

information with which to predict other outcomes is lacking. However, a full health impact assessment would cover not only death and serious illness but also less serious illness, self reported illness and even feelings about life. Indications of these could be derived from usage rates for primary care services and surveys of self reported symptoms (e.g. the Welsh Health Survey) using standardised approaches developed to measure quality of life such as the Nottingham Health Index ¹⁵, SF36¹⁶ and EuroQol¹⁷ or measures of positive health¹⁸. The importance of outcomes to people and communities must be recognised and, therefore, their participation in the health impact assessment process is essential. This is discussed later in this document.

2.15 When comparing the consequences of different options it may be inconvenient to have the outcomes expressed on a several different scales (for example numbers of deaths, numbers disabled, and numbers feeling unwell). In order to overcome this problem, attempts have been made to combine different outcomes into a single measure which reflects the many dimensions of health. Quality Adjusted Life Years (QALY)¹⁹ and Disability Adjusted Life Years (DALY)²⁰ are examples of measures which combine several dimensions. However, some dispute the validity of these and similar approaches.

2.16 One approach suggested was that health impacts could be valued monetarily ²¹ but in many cases, the level of knowledge is insufficient to allow this to be done and different stakeholders may disagree with the values used in the process.

3. History and development of health impact assessment

3.1 Formal aids to decision making are not new. In the mid sixties, cost benefit analysis was introduced as a tool to aid large infrastructure decisions, and has been used in the planning of developments in Wales as elsewhere. The World Bank has made use of cost benefit analysis in deciding whether to proceed with investments in developing countries.

3.2 It was rapidly realised that simply looking at projects in terms of financial costs and benefits was inadequate and failed to take account of the consequences for bio-diversity and the environment. In projects in developing countries these were often substantial. This gave rise to environmental assessment alongside consideration of the financial costs and benefits. In 1969, the United States introduced the Environment Protection Act²² which requires an environmental impact assessment of all projects in the United States of America and all projects funded by United States aid. This requirement was rapidly followed by other countries. In 1985, the European Commission introduced its first directive requiring all large development projects to be subject to environmental impact assessment and this was implemented in the UK in 1988. Since then there have been several revisions tightening and extending the original European Commission Directive. In many ways, the development of health impact assessment has been linked to or modeled on environmental impact assessment.

3.3 With the widespread introduction of environmental impact assessment it was increasingly realised that the issues to be addressed required far more than the skills and knowledge of any single person or discipline and an environmental impact assessment team is now likely to involve the skills of specialists from several different disciplines. Projects in developing countries were often associated with massive disruption of human communities which could be displaced and have their culture and lifestyle radically changed. Despite this often less attention was paid to the human species than to flora and other fauna. This gave rise to the practice of including anthropologists and sociologists in the environmental impact assessment team²³ and the development of social impact assessment.²⁴

3.4 The need to consider health issues in environmental impact assessment was also realised at an early stage²⁵. Health impact assessment is closely allied to social impact assessment. The difference is one of emphasis and disciplinary mix rather than one of substance. Both are concerned with impacts on human health and well being. Effects on social structures and functions, on culture and on how humans interact with their environment are powerful determinants of health. As Hirschfield et al ²⁶ remark 'it is difficult to envisage what a social impact would be that did not have an impact on health or what territory could be covered by a social impact assessment that was not enveloped within a health impact assessment.'

3.5 While understanding and skills were being developed for the assessment of environmental and health impacts of major construction projects and developments, awareness was also growing of the importance of assessing public policy. Recognition of the wide range of factors that determine health and the importance to health of 'non health' policy areas lead to calls for 'healthy public policy'²⁷ and by implication, health assessment of policies. As Milio²⁸ wrote in her influential book in 1986, 'health interests will be better served if the impact of policies affecting health important aspects of environments and patterns of living were assessed'.

3.6 Considerable experience of health impact assessment has already been developed in other parts of the world. The following paragraphs summarise this.

3.7 The early development of environmental impact assessment and health impact assessment was largely concerned with projects in developing countries which, because of the low level of economic development and absent infrastructure, tended to have massive impacts on biodiversity and the environment. The high prevalence of infectious disease and inadequate health services meant that health impacts also tended to be considerable. For example, dam projects could result in increased frequency of water borne disease, displacement of population, changed habitats resulting in increased frequency of vector borne disease, and disturbed culture and lifestyle, resulting in diseases of malnutrition, alcohol related disease, sexually transmitted disease, social disruption and mental health problems.²⁹ These difficulties have led most major funding agencies to require environmental impact assessments for all large developments. Increasingly, the tendency has been to move beyond assessment to environmental management plans which prevent or mitigate environmental and health problems.³⁰

3.8 In developed countries, the basic level of population health is higher, communicable disease less prevalent and health services much more widely available. As a result, the health impacts of projects in developed countries tend to be less dramatic but the lessons learnt with environmental impact assessment and health impact assessment in developing countries can be adapted to the circumstances of the developed world.

3.9 In New Zealand, the Resource Management Act 1991, requires consent authorities (regional, district or city councils) to make an 'assessment of any actual or potential effects on the environment' which includes 'any effect on those in the neighbourhood or wider community including any socio-economic and cultural effects'. The public health authority is expected to contribute resources and expertise to help the consent authority. An useful Guide to Health Impact Assessment has been published.³¹

3.10 In Australia, responsibility for most development planning and resource issues lies with individual States hence most environmental and health impact assessments are carried out under State legislation. The National Better Health Programme commissioned a report³² on environmental and health impact assessment and this serves as a guide for its implementation in States.

3.11 In 1993, the Government of British Columbia (Canada) required that in submissions to the Cabinet the health impacts of all options should be considered and that any significant impacts should be discussed. The guidance reads:

'The likely positive or negative impact of each option on the health of individuals, groups and communities, or on the health care system should be analysed. The analysis should recognise the social, economic and physical factors affecting health, such as economic security, employment and working conditions, social support, safety, equity, education and sense of control. The opportunity for inclusion of individuals, communities and other sectors in the decision making on issues that affect their health should be considered. Attention should be paid to short and long term effects. The consistency of each option with the Government's objectives for improved health should be evaluated.'

3.12 The Ministry of Health for British Columbia published a tool kit³³ consisting of eleven prompt questions to help Government departments to identify the health implications of each policy. Reflecting the guidance on cabinet submissions, the approach used is very broad and covers possible social, cultural and economic factors that could influence health.

3.13 In Europe, when health impact assessment is undertaken it is often as part of an environmental impact assessment. Considerable experience of health impact assessment in association with environmental impact assessment has been gained in Germany³⁴ and in the Netherlands³⁵. Much work was done in assessing the health impact of developments at Amsterdam's Schipol airport. Procedures for health impact assessment of policies have been investigated in the Netherlands³⁶, Finland³⁷ and Sweden.³⁸ The World Health Organization European region, in association with the European Commission, has supported a study of health effects of transport in four countries.

3.14 The development of health impact assessment in the United Kingdom has been pioneered by public health specialists in Merseyside. The first health impact assessment in which they were involved related to the proposed new runway at Manchester Airport³⁹. Since then, they have produced several further reports. Scott-Samuel of the Liverpool Public Health Observatory was one of the first to advocate health impact assessment in the UK⁴⁰ while the Liverpool School of Tropical Medicine has extensive experience of health impact assessment of projects in developing countries⁴¹. The Merseyside group have published guides to health impact assessment⁴² and literature reviews⁴³. They advocate extensive use of key informants and stress the importance of process in health impact assessment.

3.15 The Health Impact Assessment team at the Department of Health is collaborating with practitioners and with academic researchers in England and internationally in the development of a methodology that will help central and local Government to add value to their work by improving the quality of their decision-making. A literature review on policy appraisal and health from the University of Northumbria, ⁴⁴ was one of the first fruits of this programme. In Scotland, the Social and Public Health Sciences Unit in Glasgow and participants in the Scottish Needs Assessment Programme are developing health impact assessment methods.

3.16 Several health impact assessments have already been undertaken in Wales and some of these are highlighted in Chapter 6. Thus some experience and expertise already exists in Wales and this will provide an useful foundation for further development of the approach.

4. The practice of health impact assessment

4.1 Descriptions of health impact assessment have identified a number of steps but five major steps can be identified in all.

- Screening
- Scoping
- Risk assessment
- Decision making
- Implementation and monitoring

4.2 **Screening** consists of a preliminary assessment to see if the project is likely to pose any significant health questions and is therefore worth subjecting to health impact assessment. Where a policy is clearly beneficial to health it may well be decided that no further health impact assessment is needed though it may be considered worth undertaking one in order to quantify the benefits.

4.3 **Scoping** is the process of broadly outlining the possible hazards and benefits and identifying the questions that must be addressed in the assessment process. This is referred to as setting the terms of reference.

4.4 **Risk assessment** involves characterising the nature and magnitude of the harmful and beneficial factors, how many and which people will be affected by them and how they will be affected. A risk management plan flows from the risk assessment with suggestions how the effect of harmful factors can be negated or minimised and how the effect of beneficial factors can be maximised.

4.5 **Decision making** involves considering the report of the risk assessment and the risk management plan and making a choice of options (including the no action option). Once the main option has been determined, there will be sub-options, possible modifications and ways of mitigating possible disadvantages to consider.

4.6 **Implementation and monitoring** involves action to implement the decision(s) and to observe the consequences. Monitoring is particularly important where adverse consequences are predicted but where their nature, size and timing are uncertain. Early detection of adverse consequences may allow their effect to be minimised by modification of the way in which the decision is implemented or at least mitigated with appropriate measures.

4.7 In practice, the process is not necessarily sequential but iterative i.e. some steps may need to be repeated. For example, preliminary risk assessment may identify further issues requiring a revision of the terms of reference agreed in the scoping process. Decision making after the first risk assessment may identify further questions which in turn require further assessment. Modification of the initial proposals may generate a need for further assessment. Developments during implementation and monitoring may lead to decisions being revisited with the need for further assessment and so on.

4.8 It can be seen that impact assessment and decision making are not distinct activities but all part of the same process. However, the two may be undertaken by different people. It is clear that those who undertake the assessment and those who take the decisions need to work together very closely and need to understand each others' perspectives and goals. This brief description of the health impact assessment sequence makes it clear that, if it is to

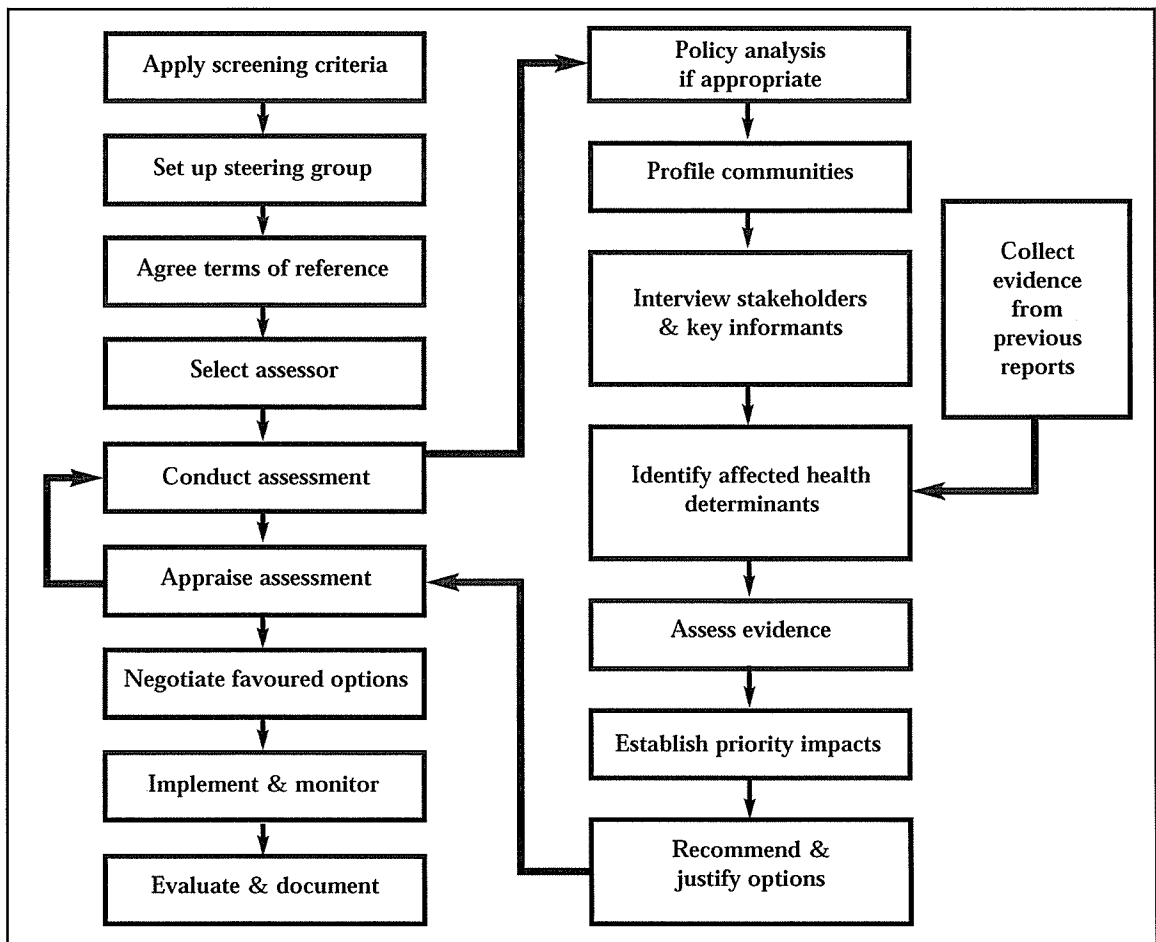
be useful, assessment must be closely integrated with the decision making process. There is a case to be made for expecting decision makers to routinely undertake the screening stage of health impact assessment for themselves rather than involve separate assessors. This avoids unnecessary delay and allows specialised health impact assessment expertise to be concentrated on the difficult cases where it will be most useful and cost-effective.

4.9 It is important to realise that health impact assessment does not avoid the need to make decisions. Health impact assessment is not a method by which decisions are made by algorithm or some sophisticated system of calculations. Health impact assessment cannot therefore absolve decision-makers of their responsibilities. It can improve decision-making by making explicit the underlying assumptions and reducing the risk that a development will bring about unforeseen and unwanted consequences. In this respect, it is very similar to cost benefit analysis.

4.10 Health impact assessment must not be allowed to delay unduly decision making or it will become another hurdle to be overcome rather than an aid to decision making. It will be necessary to compromise between the speed with which the assessment is made and the completeness of the data on which it is based.

4.11 Various ways of organising health impact assessment within the framework of the five stages have been recommended. The procedure recommended by the Merseyside group⁴⁵ is shown in Figure 1. A steering group of stakeholders is established to agree the terms of reference and oversee the remainder of the health impact assessment process. The main sources of evidence for the assessment stage are stakeholders and key informants though documentary and other evidence is also used to support this.

Figure 1: Stages in the health impact assessment process (Taken from Merseyside Health Impact Guidelines)



Source: Merseyside Health Impact Assessment Steering Group

4.12 A rather different approach is recommended in the 10 step model from Bielefeld⁴⁶. This is shown in Figure 2. Steps 1-7 describe the sequence for making the risk assessment using evidence both from measurement and information from technical literature. Qualitative assessment is given little prominence in this model.

Figure 2: A 10 Step Risk Assessment Model (Developed by The University of Bielefeld and State Institute of Public Health, North Rhine Westphalia)

0. Scoping	<ul style="list-style-type: none"> ● Defining the scope of relevant topic
1. Project analysis	<ul style="list-style-type: none"> ● Coverage of construction phase, normal operation, accidental releases and decommissioning phase ● Expected emissions, odours, noise vibration ● Hazard characterisation/ classification (toxicity etc.)
2. Regional analysis	<ul style="list-style-type: none"> ● Physio-geography, meteorology, natural features ● Anthropogenic changes, land use (housing, gardens, schools, nurseries, hospitals, agriculture, industry) ● Definition of area of interest for further investigation
3. Population analysis	<ul style="list-style-type: none"> ● Population size, distribution by age, sex etc. ● Health status, based on health reports, disease registries ● Behavioural patterns, activities, food, hobbies
4. Background situation	<ul style="list-style-type: none"> ● Environmental monitoring e.g. air, groundwater, soil, food ● Analysis of existing pollution concerning chemicals, odours, noise, vibrations, radiation ● Identification of additional data needs (parameters, places, environmental media)
5. Prognosis of additional pollution	<ul style="list-style-type: none"> ● Based on data from similar plants/ facilities which are already in existence (same technology different location) ● Coverage of air, water (surface, ground) soil, flora, fauna ● Modeling of dispersion from (non-) point sources, transfer between environmental media, terrestrial, limnic food chain
6. Prognosis of health impact	<p>6.1 Qualitative assessment</p> <ul style="list-style-type: none"> ● Changes concerning neighborhood features, quality of life ● Citizen concerns (incl. non-government organisations, local newspapers) <p>6.2 Comparison with media-specific limit values</p> <ul style="list-style-type: none"> ● Comparison of predicted emissions and ambient concentrations of chemicals in air, water, soil, food with limit values ● Comparison of predicted intensity of noise, vibrations, odours, radiation with limit values ● Total burden rather than single agents. <p>6.3 Quantitative risk assessment</p> <ul style="list-style-type: none"> ● For non-threshold effects especially carcinogenicity: Quantitative risk assessment including all relevant pathways and carcinogens leading to probability statement on additional cancer risk and on population cancer burden ● For threshold effects: Estimation of hazard quotient/ hazard index summarising over chemicals which affect the same target organ system
7. Summarising assessment of impacts	<ul style="list-style-type: none"> ● Summary and assessment of predicted impacts ● For threshold agents the assessment is implied in the comparison of predicted and threshold limit values ● For non-threshold agents there needs to be agreement about 'acceptable risk'.

Continued overleaf

8. Recommendation	<ul style="list-style-type: none"> ● Recommendations on planning alternatives ● Recommendations on additional steps e.g. emission control monitoring, public information, post-project analysis
9. Communication	<ul style="list-style-type: none"> ● Communication of results to all parties involved including planners, decision makers, public at large ● Risk comparison, visualisation of results⁹. Communication ● Communication of results to all parties involved including planners, decision makers, public at large ● Risk comparison, visualisation of results
10. Evaluation	<ul style="list-style-type: none"> ● If project is put into practice comparison of predicted impact to actual situation: systematic evaluation of prognosis providing basis for improvement of subsequent tests, methods and/or procedures ● Evaluation of communication and decision making

Checklists for health impact assessment screening and scoping

4.13 The following pages illustrate a selection of checklists sourced from the various guides on health impact assessment. These checklists are primarily suitable as screening tools or as a starting point for scoping.

4.14 Figure 3 shows an example of a very simple checklist from Sweden⁴⁷. This gives very little guidance to its users on what aspects of the proposal they should be checking and so is probably best suited to those who have a considerable understanding of health impacts.

Figure 3: Simple health impact assessment checklist

<p>The Health Question</p> <p>This simple option can be adopted prior to consideration of an individual policy proposal. It can be used before collective decisions are made at meetings of local boards/committees.</p> <p>A. Will the proposal promote health development for various groups/the population in relation to the social environment (e.g. opportunity to exert influence, mutual work and support)? YES [] NO []</p> <p>B. Will the proposal promote health development for various groups/the population with regard to certain risk factors (e.g. the physical environment or living habits)? YES [] NO []</p> <p>C. Is the proposal consistent with overall municipality / county health targets and objectives? YES [] NO []</p> <p>Comments/justification </p> <p>Alternative proposal </p> <p>Our assessment is that </p>

Source: Landstings Förbundet and Svenska Kommunförbundet

4.15 The same source contains a more searching checklist under the title Health Impact Analysis (Figure 4). As with the checklist in Figure 3, it is again best suited to those who are already very familiar with health impact assessment.

Figure 4: Health Impact Analysis Checklist

Health Impact Analysis	
Health Impact Analysis is guided by a number of key questions. They may for example, be appropriate to raise prior to analyses of strategic policy decisions.	
General questions	
1.a	What does the local Public Health Report show regarding the health conditions of different groups within the municipality/county? Are there groups which are particularly vulnerable or already exposed to numerous health risks, or are there groups with evident health-trend problems?
1.b	Are there defined health policy targets?
Questions which may be linked to the matter at hand	
2.	Are there particular health risks which can be expected to decrease or increase as a result of the proposal? Will impacts become apparent in the short term (within 5 years) or in the long term.
3.	For the distribution of ill-health within a population, it is of decisive importance which groups are subjected to decreased / increase health risks, and whether any decision will affect these groups capacity either to deal with difficulties or by contrast increase their vulnerability.
4.	In what way will the social environment in the local community be affected by the proposal?
5.	Is there a risk that a proposal may have a 'double' impact on certain groups i.e. that both their health risks increase and their social environment deteriorates? Are there alternative policies which might result in better health for exposed groups and the population as a whole?

Source: Landstings Förbundet and Svenska Kommunförbundet

4.16 The checklist produced by the British Columbia Ministry of Health Population Health Resource Branch⁴⁸ is summarised in Figure 5. This provides the decision maker with more guidance on the determinants of health which should be considered. It is notable for the broad view of health and its recognition of the importance of socio-economic factors in determining health.

Figure 5: British Columbia Health Impact Assessment Checklist from British Columbia toolkit

WILL GIVEN OPTION HAVE AN IMPACT ON	Possible impact	Information required
1. The creation of income and/or wealth? Will specific income groups or communities be impacted positively or negatively?		
2. The distribution of income and/or wealth? Will specific income groups or communities be impacted positively or negatively?		
3. Employment opportunities for individuals and/or communities? What is the impact on the nature and distribution of jobs and/or working conditions?		
4. Learning opportunities, particularly for young people and/or unemployed? Will the training/education support tomorrow's jobs.		

WILL GIVEN OPTION HAVE AN IMPACT ON	Possible impact	Information required
5. Healthier beginnings for children? This includes meeting their basic physical needs, building self-esteem and developing a sense of connectedness with others.		
6. The number and quality of healthy personal connections, such as those with friends, families, colleagues and community groups (as distinct from professional support services)? Will it segregate or isolate individuals or groups?		
7. Physical safety and security among individuals and communities?		
8. People's sense of control over their own lives in the decision making affecting their income, working and living conditions, support systems local government programs, services and/or resources?		
9. Physical and/or mental health? Which individuals are most affected?		
10. The provision of fair, equitable and respectful access to government programs, services and/or resources?		
11. The environment Will the environmental changes affect health?		

Source: Ministry of Health, Vancouver, British Columbia

4.17 Figure 6 shows a matrix taken from the Department of Health book *Policy Appraisal and Health*.⁴⁹ The determinants of health which may be influenced by a proposal are listed vertically down the table while the possible health consequences are listed horizontally. The matrix is then completed to show which determinants might produce which consequences. A comprehensive list of determinants and consequences would produce an unmanageably large matrix so it is necessary to select those that are most relevant.

Figure 6: Matrix suggested in *Policy Appraisal and Health*

	Health impacts		
	Accidents	Ill Health	Catastrophe
Diet - Choice and availability			
Psycho social environment (e.g. exposure to stress, crime risk)			
Housing & living conditions (e.g. cold, damp, noise, sanitation, food storage and preparation, lighting space, domestic waste, indoor air quality, capacity for self-care)			
Pollution			
Lifestyle (e.g. exercise, reproductive and sexual behaviour)			
Accidental injury (e.g. in the home, at work, on the roads, or from faulty products)			
Tobacco and alcohol consumption			
Occupation (e.g. exposure to industrial processes)			
Geophysical factors (e.g. exposure to ultra-violet light, radon)			

Source: Department of Health, London

4.18 Two general streams - categorised as 'broad perspective' and 'tight perspective' - can be recognised within health impact assessment (Table 1). Broad perspective health impact assessment takes an holistic view of health, has disciplinary roots in sociology, rarely attempts to quantify risk and attaches great weight to popular and lay concerns. In contrast, the roots of tight perspective health impact assessment are in epidemiology and toxicology. It emphasises aspects of health which are measurable or at least observable and seeks to derive quantified estimates of risk. Of course, there is a continuous spectrum and most practice of health impact assessment falls between these two extremes. Health impact assessment tools published from British Columbia⁵⁰ Sweden⁵¹ and Merseyside (UK)⁵² are towards the broad perspective end of the spectrum while those from New Zealand⁵³ and Bielefeld (Germany)⁵⁴ are towards the tight perspective end.

Table 1: Comparison of Broad Perspective and Tight Perspective health impact assessments

	Broad perspective	Tight perspective
View of health	Holistic	Emphasis on defined and observable aspects
Disciplinary roots	Sociology	Epidemiology, Toxicology
Ethos	Democratic	Technocratic
Quantification	In general terms	Towards measurement
Types of evidence	Key informants, popular concern	Measurement
Precision	Low	High

Integration with environmental impact assessment

4.19 Many discussions^{55, 56, 57, 58} of health impact assessment assume that it will form part of an environmental impact assessment but there is debate over the merits of this arrangement. In theory, integrating environmental impact assessment and health impact assessment could save effort and money although this is another issue which needs to be tested.

4.20 If health impact assessment and environmental impact assessment are combined there is a risk that assessment of one element may be over-emphasised at the expense of the other. Undertaking health impact assessment separately from any other impact assessment ensures that health remains the prime focus of the impact assessment. While environmental impact assessment directs attention to ecosystems and biodiversity, it may fail to adequately address impacts on human communities and culture^{59, 82, 83}. In the context of an environmental impact assessment, there is a tendency for health impact assessment to concentrate on physicochemical hazards and adopt a tight perspective approach.

4.21 In the UK, the conduct of some environmental impact assessment in development projects is defined by law. For planning applications, the terms of reference for the environmental impact assessment are set by the regulatory authorities and the proposers are required to bear the cost.

4.22 The case for combining health impact assessment with environmental impact assessment is strongest in the context of development projects and weakest in the context of policy decisions in areas such as fiscal, education and law and order which have many more implications for health than for the environment.

Involving stakeholders - people and communities

4.23 Most guides on impact assessment stress the importance of involving stakeholders including those who are concerned with, or will be affected by, the proposal i.e. people and communities. Their participation in the health impact assessment process is vital. People can be involved in various ways; for example, meetings with community representatives and service providers, holding community meetings, organising focus groups or citizens juries. It is desirable that this should take place as early as possible in the process and stakeholders should be involved in setting the terms of reference for any health impact assessment.

4.24 Involving stakeholders requires careful consideration. Health impact assessment itself is a relatively new approach and is still evolving as a subject. The approach and methods, along with the information necessary to undertake it, will therefore be new to some stakeholders. As with most subjects, effective presentation of information and data is essential to good communication and there is evidence to back this up. For example, risk is likely to be better understood as a subject if it is shown on visual scales, rather than expressed in numbers, or if comparisons with familiar events are made⁶⁰. Above all the discussion of risk should be open^{61, 62}. It is very important that health impact assessment should address issues which raise public concern. The fact that people are worried about the health effects of a development makes it a health issue even if technical experts do not share their perception of the risk.

4.25 The participation of people and communities in the process is all the more vital because health impact assessment involves many judgments which are value based rather than science based. The choice of which outcomes to consider and how the importance of different outcomes will be weighted relative to each other are value judgments. The relative importance attached to health and non-health outcomes and the preference given to present benefits over future benefits (discounting) are value judgments. The degree to which a health detriment to one group is acceptable, if there are much larger health benefits for another group, is a value judgment as is the question of what constitutes an acceptable level of risk. These issues all point to the importance of involving policy and decision makers, professionals and practitioners, and people and communities in the process.

Quality assurance of health impact assessment

4.26 Some methods^{63, 64} include an audit step at the end of the health impact assessment in which the quality of the procedure can be considered. This is desirable but raises questions on the quality criteria which could be used to evaluate a health impact assessment. The first requirement of a health impact assessment is that it shall be useful and add value to decision making. The potential benefits of health impact assessment, listed in paragraph 2.11, could provide the basis for a quality checklist. If it cannot be said to have done any of those things, its quality is low.

4.27 Another quality criterion might be the accuracy of predictions. Subsequent monitoring will demonstrate whether the predictions made by the health impact assessment are correct. In the event of the predictions not being fulfilled it is then necessary to consider whether the assumptions on which the health impact assessment was based have changed (for example the proposal was not implemented as designed) or the health impact assessment was at fault. The practicality of assessing the accuracy of predictions is limited to the relatively near future. Where health consequences are not expected until many years or decades have passed, the accuracy of predictions is more difficult to assess.

4.28 A third set of quality criteria can be drawn from study of the process⁶⁵:

- Were stakeholders involved in an appropriate and timely way?
- Has the evidence in the literature on consequences of similar proposals or events been properly searched?

- Have alternative options been adequately explored. Have the issues identified in the scoping exercise been addressed?
- Have efforts to mitigate any negative effects been concentrated on the largest impacts?

4.29 Health inequalities are a major concern of policy and the Acheson report⁶⁶ recommended that 'as part of health impact assessment all policies likely to have a direct or indirect effect on health should be evaluated in terms of their impact on health inequalities'. In developments which have both positive and negative health effects, positive effects may well be experienced by one group within the population while the negative effects fall upon another group. Health impact assessment needs to consider not only the overall impact but also the distribution of health impacts within the population. This allows decision makers to assess the impact across the groups and thus the effect on inequalities in health.

5. Risk assessment

The need to estimate effect size

5.1 Very few proposals bring unmixed benefit. Even after the proposal has been optimised, some less desirable consequences may remain and the decision has to be made whether the positive consequences justify the negative consequences. The decision is made more difficult by the fact that often the people who will experience the positive consequences are not the same as the people who will experience the negative consequences. It is easier to make decisions about these trade-offs if the extent of the positive and negative consequences can be estimated.

5.2 Even a proposal which seems to bring only good consequences will use resources which could be used for other purposes. Every proposal therefore raises the question of whether resources used in one way could, if used in another way, produced even more health benefit?⁹⁷ Once again, it is easier to answer such questions if the extent of the benefits which are produced by the different options can be estimated.

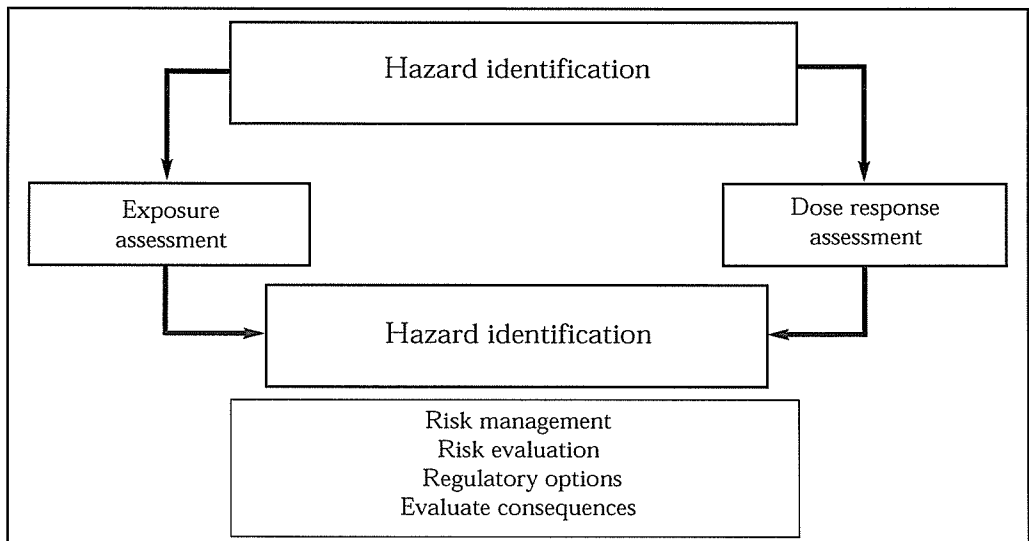
5.3 There is a tendency to talk of qualitative (described in words) and quantitative (measured using numbers) impacts but this is misleading. Any impact may be described in quantitative or non- quantitative terms. The difference lies not in the nature of the impact but in the ability of assessors to quantify it.

5.4 The following paragraphs explore how far it is possible in a health impact assessment to predict the size of the health consequences.

Epidemiological models for health impact assessment

5.5 Procedures for assessing risk due to physico-chemical hazards (such as exposure to air pollutant gases or radiation) are well established. For each particular hazard, an estimate is made of the number of people exposed to particular levels and the likelihood of an individual experiencing harm when exposed to those levels. It is then a matter to calculate the numbers of individuals who would be expected to experience particular harms.

Figure 7: United States National Research Council Risk Assessment Model



5.6 While straightforward in theory, there are many practical difficulties in applying this method. It can be difficult to estimate the number of people exposed to different levels of hazard. Very sophisticated models have been built to predict the distribution of pollutants released from chimney stacks or into water courses which take account of factors such as stack height, prevailing winds, geographical features, currents and tides but the predictions made are far from perfect.

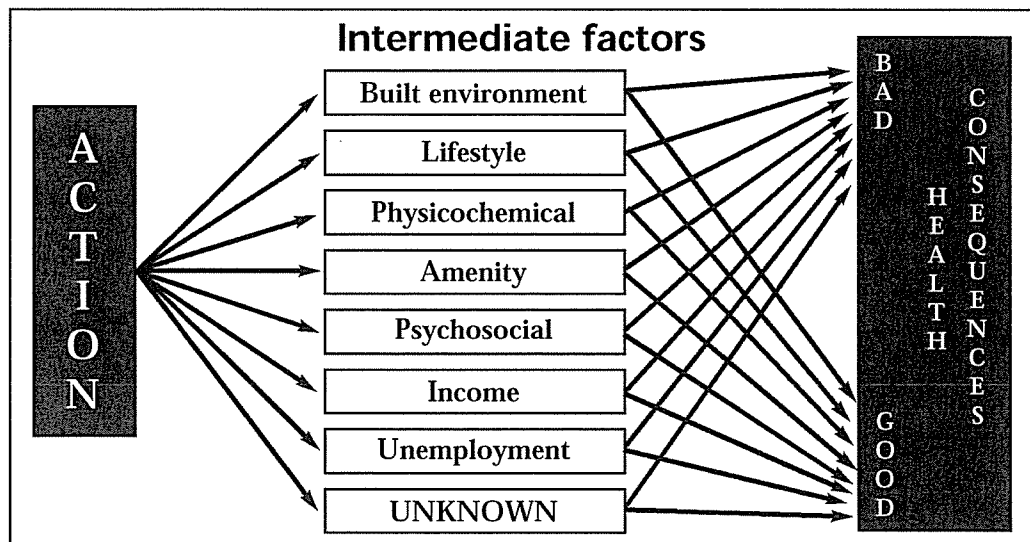
5.7 Even if the exposure level is accurately known understanding of how humans will be affected by that exposure is often incomplete. The chart showing the likelihood of suffering harm when exposed to different levels (doses) of hazard is called a dose-response curve. Sometimes there is very little evidence on which to base a dose response curve and as a result, it is constructed by extrapolating from very few observations on people who have been accidentally exposed to very high doses. Sometimes there is no data at all on humans and dose response curves can only be estimated by extrapolation from observations made on animals.

5.8 Estimating the response can be further complicated because individuals are often exposed to several hazards at the same time and there is a possibility that the response to several hazards combined may differ from the response to each one individually (the cocktail effect).

5.9 A further difficulty is that individuals vary in their susceptibility to different agents. Young children and elderly people may be harmed by exposure levels that do no harm to young adults. People with asthma may experience severe symptoms at pollution levels which do not affect those who do not have asthma. When assessing how exposure will affect a population, it is therefore necessary to consider how the groups with different susceptibilities will be affected. Frequently, however, the information available is insufficient to allow this to be done, with any degree of certainty.

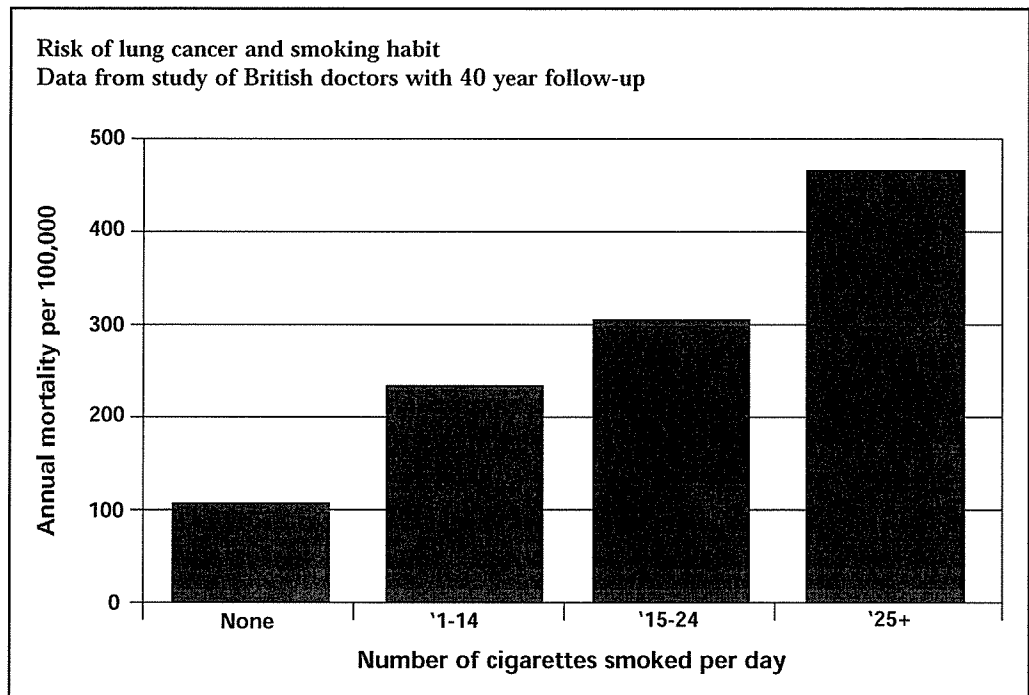
5.10 In theory, the same approach can be applied to all the determinants of health. Figure 8 illustrates a few of the numerous mechanisms through which a proposal might affect population health. The proposal will affect a range of intermediate factors which will in turn have good and bad effects on health of the population which is exposed to them. The level of unemployment, psychosocial disturbance (stress, social isolation or fear of crime), physicochemical challenge (pollution, noise), loss of amenity (contentment with environment) and other intermediate factors to which individuals are exposed can be estimated. The effect of different levels of exposure to these factors on the individuals health can also be estimated. These in turn can be used to make an estimate of the overall impact on the health of the population. The path marked 'unknown' on the chart is included as a reminder that some consequences are likely to be the result of mechanisms of which we have no knowledge and whose effect therefore cannot be predicted.

Figure 8: Health Impact model



5.11. Lifestyle is one of the intermediate factors in the model. Lifestyle refers to those aspects of living which are to a large extent chosen by the individual such as smoking, drinking alcohol, eating patterns and physical activity. Some proposals such as taxation of tobacco, regulation of advertising, licensing of alcohol and health education will directly influence lifestyle. It may also be indirectly influenced through factors such as income, unemployment, social isolation and stress. Good dose response curves can be drawn to describe the quantitative relations between certain aspects of lifestyle such as smoking and drinking and selected health outcomes (see for example Figure 9 taken from a Study on British doctors⁶⁸).

Figure 9: Example of Dose response curve - Smoking and lung cancer



Source: Data from Doll et al ⁶⁸

5.12. Some progress has been made in understanding these complex relationships and mathematical models can be built to show how the different factors could interact. For example the PREVENT model⁶⁹ allows a prediction to be made of how various lifestyle changes influence the future frequency of particular diseases and the MIASMA model⁷⁰ allows prediction of how climatic changes affect the frequency of vector-borne and other diseases.

5.13. A series of studies usually described as 'burden of disease' studies⁷¹ have analysed the present causes of illness and death in populations together with risk factors. This information has then been used to predict future trends. The same sort of methodology could be used to predict the health impact of policies which influence the risk factors.

5.14 One goal must be to develop health impact assessment to a level where knowledge and understanding are sufficient to make quantitative predictions of the consequences of proposals. Although data will always have limitations in terms of its precision, this can be taken into account when assessing the predicted effects. In the meantime, developing the health impact assessment approach will help to highlight where gaps exist in our knowledge and to make clear the assumptions which underlie decision making.

5.15 The danger in this quantitative approach is that particular hazards which have been omitted from calculations because of insufficient information are believed, erroneously, to be unimportant.

Uncertainty

5.16 Prediction is difficult because there is a great deal that is not known about the determinants of health. Sometimes, it is possible to be more precise about the level of uncertainty around risks. For example, in one study⁷² it was stated that for a female aged 40-49 who smokes more than 25 cigarettes per day, the best estimate of risk of suffering a heart attack in the next six years was 7.0 times that of a non smoker of the same age. However, the risk could be between 4.8 and 10.5 times greater (these are the 95% confidence limits attached to the estimate). Other types of uncertainty can only be acknowledged together with a rough indication of its size. For example, there is considerable evidence that alcohol causes a small increase in risk of breast cancer but it is just possible that this evidence might have some other explanation. The Merseyside guide to health impact assessment⁷³ suggests that postulated health impacts should be graded according to their certainty as definite, probable and possible.

5.17 Some idea of the level of confidence that can be attached to predictions may be obtained by sensitivity analysis. This involves varying the assumptions that are made in calculating the impacts and effects. If changing a particular assumption has little effect on the prediction, then the prediction will be robust. If, on the other hand, small changes in an assumption make large differences to the predicted outcome, then it means that the prediction relies more heavily on that assumption. Therefore, confidence in the accuracy of the prediction can be no greater than confidence held in the underlying assumption.

Baseline assessment

5.18 The usual effect of a proposal is to change one of the determinants of health rather than to introduce a factor that was previously totally absent. For example, a new road may increase the levels of noise and exhaust fumes in its vicinity but these may have been present at lower levels before the road was built. In order to assess the impact of the proposal, it is necessary to assess the baseline level of these factors and the effect of the increase or reduction in these levels. The impact of a raised hazard level may be very different in situations where the level of that hazard was previously low from situations where it was already high. Equally, when a proposal is being considered, it is unlikely that population health is perfect. Because one is concerned with the change in health after the proposal, it will be important to ascertain the health status of the population which would be affected by the proposal. Most health impact assessment methods therefore include a baseline assessment stage.

Discounting

5.19 A further problem in calculating impacts is that they tend to occur at different points in time. A death in twenty years time might at this moment be regarded as less bad than a death next week. Technically, this problem is dealt with by a process known as discounting. Discounting means that benefits and harm which are likely to occur at some future date are given less weight than benefits and harm which would occur more immediately. The selection of discount factor can affect considerably the estimated size of a health impact and is a contentious issue.

5.20 Even more difficult is the question of how one allows for impacts affecting future generations as may well be the case for long lasting hazards. One study⁷⁴ proposed that the impact of deaths in all future generation could be estimated by multiplying years of life lost in the present generation by a factor of 1.3. The assumptions underlying this type of calculation are again contentious.

Climate change

5.21 Considerable attention has been paid to the health impacts caused through climatic change^{75 76}. Human activity has reached such a scale that it is affecting global systems in a number of ways e.g. thinning of the ozone layer, global warming, rising sea levels, shifting distribution of rainfall and changing weather patterns. These in turn may impact in many ways such as increased skin cancer (due to increased penetration of ultraviolet radiation), wider distribution of diseases carried by insects and nutrition affected by reduced agricultural productivity. These dramatic changes are produced by the combined effect of thousands of activities most of which are negligible individually. It is difficult to include these sorts of considerations in health impact assessment but they are part of the larger picture. The importance of this was highlighted in paragraph 2.9.

Choosing the most appropriate method(s)

5.22 The previous chapters summarised how health impact assessment is being applied in different places. Exploring and testing its use will inform its future use in Wales. Methods which are appropriate to the scale of proposals and the setting in which they are to be implemented will need to be selected. For example, the health impact assessment procedures appropriate for a transport policy or a multi-million pound industrial development are likely to be different from those which may be used for smaller, perhaps local, developments. The precise health impact assessment procedures appropriate for use by the National Assembly may differ from those appropriate for a local authority, which in turn may differ from those appropriate for a Local Health Alliance or a voluntary organisation.

5.23 The choice of health impact assessment method must be guided by the need to make it add value to the decision making process. It follows that methods which give information on the size as well as the nature of the impact are to be preferred. This, however, must not result in impacts being ignored because there is not enough information to allow their size to be predicted accurately. Nor should it discourage groups who are unable to access the information or the skills for more quantitative predictions from making the best predictions that they can. The best results are likely to come from a judicious mix of broad perspective and tight perspective methods.

5.24 Where environmental impact assessments are being undertaken, it should be ensured that health issues are adequately covered. In situations where no environmental impact assessment is required, it may be appropriate to undertake a health impact assessment on its own.

5.25 As stated in Chapter 4, the general principle of involving stakeholders - including people and communities - in health impact assessment must be supported strongly. The precise way in which this should be done will vary with the circumstances. At local levels, it may be possible to include representatives of communities affected by decisions in any steering group which is established to consider a health impact assessment. For larger, perhaps more complex, organisations, other ways of ensuring participation of stakeholders in the health impact assessment process need to be found. Some of these may build on existing consultation mechanisms. With the above in mind, it is important that health impact assessment is not seen as academic or bureaucratic but as a participatory process which recognises the importance of outcomes for people and communities.

5.26 Discussion of what might be achieved in future years with improved techniques and specialised skills in health impact assessment must not delay the introduction of simpler methods. The aim must be to develop, on the basis of testing and experience, an incremental approach to its use. The immediate priority is to increase awareness of health consequences amongst decision makers, professionals and practitioners at all levels and to identify ways in which people and communities can be engaged in the process.

6. Progress in Wales

Previous experience

6.1 While this document focuses on the future development of health impact assessment, it recognises that a base of relevant experience and expertise already exists in Wales. For example, expertise on environmental impact assessment exists within local authorities, Environment Agency Wales, the Assembly itself and groups in several Welsh universities. Experience of health impact assessment also exists albeit to a lesser extent. Some examples are provided in the following paragraphs. Future developments will draw on existing knowledge and experience.

6.2 International expertise on the public health management of chemical accidents has been built up. The World Health Organization Collaborating Centre for an International Clearing House for Major Chemical Incidents in Cardiff is a major source of public health information and expertise on this topic. The National Focus for Work on Response to Chemical Incidents and Surveillance of Health Effects of Environmental Chemicals provides advice to the National Assembly and Government Departments in the UK while the Chemical Incident Management Support Unit in Cardiff provides advice to health authorities and local authorities in Wales.

6.3 Researchers in Wales working for the Protocol Enhancement Project have produced a series of Health Evidence Bulletins which assess the evidence that specified measures produce health benefits. The bulletins on Healthy Environments⁷⁷ and Injury Prevention⁷⁸ identify some of the causal pathways through which policies, programmes and projects could influence health. These and similar studies contribute to the knowledge base needed for health impact assessment.

6.4 A decision was taken to invest in the refurbishment of Oakdale village and this was made the subject of a concurrent health impact assessment by Caerphilly Borough Council and Gwent Health Authority. This work not only demonstrated the health consequences of a policy decision but also built up experience of how this could be monitored.

6.5 An investment project in housing in the Riverside district of Cardiff is the subject of a concurrent health impact assessment. A portfolio of questionnaires, symptom diaries and other instruments is being used to show the consequences for respiratory health, mental health and injuries.

6.6 A retrospective health impact assessment⁷⁹ was made on the effects of the grounding of the oil tanker Sea Empress in Milford Haven in 1996. This provided information on the nature and frequency of symptoms which might be expected to follow such an event.

6.7 A concurrent health impact assessment is being undertaken on the by-pass constructed at Connah's Quay in North Wales. This will provide information on how people are affected by such construction that can be used to inform future decisions.

6.8 Waste disposal is an important and sensitive issue. Retrospective health impact assessments have been undertaken on the land-fill sites at Nant y Gwyddon and Trecatti by the Welsh Combined Centres for Public Health.

6.9 The proposal to modify and extend the power station at Pembroke to enable the burning of emulsified hydrocarbon fuels (Orimulsion) was the subject of an environmental impact assessment of which health issues were a prominent feature⁸⁰. Dyfed Powys Health Authority played a major part in assessing the possible health consequences.

6.10 Bro Taf Health Authority has made health inequalities a particular priority. Following a public declaration to tackle health inequalities in the area, the Authority have introduced a Health Inequality Impact Assessment. This uses an equity checklist which is completed for each new project⁸¹.

6.11 Researchers from the University of Wales at Bangor are contributing to the UK climate change impacts programme. The programme looks at how Wales might be affected by climatic change in the next century.

Future plans

6.12 We are committed to exploring the use of health impact assessment as part of its approach to improving the health of people in Wales. The publication of this document demonstrates that commitment by providing a solid foundation for future action to develop and test the approach.

6.13 In considering the way forward, a number of broad needs can be identified. The immediate needs are:

- To raise further the awareness of health impact assessment and its potential to contribute to the achievement of better health.
- To increase understanding of the approach among policy and decision makers, professionals and practitioners in different sectors, and the community and voluntary sectors.
- To help people to become more familiar with the approach, the processes and the tools available for the purpose.
- To explore and test the approach as a means of assessing the impact on health of proposed policies and other developments and its potential as a means of identifying further opportunities to address cross-cutting issues.

6.14 This document starts the process but will need to be supplemented by additional action. For example:

- pilot projects
- dissemination and feedback
- support and guidance
- training and development events

6.15 Some pilot projects are in the process of being established by local authorities, health authorities and others. Further pilots are being considered. Work is in hand within the Assembly itself to pilot the use of health impact assessment in its own policy and decision making processes. The piloting of the approach in different sectors is important and action is in hand to do this.

6.16 As the use of health impact assessment in Wales is explored and developed, and as experience is gained and the value and benefits of the approach are assessed, it will be important to disseminate and exchange information and experience as the basis for learning and further development. Effective arrangements for information dissemination and exchange will need to be developed. Information and feedback will be used to inform the development of further action. It may also help to identify whether the concept of impact assessment, its processes and/or tools will be of relevance to other cross-cutting issues.

6.17 In order to encourage organisations to explore the approach and its use as part of decision making processes, consideration must be given to the provision of support and guidance. The nature of support and guidance required will need to be identified but it is anticipated that training and development events - initially to increase awareness and understanding - will feature as part of future action.