Chapter 4
Diagnosing Policy Problem Situations

Wil A. H. Thissen

4.1 Introduction

As argued in Chap. 2, policy processes are multi-faceted and may display a wide variety of characteristics. Consequently, policy analysis in a multi-actor context needs to be contingent, multi-faceted, and pluriform. The concluding section of Chap. 2 articulated a wide array of requirements for good policy analysis. Chapter 3 outlined a conceptualization of the variety of different activities and associated purposes policy analysts may engage in. Which of these are most appropriate and which less so depends on the characteristics of the situation and on the ambitions of the client and of the analyst. Both chapters set the scene for the question: Given a specific policy situation, what requirements and type(s) of policy analytic activities are essential for achieving the purposes of client and analyst? In other words, how can an analyst make a reasoned design of her interventions? This will be the subject of Chap. 5.

In order to be able to make such a reasoned design, an assessment of key attributes of the situation is needed. In this chapter, we first address the question of what kind of insight into the situation is important as a basis to make a reasoned design. Next, we outline a set of approaches that can assist in acquiring the needed insights. Finally, we discuss the implications of the insights for the choice of follow-on activities.

Initial reconnaissance activities an analyst undertakes are often called 'problem formulation' or 'problem framing' efforts. As these terms suggest that the objective is to reach a single or best definition of the policy problem (which fits the rational model of policymaking described in Chap. 2, but less so the other models),

W. A. H. Thissen (✉)
Faculty of Technology, Policy and Management, Delft University of Technology,
P.O. Box 5015, 2600 GA, Delft, The Netherlands
e-mail: W.A.H.Thissen@tudelft.nl

W. A. H. Thissen and W. E. Walker (eds.), *Public Policy Analysis*,
International Series in Operations Research & Management Science 179,
DOI: 10.1007/978-1-4614-4602-6_4, © Springer Science+Business Media New York 2013

we prefer the more neutral term 'diagnosis'—a term that nicely parallels medical practice, where the diagnosis precedes the choice of deliberate treatment.[1] The term also covers the exploration of the context in which a problem situation occurs, in addition to formulation of a problem in a more narrow sense.

4.2 What Constitutes a Good Situation Diagnosis?

Analyzing or structuring messy policy problem situations has been recognized for a long time as one of the most critical policy analytic activities, determining to a large extent in what direction further analytic activity will develop. Solving 'the wrong problem' is one of the most serious errors one can make (Miser and Quade 1985; Dunn 1994). In fact, Russell Ackoff (1974) once said: "We fail more often because we solve the wrong problem than because we get the wrong solution to the right problem." Despite the recognized crucial role of this initial policy analytic activity, relatively little attention has been given so far to developing and testing systematic approaches to problem diagnosis. Most authors who have written on the subject (e.g., Wildavsky 1979; Miser and Quade 1985; Dunn 1994; Sage and Armstrong 2000) stress the need for a multiplicity of approaches and for iteration, emphasize the inherent subjectivity of many of the choices to be made, and point to a variety of pitfalls in the process.

Our starting point is that problem diagnosis should provide an adequate basis for client and analyst to first decide on whether or not the situation is worth further (policy analytic) efforts. Therefore, it is important to assess the severity and urgency of the situation: is there a real problem? Is there a serious dilemma? Is there a need for short-term action? But equally important is to explore the extent to which opportunities for improvement or amelioration exist or can be created. If no such opportunities seem to exist, the best choice may be to simply leave the situation as is and spend efforts on more promising issues. Second, problem diagnosis should provide the insights needed to determine the nature and extent of the intervention activities to be undertaken: what purposes/values are important, for whom, and what types of associated activities are called for?

The various theoretical perspectives on policymaking and policy analysis discussed in Chap. 2 provide a basis for the situation characteristics that should be examined in such a diagnosis. Since each of the models discussed takes another perspective, and thereby points to other aspects and issues of potential importance, we will briefly revisit all of them here.

The *rational model* emphasizes the use of (scientific) knowledge in order to support efficiency and value maximization. Its focus is on the substance of the

[1] Sometimes there is no clear diagnosis in medical practice, but only a suspicion about the illness to be cured, and either no treatment or a tentative treatment is chosen, to explore its effects and perhaps adapt treatment after some time. Analogous situations occur in policy processes as well.

policy issue at hand. A diagnosis effort should identify the key knowledge elements of importance, and assess what kinds of knowledge are missing and could contribute to improved policymaking. Key knowledge elements include the problem definition (what is the problem about, and how bad is it?), an idea of what causes the problem, the policy objectives, the range of available policy options, insight into the impacts of policy options on the objectives, and possible other factors affecting the possibility to solve the problem in future. An initial diagnosis should identify these key elements, and the extent to which undisputed scientific knowledge about them is available, or could be acquired by additional analysis.

The *political game model* sees policymaking as complex political interactions among interdependent stakeholders pursuing their own interests in a policy arena. It acknowledges pluralism: the notion that perspectives on values, substantive problems, and solutions may vary widely. It emphasizes power, stakeholder interests, and strategic behavior. This model points to a variety of characteristics that are relevant in an initial diagnostic effort:

- Who are the key players in the policy arena?
- What are their perspectives, values, etc.? To what extent are these different?
- To what extent are knowledge and values contested?
- What is the extent and nature of value conflicts (compatible or antagonistic, incommensurable)?
- To what extent are actors interdependent? What is their relative position of power?
- To what extent is strategic behavior dominant? Is there any trust among the parties?
- Are there any possibilities for (opportunistic) deals among the parties?

The *discourse model* aims to understand the dynamics of policymaking in terms of policy-oriented or social learning occurring as a result of persuasive discourses/debates among actors or coalitions. It focuses on belief systems and advocacy coalitions. For the diagnostic phase, this means:

- What are the belief systems of the actors in the debate?
- How different are they?
- Can (advocacy) coalitions be identified?
- What are the constraints/opportunities for arranging a constructive dialog among the different individuals and/or coalitions?

The *garbage can model* highlights the chaotic character of many policy processes, and the independent ways in which problems, solutions, and policy agendas evolve. For a diagnostic effort, the following questions come up:

- To what extent is the process indeed chaotic? Are there no routine procedures or regulations about participation in the decision processes?
- What problems, solutions, actors are present in the policy arena? Do any linkages appear to be possible and worth pursuing?
- How volatile is the situation?

Table 4.1 Aspects and questions to be addressed in problem diagnosis

Substantive aspects	Perception of problem: objectives, causes for not achieving them, seriousness of the situation, policy options, external influences, insight into the relevant mechanisms affecting the problem
	Assessment of knowledge availability: to what extent are critical insights missing?
	Assessment of most relevant uncertainties
Actors and network characteristics	Who are the relevant actors, what is the boundary of the policy arena?
	What are their perceptions, belief systems, interests? How different are these?
	To what extent are knowledge and values contested?
	Actor interdependencies and power relations
	Resolution power in the network
	The type of conflict: is it about interests, divisible resources, or about more fundamental values?
	Who is to benefit, who is to lose from what solution options?
Institutional characteristics	Existence and strictness of formal rules
	Level of (dis)agreement about decision procedures
	Differences in informal rules, routines, values? Tensions as a result of these?
	Degree of fellowship and trust versus strategic behavior and fight
	Openness versus closedness of the network
	Variability/volatility of the situation

The *institutional model* emphasizes the existence and importance of institutional rules, norms, procedures, cognitions, and routines as drivers of policy processes. Diagnostic efforts need to explore the existence of such institutional elements, since they may provide constraints, as well as opportunities, for analysis. In particular, it is relevant to identify:

- The composition of the policy networks: who are the key participants, who is out (but affected)?
- Existing cultures, rules, standard operating procedures, common language, trust relations in the policy network
- How stable are the networks and rules? Are they closed, i.e., not open to change, or more open? Are there opportunities to change along this line of thinking?
- Are there tensions because of the presence of multiple, antagonistic institutions with different rules, norms, and routines?

Not surprisingly, there is some overlap among the aspects considered relevant from the perspective of the different models of policymaking. For practical purposes, we have grouped the different aspects to be explored under three classes:

- the substantive aspects of the situation;
- the actors involved, their views, needs, means, and interdependencies, with particular reference to the specific issue(s) at hand,

- the institutional and network context characteristics (these provide the general conditions for the decisionmaking process and generally exist beyond the specific issue).

Table 4.1 gives an overview of the way in which we have classified the more specific topics.

We will return to the way in which insights into these characteristics can guide the choice of follow-on activities at the end of this chapter.

4.3 Approaches to Diagnostic Efforts: How to Look, and to Decide Where to Look Further

As argued above, diagnostic efforts need to address a broad spectrum of issues covering substantive, actor and network, and institutional aspects in a coherent manner. In the process, choices also need to be made regarding what is most important, and what less so. How these choices are made may significantly affect the results.

Referring to the hexagon model of Chap. 3, different values will often be leading in this process: are they scientific values? democratic or stakeholder ones? or the values dictated by the client? When scientific and technical validity and consistency are the leading values, what is important and what not is determined based on technical data, analyses, and scientific knowledge (Lawrence 2007).

Alternatively, one may start "from the premise that subjective, value-based judgments about what is important should result from interactions among interested and affected parties" (cf Lawrence 2007, p. 736), or that "a problem is a social and political construct" (Hisschemöller and Hoppe 1995). Then, the problem diagnosis process itself should be an open, interactive process in which participating actors may choose to amend or even change the subject.

Similarly, where the diagnosis starts may significantly affect the outcome. The initial starting point may be a focus on substance, or a focus on the actors and processes in the policy arena. Let us consider the example of capacity problems at a not entirely hypothetical airport (see Box 4.1). If the initial analysis concentrates on substance, political, and institutional issues (such as competition for power or control between stakeholders, government departments, local, regional and national authorities, cultural differences, and past events affecting the relations between actors) will come to light only later, if at all. If, on the other hand, the initial attention goes to the political arena, political or institutional problems (such as the lack of trust between key actors involved) will come to the front, and the substantive aspects of the issue may be driven to the background or suppressed altogether, since solutions for the trust problem may be found in entirely different fields.

While ideally, in a balanced approach, all the different aspects are considered and synthesized, craft issues and personal judgment are important in attempts to achieve this ideal—if possible at all.

Box 4.1: Airport problem perspectives

Airline traffic at 'FlyAway' airport has been growing significantly over the past decades, to such an extent that airport and air traffic control capacity regularly falls short of demand, causing delays and disruption of travel, and increasing pressure to not accommodate new connections, despite demands by carriers to expand. A main carrier, bringing a lot of business, threatens to move its hub business to competing airports abroad. In response, airport authorities wish to expand capacity, e.g. by building new runways. They see the problem as one of a mismatch between demand and supply, and their preferred solution is to increase supply to match future demand. However, some local residents see problems of congestion, noise, and air pollution, and fear expansion will lead to even more nuisance. They advocate either restrictions on air traffic, or the 'export' of growth to other locations. Local authorities and other residents, however, cherish the airport, as it provides a main source of income and employment, so they maintain friendly relations with airport management. Environmental lobbyists see the rapid increase of air traffic as a threat to nature, in particular causing significant depletion of fossil fuel resources and climate change because of CO_2 emissions. They, therefore, oppose any increase in air traffic, and certainly decisions accommodating (and, thereby, in their view, stimulating) such increase. Regional authorities, while emphasizing the economic benefits of the airport to the region, also see the situation as an opportunity to regain some of the ground they had been losing to the national and local authorities, airport expansion being an exemplary issue requiring a lot of coordination at the regional level. The national authorities, on the one hand, emphasize the importance of the airport and an appropriate transport infrastructure for the economy (ministries of economic affairs and transport), and on the other, after a number of incidents, are concerned about safety and long-term sustainability (ministries of internal affairs and environment).

In our further elaboration of a problem diagnosis approach, we will assume that a policy analyst mostly gets involved at the initiative of a client, i.e., an actor who feels a need for support. In the description of our approach, we first take the problem owner's initial problem perception as a starting point. Next, in line with the main argument of this book, we focus on the cognitive dimensions and show how an approach starting with a focus on the substantive aspects of an issue can be extended and integrated with an analysis of actors and institutions.

4.4 Substantive Diagnosis Using a Systems Analytic Approach

4.4.1 Conceptual Framework

In our systems analytic elaboration of problem diagnosis, we will use the following working definition of a *problem*: A problem is a perceived difference between what an actor (the problem owner) considers desirable (a goal), and the present or expected future reality. Essentially, a problem is a (perceived) gap between a situation and a normative principle or objective. Different actors will perceive different problems. Returning to our example in Box 4.1, airport authorities see the shortage in runway capacity as the problem (their objective being to be able to meet demand), neighborhood residents see the excessive noise as the problem (their objective is a quiet living environment), and air travelers see the problem as the unpredictable delays (their objective is to arrive on time at their destinations).

Actors perceive problems with respect to some part of reality. We will call the relevant part of reality the *system*. What the relevant system is depends on one's problem perception. In the example, the system for the airport authorities is the runway configuration, which provides capacity to meet demand for aircraft takeoff and landing slots; for the environmentalists, who see non-renewable resource depletion and global warming as key problems, the system of relevance extends to the worldwide air transportation system, including its usage.

We will use a simple conceptual input–output model, originally developed in systems and control theory and referred to as a *system diagram* (see also the Appendix), to guide and structure efforts at identifying and selecting key elements of a client-centered problem formulation. The system diagram pictures a system as the part of reality that is affected by certain inputs called factors, and that produces specific outcomes of interest (see Fig. 4.1). We distinguish two types of inputs: factors[2] influencing the system that are not controllable by the problem owner, and factors that can be influenced deliberately by the problem owner. The former we call *external factors*. The latter we call *policies*. For the airport authorities, a largely uncontrollable external factor would be the demand for air transportation; a controllable or policy variable would be the number of runways (or the number of take-offs and landings allowed per hour on a specific runway). *Outcomes of interest* are those system outcomes in which the problem owner (and other stakeholders) is interested. The objectives of the problem owner (and the other stakeholders) determine what the outcomes of interest are. For the airport authority in the example, this will be the degree to which runway capacity matches demand (costs of expansion, of course, will also matter). We discuss the identification of outcomes of interest in Sect. 4.4.4. Specification of inputs and outputs defines the

[2] A *factor* is an attribute of an entity (a thing, a person, a process) for which a value can be established on a scale via direct or indirect measurement.

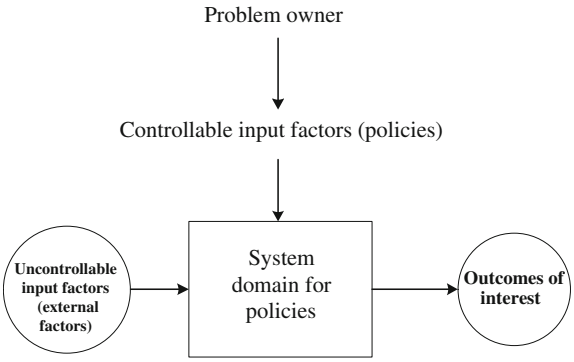

Fig. 4.1 Single-actor system diagram [3]

system boundaries. In addition to inputs and outputs, system delineation includes specification of a relevant temporal and—where relevant—spatial scope. For our example, the relevant time frame extends from the present to about 30 years in the future. That choice reflects the fact that decisionmaking, planning, and realization of a runway takes anywhere between 5 and 15 years, and that the economic lifetime of the investment extends over another 15 years or so. The spatial scope of the system would be regional, as the major impacts of shortage and possible expansion will affect a region, from the direct vicinity to 50 or 100 km from the airport.

4.4.2 Steps and Iteration

Generally, problem diagnosis is an iterative process in which new findings are confronted with earlier ones, fed back to the problem owner (and possibly others), and then reconsidered, etc.—i.e., there is a lot of feedback and iteration. For reasons of simplicity, we present an approach to problem diagnosis as a series of sequential steps. The sequence of the presentation of the steps takes key dependencies among steps and the choices made in them into account. We discuss steps the result of which may have a major impact on subsequent ones first. In some of

[3] Different systems traditions have developed different conventions regarding where to put the different types of influences in the visualization. In control systems engineering, the controls are put entering from the left side; while in the field of information systems, the controls are generally put on top, entering from above [like in the Structured Analysis and Design Technique (Marca and McGowan 1988)]. We will use the latter convention.

the steps, specific (conceptual) modeling techniques are used. The Appendix provides concise descriptions of the key features of some of these techniques.

We will describe the following steps in a substantive problem diagnosis:

1. Initial problem sensing and scoping
2. Analysis of objectives and specification of criteria
3. Causal analysis
4. Identification of possible solution directions
5. Exploring uncertainties about the future
6. Synthesis and iteration

In each of these steps, the system diagram is used as a basic framework, according to which problem specification elements are identified and structured. The findings of each step will generally lead to adaptation/changes in the previous formulation, and hence in the specification of the system diagram. We will continue to illustrate the approach with reference to the airport expansion situation introduced in Box 4.1 of Sect. 4.3.

4.4.3 Initial Problem Sensing and Scoping

The starting point for exploration is a situation in which someone—henceforth called the problem owner—perceives a problem and enlists the help of a policy analyst. While initial talks with the problem owner will provide key elements, we suggest adding exploration of written material as a basis to identify the following elements of the problem owner's situation:

- The problem owner's perception of the problem, i.e., the gap he perceives between (expected) reality and desired reality
- The problem scope according to the problem owner, including possible constraints he sees (such as limitations in time, available funds, etc.)
- The perceived causes of the problem situation
- Perceived key elements of importance to the problem situation
- Other actors who may be important with respect to the problem, possible solutions, or the implementation of solutions
- Future developments and trends that may affect the problem situation or the performance of solutions
- Possible solution directions the problem owner sees, and possible limitations to his maneuvering space

Let us illustrate this for the management of 'FlyAway Airport' as problem owner. For them, the central gap is the shortage of runway capacity. Given trends of continuously increasing demands, they expect that this situation will only worsen in the future, threatening the position of the airport as a major hub. Their perceived solution is to expand the airport by building another runway, and correspondingly intended actions concentrate on acquiring the land from private

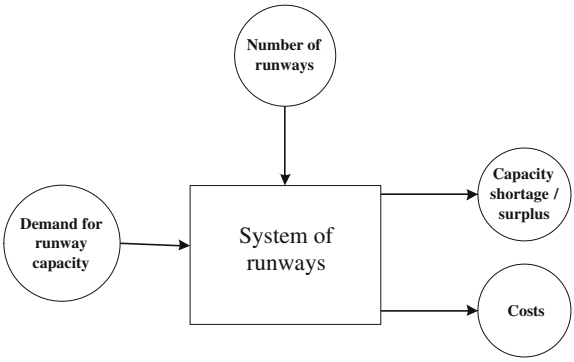

Fig. 4.2 Initial system diagram for problem owner 'airport management'

owners and obtaining the necessary permits from the public authorities—the other key actors that play a part in this venture. Costs of the investment, of course, are also important. The above simple system diagram represents this initial perception (Fig. 4.2):

In the initial version of this case, the system is confined to the configuration and number of runways; the only two outcomes of interest (or performance criteria) are (1) the extent to which capacity shortage persists; (2) the costs of the configuration. The controllable input under consideration is the number of runways; the most important external uncontrollable input is the demand for runway capacity. The dilemma is to find the appropriate trade-off between investment costs and runway capacity expansion.

4.4.4 Analysis of Objectives and Specification of Criteria

Policy analysts can make a major contribution by being critical about the initial framing of the problem: Is the initial formulation appropriate? Does it not preclude the search for options that may, in the end, be more attractive than those pointed at by the initial formulation? Well-known is the tendency of problem owners to adopt a problem formulation that is too narrow, focusing all attention on one specific solution direction. This tendency is also referred to as 'jumping to solutions'. Sometimes, a client even poses the problem in terms of finding ways to implement an already chosen solution. For example, in 1993, the Netherlands Ministry of Transport asked RAND Europe to help find appropriate ways to shift part of the freight transportation in the country from road to other transport modes, in particular rail and water (In fact, the project was initially called the "Diversion of Freight from Roads" project.). However, in critical discussions it appeared that the true underlying objective of the Ministry was to reduce the negative impacts of freight transport. It was decided, subsequently, to focus on the negative impacts of freight transport (congestion, emissions, safety, noise) as the key performance indicators. The study that followed (Hillestad et al. 1996) showed that other

options (such as smarter logistics, larger trucks, cleaner engines) were more cost-effective at achieving the objective than shifting trucks from road to rail or ship.

Something similar may be the case in our airport example. Airport management is focusing on meeting the demand for runway capacity, as illustrated by the outcome indicator 'capacity surplus/shortage' in Fig. 4.2, and considering to build a new runway. Will this really solve the underlying problem? What is the underlying problem, anyway? A helpful approach for the analyst is to ask the 'why?' question: Why is runway capacity a problem? Why would things be better if supply and demand would match? The answer would probably be that without capacity expansion the airport would not be able to satisfy its potential clients, and that providing good service to clients is a leading principle in business. Next, the 'why?' question can be asked again. The answer may be that, because of reduced service, some clients (e.g. major carriers) may shift their activities to other airports, and the airport in question will lose business. Apparently, the underlying problem is a fear of missing future business, given a desire or norm to expand business if possible. Next, the 'why?' question could be asked once more, and this time the answer could be that expanding airport business is important, since it brings all sorts of benefits (employment, attraction of other business) to the region, in addition to bringing profits to the airport itself. This way, the more fundamental, underlying objectives or values are uncovered systematically. A *means-ends diagram* (see Keeney 1992 and the Appendix) provides a graphical representation of the relationship between the fundamental or strategic objective (also called 'goal') and the more operational (means) of achieving it. The diagram is a conceptual model or graph whose top element is an intended or desired situation [formulated as '(to) achieve something'], and the arrows represent the relation 'will contribute to'. Relations represent intentions, and are based on (perceived) causal relations between lower-level means and the higher-level (fundamental) objective. The Appendix provides a more detailed explanation of the means-ends diagram, and how to construct one. For the airport example, consider Fig. 4.3.

Going upwards from what the airport authorities consider as their objective ('Meet demand for runway capacity'), the next level is found each time by following the solid arrows. The more we go upwards in the scheme, the closer we get to the fundamental objective. For the airport management, the fundamental objective could be 'Maintain a healthy airport business'. Such a fundamental objective is also called an actor's *interest*. An actor's interest is generally situation independent, i.e., it remains unchanged whether the current issue is runway capacity, safety, connections to public transport, or whatever.

A means-ends diagram used in this way helps in identifying and communicating the underlying objectives, and thereby in making a conscious choice regarding the scope of the problem to be taken as the starting point for further analysis. Taking a more fundamental objective as the starting point implies taking a broader spectrum of possible solution directions into account. This may open up possibilities for better solutions. (For example, in the freight transport case, changing the starting point from "getting the trucks off the roads" to "reducing the negative impacts of freight transport" opened up many solution directions in addition to ways to accomplish

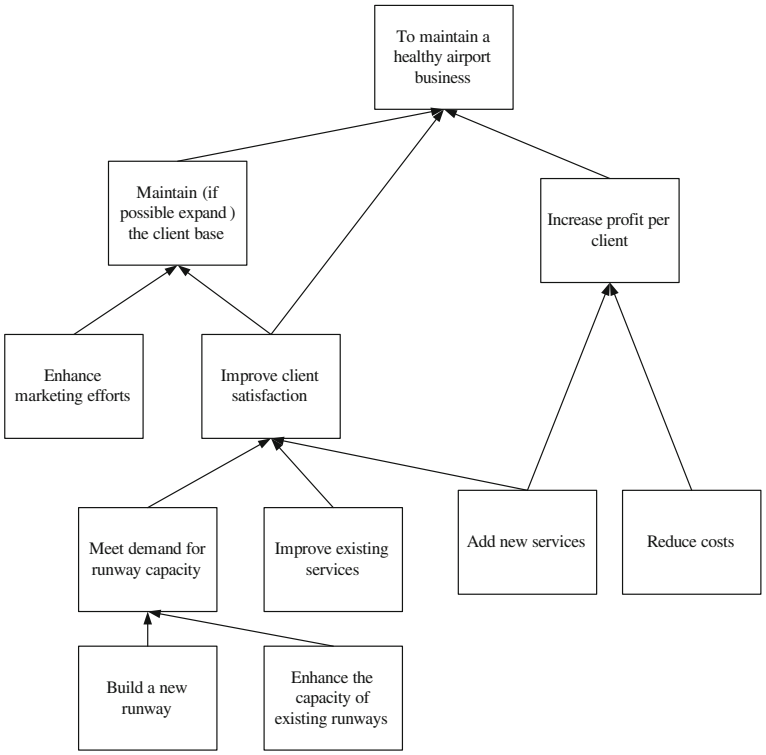

Fig. 4.3 Means-ends diagram for airport case

modal shifts). The drawback of choosing a more fundamental objective, however, is that analyses and debates may become more complex, less transparent, and unattractive if one wants to decide quickly. While there is no standard solution to this dilemma, in general we suggest the more fundamental approach, since it concentrates on what really matters instead of on only a single solution direction. Moreover, it may open more opportunities for compromises in discussions or negotiations with other interested parties, while a narrow focus on a specific solution may lead to continued deadlock. The bottom line is that the analyst should make the dilemma explicit and discuss it openly with the problem owner.

In the airport example, framing the problem as a mismatch between supply and demand for runway capacity limits attention to two solution directions, i.e., building a new runway and expanding the capacity of existing runways. This may easily lead to ignoring other ways that, perhaps in a more effective way, could lead to realization of the more fundamental objective of maintaining a healthy airport business. Therefore, it may be wiser to re-frame the problem as a threat to the long-term health of the airport business, rather than as a mismatch between demand and supply of runway capacity.

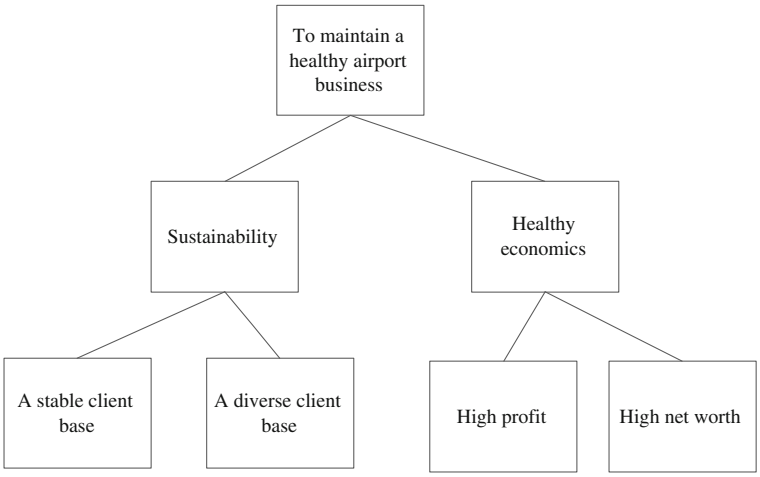

Fig. 4.4 Objectives tree for airport case

Figure 4.3 illustrates a number of ways in which the fundamental objective could be achieved. Such options may be identified by reasoning backwards from the top objective, by asking 'How could this be achieved?; by what means? The figure illustrates that building a new runway is indeed just one of many means that can contribute to maintaining a healthy airport business.

The choice of a more fundamental objective as the starting point for problem formulation directly and significantly affects the attributes used to indicate the level of achievement of the objectives. If, as in Fig. 4.2, shortage of runway capacity is seen as the key problem (and making supply meet demand the corresponding objective), then the degree of shortage is a prime outcome of interest. However, if we choose, instead, to focus on the objective of maintaining a healthy airport business, entirely different indicators are needed. Generally, the objectives or criteria should be defined such that they can be 'measured'—that is, that the degree of attainment can be expressed on some scale, preferably an ordinal or ratio-scale. Therefore, we need to be more precise as to what the rather fuzzy objective 'maintaining a healthy airport business' means, and how its achievement can be measured. This can be done by identifying the essential attributes that define the health of an airport business—for example, the turnover, the level of profit, the vulnerability of the business, and the stability of the client base.

Construction of an *objectives tree*, or *objectives hierarchy* (Keeney 1992) is a helpful way of systematically developing a set of evaluation criteria or *outcome indicators*. Essentially, the objectives tree develops the relevant attributes of the chosen fundamental objective to such a level that measurable indicators can be identified. Figure 4.4 shows an example for the airport case, assuming the fundamental objective is to maintain a healthy airport business. The hierarchy, in its first level, identifies two key attributes of the fundamental objective: the health of the operational economics, and the sustainability or durability of that situation. At

the next level, these are further specified into more specific indicators. Note that in Fig. 4.4, the sustainability of the airport business is not specified in terms of, e.g., years, but in terms of so-called *proxies*: indicators that do not directly measure the attribute, but relate to it and are more easily assessed than the direct attribute. As the objectives tree defines what is considered desirable, it directly specifies the measurable outcomes of interest (which we call outcome indicators) in the system diagram. For more guidelines on how to build an objectives tree and use it to identify a good set of outcome indicators, see Keeney and Gregory (2005) and the Appendix.

4.4.5 Causal Analysis

After (re)specification of the outcomes of interest and measurable indicators, we proceed by exploring the factors that have an impact on these outcomes. We can do this by working back from each of the outcomes that we have identified, this time asking the question: 'What factors influence the value of this outcome?' or 'What factors will cause the value of this outcome to change?' Some of these factors will be similar to the elements identified in the means-ends diagram, as the means are, in essence, intentional changes in factors that affect the outcomes of interest. The important difference between this 'causal (relation) diagram' and the means-ends diagram is that (a) a causal diagram indicates causal influences, not intentions or desired directions of change, and (b) factors that cannot be deliberately changed or controlled but that can have an important influence on the outcomes are included. For example, the shortage of runway capacity is affected by demand for capacity, which depends on international growth rates of air travel, but also on developments in air transport technology (e.g. allowing shorter intervals between landings), and on developments at competing airports. The causal diagram is based on insights into the system's workings, rooted as much as possible in generally accepted theory. It may also be relevant to explicate causal mechanisms as perceived subjectively by an actor, particularly when it is important to make his perception explicit and debatable.

A causal diagram fulfills several different functions. It serves to specify the knowledge available regarding linkages between relevant inputs and the resulting outcomes of interest. In this way, it is a first step in developing a conceptual model of the system which can be used in a later phase to build a computer system model. It also serves as an aid to communication with the client and other relevant actors about perceptions concerning what the system is, what causes the problem, etc. Thus, there is a tradeoff between comprehensiveness and transparency and the clarity of such diagrams. We suggest a relatively high level of aggregation in a first exploration phase, identifying only the major factors and their key interactions, instead of specifying the many factors and interrelationships among them at a detailed level.

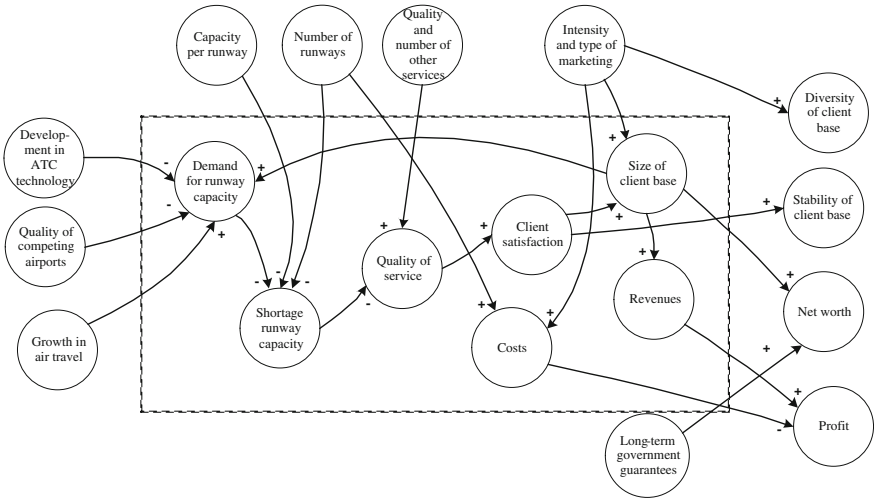

Fig. 4.5 Illustrative causal (influence) diagram for airport case

Figure 4.5 shows a simplified causal diagram for the airport example. It shows the key outcomes of interest as identified in Fig. 4.4 at the right-hand side. It also illustrates the influences on these outcomes of a number of factors. External and policy factors are also shown. We emphasize that the figure is an illustration only. It is far from complete. We also see that the diagram contains a feedback loop: shortage of runway capacity affects satisfaction, and thereby the client base; in turn, if the client base diminishes, this will negatively affect demand for capacity, more or less reducing the shortage in a 'natural' way. This is a sign that the system of concern contains internal dynamics that will need to be taken into account in the analysis.

4.4.6 Identification of Possible Solution Directions

Ideas for actions contributing to problem resolution may be defined at different levels of specificity and combined in different ways. For example, the construction of an additional runway, the submission of a request for permission to build the runway, and the start of negotiations with landowners about purchase of the land are all actions one may think of. Clearly, these actions are related: both permission and ownership of the land are required before one can actually build the runway; but, only the actually building of the runway will change the system (and, hence, change the outcomes of interest from the system). We need some clear terminology for specifying solutions to policy problems. Following Walker (2000), we use the following classification and terminology:

- a *policy option* is an individual measure that directly affects the system of interest.
- a *strategy* is a combination of policy options aimed at realizing a specific objective; for example a variety of options may exist that can help reduce costs; a smart combination of these we would call a cost reduction strategy.
- a *policy* is a combination of strategies, which might be designed to help achieve multiple objectives. A policy may also include a specification of the necessary measures for implementation.

In our example, constructing an additional runway would be a policy option, a capacity expansion strategy would be a combination of runway expansion, smarter landing and take-off logistics increasing the capacity per runway, and perhaps other policy options, and a policy for the airport might include a noise reduction strategy, a strategy aimed at increasing commercial revenues, and perhaps implementation measures, such as obtaining permits and buying land, obtaining investment funds, etc.

We suggest that the exploration of solution options in the problem diagnosis phase should primarily concentrate on the identification of categories of policy options; too detailed an elaboration of specific options at this stage would lead to a waste of resources and distract from exploring the broadness and variety of the solution space.

There are various complementary approaches to developing ideas about possible policy options, for example:

- using a causal diagram, and scanning all factors for possibilities to actively change their behavior;
- using a means-ends diagram (this overlaps partially with using a causal diagram);
- diagnostic thinking: what are the causes of the problem, what could be done about them?
- using creativity enhancing methods (see Michalko 2001), such as brainstorming, brainwriting, and the like;
- using checklists—for example, look for policy options in each of the following categories: technical, financial, managerial, regulatory, and informational (Walker 1988);
- interactive processes involving stakeholders and/or experts, e.g. workshops, IT enhanced group work, and the like.

Depending on the method(s) used, one may quickly be overwhelmed with large numbers of ideas and detailed policy options. We suggest, in this stage, to look for possibilities for aggregation, grouping similar options together. What matters in the problem diagnosis phase is to get a broad view of the spectrum and type of possible ways to influence the system, rather than a detailed one.

An important next step is to explore the possible side effects of the identified policy options. For example, expansion of the airport's capacity may lead to increased noise hindrance, and the airport may be forced to compensate affected

residents for this, leading to increased costs. Costs of implementation, in general, are a side effect of most policy options. Knowledge about relevant side effects should be included in the causal diagram, and if other objectives than those already identified are affected, these and their associated criteria should be added.

Building on the (partial) causal diagram of Fig. 4.5, factors that can be changed through policies under control of the airport management include the capacity per runway, the number of runways, the quality (and number) of other services, and marketing efforts.

4.4.7 Exploring Uncertainties about the Future

The preceding sections have largely concentrated on analyzing the present or soon to be expected situation, based on 'business as usual' assumptions with respect to the factors determining the outcomes of interest. Some of these factors, however, may change dramatically in the future, and a problem exploration effort is not complete without explicitly addressing possible future changes of relevance.

We suggest creative thinking about possible future developments and constructing a variety of possible future system changes and contexts to become aware of the scope of uncertainties about the future. One approach is to follow the well-known steps of scenario building and use (e.g., van der Heijden 1996). Chap. 9 provides a more extensive discussion on scenarios, and how to deal with the many different varieties of uncertainty in carrying out a policy analysis.

The traditional scenario building steps are:

1. Start from the most recent (i.e., adapted based on the results of the preceding efforts) system and causal diagram, establish an appropriate future time horizon, and identify the external factors that could significantly affect the outcomes of interest.
2. Identify the more general driving forces or mega trends driving change in the external factors.
3. Roughly assess each of these with respect to (a) degree of uncertainty in development over the relevant time horizon, and (b) significance of the impact of these uncertainties on the outcomes of interest. Then select those that display significant uncertainty and would have significant impacts.
4. Consider combinations of plausible (not probable) developments in each of the selected uncertain external forces (there may be many possible combinations depending on the number of forces selected in Step 3), and screen these for feasibility (check for internal inconsistencies). Select three or four combinations that span a broad variation in futures.
5. Develop a scenario description for each of these combinations.
6. Confront the present problem formulation with each of the scenarios and assess what the impact of the scenario situation on the problem situation would be. Does the problem worsen, or perhaps ameliorate, or even disappear in some

possible futures? Which are the uncertain factors having the largest impacts? Will new factors possibly come in?

The insights and awareness thus obtained may enrich the problem analysis in two ways. First, a better impression of the stability of and possible autonomous developments in the problem situation is obtained, underscoring or qualifying the need for action. Second, factors and mechanisms that may have important effects on the system and its outcomes of interest in the future that were not identified yet should be added to the analytical framework. In turn, these findings may trigger the need to think of even other solution directions than those considered thus far. More generally, how scenarios can be used for policy development that explicitly takes uncertainty into account will be explained in Chap. 9.

For the airport example, a future time horizon of 25–30 years is reasonable in view of the (technical and economic) lifetimes of the investments considered. Significant and unpredictable changes may occur over this period in various factors. For example, demand for air transport may go up significantly, or stabilize, or even go down as the result of political crises, terrorism, costs of fuel, etc. The dominant structure of air transport may change from the current hub-and-spoke system to a system of direct connections (which would mainly negatively affect airports now benefiting from a hub function for a major airline). Major competition from a nearby airport may develop. Important clients of the airport (such as the hub airline) may go bankrupt or be taken over by another airline that decides to use a different airport as a hub. National policy and public opinion may change dramatically—e.g., toward isolationism or environmentalism. Flight technology may change and improve safety, noise, and/or emissions, and much larger planes may come into operation, reducing the number of take-offs and landings per passenger, but requiring more sturdy construction of landing strips and adaptation of other terminal features. An example of the elaboration of these and other scenario examples for a case of airport strategic planning in the Netherlands may be found in (RAND Europe 1997).

In contrast to the perspective from which the analysis for the airport example started (expected continued growth in air transport demand), the exploration of plausible futures can identify possible developments in which the runway capacity shortage problem may disappear—for example, in the event of a decline in the demand for air transport, or when a major carrier leaves for another airport or goes bankrupt. Of course, this would perhaps be an even bigger threat to the health of the airport's business than a situation of continued growth in demand that cannot be met! Awareness of this possibility underscores the need to explore policy options that would be beneficial under such situations, such as investing in additional services, added-value activities, etc. Similarly, the possibility of much larger airplanes would trigger reconsideration of runway (re)construction options as part of the solution space.

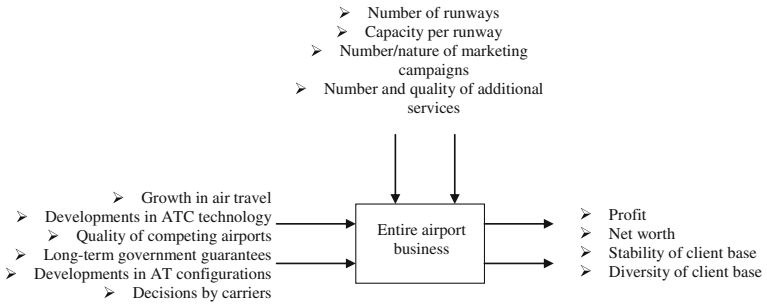

Fig. 4.6 System diagram after redefinition of the problem, cf. Fig. 4.5

4.4.8 Synthesis and Iteration

The system diagram keeps playing a role throughout the problem diagnosis process as a vehicle for synthesis and maintaining consistency. Choices with respect to the core of the problem formulation, including the elaboration of indicators for the objectives chosen, identification of causal factors, and possible solution directions, all help specify key elements of the diagram: the inputs, outcomes of interest, and key factors inside the system.

Figure 4.6 illustrates an expanded system diagram for the airport example, based on choices discussed above. To keep things simple, the figure shows only the inputs and outcomes of interest. Note the significant differences from the diagram shown in Fig. 4.2. As a consequence of the choice for a more fundamental approach, the system's boundaries are much wider, including the total of the airport business instead of just the runway system. Accordingly, the outcomes of interest are now defined at the more fundamental level, a wider range of policy options is included, and, through the causal analysis, a number of uncontrollable but very important external factors have been identified. Yet, this still is a representation based on the single-actor view of the airport management. In the next section, we discuss how to proceed to consider multi-actor complexity.

4.5 Exploring the Policy Arena

In the preceding sections, we have adopted the perspective of a single problem owner, and concentrated on the substantive aspects of the problem situation. We have focused on the part of reality of concern to the problem owner's problem perception, which we called the 'system domain for policies'. In a single-actor situation, the problem owner may decide by himself. However, decisionmaking about public policies generally takes place among multiple actors, who may influence the system and each other. We conceptualize the (multi-actor) process of deliberation, negotiation, and policy choice to occur in a *policy arena* outside the

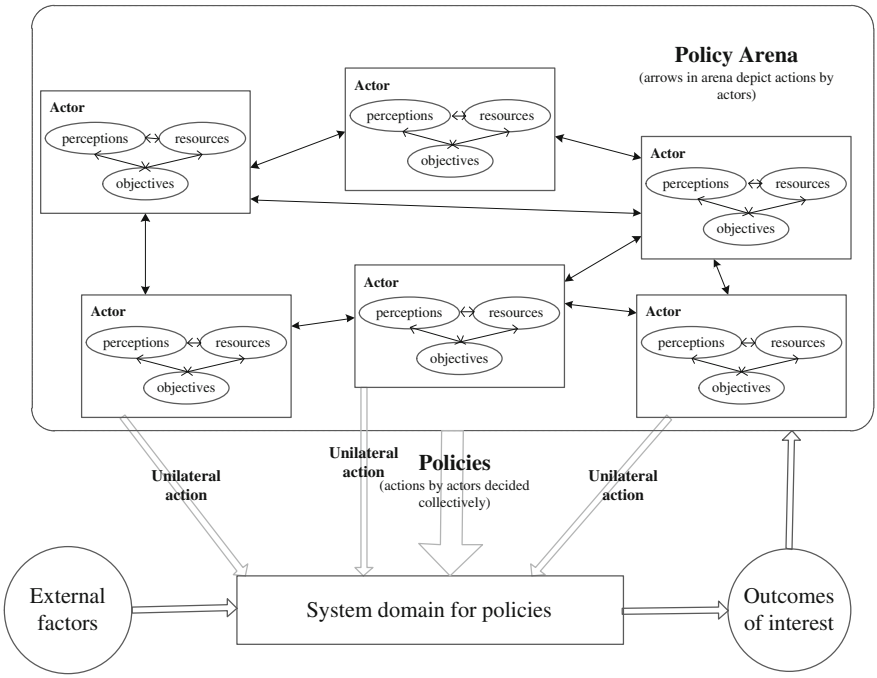

Fig. 4.7 System diagram with multi-actor policy arena added (after Hermans 2005; see also Fig. 8.1)

system domain for policies, and, in this section, we take a complementary view to the one taken in Sect. 4.4, considering the policy arena as the central object of analysis. That is, we focus on the relevant actors, their interrelationships, the more general institutional context, and the characteristics of the decision situation from a multi-actor perspective. This expanded view leads to an expansion of the simple diagram of Fig. 4.1 to one that adds a (multi-actor) policy arena (see Fig. 4.7).

Note that in Fig. 4.7, actor perceptions, objectives, and resources are depicted as key attributes of each of the actors. Furthermore, a distinction is made between policies decided by actors collectively and unilateral actions by individual actors affecting the system of interest. The introduction to Part II of this book, and in particular Chap. 8, provide more information on the policy arena.

4.5.1 Actor Analysis

In this section, we first discuss how to identify the relevant actors. We then indicate what basic information about those actors to collect. We conclude by pointing out some analytic methods that can be used to explore some of the relevant features of the situation. These methods will be discussed in more detail in Chap. 8.

4.5.1.1 Identification of Relevant Actors

Who the relevant actors are depends on the definition of the substantive problem. Alternatively, by selecting a specific set of actors, we implicitly choose the (set of) problem(s) relevant to those actors. For example, selecting the problem formulation of environmental actors in the airport case as a starting point would have led us to issues like non-renewable resource depletion, global climate change, and the like—and these subjects are debated in a different policy arena than issues of expansion of a specific airport. As outlined before, we assume that a client/problem owner initiates the policy analysis process, and we start from his or her problem perception. We note that actors can be related in different ways to a problem situation:

- Actors *affected by* the problem situation or by (some of) the solutions considered. (In the remainder of the book, we call these actors *stakeholders*, since they have a stake in the outcome of the policymaking process.)
- Actors *having an influence on* the problem situation and its development, including those formally involved in decisionmaking in the field, e.g. public authorities. (In the remainder of the book, we call these actors *policy actors*.)
- Actors *needed for implementation* of (some of the) solutions, e.g. for obtaining permits, or because they may oppose or even block certain solutions.

Note that some of the actors may have different roles at the same time, for example, stakeholders may also have the possibility to actively influence the situation, and/or possess means needed to implement certain solutions.

There are several complementary methods for identifying the relevant actors (see, e.g., Mitroff 1983; Bryson 2004; Enserink et al. 2010). First, an initial substantive analysis as outlined in the preceding sections offers several starting points. Which actors can influence the key factors that determine the outcomes of interest? Which actors have an interest in (maintaining or resolving) the problem situation at hand? Which actors may be affected by solutions under consideration? Which actors control resources needed to implement certain solutions (capital, land) or could block implementation (e.g., by refusing building permits)? Discussions with the problem owner and study of written material can help in drawing up an initial list.

Second, analyzing the formal structure of decisionmaking in the policy arena will help to identify key actors, their formal relations, and the procedures in which various actors could take part and affect decisionmaking. This is mostly seen as part of the institutional analysis (see also Sect. 4.5.2).

Third, the so-called 'snowball' or 'reputation' method can be useful. An initial list of actors is drawn up with the problem owner; next, the actors on this list are interviewed and asked to identify other actors who, in their perspective, are relevant, etc.

Fourth, individuals or organizations who see themselves as stakeholders may nominate themselves (for example, they may respond to a public call for inputs). This is called the 'self-application method' of stakeholder identification.

Application of these methods may result in an extensive list of potential actors. For practical reasons, the number of different actors selected for a first, deeper analysis can be reduced by aggregation of actors sharing similar perceptions and interests into a single composite actor, and by concentration on actors on which the problem owner is dependent (i.e., actors who possess means necessary to realize the problem owner's goals).

Note that the framing of the airport problem as discussed in Sect. 4.4.3 significantly affects the selection of actors. If the problem is framed as overcoming the burdens of realizing an additional runway, actors such as major airlines stay out of the picture; they come into play, however, if the problem is to maintain a healthy airport business. For the airport case, assuming the substantive problem framing as elaborated in Sect. 4.4, a variety of relevant actors can be identified:

- National, regional, and local authorities, since they may change zoning laws, control the necessary permits, and may contribute in other ways (e.g. by adapting the highway structure around the airport); they also have overarching interests with respect to both the living environment and economic progress.
- Major airlines using the airport, since their decisions may strongly affect demand for airport facilities and, hence, affect the health of the airport business.
- Air travelers who, depending on developments, may decide to favor other airports.
- Air traffic control, which may coordinate with the airport toward a more efficient use of existing capacity.
- Local residents, who may be affected by noise, odors, and other nuisances, and may block or slow down procedures.
- Landowners in the area where a new runway would be built.
- Environmental lobby groups who oppose expansion, stress reduction of air traffic, noise, etc., and may block or slow decisionmaking procedures.
- Businesses that benefit from expanding airport activities.
- Workers who depend on the airport for their income.

4.5.1.2 Actor Needs, Perceptions, and Positions

The literature on actor analysis shows a wide variety of partly overlapping approaches regarding what information to collect about the relevant actors (cf. Hermans 2005, Chap. 2; Hermans and Thissen 2009). For the sake of simplicity, we distinguish three different angles to actor analysis:

1. Identification of individual actor needs, problem perceptions, and positions. This information helps to:
   - enrich the problem formulation;
   - identify the degree to which problem perceptions are different;
   - identify potential conflicts and their nature;
   - identify the degree to which perceptions on relevant causalities differ.

2. Actor interdependencies. Insight into interdependencies helps to identify the practical relevance of taking other actors' needs into account; it may also point to possible deals or trade-offs that could be made among the actors.
3. Differences and commonalities among the actors, based on insights obtained under 1.

We suggest to start with the completion of a relatively simple table specifying the key characteristics per actor as the preliminary target product of an actor analysis. In the table, the following elements should be included for each actor:

- The problem perception, formulated as a perceived gap between reality and the actor's objectives;
- The objective(s) with regard to the problem situation;
- The actor's more fundamental interests;
- The causes the actor sees for the problem situation;
- Potential resources of interest under the control of the actor;
- The actor's position with respect to the situation; i.e., his intention to act or not act, and the way in which he would act.

We emphasize the relevance of identifying the actor's more fundamental interests, since a focus on interests rather than objectives may yield more opportunities for compromise or arrangements satisfying multiple interests than does a focus on specific objectives. For example, a focus on the initial objectives of the airport authorities and the environmentalists would lead to two diametrically opposed positions: the airport management's initial objective is to build a new runway; the environmental lobbyists' objective is to block further expansion of the airport. Concentration on both parties' interests (a healthy business for the airport and improving environmental conditions for the environmentalists) may offer more opportunities for compromise. For example, one may search for possibilities for a healthy airport business that is environmentally friendly, or for possibilities for compensation of environmental damage by re-building nature elsewhere (van Eeten 2001).

Several different approaches can be used to search for the information needed. Analysis of publicly available documents (reports, position statements, mission statements, etc.) may provide a good starting point. Interviews will help to verify and deepen initial impressions. Increasing the number of interviews and questioning the actors about each other's positions may help improve the reliability of information.

In addition to bilateral interactions with individual actors, a variety of participative group methods have been proposed in recent years. These include structured workshops, ICT-supported group meetings, policy exercises, focus groups, quick scans, and the like (see, e.g., Mayer 1997). While many of these approaches extend beyond initial problem situation diagnosis, they can nevertheless be particularly helpful in this initial phase.

A point to keep in mind is that actor perceptions and positions may change over time, and that actors may behave strategically—for example, they may have

Table 4.2 Actor analysis table for airport example

Actor	Problem perception	Objective(s)	Interest(s)	Causes of problem	Resources	Position
Environmentalists	Growing air traffic depletes resources and pollutes the environment	Prevent further expansion of airport; reduce air travel	Nature conservation/ restoration	Growth in air travel	Lobbying power; publicity campaigns, blocking/slowing down procedures	Will try anything to block new runway
Local residents	Aggravation of noise nuisance and safety concerns	Reduce nuisance; increase safety	An undisturbed, safe living environment	Growth in number of flights	Lobbying power, publicity, block/slow down procedures	Will use all opportunities to protest
Airlines	Unwanted delays	Prevent delays, fly 'on schedule'; cheap and reliable airport facilities	Healthy business: good market share, profits	Capacity shortage and slowness of airport to adapt to demands	Power to move business away to other airports	Waiting to see what will happen
Public authorities (national, regional, local)	Continued prosperity is at risk if the airport business cannot expand; however, also concern about safety, environment	Safeguard economic benefits while not allowing environmental and safety problems to worsen	A prosperous, safe, and environmentally clean jurisdiction	Lack of capacity at airport; environmental unfriendliness of air travel	Power to develop policies and grant permits; holds part of airport stock; money to build infrastructure to accommodate growth	Looking for an acceptable compromise
Local businesses	Attractiveness of region and long-term growth perspectives are threatened	Expansion of airport	A healthy business in an economically attractive region (accessibility, communications, presence of other businesses)	Lack of airport capacity; growing protests damage business image of region	Lobbying power; ability to move business to other region/country	Will lobby actively for expansion
Landowners (farmers)	Loss of land threatens continuity of business	Keep farming as usual or obtain maximum compensation	A healthy, stable farming business	Expansion plans of airport	Power to refuse selling the land; will slow down procedures	Refuse to sell; obtain maximum price if forced to sell

hidden agendas, may give 'desirable answers', and withhold some of their real motives.

Table 4.2 presents an example of how an actor analysis table for the airport case could be filled in. Note that the example is illustrative only, and incomplete—actors such as the air travelers and air traffic controllers and probably others may have to be added.

4.5.1.3 Analysis of Interdependencies of Actors

It is of interest to explore how the problem owner is dependent on other actors for realizing his objectives. We distinguish three different types of dependencies:

- Actors may control resources needed to achieve the problem owner's objectives (for example, owners of land required, or financial institutions able to provide investment capital).
- Actors may have formal power over necessary conditions (for example, local, regional, and national authorities make noise regulations, can set standards of safety, and have the power to grant or withhold various legally required permits needed for airport expansion).
- Actors may have more informal powers to block decisions or frustrate the process (for example, environmental lobby groups can appeal permits several times, and public authorities may be sensitive to their arguments).

To be of practical use, an analysis of dependencies should focus on major dependencies and resources only; an exhaustive list could easily extend over numerous actors and pages, and lead to confusion rather than clarity. A relatively simple way to start the dependency analysis is to start from the relevant resources and powers of the actors identified thus far. Next, the question is asked how crucial this resource is to the problem owner's needs. Actors who control or possess resources that are unique and crucial to the problem owner are called *critical actors*, since their cooperation is essential to reaching the problem owner's goals. If different actors can provide the same crucial resource, these actors are not considered critical. For example, different banks could provide investment capital, and an investor needing such capital is not critically dependent on any individual bank.

The result of the analysis of interdependencies can be condensed into a table listing the resources per actor, the relevance of these resources, the degree to which the actor could be replaced by another actor, and concluding with whether the actor is considered critical or not. Table 4.3 illustrates the possible results of a quick dependency scan for the airport expansion case.

Table 4.3 illustrates, among other things, that the airport authorities are crucially dependent on decisions by the public authorities: national, regional, and local. Regarding their broader ambitions, actors such as the airlines using the airport as a main hub are also critical.

Table 4.3 Actor dependency scan for airport example, viewed from the perspective of the problem owner

Actor	Important resources under control of the actor	Degree to which actor/ resources may be substituted	Dependency on actor	Critical actor?
Environmentalists	Power to formally oppose and hence delay procedures, generate negative publicity	Not so much a resource but a potential resistance	Moderate to low	Not critical, but moderation of resistance welcome
Local residents	Lobby/voting power with authorities Power to formally oppose expansion, permits leading to noise hindrance, perceived lack of safety	Not so much a resource but a potential resistance	Moderate	Partly
Airlines	Choice of airport to use	Airline companies may be substituted by others	Moderate, depending on size/share in business	A carrier using a large fraction of capacity (e.g. 30 % or more) could be critical
National government	Major shareholder: board member Permit granting authority for noise, safety, and supervising regional and local authorities Authority to expand connecting infrastructure	Hardly Not Not	Large	Yes
Regional/local authorities	Regional development and land use planning authority Power to support local and regional facilities	Not Hardly	Large	Yes
Local businesses	Power to lobby with authorities Capital to invest in quality of services improvement	Resident entrepreneurs may be replaced by others	Moderate to low	Not critical, but support is welcome
Land owners (farmers)	Power to delay expansion by refusing to sell the land	Somewhat, but may be overruled by government in the end	Moderate to low	Not critical, but moderation of resistance welcome

While the table lists direct dependencies of the problem owner only, the identification of indirect dependencies among the actors can provide additional insights into the policy network structure, and could even lead to the identification of possibilities for three- or four-way exchanges among the actors. A more extensive, 'transactional analysis' (Coleman 1990; Timmermans 2004) can help detect such mutual and indirect dependencies. Section 8.5.3 provides a more extensive description of the approach. Here it suffices to note that such an analysis can be of help in diagnosing whether a specific set of actors possesses enough 'resolution power' to make significant progress toward satisfying the actors' needs. If not, this may be an indication that other actors who control needed resources need to be included in the policy arena. This kind of analysis can also be helpful in identifying the potential of so-called 'package deals', where action on different issues can be traded off to the eventual benefit of all the actors concerned.

For the airport authority example, Table 4.3 does not show a direct dependency on environmental groups or local residents. However, because public authorities are, to a certain extent, sensitive to arguments put forward by environmental groups and local residents (who complain about safety, noise, pollution), the airport authorities indirectly also depend on these groups. The airport also needs land owned by the local farmers for its expansion; this dependency, however, seems to be less critical. If public authorities back up the expansion plan, they have the power to expropriate the land, so this is not a direct concern for the airport.

4.5.1.4 Discourse Analysis

A richer analysis of perceptions and beliefs of actors than the one illustrated in Table 4.3 can reveal interesting insights into the structure of the policy arena: To what extent are the actor perceptions and beliefs essentially different? To what extent are views on problems, their causes, their solutions, and the knowledge claims underlying them, contested or accepted by the actors? Can a few different sets of relevant actors be identified that share the same or similar beliefs?

Again, various methods (most of which can be grouped as 'discourse analysis' methods) exist and can be employed to explore these questions. For example, (semi-)structured interviews with stakeholders (see Hermans 2005) are a good (but time consuming) approach for getting a richer view on actors' argumentation structures, and the findings can then be structured in formal ways (e.g. Toulmin 1958), some of which are supported by computer software (Eden 1989; Bots et al. 2000). Another approach is Q-methodology (McKeown and Thomas 1988). In this approach, respondents are asked to express their degree of (dis)agreement with a number of statements regarding the issue at hand. The answers are analyzed, resulting in identification of a limited set of essentially different views shared by groups of respondents. The resulting insights help to assess more thoroughly what the key differences are between the different perceptions, what the underlying reasons for disagreement are (conflicting interests or more fundamental value differences), and to what extent possibilities exist for fruitful discussions across the

different perceptions/coalitions. Section 8.3.1 provides a more extensive discussion of discourse analysis approaches.

Regarding airport expansion, van Eeten (2001) performed such a Q-methodology analysis for the case of Amsterdam Airport Schiphol, and found widely different views relative to the problem situation, ranging from "Expansion of civil aviation infrastructure as a necessity in the face of international economic competition" to "Societal integration of a growing airport" (emphasizing the need to reduce local safety, congestion, pollution, etc.), and "Search for sustainable solutions to a growing demand for mobility". The reader is referred to the original article for a more extensive discussion.

4.5.2 Institutional and Decision Situation Analysis

As a complement to actor analysis, institutional and decision situation analysis focuses on the formal and informal context within which a policy issue comes up and may be resolved. This includes the nature of relations between actors, such as the culture and dynamics in the network, dominant habits of actor interaction, characteristics of the network (e.g., communication patterns), and potential changes in actor positions and relations. Typically, these characteristics are less dependent on the specific topic of concern, if at all. The institutional context characteristics to a certain extent determine the formal and informal rules of the playing field. Among the many aspects of institutions, the following paragraphs describe the aspects that are of particular interest to a policy analyst exploring a problem situation presented to her.

Actors interact in formal and informal ways. The formal interaction structures can be identified by studying legislation (specifying procedures for decision-making) and related documents (e.g., private arrangements between actors, such as banks or the government providing capital in turn for a certain degree of control). Formal interaction structures may be depicted using an organization chart or a similar type of diagram. Also, in certain cases there may be formal rules or requirements regarding the decision process, such as the necessity to prepare an environmental impact assessment of the options. This, of course, should be taken into account when planning further action.

Informal interaction structures are not as easy to identify, but they can be highly relevant. Insight into ways in which the actors perceive each other and deal with each other informally may be obtained by holding interviews with key players, observation of and participation in debates, and study of newspaper articles on the specific sector. Exploring the history of the problem and ways in which it was (or was not) dealt with in the past may also provide interesting clues: What were the dominant perceptions, what actors were supporting them, has there been a change in argumentations or in coalitions, or not, and why?

A quick, qualitative impression may be obtained by concentrating on different types of relationships that may exist among actors—cooperation, competition, and conflict:

- Typically, long-term natural coalitions among groups of cooperating actors will exist. For example, environmentalists and local residents complaining about noise, pollution, safety, etc., share certain interests and will generally cooperate. They share a common problem frame, and have developed informal ways of exchanging information and helping each other (Sabatier and Jenkins-Smith 1993; Sabatier 1988; Weible and Sabatier 2006)
- Competition exists if actors compete for the same resources, clients, etc. The existence of competition may help explain actor positions and behavior. For the airport example, the airport clearly competes with the local landowners for use of the space. And the airport itself competes with other airports for airline and traveler business.
- Situations of conflict among actors can be the result of conflicting interests. But conflicts may have different natures and origins (Rommetvedt 2006). The conflict may be about different preferences, in which case it is relevant to explore whether the preferences are compatible (i.e., satisfying one preference does not exclude the other) or not. It is also relevant to explore whether the conflict is about divisible goods (so that compromises are possible), and whether the decision situation can be characterized as 'zero-sum', or whether win–win solutions appear to be possible. Finally, conflicts may not be about direct or pragmatic interests, but may find their origins in differences in deep normative principles. Furthermore, cultural differences may cause conflicts, or developments in the past may have led to disturbed relations and created an atmosphere of distrust among some of the actors. Situations of conflict and lack of trust can seriously frustrate attempts to build cooperation. For example, there is often a history of distrust between business interests on the one hand and environmental groups on the other.

More generally, cultural aspects relate to how authority is experienced, how conflicts are resolved (or not), and, how people interact with each other and the values associated with their interactions. A well-known typology of cultural dimensions was developed by Hofstede (1984) and Hofstede et al. (2010). Since our focus is on supporting problem resolution in complex multi-actor settings, dominant habits and values related to conflict resolution and negotiation are of particular relevance to choosing an appropriate approach. These may be present in society as a whole, but can also be specific for the issue at hand. At a minimum, we suggest exploring the following:

- Whether the problem situation is one for which standard approaches and rules have been developed. For example, legislation, procedures, and (technical) requirements for decisions on small-scale building permits and unemployment benefits are clear and well established in most developed countries, while processes and requirements are much less clear (and thus themselves subject to

dispute) for large-scale infrastructure expansion and privacy protection in the age of the Internet.
- What the dominant way of conflict resolution is. Is it, as in U.S. culture, based on a courtroom-like adversarial fight in which the winner takes all, or is a consensus and compromising model dominant (like the 'polder model' in the Netherlands')? Is there a strong hierarchy, such that decisions made by those high in the hierarchy are more respected and more likely to be implemented?
- The extent to which key actors relevant to issue resolution trust each other.
- The extent to which strategic behavior is dominant.

The characteristics of actor networks generally change over time. Individual actor perceptions change; dependencies and other relations among actors change. An analyst should be aware of potential changes and the mechanisms behind them. Some factors causing changes are foreseeable. For example, elections may affect the composition and viewpoints of the local, regional, and/or national government. Some changes are part of existing policy and can be anticipated. Other changes are less predictable. Mergers and takeovers may suddenly change the institutional setting. Because of events outside the direct problem scope, relations among actors may change from friendly to hostile.

We do not know of a standard recipe to assess the dynamics of an actor network. Good starters will be to look into recent history, identify changes to be expected, and explore mechanisms that may affect the dependencies among actors. As explained in Chap. 5, it is also strongly recommended to monitor situation developments as time proceeds, so as to detect possible changes in key characteristics, and adapt the chosen approach in subsequent steps as necessary.

4.6 Synthesizing the Results of the Systems Analysis and the Actor and Institutional Analysis

Unless the analysis has revealed that the problem owner may solve his problem independently, without taking into account other actors' interests (in which case the systems analysis as described in Sect. 4.4 can guide further efforts), a synthesis of the findings of the initial (mono-actor) systems analysis and the multi-actor analysis is needed. The results of the actor analysis, in particular, will generally lead to a need for adaptation and enrichment of the initial substantive, systems analysis. First, it is advisable to extend the initial systems analysis and the associated system diagram by including the critical actors' needs as additional outcomes of interest (see, e.g., Gregory and Keeney 1994). Second, the instruments that these other actors control can be added to the set of policy instruments affecting the system. As a result, the boundaries of the system of interest will be broadened. The resulting system diagram provides the conceptual basis for an analysis of the impacts of a broader variety of policy options on a broader set of outcomes of interest. Third, other actors may contribute additional views on key

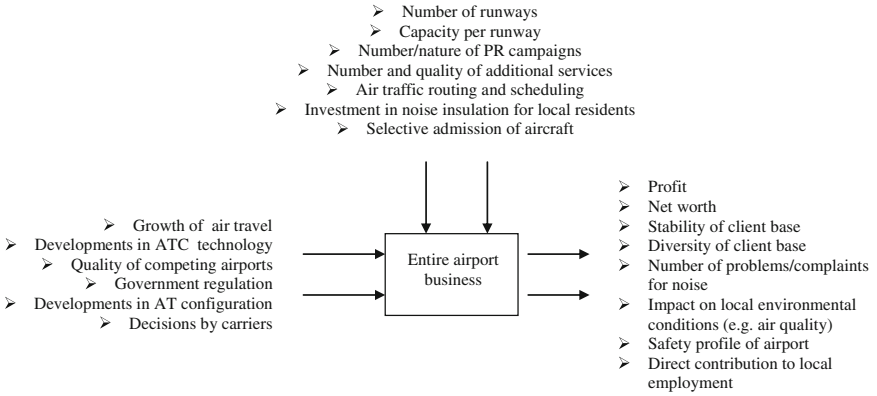

Fig. 4.8 Illustration of possible expansion of system diagram inputs and outputs after actor and institutional analysis

elements and relationships, thus enriching the systems analysis—and, in particular, the system model to be used in the analysis (see Chap. 7).

Continuing with the example of the airport expansion, in a further analysis, the objectives of public authorities, environmental groups, and local residents should be taken into account. Adding these to the analytic framework is a first step. As a result, criteria with respect to local pollution, noise, safety, and the impacts of the airport on the regional economy will need to be added to the outcomes of interest. Next, the causal analysis needs to be extended, in order to include factors affecting these additional criteria, and exploration of additional solution directions and external factors should result in a broadening of the scope of policy instruments to be considered and external influences to be monitored. 'New' instruments may include adaptation of flight paths and schedules, compensation of local residents for extra costs for noise insulation, more selective admission of aircraft and/or carriers, creating extra services at the airport in order to create extra jobs and added value, etc. Figure 4.8 illustrates a system diagram, adapted from Fig. 4.6, to illustrate the possible consequences for the analytic framework (a new causal diagram has not been elaborated).

More generally, after extending the systems analysis based on the results of the actor analysis, a consistency and completion check is needed at this point. When new factors have been added, has due consideration been given to identification of (controllable or non-controllable) influences on those factors, and have these been added to the systems analytic problem description? And have the added influences been scanned for actors controlling them, and had these actors already been taken into account? If new actors having an influence on the system are added, are these added actors important to the problem owner and should their objectives also be taken into account in the further analysis? When new solution directions were identified, has it been investigated sufficiently whether these would have side effects relevant for the problem owner and/or other actors? We suggest a 'final' revision of the analytic framework at this stage in an attempt to include all elements deemed sufficiently relevant, and to achieve as much consistency as possible

between the actor analysis findings and the systems analytic representation of the problem situation. Note that each adaptation may affect earlier findings, e.g. regarding actor interdependencies, and other important aspects of the problem situation. Tools such as Dynamic Actor Network Analysis (Bots et al. 2000) have been developed to assist analysts in this process.

We have in the foregoing assumed that knowledge about causal factors and mechanisms was readily available and undisputed. This, however, is hardly ever the case. When this has not been done before, the balance should be made up as part of the synthesis. What parts or elements of the causal model are based on undisputed knowledge and accepted by all? What parts are based on shared perceptions for which solid scientific evidence is lacking? What parts are merely assumptions or best guesses of the analyst? Where do opinions and beliefs regarding key causal mechanisms diverge among actors, and to what extent? To what extent do actors share perceptions on actor interdependencies and positions? What key differences exist in this respect?

Detailed insight into the availability of undisputed knowledge and into differences in perceptions requires a significant effort and interaction with all relevant actors, and time and/or funds may not always be available (Hermans 2005). It is, however, of great importance to the choice of follow-up activities to establish, at a minimum, a broad-brush assessment of the extent of (dis)agreement among relevant actors, and on what topics differences of opinion are most dominant. As problem exploration should provide a basis for deciding whether the situation is worth further efforts, also the feasibility of effective solution options within the scope of the present formulation should be assessed, albeit globally at this stage. To what extent are the solution options identified promising? Can they be implemented without the help of other actors? If not, is there a perspective on cooperation of these other actors? Do fundamental, perhaps long-lasting, conflicts exist, and are there any perspectives for compromises or other ideas for ways to break the deadlock? Are opportunities for compensation available when the situation has a zero-sum character (i.e., some actors may benefit, but others will lose)? In short, is sufficient solution potential present in the problem situation as analyzed and framed to warrant further efforts?

As the primary output from this stage of the analysis, we suggest that the findings be summarized in the form of an 'issue paper' (Quade 1989, pp. 73–78; van der Lei et al. 2011). The issue paper serves as a basic communication document with the problem owner and others as needed, and contains the key results of the problem exploration effort, both in systems analytic and actor analytic terms, as well as a suggestion for further steps in light of these findings.

4.7 Implications for Further Action

Issue papers also generally contain recommendations or proposals for follow-on activities, such as what types of activities to engage in, what questions further research should answer, what actors to approach/involve in further activities, in short: what policy (analytic) approach to choose given the situation.

The combination of the system analysis and the actor analysis provides a rich picture of the context for action by the problem owner. Based on that picture, an initial assessment may be made in order to determine how to proceed. In the literature, several authors (Douglas and Wildavsky 1982; Hisschemöller and Hoppe 1995) have proposed a typology of problem situations based on two distinguishing factors: the level of (dis)agreement on knowledge or facts, and the level of (dis)agreement on values. When agreement on both is dominant (this situation is also referred to as 'well structured'), a policy development approach based on independent expertise is suggested—supported by policy analytic efforts corresponding to the upper parts of the hexagon typology developed in Chap. 3: "Research and Analyze", and "Design and Recommend". When there is general agreement on values, but not on knowledge, a 'negotiation' approach is suggested, an 'accommodation' approach when fundamental value conflicts are dominant, and a 'learning' approach in unstructured situations involving both knowledge and value disagreements (cf. Hisschemöller and Hoppe 1995). De Bruijn and Porter (2004) add the perceived urgency and the perceived importance as distinguishing characteristics, suggesting 'no action' in situations when both are low.

Acknowledging the relevance of these typologies of problem situations, we note that yet other characteristics than those mentioned in the preceding paragraph need to be taken into account, such as the degree of trust, the dominant decisionmaking culture, and the type of issue or conflict at stake. Based on the findings of the problem diagnosis as described above, and linking to the six different policy analytic activity types distinguished in Chap. 3, we suggest the following implications for policy analytic support.

Clearly, when the problem situation is not perceived as serious or urgent, the dominant advice would be to do nothing (we do not explore strategic reasons policy actors may have to act in such situations, e.g. to divert attention from other concerns).

If it appears that the problem owner's means are sufficient to solve his problem, i.e., little if any dependency on other actors exists, and there is no need to take other actor's interests into account, the systems analysis as described in Sect. 4.4 can guide further efforts, and these could be targeted at resolving any knowledge gaps about the effectiveness and efficiency of alternative strategies. This situation resembles the 'well structured' or 'tamed' type of policy problem mentioned above. Referring to the hexagon model, the dominant types of activities would be 'research and analyze', and/or 'design and recommend'. Situations like this, however, will be very rare in the field of public policy analysis where, typically, different actors and stakes need to be taken into account.

If deep normative conflicts are dominant, as is often the case on social issues such as legislation on abortion, or acceptance of the death penalty, it is questionable whether any further policy analytic efforts of the type discussed here could be of assistance. Rather, it should be explored either whether some compromise situation can be developed with which actors are prepared 'to live' (the 'accommodation strategy'), or, in situations dominated by adversarial decisionmaking habits, whether agreement can be reached about the *procedures* for

resolution of such conflicts, e.g. voting, court procedures, or other ways outside the spectrum of policy analysis.

If the nature of the conflict is such that perspectives on win–win solutions (or, to the least, win—no-lose solutions) exist, and/or divisible goods are at stake, an approach focusing on supporting a negotiation process would be worth exploring.

The characteristics of the policy arena and of the conflict situation provide further indications about the kind of approach that could be fruitful in situations of significant dependency. If there is a sufficient basis of trust among the key actors that need to be involved, and if the client prefers to work toward a solution in a consensual way, the development of a shared and joint problem framing and action plan is indicated. However, when strategic behavior is dominant, and/or there is a history of conflict and distrust, and/or the dominant culture of conflict resolution is adversarial, it may be wise to advise the problem owner to explore a more strategic approach and propose further analysis supporting such an approach ('advise strategically'). Further indications may be found in Chap. 5 (in particular Sect. 5.2), and Chap. 6.

In practice, the situation will generally not be clear-cut, and different characteristics may be present, calling for an appropriate mix of activity types, where the emphasis may even shift during the process. Because of the often unpredictable dynamics of policy situations, substantive problem perceptions, actors involved, and institutional characteristics may all change, even during the policy analysis process, calling for continuous monitoring and adaptation of the policy analytic approach chosen. This will be further elaborated upon in Sect. 5.7.

4.8 Discussion

In the preceding sections, we have outlined a systematic, stepwise (but iterative) analytic approach to problem diagnosis. The methodology rests on the combination of two cornerstones: systems analysis and actor analysis. We started from the perspective of a single actor as problem owner, emphasized substantive analysis first, and subsequently used the results as a stepping stone for exploration of various characteristics of the multi-actor policy arena. We then suggested a synthesis that enriches, and mostly broadens, the initial systems analysis.

This approach does not necessarily lead to a single, unique problem description. Lack of commonly accepted knowledge and differences in perceptions of actors may give rise to a range of variation in the conclusions of the analysis. Unless undisputed scientific knowledge can resolve such differences, we recommend allowing such variety on the one hand to acknowledge existing uncertainties in the analysis, and on the other, to prevent losing the support of some of the actors. Chapter 9 discusses analytic approaches to deal with such uncertainties.

Beyond the variation in outcomes resulting from the approach outlined above, the question remains whether other approaches would lead to totally different findings. What if the actor analysis would come first instead of the systems analysis? What would, for example, be the impact of taking another actor as the starting point?

As indicated in Sect. 4.3, our initial focus on substance may lead to a lack of attention to purely political issues (such as dealing with favors from the past, or fights for power), which may dominate relations and the attitudes of actors toward each other. These will come to the forefront more prominently if the agenda of a political actor is taken as a starting point (and the actor does not hide his true agenda from the analyst!). However, such an approach would be more suited as a basis for political advice instead of policy analysis. Starting from the substance, our approach will eventually allow the inclusion of political motives—without putting these central.

A different scope and emphasis of the problem framing effort, however, may result if the analysis starts from the perspective of a different actor. In situations with relatively weak dependencies, starting with a different actor in fact means solving a different problem. In a situation with strong interdependencies, however, actors need to take other actors' interests and objectives into account, and the multi-actor problem framing will include the concerns of the interdependent actors, regardless of the choice of initial problem owner. For example, the scope of outcomes of interest, external factors, and actors in the final analysis of our airport example would not have been very different had we chosen to start with one of the public authorities instead of airport management as the initial problem owner. Of course, the solution options under their control would have been different. Had we, however, taken the environmentalist's point of view as the starting point, the scope might have been quite different and may have included the whole of the environmental impacts of air transport, and all of the mechanisms affecting these.

Following the systems analytic path, we have suggested to frame a problem situation as a search for solution directions that will effectively achieve some or all of the objectives. Leading values behind this approach are instrumental rationality, effectiveness, and efficiency. We have added multi-actor concerns and focused on interdependencies in a search for feasible and implementable solutions. In our description, we have focused on the cognitive dimension of diagnosing policy problem situations, and only incidentally mentioned deliberative approaches in which problem exploration is the subject of debate and negotiation between participating actors. While such process-centered approaches are not at the core of this book, Chap. 6 briefly explores this field and presents a number of guidelines for process design. Here, we suffice to say that the type of cognitive analytical analyses presented above may be crucial in structuring and facilitating such multi-actor processes.

References

Ackoff RL (1974) Redesigning the future: a systems approach to societal problems. Wiley, New York

Bots PWG, van Twist MJW, van Duin JHR (2000) Automatic pattern detection in stakeholder networks. In: Nunamaker JF, Sprague RH (eds) Proceedings HICSS-33. IEEE Press, Los Alamitos. See also http://dana.actoranalysis.com for examples

Bryson JM (2004) What to do when stakeholders matter. Stakeholder identification and analysis techniques. Public Manag Rev 6(1):21–53

Coleman JS (1990) Foundations of social theory. The Belknap Press of Harvard University Press, Cambridge
de Bruijn JA, Porter AL (2004) The education of a technology policy analyst to process management. Technol Anal Strategic Management 16(2):261–274
Douglas M, Wildavsky A (1982) Risk and culture: an essay on the selection of technical and environmental dangers. University of California Press, Berkeley
Dunn W (1994) Public policy analysis: an introduction, 2nd edn. Prentice-Hall, Englewood Cliffs
Eden C (1989) Using cognitive mapping for strategic options development and analysis (SODA). In: Rosenhead J (ed) Rational analysis for a problematic world: problem structuring methods for complexity, uncertainty and conflict. Wiley, Chichester
Enserink B, Hermans L, Kwakkel J, Thissen W, Koppenjan J, Bots P (2010) Policy analysis of multi-actor systems. Lemma, The Hague
Gregory R, Keeney RL (1994) Creating policy alternatives using stakeholder values. Manage Sci 40(8):1035–1048
Hermans LM (2005) Actor analysis for water resources management. Putting the promise into practice. Eburon Publishers, Delft
Hermans L, Thissen W (2009) Actor analysis methods and their use for public policy analysts. Eur J Oper Res 196(2):808–818
Hillestad R, Walker WE, Carrillo M, Bolten JG, Twaalfhoven PGJ, van de Riet O (1996) FORWARD–Freight options for road, water, and rail for the Dutch: final report, MR-736-EAC/VW, The RAND Corporation, Santa Monica, CA
Hisschemöller M, Hoppe R (1995) Coping with intractable controversies: the case for problem structuring in policy design and analysis. Knowl Policy Int J Knowl Transfer Utilization 8(4):40–60
Hofstede G (1984) Culture's consequences. Sage Publications, Newbury Park
Hofstede GH, Hofstede GJ, Minkov M (2010) Cultures and organisations: software for the mind. McGraw-Hill, New York
Keeney RL (1992) Value-focused thinking a path to creative decision making. Harvard University Press, Cambridge
Keeney RL, Gregory RS (2005) Selecting attributes to measure the achievement of objectives. Oper Res 53:1–11
Lawrence DP (2007) Impact significance determination—designing an approach. Environ Impact Assess Rev 27(8):730–754
Marca D, McGowan C (1988) SADT: structured analysis and design technique. McGraw Hill Book Co., Inc., New York
Mayer I (1997) Debating technologies. A methodological contribution to the design and evaluation of participatory policy analysis. Tilburg University Press, Tilburg
McKeown B, Thomas D (1988) Q-methodology. Series: quantitative applications in the social sciences, Number 07-066. SAGE Publications, Newbury Park, CA
Michalko M (2001) Cracking creativity: the secrets of creative genius. Ten Speed Press, Berkeley
Miser H, Quade E (eds) (1985) Handbook of systems analysis: overview of use, procedures, applications, and practice. Wiley, Chichester
Mitroff I (1983) Stakeholders of the organzational mind. Toward a new view of organizational policy making. Jossey-Bass, San Francisco
Quade ES (1989) Analysis for public decisions, 3rd edn. Elsevier Science Publishers, New York
RAND Europe (1997) A policy analysis of civil aviation infrastructure options in the Netherlands, DRU-1512-VW/VROM/EZ. The RAND Corporation, Santa Monica, CA
Rommetvedt H (2006) The multiple logics of decision-making. Eur Polit Sci 5:193–208
Sabatier PA (1988) An advocacy coalition framework of policy change and the role of policy-oriented learning therein. Policy Sci 21(2):129–168
Sabatier P, Jenkins-Smith HC (1993) Policy change and learning: an advocacy coalition approach. Westview Press, Boulder
Sage AP, Armstrong JE Jr (2000) Introduction to systems engineering. Wiley, New York

Timmermans JS (2004) Purposive interaction in multi-actor decision making. Eburon Publishers, Delft
Toulmin SE (1958) The uses of argument. Cambridge University Press, Cambridge
van der Heijden K (1996) Scenarios: the art of strategic conversation. Wiley, Chichester
van der Lei T, Enserink B, Thissen W, Bekebrede G (2011) How to use a systems diagram to analyse and structure complex problems for policy issue papers. J Oper Res Soc 62(7):1391–1402
van Eeten MJG (2001) Recasting intractable policy issues: the wider implications of the Netherlands civil aviation controversy. J Policy Anal Manag 20(3):391–414
Walker WE (1988) Chapter 6: Generating and screening alternatives. In Miser HJ, Quade ES (eds) Handbook of systems analysis: craft issues and procedural choices. North-Holland, New York
Walker WE (2000) Policy analysis: a systematic approach to supporting policymaking in the public sector. J Multicriteria Decis Anal 9(1–3):11–27
Weible CM, Sabatier PA (2006) A guide to the advocacy coalition framework. In: Fisher F, Miller G, Sidney M (eds) Handbook of public policy analysis. Theory politics and methods. CRC Press, Boca Raton, pp 123–136
Wildavsky A (1979) Speaking truth to power: the art and craft of policy analysis. Little Brown and Company, Boston