



***A PRIMER ON THE
POLICY CHOICE FRAMEWORK***

Version 8.2

Geoff Kaine
RESEARCH



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Introduction

Much agricultural policy, and some natural resource policy, is about influencing the behaviour of primary producers. Consequently, successful policy design and implementation requires integrating knowledge about public policy, agricultural systems, economics, producer behaviour and the behaviour of public agencies. Rarely are policy makers skilled in all of these subjects.

The Policy Choice Framework (PCF) was developed as a tool to assist policy makers wishing to influence the behaviour of primary producers. The Framework is unique among methods for choosing policy instruments because it includes components to systematically link the choice of policy instruments with predictions of the behaviour of primary producers and government agencies.

The Framework has been developed over a number of years and draws on the knowledge and effort of many people. The Framework originated from research supported by the Victorian Water Trust, the Victorian Department of Sustainability and Environment and the Goulburn Broken Catchment Management Authority (Johnson et al. 2006; Kaine et al. 2007).

The National Action Plan for Salinity, the Victorian Climate Change Adaptation Program, and the Victorian Department of Primary Industries were contributors to development and revision of the Framework, and various components in it (Kaine and Higson 2006a; Kaine and Higson 2006b; Kaine and Johnson 2004; Kaine and Lourey 2012; Kaine et al. 2006; Kaine et al. 2010a; Kaine et al. 2010b; Lourey et al. 2011a; Lourey et al. 2011b; Sandall et al. 2009).

Applications of the Framework to irrigation modernisation can be found in Johnson et al. (2009), to nutrient management in Kaine et al. (2008) and Young and Kaine (2009) and to wild dog management in Lourey et al. (2011a).

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Overview

The purpose of a policy is to change the behaviour of people. The purpose of the Policy Choice Framework is to help policy makers decide how to change the behaviour of primary producers. In other words, the purpose of the PCF is to assist policy makers to choose a policy instrument or intervention to influence the behaviour of producers.

Since the PCF is for deciding how to change the behaviour of primary producers, the behaviour that is to be changed must be identified before the PCF can be applied. This means a policy objective or outcome must be formulated and that one or more behaviours that contribute to, or detract from, the policy outcome must be identified before the PCF can be used. Once the policy outcome has been formulated and relevant behaviours identified, the PCF may be used to decide how to encourage any behaviour that is desirable because it contributes to the policy outcome, and to decide how to discourage any behaviour that is undesirable because it detracts from the policy outcome.

Choosing a policy instrument

Classical microeconomics theory is used in the PCF to guide the selection of a policy instrument to change the behaviour of producers. The theory is used in the PCF to identify the reason why a desirable behaviour is not occurring, or the reason why an undesirable behaviour is occurring and, consequently, how that behaviour can be changed.

However, microeconomic theory describes the functioning of markets for products and services. Consequently, to use microeconomics to guide the selection of a policy instrument the behaviour of interest, whether desirable or undesirable, must be translated into either the supply of a product or service, or the use of a product or service. The first tree in the PCF, the 'policy and products tree', is intended to help make this translation (see Figure 1).

Once the behaviour of interest has been translated into supply or the use of a product or service then microeconomic theory can be applied to identify the fundamental reason why the desirable behaviour is not occurring (or the undesirable behaviour is occurring). In other words, microeconomics can be applied to ascertain why primary producers are not supplying or using a product or service when this is desirable, or why primary producers continue to supply or use a product or service when this is undesirable. The second tree in the PCF, the 'justifications tree', is intended to help identify this fundamental reason.

The fundamental reason for the behaviour of interest provides the technical justification, from an economic perspective, for government to intervene and change the behaviour of producers to achieve the policy outcome. Whether intervening is worthwhile depends on whether the benefits of intervening outweigh the costs; a matter that is not considered here as it is more than adequately dealt with by benefit-cost analysis.

Once the fundamental reason for the behaviour of interest has been identified, a policy instrument that counteracts that reason and thereby may change behaviour can be identified. This instrument is termed the primary instrument because it is intended to nullify the fundamental reason for the behaviour the policy maker wishes to change.

The choice of primary instrument depends on whether producers are to be encouraged to engage in behaviours that are desirable because they contribute to the policy outcome, or they are to be discouraged from continuing behaviours that detract from the policy outcome. The third through sixth trees, the 'primary instrument tree', the 'public benefits tree', the 'public costs tree' and the 'compulsory change tree', are intended to help identify the primary policy instrument.

Predicting producers' responses

The purpose of the primary instrument is to change the behaviour of producers. Consequently, having selected the primary policy instrument the next logical step is to assess whether producers will react to the instrument and change their behaviour as expected. A combination of farm systems theory and social psychology are used in the PCF to predict producers' reactions to the policy instrument and changes in their behaviour.

If producers are forecast to react unfavourably to the primary instrument and behave in counter-productive ways then it may be possible to counteract these reactions by changing the way in which the primary instrument is implemented. This involves choosing additional policy instruments to complement the primary instrument. For example, offering incentives might counteract producers' unfavourable reactions to a regulation.

Alternatively, producers' reactions to the primary instrument may be so unfavourable that it is not feasible to implement the instrument. In these circumstances choice of the primary instrument may be revisited, the factors governing that choice reconsidered, and an alternative instrument selected.

The seventh and eighth trees in the PCF, the 'I₃ response tree' and the 'use variety tree' are intended to help predict producers' reactions to the primary instrument and changes in their behaviour. The results can provide guidance on the need for any complementary instruments, or the need for reconsidering the original choice of primary instrument.

Although producers may react as expected to the primary instrument, and any accompanying package of complementary instruments, the possibility arises that the number of producers that change behaviour is not sufficient to meet the policy outcome. Alternatively, there may be a deadline for achieving the policy outcome and producers may be changing their behaviour too slowly to achieve the deadline. In these circumstances additional policy instruments may be required, or the choice of the primary instrument reconsidered. For example, a regulated code of conduct may replace a voluntary industry code of conduct as the primary instrument to ensure all businesses in an industry meet certain operating standards.

The number of producers that will change their behaviour may be estimated using the same techniques that were used to predict producers' reactions to the primary policy instrument. In the PCF, predictions of the rate at which producers will change their behaviour may be made using a technique that combines farm systems theory, innovation theory and consumer purchase theory.

The ninth tree in the PCF, the 'scope and rate tree' is intended to help predict the number of producers that will change their behaviour and the rate at which this will occur.

Predicting agency responses

An important factor in the successful implementation of policies to change the behaviour of producers is the suitable design and resourcing of government agencies charged with the responsibility of implementing them. The principles underpinning the design and operation of policy instruments differ depending on the instrument. Consequently, different organisational procedures, processes, structures and even cultures are required to successfully implement different instruments.

This means agencies may be forced to change their procedures, processes, structures, and sometimes cultures, when called on to implement a policy instrument that is new to them. Such organisational changes require resourcing. In other words, the introduction of new policy instruments to change the behaviour of primary producers may also induce changes in the organisational behaviour of government agencies.

A combination of organisational behaviour theory and systems theory is used in the PCF to predict the organisational changes that may be required of government agencies for them to successfully implement the primary policy instrument and any complementary instruments. The tenth tree in the PCF, the 'policy innovation tree' is intended to help predict the organisational changes, if any, which may be required to implement the primary policy instrument and any complementary instruments.

Typically, the authority, responsibility and resources for the design and implementation of natural resource policy are distributed among different organisations. This creates circumstances that are similar to those that arise with outsourcing in business. Outsourcing involves contracting with a supplier from outside an organisation for the provision of goods and services that in the past would have been provided internally by the organisation.

Outsourcing creates dependencies between organisations because the achievement of the objectives of one organisation influences the achievement of the objectives of others. To the degree that the objectives and strategies of the organisations that are parties to an outsourcing contract differ, and these differences result in different expectations about the outcomes of outsourcing, outsourcing creates risks for organisations.

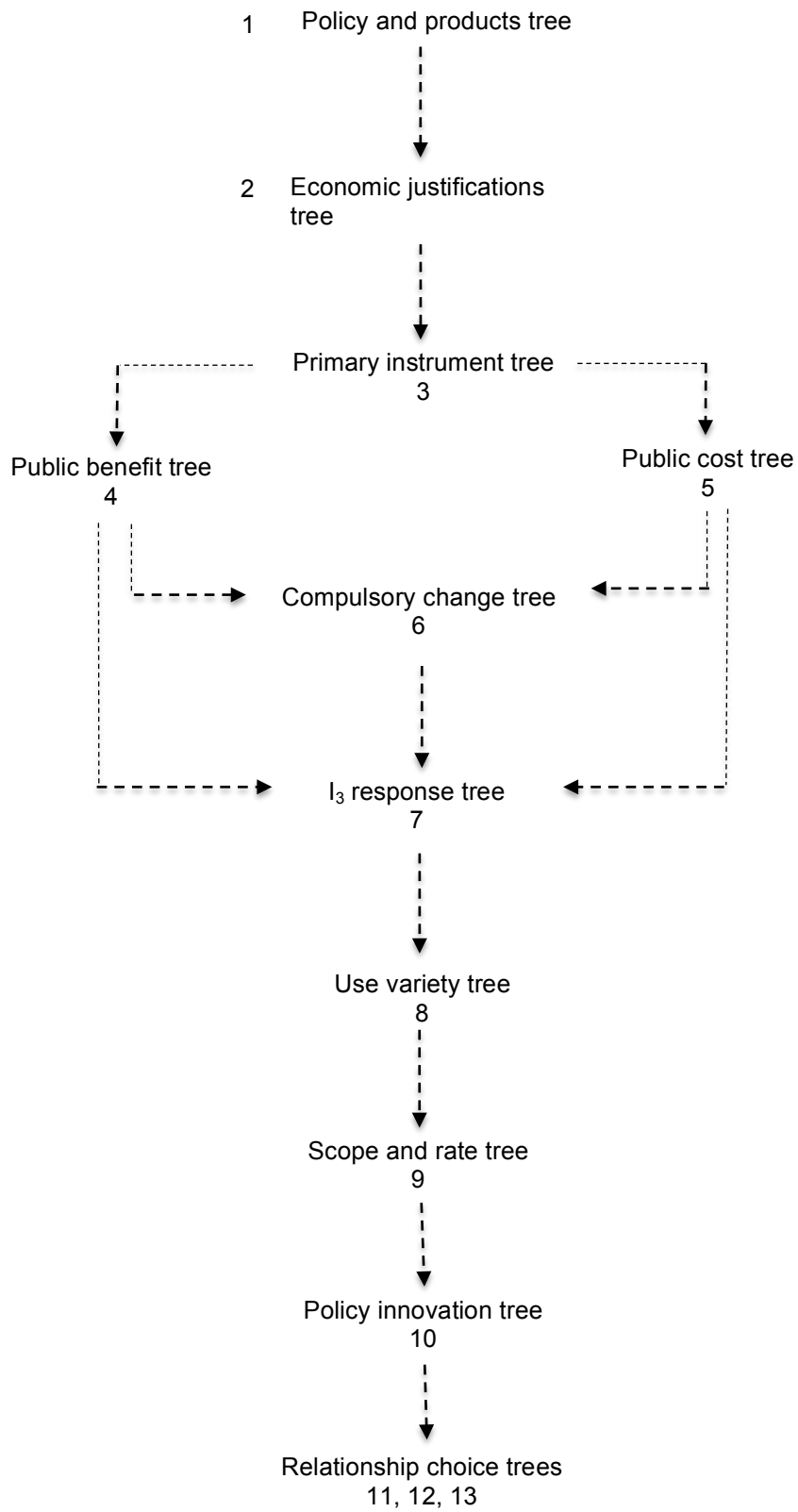
Conventions that distribute the authority and responsibility for the design and implementation of natural resource policy among organisations create similar dependencies, and therefore similar risks. Consequently, and in principle, the literature in regard to outsourcing should provide insights into the management of the risks that arise when the various activities that constitute policy design and implementation are distributed among organisations.

A combination of economic theory, strategy theory and human resource theory is used to identify the potential risks of distributing the responsibility for developing and implementing natural resource policy among a group of organisations.

The eleventh and twelfth trees in the PCF, the 'relationship choice trees' are intended to help predict the governance and strategic risks that may arise when policy design and implementation activities are shared among a set of organisations.

Each of the twelve trees in the PCF is described in detail in the following sections.

Figure 1: Overview of PCF



Identifying the product or service of interest

Microeconomic theory is used in the PCF to guide the selection of a policy instrument to change the behaviour of primary producers. The theory is used to identify the reason why a desirable behaviour is not occurring, or an undesirable behaviour continues to occur and consequently, how that behaviour can be changed. This section is based on Kaine and Lourey (2012).

Microeconomic theory applies to the operation of markets for products and services and there is an extensive literature in microeconomics on the conditions that create situations where undesirable behaviours continue to occur, and desirable behaviour fails to occur; such as externalities, market power and information asymmetries. However, this literature does not in itself provide a logical process for identifying which market should be investigated to determine if any of these conditions are present.

The first step, then, in identifying how to change the behaviour of primary producers, is to identify precisely in which market intervention is necessary. This requires translating the desirable, or undesirable, behaviour the policy seeks to change into market behaviour. That is, classifying the behaviour as being the equivalent of supplying a product or service, or consuming a product or service.¹ The 'policy and products framework' was developed to assist this classification task (see Tree 1). The logic of the framework is as follows.

The purpose of a policy, in this context, is to change behaviour of some, or all, primary producers. Consequently, a policy is constructed on the assumption that, in its absence, primary producers will either:

- Fail to act in ways that contribute to the policy objective, or
- Continue to act in ways that detract from the policy objective.

Hence, translating a policy outcome into a series of associated products and services also requires identifying, in the absence of any government intervention, what actions primary producers would fail to take that are desirable because they are consistent with the policy outcome. An action here means activity, that is, deeds.

Actions that are desirable but would not voluntarily occur without government intervention can be characterised as either:

- (i) A business failing to supply a product or service. For example, a business is failing to eradicate pests. The product or service of

¹ The term 'products and services' has been used rather than 'goods and services', which is more common in economics, to avoid confusion among non-economists between goods, public goods, and the public good.

- interest here is a pest eradication service. The purpose of the policy is to encourage the business to supply the product or service.
- (ii) An individual failing to use a product or service. For example, an individual is failing to use seat belts. The product or service of interest here is seat belts. The purpose of the policy is to encourage the use of the product or service.

Translating a policy outcome into a series of associated products and services also requires identifying, in the absence of any government intervention, what actions primary producers would take that are undesirable because they are not consistent with the policy outcome.

Actions that are undesirable and will continue voluntarily unless there is government intervention can be characterised as either (Kaine and Lourey 2012):

- (i) A business using a product or resource as an input in their production of a product or service. In this case the resource is the product or service of interest. For example, a business is creating pollution by releasing nutrients into the environment. The resource in this instance is the capacity of the environment to absorb nutrient pollutants. The purpose of the policy in these circumstances is to change the use of the resource by the business.
- (ii) An individual using a product or resource while consuming a product or service for personal satisfaction. For example, an individual allows their pet dog to roam freely. The resource they use in this instance might be the capacity of the environment to absorb dung and odours. The purpose of the policy is to change the use of the resource by the individual.

To recapitulate, in the absence of a policy there will be deeds producers choose not to perform: certain activities they will choose not to undertake. These actions that producers choose not to take can be classified into two kinds given a policy outcome: those that are desirable because they would contribute to the policy outcome and those that are undesirable because they would not. In this context the purpose of policy is to encourage those deeds that are desirable (and avoid encouraging those deeds that are undesirable).

Furthermore, producers will choose to perform certain deeds in the absence of a policy: they will voluntarily undertake certain activities. These are actions that producers choose to take and can be classified into two kinds given a policy outcome: those that are desirable because they contribute to the policy outcome; and those that are undesirable because they do not. In this context the purpose of policy is to discourage those deeds that are undesirable (and avoid discouraging those deeds that are desirable).

Identifying desirable and undesirable behaviours, actions, activities or deeds can be time consuming. Sometimes this is because the specific behaviours that contribute to a policy outcome are yet to be clearly articulated. For example, increasing the efficiency of water use in agriculture has been, and

continues to be, an important policy outcome. This increase in efficiency may be achieved by the adoption of certain irrigation technologies and practices. Identifying these technologies and practices can take time.

Translating a policy outcome into the apposite set of desirable or undesirable behaviours can also be difficult because undesirable behaviours can be framed as the reverse of desirable behaviours, and desirable behaviours can be framed as the reverse of undesirable behaviours. This can result in confusion as to precisely what specific actions the policy is intended to change.

For example, the act of conserving native vegetation may be reframed as not destroying native vegetation. The problem that arises here is deciding which framing is pertinent because this determines the kind of action the policy is intended to change. If a conservation framing is chosen then the purpose of the policy is to encourage actions that would not occur and are desirable because they conserve vegetation. If the framing is not destroying native vegetation then the purpose of the policy is to discourage actions that would occur but are undesirable because they destroy native vegetation.

The solution to this problem lies in considering what would happen in the absence of the policy. If, in the absence of the policy, producers would voluntarily choose to clear native vegetation then the policy outcome is achieved by discouraging the undesirable behaviour that would otherwise occur: the clearing of vegetation.

On the other hand if, in the absence of the policy, producers would not clear native vegetation then the policy outcome is achieved by encouraging a desirable behaviour that might not otherwise occur; namely the planting of native vegetation.

The problem of translating a policy outcome into the apposite set of desirable or undesirable behaviours may also be difficult when a policy outcome spans a potentially unlimited set of behaviours. For example, an outcome of education policy may be to reduce absenteeism. Using this framing, the purpose of the policy can be described as intervening to reduce the number of children who are choosing not to attend school, preferring to engage in other activities. The list of activities children may choose to do rather than attending school is, potentially, unlimited. This makes the task of specifying the set of actions the policy is intended to influence problematic.

The solution here lies in considering that the list of desirable (undesirable) actions contains alternatives that are the opposite of a single undesirable (desirable) action. Hence, the purpose of the policy should be described in terms of seeking to change that single action. Returning to the example, the list of activities contains different alternatives to the single act of attending school. Hence, the purpose of the policy should be described as changing the behaviour of children to increase the number attending school.

In terms of the policy, attending school is a desirable activity; any other activity is undesirable. Consequently if, in the absence of the policy, children would choose activities other than going to school then the policy outcome is achieved by encouraging a desirable behaviour that would not otherwise occur; namely, attending school.

Policy and products tree

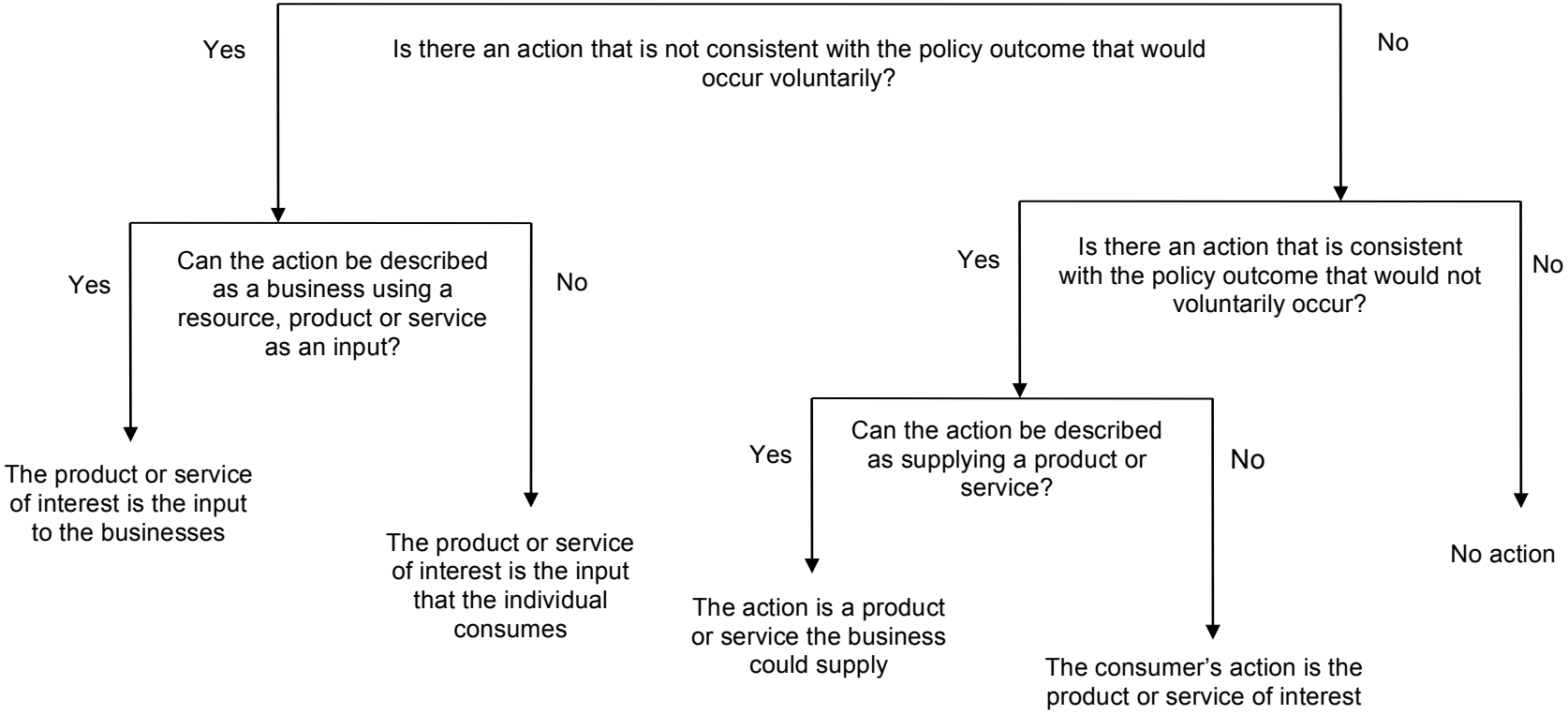
The above provides criteria for translating a series of behaviours associated with achieving a policy objective into a series of products and services for analysis. The criteria are:

- Is the action consistent with the policy objective?
- Will the action be taken voluntarily in the absence of a policy intervention?
- Will a business or an individual take the action?

These criteria are laid out in the form of decision trees, the criteria being expressed using different terms in each tree, in Trees 1a, 1b and 1c.

The resulting classification provides the information necessary to apply the economic justification framework and the subsequent primary instrument frameworks.

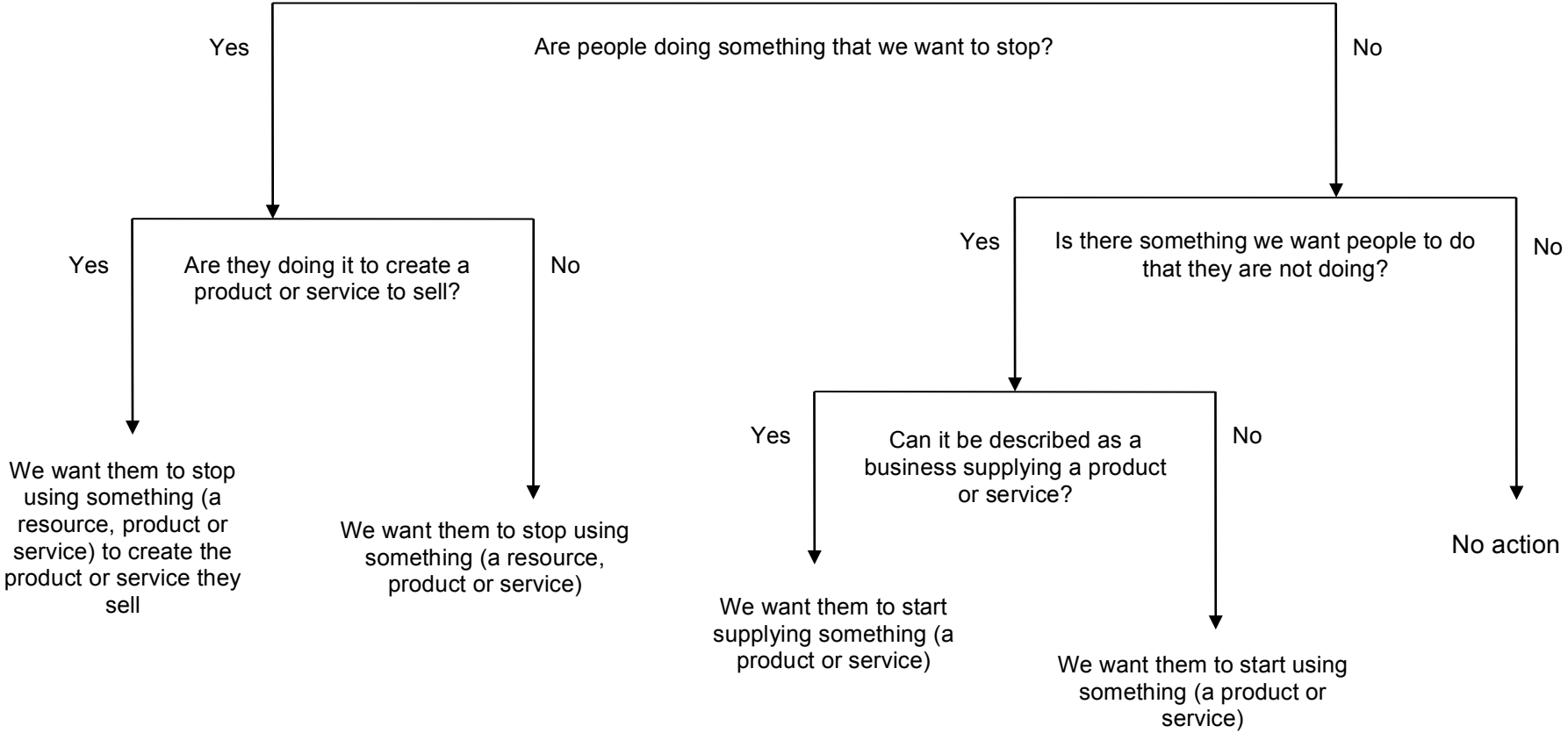
Tree 1a: Policy and products tree - policy version



Adapted from Kaine and Lourey (2012)



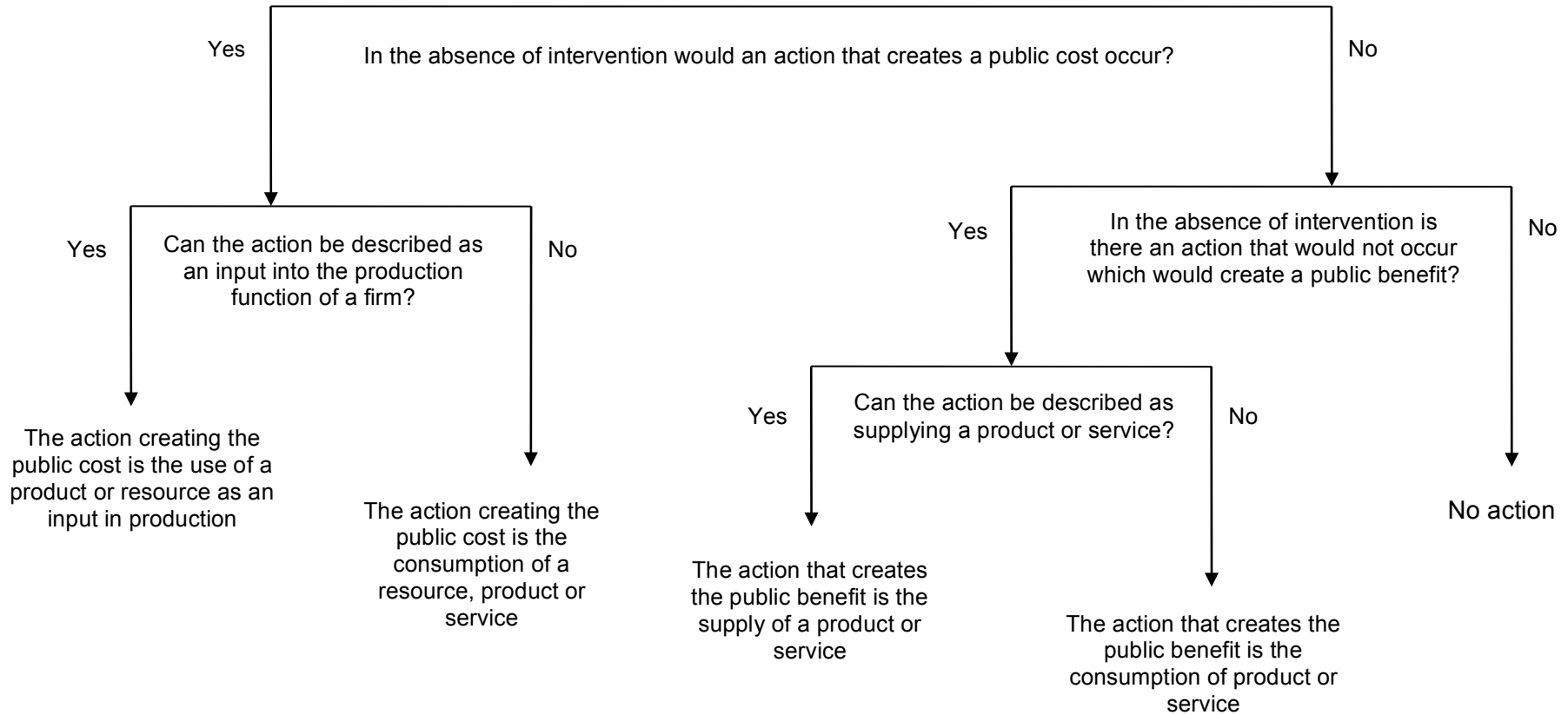
Tree 1b: Policy and products tree - plain version



Based on Kaine and Lourey (2012)



Tree 1c: Policy and products tree - economics version



Based on Kaine and Lourey (2012)

Economic justifications for government intervention

In this section the conditions that may justify government intervention to change the behaviour of primary producers on microeconomic grounds are explained. Knowing which condition is present is important when choosing a policy instrument as, depending on the condition, some policy instruments will be more efficient than others in securing the policy outcome. This section is based on Sandall et al. (2009).

The unrestricted operation of purely competitive markets is an ideal in microeconomics. In theory, the unrestricted operation of purely competitive markets should maximise social welfare. In practice, however, markets may not be purely competitive and, as a consequence, government intervention in the economy may be justified to improve social welfare.

In essence, four conditions may justify government intervention in the economy. These are (Sandall et al. 2009):

- When there are inequalities in income distribution
- When markets are missing
- When markets are incomplete
- When markets are imperfect

The first condition, inequality in income distribution, involves preferences about the sharing of wealth generated by an economy. The other three conditions concern the efficient functioning of markets in the economy. From an economic perspective income and wealth are outcomes of the operation of markets. The more efficient markets are, the greater the income and wealth that is generated by the economy. Hence, the importance economics attaches to correcting inefficiency in the economy.

From an economic perspective, each condition provides a necessary, though not sufficient, justification for government intervention. For government intervention to be fully justified it is also necessary to establish that the social benefits of the chosen intervention outweigh the costs (Stern 2007).

Income inequality

Income inequality is about the fairness with which wealth is shared. Strictly speaking, the fairness of income distribution is a separate matter from the efficiency of markets (Productivity Commission 2009). Theoretically, all the markets in an economy may function efficiently; thereby generating the maximum wealth possible for the community, but the community may still be dissatisfied with how that wealth is shared among its members.

Changing how wealth is shared requires redistributing income among the members of a community. Ideally, income should be redistributed using a mechanism that avoids reducing the wealth available to the community. This means using a mechanism that does not reduce the efficiency of markets.

Consequently, inequalities in income are usually best corrected by transferring income between members of the community using transfer payments (e.g. taxation) rather than intervening in the operation of markets for products and services (Alston and Pardey 1996).

Sometimes efforts to improve the efficiency of a market may change the distribution of income in the community in an unsatisfactory way. In these circumstances, income should be redistributed using a mechanism that avoids reducing the increased wealth that the improved efficiency of the market creates for the community. Consequently, transfer payments should also be used in these circumstances, rather than modifying the market, to counter the change in income distribution.

Generally speaking, the focus of agricultural and natural resource policy is on the efficiency of markets rather than income inequality. However, the impact of agricultural and natural resource policy on the distribution of wealth in the community is often a matter of concern. Consequently, in practice, agricultural and natural resource policy must be formulated and implemented bearing in mind the consequences for the distribution of wealth in the community.

Economic efficiency

When a policy objective does not concern income inequality, from an economic perspective government intervention in the economy may be justified because of a concern about the efficiency of markets. When markets persistently, substantially and systematically fail to allocate resources to their most highly valued use then they are inefficient.

The crucial term here is 'persistently' as this signals the presence of a fundamental flaw in the operation of markets (Randall 1983). Inefficiency occurs when markets are either missing, incomplete or imperfect.² These represent different forms of market failure.

Missing markets

Randall (1983) identified two properties that provide a basis for identifying why markets are missing or incomplete and so are persistently inefficient. These properties were non-exclusiveness and non-rivalry. Non-exclusiveness occurs when either:

- The supplier of a product or service is unable to obtain payment in full from those that benefit from the product or service
- The user of a product or service can avoid paying the full cost of using the product or service

² The terms public goods (missing markets) and externalities (incomplete markets) have been avoided, as there is confusion about the meaning of 'public goods' and 'the public good' among non-economists. Similarly to talk of market failure can confuse as it implies the presence, rather than the absence, of a market.

Free-to-air television is an example of a product that is non-exclusive. Anyone with a suitable television that is within transmission range can watch a broadcast program. However, the broadcaster cannot recoup the cost of creating the program by easily and inexpensively extracting a payment from viewers of the broadcast. Cable television, on the other hand, is exclusive since the broadcaster has sole control over the technology that is required to view the television signal and so can extract payment from viewers.

Non-rivalry occurs when the use of a product or service by one individual does not affect the use of a product or service by others (Randall 1983). Both free-to-air television and cable television are non-rival because the viewing of a transmission by one viewer does not affect the viewing of the transmission by others. On the other hand, viewing of a film at a cinema is rival. Cinemas have limited seating and, if the number of people that wish to view a film at a cinema is greater than this limit, then some individuals will not see the film because the cinema is full. Here, the limited capacity of the cinema means viewing of the film is rival: the viewing of the film by some means others cannot.

When a product or service has the properties of being both non-exclusive in production and non-rival in consumption then a market cannot be established in that product or service: the market is missing (Randall 1983). Such products or services are often termed public goods (Godden 2006).

When markets are missing then the supply of the relevant product or service will be less than economically optimal. This means that the welfare of the community can be improved by encouraging the supply of the relevant product or service. In economic terms, increasing the supply of the product or service will create a net social benefit (Sandall et al. 2009).

Missing markets can be corrected if exclusivity in production can be established through technological innovation (e.g. cable television) or establishment of property rights (e.g. licencing of television receivers). Missing markets may also be corrected if use of the product or service can be linked to the use of products and services that are rival (e.g. television advertising).

Incomplete markets

Another condition that may justify government intervention is when there is a market for a product or service but the supply or use of the product or service creates costs or benefits that are not fully reflected in its price (Vatn and Bromley 1997). In other words, there are non-exclusive benefits or costs associated with the supply or use of the product or service: the set of markets associated with the product or service is incomplete (Randall 1983).

The market exists for a product or service but the persistent failure to adequately price all costs and benefits associated with the supply or use of it implies rivalry, but non-exclusivity, in at least one of the inputs or resources involved in the supply or use the product or service. Such non-exclusive benefits or costs are commonly termed positive or negative externalities,

respectively (Randall 1983). Examples of non-exclusive benefits and costs are pollination of crops by honeybees and production of greenhouse gases by livestock, respectively.

When markets are incomplete and create non-exclusive benefits then the supply or use of the relevant input or resource will be less than is economically optimal. This means that the welfare of the community can be improved by encouraging the supply or use of the relevant product or service. In economic terms, encouraging the supply or use of the relevant product or service would create a (net) social benefit (Sandall et al. 2009).

When markets are incomplete and create non-exclusive costs then the supply or use of the relevant resource or input will be greater than is economically optimal. This means the welfare of the community can be improved by discouraging supply or use of the relevant product or service. In economic terms, discouraging the supply or use of the product or service would reduce (net) social costs (Sandall et al. 2009).

Incomplete markets can be corrected if exclusivity can be established in the relevant input or resource or use of the relevant input or resource can be eliminated through, for example, technological innovation (e.g. lead-free petrol) or the establishment of property rights (e.g. emission quotas).

Imperfect markets

The final condition that may justify government intervention occurs when there is a market for a product or service but one or more participants in the market can influence the price they receive, or pay. In other words, competition in the market is imperfect. This influence might arise from the cost structure of an industry favouring the formation of monopolies and suchlike (Henderson and Quant 1980) or information asymmetries (Stigler 1961).

When competition in the market for a product or service operates imperfectly the quantity of the product or service supplied and used, and its price, may be less, or more, than is socially optimal depending on the source of the market imperfection and the interrelationships among participants in the market.

Imperfect markets can be corrected if the influence over price can be reduced by, for example, technological innovation changing the cost structure of an industry (e.g. internet technology) or ensuring the sharing of information (e.g. regulated disclosure).

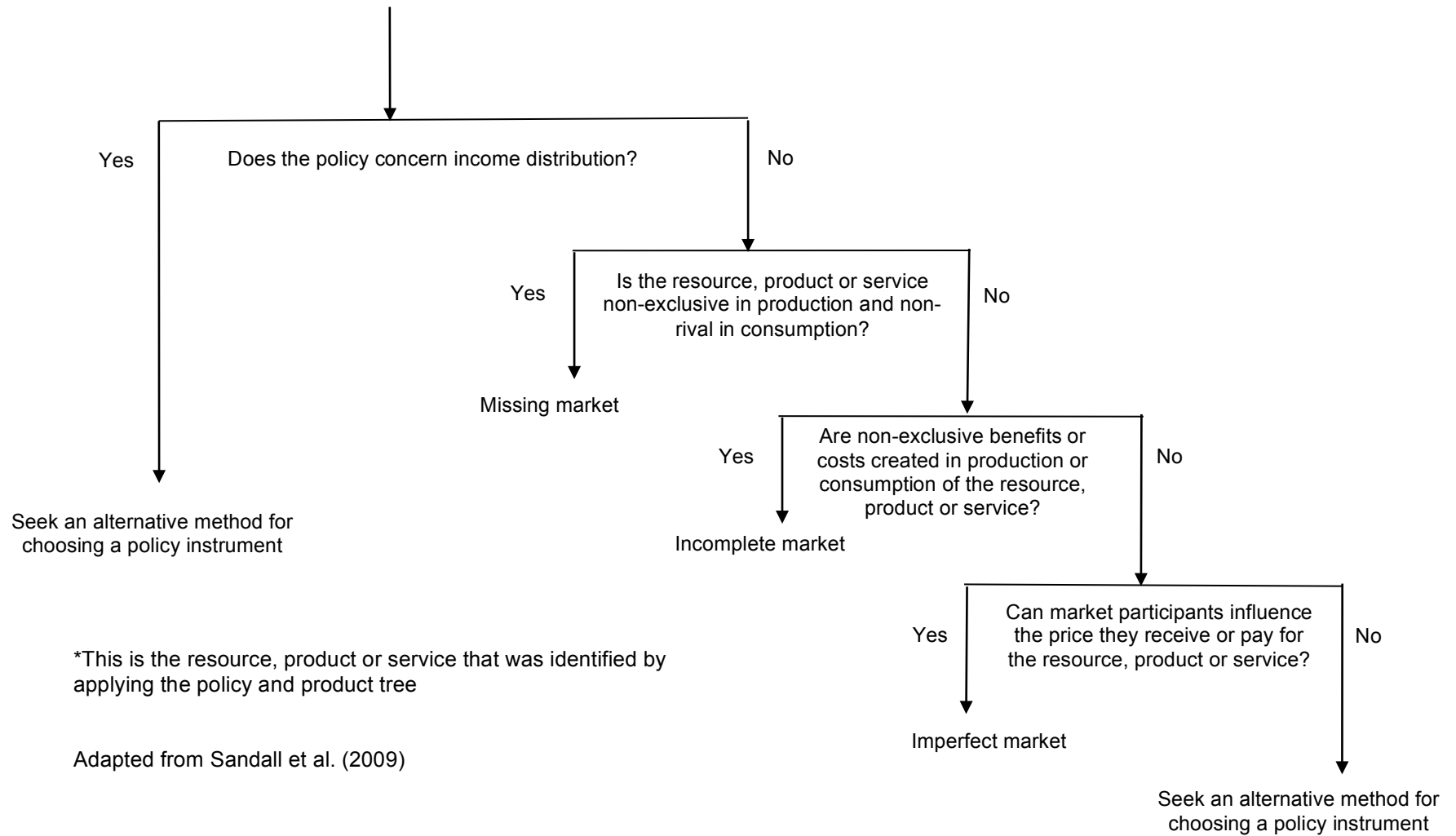
Economic justifications tree

The above provides criteria for identifying the economic justification for government intervention to change the behaviour of primary producers to achieve a policy objective. The criteria are:

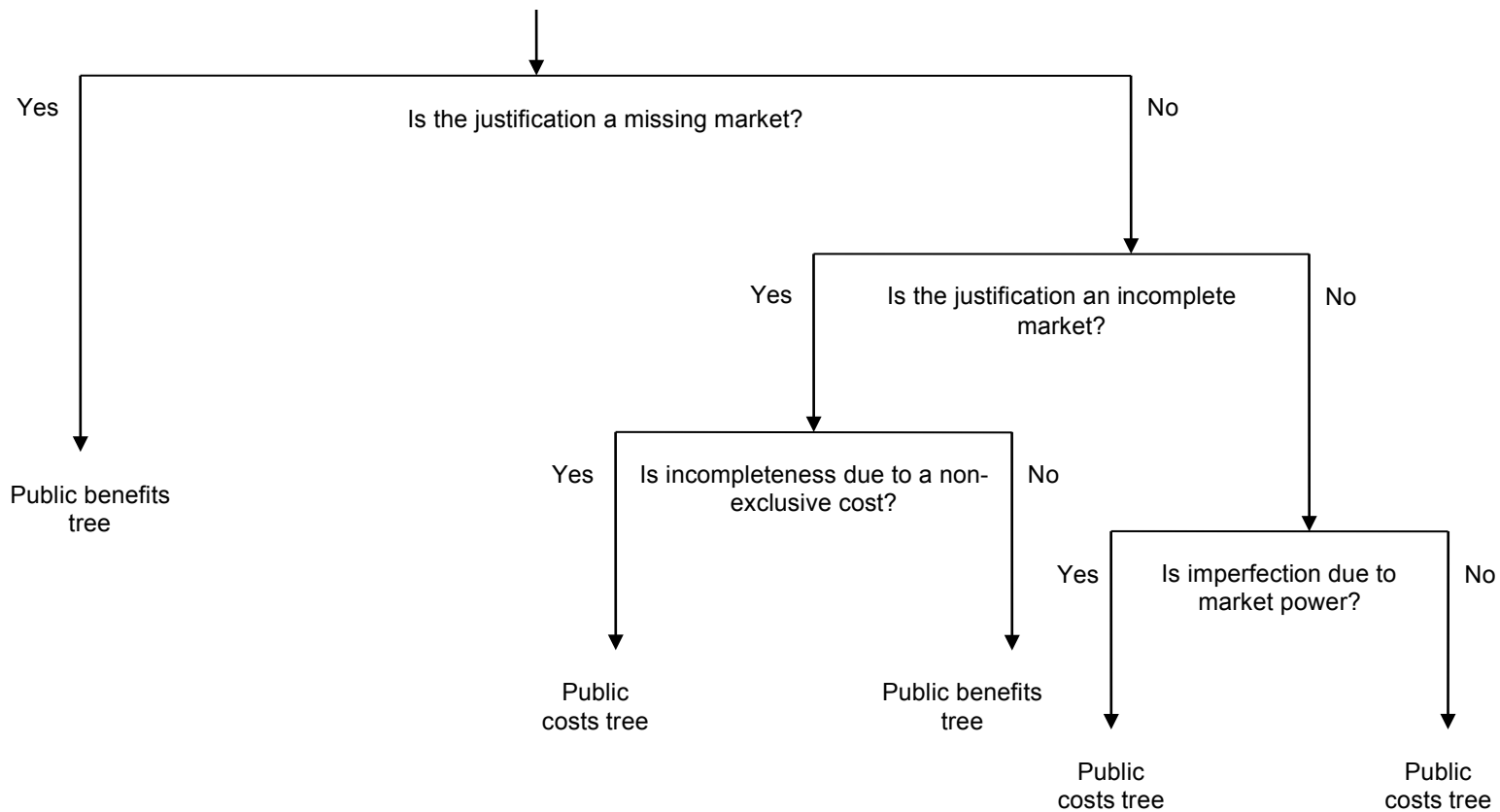
- Is the policy objective an expression of concern over the distribution of income?
- Is the product or service of interest non-exclusive in production and non-rival in consumption?
- Are there non-exclusive costs or benefits associated with the supply or use of the product or service of interest?
- Is a participant in the market for the product or service of interest able to influence the price they receive or pay?

These criteria are laid out in the form of a decision tree in Tree 2. The resulting classification provides the information necessary to choose a primary policy instrument (Sandall et al. 2009).

Tree 2: Economic justification tree*



Tree 3: Primary instrument tree



Kaine and Lourey (2012)



Selection of the primary policy instrument

Broadly speaking, policy instruments can be classified into three types: instruments that promote voluntary changes in behaviour, instruments that create compulsory change in behaviour, and government supply of a product service. The type of instrument that is likely to be most suitable may be found by eliminating instruments that are inefficient or unworkable using economic and feasibility criteria. The purpose of the primary instrument framework is to identify the type of policy instrument that, in theory, should efficiently achieve the policy outcome. This section is based on Kaine and Lourey (2012).

Linking justifications and policy instruments

Where the cause of inefficiency in the economy is a missing market or an incomplete market that creates non-exclusive benefits, then the policy outcome amounts to increasing the supply or use of the relevant product or service. Consequently, a policy instrument that encourages this behaviour is appropriate.

Where the cause of inefficiency in the economy is an imperfect market or an incomplete market that creates non-exclusive costs, then the policy outcome amounts to reducing the supply or use of the relevant product or service. Consequently, a policy instrument that discourages this behaviour is appropriate.

The translation of the economic justifications for intervention into appropriate choices among instruments that encourage, or discourage, the supply or use of a product or service is summarised in the form of a decision tree in Tree 3.

Primary policy instruments

Having determined whether the policy outcome is to encourage, or discourage, the supply or use of a product or service, the next step is to determine which type of policy instrument should be used to achieve the outcome: voluntary, compulsory or government supply. Government provision includes where a product or service is supplied directly by the government (e.g. police services) and where government contracts businesses to supply a product or service.

The choice between the three types of policy instruments depends on whether (Kaine and Lourey 2012):

- There are economies of scale or scope in supply or use of a product or service
- The rights of those that experience uncompensated costs or benefits (often termed the community) have priority over the rights of those who create uncompensated cost or benefits (often individuals)
- The supply and use of the relevant product or service can be measured

- The value of the public benefits or costs associated with the supply or use of the relevant product or service can be measured

Instruments to encourage desirable behaviour

In regard to actions that are desirable, that is, where the supply or use of a product or service would create a public benefit, government supply or contracting of supply deserves consideration as the primary instrument where economies of scale or scope are present (Dollery and Fleming 2005).

Where scale or scope economies are absent the choice of primary instrument lies between using incentives to encourage voluntary changes in behaviour or instruments to create compulsory changes in behaviour. The choice between these depends on whose rights have priority: the rights of individuals who would have to change behaviour, or the rights of those in the community who would benefit from change (Kaine and Lourey 2012).

When the rights of the individual have priority over the rights of the community then changing behaviour is voluntary and incentives to encourage voluntary change are the most suitable policy instrument. When the rights of the community have priority over the rights of the individual then changing behaviour becomes compulsory and instruments to compel change are suitable.

Where incentives are chosen to promote voluntary change, two possibilities arise. If the activity that creates the public benefit can be measured then incentives can be offered to entice producers to voluntarily change their behaviour and engage in the activity. If the activity cannot be measured then it may be possible to place a disincentive on alternative activities, should there be any. For example, rather than offering an incentive on planting native species to promote biodiversity, a duty could be levied on the import of exotic plant species.

Public benefit tree

The above provides criteria for choosing between public provision of a product or service, incentives to promote voluntary changes in producer behaviour, or instruments to compel changes in producer behaviour. The criteria are whether:

- There are economies of scale or scope in supply or use of a product or service
- The rights of those in the community that will enjoy the public benefit (the community) have priority over the rights of those individuals who will create the benefit (the individual)
- The supply or use of the product or service creating the public benefit can be measured

These criteria are laid out in the form of a decision tree in Tree 4.

Instruments to discourage undesirable behaviour

In regard to actions that are undesirable, that is, where the supply or use of a product or service is creating a public cost, compulsory change deserves consideration as the primary instrument when economies of scale or scope are present (Dollery and Fleming 2005). This is because the number of businesses creating the public cost is likely to be small.

Where scale or scope economies are absent the choice of primary instrument lies between using incentives to encourage voluntary changes in behaviour or instruments to create compulsory changes in behaviour. Again, the choice between these depends on whose rights have priority: the rights of individuals who would have to change behaviour, or the rights of those in the community who would benefit from change (Kaine and Lourey 2012).

As before, when the rights of the individual have priority over the rights of the community then incentives to encourage voluntary change are the most suitable policy instrument. When the rights of the community have priority, instruments to compel change are suitable.

Where incentives are chosen to promote voluntary change two possibilities arise. If the activity that creates the public cost can be measured then disincentives can be offered to entice producers to voluntarily change their behaviour and stop the activity. If the activity cannot be measured then it may be possible to offer an incentive on alternative activities, should there be any.

Public costs tree

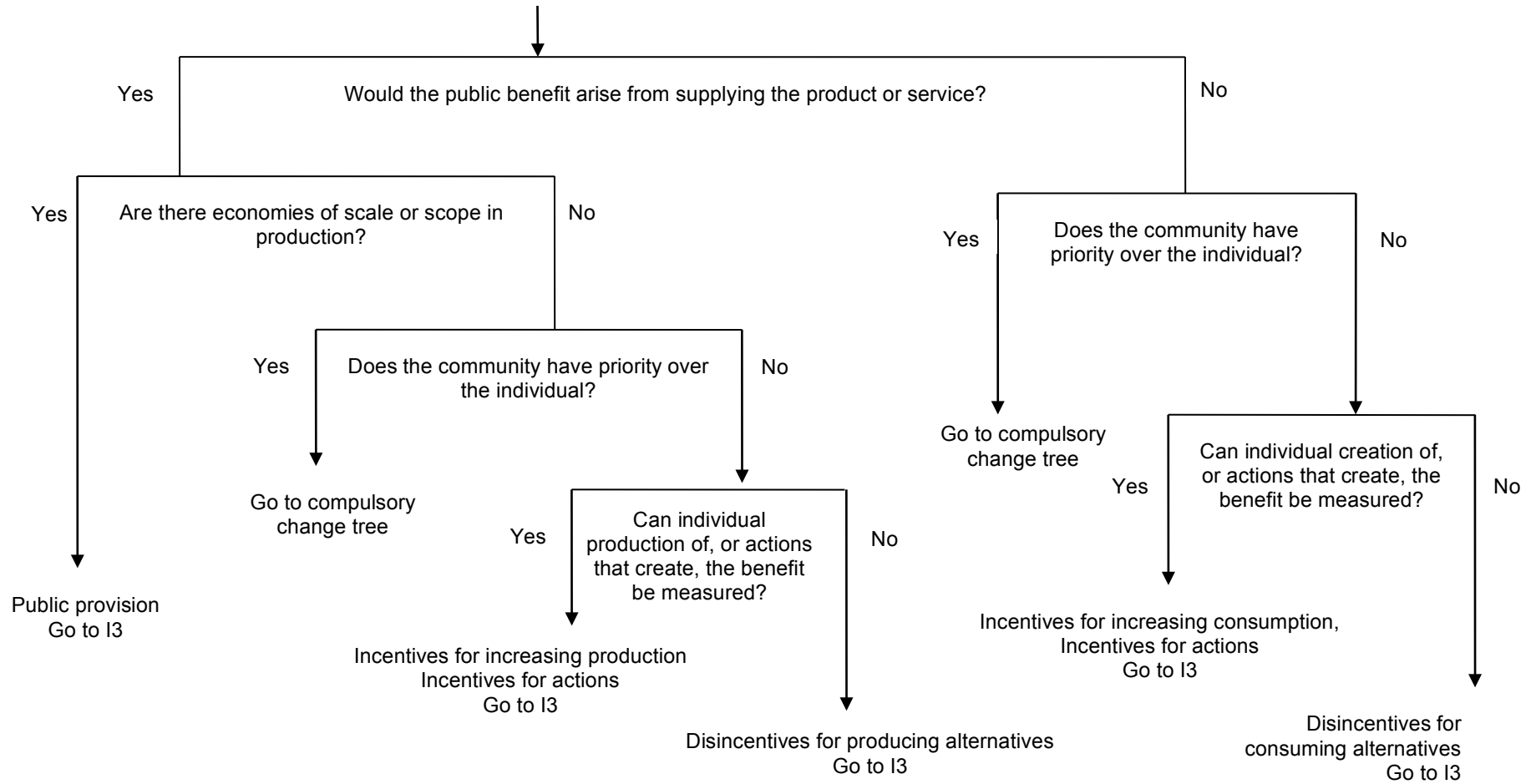
The above provides criteria for choosing between incentives to encourage producers to voluntarily change behaviour, or instruments to compel changes in behaviour. The criteria are whether:

- There are economies of scale or scope in supply of a product or service
- The rights of those in the community that will bear the public cost (the community) have priority over the rights of those individuals who are creating the cost (the individual)
- The supply or use of the product or service creating the public cost can be measured

These criteria are laid out in the form of a decision tree in Tree 5. The specific design of an incentive will depend on contextual factors.

To summarise, the public benefits tree is employed where the supply or use of a product or service would create a public benefit. This occurs when markets are either missing or they are incomplete and create non-exclusive benefits. The public costs tree is employed where the supply or use of a product or service is creating a public cost. This occurs when markets are either imperfect or they are incomplete and create non-exclusive costs.

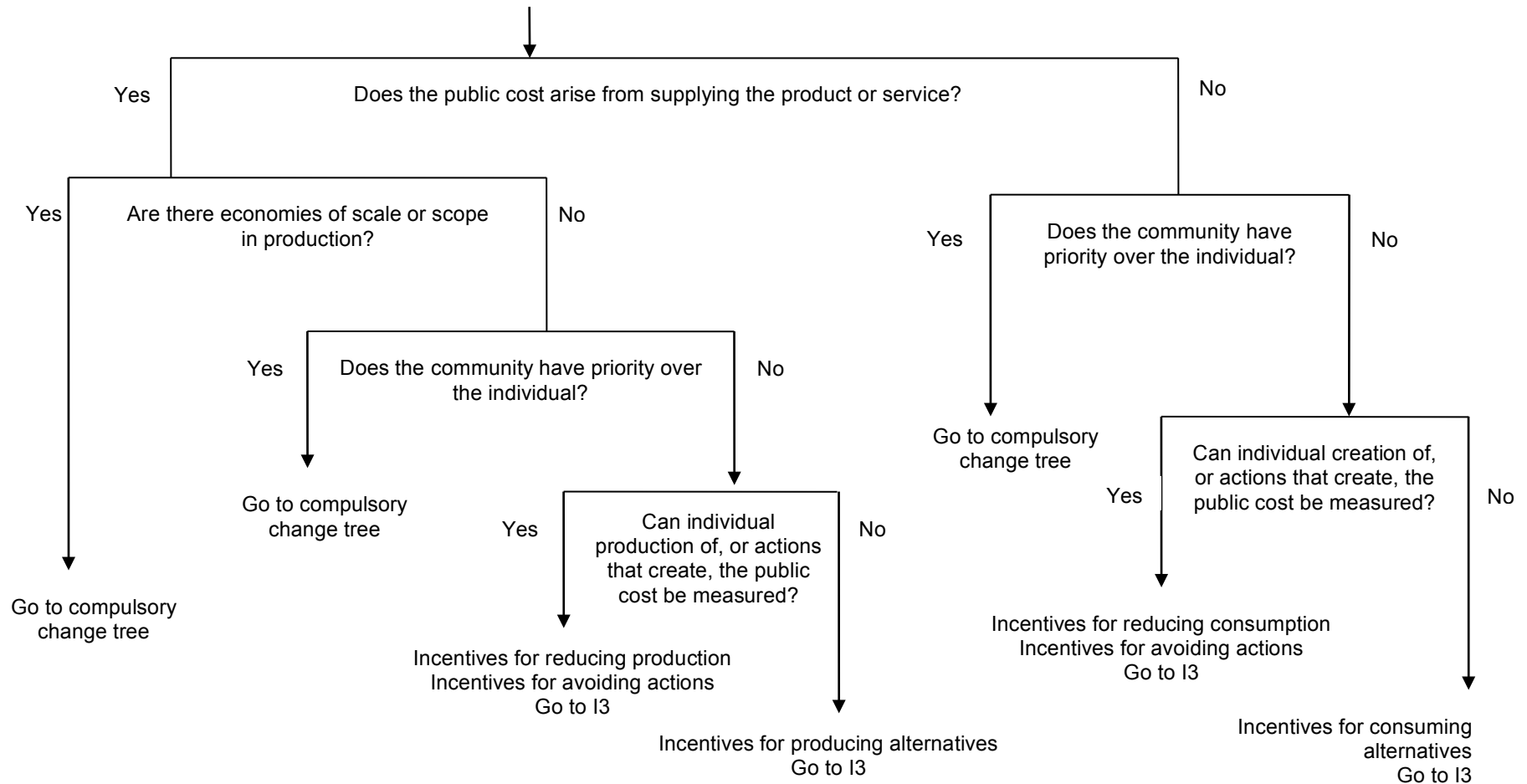
Tree 4: Public benefits tree



Kaine and Lourey (2012)



Tree 5: Public costs tree



Kaine and Lourey (2012)



The two trees could be combined into a single tree; however, separate trees seem easier and more convenient.

Where the choice of primary instrument is either public provision of a product or service (e.g. research, extension, infrastructure) or the use of an incentive to encourage voluntary changes in behaviour (e.g. flat rate payment, matrix payments, payment by tender) the next step is to consider producers' reactions to the instrument.

Instruments to compel change

Where the choice of primary instrument is among instruments that compel changes in behaviour, the next step is to choose between some kind of regulation, a tax or charge, or some form of market instrument (Kaine and Lourey 2012).

Kaine and Lourey (2012) observe that where individual supply or use of the product or service that creates the public benefit or cost cannot be measured directly or imputed in some way the only practical options for a primary instrument are: (1) regulation of the technology and materials used in the relevant activities; or (2) the regulation of the management of materials and technologies used in those activities (Gunningham et al. 1998).

Selecting between these depends on how closely the type of technology and materials used in the activity and the management of the technology determine the creation of the public benefit or public cost (Bluff and Gunningham 2003).

The more the creation of the public benefit or cost depends on the type of technology and materials used in an activity, the more likely technology standards are feasible. The more the creation of the public benefit or cost depends on the on the way technology and materials are used in an activity, the more likely process standards are necessary. Depending on circumstances, both kinds of standards could be required (Bluff and Gunningham 2003).³

(Kaine and Lourey 2012, 9)

The precise design of technology and process standards will depend on the circumstances.

Where individual supply or use of the product or service that creates the public cost or benefit can be measured relatively easily and inexpensively then the options for a primary instrument are: (1) the use of a market instrument such as a tax or cap and trade scheme; or (2) regulation of relevant activities

³ Technology standards mean prescriptive regulations in regard to specification standards, technical or design standards. Process standards mean prescriptive regulations in regard to specification standards, technical or design standards.

through performance standards [Gunningham et al. 1998]. The choice between these depends on whether individual differences in the value of creating the public cost or benefit are present and can be measured relatively inexpensively. If this is the case, then market instruments are feasible.

(Kaine and Lourey 2012, 9)

Market instruments that compel change include cap and trade schemes, taxes and charges, and compulsory credit or offset schemes. The precise design of the market instrument (cap and trade, variable cap and trade, flat rate tax, variable rate charge) or performance standard will depend on the circumstances.

If such differences do not exist or cannot be measured, market instruments are not feasible and performance standards (including bans) are the preferred option for primary instrument as market instruments are not practical.

Compulsory change tree

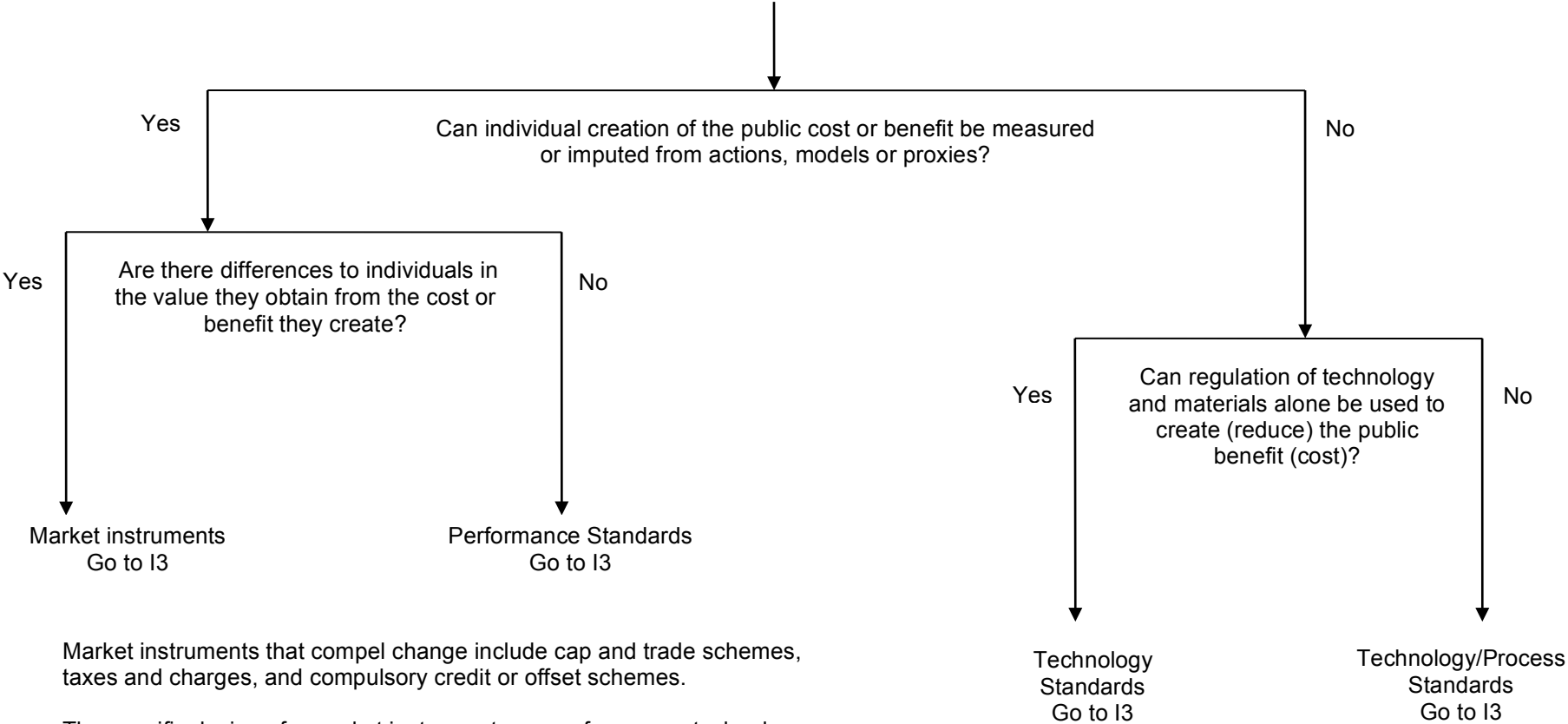
The above provides criteria for choosing between market instruments and different kinds of regulations to compel changes in behaviour. The criteria are:

- The practicality of measuring individual supply or use of the relevant product or service
- The practicality of measuring differences in the value to individuals of the public benefit or public cost they create
- The impact of technology and materials on creation of public benefits or costs

These criteria are laid out in the form of a decision tree in Tree 6.

Once the choice of primary instrument is finalised the next step is to consider producers' reactions to the instrument.

Tree 6: Compulsory change tree



Market instruments that compel change include cap and trade schemes, taxes and charges, and compulsory credit or offset schemes.

The specific design of a market instrument or a performance, technology or process standard depends on contextual factors.

Kaine and Lourey (2012)

Producer reactions to the primary instrument

Producers' reactions to a primary policy instrument are predicted using the I₃ Response Framework (Kaine et al. 2010a; Murdoch et al. 2006), which is based on social psychology and consumer behaviour theory. The Framework was developed to understand and predict how producers would respond behaviourally to a regulatory policy intervention. Predictions of behaviour were based on producers' involvement with a policy issue or outcome, and their involvement with, and attitude towards, a policy intervention or instrument.

The premise of the Framework is that knowledge of producers' involvement in a policy outcome and instrument would allow their likely response to be predicted and strategies to promote achievement of the policy outcome could be identified. The purpose of using the I₃ Response Framework here is to predict producers' reactions to the primary policy instrument to decide whether additional policy measures are necessary to achieve the policy outcome. This section is based on Kaine et al. (2007), Kaine et al. (2010a) and Murdoch et al. (2006).

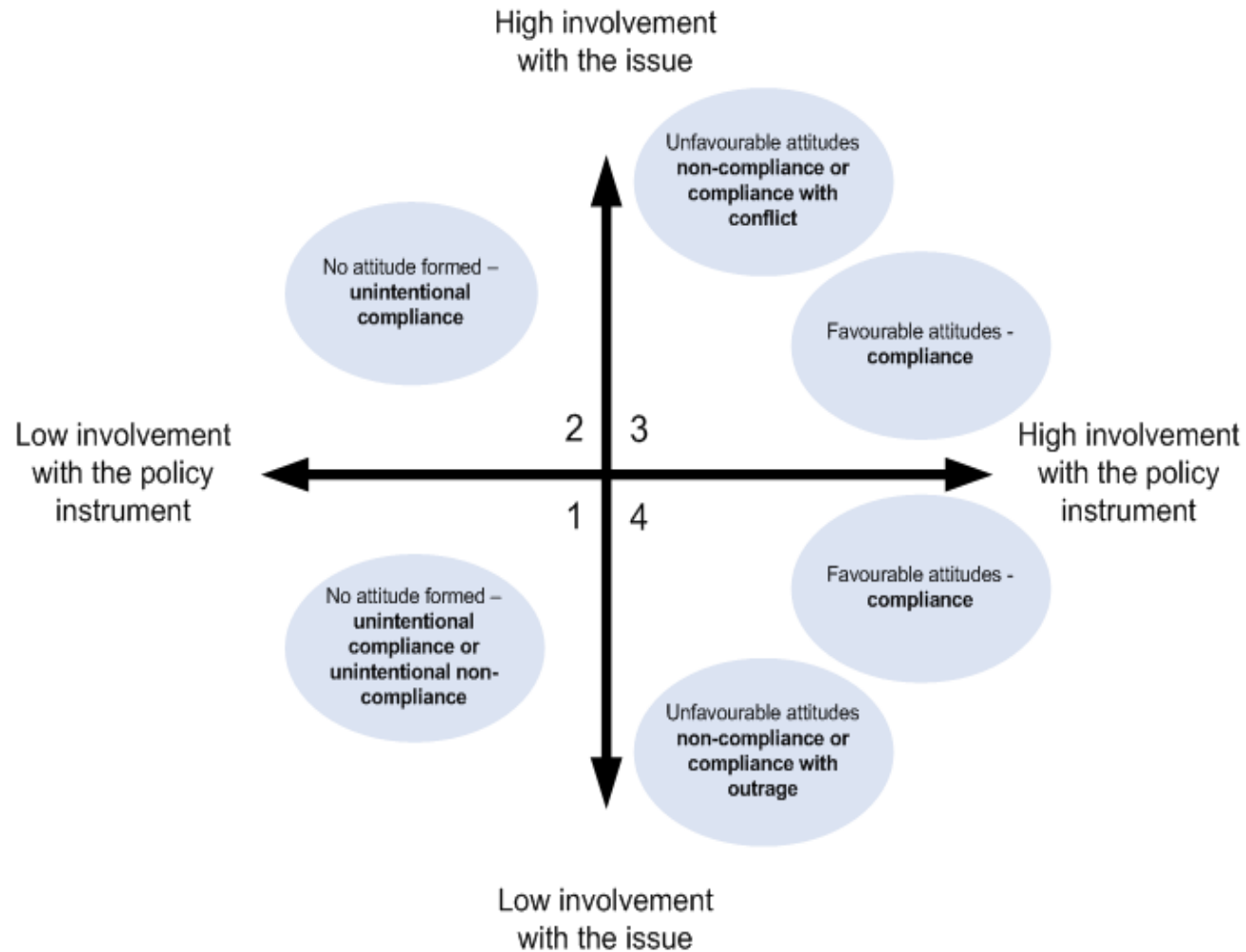
Predicting producer reactions

Predictions of producers' reactions to a primary instrument are based on their involvement with the policy outcome and their involvement with, and attitude towards, a policy instrument. Involvement is a measure of motivation. The degree of involvement an individual has in a subject is a key determinant of the effort an individual will spend in making decisions in relation to that subject, and acting on them. Involvement tends to be higher the more the subject of interest is novel, complex, and entails substantial social and financial risks.

High involvement in a subject is associated with greater time and effort devoted to obtaining information about the subject, the formulation of strongly held beliefs and attitudes about the subject, and greater likelihood of taking action in regard to the subject (Dholakia 2001; Kapferer and Laurent 1986; Verbeke and Vackier 2004; Zaichkowsky 1986). By contrast, low involvement in a subject is associated with little time and effort devoted to obtaining information about the subject, the formulation of weakly held beliefs and attitudes, if any, about the subject, and a lower likelihood of taking action in regard to the subject.

The two dimensions of involvement with the policy outcome and involvement with the policy instrument means that the reactions of producers to a policy instrument can be classified into four quadrants (Kaine et al. 2007) as shown in Figure 2.

Figure 2: I₃ Response Framework



I₃ Response Framework (adapted from Kaine et al 2010)

Producers in quadrant one exhibit low involvement in both the policy outcome and the primary instrument. These producers are likely to have little knowledge or even awareness of the policy outcome. They are likely to have limited knowledge of the primary instrument and have weak attitudes towards it, if any. Non-compliance with the instrument is largely unintentional (Murdoch et al. 2006).

If producers in quadrant one represent little risk in terms of achieving the policy outcome then they can be ignored. Otherwise, their compliance may be encouraged by linking the policy outcome to a subject they find more involving, reducing the effort required to be compliant, and promoting awareness of the policy outcome and the policy instrument. The last is likely to be the least effective.

Producers in quadrant two exhibit high involvement with the policy outcome but low involvement with the primary instrument. These producers are likely to have knowledge of the policy outcome. They are likely to have limited knowledge of the primary instrument and may have weak or ambiguous attitudes towards it. Non-compliance with the instrument is largely unintentional (Kaine et al. 2010a).

If producers in quadrant two represent little risk in terms of achieving the policy outcome then they can be ignored. Otherwise, their compliance may be encouraged by reducing the effort required to be compliant, and by promoting awareness of the policy instrument.

Producers in quadrant three exhibit high involvement with the policy outcome and the primary instrument. These producers are likely to have extensive knowledge of the policy outcome. They are also likely to have extensive knowledge of the primary instrument and strong attitudes towards it. If their attitude towards the primary instrument is favourable then they will comply with the instrument and may even advocate for it (Murdoch et al. 2006).

If producers in quadrant three have an unfavourable attitude towards the primary instrument then they may comply reluctantly (Kaine et al. 2010a). Non-compliance with the instrument will be intentional. Most likely they will prefer, and even advocate for, alternative instrument designs. Where practical, incorporating alternatives into the design of the primary instrument may encourage the compliance of these producers. Alternatively, offering incentives to reduce compliance costs may neutralise unfavourable reactions.

Producers in quadrant four exhibit low involvement with the policy outcome but high involvement with the primary instrument. Producers in this quadrant are likely to have limited knowledge of the policy outcome. They are likely to have detailed knowledge of the primary instrument and have strong attitudes towards it. If their attitude towards the primary instrument is favourable then they will comply with the instrument (Kaine et al. 2010a).

If producers in quadrant four have an unfavourable attitude towards the primary instrument then they will comply reluctantly. Non-compliance with the

instrument will be intentional. These producers will regard the instrument as imposing unwarranted costs upon them. Most likely they will agitate against the primary instrument (Kaine et al. 2010a). Offering incentives to offset compliance costs may neutralise unfavourable reactions.

I₃ response tree

The above provides criteria for identifying whether the non-compliance with the primary instrument by producers may put the achievement of the policy outcome at risk. The criteria are:

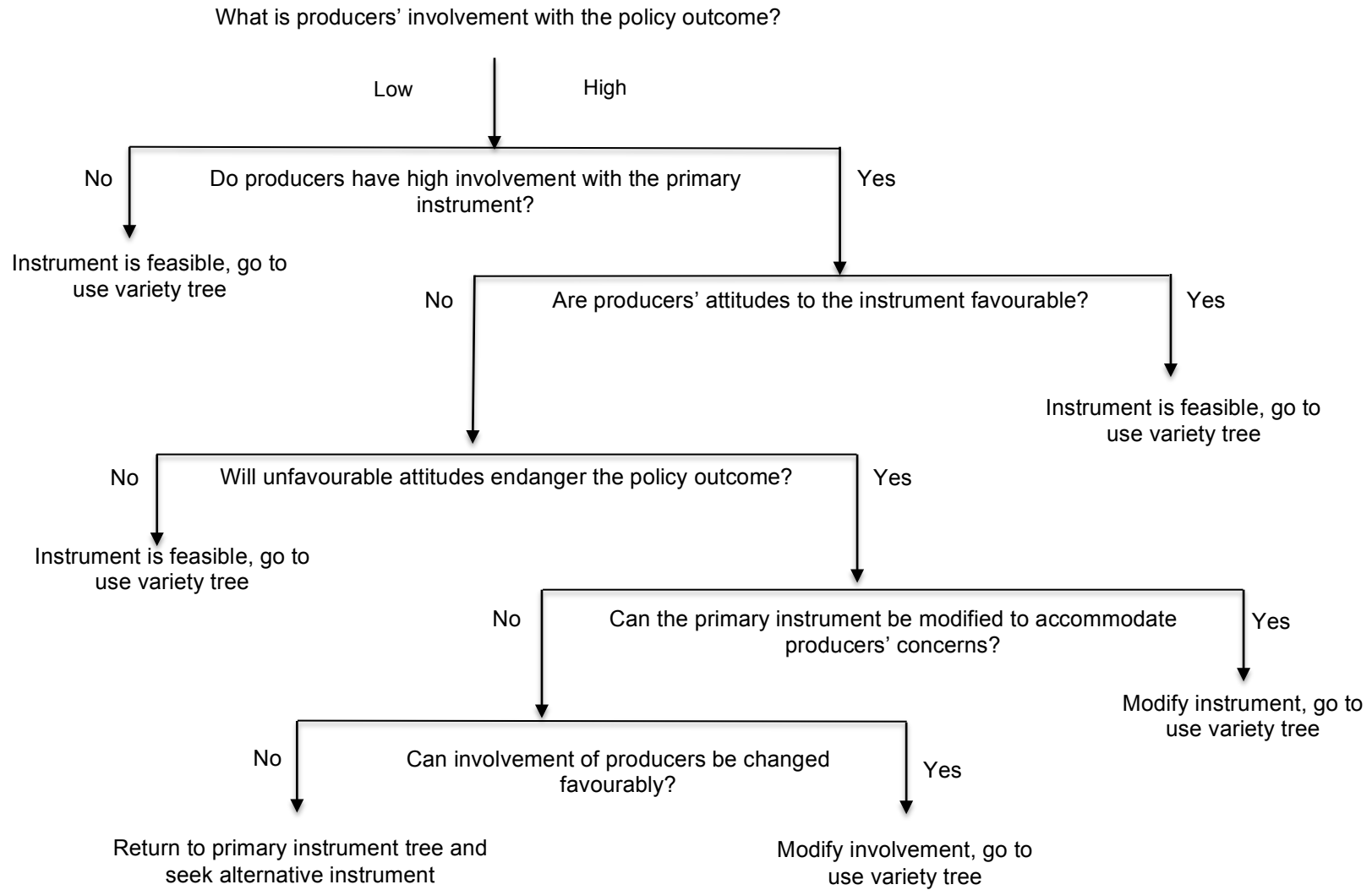
- The involvement of producers with the policy outcome
- The involvement of producers with the primary instrument
- The attitude of producers toward the primary instrument

These criteria are laid out in the form of a decision tree in Tree 7.

Where non-compliance may put implementation of the primary instrument at risk then modifications to the primary instrument may be required to neutralise this risk. The specific measures required will depend on the circumstances.

Once the producers' reactions to the instrument have been predicted the next step is to identify the potential for producers who comply with the primary instrument to do so in ways that are not consistent with the policy outcome.

Tree 7: I₃ response tree



Based on Kaine et al. (2007)

Use variety in producer compliance

The achievement of policy outcomes can be put at risk when producers do not act in accordance with the requirements of a policy instrument. In the preceding section the I₃ Response Framework (Kaine et al. 2010) was employed to predict the potential for non-compliance among primary producers and to identify any counter-measures. In this section the potential for producers to comply with the requirements of a policy instrument but in ways that would not contribute to the policy outcome is considered. This section is based on Kaine and Higson (2006).

The Use Variety Framework (Kaine and Higson 2006) is employed to identify the potential for producers to comply with the requirements of a policy instrument in ways that would not contribute to the policy outcome. This Framework draws on concepts from consumer behaviour theory and uses diffusion theory to identify the factors that promote diversity in producers' implementation of policy measures. It is used here to indicate the potential for producers to implement measures in ways that are counterproductive. Examples of this behavior are described in Kaine and Johnson (2004a). Where this potential is unacceptably high it may be managed by introducing modifications to the primary instrument or employing supplementary instruments (Kaine et al. 2007).

Predicting use variety

Kaine and Higson (2006) described four categories of factors, as identified by Shih and Venkatesh (2004), influencing the potential for producers to display use variety. The first factor was the social context of producers. Producers have extensive social networks in their local communities that link a broad range of businesses, community groups and producers in other industries, as well as industry peers. This has the potential to introduce a high degree of diversity into producers' cognitive processing and decision-making. This diversity creates opportunities for the emergence of novel responses to policy measures (Kaine and Higson 2006).

This potential is supported by intensive communication within producers' networks, which promotes the formal and informal sharing of knowledge, learning and experiences (Chambers et al. 1989; Kilpatrick et al. 1999; Black 2000). This sharing increases the potential for use variety in producers' responses to policy measures.

The second factor was the personal characteristics of producers. Most producers are willing to experiment with new products and technologies and are skilled at adapting new products and technologies to better fit with their farm situation (Chambers et al. 1989). This suggests that many producers should have the capacity and skills to respond in novel ways to policy measures. Where a policy has potentially serious economic implications for producers, the policy creates a highly involving situation for producers and

they are likely to respond by devoting considerable time and effort to considering alternative courses of action (Kaine and Higson 2006). This increases the likelihood of use variety.

The third and fourth factors were the attributes of the policy instrument and the farm context. Farming systems are highly complex and a change in one part of the farm system tends to create a cascade of changes throughout the farm system. For a producer there will be a set of factors in their farm context that determines the nature of the consequences of a policy measure for them (Lindner 1987; Guerin and Guerin 1994; Black 2000). These factors can include the technology mix, resource base, economic restrictions, and the skills and experience of the farm labour.

Individual differences in these contextual factors means a policy measure can have different interactions with, and effects upon, farm systems. This increases the potential for unexpected responses from producers and so the potential for use variety. The more complex and multi-faceted a policy is, the greater the potential for diversity in impacts and, therefore, variety in producers' responses (Kaine and Higson 2006).

Use variety tree

The above provides criteria for identifying whether compliance with the primary instrument by producers may put the achievement of the policy outcome at risk because producers comply with the policy in ways that do not contribute to the policy outcome. The criteria are the:

- Social context of producers
- Personal characteristics of producers
- Attributes of the policy instrument
- Usage situation

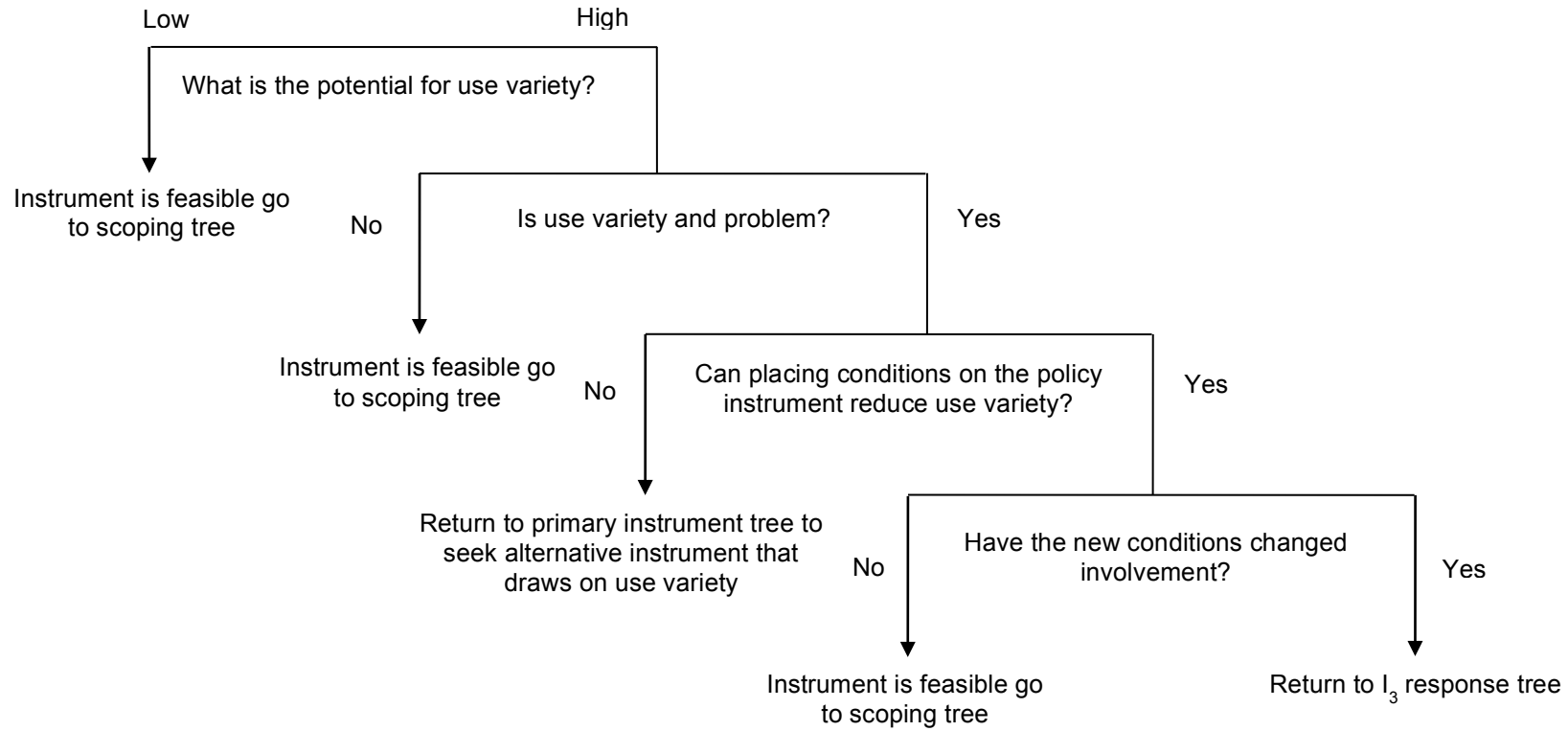
These criteria are laid out in the form of a decision tree in Tree 8.

An assessment of each of these factors provides an overall indication of the potential for unanticipated responses to a particular policy instrument (Kaine and Higson 2006).

Modifications to counter use variety can involve limiting the factors in the farm context that will influence the consequences of the policy on the farm system (Kaine and Higson 2006). For example, reducing authorised exemptions to a regulation removes opportunities for producers to modify their behaviour in order to qualify for such exemptions (Kaine and Higson 2006).

An alternative approach is to harness the inherent creativity that exists within use variety (Kaine and Higson 2006). For example, a cap and trade market for nutrient emissions allows producers to draw on their creativity and make their own management choices in regard to meeting their emission entitlement.

Tree 8: Use variety tree



Adapted from Kaine et al. (2007)

The scope and rate of change in producer behaviour

At this point in the PCF a primary instrument, and perhaps a mix of complementary instruments, has been identified that is technically feasible from an economic perspective. This instrument is also feasible in terms of eliciting responses from producers that contribute to the policy outcome. The next step is to assess the potential effectiveness of the instrument in terms of the numbers of producers changing behaviour (scope) and rate at which they change behaviour (rate).

The achievement of a policy outcome can be put at risk if too few producers change their behaviour or if producers do not change behaviour quickly enough. Where this is the case then the primary instrument may need modifying. Concepts from marketing theory, innovation theory and farm management theory are integrated in the scope and rate framework to provide a basis for assessing if the number of producers changing behaviour, and rate at which they change behaviour, is sufficient to achieve the policy objective. This section is based on Kaine and Johnson (2004b), Kaine (2010b) and Kaine et al. (2012).

Decision-making

The potential to influence the number of producers changing behaviour, and the rate at which they do so, depends on the how producers make decisions and the nature of the primary policy instrument (Kaine and Johnson 2004b). In the social psychology and marketing literature different decision-making processes are associated with high and low involvement with a subject. In broad terms, complex decision-making is associated with high involvement and limited decision-making is associated with low involvement.

Complex decision-making

High involvement decisions are novel and entail considerable financial, social or psychological risks (Assael 1998). Consequently, substantial time and effort is devoted to making high involvement decisions. In consumer decision-making high involvement invokes complex decision-making which is a deliberate, extensive, often iterative, process in which the consumer learns about the attributes of products and develops a set of purchase criteria for choosing among them (Assael et al. 1995).

The consumer endeavours to make the best possible choice based on an evaluation of the fit of the attributes of alternative products with their purchase criteria, prior to purchase. The purchase criteria reflect the key benefits consumers are seeking and are the key to influencing high involvement decisions. In the case of agriculture, the purchase criteria that producers use to evaluate new practices and technologies will reflect the key benefits the practice or technology offers, given their farm context.

Complex decision-making may be influenced in two fundamental ways. One way is to stimulate a change in the purchase criteria employed in making a decision (Kaine and Johnson 2004b) or, relatedly, change the relative importance on a criterion or criteria. Changing purchase criteria will change the degree of fit between the attributes of alternative products and, thereby, the number of consumers contemplating the purchase of any particular alternative.

The other way to change the outcome of complex decision-making is to change the value assigned to an alternative on a criterion or criteria (Kaine and Johnson 2004). This will change the degree of fit between the attributes of alternative products and, thereby, the number of consumers contemplating the purchase of any particular alternative.

Importantly, identifying the benefits a technology or practice may offer, identifying the elements of the farm system that influence the magnitude of those benefits, and gathering data on the attributes of technologies and practices, take time and effort. Hence, the more easily these kinds of information can be obtained, the more swiftly complex decision-making can happen.

Limited decision-making

Low involvement decisions are routine and present little financial, social or psychological risk (Assael 1998). Consequently, limited time and effort is devoted to consideration of alternatives before making a decision (Kapferer and Laurent 1986). In consumer decision-making low involvement invokes limited decision-making where the consumer's beliefs about products may be extremely limited in nature and are formed by passive learning, that is, by evaluating products after purchase.

Changing technologies or practices may be low involvement for producers in situations where the change is relatively inexpensive and presents little financial, social or psychological risk. This may be the case for changes in technologies or practices that are perceived as improvements on routinely purchased inputs and as being relatively simple and easy to trial.

Low involvement does not equate with little benefit. Rather, low involvement suggests that the producer has some familiarity with the technology or practice embodied in the change, or that the perceived risks associated with trialling the technology or practice are low, indicating that any undesirable consequences are easily reversed or any losses are likely to be small, or both (Kaine et al. 2010b). This means the purchase decision may be easily influenced at point of sale.

Estimating and changing scope

Complex decision-making

When producers engage in complex decision-making, technologies and practices are selected after considerable analysis of their benefits prior to adoption. Given that complex decision making is most likely to occur where changes in technology or practice tend to be architectural or radical (Kaine et al. 2012) the number of producers that potentially may change can be inferred from those producers whose farm context suits the new technology or practice (Kaine et al. 2010b).

Kaine (2008) describes in detail a method for identifying and quantifying benefit segments for agricultural technologies and practices. This method can be employed to predict the number of producers that may voluntarily change behaviour. In principle, the I₃ Framework (Kaine et al. 2010a) described earlier can be employed to predict changes in the behaviour of producers, and the numbers involved, when changes in behaviour are compulsory.

The use of complex decision-making implies that producers develop explicit chains of reasoning and criteria to guide their decision-making. This suggests that, in circumstances where involvement is high, altering these criteria can change the number of producers that will change behaviour. Consequently, policy can influence the outcomes of complex decision-making by changing the decision criteria used by producers or the alternatives available to them. This can be done in a variety of ways including:

- Altering the set of alternatives available to producers through research or regulation (e.g. GM crops, chemical bans, technology standards)
- Changing the farm context of producers, which changes the benefits to be had from a technology or practice (e.g. irrigation modernisation, output quotas, water use licences)
- Changing the decision criteria employed by producers (e.g. tenders to conserve native vegetation)

In circumstances where involvement is high, policy can influence the rate at which producers will change behaviour. For example, extension may be used to create awareness among producers and supply information about a changed technology or practice that is favoured by a policy maker. Alternatively, incentives may be employed to accelerate the rate of change. Incentives reduce the cost of adopting a technology or practice. Consequently, where an alternative offers a net benefit to producers then offering incentives can accelerate change.

Where an alternative does not offer a net benefit to producers then offering incentives that represent a substantial proportion of the cost of the alternative may increase both the number of producers changing behaviour and the rate at which they change.

Limited decision-making

When producers engage in limited decision-making, technologies and practices may be selected for trial with little, if any, prior analysis of their benefits and consideration of alternatives. Given that limited decision-making is most likely to occur where changes in technology or practice tend to be incremental or modular (Kaine et al. 2012), the number of producers that potentially may change can be inferred from those producers who use the technology or practice that the new technology or practice replaces. In other words, where limited decision-making is likely, the number of producers who use the superseded technology or practice should provide a reasonable estimate of the number of producers that could change their behaviour (Kaine et al. 2010b).

The use of limited decision-making implies that the producer does not develop explicit chains of reasoning to guide their decision-making. Instead, they trial and evaluate the extent to which a change provides the benefits they were expecting. A decision is then made to continue with the change, or not. This suggests that, in circumstances where involvement is low, the numbers of producers changing behaviour may be influenced simply by restricting the options available at the point of sale, or its equivalent (Kaine et al. 2010b). This course will only be practical in circumstances where desirable and undesirable behaviours are coupled with the use of specific technologies and practices.

Consequently, policy may influence the outcomes of limited decision-making by changing the set of options available for consideration. For example, regulations and standards may be used to constrain producers' choices to a changed technology or practice that is favoured by a policy maker.

Estimating rate

Wright (2011) proposed that the rate of adoption of agricultural innovations would not only be influenced by the level of producer involvement with the innovation, their motivation, but also by the type of agricultural innovation (Kaine et al. 2008).

Henderson and Clark (1990) argue that products (innovations) are systems and describe how innovations can be classified into four types: incremental, modular, architectural and radical. Incremental and modular innovations build on existing capabilities and knowledge, and are the least disruptive type of innovation. The implementation of architectural and radical innovations requires new capabilities and knowledge, and the redesign of production processes and procedures; they are the most disruptive type of innovation (Abernathy and Clark 1985). Consequently, the resources required, and resistance to, implementation of innovations is lowest with incremental innovations and highest with radical innovations (Henderson and Clark 1990).

To classify a new technology or practice as a type of innovation, the components, component principles, architecture and architectural principles

embodied in the technology or practice must be identified and described. The physically distinct parts of an innovation are its components and each performs a particular function (Henderson and Clark 1990). For example, irrigation bays, piping and pumps would be components of an irrigation system (Kaine et al. 2008). Each component is underpinned by a component principle that guides the design and function of the component. For example, design of bays in an irrigation system is guided by principles in relation controlling the direction and rate of flow of water (Kaine et al. 2008).

The way that the components of an innovation are arranged comprises its architecture, which is underpinned by a set of architectural principles (Henderson and Clark 1990). For example, in a flood irrigation system the layout of channels, bays and dams is governed by the principle that water flows downhill. The scheduling of irrigations is governed by principles relating to plant physiology (Kaine et al. 2008).

Different innovations can have different architectures and so are underpinned by different architectural principles. For example, while the principle that water moves downhill governs the architecture of flood irrigation systems, the architecture of pressure irrigation systems is based on the principle that water moves from high to low pressure (Kaine et al. 2008).

The number and nature of any differences between an innovation and the technology or practice it replaces in its component and architectural principles provides a basis for classifying an innovation into one of four types: incremental, modular, architectural and radical. The four types of innovation are distinguished by the dimensions of change the innovation introduces to the component principles and architectural principles of the original technology or practice.

An incremental innovation involves limited changes to component principles and little, if any, change in architectural principles (Henderson and Clark 1990). The implementation of incremental innovations can usually be achieved using existing organisational skills and competencies. A modular policy innovation involves major changes to component principles with little, if any, change to its architectural principles (Henderson and Clark 1990). The implementation of modular innovations often requires the acquisition of new organisational skills and competencies and modifying of some organisational procedures and processes (Abernathy and Clark 1985).

An architectural policy innovation involves major change to architectural principles but little, if any, change to component principles (Henderson and Clark 1990). Architectural innovation essentially involves rearranging the components of an existing technology or practice. The implementation of architectural innovations often requires changing key organisational procedures and processes and even altering organisational structures (Abernathy and Clark 1985).

A radical innovation involves major changes to both component principles and architectural principles (Henderson and Clark 1990). The implementation of

radical innovations requires the acquisition of a host of new skills and competencies, major changes to organisational procedures and processes, organisational restructuring and even the revision of organisational cultures (Abernathy and Clark 1985).

Kaine et al. (2008) argued that the classification proposed by Henderson and Clark (1990) applies to agricultural innovations. Agricultural innovations that can be classified as incremental or modular would, being least disruptive, be adopted relatively quickly. Agricultural innovations that can be classified as architectural and radical innovations would, being more disruptive, be adopted relatively slowly.

A pilot application of the model proposed by Wright (2011) has demonstrated that the rate of adoption of agricultural innovations is strongly influenced by the level of producer involvement with the innovation, and the type of agricultural innovation (Kaine et al. 2012). As expected innovations that could be classified as incremental or modular were associated with lower involvement and more rapid adoption than innovations that could be classified as architectural or radical.

Changing rate

In circumstances where involvement is high, policy can influence the rate at which producers will change behaviour by using extension to reduce the effort involved in gathering information. For example, extension may be used to create awareness among producers and to provide information about the characteristics and benefits of a changed technology or practice that is favoured by a policy maker. Alternatively, incentives may be employed to accelerate the rate of change. Incentives reduce the cost of adopting a technology or practice. Consequently where an alternative offers a net benefit to producers then offering incentives can accelerate change.

In circumstances where involvement is low, policy can influence the rate at which producers will change behaviour using promotion and incentives. Limited decision-making implies that the producer first acquires, and then trials, a new technology or practice, and evaluates the extent to which it provides them with a net benefit. Depending on the outcome of the trial a decision is then made to continue with the technology or practice, or not. This suggests that, in circumstances where involvement is low, the decision to adopt technologies and practices can be accelerated by fast-tracking trialling. This could be done by bringing the technology or practice to the attention of the producer at the point of sale, or by offering incentives to trial (Kaine et al. 2010b).

Importantly, promotional activities such as extension do not change the number of producers that will change behaviour in the long term. They only affect the rate at which producers change. They do this by reducing the costs of introducing changes to management practices and technologies by

reducing the time or effort involved in obtaining information about, evaluating and implementing management practices and technologies.

Scope and rate tree

To summarise, policy instruments can alter the number of producers that will change their behaviour, and how quickly behaviour can change. Generally speaking, policy instruments that change the decision-making criteria used by landholders to evaluate the benefits of changes to agricultural enterprises, practices and technologies, affect the number of landholders that change behaviour. Policy instruments that do not change the decision making criteria used by producers to evaluate the benefits of changes to agricultural enterprises, practices and technologies, but reduce the costs of introducing those changes, affect the rate at which producers change behaviour (Kaine and Johnson 2004b).

Policy instruments can change the behaviour of producers in a number of ways:

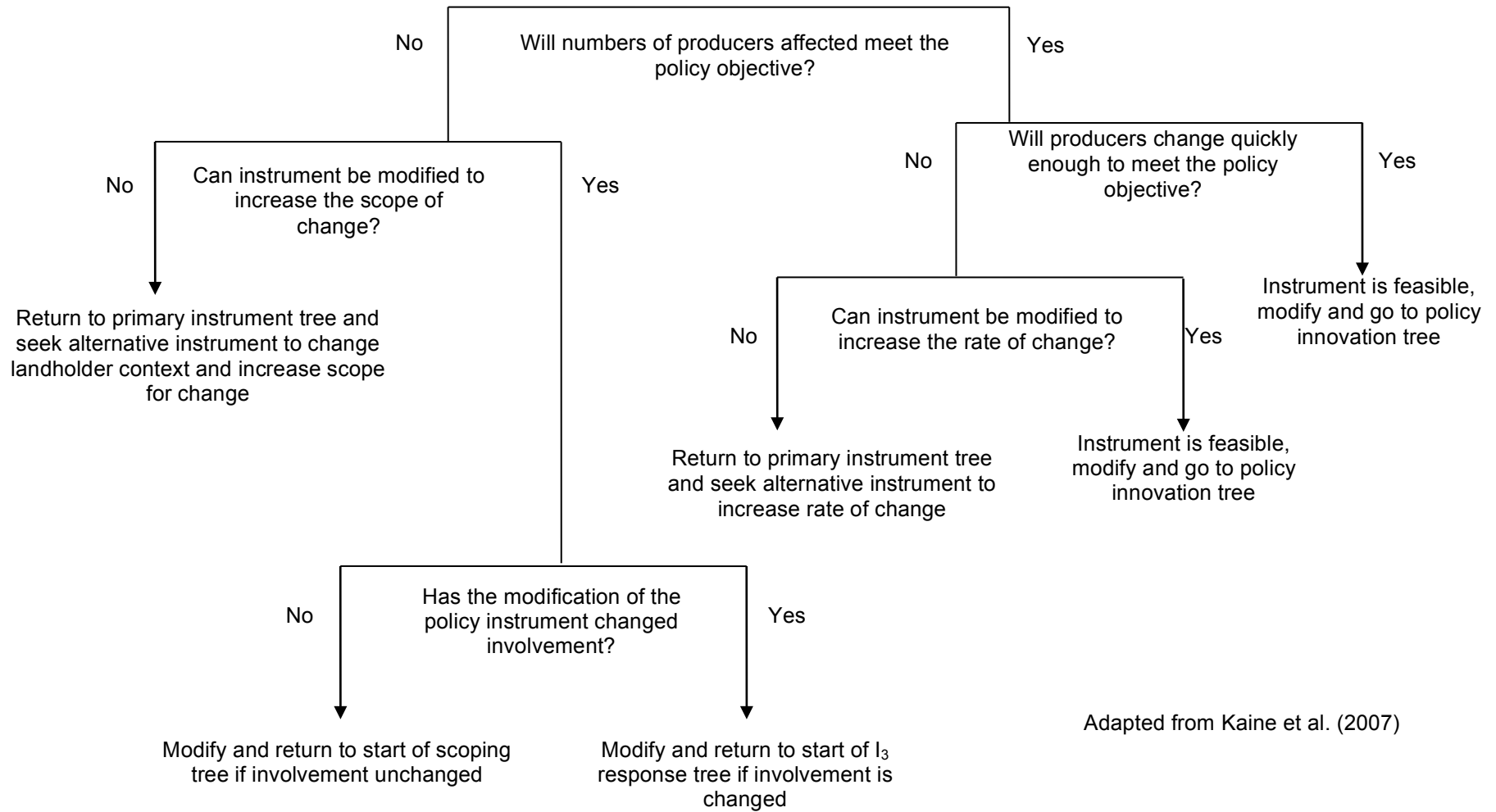
- (i) An instrument can change the number of producers that will change behaviour by creating a change in farm context. This changes the benefits to be had from a technology or practice.
- (ii) An instrument can change the number of producers that will change behaviour by limiting their options available to the desired technology or practice.
- (iii) Where complex decision-making is employed an instrument can change the number of producers that will change behaviour by changing the choice criteria used to evaluate a technology or practice.
- (iv) Where complex decision-making is employed an instrument can change the rate at which producers will change behaviour by changing the value of choice criteria used to evaluate a technology or practice.
- (v) Where producers employ complex decision-making an instrument can change the rate at which producers will change behaviour by increasing the ease with which they can obtain information.
- (vi) Where producers employ limited decision-making an instrument can change the rate at which producers will change behaviour by increasing awareness of the changed technology or practice.

The above provides criteria for assessing whether the achievement of the policy outcome may be at risk because too few producers will change behaviour, or they will not change quickly enough. The criteria are:

- Is the behaviour associated with complex or limited decision-making?
- Does the change in behaviour comprise incremental or radical innovation?
- Will sufficient numbers of producers change behaviour?
- Will producers change quickly enough?

Some of these criteria are laid out in the form of a decision tree in Tree 9 and may be used to assess the need to modify or supplement a policy instrument in order to meet targets for the number of producers that must change their behaviour to achieve a policy outcome, and how quickly this change must happen.

Tree 9: Scope and rate tree



Adapted from Kaine et al. (2007)

Organisational responses to policy instruments

To this point the reactions of producers to policy instruments has been the focus of analysis. The focus of analysis now shifts to the implementation of the primary policy instrument by government agencies.

The role of government agencies is to implement policy instruments. Consequently, like any other organisation, agencies seek to acquire expert capabilities and knowledge, develop tailored processes and procedures, and craft their organisational structure and culture to achieve their purpose as efficiently as possible.

This means that agencies become specialised in the implementation of policy instruments; and a change to an instrument can disrupt the capabilities, procedures, structures and even culture of agencies. Such disruptions can be extremely costly and time consuming, and put the achievement of the policy outcome at risk.

The response of organisations to a policy instrument depends on the consistency of the set of principles underpinning the policy instrument with the set of principles underpinning the policy culture of the organisations. Inconsistencies between these sets of principles indicate that changes will be required in the structures, procedures and technical characteristics of organisations (Kaine and Higson 2006b).

(Kaine et al. 2007)

In this section the Policy Innovation Framework (Kaine and Higson 2006b; Kaine et al. 2006) is used to reveal the potential impacts of the primary instrument for the organisations implementing them and what this means for achieving the policy objective.

Policy innovation

The Policy Innovation Framework (Kaine and Higson 2006b; Kaine et al. 2006) draws on theories of organisational behaviour and design to reveal the potential scale of change that the primary instrument may require of government agencies charged with responsibility of implementing the instrument; that is, changes in organisational skills, competencies, procedures, policies, structure and culture (Abernathy and Clark 1985).

Application of the Policy Innovation Framework involves classifying the primary instrument as one of four types of innovations: incremental, modular, architectural and radical (Henderson and Clark 1990). The implementation of each type of policy innovation has different organisational implications for agencies. Incremental policy innovations build on existing organisational

capabilities and knowledge, and are the least disruptive type of innovation. The implementation of radical policy innovations requires wholesale changes in organisational capabilities and knowledge, processes and procedures, structure and even culture; they are the most disruptive type of innovation. Consequently, the resources required, and organisational resistance to, implementation of policy innovations is lowest with incremental policy innovations and highest with radical policy innovations (Henderson and Clark 1990).

To classify a policy instrument as a type of policy innovation, the components, component principles, architecture and architectural principles embodied in the instrument must be identified and described (see Table 1). The individual rules, processes and procedures that form the policy instrument are its components (Kaine and Higson 2006b). Each component performs a particular function. For example, one component of an incentive program will be the conditions that define eligible producers. Another component may be a list of activities or works that qualify for an incentive.

Each component is underpinned by a component principle that guides the design and function of a component (Kaine and Higson 2006b). For example, the choice of activities that qualify for an incentive program might be guided by the principle that producers' behaviour must contribute to an environmental outcome.

The way that the components of the policy instrument are arranged or integrated to form the instrument is its architecture, which is underpinned by a set of architectural principles (Kaine and Higson 2006b). Architectural principles guide the arrangement of the components that form the policy instrument. Different instrument concepts have different architectures and so are underpinned by different architectural principles.

For example, the design of an incentive program might be guided by the principle of rewarding producers for contributing to environmental outcomes. Consequently, this principle guides the linking together of components such as a list of qualifying activities, eligibility rules, allocation rules and funds to form an incentive program.

Types of policy innovation

There are three steps involved in classifying a primary instrument as a type of policy innovation (Kaine and Higson 2006b). The first step is to identify and describe the components, architecture and principles embodied in the primary instrument and any other relevant policy instrument already implemented by an agency. The number and nature of any differences between the primary instrument and the existing instruments in their component and architectural principles provides a basis for classifying the primary instrument into one of four types of policy innovation: incremental, modular, architectural and radical.

The four types of policy innovation are distinguished by the dimensions of change the policy innovation introduces to the component principles and architectural principles of the original policy instrument (see Figure 3). An incremental policy innovation involves limited changes to component principles and little, if any, change in architectural principles compared to existing instruments (Kaine and Higson 2006b).

A modular policy innovation involves major changes to component principles with little, if any, change to its architectural principles (Kaine and Higson 2006b). The implementation of modular innovations often requires the acquisition of new organisational skills and competencies and modifying of some organisational procedures and processes (Abernathy and Clark 1985).

An architectural policy innovation involves major change to architectural principles but little, if any, change to component principles (Kaine and Higson 2006b). Architectural policy innovation essentially involves rearranging the components of an existing instrument. The implementation of architectural innovations often requires changing key organisational procedures and processes and even altering organisational structures (Abernathy and Clark 1985).

A radical policy innovation involves major changes to both component principles and architectural principles (Kaine and Higson 2006b). The implementation of radical innovations requires the acquisition of a host of new skills and competencies, major changes to organisational procedures and processes, organisational restructuring and even the revision of organisational cultures (Abernathy and Clark 1985).

The four types of policy innovations signal different implications for the government agencies in terms of the changes in capabilities, processes, structure and culture that may be required to successfully implement a primary instrument. Primary instruments that represent architectural or radical policy innovations for government agencies will require greater resourcing and time to implement. The implementation of architectural and radical policy innovations may be resisted, if not subverted, by agencies. Consequently, the achievement of the policy outcomes may be put at risk unless the organisational changes that are necessary are sensitively and expertly managed.

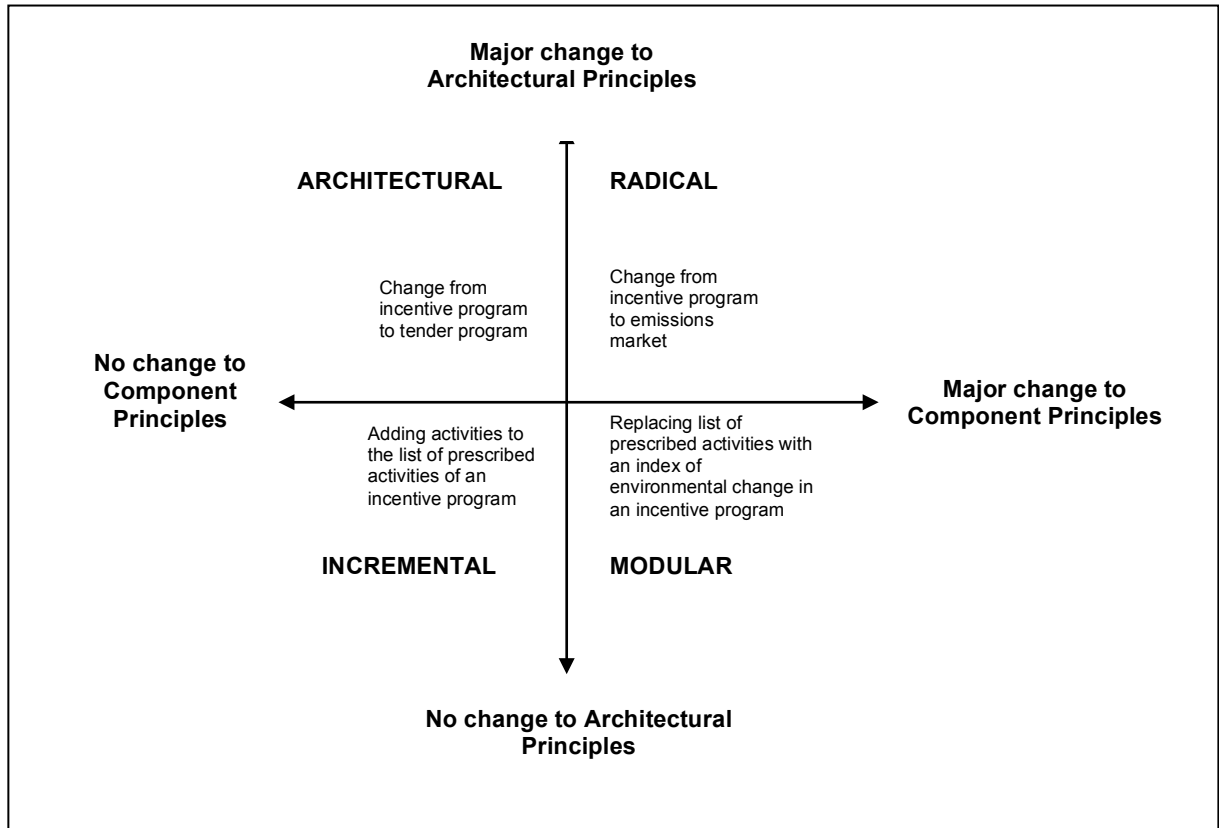
Where a number of agencies are involved in the joint implementation of a primary instrument differences may occur among them in the type of innovation, and degree of disruption, the primary instrument represents.

| | |
|--------------------------|--|
| Instrument Concept | A generic description of the way that the policy instrument achieves the policy objective. |
| Components | The individual rules, processes and procedures that form the policy instrument. |
| Component Principles | The fundamental principles that guide the design and functioning of a component. |
| Architecture | The way that the components are arranged or integrated to form the policy instrument. |
| Architectural Principles | The fundamental principles that underpin the arrangement and combined functioning of the components that form the policy instrument. |

Table 1: Fundamental elements of the policy innovation framework

Source: Kaine, Higson, Sandall and Lourey (2006)

Figure 3: Examples of policy innovations



Source: Adapted from Kaine and Higson (2006b) and Kaine, Higson, Sandall and Lourey (2006)

Policy innovation tree

The above provides criteria for identifying the nature and extent of change the primary instrument represents for government agencies and, so, an indication of the resources and time that might be required for implementation. Hence, these criteria may be employed to indicate whether achieving the policy outcome may be at risk because the organisational changes required of government agencies will be too expensive and time consuming.

Two options are available where it is the case that insufficient resources or time are available to implement the organisational changes that are needed to successfully implement the primary instrument. One is to delay full implementation of the primary instrument and consider a more incremental approach to implementation. The other is to choose an alternative primary instrument that may be less effective but more likely to be feasible given resource and time constraints.

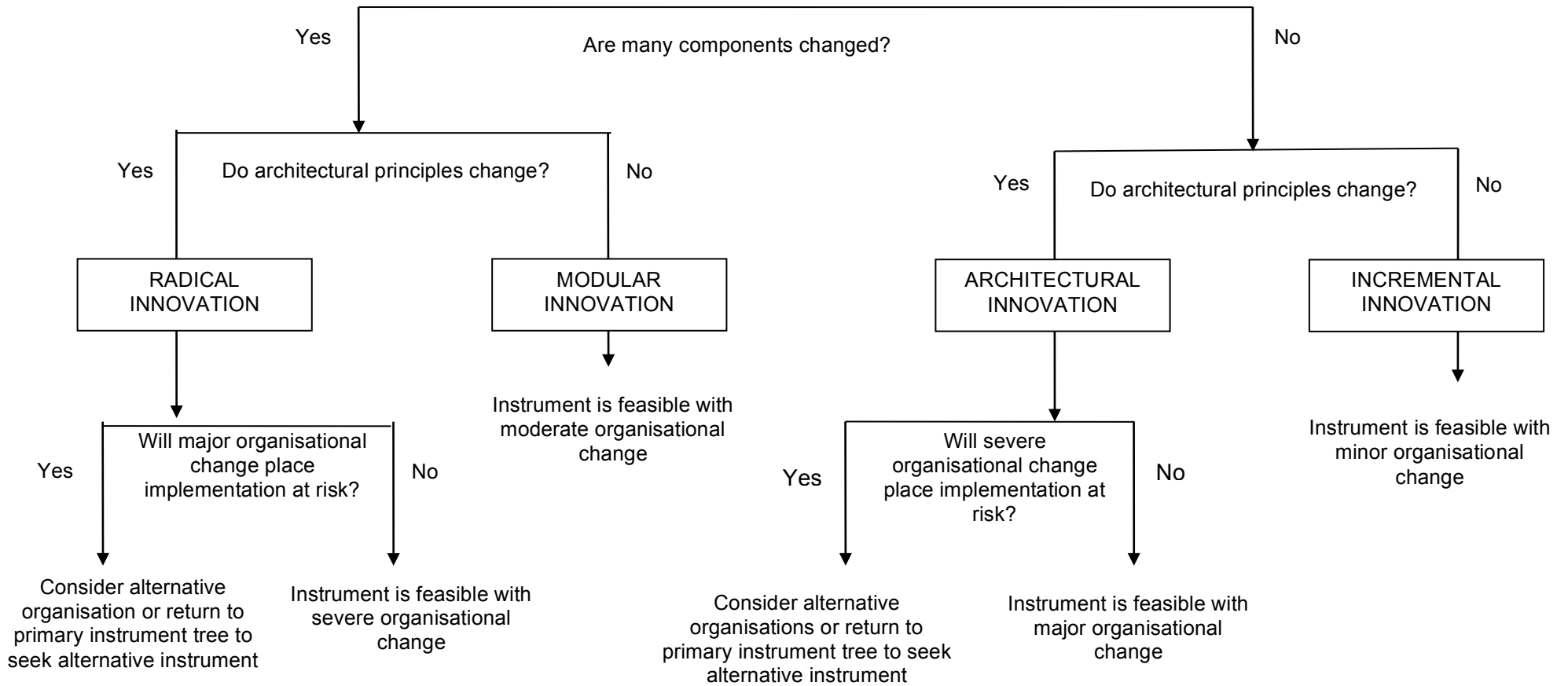
The criteria are the:

- Number of changes to component principles
- Number of changes to architectural principles
- Scale of resources allocated to organisational change
- Time available for organisational change

These criteria are laid out in the form of a decision tree in Tree 10.

An assessment of each of these factors provides an overall indication of the potential for unanticipated responses within government agencies to a particular policy instrument.

Tree 10: Policy innovation tree



Adapted from Kaine et al. (2007)

Joint implementation of policy instruments

The implementation of natural resource policies often involves government agencies, industry and community organisations. This is because:

Legislative and institutional conventions distribute authority and responsibility for the implementation of natural resource policy among a range of government and community organisations. Consequently, the development and implementation of policies to deal with natural resource issues usually involves sustained and coordinated action across these organisations. Each of these organisations will, rightly, have specific interests and agendas that reflect their respective, particular responsibilities. Naturally, tensions will arise ... from differences in the degree to which the particular responsibilities of organisations align with their collective responsibility for the development and implementation of natural resource policy. These tensions will inevitably create relational problems between organisations and may hinder the effective implementation of natural resource policies.

(Kaine and Keeble 2007)

The distribution among different organisations of the authority, responsibility and resources for the design and implementation of natural resource policy creates circumstances that are similar to those that arise with outsourcing in business.

Outsourcing involves contracting with a supplier from outside an organisation for the provision of goods and services that had (or could have) been provided internally by the organisation. Outsourcing creates dependencies between organisations because the achievement of the objectives of each organisation influences the achievement of the objectives of the others. To the degree that the objectives and strategies of the organisations that are parties to an outsourcing contract differ, and these differences result in different expectations about the outcomes of outsourcing, tensions can arise between the organisations.

Legislation and conventions that distribute the authority and responsibility for the design and implementation of natural resource policy among organisations create dependencies among them similar in nature to those created by outsourcing. Examples include establishing national standards for water quality which regional government must implement, and investing decision-making authority in participatory mechanisms such as stakeholder groups, technical alliances and partnerships.

Whereas outsourcing among businesses is voluntary, dependencies created by legislative and institutional conventions are, generally speaking, obligatory. Consequently, while the commercial decision to outsource can be reversed the legislative decision cannot. This means that organisations that are jointly

responsible for designing and implementing policy must manage the consequent dependencies as best they can.

There will be differences among organisations that are jointly responsible for natural resource management in their purpose, objectives and strategies. This will create differences in the degree of alignment between each organisation and their collective responsibility for the development and implementation of natural resource policy. These differences will, naturally, create tensions between organisations. These tensions parallel those that arise between organisations that are parties to outsourcing. In principle then, the literature in regard to successful outsourcing should provide insights into the successful management of relations between organisations with a collective responsibility for the development and implementation of natural resource policy.

In this section the Relationship Choice Framework (Kaine and Keeble 2007; Keeble et al. 2008) is used to reveal the potential consequences of distributing the responsibility for developing and implementing natural resource policy among a group of organisations and what this means for achieving policy objectives.

Relationship choice

The Relationship Choice Framework (Kaine and Keeble 2007; Keeble et al. 2008) draws on transaction cost theory, competitive strategy theory, and human resource theory to identify the governance, strategic and human resource risks that can arise when a group of organisations are collectively responsible for developing and implementing natural resource policy. Framework is adapted from Hunter's (2004) multi-disciplinary approach to assessing opportunities for outsourcing in business. The Framework may be employed to help identify management strategies and tactics to counter those risks.

Hunter (2004) found that the success of outsourcing was influenced by three different dimensions; namely governance, strategy and human resources. Governance concerns the arrangement organisations establish interactions between them. Strategy concerns choosing and arranging organisational activities and processes so that they contribute as fully as possible to organisational objectives. Human resources concerns how best to manage the internal and external workforce an organisation depends on to meet its objectives.

Kaine and Keeble (2007) reasoned that, if the sharing of responsibility for implementing natural resource policy was interpreted as obligatory outsourcing, then these same three dimensions might influence the success of relationships established between organisations to jointly design or implement policy.

The dimensions of the Relationship Choice Framework are summarised in table 2 and each is described in detail below, starting with governance.

Governance

In this context the term governance describes the arrangements between organisations that guide interactions between them. Governance encompasses rules for how transactions will occur between organisations (contractual arrangements), the tenure of the relationship between them (short or long term), and the management of disputes between them. Here, a transaction is the exchange of products or services between organisations.

There are four types of governance and each type facilitates different kinds of transactions between organisations. The four types are (Williamson 1979):

- **Market.** This type of governance involves a short-term exchange between organisations; the organisations remain independent of each other and disputes are dealt with by reference to third parties.
- **Trilateral.** This type of governance is similar to market governance because it is short-term and disputes are dealt with by a third party, however organisations are partly dependent for an agreed time.
- **Bilateral.** This type of governance involves long-term exchanges, where organisations are heavily interdependent and the responsibility for dispute resolution lies more with the organisations involved.
- **Unified.** This type of governance involves undertaking transactions entirely within an organisation. This is the most flexible arrangement that can account for transaction adjustments, particularly as disputes are dealt with internally thereby minimising negotiation costs.

Transactions can be distinguished into different kinds on the basis of three characteristics. These characteristics are:

- The degree to which an organisations must customise investment to engage in the transaction;
- How frequently the transaction occurs; and
- The degree of uncertainty about the transaction achieving its proposed purpose (Williamson 1996).

These three characteristics of transactions guide the selection of the type of governance arrangement that will best facilitate them (Williamson 1996). These three characteristics will now be described in detail.

| Dimension | Key characteristics | Management responses |
|----------------------|---|--|
| Governance | Frequency of transactions Type of transaction Uncertainty | Market Trilateral Bilateral Unified |
| Strategy | Core activity Essential activity Peripheral activity | Structures Systems HR practices Conflict resolution |
| Workforce management | Level of skill Type of activity | Hard management style Soft management style |

Table 2: The three dimensions of the relationship choice framework including management responses

Source: Keeble et al. (2008)

Transaction characteristics

Asset specificity

To engage in transactions organisations must first invest resources in producing the products and services that are to be exchanged in a transaction. Resources can include staff as well as plant or equipment. These investments are costs for the organisation, of course, which must be recouped through transactions. Asset specificity refers to the extent to which an organisation must invest in specific assets to make a transaction possible (Williamson 1979).

Williamson (1979) argued that the more customised the investment that is needed in assets to conduct a transaction, the less likely those assets can be redeployed to alternative uses. Consequently, when an organisation makes asset-specific investments in relation to a transaction they are exposed to financial risk in the form of sunk costs and the threat of opportunism from other parties to the transaction (McIvor 2005).

Williamson (1979) classified investments for transactions as non-specific, mixed and customised. A non-specific investment can be used to enable a variety of transactions and consequently are considered cost effective. However, rival buyers or suppliers may easily make similar investments. Customised investments are tailored to suit a particular transaction and are considered high risk because there is a greater potential for loss should the transaction not be finalised. However, rivals may not have the technical capacity to make similar, specialised investments.

Water quality testing might be an example of low asset specificity in regard to natural resource policy. Tests for water quality are standardised hence suppliers can easily provide such services to a range of purchasing agencies. Conversely, agencies can purchase such services from a variety of suppliers and switch between them relatively easily.

High asset specificity in regard to natural resource policy might arise where an agency invests time and resources in recruiting and training staff so they have the specialist technical knowledge and skills to develop nutrient management plans with landholders. Such investments are only worthwhile if the agency is certain that there is a reliable purchaser for an advisory service in regard to nutrient management plans, either internally or externally.

Frequency

Another characteristic of transactions that influence governance is the frequency with which the transaction occurs. Transactions may be recurrent or occasional (Williamson 1996). Recurrent transactions occur repeatedly, at least annually if not more frequently with respect to natural resource policy. Occasional transactions occur less frequently, perhaps as infrequently as once every couple of years. Recurrent transactions may be more cost effective than occasional transactions because, at least in principle, there are repeated opportunities to recoup the investment that was made to enter in to them.

The monthly testing water quality in rivers could be classified as a recurrent transaction. Periodic reviews of land and water management plans every few years could be classified an occasional transaction.

Uncertainty

The third characteristic for classifying transactions is the degree of uncertainty associated that a transaction will achieve its purpose. Uncertainty concerning the outcome and the cost of conducting a transaction will be lower the more precisely the nature and outcome of a transaction can be defined. Uncertain transactions require organisations to constantly review and adjust their investments to complete a transaction as new information comes to light. If organisations must constantly review and revise the activities and investments required to complete a transaction, costs will accrue in terms of time and resources. Thus the more uncertain the outcome of a transaction the more likely unforeseen additional costs will be incurred Williamson (1979, 1996).

For example, there may be relatively little uncertainty in regard to the provision of tests for water quality because the nature of the tests, their frequency and the testing sites can be specified quite precisely. There may be more uncertainty in regard to an advisory service for nutrient planning. While the content of plans may be specified with some precision defining and measuring the performance of the advisory service may be more difficult. There may be a great deal of uncertainty in regard to a policy design service. While some aspects of the content of the policy may be specified in legislation, precisely specifying the outcome of the policy, the design process to be followed, and how the policy is to operate may be problematic.

Governance and transactions

In Table 3 the different types of governance arrangements are aligned with transactions based on their asset specificity, frequency and uncertainty characteristics.

Generally, when transactions are predictable and investment is non-specific, market governance is the lowest cost arrangement. Market governance is based on classical contract law and provides the institutional framework for traditional market trading where buyers and sellers meet to exchange standardised products and services (Williamson 1979, 1991). The market price sends signals to both parties concerning the costs and benefits of these transactions. Both parties decide independently whether to continue to trade or not on the basis of those signals. The specific identity of each party is not critical to the transaction and there is no reason for the parties to develop and maintain a relationship.

| Governance arrangement | Governance characteristics | Transaction characteristics |
|------------------------|---|---|
| Market | <ul style="list-style-type: none"> - Market price signals of costs and benefits of a transaction - Buyers and sellers are independent Relationships between organisations are unnecessary - Market provides a legal framework for protection against opportunism and disputes - Administrative costs are minimal | <ul style="list-style-type: none"> - Non-specific and standardised - Recurrent - Low uncertainty |
| Trilateral | <ul style="list-style-type: none"> - An agreed contract between organisations for a defined period of time - The relationship is regulated by arbitration involving a third party - Relationship is semi-dependent, as a partner is selected and acknowledged - Administrative costs are moderate | <ul style="list-style-type: none"> - Mixed or customised - Occasional - Limited uncertainty |
| Bilateral | <ul style="list-style-type: none"> - Long term contract - Organisations are equally dependent on each other, and this is acknowledged - The relationship is critical to achieving the transaction - Contract guarantees greater co-operation between organisations and protection from risk of opportunism with customised investments - Agreement for transactions is flexible to accommodate uncertainty about transactions - Administration costs are high | <ul style="list-style-type: none"> - Customised - Recurring or occasional - High uncertainty |
| Unified | <ul style="list-style-type: none"> - Vertical integration - Transaction, removed from the market and occurs within the organisation - Disputes dealt with internally | <ul style="list-style-type: none"> - Highly customised - Recurring - High uncertainty |

Table 3: Types of governance and transaction characteristics

Adapted from Williamson (1979)

Both parties are protected from opportunism because of the standardised nature of the transaction. Each party can go its own way at negligible cost to the other (Williamson 1991). The market operates as a legal framework providing protection for both parties through self-enforcing rules. Litigation is strictly for settling claims but disputes are settled formally (Williamson 1991).

When organisations customise their investment to conduct a transaction there is strong pressure to complete the transaction because the costs incurred cannot be offset by using the investment for other transactions. Hence, the greater the need for investments in asset specific capital to enable a transaction to proceed the greater the need for governance structures that allow the uncertainty and risks associated with the transaction to be managed by the parties to the transaction. In these circumstances, governance arrangements that acknowledge this dependency and offer protection are most desirable. Consequently, trilateral and bilateral governance are the preferred types of governance in these circumstances because they offer security in commitment and flexibility to adapt to change, which minimises negotiation costs (Williamson 1979).

Trilateral governance anticipates the possibility of unanticipated changes in circumstances. Consequently, contracts established under trilateral governance are more flexible than those established under market governance. Unlike market governance, contracts established under trilateral governance can be adapted if circumstances change, subject to the agreement of the parties involved. Trilateral governance requires information disclosure and substantiation if change is proposed and provides arbitration if a voluntary agreement fails (Williamson 1991).

Under trilateral governance relationships are established between autonomous parties to a transaction as a contract for a usually lengthy period of time between the parties. A feature of this form of governance is that a third party such as a regulatory agency has a role in arbitration and disputes (Williamson 1991). This feature allows contracts to be adapted in response to unpredictable situations without the costs of litigation.

Although trilateral governance offers flexibility and reduces the likelihood of litigation, these benefits come at the price of higher transaction costs. The main risk with trilateral governance is that transactions become maladapted to the environment during the bargaining interval (Williamson 1991). Examples of trilateral governance arrangements include long-term contracting, reciprocal trading and franchising (Williamson 1991).

Bilateral governance is similar to trilateral governance except the resolution of disputes lies entirely with the parties to the transaction. Bilateral governance is selected over trilateral governance when the human and physical assets required for the transaction are specialised, transactions are recurring and outcomes are difficult to specify. Bilateral governance is selected over unified governance when the human and physical assets required for the transaction are extensively specialised and efficiencies cannot be realised by supplying

the product or service internally. Examples of bilateral governance include service level agreements and memoranda of understanding.

Unified governance arises where an organisation completes a transaction internally rather than contracting with another organisation. Hence, unified governance or vertical integration entails the removal of the transaction from the market. The transaction types that are likely to require unified governance are recurring transactions of the mixed and highly idiosyncratic kinds. These types of transactions constantly expose the organisation to the threat of opportunism and the risk of damaging losses incurred through sunk costs. Internalising the transaction eliminates these risks.

The application of the governance principles described here requires:

- Identifying the products and services that arise from the various activities that constitute policy design and implementation
- Characterising the transactions the activities entail
- Selecting the type of governance arrangement that best suits the characteristics of the transactions

Some examples are provided in table 4.

Strategy

Corporate strategy provides a framework for choosing and arranging organisational activities and processes so that they contribute as fully as possible to the creation of value for customers and thereby contribute to organisational objectives (Porter 1996). Evidently, decisions about outsourcing activities should be made with appropriate reference to those judgements.

When organisations develop their strategy they are deliberately deciding what objectives they want to achieve and how to achieve them in the context of their internal capabilities (resources, assets, funds etc.) and their external environment (e.g. the market, competitors, substitutes etc.). The resulting strategy creates a set of principles governing the way the activities, structures, processes and resources of an organisation are configured to achieve the organisation's objectives.

The fundamental objective of organisations in the private sector is to produce profits. Hence, the purpose of strategy for organisations in the private sector is to direct organisational effort towards the creation of value for customers in order to produce profits (Porter 1985). Hence, corporate strategy in the private sector is about seeking a competitive advantage in the creation of value for customers so as to maximise performance and secure survival (Hunter 2004).

| Governance arrangement | Activity | Transaction characteristics | Product or service |
|------------------------|--|--|---|
| Market | <ul style="list-style-type: none"> - Water quality monitoring - | <ul style="list-style-type: none"> - Non-specific and standardised - Recurrent - Low uncertainty | <ul style="list-style-type: none"> - Water quality reports - |
| Trilateral | <ul style="list-style-type: none"> - Research - Nutrient benchmarking - Extension | <ul style="list-style-type: none"> - Mixed or customised - Occasional - Limited uncertainty - | <ul style="list-style-type: none"> - Best practice guidelines - Nutrient management plans - Field days |
| Bilateral | <ul style="list-style-type: none"> - Implementation of incentive program - Assessment of consents | <ul style="list-style-type: none"> - Customised - Recurring or occasional - High uncertainty | <ul style="list-style-type: none"> - Distribution of incentives - Ruling on consent |
| Unified | <ul style="list-style-type: none"> - Selecting water quality targets for regional plan - Choosing policy measures to achieve targets | <ul style="list-style-type: none"> - Highly customised - Recurring or occasional - High uncertainty about process | <ul style="list-style-type: none"> - Water quality limits - Policy measures |

Table 4: Examples of policy activities, transaction characteristics and governance

Given the identification of the competitive advantage of an organisation, certain activities will be critical to the pursuit of that advantage. The most critical will be those that provide the basis for the creation of value for the customer and are valuable, rare, or difficult for others to imitate. These are an organisation's core activities and are the source of its competitive advantage (Hunter 2004).

Other activities are essential to the conduct of core activities and so may be critical to the pursuit of competitive advantage (Hitt, Ireland and Hoskisson 1996). In addition, responsiveness to external signals is vital if organisations are to retain their competitive advantage. Consequently, activities that are central to the gathering of intelligence on customers and relevant dimensions of the environment may also be considered critical (Wishart, Elam and Robey 1996).

In principle, critical activities, especially core activities, should be internal to the organisation. Hence, in normal circumstances organisations should only contemplate outsourcing non-core, preferably non-critical activities. Hunter (2004) lists the following concerns with outsourcing critical or core activities:

- Outsourcing core activities means the purchasing organisation is effectively sharing their competitive advantage with the supplying organisation. This may create opportunities for the supplying organisation to take the lead in the core activity and become a rival.
- Internal capabilities may be reduced if core or essential activities are outsourced. By contracting specialist skills the purchasing organisation may effectively deskill their own staff resulting in reduced capacity to pursue their competitive advantage.
- It is important for purchasing organisations that outsource essential activities to ensure the supplying organisation is capable of performing the activity to the desired standard, consistency and timeliness.
- The purchasing and supplying organisations may have different strategic priorities with respect to a critical activity. These differences need to be considered as they may affect the standard, consistency and timeliness of the product or service and the relative importance of these attributes to the each organisation.
- Given the importance of collecting intelligence on the environment and customers, if outsourcing an activity results in loss of access to this intelligence then purchasing organisations will need to ensure processes are negotiated for the transfer of this intelligence within the outsourcing arrangements.

These concerns have important implications for relationships between organisations that are jointly responsible for the development and implementation of natural resource policy.

The fundamental objective of organisations in the public sector is to create social value by designing and implementing public policy. Hence, the focus of corporate strategy for organisations in the public sector is on how they can best deploy their resources to create public value. However, organisations in

the public sector have only one customer - the government - and the creation of value for the government arises from the creation of value the community. This means, compared to commercial businesses, the link between customer satisfaction and organisational performance is attenuated for public sector organisations. This makes measuring organisational performance a challenge, and assessing the relative merits of alternative corporate strategies problematic.

The objectives of organisations in the public sector are largely defined by the assignment to them by government of responsibility for achieving particular public policy outcomes. This responsibility places a constraint on the range of strategies for creating public value that can be considered by any particular public organisation. Hence, the development of a strategy for organisations in the public sector concerns how they can create value for the government by operating within the constraints of their government assigned organisational objectives, as well as within the constraints imposed by internal resources and the external environment.

Certain activities will become critical for a public organisation given the responsibilities they are assigned by government. Consequently, given government has distributed responsibilities, activities and capabilities in regard to natural resource policy among a set of organisations, those organisations may well find themselves in a position where at least some critical activities, possibly even core activities, are undertaken by another organisation.

The following implications arise from such a distribution:

- Given that internal capabilities may be reduced if core activities are conducted externally then joint staffing of projects may be required if retention of specialist skills is a priority for the purchasing organisation.
- Governance arrangements that ensure the supplying organisation is capable of delivering products and services to a desired standard, consistency and timeliness are essential. The more idiosyncratic and recurrent the transactions around these products and services the greater will be the need for flexible, relational based governance arrangements for the responsible organisations.
- The supplying organisation may have different strategic priorities with respect to the activity. These differences need to be considered as they may affect the standard, consistency and timeliness of the product or service and the relative importance of these attributes to the supplying organisation.
- Given the importance of monitoring for changes in dynamic environments that influence which activities are core, then the establishment of processes for the transfer of intelligence on clients and customer perceptions of value may be a vital to consistently creating public value.

In short, the spreading of core activities among public agencies can create risks for them in terms of being capable of consistently creating value for

clients and achieving policy outcomes as embodied in their organisational objectives.

Porter (1985) suggested there are four categories of responses to manage the risks when core or essential activities are shared (see table 5). The four categories are:

- Management structures;
- Management systems;
- Workforce management; and
- Conflict management.

These responses are intended to reinforce coordination and linkages between organisations so as to encourage the transfer of intelligence and alignment of priorities, thereby encouraging the achievement of shared core and essential activities.

Management structures can be established to encourage collaboration and coordination between organisations. Management structures are temporary or permanent organisational entities that cut across organisational boundaries (Porter 1985). Examples include establishing inter-divisional taskforces to encourage intelligence sharing, committees focused on customer preferences and product information, and centralising groups responsible for core activities. These are useful in situations where core and essential activities need regular adjustment in response to constantly changing conditions.

Establishing management systems that link functions across organisations can improve the transfer of information. For example joint strategic planning, joint budgeting and implementing systems to coordinate delivery. These systems assist organisations to align their strategic priorities and support product quality so they are useful where core or essential activities are shared and quality and timeliness of products and services is critical to creating value in a dynamic environment (Porter 1985).

Workforce management responses can facilitate cooperation between organisations. Examples include staff rotations between organisations to promote sharing knowledge among staff across organisations, staff education about the interrelationships between the organisations, and cross unit management forums (Porter 1985). These responses may reduce the risk of losing capability in situations where core or essential activities are shared in a dynamic environment.

Establishing mechanisms for resolving conflict between organisations is essential in a dynamic environment (Porter 1985). Otherwise activities may be stalled resulting in losses and policy failure. An example is senior support to resolve disputes.

| | Management actions |
|---------------------|--|
| Structures | <ul style="list-style-type: none"> - Inter-divisional taskforces and focus committees - Group business units together that are significant to competitive advantage - Inter-organisational committees with a focus on client and product information - Create group executive whose chief strategic role is to foster interrelationships |
| Systems | <ul style="list-style-type: none"> - Joint strategic planning - Coordinate management systems that cross business units like planning, control, budgeting - Coordinate strategy delivery - Appoint relationship champions to manage interrelationships - Temporary taskforces to transfer information - Communication strategy |
| Workforce | <ul style="list-style-type: none"> - Staff rotation to share knowledge and acquire skills - Cross-unit management forums and meetings - Emphasis on promotion from within the organisation - Education on interrelationship concepts - Collective training across organisations |
| Conflict resolution | <ul style="list-style-type: none"> - Unifying theme - Senior executive support |

Table 5: Actions to manage risks when sharing core and essential activities

Adapted from Porter (1985)

Human resources

An organisation's employees are fundamental to organisational success because it is employees that translate organisational objectives into action (Hunter 2004). Consequently, since the performance of employees depends on how they are managed, how an organisation interacts with its employees has a crucial bearing on organisational performance (Legge 2005). A critical determinant of employees' motivation to contribute to organisational objectives is their perception of the relationship between them and their employer. This relationship can be described and analysed using Rousseau's (1990) model of the psychological contract.

The implementation of natural resource policies however, often involves primary producers, industry and community organisations as well as employees of government agencies. For example, government agencies often rely on primary producers to voluntarily adopt farm practices that may improve water quality. In this instance, producers function as an external workforce. Their cooperation is a prerequisite for policy success. Government agencies often establish working groups in various guises to assist in policy design and implementation. Some members of such groups may be professionals representing certain interests while members representing other interests may be volunteers. The members of these working groups function as an external workforce and their cooperation is a prerequisite for policy success.

Consequently, the successful implementation of policy will also depend on how an organisation interacts with these external workforces. As with employees, a critical determinant of the motivation of these external workforces to contribute to the objectives of an organisation is their perception of the relationship between them and the organisation. Rousseau's (1990) model of the psychological contract (Keeble et al. 2012) can be employed to describe and analyse these kinds of relationships.

Rousseau (1990) proposed that the relationship between an employer and employee often entails expectations and obligations over and above the content of any legal or written contract. These expectations and obligations emerge through the interpersonal relationships formed in the work place over time (O'Donohue 2007) and give rise to an enduring mental model of the employment relationship. Employers and employees develop beliefs about the obligations that exist between them. These beliefs shape their expectations of, and ultimately their commitment to, each other. Over time employees negotiate the duties they must perform to satisfy their side of the bargain, and the nature of the rewards they can expect in return from employers. The psychological contract is therefore voluntary, dynamic and informal (O'Donohue 2007).

The Psychological Contract

Rousseau (1990) argued that there were two dimensions to the psychological contract: the transactional contract and the relational contract. The

transactional contract is explicit, short term and economic in nature O'Donohue (2007). It is based on the pursuit of self-interest and assumes that the relationship between the employer and employee does not result in continuing interdependence.

The relational contract is characterised by broader agreements that seek to create and sustain a long-term relationship between the employer and employee. In relational contracts obligations of loyalty and commitment on the part of employees are matched by obligations to provide training, career opportunities and job security on the part of the employer (Hunter 2004). Examples of relational expectations in the context of a natural resource management agency and its internal and external workforce are presented in Table 6).

The psychological contract with an employee can be anywhere along a continuum between one that is purely transactional and one that is purely relational. Since much of the relational content of psychological contracts is often implicit and dynamic, unforeseen breaches of the contract may easily arise. Understanding employee perceptions of where they are on this continuum allows employers to anticipate the expectations of employees and to determine whether any planned changes to work practices are likely to be seen as renegeing on their obligations to employees.

The model of the psychological contract highlights the fact that organisations will experience problems with staff if the organisation deliberately or inadvertently breaches the conditions of the contract. The contravention of perceived obligations can result in an unfavourable change in employees' perceptions of the relational obligations of employers, with a corresponding weakening in their loyalty to the organisation.

Breaches of a psychological contract may be distributive, procedural or interactional (Pate 2006). A distributive breach occurs when outcomes, for example financial rewards, are perceived by employees to have been unfairly distributed. A procedural breach refers to the perception among employees of the unfair application of procedures such as promotion. Interactional breaches are linked to employees' perceptions of trust of supervisors and the organisation as a whole. Breaches may arise as a result of retrenchment of staff and changes in organisational structure, processes, standards and norms.

| Relational expectations | Producer Expectations | Agency Expectations |
|--------------------------------|--|---|
| Inter-personal | <ul style="list-style-type: none"> • Familiarity with my farm • The same staff member continuously • Trustworthiness • Clearly map programs into the my context and goals • Open and listens to my side | <ul style="list-style-type: none"> • Duty of care to their farm and the physical environment • Authentic relationship |
| Professionalism | <ul style="list-style-type: none"> • Reliability and timeliness in follow-up of commitments made • Being proactive and make things happen • Be straight and respond in a timely manner | <ul style="list-style-type: none"> • Interested in productivity enhancing change |
| Expertise | <ul style="list-style-type: none"> • Broad knowledge • Informed by practices of other farmers in the area • Cut through the red tape | |
| Respect | <ul style="list-style-type: none"> • Receptivity and empathy • Punctuality (a respect signal) • Maintaining confidentiality • Live local | <ul style="list-style-type: none"> • Respect and trust staff |

Table 6: Relational expectations of agency staff and primary producers in a natural resource policy context

Extracted from Keeble et al. (2012)

The impacts of a breach of the psychological contract will depend on the circumstances of the breach, the consequences for employees and the strength of interpersonal relations between employees and the employer (Pate 2006). Where the relationship between employees and the employer is sufficiently strong the psychological contract may remain unchanged (relationship restoration). Alternatively, the psychological contract may remain intact but become more transactional (relationship recalibration). Finally, the breach may provoke strong feelings of violation and trigger significant damaging, changes in the relationship between employees and the employer (relationship rupture).

The violation of the psychological contract can initiate a number of attitudinal or behavioural responses including reduced organisational commitment and job satisfaction, cynicism or a belief that the organisation lacks integrity (Pate 2006). Employees may be more likely to display unfavourable emotions towards the organisation and they will tend to be critical of their organisation. Relationship rupture may evoke behavioural changes in terms of reduced effort and citizenship in the workplace. Clearly in this case there are profoundly unfavourable implications for the employee and organisational performance.

The psychological contract model has some interesting implications for managers in organisations that are jointly responsible for the design and implementation of natural resource policy. Some implications concern the internal workforce, that is, the staff, of a government agency such as a regional council. Others concern external workforces, which may consist of the employees of other government agencies and industry organisations, community representatives and primary producers

Implications for the internal workforce

First, the psychological contracts in these organisations are likely to be strongly oriented to the relational form because a high proportion of employees have high levels of expertise and prefer autonomy and responsibility for their performance. Consequently, many of the conditions of these psychological contracts will be implicit and dynamic. Hence, inadvertent and unforeseen breaches of these contracts may easily arise.

Second, Marks (2001) observed that individual employees often have multiple psychological contracts as the result of arrangements such as decentralisation, contracting, outsourcing and the rise of work teams. As a result these individuals tend to have an increased attachment to the organisational entities that they interact with most regularly, such work groups, and a diminished sense of attachment to their own organisation. Hence, the establishment of cross-organisational entities such as working groups and task forces to deal with issues in natural resource policy that span organisational boundaries may undermine the loyalty, attachment and commitment of employees to their organisation. This may be beneficial in

terms of the objectives of the cross-organisational entity but potentially damaging for the organisations themselves.

Third, there is potential for arrangements such as the establishment of external work groups to seriously undermine the commitment of employees to their organisation when these arrangements result in breaches of psychological contracts. The establishment of external working groups, like outsourcing, involves the transfer of one or more organisational functions and may entails changes in organisational processes, standards and norms.

For organisations that are jointly responsible for natural resource policy this means there is a risk that their employees may become less committed to their organisation when employees' experiences of such changes are unfavourable. For example, the establishment of external working groups may substantively change:

- The tasks and duties of employees
- The competencies required of employees
- The authority and discretion employees may exercise
- The degree of control employees have over their performance

Employees may justifiably regard these changes as interactional breaches of their psychological contract.

Fourth, the potential for arrangements such as contracting, outsourcing and inter-organisational work groups to undermine the commitment of employees to their organisation may be increased even when employees perceive those arrangements as responsible for their experience of favourable emotions. Marks (2001) has suggested that if the psychological contract represents affective states of trust and fair treatment, then those organisations that are perceived by employees as being responsible for positive feelings such as comfort or safety will be seen as having the most impact on any collective psychological contract.

For organisations that are jointly responsible for natural resource policy this means there is a risk that their employees may become less committed to their organisation, and more committed to other organisations, when employees' experiences of working in other organisations are positive.

Implications for the external workforce

First, the psychological contracts with external workforces are likely to be strongly oriented to the relational form when external work groups have specialised skills. Inadvertent and unforeseen breaches of the psychological contracts with external workforces will be an especial concern where the achievement of an organisation's objectives is highly sensitive to the performance of such groups. This means a singular effort must be invested in clarifying and aligning the expectations of all parties to maximise workforce performance and minimise the likelihood of breaches. Confusion over function, rights, responsibilities, and resourcing can result in relationship rupture, loss of motivation and the downgrading of commitment.

Second, as well as having a commitment to the sponsoring or contracting organisation the members of an external workforce (such as members of stakeholder working groups) will also have a commitment to their own organisation, industry or interests. This dual commitment will be an important influence on their attitudes and behaviour. Differences in organisational cultures, norms standards and processes may easily give rise to entirely unintended and accidental breaches of psychological contracts with the members of an external workforce. Such differences can also create circumstances where the members of an external workforce can also unintentionally and accidentally breach the psychological contract with the sponsoring or contracting organisation.

Again, this reinforces the importance of investing time and effort in clarifying and aligning the roles, responsibilities and expectations of all parties to maximise workforce performance and minimise the likelihood of breaches. Furthermore, defining expectations in regard to what behaviours are acceptable in situations where conflicts arise between commitments to the contracting organisation and commitments to other organisations, industries and interests is essential.

Third, some members of an external workforce may be volunteers. Examples may include community and representatives and primary producers. The psychological contract with those members will necessarily be relational in form. Consequently, the strength of the commitment of these members to the contracting organisation will be extremely sensitive to any failure to meet their relational expectations. For example, Keeble et al. (2012) found that having *influence* over an issue or pending change was a key expectation of farmers who were voluntary members of working groups. In the absence of any substantive transactional contract a failure to meet this relational expectation would result in relationship rupture and the consequent withdrawal of farmers' commitment and cooperation.⁴

In conclusion, the psychological contract approach to human resource management offers the potential for a detailed analysis of the relationship between an organisation and its internal and external workforces, including voluntary workforces. Such an analysis can be used to explicitly identify the key relational expectations and formulate appropriate management responses. Keeble et al. (2012) provides a detailed example in regard to a natural resource management agency relying on primary producers as a voluntary external workforce.

The Relationship Choice Framework (Kaine and Keeble 2007; Keeble et al. 2008; Keeble et al. 2012) may be used to identify the governance, strategic and human resource risks that can arise when a group of organisations are collectively responsible for developing and implementing natural resource policy. The Framework may be applied when such a group consists of industry associations and community organisations as well as government

⁴ Keeble et al (2012) explore this matter in some detail in regard to using farmers as a voluntary external workforce to implement natural resource policy (which is the case when farmers are expected to voluntarily adopt practices that contribute to the environment but not productivity).

agencies. The Framework may also be adapted and applied, in principle, to evaluate interactions between divisional or functional units within an organisation such as a unified council.

Relationship choice trees

The above provides criteria for identifying the nature and magnitude of the risks that arise when responsibility for designing and implementing natural resource policy is shared among organisations. Hence, these criteria may be employed to indicate whether a policy outcome may be at risk because of the way in which policy design and implantation activities are distributed among public agencies.

With respect to policy design and implementation activities the criteria are:

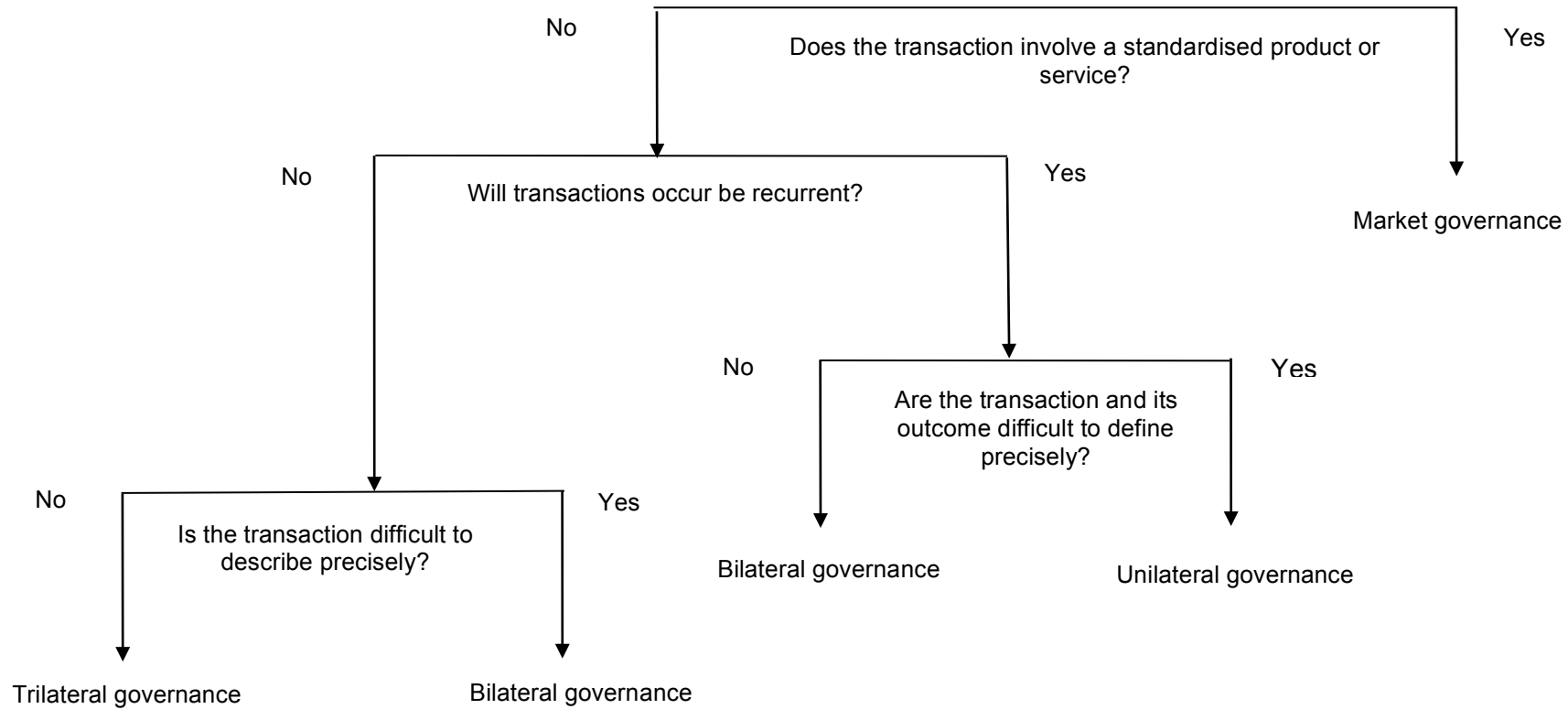
- The extent to which customised investment is required to undertake an activity and provide a product or service
- The frequency with which the product or service must be supplied or acquired
- The level of uncertainty about the nature of the activity and the resulting product or service
- Are activities critical (core, essential or intelligence gathering)
- Do the activities involve specialised skills and knowledge
- Does sharing activities involve engaging a de facto external workforce
- Does sharing activities involve utilising a voluntary external workforce

The governance and strategy criteria are laid out in the form of a decision trees in Trees 11, 12 and 13.

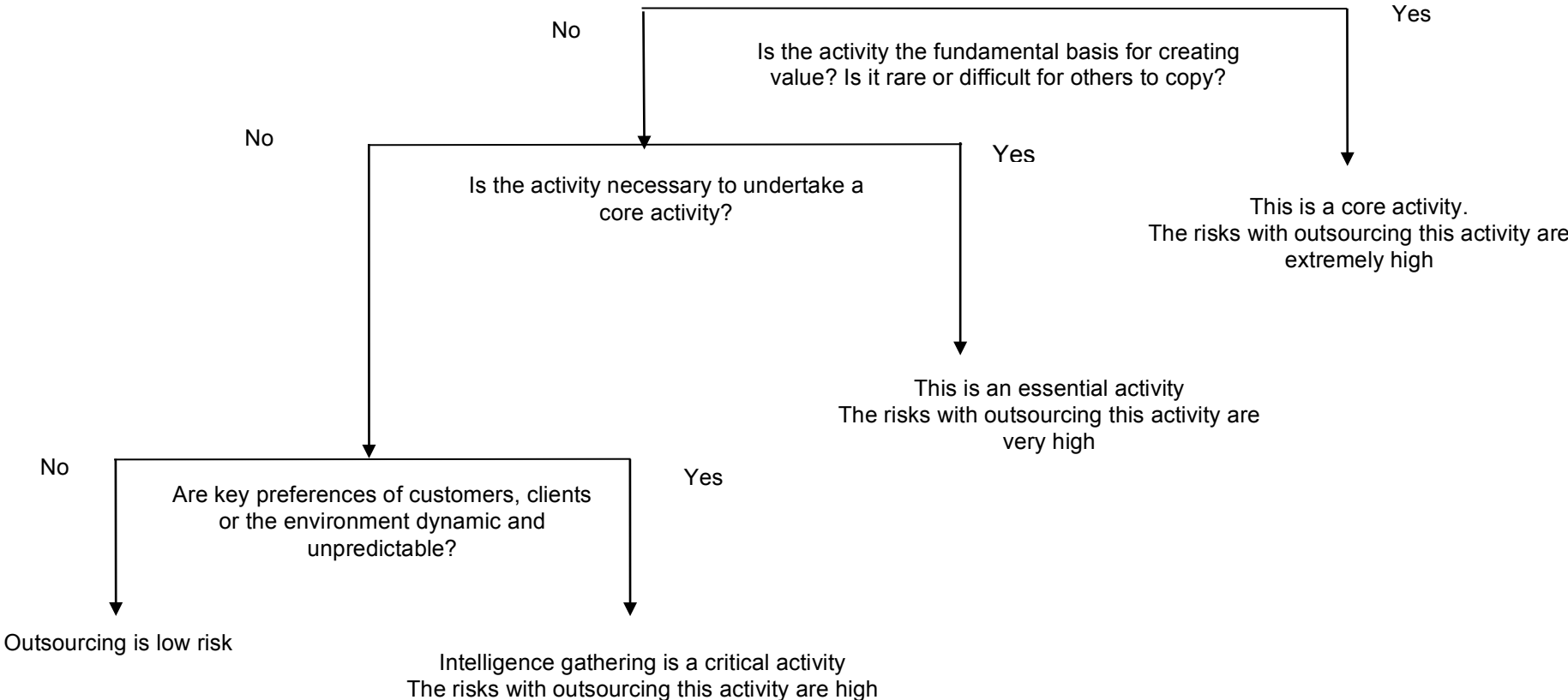
An assessment of each of these factors provides an overall indication of the potential risks involved with sharing the responsibility for designing and implementing natural resource policy among a collection of public agencies, industry associations and community groups. The trees may be employed to identify management actions that may be taken to mitigate these potential risks.

In principle, this component of the PCF may be applied circumstances where responsibility for the design or implementation of natural resource policy involves industry and community associations as well as government agencies, such as with collaborative processes. This component of the PCF could also be adapted and applied to analyse relationships between functional groups within an organisation.

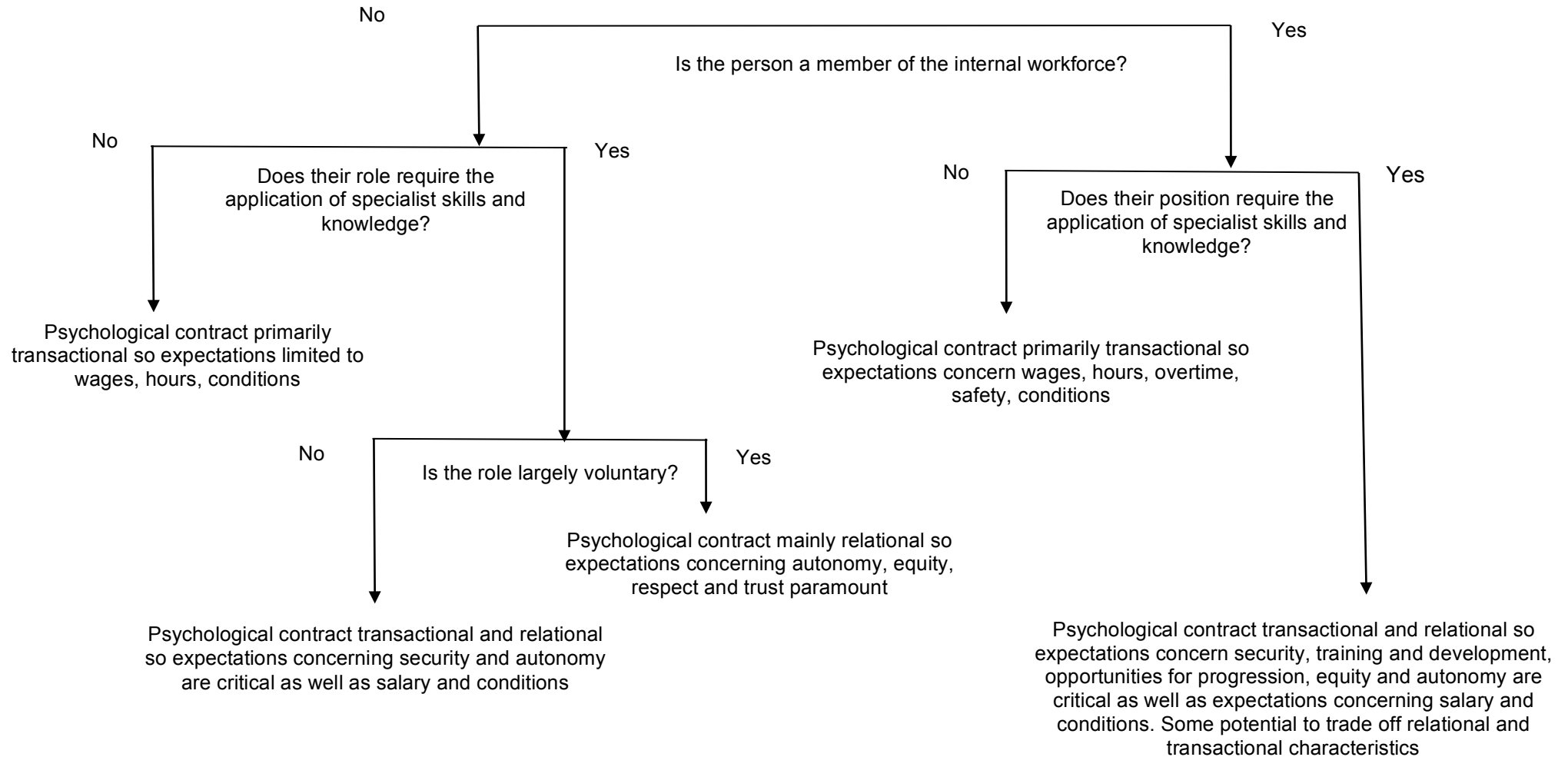
Tree 11: Relationship choice tree (governance)



Tree 12: Relationship choice tree (strategy)



Tree 13: Relationship choice tree (workforce)



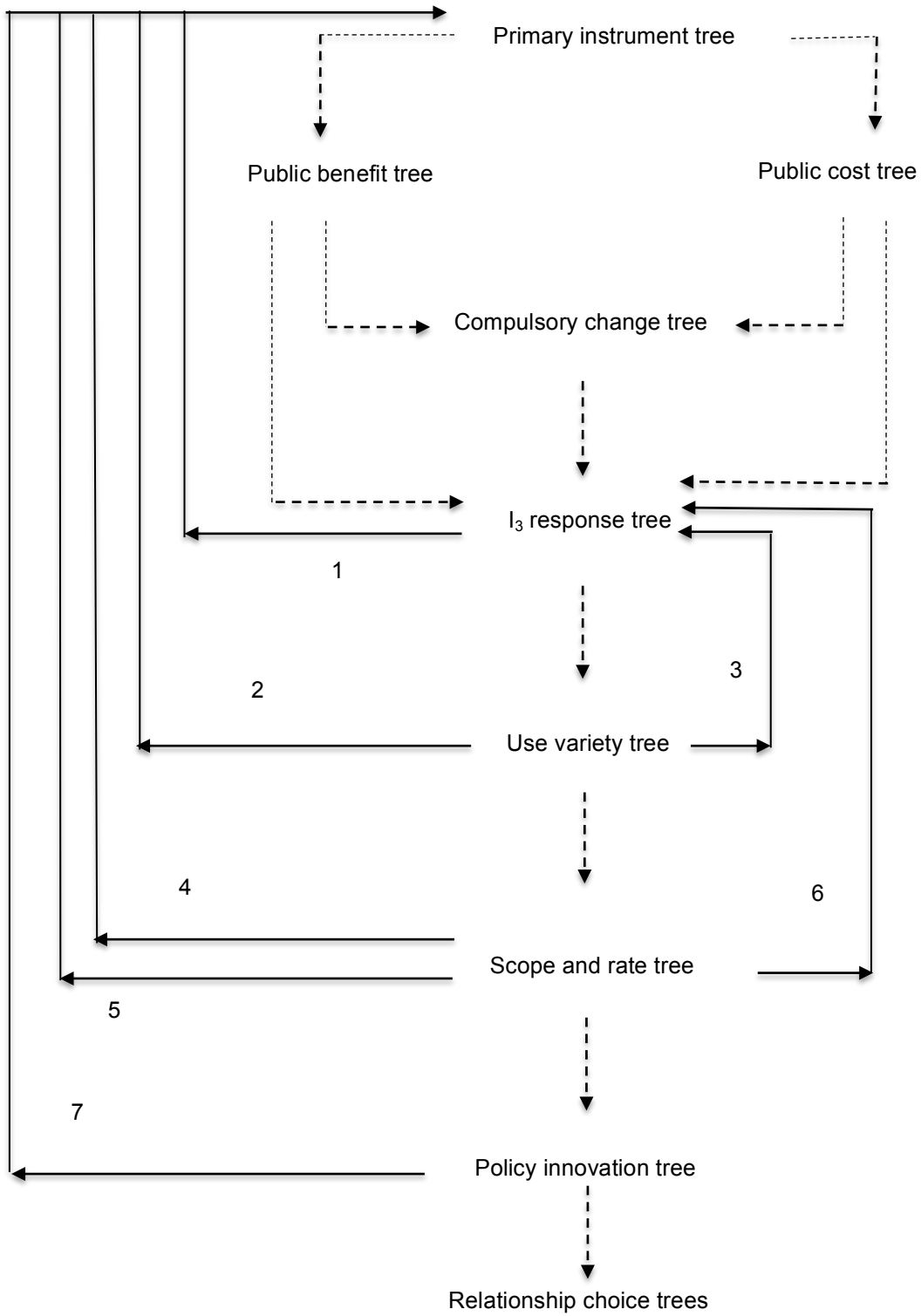
Feedback loops

There are a number of ways in which the components of the PCF interact to create feedback loops. These interactions primarily arise where the reactions of primary producers to the primary instrument put the achievement of the policy outcome at risk.

The feedback loops are summarised diagrammatically in Figure 4. There are a total of seven feedback loops in the PCF with five of these concerning the responses of producers to policy instruments. These loops are:

1. Unfavourable reactions of producers with high involvement to the primary instrument putting the policy outcome at risk, thereby prompting reconsideration of the primary instrument (return from the I_3 response tree to the primary instrument tree)
2. Excessive potential for use variety putting the policy outcome at risk, thereby prompting reconsideration of the primary instrument (return from the use variety tree to the primary instrument tree)
3. Modifying the primary instrument to reduce potential for use variety changing producer involvement with the primary instrument (return from the use variety tree to the I_3 response tree)
4. Insufficient numbers of producers changing behaviour to achieve the policy outcome, thereby prompting reconsideration of the primary instrument (return from the scope and rate tree to the primary instrument tree)
5. Producers changing behaviour too slowly to achieve the policy outcome, prompting reconsideration of the primary instrument (return from the scope and rate tree to the primary instrument tree)
6. Modifying the primary instrument to increase the rate at which producers change behaviour, changing producer involvement with the primary instrument (return from the scope and rate tree to the I_3 response tree)
7. Unfavourable reactions of agencies responsible for implementing the primary instrument putting the policy outcome at risk, thereby prompting reconsideration of the primary instrument (return from the policy innovation tree to the primary instrument tree)

Figure 4: Feedback loops



Applying the PCF

The application of the PCF can be considered in three stages. The first stage consists of working through the policy and products tree and the economic justification tree, and working through trees relevant to the selection of the primary instrument; primary instrument tree, public benefit tree, public cost tree and compulsory change tree (Trees 1 through 6). Completing this stage of the PCF requires:

- Extensive knowledge of the policy outcome, the policy context and relevant producer behaviours
- Expertise in microeconomic theory
- Expertise in policy instrument design

In practice, this stage of the PCF can be completed in four to eight weeks by an experienced team.

The main factors influencing the time taken to complete the first stage of the PCF are: the ease with which specific producer behaviours that are relevant to the policy outcome can be identified; the number of behaviours; and the variety in them.

The second stage consists of working through the I_3 response tree, the use variety tree and the rate and scope tree (Trees 7 through 9). Completing this stage of the PCF requires:

- Expertise in I_3 Response Framework and Kaine (2008)
- Expertise in farm systems and producer decision-making
- Expertise in interviewing techniques
- Expertise in survey design and statistical analysis
- Expertise in interpretation of statistical results

In practice, the second stage of the PCF takes an experienced team between three and twelve months to complete.

The main factors influencing the time taken to complete this stage include: the number of specific behaviours and policy instruments that are investigated; the complexity of the behaviours in terms of changes to farm systems; whether a large scale survey is necessary to quantify the numbers of producers in the different quadrants, and establish statistical relationships between involvement, attitudes and behaviour; whether validation with producers of these relationships and of instrument choice is required; and whether an estimate of the rate of change is required.

The third stage consists of working through the policy innovation tree and the relationship choice trees (Trees 10 through 12). Completing this part of the PCF requires:

- Thorough knowledge of the principles of policy instruments and instrument design

- Thorough knowledge of the principles of transaction theory and competitive strategy theory
- Expertise in classification of innovations
- Expertise in analysis of instrument components and architecture
- Expertise in the application of transaction theory
- Expertise in the application of competitive strategy theory
- Expertise in interviewing techniques

In practice, this stage of the PCF takes an experienced team between one and three months to complete. The main factors influencing the time taken to complete the third stage include: the number of policy instruments that are investigated; the number of government agencies and other organisations involved in implementation of the primary policy instrument, and the distribution of policy design and implementation activities among agencies and organisations.

The second and third stages can, in principle, be conducted concurrently, though this would require additional personnel. There is also potential to commence the second stage before the first is completed. Interviews to identify the factors influencing relevant behaviours can commence with producers once such behaviours have been identified. However, the primary instrument, and any relevant modifications or alternatives, must be identified and specified before surveying to place producers in the respective quadrants of the I₃ Response Framework can commence. This can require some time if there are technical matters, such as effectiveness of technology standards, that need to be investigated before the specification of the primary instrument can be finalised.

Example application of the PCF

An example application of the PCF is provided here. The example is adapted from Young and Kaine (2009) in which the PCF was applied, retrospectively, to the problem of limiting nutrient emissions from agriculture into Lake Taupo, New Zealand.

The policy outcome sought was to protect the quality of the water in the Lake (Young and Kaine 2009). Scientific analysis had established that nitrate emissions from agriculture were a major contributor to the decline in water quality and that emissions should be reduced by approximately 30 per cent to preserve the quality of water in the Lake. Consequently, the behaviours that were relevant were actions by producers that resulted in the emission of nitrate.

Policy and products tree:

An action that would contribute to preserving the quality of water in the Lake, and which producers were choosing not to do, could not be identified. However, producers were engaging in actions that resulted in the discharge of nitrates and so were reducing the quality of water in the Lake. Hence, to protect water quality the Council sought to stop some of these actions in the future.

In other words, and in plain language, there wasn't something that producers should do, but were not doing. Rather, they were doing something that was harming water quality in the Lake; namely, farming livestock. Hence, the Council sought to reduce nitrate discharges from livestock farming.

Since the actions that resulted in nitrate discharges were engaged in by agricultural businesses, then the actions can be described as using a product or resource as an input in production. Specifically, the action of discharging nitrates into the Lake can be described as an agricultural business using a resource, namely the capacity of the Lake to assimilate nitrogen, as an input into the production of agricultural products. In plain language, producers are using a resource, the Lake, to dispose of nitrates, which are a by-product of livestock farming.

Economic justification tree:

The preservation of water quality concerns the conservation of a resource; it is not a matter of income distribution. The resource, the assimilative capacity of the Lake, is clearly rival in consumption since the decline in water quality is affecting other users of the Lake. However, the use of the resource by producers, by reducing water quality in the Lake, is creating non-exclusive costs for others; hence the justification is that there is an incomplete market. In economic terms, there are negative externalities associated with the use of the resource (Young and Kaine 2009).

Primary instrument tree:

Since the economic justification for intervening to change producer behaviour is because there is an incomplete market arising from the creation of non-exclusive costs then the public costs tree should be used to identify the primary instrument.

Public costs tree:

The non-exclusive costs arise from extensive livestock production (Young and Kaine 2009). The potential for economies of scope or scale in extensive agriculture are extremely limited. In this instance, the desire to preserve the water quality in the Lake was sufficiently powerful to conclude that any further decline in the quality of water in the Lake was unacceptable (Young and Kaine 2009: 16), therefore the rights of those bearing the non-exclusive costs, the community, took priority over the rights of those creating the non-exclusive costs, the producers. Consequently, the change in producers' behaviour, the reduction in nitrate emissions, was to be compulsory.

Compulsory change tree:

Creation of the public cost by individual producers could be inferred inexpensively and with an acceptable degree of accuracy using simulation modelling of agricultural enterprises (Young and Kaine 2009: 17). Differences were apparent in the value to individual producers of their emissions, particularly between dairy and other enterprises. Consequently, a market instrument was feasible to consider as the primary instrument.

A cap-and-trade market was considered the most suitable form of market instrument. A cap placed an absolute limit on emissions and so provided confidence that water quality would be preserved no matter what changes occurred in the structure of the agricultural sector in the future.

I₃ response tree:

The engagement of producers in community consultation and planning processes clearly signalled that community and producer involvement with the policy problem of maintaining the quality of the water in Lake Taupo was moderate to high. Producer participation in political activity and planning processes signalled they had high involvement in the proposal to implement a cap-and-trade market. This suggests that most producers were in quadrant three of the I₃ framework (Young and Kaine 2009: 23).

On the whole producers' attitudes towards a cap-and-trade market were unfavourable, but less unfavourable than their attitudes to technology or process standards (Young and Kaine 2009). Producers preferred a cap-and-trade to standards because, given limits were to be placed on discharges, a market gave them the choice as to how to limit their discharges, and the potential to trade discharge permits.⁵

⁵ Producers' level of involvement with policy issues such as protecting water quality, and their involvement and attitudes towards instruments such as technical or process standards or a cap-and-trade instrument can now be quantified and statistically validated using the techniques described in Lourey et al. (2011b).

Producers' attitudes towards the cap-and-trade market were favourably influenced by the decision of the Council to allocate discharge permits on the basis of historical emissions and thereby reduced the financial and social disruption producers faced. Acceptance of the market may have been encouraged further by the decision of the Council to reduce the initial allocation of permits to a level consistent with the cap by purchasing discharge permits, though initial reactions to this proposal were unfavourable (Young and Kaine 2009).

Overall, the potential for unfavourable reaction from producers to put implementation of the cap-and-trade market at risk appeared relatively low.

Use variety tree:

Since the primary instrument was a cap-and-trade market, and such markets by their nature encourage innovativeness, the potential for use variety in regard to reducing nitrate emissions was low, therefore the primary instrument remained feasible.

Note, the potential for non-compliance among producers depends on the ease of detecting non-compliance, the intensity of enforcement, and the nature of penalties for non-compliance

Scope and rate tree:

The creation of the cap-and-trade market required that all producers in the catchment of the Lake possess a permit to discharge nitrogen. Hence scope was not a relevant matter in this context. However, there was potential for producers to slow the rate at which the market was implemented. Producers could introduce delays into the process of benchmarking their emissions and thereby the issuing of discharge permits. They could also postpone management actions to reduce their emissions and sell surplus permits. In principle, these actions put the implementation of the market at risk. Consequently, some modification to the implementation of the market could be worthwhile to reduce this risk.

The Council responded by offering financial assistance with benchmarking to producers, negotiating individually with producers, and supplying detailed information to producers on the operation of the market. The Council also extended its deadline for completion of the benchmarking process and the schedule for acquiring permits from producers (Young and Kaine 2009).

Policy innovation tree:

A cap-and-trade market in nutrient emissions constituted a radical policy innovation for Waikato Regional Council. The Council primarily had experience in the implementation of regulatory policies based on performance, technology or process standards. The design principles underpinning a cap-and-trade market are different from those that underpin standards and were entirely new to the Council.

For example, technology standards are based on the principle that environmental benefits are obtained by controlling farm practices whereas the

market is based on the principle that environmental benefits are obtained by leaving farm practice uncontrolled but limiting discharges. With performance standards allocations are usually non-transferable and are protected from subsequent applications meaning that economic efficiency may be ignored. Under a market approach allocations are transferable to maximise economic efficiency.

Given the components and principles of a cap-and-trade market are substantially different from those of technology, process or performance standards, the introduction of a cap-and-trade market was judged to be a radical policy innovation for the Council (Young and Kaine 2009: 31). Hence, major organisational change would be required to implement the market. Given the political and organisational will was present in the Council to pursue such change a cap-and trade market was feasible in terms of agency implementation.

Subsequently, new processes and procedures were developed and specialist knowledge, skills and experience in market systems were acquired by redeploying staff from different parts of the organisation and from external agencies. At the same time changes were made in the roles, responsibilities and relationships between functional groups within the organisation. As expected, these wide ranging changes were disruptive and required considerable time and resources to successfully implement (Young and Kaine 2009).

Relationship choice trees:

Council undertook the activity of designing (choosing a policy instrument for example) the policy, although it did follow a consultative process. The Council purchased a range of products and services that were inputs into the design activity including research into community values (Stewart et al. 2000) and modeling of nutrient flows (Elliot and Stroud 2001). These products and services were purchased using a tender process.

Two important activities with respect to policy implementation were nutrient benchmarking of farmers and the acquisition of emission permits to reduce aggregate emissions to the cap. In terms of governance, the risks involved in outsourcing the benchmarking activity appeared low as they involved a provision of what could become a standardised service in the longer term. From a strategic perspective however, benchmarking was necessary for the successful implementation of the policy. Consequently benchmarking was an essential activity, perhaps even a core activity, in the creation of value by the Council. This means benchmarking activities were at least strategically essential and so there would be a high risk in outsourcing them.

In the event, the Lake Taupo Protection Trust, a council-controlled organisation, undertook nutrient benchmarking of farmers (Lake Taupo Protection Trust 2014). This amounted to outsourcing an implementation activity that was central to achieving the policy objective. Consequently, establishing management structures and systems to ensure coordination of activities between them could be critical to success. These could include an

inter-organisational committee with a focus on landholder behaviour and joint strategic planning where appropriate. In addition, measures such as cross-unit management forums and meetings, staff rotation and collective training to share knowledge and skills would have merit in contributing to the alignment of each organisations' priorities and the retaining of specialised skills and knowledge within the Council.

Nutrient emission permits were allocated among landholders based on estimated historical emissions. Hence, to reduce aggregate emissions to the cap the Council needed to acquire nutrient emission permits from landholders (either directly or by acquiring land and retiring permits). In terms of governance, the acquisition of emission permits was a non-standardised, asset-specific and unique activity. Once sufficient permits were acquired the activity would, presumably, be redundant. The principles guiding the operation of the activity and the rate at which it should achieve its' objectives, could not be precisely defined in advance. This suggests that the relationship between the Council and the activity should be subject to bilateral, if not unilateral governance.

From a strategic perspective the acquisition of emission permits was necessary for the successful implementation of the policy. Consequently the acquisition of permits was an essential activity, perhaps even a core activity, in the creation of value by the Council. This means the acquisition of permits was at least strategically essential, if not core, and so there would be a high risk in outsourcing this activity.

In the event the Lake Taupo Protection Trust was established to acquire emission permits (Waikato Regional Council 2014). This amounted to outsourcing an implementation activity that was central to achieving the policy objective. Consequently, establishing management structures and systems to maintain alignment of the Council's and the Trust's corporate strategies and priorities, and to ensure coordination of activities between them could be critical to success. These could include an inter-organisational committee with a focus on landholder behaviour and permit acquisition and joint strategic planning where appropriate.

In addition, measures such as cross-unit management forums and meetings, staff rotation and collective training to share knowledge and skills would have merit in contributing to the alignment of priorities and the retaining of specialised skills and knowledge within the Council. Finally, a commitment from senior executives in both organisations to resolve any conflicts that should arise could be vital.

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Glossary

Architectural innovations: one of four types of innovations and occurs when there is a major change in the design principles governing the way the components of a product (or a technology or practice) fit together.

Architectural principles: the rules that underpin the arrangement and combined functioning of the components of an innovation.

Architecture: the way that the components of an innovation are arranged.

Complex decision-making: decision-making where substantial effort is devoted to gathering information about, and comparing, options before making a decision. Strong, stable attitudes are developed about the options prior to making a decision. These attitudes are based on how well the features of each option match the benefits the decision-maker is seeking.

Components: the physical elements of an innovation.

Component principles: the fundamental principles that guide the design and functioning of the components of an innovation.

Compulsory change tree: a diagram (Tree 6) that illustrates the use of criteria for choosing between market instruments and different kinds of regulations to compel changes in behaviour.

Compulsory policy instrument: a policy instrument designed to force changes in the behaviour of primary producers.

Core activities: these are activities that are difficult, valuable, rare, or difficult for others to imitate and are critical to implementing the corporate strategy. Many of the activities involved in policy design are core activities for government agencies. The **outsourcing** of these activities can place the achievement of an organisation's purpose at extreme risk.

Corporate strategy: the means by which an organisation seeks to fulfil its purpose. In the private sector corporate strategy is synonymous with competitive strategy.

Economic inefficiency: when markets persistently, substantially and systematically fail to allocate resources to their most highly valued use.

Economic justification tree: a diagram (Tree 2) that illustrates the use of criteria for identifying the economic justification for government intervention to change the behaviour of primary producers to achieve a policy objective.

Essential activities: these are activities that are essential to the conduct of **core activities**. Many of the activities involved in policy implementation are essential activities for government agencies. The **outsourcing** of these activities can place the achievement of an organisation's purpose at risk.

Exclusiveness: one of two properties that provide a basis for markets to exist (see **rival**). Occurs when people have to pay for a benefit they obtain from the actions of others and when people have to compensate others for costs they impose on them. Cable television is an example of a service that is exclusive; viewers must pay for the benefit of receiving the television signal. Groceries, white goods, and consumer electronics are all examples of products that are exclusive; the user must pay the supplier to obtain the benefit of using the product.

Farm context: the elements in a farm system (resources, technology, practices, strategies) that influence the benefits and costs of a change to the farm system.

Farm system: a description of a farm as a managed, open system of inter-related components (resources, technology, practices, strategies) interacting with its environment.

Farm systems theory: a systems approach to understanding the management of farms.

Feedback loops: where there is capacity for the outcome of a decision to lead to a change in that decision.

Governance: describes the arrangements between organisations that guide interactions between them. It encompasses contractual arrangements, the tenure of the relationship, and the management of disputes between them. There are four types of governance; market, bilateral, trilateral and unified. Each type facilitates different kinds of **transactions** between organisations.

I₃ Response Framework: a framework (Figure 2) to predict how producers would behave in response to a policy instrument.

I₃ response tree: a diagram (Tree 7) that illustrates the use of criteria for predicting producers' behaviour in response to a policy instrument.

Imperfect markets: one of four conditions (see **income inequality**, **missing markets** and **incomplete markets**) that may justify government intervention in the economy and occurs where one or more participants in a market can influence the price they receive, or pay for a product or service.

Income inequality: one of four conditions (see **missing markets**, **incomplete markets** and **imperfect markets**) that may justify government intervention in the economy and occurs when the distribution of wealth is judged to be unfair.

Incomplete markets: one of four conditions (see **income inequality**, **missing markets** and **imperfect markets**) that may justify government intervention in the economy and occurs when there is a market for a product or service but the supply or use of the product or service creates costs or benefits that are not fully reflected in its price (positive or negative externalities). Odours created by piggeries are an example of an incomplete

market due to the odours being a non-exclusive cost; neighbours are not compensated for these costs of pork production, which they have to bear.

Incremental innovations: one of four types of innovations and occurs when there are small changes in the design principles underpinning some of the components of a product (or a technology or practice).

Information asymmetries: a cause of imperfect competition and arises when only some participants in a market for a product or service have access to pertinent information and can use that information to alter the price they receive, or pay, for a product or service.

Instrument concept: a generic description of the way that a policy instrument achieves the policy objective.

Limited decision-making: decision-making where little effort is devoted to gathering information about options before making a decision. Attitudes towards options prior to making a decision are weak and unstable.

Market instruments: policy instruments that change producer behaviour by changing the volume of supply, or demand, for a product or service (e.g. cap-and-trade) or the price of products and services (e.g. incentives, taxes).

Market power: a cause of imperfect competition and arises when some participants in a market for a product or service have the capacity to alter the price they receive (or pay) for a product or service because they supply (or buy) a high proportion of their market. This can occur when a differentiated product or service appeals strongly to a particular market segment effectively creating a quasi-monopoly in that market segment.

Microeconomic theory: describes the functioning of markets for products and services. Used in this context to guide the selection of a policy instrument to change the behaviour of primary producers.

Missing markets: one of four conditions (see **income inequality**, **incomplete markets** and **imperfect markets**) that may justify government intervention in the economy and occurs when a product or service has the properties of being both non-exclusive in production and non-rival in consumption, consequently a market cannot be established in that product or service (public goods). Quarantine services and defence are examples of services that have missing markets because they are non-exclusive in production and non-rival in consumption.

Modular innovations: one of four types of innovations and occurs when there are major changes in the design principles underpinning many of the components of a product (or technology or practice).

Non-exclusiveness: one of two properties that provide a basis for identifying why markets are persistently missing or incomplete and so are inefficient (see **non-rivalry**). Occurs when people do not have to pay for a benefit they obtain from the actions of others (positive externality); and when people do not have to pay for a cost they impose on others (negative externality). Pollination of

crops by honeybees is an example of a non-exclusive benefit; beekeepers create an uncompensated benefit for orchardists. Climate change caused by the production of methane by livestock is an example of a non-exclusive cost; communities bear the uncompensated costs of livestock production.

Non-rivalry: one of two properties that provide a basis for identifying why markets are persistently missing or incomplete and so are inefficient (see **non-exclusiveness**). Occurs when the use (consumption) of a product or service by one person does not change the availability of the product or service to others. Free-to-air television is an example of a service that is non-rival in consumption. Free-to-air television is also non-exclusive in production. Cable television is non-rival in consumption but exclusive in production.

Outsourcing: contracting with a supplier from outside an organisation for the provision of goods and services that had (or could have) been provided internally by the organisation. Legislation and conventions that distribute the authority and responsibility for the design and implementation of natural resource policy among organisations creates dependencies between organisations similar to those created by outsourcing.

Psychological contract: The expectations and obligations that are embedded in a relationship between an employer and employee. The psychological contract has two dimensions: the transactional which concerns matters such as salaries, conditions and the relational which concerns matters such as autonomy, personal development and security.

Policy and products framework: a framework (Figures 1a, 1b, 1c) for translating a desired change in the behaviour of producers into its equivalent in terms of changing the supply of, or demand for, a product or service (to allow subsequent application of microeconomic analysis).

Policy and products tree (economics): a diagram (Tree 1c) using economic terminology illustrating the use of criteria to translate a desired change in the behaviour of producers into the supply of, or demand for, a product or service.

Policy and products tree (plain): a diagram (Tree 1b) using plain language illustrating the use of criteria to translate a desired change in the behaviour of producers into the supply of, or demand for, a product or service.

Policy and products tree (policy): a diagram (Tree 1a) using policy terminology illustrating the use of criteria to translate a desired change in the behaviour of producers into the supply of, or demand for, a product or service.

Policy Choice Framework: a tool to assist policy makers in choosing policy instruments to change the behaviour of primary producers.

Policy Innovation Framework: a framework (Figure 2) to predict the nature and scale of organisational change that an agency may have to make to successfully implement a policy instrument.

Policy innovation tree: a diagram (Tree 10) that illustrates the use of criteria to predict the organisational changes that an agency may have to make to successfully implement a policy instrument.

Policy instrument: a way of changing the behaviour of producers.

Primary instrument: the policy instrument that is primarily responsible for changing the behaviour of producers because it changes one or more of the fundamental factors that governs their behaviour.

Primary instrument framework: a framework to identify the type of policy instrument that, in theory, should efficiently achieve a policy outcome.

Primary instrument tree: a diagram (Tree 3) illustrating the use of criteria for choosing whether to select a policy instrument that encourages the creation of public benefit or discourages the creation of public costs.

Public benefits tree: a diagram (Tree 4) illustrating the use of criteria for choosing between public provision of a product or service, incentives to promote voluntary changes in producer behaviour, or instruments to compel changes in producer behaviour (when the change in behaviour will create a public benefit).

Public costs tree: a diagram (Tree 5) illustrating the use of criteria for choosing between incentives to encourage producers to voluntarily change behaviour or instruments to compel changes in behaviour (when the change in behaviour will reduce public costs).

Public goods: refer to **missing markets**.

Public provision: where government directly supplies, or contracts for the supply of, a product or service.

Radical innovations: one of four types of innovations and occurs when there are major changes in the design principles underpinning many of the components of a product (technology or practice) as well as major changes in the design principles governing the way the components of a product fit together.

Rate: how quickly producers change their behaviour.

Relationship choice framework: a framework to identify the type of governance arrangements that, in theory, should support organisations that are jointly responsible for designing or implementing policy to efficiently achieve a policy outcome.

Relationship choice tree (governance): a diagram (Tree 11) illustrating the use of criteria for choosing the type of arrangements (market, trilateral, bilateral or unilateral) to govern relationships between organisations when they are jointly responsible for designing or implementing policy.

Relationship choice tree (strategy): a diagram (Tree 12) illustrating the use of criteria for identifying and managing the strategic risks that arise when organisations are jointly responsible for designing or implementing policy.

Relationship choice tree (workforce): a diagram (Tree 13) illustrating the use of criteria for identifying and managing internal and external workforces when organisations are jointly responsible for designing or implementing policy.

Rival: one of two properties that provide a basis for markets to function (see **exclusiveness**). Occurs when the use (consumption) of a product or service by one person reduces the availability of the product or service to others. Groceries, white goods, and consumer electronics are rival in consumption.

Scope: how many producers will change their behaviour.

Scope and rate tree: a diagram (Tree 9) illustrating the use of criteria for predicting how many producers will change their behaviour and how quickly they will change.

Transactions: Transactions are exchanges of products or services. They can be distinguished into different kinds on the basis of asset specificity, frequency and uncertainty. Different **governance** arrangements suit different kinds of transactions.

Use variety: the potential for producers to comply with the requirements of a policy instrument but in ways that do not contribute to achieving the policy objective and so are counterproductive.

Use Variety Framework: a framework employed to indicate the potential for producers to exhibit **use variety**.

Use variety tree: a diagram (Tree 8) illustrating the use of criteria for predicting the potential for producers' to exhibit **use variety**.

Voluntary policy instrument: a policy instrument that encourages voluntary change in the behaviour of primary producers.