Policy innovation and energy

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Abstract

Policy innovation has become a critical policy area in public policy-making. In the context of globalisation, policy innovation should take into account socio-economic issues to enable national governments to compete in the international arena. Smaller countries with less capital may be in a predicament. Policy-makers should strike a balance between local interests and peculiarities and international demands, which require new policy-making capacities and policy innovation. The question arises whether innovation in one country is necessarily innovation in another. It is also uncertain whether an innovation policy necessarily leads to innovation activities. For instance, in the field of energy policy and energy policy innovation, tensions arise between social and financial capital. In this article, it is argued that the leaders of countries – especially smaller and developing countries – face continuous challenges in their attempts to promote renewable energy policies.

Keywords: energy policy innovation, policy learning, policy networks, renewable energy policies

1 INTRODUCTION

Policy innovation is currently a topical issue in the field of policy science, but there is still no consensus on the nature and meaning of policy innovation as a concept, particularly as the public and private sectors attach different meanings to the notion. This article briefly explores various meanings of policy innovation, and uses energy policy as an example.

The private sector's interpretation of the concept of policy innovation has a strong influence on the public sector's interpretation. Innovation is a process that moves from the trigger or initiation phase, to development and then to an adoption phase, but in the real world this process is not necessarily linear: provision should be made for failures and policy learning. The ultimate test of policy innovation is the social

acceptance of the policy in the adoption phase. Not all innovation initiatives make it through to successful implementation. In many cases, the innovation journey is a shock to the institution trying to make the innovation; indeed, some innovation exponents even doubt whether any institution really allows innovation, which is why champions of innovation may be important drivers in the innovation process.

The adoption of innovation requires policy learning, which is often underestimated as both a cause and effect of policy innovation. Governments can and do learn, but so should global institutions. Although there are different kinds of learning, as set out in the article, various factors can influence the learning process. Learning something new is difficult when there are already customs and technologies in place that work well. Grasping the sources of and barriers to innovation is critical in understanding the sometimes somewhat unexpected path of innovation.

Policy innovation and energy, the dual focus of this article, are global issues. This raises the concept of policy networks. Formal government structures are supplemented by and connected to networking between actors within those government systems.

When it comes to energy policy innovation, there is constant tension between social and financial capital: governments need to address the tension between market forces and the social aspects of energy. In this article, a few examples are provided to illustrate policy innovation in the context of this issue.

The current world-wide demand for energy requires timely policy innovation, because conventional energy sources are becoming depleted. Developing and switching to renewable energy sources are two arenas for policy innovation. Whatever policy option is chosen, creating awareness of it is important to attract the attention of decision-makers. Planning for innovation requires a long-term plan, but governments face the challenge of deciding exactly how long the long term is. In this article, examples from Korea and in the United Kingdom (UK) are presented to highlight long-term energy policy innovation, and a few examples of energy policy modelling are examined.

2 THE RESEARCH PROBLEM

How does change take place in the development of policy? What is the reason for shifting from one policy to another? Most recently, energy has become the top technological priority at a national and global level. Increasing amounts of money are spent on energy policy world-wide, and more and more institutions are becoming involved in energy provision. The question then arises how policy innovation will address the energy crises of the future.

Policy innovation implies introducing activities that represent a break from old activities (discontinuity), but this kind of behaviour is scarce among both governments and individuals. However, the depletion of conventional energy sources in the world is a reality that requires policy innovation if our world is to continue to function. Countries have different energy needs: some countries import, while others export energy. Some countries are in a state of transition, from being self-sustainable energy providers to becoming importers of energy. Energy is a global issue, but is there sufficient global policy innovation and leadership to address the energy challenge? Previous attempts by countries to design long-term policy innovation have often failed. Uncertainties – especially with regard to new energy sources and their commercial adoption – complicate projections about the future use of new energy sources.

3 TOWARDS DEFINING PUBLIC SECTOR INNOVATION

Public sector innovation, and therefore policy innovation, are current topics in the literature. In this context, concepts such as innovation, change and modernisation are often used interchangeably. The meaning that the public and private sectors attach to the term 'innovation' seems to be similar to some extent, although there appear to be some meanings attached to innovation in the literature that are specific to the public sector. According to Kattel and Vask (2008: 2), two distinct meanings of public sector innovation are pertinent. The one view is that it involves developing existing public sector innovation models. The second view is that it implies developing the concept of public sector innovation from the perspective of the private sector.

Public sector definitions of innovation vary considerably. In some instances, simple definitions such as 'new ideas that work' are used, as opposed to subjective meanings such as 'anything perceived as new by the actor, can be called innovation' (Kattel and Vask 2008: 2). It seems that innovation involves change that represents discontinuity, and it has to be differentiated from gradual organisational development, where the emphasis is on continuity (Herbig 1991). Despite these definitions, it can be argued that the literature on public sector innovation has often been overly reliant on private sector research and literature (Albury 2005). One would like to see a public sector definition that at least includes the concept of service delivery. Thus, public sector innovation can be defined as a new service concept, client interaction channel, service delivery system or technological concept that individually, but probably in combination, leads to one or more renewed service functions (Kattel and Vask 2008: 4).

Several attempts have been made to present innovation models in Public Administration. The three-phase model, developed by Angle and Van de Ven (1989),

is generic in nature and provides a meaningful reference to the implementation phase. Table 1 depicts this three-phase model of innovation, which provides for innovation processes as well as a timeline.

Table 1: The three-phase innovation model

Phase 1	Phase 2	Phase 3
Initiation period	Development period	Implementation/ termination period

Source: Angle and Van de Ven (1989)

The three-phase innovation model also closely resembles the well-known policy cycle. The typical policy cycle phases are problem identification, agenda-setting, policy formulation, decision-making, policy implementation and policy analysis (Bridgman and Davis 2004). The similarity to the model in Table 1 is obvious, because public sector policy innovation is, as a rule, part of a policy. Kattel and Vask (2008: 6) amended the three-phase model with corresponding layers (depicted in Table 2).

Table 2: Public sector innovation model

Pre-innovation	Innovation generation	Post-innovation
Initiation phase	Development phase	Innovation-decision process
Incentives	Implementation phase	Consequences and impacts
Triggers	Innovation	Adoption

Source: Kattel and Vask (2008: 7)

The pre-innovation phase is where the innovation starts. This phase is typified by incentives and different triggers, but is not necessarily always successful. In the pre-innovation phase, organisational or even individual incentives have to be put in place for possible innovation. Where incentives are absent, innovation often proves to be unsuccessful (Kattel and Vask 2008: 11). The second phase in Table 2 involves a specific plan of innovation; and the last phase deals with the implementation of

innovation.

Like other Public Administration models, this model describes the innovation process as a linear sequence. Doing so may be important for the purposes of studying the process, but in reality, like in the policy cycle, these phases are not necessarily linear. For example, the consequences of a public sector innovation process could already emerge in the innovation generation phase, where the public attitude to the innovation can either promote or impede innovation. The issue of social acceptance is critical in the adoption phase of policy innovation. Social acceptance is, for instance, central in the technology transfer debate, where the role played by technology cooperation on the part of different stakeholders contributes to social acceptance: for example, the introduction of renewable energies requires cooperation that will lead to adoption (Mallett 2007: 2790). The potential user consciously or subconsciously assesses the benefits and costs of the innovation. The final acceptance decision is based on several factors: the first is whether or not the technology is perceived to have relative benefits (economic, social, etc.). The second factor is how well potential users understand how the technology works and the principles behind it. The third factor is 'triability', or whether or not a potential user can try out an innovation before committing to it (Mallett 2007: 2791). A study done in Mexico City on the introduction of solar water heaters found that a lack of communication was a critical hindrance in the social acceptance of a new technology. Different companies which sold solar water heaters so jealously guarded and protected information, because of competition, that the stakeholders could not obtain enough information to decide whether or not to support the innovation (Mallett 2007: 2794).

When looking at the meanings of innovation, it is worth noting that any change in the public sector – be it on the level of policy, organisations or services – may be called 'innovation'. There does not seem to be a clear distinction between change and innovation. Unlike change, which is a more neutral concept, innovation is supposed to have only positive connotations. Thus, success in the public sector may be difficult to determine as, compared to innovation in the private sector, innovation in the public sector seldom has a highly visible impact.

In terms of systems theory, innovation takes place within a system consisting of individuals, organisations and institutions, as well as in a certain cultural regulatory framework. Interestingly, innovation normally does not start in institutions of basic science, but rather in institutions trying to solve problems. The systems approach to innovation also implies a holistic approach. There is some time lag between the development of the new product or service and its eventual implementation – learning processes take time (Roste 2005: 3).

The innovation process (or the innovation journey, as Angle and Van de Ven (1989) call it) emerges, develops, grows and terminates over time. Innovations are

often triggered by 'shocks' in the institution, but that original innovative idea may multiply into numerous ideas and activities that might proceed along divergent, parallel or convergent paths. It is critical to realise that mistakes occur frequently, and that criteria for success and failure often change throughout the process. Innovation, like policy, therefore involves uncertainty; and success depends on good communication with the stakeholders, to attract their support and resources. Champions are needed to see the innovation through any difficulties during the development process.

4 POLICY LEARNING

The role of policy learning in the process of policy innovation should not be underestimated. Policy learning is both a cause and an effect of policy innovation, as policy learning results in structured and conscious thinking about a particular policy issue. Governments can and do learn, but determining how they do so and who does the learning, is not that simple. Learning involves absorbing knowledge. In this article, the issues of knowledge and information cannot be discussed in detail, but briefly, it is assumed that knowledge is information that is meaningful for the knowledgeable agents (Fleck 1997: 384). For the purposes of this article, the following kinds of knowledge can be distinguished:

- Know how: the ability to do something;
- Know what: knowledge about facts;
- Know why: knowledge about principles and laws; and
- Know who: knowledge about who knows what (Johnson and Lundvall 2001).

There are also several other distinctions between different kinds of knowledge. One such distinction is made between codified and tacit knowledge (codified knowledge is explicit, whereas tacit knowledge is rooted in practice and experience). Another distinction is made between generic and specific knowledge, or even between individual and collective knowledge (Johnson and Lundvall 2001). Collective knowledge is shared knowledge and is generally encoded in institutions in the form of norms, habits and laws (culture can be regarded as a form of collective knowledge).

Policy learning should, therefore, involve individual, organisational and social learning. Policy learning in the organisation implies that the individuals inside the organisation should gain knowledge, but it is not easy to distinguish between the learning of those individuals and the organisation. When organisational learning

extends beyond the organisation, it implies social learning.

Besides the different kinds of knowledge, a further distinction can be made between different kinds of learning. Organisational and management learning are complex topics to which a great deal of research has already been devoted. A basic dictionary definition of learning is 'acquiring of knowledge or skill through study, experience or teaching' (*Cambridge advanced learner's dictionary*, third edition, 2008). The popular view is that an organisation only learns if a range of potential behaviours changes (Huber 1991). In general, people learn from the following:

- experience;
- knowledge;
- values, beliefs, opinions;
- goals;
- policy issues; and
- organisational culture.

Learning is normally influenced or tinted by organisational views, interests and culture. Learning is not necessarily an informational process. In some instances, people filter and manipulate information flows: employees avoid passing on negative information to their superiors, for example. The risk of failing is often high.

Policy learning is a form of collective learning (Argyris and Schon 1979). Policy learning is often complex because it is not learning within one organisation only, but learning across a number of organisations which implement the same policy. Kemp and Weehuizen (2002) highlight three types of policy learning:

- Instrumental learning (technical learning about instruments and their effects, and about how the instruments may be improved to achieve set goals);
- Conceptual learning or problem learning (learning how to see things from a different evaluative viewpoint, in a 'new light'); and
- Social learning (learning about values and other 'higher-order' properties such as norms, responsibilities, goals, and the framing of issues in terms of causes and effects selected for attention).

Public sector innovation and learning depend on belief systems (Kemp and Weehuizen 2002). In this regard, Koch et al. (2002) make an interesting distinction between rationalities and mentalities. Rationalities have to do with understandings of reality, and with culturally and socially defined belief systems. Mentalities are

'supra-rationalities', grounded in beliefs, philosophies, ethics and myths, which suggests that they are a shared outlook for a certain time and context.

5 SOURCES OF AND BARRIERS TO INNOVATION

Sources of innovation can also become barriers to innovation. Incongruities, the unexpected, demographics and process needs are all examples of sources of or barriers to innovation. One case in point is the original design of the QWERTY keyboard, which is still used even with computers, 120 years after this keyboard was invented. The QWERTY keyboard was originally invented to stop mechanical typewriter keys from jamming; today it is still deeply rooted in technological design. Numerous designers and manufacturers have tried to shift away from it, but it is still here, an incongruous relic of a bygone technology (Yapp 2005: 57). Does this have any parallel in the public service? Are there any similar outdated items or practices? One might look at the common practice of asking the public the same information 15 times over and expecting them to provide the same facts accurately and timeously every time. In South Africa one finds, for instance, that information gathered by the Department of Home Affairs is not shared by the South African Police Service or the Department of Social Development. Surely, such inefficiency creates numerous avenues for innovation and, in the context of this article, for policy innovation.

The unexpected is often a source of innovation. The recent swine fever in the Eastern Cape of South Africa, the outbreak of the x-strain of TB, the rise of xenophobia across the country, load-shedding by the Electricity Supply Commission (Eskom) – these could all be regarded as creating opportunities for innovation through necessity. In such cases, key infrastructure was not available or there were new demands that had never had to be met before. In such cases leaders, managers and staff may have to be inventive, doing things which have never before been thought of. This may lead to unexpected successes as well as failures. Innovation failure is often a critical part of the learning curve. The question is how to train people to learn successfully by failing.

5.1 The role of conceptual innovation in policy

An example of conceptual innovation in policy is the idea in Sweden to reduce working time in order to employ more people. This experiment in employment was preceded by conceptual innovation in policy (Compston and Madsen 2001: 119). General cuts in working hours were seen as a solution to the challenges of unemployment. Surprisingly, the reduction in working hours between 1986 en 1990 did not reduce unemployment, but rather resulted in more people being unemployed.

This prompted the interested parties (unions and government) to seek new ways to reduce unemployment. During 1991, the Swedish government introduced a new paid leave scheme, according to which employed staff could take leave to study or raise children. During the time when they vacated the post, an unemployed person could temporarily fill the position, and therefore lower the unemployment statistics. This practice resulted in various forms of paid leave schemes. In the end, the substitution of staff in temporarily vacant positions was dropped, because of the difficulty of controlling movement inside the system.

The lessons learnt from the Swedish paid leave system prove that conceptual innovation is not always without flaws, but once learning takes place, the outcome for innovative policy might be favourable. Concerns about rising unemployment were, in the end, addressed through conceptual innovation.

5.2 The importance of networks in innovation

A considerable body of literature focuses on innovation from outside government, but not much has been written on what is happening inside government. However, it has been shown that the procedures of government have an impact on innovation. One can also look at the networks in government and their involvement in innovation. Considine et al. (2008) have identified several dimensions of innovation inside government. The first is normative or conceptual innovation, through which key players in any system define innovation and orient themselves to a particular approach. The second has to do with the way participants understand and evaluate the main governmental institutions that might be used to create innovations within their environment. In this dimension, it is also important to see whether legislation and financial support are conducive to the system. The third dimension of innovation has to do with the roles and positions of actors inside the system. The way a person thinks about innovation is often shaped by the particular position that person fills in the organisation – in this case, in the public sector.

Formal structures for innovation are supplemented by and connected to informal patterns and networking among actors within government systems. It is important to know who sits on what committee and shares what responsibilities. According to Considine et al. (2008), repeated and successful acts of innovation are seen to occur when a system is geared towards innovative outcomes. This situation does not always prevail. In some instances, innovation runs counter to existing structures, but frustration with the status quo may become an important source of innovation. Another question that could be asked is who the innovator is. In Public Management, being innovative may be regarded as a desirable trait, which explains why some public sector models of innovation are concerned with leadership.

Networks are the prime facilitators of information exchange within organisations and governments. The clusters (between groups of organisations) or links provide opportunities for policy learning (Borins 2000). The innovation capacity of institutions is, therefore, linked to strong internal and external networks. Most policy networks have emerged over the past decades, and public policy is increasingly influenced by global conditions. The geographic scope of public policy now extends far beyond national borders. It is, therefore, imperative that leaders and decision makers understand that new challenges lie far beyond their jurisdictions (Reinicke 2000: 45).

The World Wide Web can contribute to global public policy networks, which are often loose alliances of government agencies, international organisations, corporations, elements of civil society, non-governmental organisations, professional organisations or religious groups. These networks could cover fields that range from energy, crime, fisheries, public health or malaria, to technology and much more (a schematic illustration of policy networks is provided in Figure 1).

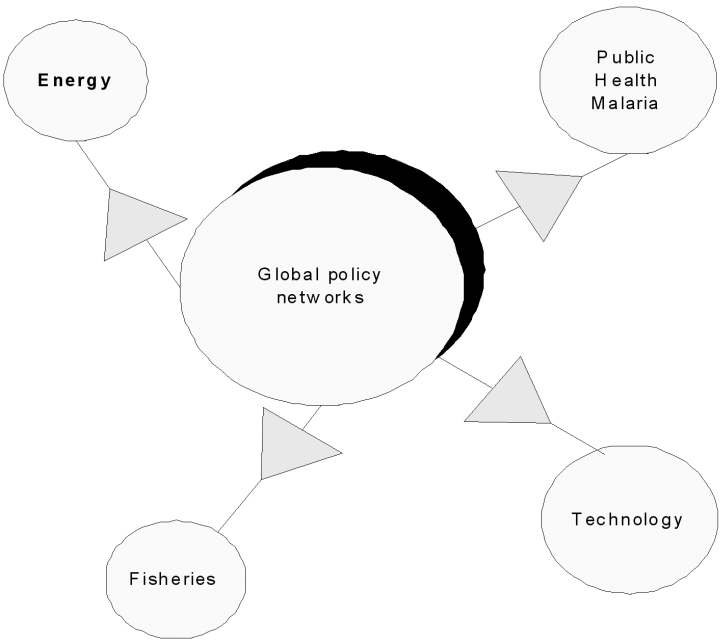

Figure 1: Loose global policy networks

Source: Adapted from Reinicke (2000: 45)

To illustrate the notion of innovation and networking in practice, the instance of the energy policy is a good example. Innovation in energy policy not only requires sound leadership, but also proper institutional arrangements and international cooperation.

5.3 Energy policy and institutional context

Growing concerns about climate change have prompted an extensive review of energy policies in the world. Renewable energy has moved from the margins to take centre stage. This involved a process where countries with more experience in renewables stimulated policy initiatives in other countries. This was especially true where there were signs of industrial success, and experience in manufacture and export.

The policy review process is often influenced by an innovation systems perspective that emphasises the role of social capital, which refers to a collaborative process of learning and knowledge transfer between multiple, distributed agents. Social capital sometimes stands in sharp contrast to financial capital market competition, private investment, and picking technology winners. The tension between social capital and financial capital is depicted in Figure 2.

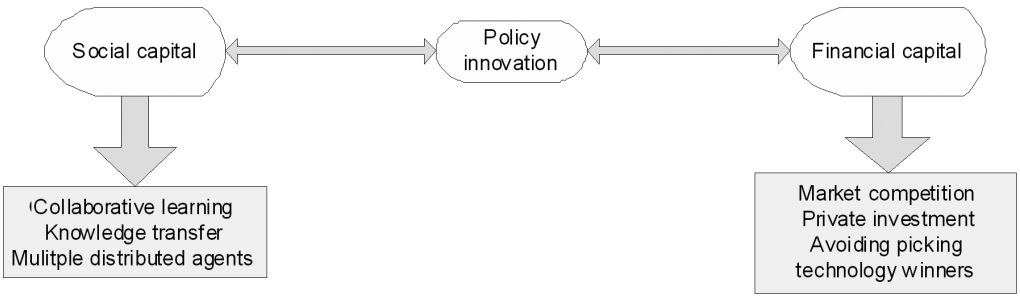

Figure 2: Policy innovation tension

Source: Winskel et al. (2006: 366)

A good example of financial capital in energy policy was in the UK in the 1980s, with the policy of privatisation (Winskel et al. 2006: 365).

In South Africa, the transition of the Electricity Supply Commission (Eskom) from a public sector entity to a corporation in 2001 (Bekker et al. 2008: 3129) brought about a shift in emphasis from social to financial capital. The change increased the tension between the demand for 'electricity for all' (the previous slogan) and the demand for affordable electricity – especially in poor households.

In this context, Bekker et al. (2008: 3130) argue that it is practically impossible to accomplish Eskom's policy goal of providing access to electricity to 100 per cent of South Africans by 2013, mainly due to financial constraints and capacity obstacles. An attempt to alleviate this tension was made by the government, which introduced a subsidy for poor households. Interestingly, the so-called subsidy (free basic electricity) has not necessarily led to decreased use of other energy carriers. According to Bekker et al. (2008: 3135), it is an open question whether electricity is the best energy carrier for thermal use in lower-income households.

Policy innovation tensions tend to inhibit proper policy innovation development, which is also the reason for the lack of universal policy innovation prescriptions.

5.4 Policy innovation systems

Policy innovation systems originate in studies of conditions for successful innovation. Although one might find that conceptual and methodological aspects differ, early policy innovation systems studies tended to follow the approach of emphasising the role of multiple-agency and distributed-learning mechanisms for change (Winskel et al. 2006: 366). In other words, this approach stresses the flow of information between people, enterprises and institutions that are critical to the innovation process (such as enterprises, universities or research institutes). In the case of energy innovation, policy systems are usually linked to specific institutions and are consequently locked into particular institutional characteristics. In such cases, energy policy innovations are inevitably institutionally disruptive (Winskel et al. 2006: 367). Informal institutions and the accompanying kind of behavioural organisational norms would, therefore, be more suitable for energy policy innovation.

5.5 Policy innovation and energy

The policy innovation process, for instance in the case of energy innovation, normally starts with an awareness of the policy problem or opportunity. This awareness could arise inside government or even outside of it, in individuals or groups. The initiators of the process are not necessarily the decision-makers. The decision requires political will, which implies that policy adoption occurs at the highest level of the political system. Whatever energy policy is adopted, it may fail in the implementation not because of what implementers do or fail to do, but because new people may inject a new stage (called 'evaluation'). Such an evaluation may indeed lead to modifications or the death of the policy (Lambright et al. 1979: 141).

During the implementation stage, ends and means must be accommodated. The agency or department responsible for the implementation will take the leading role. Several changes are possible during the implementation phase – the problem itself may change along the way; the solution might not be fully accepted; the impact, cost, risk and vested interests are all factors that can influence the innovation process. According to Lambright et al. (1979: 141), many policy innovations never reach their culmination. Policy innovation runs the risk of being rejected at the adoption phase, or terminated due to problems with implementation. The process, as described, is therefore not always as linear as it appears to be in theory. The whole process is one of going forward and backward, with plenty of zigs and zags. In policy and energy innovation, different actors and agencies are involved, which makes the policy innovation process exceedingly complex.

5.6 The awareness of energy policy

The input of energy specialists is critical during the period of creating awareness of energy policy. Technical energy specialists are so immersed in the field that they can normally observe the problem and opportunities. The challenge is then to bring the problem to the attention of the decision-makers, who are to be found on different levels and in different agencies, but the ultimate decision-makers are the elected officials.

A good example of a specialist's involvement in raising awareness amongst decision-makers is that of Albert Einstein, who used his name and reputation to alert President Franklin Rooseveldt to the potential for developing the atomic bomb (Lambright et al. 1979: 142). The process of getting the attention of decision-makers may involve going through several layers of bureaucracy, and can be quite problematic. The challenge is to move from awareness to decision-making, as depicted in Figure 3. The final decision-makers often only have a vague idea of the problem and opportunities – the future seems distant and is still not a reality for the lay person. Technical experts sometimes add to the confusion, with debates on what is really the best option for the policies of the future.

It is now an established fact that the earth's supplies of petroleum and natural gas are finite, and that with the contentious increase in consumption, the time is not far off when these resources will run out. In the mid-1950s, geologist M. King Hubbert (Lambright et al. 1979: 142) already predicted that oil production in the US would peak in the 1960s. Hubbert was correct, but few policy-makers paid attention to his predictions. Indeed, over time, if a particular country runs out of energy, the next step is usually to import it. Importing energy is now a world-wide phenomenon, and is therefore part of the global leadership and policy scene. Korea, for instance,

imports 98 per cent of its energy resources – this implies that the Korean economy is both directly and indirectly affected by changes in oil prices (Lee et al. 2009: 588). Reliance on foreign energy sources has become heavier, as domestic supplies globally begin to be depleted. Energy consumption is growing; and it has been predicted that it will double in the next 20 years. This situation has to be a trigger for policy innovation. Different kinds of sources of energy – whether oil, solar, gas, wind, hydro or nuclear – have become the focus of policy innovation (Lambright et al. 1979: 143). The significant impact of the energy crisis has widened global

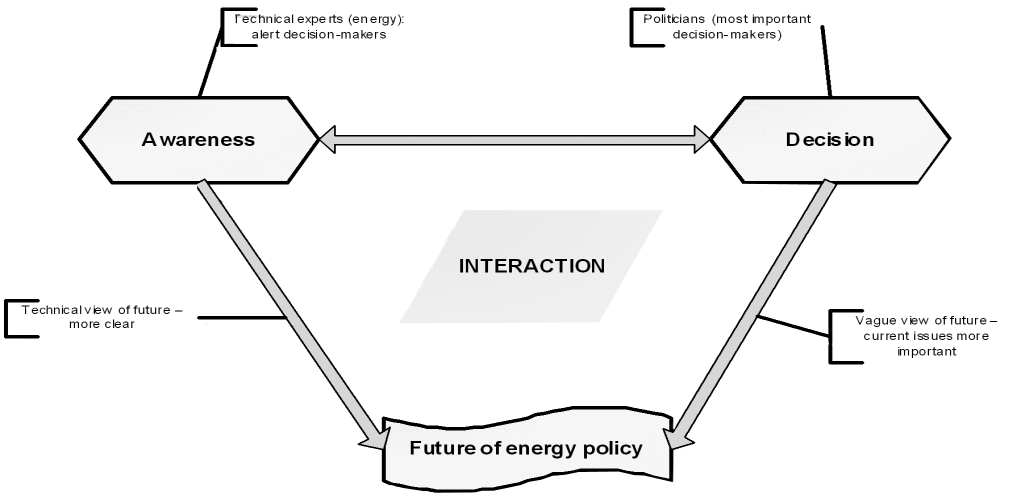

Figure 3: Awareness of energy policy

Source: Lambright et al. (1979: 142)

participation in policy innovation. In this field, the role of the private sector *vis-à-vis* the public sector has also become critical. One important question is to what extent governments will become involved in the commercialisation of energy technologies.

6 NEW ENERGY TECHNOLOGIES

6.1 Energy policy in Korea

To counter high oil prices and prepare for the inevitable depletion of the resource, governments will have to improve energy efficiency technologies for petroleum, and will have to develop alternative fuel technologies. Energy policy innovation should, therefore, focus on the core energy technologies to be developed in the foreseeable future. A good example of the execution of energy policy innovation is the Korean Energy Technology Road Map (ETRM). In the case of Korea, the absence of an energy strategy spurred the Korean Institute of Energy Research to establish a long-term ETRM (Lee et al. 2009: 588), when the signs of an impending energy crisis became unmistakable.

The Korean energy policy innovation followed four stages: during the first stage, a list of the energy technologies developed in that country, was compiled. These technologies were clustered into three major sectors. The second stage consisted of an analysis of the various technologies, based on factors such as their economic spin-offs, commercial potential, and patents and rights. The third stage presented the state of Korean energy development, centring on the Korea Institute of Energy Research, and was analysed from the standpoint of the present state of R&D, patents, and policy linkages. In the fourth stage, the ETRM was designed by selecting core technologies (see Figure 4 for a flow chart of the stages).

The concluding action was to provide the ETRM to decision-makers within the Ministry of Education, Science and Technology, the Ministry of Knowledge Economy and the Korea Energy Management Corporation (Lee et al. 2009: 590). This road map, which projects the route for the next ten years, illustrates the movement from awareness in specialists to awareness in the critical decision-makers in Korea. The results of this study will help decision-makers and policy-makers to broach issues of innovation, and to forecast future technology needs on a long-term basis.

6.2 The UK policy innovation for renewable electricity technologies

The UK's commitment to developing renewable sources of energy started in 1997. The first drive was to derive 10 per cent of the UK's electricity supply from renewables by 2010. Several policy options were considered to attain this goal, and the idea was a liberalisation of the domestic energy market. In spite of large-scale hydroelectricity generation, the annual increase targets of 3 per cent towards

2010 could not be met. The largest shares of renewable energies originate from landfill gas (48%) and onshore wind (20%), with smaller contributions coming from biomass, small hydro, sewage gas and offshore winds (Foxon and Pearson 2007: 1541). Onshore wind generation of energy can almost compete in cost with gas and coal-fire generation. The absence of price mechanisms that recognise major externalities associated with energy use in competitive markets is distortionary. A classic example is when clean energy technologies, such as wind, compete with fossil-fuel technologies, when no value is placed on pollution (McHenry 2009). In

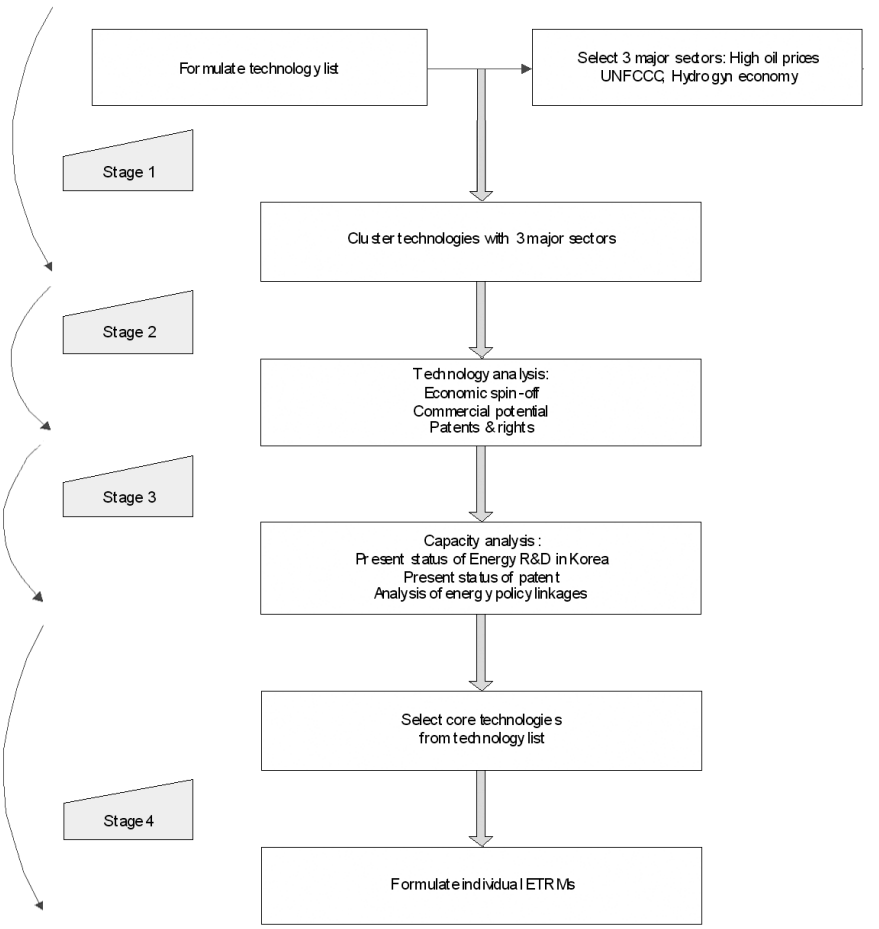

Figure 4: Stages of the ETRM

Source: Lee et al. (2009: 589)

the UK, it was realised that renewable energies were a long-term policy measure, designed to be in place by 2026. However, this long-term agreement between stakeholders in the renewables industry seems likely to add to uncertainty in the investment community. The aspect of policy learning (as alluded to earlier in this article) is applicable to the long-term vision of renewable energy. Policy learning in the UK therefore set out four goals for UK energy policy, namely to put the UK on a path to cut its carbon dioxide emissions by 60% by about 2050, with real progress by 2020;

- to maintain the reliability of energy supplies;
- to promote competitive markets in the UK and beyond; and
- to ensure that every home is adequately and affordably heated. (Foxon and Pearson 2007: 1544)

Energy policy innovation requires that long-term outcomes be addressed. This can explicitly be addressed in energy policy modelling.

6.3 Energy policy modelling

Energy policy modelling enables a meaningful analysis of various countries. Results from a variety of models need to be considered by policy-makers in order to assist them in their energy policy decisions. It is clear from the literature that the complex nature of energy policy problems implies the involvement of mathematical modelling. The long life of most energy technologies and long-term impact of energy investment decisions on the economy, resource depletion and environment, necessitate a long planning horizon. Changes in government and government policies, plus the macro-economic uncertainties in these times, add to the complexity of decision-making and policy innovation in the energy sector.

The challenges to developing countries are unique for the process of policy modelling. Although most policy models address the concerns of developed countries, they can also be useful for developing countries. According to Pandey (2002: 97), an increase in deregulation and privatisation as regards the energy sector in developing countries like China, India and Brazil, causes the inflow of foreign capital and increases foreign ownership.

Energy is a global issue which requires global leadership. This article, however, emphasises the issues in developing countries. Over the past few decades, developing countries have faced multiple social and economic problems which may vary in degree, but tend to involve general aspects such as large-scale poverty, ineffective resource usage, service delivery challenges, and growing shortages of infrastructure

service (including electricity and petroleum products). These challenges could either be the result of policies or the implementation of those policies. Common trends, such as heavy state regulation and control on trade prices, and a lack of capacity and performance, are evident. Some developing countries recently saw a radical shift towards deregulation and privatisation (Pandey 2002: 98). In developing countries, several factors contribute to their specific energy policy, including the existence of large-scale inequity and poverty, the dominance of traditional lifestyles and markets in rural areas, the transition of populations from traditional to modern markets, the existence of multiple social and economic barriers to capital flow, and technological diffusion. Long-term policy frameworks need to be developed for developing countries.

Developing countries should have policy priorities, such as aggregate economic growth, equity of distribution and the sustainability of resources. Continued unsustainable use of fossil energy resources in large developing countries such as China and India threatens to contribute significantly to local as well as global emissions. This again proves that developing countries need to undertake long-term policy innovation. Policy innovation with regard to energy tends to have global effects that should be a concern for global leadership. Rural communities continue to operate outside modern markets, and the reach of modern market commodities (including energy) remains inadequate. Traditional communities face a constant threat to their survival. Policy models developed in industrially advanced countries assume well-developed markets, perfect competition, minimal trade and other social-economic barriers. Models for developing countries should, therefore, emphasise equity of distribution and the sustainability of resource use (Pandey 2002: 99).

The transition from the traditional to the modern sector should also be part of policy modelling for developing countries. Modernisation and urbanisation are key issues in transitional lifestyles. Migration to urban centres, seeking employment opportunities in the modern market economy, increasing consumption levels and rising energy intensify consumption. These transition dynamics have significant implications for growth in demand and supply (Pandey 2002: 99). Policy energy models should also reflect ongoing radical changes in energy markets in developing countries. In Colombia, China, India and Brazil, the general trend is a transition from a government-controlled, centrally planned energy sector, to a liberalised, restructured and capital-market-driven sector (Pandey 2002: 100). This also implies that the level of competition between local utilities is increasing. The norms for deciding electricity tariffs are also changing, from government-regulated to partly government-driven tariffs.

7 CONCLUSION

This article has pointed out that there are clearly different ways of conceptualising public sector innovation. The research into public service innovation is at a theoretical and conceptual crossroads. The current use of the term 'innovation' is still confusing and sometimes empty of meaning. It remains difficult to inject private sector understandings of innovation into the public sector's understanding of the term. Policy innovation is also an elusive concept that involves many uncertainties. The mere fact that no single definition exists, implies that it is often used interchangeably with similar concepts such as change, reform and development. It is clear from this article that the conventional public sector institution does not always favour policy innovation. This, therefore, requires the establishment of institutions that are conducive to policy innovation. The policy innovation journey should also provide for possible failures, but this begs the question of how we train for such policy failures.

In the field of energy, the model for policy innovation that is customarily sketched by analysts is linear. This implies the adoption and implementation of policy. As world demand for energy increases, in future we will see governments increase their budgets in support of energy policy innovation. The whole question of energy policy will not only be institutionalised (for example, in the form of departments of energy), but growing competition between the different kinds of sources of energy will occur. Different kinds of energy cannot have the same value, but how will this value be determined? Will the market be the only way to determine the value of energy, or will depletion and emissions factors also come into play?

It is clear that an awareness of the need for new energy innovations is necessary for both the decision-makers and the users of the innovation. In the case of energy policy innovation, awareness, understanding and eventual adoption by users are critical. Global leadership is under pressure to react to the challenges of energy policy innovation, which is indeed a global issue. The uneven spread of energy sources across the world makes it a global issue that requires sound leadership and cooperation. The advantageous properties of oil, which resulted in the decline of coal, for most countries also resulted in a switch from domestic to foreign energy, creating a new world power pattern. Renewable energy sources and technology are central to the social acceptance of the users. The success of energy policy innovation is also determined by users' understanding and testing of new technologies. Consistent communication is, therefore, needed not only globally, but indeed with the local users of new energy technologies. Close cooperation between all stakeholders is of the utmost importance.

BIBLIOGRAPHY

Albury, D. 2005. Innovations, futures thinking and leadership. *Public Money & Management* (January): 51–56.

Angle, H.L. and A.H. van de Ven. 1989. Suggestions for managing the innovation journey. In *Research on the management of innovation: the Minnesota studies*, ed. A.H. van de Ven, H.L. Angle and M.S. Poole, 663–697. New York: Harper & Row.

Argyris, C. and D. Schon. 1978. *Organizational learning: a theory of action perspective*. Reading, MA: Addison-Wesley.

Bekker, B., A. Eberhard, T. Gaunt and A. Marquard. 2008. South Africa's rapid electrification programme: policy, institutional planning, financing and technical innovations. *Energy Policy* 36(8): 3125–3137.

Borins, S. 2000. Loose cannons and rule breakers, or enterprising leaders? Some evidence about innovative public managers. *Public Administration Review* 60(6): 498–507.

Bridgman, P. and G. Davis. 2004. *The Australian policy handbook*, third edition. Sydney: Allen and Unwin.

Compston, H. and P.K. Madsen. 2001. Conceptual innovation and public policy: unemployment and paid leave schemes in Denmark. *Journal of European Social Policy* 11(2): 117–132.

Considine, M., J.M. Lewis and D. Alexander. 2008. Innovation inside government: the importance of networks. Paper delivered at the EGPA Policy Innovation Conference, September.

Fleck, J. 1997. Contingent knowledge and technology development. *Technology Analysis and Strategic Management* 9: 383 –397.

Foxon, T.J. and P.J.G. Pearson. 2007. Towards improved policy processes for promoting innovation in renewable electricity technologies in the UK. *Energy Policy* 35(3): 1539–1550.

Herbig, P. 1991. A Cusp Catastrophe Model of the adoption of an industrial innovation. *Journal of Product Management Innovation* 8(2): 127–137.

Huber, G.P. 1991. Organizational learning: the contributing processes and the literatures. *Organization Science* 2: 89–115.

Johnson, B. and B.A. Lundvall. 2001. Why all this fuss about codified and tacit knowledge? Paper for Druide Conference, 18–20 January.

Kattel, R. and L. Vask. 2008. What is public sector innovation? Paper delivered at the EGPA Policy Innovation Conference, September.

Kemp, R. and R. Weehuizen. 2002. Policy learning: what does it mean and how can we study it? PUBLIN Report No. D15. http://www.step.no/publin/reports/d15policylearning.pdf (accessed 17 September 2008).

Koch, P., J. Haukes and R. Rannveig. 2002. Rationalities and innovation policy learning. In *Good practices in Nordic innovation policies* (*GoodNIP*). April. http://www.step.no/goodnip (accessed 17 September 2008).

Lambright, W.H. and A.H. Teiche. 1979. Policy innovation in Federal R&D: the case of energy. *Public Administration Review* 39(2): 140–147.

Lee, S.K., G. Magi and J.W. Kim. 2009. Energy Technology Road Map for the next 10 years: the case of Korea. *Energy Policy* 37(2): 588–596.

Mallet, A. 2007. Social acceptance of renewable energy innovations: the role of technology cooperation in urban Mexico. *Energy Policy* 35(5): 2790–2788.

McHenry, M. 2009. Policy options when giving negative externalities market value: clean energy policymaking and restructuring the Western Australian energy sector. *Energy Policy* 37(4): 1423–1431.

Pandey, R. 2002. Energy policy modelling: agenda for developing countries. *Energy Policy* 30(2): 97–106.

Reinicke, W.H. 2000. The other World Wide Web: global public policy networks. *Foreign Policy* 117: 44–57.

Roste, R. 2005. Studies of innovation in the public sector: a literature review. PUBLIN Report No. D16. http://www.step.no/publin/reports/d16literaturesurvey.pdf (accessed 12 September 2008).

Winskel, M., A. McLeod, R. Wallace and R. Williams. 2006. Energy policy and institutional context: marine energy innovation systems. *Science and Public Policy* 33(5): 365–276.

Yapp, C. 2005. Innovations, futures thinking and leadership. *Public Money & Management* 25(1): 56–60.