Statement:

Unemployment is both personally and socially costly. At a personal level unemployment causes a loss of commitment and a sense of "social place". Socially, the costs may include increases in: the use of alcohol and drugs; crime rates; suicide rates; and racial tension. Unemployment affects young people and Maoris more than it affects others. Unemployment seems likely to increase in the future, as a period of economic stagnation coincides with the introduction of manufacturing technology that reduces employment opportunities.

National importance scales

| Rank on magnitude scale: 4 |
| Position on magnitude scale: 89.3 |
| Rank on category scale: 3 |
| Mean category score: 7.59 |

Distribution on category scales
Statement: If New Zealand is to be a bicultural society then it must be a bilingual society. Maori language is an essential ingredient of Maoritanga. Maori language should be taught in our schools and spoken in our parliament and courts. To accept Maori culture we must, as a society, accept Maori language.

National importance scales

- Rank on magnitude scale: 46
- Position on magnitude scale: 0
- Rank on category scale: 46
- Mean category score: 4.73

Statement: Present trends in fertility, emigration and immigration suggest that New Zealand may face population problems in the future. For the next 20 years or so, the key problem will be one of providing an increasing number of jobs each year, as children leave our schools and enter the workforce. During this period the ratio of workers to dependants (children and pensioners) will steadily improve. Thereafter, the problem becomes one of an increasing number of old people and a decreasing number of workers.

National importance scales

- Rank on magnitude scale: 36
- Position on magnitude scale: 31.1
- Rank on category scale: 41
- Mean category score: 5.67
Short title: confrontation over Maori land.

Statement: The basic issues that have caused confrontations between Maori and Pakeha authority over Maori land have not yet been settled. Some land claimed by Maoris is still held by others, and any Maori land may be taken by the Crown under a number of acts of parliament. Tracts of Maori land may span several borough councils, each of which can impose a different set of conditions on land use. Maori landowners may be prevented from developing their land on the grounds that it carries irreplaceable remnants of native forest. Maoris want the right to hold, and use (or not use), land that is legally theirs in ways that are determined by Maoritanga, not by Pakeha ideas of land use.

National importance scales

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Short title: the distribution of resources within our society.

Statement: There is a sizeable group of people in New Zealand who are poor in the sense that they live under conditions that most of us would regard as being below an acceptable standard for our society. These people suffer deprivations that include: inadequate housing, clothing and nutrition; and poor standards of health and dental care. Poverty is more common among larger families, and three times more common among Maoris, than in the population at large. Poverty may contribute to domestic violence, marriage breakdown, the use of alcohol, racial tension and crime. New Zealand society generates enough wealth for all to have and adequate standard of living.

National importance scales

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APPENDIX 4D

A REVIEW OF THE LITERATURE ON FACTOR ANALYSIS

The following review of factor analysis methodology is based on the works of Cattell (1978), Harman (1967), Guerin and Bailey (1970) and Kim (1975). Harman (1967) and Cattell (1978) are regarded as the "standard works". Harman's work is heavily mathematical and his interest is in statistical methodology. Cattell, on the other hand, is more empirical in his approach. His principal interest lies in applications. Because several of my experiences with factor analysis confirm Cattell's rather firm opinions about how things should be done, this review is based principally upon his work.

Factor analysis is one member of a family of statistical procedures called CORAN (multivariate correlational analysis). Cattell recognises three main models (approaches) within this group:

- cluster analysis;
- principal components analysis; and,
- common factor analysis.

All of these methods have in common the capacity to reduce data from many variables to a few. To Cattell, factor analysis is the "reigning queen" of the multivariate statistical procedures.

Factor analysis seeks an underlying pattern of relationships in a set of variables. The underlying pattern is expressed as a small number of constructs (common factors) that can explain, or even substitute for, the much larger number of variables. Each of the constructs extracted from the data set is built out of
variance held in common by several (but not necessarily all) of the variables in the set. Thus the purpose of factor analysis is to find a new set of variables (the factors), fewer in number than the original variables, which together express that which is common among the original variables. The unique parts of the variables (the variance that each variable holds to itself alone) take no part in factor analysis.

THE KEY STEPS IN A FACTOR ANALYSIS
A typical factor analysis consists of five steps:

- the preparation of an intercorrelation matrix;
- determining the community (proportion of variance shared with other variables) of each variable;
- the extraction of initial factors;
- determining the number of "true" factors; and,
- rotation of the true factors to simple structure.

Different methods exist for each of these component processes, except the first. Thus the term "factor analysis" covers a wide variety of methodological packages. Unfortunately, the answer obtained from the analysis can depend upon the combination of sub-methods chosen. While most outcomes have some meaning (some are absurd), the utility of factor analysis depends very much upon finding a package of methods capable of yielding the elusive "best answer" that Thurstone calls "simple structure" (Thurstone, 1947).

THE PREPARATION OF A CORRELATION MATRIX
A correlation matrix, in which each variable is correlated with every other variable, is necessary for the determination of communalties. Factor analysis
rests on the fundamental assumption that the variance associated with each variable is composed of three parts:

- variance held in common with some other variables in the set, as a result of the influence of some underlying determiner;
- variance that is unique to that variable stemming from its unique nature; and,
- error variance (also unique) as a result of the measurement process.

Common variance (communalities) are the "stuff" of which common factors are composed. The communality of a variable is expressed in its intercorrelations with the other n-1 variables in the set. Thus factor analysis begins with the preparation of an "n x n" correlation matrix.

**ESTIMATING COMMUNALITY AND ITS RELATIONSHIP TO THE NUMBER OF FACTORS**

Unfortunately, no direct mathematical method exists that can tease out the common from the total variance. Common variance must be estimated, and for reasons that will become clear later, the correctness of the factor analysis depends very much upon the correctness of the communality estimates. This is the central problem of factor analysis, "the problem of communality" (Harman, 1967).

Common ways of estimating communalities include:

- the highest correlation value associated with a given variable (excluding the main-diagonal value of 1) (Harman, 1967); which may be modified downwards by an empirical rule (Cattell, 1978); and,
- the squared multiple correlation (smc) of each variable. This produces an estimate that can be demonstrated to be the lower bound of the communality. This estimate is favoured by Harman (1967).

The critical significance of communality estimates lies in the relationship between estimates made and the number of factors extracted from the correlation matrix. Cattell states:

Let us first reiterate the principle that the number of factors one extracts and the size of the communalities one settles for are organically mutually dependent. (p.73)

Overestimates of communalities will lead to the extraction of too many factors, or overfactoring. Underestimates will lead to underfactoring. Both under and overfactoring are sources of serious error in the rotation phase. Underfactoring is more serious than overfactoring (Cattell, 1978), but both can be fatal. Underfactoring leaves out of the rotation process important common variance carried by the rejected factors. It also results in spuriously high loadings deriving from the factors retained in rotation. Overfactoring leads to fission of the true factors and to the contamination of the final solution by error variance spread around during rotation, since factors beyond the "true number" are composed principally (and increasingly) of accidental associations of error variance (Cattell, 1978).

Thus any objective factor analysis requires a reliable method for determining either the communalities or the true number of factors. Once one of these is known, the other may be derived from it. In the relationship between
these two parameters, and in the existence of at least one reliable method for determining the number of "true" factors, lies the solution to the problem of communalities. I will return to communalities after considering methods of factor extraction.

**Factor Extraction Methods**

Within the common factor model the most widely used process is the 'principal axis method' (Cattell, 1978; Kim, 1975). Factors are subtracted, one at a time, from the correlation matrix until it is "empty". Correlations of variables with the first factor are estimated and a product matrix is formed showing correlations among variables due to their loadings on the first factor. This is then subtracted from the original correlation matrix to leave a residual matrix. Factor extraction continues until a residual is left that contains essentially nothing but zeros.

Principal axis extraction can be regarded as a statistically neutral approach. It makes no statistical or psychometric inferences about either the variables or cases (respondents). Other extraction methods, however, do one or other of these. They can be divided into two groups (Cattell, 1978). The first group includes cannonical factoring and maximum likelihood methods. The second group includes alpha factoring and image methods. The cannonical factoring group concentrates on the sample of variables while the alpha group emphasises the sample of cases.

Cannonical factoring (Rao, 1965) "adjusts" communality estimates in order to derive a solution that maximises correlations between variables and factors. The variables are considered to be the entire universe of
variables but the cases are treated as a sample from the universe of cases. Canonical factoring seeks to estimate the parameters of the population of cases (Kim, 1975).

Alpha factoring (Kaiser and Caffrey, 1965) also "adjusts" communality estimates. The variables are assumed to be a sample from the universe of variables and inferences are made about the parameters of the population of variables. The result is the derivation of factors with the maximum degree of generalisability (Kim, 1975).

Determining the Number of Factors and Returning to Community Estimates

It seems evident that current methods for determining the number of factors (one in particular) offer greater reliability than methods for estimating communality. Cattell (p.53) recommends determining the number of factors first and then fitting communalities — which is the reverse of the standard approach.

Four methods for determining the number of factors are in common use:

1. The Kaiser-Guttman rule of stopping the extraction of factors from the correlation matrix with unities in the diagonal when the eigenvalue (latent root) of a factor falls below 1. The eigenvalue is the sum of the squares of the variable loadings on the factor in the unrotated matrix (Guertin and Bailey, 1970) Cattell (p.62) considers this widely-used method to be, "...wrong, in principle, and erratic in practice". Kaiser (1974), however, continued to advocate its use;
2. **The scree test** which depends upon properties of slope in a plot of eigenvalues against factor number. The scree is strongly recommended by Cattell (1978) and appears to have strong empirical credentials in studies that produce a 'good scree';

3. **Percentage of common variance accounted for** by the extracted factors, which should research a cut off value of around 98% (Guertin and Bailey, p.114). Cattell considers this criterion to be, "...absolutely of no relevance"; and,

4. **Specific factoring methods** that either avoid the need for determination of the exact number of factors (e.g. image analysis, Kaiser, 1963), or converge on factor number and communalties simultaneously (e.g. the maximum likelihood method, Harman, 1967). Maximum likelihood factoring now appears to have become a standard method. Unfortunately, it is computationally complex and is not available in the SPSS factor programme.

Of these four methods the scree test appears to have strong credentials as a simple yet reliable method for determining the true number of factors. While it is entirely empirical in nature, Cattell notes:

> The scree has had the most extensive theoretical analysis and practical testing among... methods depending upon properties of the curve in the plot of descending root sizes. It concludes that extraction should stop where the steeply descending curve turns into a gently sloping straight line - the scree... (p.90)

A scree test is drawn with eigenvalues on the vertical axis. Eigenvalues are obtained from an initial principal components factoring - i.e., communalties are set at unity. Scales are chosen such that the distance
representing each additional factor is equal to a movement of 0.1 on the eigenvalue scale. Cattell makes the following points about the interpretation of factor plots (pp. 77-80):

- the scree should have a slope of below 40°;
- points on the scree should be close to a straight line;
- there should be a sharp, but small, break between the last point on the slope (the last "true" factor) and the first point on the scree;
- there may in fact be between 1 and 3 screes, corresponding to plots from:
  - real factors that are inadequately developed by variables in the study;
  - error factors stemming from sampling; and,
  - error factors stemming from measurement problems; and,
  - where the error component of the data is large, the scree test will overestimate the number of factors by 1 or 2. These common error factors will appear as a pattern of small, random loadings on the factor pattern matrix.

The relationship between the number of factors and communalities also enables communality estimates to be improved subsequent to the extraction of initial factors. This is the technique of "iterative estimation" (Comrey, p. 73), which involves:

1. Initial estimates of communalities.
2. Initial factor extraction.
3. The calculation of improved communality estimates from the sums of squared factor loadings.
4. The replacement of initial communalities with the improved estimates from calculation.
5. Iteration of steps 2, 3 and 4 above until estimates converge.

Thus the achilles heel of early factor analysis - the problem of communalities - seems to have responded to methodological massaging. It is now considerably less of a problem than that of selecting a method of rotation.

The Rationale for Rotation

Factor rotation depends upon geometric representation of the initial factor matrix. This matrix can be represented as a series of plots in the k dimensional space (where k is the number of factors extracted). Each variable may be placed in hyperspace in relation to the k axes by geometric representation of its correlation with each factor.

The factor axes to a configuration of variables can be rotated to an infinite number of mathematically equivalent positions. No matter what position the relevant axes are placed in, the resulting factor matrix bears a constant relationship to the original correlation matrix. Each new position is simply a different "view" of the same spatial relationship (Guertin and Bailey, 1970).

Factor rotation involves a search for that one "view" that is inherently more "meaningful" than all others, in the sense that it displays most clearly the underlying causes behind the observed correlations (Cattell, 1978). In practice, this involves finding a rotated position which maximises the zero loadings in the rotated factor matrix, separately considered by columns and rows. By convention, a "zero" loading is a value between some stated bounds, often +.1 (Cattell, 1978). As for other
steps in factor analysis, a range of rotation methods are available, each supported by computer packages, and each with its supporters and detractors.

**Approaches to Rotation**

Cattell (p.93) provides an explicit warning:

> Having determined the number of factors, and holding in his hands an unrotated factor matrix, ... the investigator stands at the most perilous phase of factor analysis. However excellent the work up to this point, the way in which the next step is carried out - that of finding the uniquely meaningful rotation - will decide whether a conclusion is drawn that is enlightening, or somewhat misleading, or positively absurd.

Rotation may be either orthogonal or oblique. In an orthogonal rotation the reference axes are held mutually at right angles. This is equivalent to an assumption that no relationships exist between the factors, i.e., that their intercorrelations are all zero. The mathematics of orthogonal rotations is well worked out and the majority of computer programmes for rotation are for the orthogonal case. Oblique rotations allow for the assumption that relationships may exist between the factors. In an oblique rotation, axes are freed from the restriction of orthogonality and may take up oblique positions if this assists the task of maximising the zero loadings. Harman (p.326) cautions that the mathematics of oblique rotations is not yet fully resolved, although he finds the more recent "direct oblimin" methods to have potential (p.326). Comrey (1973) notes that the most difficult problem with oblique rotations lies in deciding how much obliquity to accept. Simple structure fails as a guide because it is possible to continue improving
hyperplanes by allowing axes to go more oblique. He proposes that some criterion be found to identify an optimal degree of obliquity.

Both Cattell (1978) and Guertin and Bailey (1970) counsel against the uncritical use of orthogonal rotations. Their grounds are, first, that the orthogonal (uncorrelated) assumption is rarely correct and, second, even if it is, an oblique programme will stop at orthogonal position. Cattell also cites a number of difficulties associated with the standard orthogonal programme, VARIMAX.

**Simple Structure**

I have introduced rotation as a search for the most meaningful "view" of a factor matrix plotted in the dimensional space. That most meaningful view is commonly called "simple structure".

In fact, this is something of an over-simplification. In geometric terms each of the factors is a hyperplane (a plane in more than three dimensions) through the k dimensional matrix which intersects (or passes very close to) a large number of points. According to Cattell (p.169) the factorial hyperplanes lie in the space of the matrix, "...in as real and substantial a form as cleavage planes in some crystal masses, waiting to be found". Each point intersected by a hyperplane has a zero loading on that factor. The number of points on or close to (say between +/-1) a hyperplane is the hyperplane count of that factor. Simple structure is obtained when the pre-existing factorial hyperplanes are located - i.e., when
the total hyperplane count is maximised (see Mulaik, 1972). Cattell, however, requires only two simple (but very demanding) tests of simple structure:

- the total hyperplane count must be truly maximal; and,
- each factor in the simple structure matrix must pass a test of statistical significance (Cattell, 1978, p.176, tables p.554-569).

Cattell's statistical test for factors derives from unpublished tables by Bargmann which estimate the probability of locating a hyperplane with that count by pure chance from a matrix containing n variables and k factors.

Interpretation of Factor Patterns
From the point of view of interpretation, the most significant result of the rotation process is a table of variable loadings on factors. The loadings are values derived from the correlations between variables and factors when the correlations between factors have been allowed for. For an orthogonal solution, therefore, a table of variable loadings on factors (the factor pattern matrix) will be identical to a table of correlations between variables and factors (the factor structure matrix). For an oblique solution they will be similar, but not identical. It is to the factor pattern matrix that one looks, both for evidence of simple structure and to interpret factors (Cattell, 1978).
Interpretation of factors consists, quite simply, of deducing the nature of the underlying determiner from the pattern of variable loadings on factors. Cattell (p. 233) observes that:

...the game of factor interpretation can offer to the theoretician an intellectual exercise at least as entertaining as a crossword puzzle, and as demanding as abstract philosophy. He has to ask: "What is likely to be positively acting on variables a, b, c, etc., inhibiting to variables p, q, r, etc., and unable to act at all on variables u, v, w, etc?"

Comrey (19..) suggests that all loadings with a magnitude of below .3 should be disregarded for interpretation purposes. Cattell (p. 231), on the other hand, believes that all values have interpretational significance. Low values, he believes, tell us what a factor is not, and knowing what it is not is part of knowing what it is.

Two other statistics can be of value in interpreting a factor pattern matrix. The first is the percentage of total variance accounted for by the factors. According to Guertin and Bailey (1970), this value indicates the "prominence or viability" of the extracted factors. A value of 10% is considered so low as to be meaningless; while around 60% is considered to be the maximum achievable value.

The second useful statistic is the table of correlations between factors (which will apply to the oblique case only). Interpretation should take into account any discovered positive or negative correlations between factors.
APPENDIX 5A

ANALYSIS OF THE WRITTEN CURRICULUM
**MENTS OF ENVIRONMENTAL EDUCATION**

**WRITTEN CURRICULUM ANALYSIS**

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  FII SOCIAL STUDIES: changing use of physical environment  
  FV GEOGRAPHY: understanding of current problems  
  FV GEOGRAPHY: current NZ and world problems |
| biological environment              | FVI BIOLOGY: conservation  
  FVII BIOLOGY: man and biosphere | JI-S4 SOCIAL STUDIES: current events  
  FV GEOGRAPHY: understanding of current problems  
  FVII GEOGRAPHY: current NZ and world problems |
| resources                           | FVII BIOLOGY: man and biosphere | JI-S4 SOCIAL STUDIES: current events  
  FII SOCIAL STUDIES: how people use resources  
  FV GEOGRAPHY: understanding of current problems |
| social environment                  | JI-S4 SOCIAL STUDIES: people and their problems  
  FI-II: HEALTH: use of alcohol, tobacco  
  FIII SOCIAL STUDIES: conflict  
  FIII ECONOMIC STUDIES: consumer affairs  
  FIV SOCIAL STUDIES: social problems: participation  
  FV HOME ECONOMICS: NZ health problems | JI-S4 SOCIAL STUDIES: current events  
  FI-II HEALTH: global malnutrition (topic 1)  
  FIII-IV HOME ECONOMICS: family problems  
  FIII-IV HOME ECONOMICS: consumer affairs  
  FV GEOGRAPHY: understanding of current problems  
  FVI GEOGRAPHY: regional problems  
  FVII GEOGRAPHY: current NZ and world problems |
<p>| economics                           | FIII ECONOMIC STUDIES: inequalities and income | JI-S4 SOCIAL STUDIES: current events |
| aesthetics                          |                  | JI-S4 SOCIAL STUDIES: exploring district together |</p>
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<td>FII SOCIAL STUDIES: sensitivity to needs of</td>
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<td>others</td>
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<td>FII SOCIAL STUDIES: sensitivity to needs of others</td>
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### D. PROBLEM SOLVING

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FVII BIOLOGY: man and biosphere | FIII-IV SCIENCE: plant way of life  
FIV SOCIAL STUDIES: change brought by technology  
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<p>| inventories of energy/resource use | | FIII-IV SCIENCE: energy |
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| minerals-formation, extraction, use | FVI GEOGRAPHY: resources and relation to technology | FIII-IV SCIENCE: earth science |</p>
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APPENDIX 5B

INSTRUMENTS FOR CLASSROOM RESEARCH
Observer __________________________ Date __________________________

Processing code for this observation __________________________

Level __________________________ Subject/syllabus __________________________

**SUMMARY OF OBSERVATION**

This lesson contained instructional event(s) that dealt with:

- [ ] problem description
- [ ] problem solving and action
- [ ] decision making
- [ ] sensitivity/valuing
- [ ] environmental education content

Record any thoughts for future discussion with the teacher about curriculum potential:

________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
An environmental problem facing students or their society was introduced. (Test: at least the implication that things are not what they should be.)

Describe problem using teacher's words:

---------------------------------------------

Problem best fits the category of:

☐ 2.1 conservation of living things
☐ 2.2 injustice - social, cultural, economic
☐ 2.3 physical resources - management and conservation
☐ 2.4 physical environment - management and conservation
☐ 2.5 resources for people - health, education, welfare
☐ 3.1 chemical contamination/pollution
☐ 3.2 none of these categories

Scope of problem (as introduced):

☐ 4.1 local
☐ 4.2 national
☐ 4.3 global

PROBLEM SOLVING

☐ 5.1 Information or skills important to problem solving were assembled

☐ 6.1 Ways of solving an environmental problem were introduced:

☐ 7.1 alternative solutions proposed
☐ 7.2 one best solution chosen from alternatives
☐ 7.3 action strategies proposed
8.1 Students were involved in problem-solving action. Describe action that students were involved in:


Students' action best fits the category of:

- [ ] 9.1 persuasion of other citizens
- [ ] 9.2 persuasion of those in authority
- [ ] 9.3 management (e.g. recycling, tree-planting)
- [ ] 9.4 consumer action
- [ ] 9.5 none of these categories

DECISION MAKING

10.1 The role or scope of any N.Z. decision making body (council, department, tribunal) is introduced:

Describe the decision making body:


11.1 Participation in decision making by citizens is encouraged:

- [ ] 12.1 avenues for citizen participation are outlined
- [ ] 12.2 participation skills are practised
- [ ] 12.3 participation is initiated

SENSITIVITY OR VALUING

(Test: sensitivity involves teaching directed at sensory awareness, feelings and emotional responses. Valuing focuses on students' opinions and their justifications, implication. Where feelings and beliefs are mixed, record on sensitivity.)

13.1 Sensitivity towards part of the environment is encouraged:

- [ ] 14.1 there is opportunity to experience the subject (direct or audiovisual)
- [ ] 14.2 teaching is directed towards feelings or emotional response
- [ ] 14.3 students express their feelings
- [ ] 14.4 the feelings of others are considered
Describe the subject of this sensitivity/valuing exercise:

**ENVIRONMENTAL EDUCATION CONTENT**

| 18.1 | interrelatedness of plants, animals, seasons, climate |
| 18.2 | cycles of energy or materials through natural or human systems |
| 18.3 | diagramatic models of systems |
| 18.4 | adaptation or niche |
| 18.5 | population dynamics - growth curves, birth rates, death rates (not human) |
| 19.1 | succession - changes in natural systems through time |
| 19.2 | human management of natural systems - farms, forestry, fishing |
| 19.3 | natural history or nature study |
| 19.4 | endangered species or habitats |
| 19.5 | pollution of air, water, land |
| 20.1 | spaceship earth (the limited nature of all resources) |
| 20.2 | growth in the use of resources |
| 20.3 | low material lifestyle or the steady state society |
| 21.1 | renewable and non renewable resources (the words, examples) |
| 21.2 | the students' own use of energy or resources |
| 21.3 | sustained yield |
| 21.4 | common property resources |
| 21.5 | minerals and energy - formation, extraction uses, stocks or lifetimes |
| 22.1 | recycling or resource conservation |
| 22.2 | New Zealand's energy resources |
| 22.3 | energy conservation |
| 22.4 | alternative sources of energy |
23.1 economic wellbeing - GNP or GNP/cap
23.2 discount rate or present vs future use
23.3 supply and demand - price as an allocator of a resource
23.4 benefits of different economic systems - socialism, mixed, capitalism
23.5 human population size and future - age structure diagrams, trends
24.1 the city - urbanisation or industrialisation
24.2 welfare - distribution of resources within society
24.3 rich world/poor world - distribution of resources between societies
24.4 changes in land, sea, climate - natural and man-made
24.5 technology and the change it brings
25.1 N.Z. lifestyles - past, present, alternative
25.2 Maori and Pacific Islander lifestyles or culture - past and present
25.3 other societies' lifestyles or culture (present only)
25.4 transportation - its influence on lifestyle
25.5 work and leisure - resources for recreation
26.1 information and communications as social resources
26.2 social concerns and changing attitudes (e.g. unemployment)
26.3 social crises and conflicts (e.g. natural disaster, warfare)
27.1 urban environmental aesthetics - townscapes, architecture, urban graphics
27.2 natural landscapes and landscape quality
27.3 design as an influence on quality of life
27.4 aesthetics as a reflection of cultural identity.