5 RISK COMMUNICATION

5.1 Introduction

Most human activities have some interactions with the environment. Coastal aquaculture is no exception, and the interactions should not be ignored. However, as with other industries, the interactions arising from coastal aquaculture occur in specific settings. Risk analysis offers a comprehensive framework for clarifying the processes of interaction that can lead to environmental changes, and the uncertainty associated with the probabilities of the links between hazards and undesirable effects or endpoints being expressed. To be acceptable and useful, risk analysis should be transparent, iterative, and help to build consensus among stakeholders and other interested parties.

5.2 Risk communication objectives

The purpose of risk communication is to provide planners, managers, industry experts, environmental agencies and stakeholders with the information they need to make informed, independent judgements about potential risks to their health, the safety of the operation under consideration, and the potential environmental effects, as well as the economic and social risks that may be associated with a proposed development (Fischhoff 1990; Gow and Otway 1990). Risk communication is an essential tool with the following objectives:

1. Offer stakeholders a sense of ownership of the process, and foster trust in those conducting the exercise.

2. Identify issues of concern, and stakeholder priorities that need to be incorporated into risk identification and risk analysis.

3. Ensure that user knowledge is effectively incorporated into the decision-making process.

4. Provide sound mechanisms by which stakeholders are informed about the nature and strength of links between hazards and endpoints, and the probabilities and uncertainties associated with these relationships.

5. Help the achievement of outcomes that benefit everyone involved, through ensuring that both the proponent and stakeholders understand the problems in advance.

6. Encourages openness through the entire risk analysis process leading to decision-making by effective exchange of information, and by dealing explicitly with perceptions, facts and uncertainty.

7. Ensure that all pertinent and significant data required for the risk analysis are captured, not only from the traditional natural science disciplines that allow assessment of environmental influence or change, but also through stakeholder information on objectives, priorities and perceived risks.

8. Provide mechanisms by which any information generated as a result of the implementation of recommendations arising from the risk analysis (for example, for mitigation or additional research) is also captured.

9. Guarantee that the results of the risk analysis are communicated in a format that is clear and useful to the individuals and organisations that use the information in their decision-making processes.

Of these nine objectives, the last is by far the most complex and challenging undertaking, because the groups receiving the information can have very different levels of understanding of the subject area and of its perceived and real risks. Therefore, a high degree of flexibility is required to ensure good communication between scientists, planners, managers, regulators, developers and the public at both the government and local level. It is almost impossible, without empirical testing, to predict the consequences of effective communication for people's responses. Experts and laypersons alike often face difficulties associated with communication on subjects related to choice, risk or change. The process of risk communication, therefore, also involves educational steps in order to assess and respond to risks and benefits appropriately (Fischhoff and Downs 1997).

Risk communication is a continuous process, the outcome of which (if well performed) should be sustainable resource development where potential hazards have been identified, risks are assessed and serious risks are controlled even in the absence of full information, in accord with the Rio Declaration, and negativities arising from fear of the unknown are minimised and economic opportunities are maximised within socially agreed ranges of risks.

5.3 The need for better communication

Past experience of the management of coastal aquaculture development has shown that a top-down flow of information will often be met by a reactive response, and that this initial response can lead to long-term resistance. There is a need to improve the quality of discussion and communication of risk characteristics of coastal aquaculture in all relevant areas of environmental effects. This should become a normal and regular input to national policy on aquaculture strategy, and influence the development of regulatory practices as well as any SEA/EIA process, building on planning consents as well as licensing and product labelling initiatives.

Communication in a regulatory context is a two way process, with the objectives of understanding the stakeholders' values, their views of an industry and its products, as well as their priorities. Drawing more extensively on stakeholders' knowledge should lead to better decisions, while also ensuring transparency of the decision-making process.

Within the research priorities of the EU Framework VI, a project has been completed on "Stakeholders in Risk Communication: Risk communication practices in EU Member States, selected other countries and industries" (Wright *et al.* 2006). This survey of approaches to risk communication in the 25 EU member states clearly demonstrated the different ways in which risk communication is handled in most countries, despite the agreed definition by IOS (International Organisation for Standardisation). The conclusions of the project support the concept that risk communication should be seen as a continuum (or as a cycle) in which emergency and crisis communication should be a part. Interestingly, the survey also identified the need for developing generic risk communication plans or guidelines, as already exist in a few countries, favouring "...risk communication at the pre-assessment/assessment stage, since stakeholders, including the public, may bring information that might not otherwise come to light from the experts, and stakeholders will certainly bring their values and opinions, which may well be different from those of the experts and/or risk managers." (Wright *et al.* 2006).

It is precisely for these reasons that Risk Communications MUST gain a much higher profile in the entire environmental assessment process than it has achieved in the past. Commonly practised Environmental Impact Assessment (EIA) and Environmental Impact Statement (EIS) procedures employ a communications process often very late (almost as an inconvenient "attachment" to the entire development process). This has frequently given room for the development of a reactive (and mainly counter-productive) process among stakeholders, while creating fears and perceived risks which can drastically affect not only the efficiency of the process but also result in forced decisions which are not necessarily based on solid facts and real risk. However, a fundamental change in approach is now taking place. Risk Communications should be implemented in the development process right from the outset of any development, thereby minimising the chances for 'distrust' evolving among stakeholders at all levels. One of the major objectives of Risk Communication, therefore, is to build trust among stakeholders, providing a platform for the recognition and articulation of problems, and consensus building as an iterative process in the entire decision path of a development.

5.3.1 Trust, ownership and politics

Trust is only gained over time and can be destroyed by single mishap or mistake. Further, once lost it can take a long time to rebuild. Our social and psychological training/experience also works against developing trust. The 1999 report of the ICES Working Group on the Environmental Interactions of Mariculture identified that the reactive role of environmental managers in dealing with the potential environmental effects of aquaculture, in addition to the long lag required for research to reduce the uncertainty in our prediction of the probability of effects, creates tensions between the scientific and public views of the severity of the risks arising from aquaculture. Not having the foresight to recognise and be prepared to respond to the public need for answers, and thereby not having reliable and convincing answers for the public, fuels the fires of potential distrust.

For a number of other psychological reasons, there is even a further bias against the development of trust (Slovic 1999). These include:

1) Negative (trust destroying) events are more notable than positive (trust building) events;

2) When both types of events come to our attention, the negative ones have greater weight than the positive events;

3) A quirk of human nature is that bad news (negative events) are generally seen as more memorable than good news (positive events); and,

4) Distrust, once initiated, tends to perpetuate distrust, inhibiting the kinds of personal contacts and experiences that are necessary to overcome the distrust.

All of this generates a need for the public to find a champion for their concerns who will act as a hedge against possible lack of concern or unwillingness of resource managers to safeguard effectively environmental quality. Many environmental non-governmental organisations (ENGOs) attempt to fill that role.

5.3.2 Standards and priorities

Hazards and risks are, by definition, issues of concern to the wider population who may be affected directly or indirectly. They will have their own views on the relative importance of different effects or endpoints, and the standards or thresholds which might be applied to them. It is therefore appropriate that they should be engaged in scoping the causes for concern to be assessed through risk analysis, prioritisation of these causes for concern, and the setting of standards against which the undesirability of differing degrees of environmental effect can be assessed.

Some characteristics of risk of concern to the general public (Slovic *et al*. 2004)

- Scale / size / extent / numbers of people affected
- Severity (especially mortality)
- Catastrophic
- Familiarity
- Quantity of scientific understanding / uncertainty
- Controllability: ease of mitigation
- Naturalness
- Voluntariness
- Fairness (equity)
- Present v. future risk
- Visibility / detectibility
- Cost / benefit
- Nature of the source

Conventional environmental risk analysis only addresses some of these characteristics: decisions arising as a result of the analysis may need to take account of these wider concerns

5.3.3 User knowledge

Those involved in either the use or management of natural resources usually have a good deal of knowledge about natural systems, and the relationships between different elements of them. If practical knowledge is ignored in the process of risk analysis, the analysis will be weaker, and it is unlikely that users will accept its findings. The nature and scope of user knowledge will vary between user groups, for example, the general public, commercial fishers, or indigenous people. Effective communication requires that participants understand the depth of user knowledge, as indicated in written and oral contributions to the risk analysis process, and respond appropriately to this in their interactions. The process of risk analysis should allow for rigorous exploration and testing of scientific information, user knowledge, public concerns, and where appropriate the synthesis of all three.

5.3.4 The perception of risk

In dealing with risk communication, it is important to recognise that members of the public and experts can have different perceptions of risk. This is because, among other factors, they can have different worldviews, experiences, emotional reactions and social status. One of the possible consequences of these differences is that members of the public may find it difficult to trust the scientists' assessment of risk. However, such differences take us into a field known as Risk Feelings.

Proponents of a purely technical approach to risk analysis can tend to view Risk Feelings as irrational, or at least not amenable to rigorous analysis. Several recent studies, however, dispute this view. In fact, the Risk Feelings (an experiential based approach) and the Risk Analysis (a rational approach) operate not only in parallel but often seem to depend on each other for some guidance. Studies have demonstrated that analytical reasoning cannot be effective unless it incorporates experiential forces. In short, rational decision-making requires proper integration of both modes of thought (Slovic *et al.* 2004).

Feelings are the result of a number of experiential forces working in concert. In an attempt to systematically study those forces, Slovic *et al.* (1980) examined 90 hazards using factor analysis. As might be anticipated, one of the most important axes simply describes the number of people exposed to a hazard (*See* box above). The other two axes that 'account' for much of the variation in how risk is felt, demonstrate a much more subtle interplay of factors.

One of those axes has, at one extremity, hazards that were uncontrollable, lethal, dreaded, globally catastrophic, seriously affected future generations, were not easily reduced, involuntary and generally affected 'me'. Hazards at this end of the axis included: crime, warfare, terrorism, nuclear weapons, nerve gas, and nuclear power. At the other extremity of this axis are hazards that are not obvious, but are especially applicable to the particular individual being exposed to them. These hazards are usually controllable, lack dread, are not globally catastrophic, do not have fatal consequences, are equitably distributed across the population (and yet apply to the individual rather than the whole population), present low risks to future populations, are easily reduced, are voluntary and are seen as generally not applying to 'me'. Hazards at this end of the axis exhibit a high level of familiarity, and included bicycles, power tools, home appliances, hair dryers, and cosmetics.

The second axis described many of the hazards that were observable and known to those exposed, had an immediate effect, were 'old' risks and had consequences known to science. At this end of that axis were; bicycles, motor vehicles, police work, dynamite, and crime. The hazards at the other extremity of this axis included items that were not observable, unknown to those exposed, had a delayed effect, were new risks, and had risks unknown to science. Example of hazards with these attributes included cosmetics, food colouring, DNA research, space exploration and nuclear power.

When feelings and analysis fail to satisfy people's needs to accommodate risk in their lives, recent studies have shown that people also use other factors to judge risks. Factors such as gender, race, political worldview, affiliation and trust strongly affect how a risk is judged (Slovic 1999). Clearly most of these factors are not immediately amenable to influence by the risk analysis process, and must therefore be accommodated within that process. Past practices of EIA and EIS failed to incorporate these factors effectively with the consequence that development was unnecessarily delayed or prevented. Thus risk communication is an essential component to the process and plays a central role in fostering a fair and cost-effective decision-making process to the benefit of all stakeholders involved.

Damasio (1994) neatly sums up the dynamic that has to be enabled.

"*The strategies of human reason probably did not develop, in either evolution or any single individual, without the guiding force of mechanisms of biological*

regulation, of which emotion and feelings are notable expressions. Moreover, even after reasoning strategies become established .... Their effective deployment probably depends, to a considerable extent, on a continued ability to experience feelings."

To summarise, hazards exist, and our view of the risks is heavily influenced by psychological and social factors. Risk communication must therefore blend science with psychological, social, cultural and political factors. Regrettably, our social and democratic institutions tend to breed distrust, and work against resolving the risk management equation.

When communicating about risk, it must be recognised that logic, used in isolation, is an inadequate communication strategy. Risk, and particularly the perception of risk, is multi-dimensional, with both objective and subjective elements. Risk analysts need to understand the subjective dimensions if they are to focus their work on key concerns and communicate information in ways that address those concerns.

5.3.5 Complexity and uncertainty

Risk analysis is complex and multi-dimensional, dealing with the interface between human responses and complex physical and natural systems. Risk analysis provides a framework for exploring this complexity in a standardised and rigorous framework, and also for incorporating uncertainty in an explicit and clear way. A role of the risk communicator is to use the structure of risk analysis to inform regulators or stakeholders, and others, about the nature of risk, and to attain consensus as to appropriate mitigative actions.

5.3.6 Monitoring

In many instances, the risk analysis will suggest that environmental monitoring should be undertaken after initiation of an aquaculture project, for example, as an element in a cycle involving data collection, assessment, and review of farm operating procedures and conditions. Monitoring can provide information directly relevant to the situation being monitored, and also provide data to assist in risk analyses of other, similar, situations. New assessment technologies are emerging using genomic (transcriptomic) technologies that may allow forecasting of effects on organisms by detecting the up and down regulation of target genes. In some cases, monitoring is a normal requirement of licences/permits to develop/operate fish farms. In some other cases, the uncertainty in the assessed probability of the undesirable outcome being expressed may suggest that targeted monitoring should be undertaken to try to ensure that, if the undesired effect does occur, then corrective measures can be taken.

An example of the latter occurred in British Columbia, Canada, where a decision was made to allow the farming of Atlantic salmon, a species not native to the Canadian west coast. There was a substantial body of experiential evidence from many hundred introductions of this species outside its home range. In no instance was Atlantic salmon able to establish anadromous populations. It was recognised that the salmon were likely to escape containment and enter the marine waters, and that if mature reproductive individuals escaped near a suitable stream, they might reproduce and produce some offspring. However, the available evidence suggested that it was very unlikely that the offspring themselves would survive to reproduce. To help evaluate if that conclusion was accurate, a monitoring program was developed, built around government and stakeholder participation (Figure 5.1). As predicted, a very limited number of juveniles were detected in a few streams close to farms, but there has been no evidence to date that the F1 generation was ever able to complete the life cycle of wild Atlantic salmon and return to breed. While these observations do not provide absolute proof that it cannot happen, the data are now becoming invaluable in assisting to quantify the level of risk of establishing a wild population of Atlantic salmon presented by future individual salmon farms.

5.4 Learning from past experience

5.4.1 A brief history

Historically, risk analysts undertook risk analysis as a technical procedure, at the end of which, results were communicated. Given the lack of explicit recognition and incorporation of the uncertainties inherent in risk analysis, stakeholders often responded negatively to the outcomes. Fischhoff (1995) reviewed some of the approaches used, and attitudes held, in the past and identified a pattern of miscommunication and misconceptions among participating parties that subsequently lead to an attempt to improve communication. He describes seven types of approach ranging from the technocentric "all we have to do is get the numbers right", to genuinely participatory or partnership approaches. These latter recognise not only the importance of transparency and trust, but also the potential contribution of stakeholders to the risk assessment process, and especially to those parts of the process which have significant subjective elements. In accord with Fischhoff (1995), we interprete these categories as follows:

1. "*All we have to do is get the numbers right.*" Risk analysis here is seen as a purely technical process which scientists can undertake before delivering the results to managers. This disregards the fact that such a process involves judgement about issues which may affect many people – and that they need to be reassured about how those judgements are made. It lacks transparency. Simple questions by the media have often undermined this approach.

2. "*All we have to do is tell them the numbers*." Scientists and risk analysts have often been tempted to hand out their conclusions in the simplest possible format – a set of numbers reflecting the conclusions of their analysis. While having some attractions, Fischoff argues that such a straight-forward approach may be met by a feeling in stakeholders that nobody in the planning process seems to care about their view and perspective.

Figure 5.1 : An example of post analysis data collection

3. "*All we have to do is explain what we mean by the numbers*." Scientists often believe that an analytical science approach is all that is needed when conveying complex data analysis in simplified ways. This may not be sufficient and can be difficult where the audience or stakeholders do not share the same conceptual framework or background.

4. "*All we have to do is show them that they already accept similar risks*." This attitude ignores the multiple dimensions of risk perception. In particular, acceptability depends on benefits as well as risks, and also that new risks are less well tolerated than old ones. People can be (apparently) inconsistent for a whole host of reasons.

5. "*All we have to do is show them that it's a good deal for them*." This may be done by considering the expected costs and benefits associated with particular risks or strategies. Explaining benefits can encounter difficulties that are analogous to those involved in explaining risks. For example, logically equivalent ways of presenting the same options can produce systematically different choices (known as 'framing effects').

6. "*All we have to do is treat them nicely.*" If people do not feel respected, then they have more reason to suspect that they are not being fully informed. They also have more reason to fear that risks are not being managed properly on their behalf, and that the risk-management process is part of a larger trend to disenfranchise them. Although sympathetic delivery is no guarantee of respect, it does show that one is recognised as a person with feelings (even if those are being manipulated).

7. "*All we have to do is make them 'partners'*". Stages 1 through 6 involve increasing levels of recognition of the recipients of the message as individuals with complex and genuine concerns. This still implies a one way process – a well researched sales message. However, the understanding is cultivated in order to get across a message whose content has been determined by the communicator. That means seeing recipients as individuals but not engaging with them as such. This stage involves the public as partners in risk management. It means providing them with a seat at the table and allowing them to communicate their own concerns. In effect, it means opening a communication channel in the opposite direction. Care must be taken to establish with the partner/stakeholders how their input will be incorporated into the process. For example, is their invited input only tokenism (it may be perceived as that) or may their input dominate the discussion? What happens to people's input (especially non-experts) once it has been given, especially if it is contrary to expert opinion? The process by which controversial opinions are accepted is a necessary issue which should be addressed early in discussions with partners.

The approaches towards the end of the above list begin to recognise not only the importance of transparency and trust, but also the potential contribution of stakeholders to the risk assessment process, and especially those parts of the process which have significant subjective elements.

5.4.2 The way forward: a more participatory approach

As discussed above, our responses to hazards and risk are heavily influenced by psychological and social factors. Risk communication must therefore seek to integrate the scientific aspects of risk analysis with relevant psychological, social, cultural and political factors. However, distrust seems to be an inevitable element of our social and democratic institutions, and this tends to work against the resolution of the conflicts that so often complicate risk analysis and management.

A new approach is therefore needed – one that focuses on introducing more public involvement early in a risk analysis which is transparent and in which it is clear to all involved that the biological and physical sciences have a distinct role from that of the economic and political sciences. The role of the biophysical sciences is to measure and develop the knowledge that will allow prediction of how much change will result from the introduction of a hazard into the environment, its geographic extent and its temporal duration (this is risk assessment). Risk communication takes information from these sources and orders it in a way that speaks to people's concerns, by translating the socio-economic values to the environmental manager and helping to make the science relevant and informative in relation to socio-economic interests. Managers can also supply supplementary post-analysis data from monitoring programs that will allow the risk assessment to be used in an adaptive management protocol.

Work in Europe and North America has begun to lay the grounds for public participation in the deliberative and decision-making process (for example, *see* Renn *et al.* 1991; Renn *et al.* 1995; Stern and Fineberg 1996), and for the creation of tools to improve the effective use of the contributions from stakeholders and other interested groups.

5.5 Developing a Communication Strategy

5.5.1 Overall considerations

Risk Communications strategies inevitably differ between situations, even within a single field such as coastal aquaculture. The particular circumstances vary with location, and the mix of concerns will vary with the people affected or concerned about a development. It is therefore not possible to be highly prescriptive in advice on how to undertake risk communication. However, the following sections attempt to identify some themes that are generally applicable, although the scale of effort required to complete the tasks will vary greatly. Communication in relation to a regional or national plan for coastal aquaculture will be a very different challenge to that required for the extension of a single existing production site. The communications strategy mapped out at the outset of the risk analysis process should:

- Define the need and scope of consultation and communication;
- Identify relevant stakeholders, interest groups and experts who should be involved, and their particular interests, knowledge, needs and perspectives;
- Decide on the approach and technique for engagement and communication with respect to each stage of the risk analysis and for each stakeholder group, government, and technical experts.

The details of such a strategy will depend on the issues being addressed, the political or decision-making context, and the nature of the lead organisation. The following guidance should therefore be interpreted with flexibility. Nonetheless there are some general principles which should be applied in most circumstances:

- Engagement with key stakeholders should be undertaken from the outset, to maximise transparency and ownership;
- Specifically seek out, show respect for, and take full account of local and/or user knowledge;
- Consultations should be expertly facilitated by someone seen by all parties as neutral and trustworthy;
- The process should be iterative – consultation informs analysis; analysis informs consultation; consultation generates consensus..... and so on. The number of iterations may range from one to many according to the issues being addressed and the scope of the whole exercise.
- The final assignment of estimates of severity, probability and uncertainty – the core of risk assessment – should not be done by a single individual. Although they may be informed by technical experts, final estimation should be undertaken by an agreed delegated group, including technical experts, and including appropriate or requested stakeholder representatives.

The objective of this process is to maximise the flow of information and the interactions between all involved. It is a continuous process, including not only the risk identification and risk assessment but also the implementation of the decision, its subsequent monitoring and iterative improvement (mitigation) process.

It should also to be emphasised that a risk communicator and/or facilitator is not a public relations official whose primary aim is to limit the possible impact of the Risk Analysis on the development of the project. The risk communicator's main objective is to ensure that stake-