
purposefully organised around real life problems in a multi actor setting, with at its core a learning community which is set up by its participants who willingly participate in social learning and are aiming to use this to change existing policies, frames, practices, habits, etc. The results of the knowledge and learning process is actively shared and translated by boundary workers to non-participants of the learning community who may decide to use the results of knowledge governance for decision making or the execution of policies.

The idea of 'mental proximity' in production networks (Sacchetti & Sugden, 2009) is also relevant to knowledge governance. This is grounded in economic geography and spatial economy theory in which proximity is traditionally a core theme. Proximity was originally seen as spatial proximity, but a social and organisational meaning has been added to this. Mental proximity makes it possible to achieve common objectives by engaging in deliberation. Gerritsen *et al.* (2013) see this as part of social learning condition. A knowledge community is needed to be able to exchange knowledge and to attach meanings. In organisation science these are called 'learning networks' (e.g. Hansen, 2002; Contactor & Monge, 2002).

3.1.7 Modes of governance framework

Each mode of governance is characterized by a distinct set of coordinative principles to achieve collective action (see Table 1). Each mode of governance has its strengths and weaknesses, based on their coordinative principles. Network governance for instance, cannot function well, when actors want to remain in control and mutual trust is low, market governance finds it hard to cope with market failures and free rider behaviour, and hierarchic governance does not function properly when regulations are lacking and when the allocation of tasks and responsibilities is unclear (Van Buuren & Eshuis, 2010). Self governance has problems with coping with outside influences, by governments (Ostrom, 1999) or businesses. All of these limitations limit the potential of these modes of governance to tackle complex policy problems.

3.2 Policy instruments

3.2.1 Policy instrument research

The study into policy instruments started in the 1970's. Although different definitions of policy instruments exist, most of them start from the premises that policy instruments are developed by the government as a way to implement their policies and influence the behaviour of citizens and businesses (Howlett, 1991; Bemelmans-Videc & Rist, 1998). Due to changing views of the role of the government and society in policy implementation also views on policy instruments have broadened in order to account for situations in which network governance or knowledge governance dominates (Gunningham *et al.*, 1998; Jordan *et al.*, 2005; Lascoumes & Le Gales, 2007).

Policy instruments are sometimes depicted as neutral devices. Governments can select a broad array of policy instrument to implement their policy based on considerations regarding effectiveness or efficiency (Salamon, 2002). However in practice their choice is often limited due to their embedding in a larger framework of established modes of governance and policy regime logics (Howlett, 2009; Gossum *et al.*, 2010; Böcher, 2012). Furthermore over time governments tend to develop a preference for specific instruments e.g. policy instrument mixes referred to as implementation styles (Kagan and Axelrad 1997; Howlett 2002 and 2005).

Often policy instruments, as are modes of governance, are described in their ideal form – however in practice many hybrids exist. The following instruments are commonly distinguished in different typologies (Vedung, 1998; Jordan & Adelle, 2014; more ref) being 1) legislative /regulatory instruments, 2) economic/fiscal instruments, 3) agreement based/co-operative instruments, and 4) (traditional) information/communication based instruments. Additionally in this report we distinguish: 5) knowledge instruments. Although one could argue that knowledge instruments are akin to information and communication instruments, the focus is different. Central in these knowledge instruments is that they aim to develop shared knowledge between actors and promote innovation.

Unlike the more traditional information and communication instruments, they are not one-way but two-way communication. They are not about the government of a government agency that brings a message but about shared knowledge development.

In Section 3.2.2 these instruments are described in more detail and in Table 1 examples of these instruments in the EU policy are given.

3.2.2 Legislative and regulatory instruments

Legislative and regulatory instruments are used to denote a broad variety of laws and regulations. Their main characteristic is that a public authority sets binding requirements, which in cases of non-compliance will be followed by sanctions. Government apply “command-and-control” principles to influence actors' behaviour. The requirements can either be prohibitive (e.g. forbid certain behaviour) or be prescriptive (e.g. require certain behaviour). Overall the approach of the EU – in particular in environmental policy – has been based on legislative and regulatory instruments. Examples of EU legislative and regulatory instruments are provided in Table 1.

The most obvious mode of governance which is related to these instruments is hierarchical governance. However the approach to these instruments has changed over time. Initially they contained strict prohibitions and assessments, but nowadays they can also contain more loose due diligence systems prescribing some corporate carefulness or merely process rules. Different reasons underlie the choice for these types of instruments. First of all they have the advantages that they enforce stakeholders to comply even if they do not want to, as such they do not rely on the free co-operation of the targeted actor (high degree of coerciveness). Also they apply equally to all targeted actors and protect them from arbitrary governmental decisions (rule of law). Furthermore they improve the predictability of governmental actions. However there are also disadvantages to such types of instruments. Often there is considerable reluctance towards selecting these instruments on side of actors involved. One of the reasons for this reluctance is that often the costs to comply are paid by the involved actors (externalisation of costs). In case of high noncompliance, the cost of enforcement on the side of the government will be high. Furthermore they have a limited ability to cope with complex dynamic situations and do not stimulate stakeholders to commit themselves to policy objectives.

3.2.3 Economic and fiscal instruments

Economic and fiscal instruments are based on a government that influences market mechanisms though for instance subsidies, loans, taxes, concessions of rights. The most logical mode of governance is market based. Furthermore for a majority of these instruments, compliance has a more voluntary character as they simulate the involved actor to act in a certain way by rewarding or financially discourage certain behaviour. The advantage of these instruments is that they have a potential to correct market failure in particular in respect to common goods for which markets do not exist. The usage of economic and fiscal instruments in principle can create the economic conditions for the establishment of functioning markets. However the possibilities to create and manage these market failures with financial instruments is extremely difficult. Disadvantages are the costs associated with the subsidies. Loans or taxes themselves require coordination programs to distribute or collect the money. Also financial incentives can prevent compliance for other reasons, such as intrinsic motivations. Also the competition for the funds between stakeholders can lead to high transactions costs and much frustration on their side.

3.2.4 Agreement-Based or cooperative instruments

Agreement based or co-operative instruments are those instruments in which the government and/or involved actors jointly and on a voluntary basis decide to behave in a certain way. They often arise from consortia that share an agenda – mostly consisting of both public as well as private actors (public-private partnerships). Often the agreements reached between the parties (whether governmental or not) are fixed in a covenant code or agreement. Advantages are that these instruments are completely voluntary and that actors use them because they rely on one another to

achieve anything. These instruments are related to network governance and are suited for situations in which resources are divided among multiple actors, and are therefore quite complex.

In general there will be limited resistance towards the instrument on side of actors involved, although this depends on how open or closed the networks are in which agreement is being sought. Actors who are not included in these agreements could very well oppose these instruments. Disadvantages can be that they have a low level of coerciveness – because it has not been arranged that if parties do not uphold the agreement sanctions can follow. Of course, voluntary agreements can be formalized with contracts which do include penalties. Agreement based instruments often have high transaction costs because they take a long and intensive process to be employed. These instruments also might lead to unclear division of tasks and responsibilities, which can cause all kinds of conflicts and can limit their potential to bring about change.

3.2.5 Information and communication instruments

These instruments try to influence behaviour through disseminating information to actors on certain issues in the hope that this will entice them to change their behaviour. It therefore is limited to one way communication. These instruments can target a broad audience and use media as a way to reach people (publicity information campaigns) for instance campaigns against smoking. However they can also consist of targeted educational programs to reach a specific audience (group lessons, individual coaching) or providing product related information through certification (labeling) or ranking. Whichever approach, all instruments are voluntary as people can decide to ignore them. This is also the main disadvantage of these instruments; information does not lead to compliance in a direct way; only indirectly. Furthermore it might be difficult to reach non-interested parties because they are not searching for information or follow other logical frameworks than the regulator (information has little meaning to them).

Of course, recently there are also more interactive communication instruments, such as direct dialogue, interactive workshops, and invitation of sharing opinions and viewpoints between governments and communities. These instruments are on the boundary of information and knowledge instruments (see at Section 3.2.6).

3.2.6 Knowledge and innovation instruments

Knowledge based instruments are those instruments in which participating actors jointly increase their knowledge by engaging in social learning. In these instruments knowledge is both information and capacity to act and therefore includes both tacit and explicit knowledge. Examples of such instruments are developing communities of practice (exchanging best practice), living labs, creative workshops, or pilots (e.g. legal pilots by means of environmental law experiments, or trying out new technologies), and constructing business cases or land use plans. A benefit of these instruments is the limited resistance on the side of the involved actors and that they can cope with situations that are complex and dynamic.

Actors might be enthusiastic to participate as it might provide them with new insights and capabilities. These instruments also may lead to actual new ideas which have a better chance of succeeding than previously considered policy measures. A disadvantage is that these instruments might primarily benefit a small group of front runners or might only appeal to actors that belong to a certain community. The instruments require a high level of co-operation and a shared identity between the actors involved. In case this is absent, the instrument might not work as actors might not be able to reflect on their own viewpoint and learning does not occur due to a 'knowledge fight' between different epistemic communities. The transaction cost will even be higher than at the agreement based instruments, because innovation is a labor intensive process with a high chance of failure. These instruments therefore are primarily relevant for stagnating processes in which knowledge or capabilities are lacking.

Table 1

Examples of EU policy instruments in the environmental field (based on Jordan & Adelle, 2014 and this study)

Legal and regulatory instruments	Financial and economic	Agreement based	Information/ communication	Knowledge instruments
<ul style="list-style-type: none"> • Habitats Directive assessment (Art 6.2 of the Habitats Directive) • Due diligence systems (Art. 6 of the EU Timber Regulation) • Requirements for drinking water (Art. 4 of Water Framework Directive) 	<ul style="list-style-type: none"> • Agri-environmental subsidies (1992-now) • EU Upper and lower limit for national fuel taxes • Emissions trading 	<ul style="list-style-type: none"> • Voluntary Car emissions in Automotive industry (1999/2000) • Requirement for stakeholder inclusion in European Water Framework Directive 	<ul style="list-style-type: none"> • Eco-labelling • Energy labelling for houses 	<ul style="list-style-type: none"> • European Innovation Partnership on Agricultural Productivity and Sustainability • Horizon 2020 innovation and research programs • Joint Programming initiatives