Beyond control? - The uncertainties and diverging images of Swedish chemicals regulation

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Abstract

Today, industrialised societies are frequently confronted with new warnings delivered by experts about risks associated with anthropogenic substances. Such warnings are typically not related to any definitive consequences but rather to admissions of great uncertainty about effects, and thus they contrast sharply to political promises of non-toxic environments and a highly regulated production of chemicals. It is the argument of this article that the high uncertainty surrounding chemicals allows for the proliferation of radically divergent and paradoxical images of chemicals regulation and its functionality. The article analyses the rationality underlying the system of chemicals control in Sweden, a country often priding itself on having one of the most progressive legislations in the world. The regulation and control performed by the two central agencies involved in the control of chemicals are studied through text analysis and interviews, and the concluding discussion frames chemicals regulation by theories on post-politics and post-ecologism.

In the industrialised world of today, we are frequently confronted with new warnings of chemical substances in the natural or urban environment that may pose a threat to ecosystems and human health. The characteristic of these warnings is that they rarely involve broader analytical visions or any definite assessments regarding consequences. In that respect, the threats posed by the chemical society are fundamentally different from those identified in relation to climate change, which are clearly defined in terms of future environmental effects and temperature levels. Instead, chemical risks are usually described in terms of high uncertainty, and the troubling aspect lies not in a clearly identified hazard but in the lack of knowledge of possible effects. Also, chemical warnings are typically associated with certain specific substances rather than overall problem descriptions of the chemical society in which we no doubt live. Thus, by being at the same time incessant and ephemeral, and by their fundamentally uncertain nature, these warnings result in a paradoxical image of the chemical society as simultaneously a simple fact of life and something deeply troubling.

Nowhere is this paradoxical image of the chemical society more pronounced than in Sweden, a country that has long prided itself on having one of the most developed systems of environmental monitoring and progressive environmental legislation. The image of a highly controlled diffusion of chemicals is constantly undermined by experts warning about a fundamental lack of knowledge regarding the consequences of releasing all these chemicals to the environment and to society.

Such warnings, in turn, contrast sharply with the governmental environmental objective, 'A Non-Toxic Environment', which stipulates that 'the environment must be free from man-made or extracted compounds and metals that represent a threat to human health or biological diversity', and that 'one generation from now, the major environmental problems currently facing us will have been solved.'

This article analyses the official Swedish system of chemical control. After an analysis of what is identified by the author as the central tenets of the system of control and the problems associated with these tenets, the article goes on to discuss the underlying rationality of Swedish chemical regulation. The focus is on the tension between chemicals as uncontrollable and unknowable phenomena on the one hand, and the chemical society as something taken for granted and controlled on the other. It asks:

- What are the central tenets of Swedish chemicals control?
- What problems are associated with these tenets?
- What implications do these problems have for the overall system of control?

The article begins with a historical walkthrough explaining the development of the Swedish system of chemicals control. After this, it analyses the problematic aspects of the central tenets in the system, and in the following discussion it goes on to show the implications of this analysis. The article is concluded by some remarks on how to understand the findings in a context of theories on post-political and post-ecological sustainability politics.

Methodological Approach

The analysis is based on material collected from two state agencies: The Swedish Environmental Protection Agency (EPA) and the Swedish Chemicals Agency (SCA). There are several other organisations and agencies involved in the Swedish system of chemicals control, but these two hold the central responsibility for the monitoring and regulation of anthropogenic substances. The EPA has been the primary environmental state agency since its inception in 1967, and its list of responsibilities include the majority of the national environmental objectives, coordination of natural protection activities around the country, and the administration of the national program of environmental monitoring. The SCA is responsible for the environmental objective 'A Non-Toxic Environment", it administers the national index of chemical products, and it has been identified as the national chemicals agency within the framework of REACH (Registration, evaluation, authorisation and restriction of chemicals), the European chemicals legislation. As the primary supervisory agency regarding chemicals, it may report companies for breaches of legislation. While it wields no direct prohibitive powers, it can suggest regulatory measures regarding specific substances, which will usually have to be routed through the EU system. The

EPA and the SCA are complementary institutions within the system, the former having the role of the passive monitor, while the latter performs active regulation. Since this analysis is devoted to the official system of chemicals control, NGOs such as the Society for Nature Conservation, which make an important contribution to the detection of environmental hazards, have been excluded. While the inclusion of other state agencies would have further strengthened the empirical basis, it would be unlikely to have contributed anything substantial to the main analysis.

The empirical material consists of official reports and policy reviews published by the EPA and the SCA, as well as interviews with employees at the agencies between 2009 and 2012. The interviewees were selected through identification of important positions from each agency's webpage, and through personal referral. The persons interviewed held the following positions at the time of the interview:

- Head of the environmental monitoring unit, EPA (cited as I-1)
- Administrator of the unit for environmental monitoring, EPA (I-2)
- Manager of the screening program, EPA (I-3)
- Program area manager, unit for environmental monitoring, EPA (I-4)
- Environmental risk assessment expert, SCA (I-5)
- Toxicological expert, SCA (I-6)
- Director, SCA (I-7)
- Eco-toxicological expert, SCA (I-8)
- Expert on risk assessment within REACH, SCA (I-9)

The material has been treated as representing an *official, organisational* view of the Swedish system of chemicals control. In this, the author has followed Smith's sociological view on texts as key elements in constituting an organisational identity and standardised, organisational activities (Smith 2001, p.174). As the respondents were engaged in the interviews in their professional capacity, the interviews have been treated as representing the same, official, organisational view as the official reports, following the text-ontological perspective given by Bakhtin (1986). The definition of an institution provided by Berger and Luckmann (1967) is appropriate to explain the organisational perspective adopted in the article, by which the organisations (the EPA and the SCA) are regarded as entities founded on and constituted by their own common worldview, common knowledge and common values.

The term *chemicals control*, or *system of chemicals control*, as used in the article, encompasses every activity performed by state institutions within formalised routines for the purpose of regulating or monitoring the use, production or effects of chemicals in Sweden. The majority of these activities are performed within the framework of two overarching, institutionalised orders: the national program for environmental monitoring and the system of environmental objectives. It should be noted that the term is self-made and that it may well differ from official boundaries between different professional activities and areas (for example: *monitoring* and *regulation* denote two highly separate activities in the official vocabulary).

The analysis has evolved around certain themes, which were preliminarily identified through a first round of extensive reading (see e.g. Ryan & Bernard 2003). These themes have been constituted either by certain mechanisms or operative principles within the system of chemicals control – such as *screening* or the *precautionary principle* – or by certain problematic phenomena that the author has identified as central. The themes have formed the basic structure on which the interviews and subsequent coding of all text material has been built. The interviews and written texts have been treated as mutually complementary and *not* as two totally separate storylines, from which the author has searched for contradictions. Of course, crucial contradictions have been highlighted, but the ambition has never been to juxtapose interviews with an official version and thereby find fault with the way the professionals perform their duties. The contradictions that have been of interest for the author lie on a systematic level, i.e. on the level where political mission statements meet with the organisations' realities in the form of path-dependency, budgetary restrictions, and legal permutations. The main themes around which the preliminary, initial analysis has been formed were subsequently revised, as interviews and further reading revealed new paths for exploration, as well as analytic dead-ends.

The History of Chemicals Control in Sweden

The Society for Nature Conservation (SNC) was a Swedish pioneer in paying attention to possible environmental dangers associated with the use of chemicals. Already in 1950, the organisation attempted to draw political attention to the over-effectiveness of DDT, which meant that non-target insects were being eradicated (Anshelm 2004). Their work would pay dividends more than ten years later in the 1960s, which is traditionally described as the decade when Sweden awoke to the environmental degradation resulting from industrial progress. The chemical hazards were exposed to the public and politicians alike by Rachel Carson's *Silent Spring*, published in Sweden in 1963. In the same year the SNC held a significant conference about the environmental effects of mercury (Lundgren 1989). Domestic publications by Rolf Edberg (1966), Hans Palmstierna (1967) and Åke Edfeldt (1969) helped cement the idea of environmental toxins as a problem in need of immediate political action (Anshelm 1995). In 1963 the first state agency specifically devoted to toxins, Giftnämnden, was established. Its scope was eventually broadened to include anthropogenic substances more generally. In 1964 the Social Democratic government decided to pay increasing attention to environmental issues, and in 1967 the Environmental Protection Agency (EPA) was created. A government proposition in 1973 (governmental proposition 1973:17) focused on the use of chemicals in consumer products, and in 1978 the national program for environmental monitoring was established. In 1986 Giftnämnden changed its name to the Swedish Chemicals Agency, the name that is still in use, in conjunction with the establishment of the "Law on chemical products" (Lundgren 1989). In 1998 chemicals control was incorporated into a new system with environmental objectives decided by parliament. Several of

the 16 objectives (in 1998, there were only 15) relate in some way to chemical hazards. One objective, ‘A Non-Toxic Environment’, is exclusively devoted to such issues. In 2007 the European chemicals legislation REACH was adopted. The consequences for Swedish regulation are yet to be evaluated.

Since chemicals first started to be defined as objects for political action in the 1960s, the Swedish landscape of chemicals control has gone through significant changes, reflecting broader developments on the global market for chemicals. First, the primary sources of chemical diffusion are no longer singular point sources, which were relatively easy to identify and control. Instead, chemicals are typically spread through diffuse distribution through water, air and consumer products, making the task of tracing substances nigh on impossible. Secondly, whereas the environmental problems associated with chemicals in the 1960s were typically national in scope, the problems facing chemical regulators today are global, both in the sense that the country of origin may be located just about anywhere and in the sense that legislation has to be harmonised through international treaties (Lundgren 1989). Third, global chemical production has grown dramatically, both in terms of the number of individual substances and in terms of volume. From the 1930s to the end of the century, global production is estimated to have grown from 1 million tonnes annually to 400 million tonnes (EU Commission 2001, p.4). The OECD estimates that global production will increase by 3 % per year up to 2050 (OECD 2012, p.311). This increase in chemical production has been accompanied by an uncertainty increase. Growing knowledge about chemicals’ effects and characteristics has brought increasing awareness about how much is not known (e.g. Thelander & Lundgren 1989).

Finally, the political approach to the environmental issues associated with chemicals has gone through two significant shifts. When the Social Democratic governments of the 1960s first acknowledged the need for political measures in order to safeguard human health and the environment from the hazards of industrial society, it did so on the premise that rational, technocratic policies that balanced industrial and environmental interests against each other would be adequate to the task of protecting nature while allowing for continued economic growth (Anshelm 1995; Lundqvist 1971; Mårald 2007; Lundgren 1989). However, as the realisation dawned on experts and policymakers that the complexity of environmental degradation would not allow for any quick fixes and that environmental protection might actually be incompatible with industrial expansion, the idea of controlled pollution of nature started to be questioned. Since the Brundtland report of 1987, the idea of a sustainable society has somewhat defused the threat of chemical pollution, cancelling the tension between economic growth and environmental protection, and signalling the promise of adequate political and market solutions (see Swyngedouw 2007; Bludhorn 2007). The framing of the chemical issue in terms of the vision of a sustainable society has brought the paradoxical situation of today, in which the image of chemical society fluctuates between something highly regulated and controlled and a great, scary experiment for which no one is responsible.

The Central Tenets and Their Problems

The Swedish system of chemicals control rests upon a number of central principles, methods and ideas, some of them pronounced and distinctly formulated, some of them tacit and informal. In the following, the article presents what will be called the central tenets of Swedish chemicals control, and the associated problems for the EPA and the SCA. In the section that follows, the implications of these problems for the overall system of chemicals control are discussed.

Environmental monitoring – slowness and systemic lock-ins

The overall purpose of the environmental monitoring program in Sweden is described by the EPA in its 2007 review as:

> "The detection of new, hitherto unknown environmental disturbances [and] to register potential changes in the quality of the natural environment, thereby revealing whether the environmental work is leading to a better or a worse overall environment." (EPA 2007, p.14).

The detection of environmental disturbances or changes in the environment is, however, precarious. The monitoring that is performed by the EPA is primarily focused on long-term, standardised measures in a range of specific geographical areas designated as representative of certain natural environments, such as inland lakes or forests. Being able to detect a change from such tests is highly difficult in the first place, and being able to trace such changes to individual chemical substances is nigh on impossible (I-1; I-2; I-3: I-4). Therefore, there is a substantial divide between the actual monitoring of the environment and the testing of chemicals, which is mainly done through standard testing in laboratories.

By far the largest budgetary item in the environmental monitoring program is the time-series monitoring through which classic toxins, such as DDT and PCB, are followed over long periods of time (Bremle 2006). This is quite far from the 'detection of new environmental disturbances' that is said to be its primary objective in the above quotation. Rather, it is about the continuous monitoring of well-known substances that, in most cases, have long been phased-out of production. The precarious and uncertain nature of every kind of pronouncement about environmental status is shown by the fact that not even in these instances is the EPA able to conclude much more than whether the occurrence of a substance is increasing or decreasing; judgements about reasons for such fluctuations are often not feasible (e.g. EPA 2005b; I-4). Indeed, the EPA, in their investigation regarding the objective of developing early warning signals in the monitoring system, conclude that:

> "In order for the environmental monitoring programs to be able to detect new environmental threats, they have to be fundamentally designed for that purpose. Such is not the case today, with some exceptions. On the contrary, this objective has been consciously down-prioritised. [The

> current approach] instead means a focus on the monitoring of *known* environmental qualities, *known* threats, and *expected* effects of *adopted* targets. This is hardly compatible with a broad warning system for more or less unknown or rapidly emerging environmental threats." (EPA 2005, p.p.6; author translation, italics in original).

Actual effects testing is done according to standardised parameters that usually cover persistence, tendency to accumulate upwards in the food chain, and toxicity (EPA 2007b). These are the characteristics of the classic toxins such as PCB and DDT, which is explained by the simple fact that the environmental monitoring program was established to deal with these and similar toxins. There are, however, three problems associated with this systemic lock-in. First, there is always an inherent – and of course therefore unavoidable – uncertainty in every kind of analysis of environmental data (e.g. EPA 2007b; I-2; Fischer 2000; Stirling 2003; Michaels & Monforton 2005). Secondly, there are a number of aspects of chemicals behaviour which were not known or were not relevant when the monitoring program was established, but are now known to be of acute importance. These are often difficult or impossible to capture through standardised testing (EPA 2007; see also Jasanoff 1999; Olwenn, Scholze & Kortenkamp 2013). For example, there is what is known as the cocktail-effect in which chemical substances interact in unpredictable ways, creating synergy effects that none of them would reveal when tested individually. Another is long-term exposure (SCA 2010c; EPA 2007b; EPA 2012; I-1). Thirdly, the EPA and the SCA live under the impossible epistemological condition that knowledge about what aspects of chemical behaviour are relevant to consider is continuously changing (I-6; SCA 2010). Given this, it is not surprising that when new potentially dangerous substances are identified in the natural or urban environment, this is often done *outside* of the systematic monitoring system, either by non-standard methods of testing or more or less by chance, through the attention of individual scientists (I-3; SCA 2011b; Wiklund et al. 2012). As stated above, the slowness was built into the system from its inception in the 1960s. Duit, in his institutional analysis of Swedish environmental protection, sees the reformation in the 1990s, in which the system of environmental objectives was established, as a largely failed attempt to adjust the structures of environmental monitoring to new problems (Duit 2002).

To this image of thoroughly slow-moving environmental monitoring, with a highly limited search spotlight, should be added the inherent slowness of regulatory processes. In order to be able to impose restrictions on a chemical substance, the SCA has to be able to prove its potential hazards, as well as be able to argue convincingly that restrictions will not have unduly detrimental socioeconomic effects (in which case it will also have to be able to identify possible alternatives). The problems associated with regulation are discussed below. Suffice it to conclude for now that environmental monitoring and chemical regulation are slow, long-term and mostly by definition retroactive processes, despite the standard rhetoric within official environmental policy about early warnings and pre-emption.

Now, it may be argued that the area of chemical regulation is one where slow-moving processes of problem identification and remediation are not problematic, since environmental effects themselves are slow to arise and rarely irreversible. However, when the estimated growth-rate of the chemicals market – 330% to 2050 according to one of SCA's estimations (SCA 2008b, p.28) – as well as the inherent uncertainty surrounding every investigation of a certain substance are taken into account, we do appear to be faced by a dilemma. This dilemma is perhaps most obvious in cases of radically new technologies, such as nanomaterials, for which existing regulatory frameworks are deeply inadequate and for which even the most basic knowledge is often missing. The deep lack of knowledge about such products and the difference in regulatory cultures between countries and regions, aggravates the inherent problem of slowness (see Falkner & Jaspers 2012).

The Precautionary Principle

Even before the implementation of REACH, the Swedish market for chemicals was formally regulated by the precautionary principle, which stipulates that definitive scientific proof shall not be a prerequisite for the imposition of regulations on a substance if it poses a possible threat to human health or the environment. In absolute theory, this would mean that only safe chemicals are produced, whereas in practice, of course, difficulties of interpretation and implementation frequently arise. There is a vast literature on the merits and demerits of the precautionary principle, and it is often juxtaposed to regimes privileging formalised risk-assessment instead (e.g. Dinneen 2013; Ambrus 2012; Antonopoulou & van Meurs 2003; Wiener et al. 2011; Warshaw 2012). However, while there may indeed be important differences in degrees of precaution between different regulatory approaches – most notable is perhaps the US-EU controversy over GMO regulation – the fact is that every form of regulation is equally dependent on science in combination with normative judgements. In itself, the precautionary principle determines nothing about how the burden of proof should be divided between industry and regulatory agencies.

Two main issues make the use of the precautionary principle problematic for the SCA. First, they are reliant upon the data supplied by the producer, data which, while being a crucial factor in the regulation, is severely limited in that it reveals only some basic, laboratory parameters about the substance in question, while it is also quantitatively enormous when gathered in the ECHA (European Chemicals Agency) database. Somewhat paradoxically, then, this mass of data is both insufficient and over-abundant. Much of the work at the SCA is devoted to finding creative ways of identifying troubling substances in the jungle of product information supplied by chemical companies (I-5; I-9). When a troubling substance has been identified, it is rarely a clear-cut case of immediate danger. Rather, it becomes the target of further investigation by the SCA (or by another national chemicals agency), something which usually takes a couple of years, and which typically results either in the recommendation of a safe limit or of dialogue with the industry regarding possible

substance substitution (e.g. SCA 2009; SCA 2008; SCA 2010b; SCA 2011). Only rarely does the SCA propose an all-out ban.

Secondly, the SCA will then have to take action through the framework of REACH and the EU, where the precautionary principle has traditionally been applied less strictly than in Sweden in issues relating to the production of chemicals (I-9; Löfstedt 2003; Eckley & Selinn 2004). Since the implementation of REACH, such action is typically taken by arguing for the incorporation of a certain substance in the Candidate List, which includes substances of very high concern (so called SVHC substances). Substances from the list may eventually be moved into Annex XIV of REACH, which means they may only be produced under special permits, but the idea is also that the Candidate List in itself will put pressure on companies to initiate a substitution process. There is also the possibility of arguing for the incorporation of a substance into Annex XVII, which means production is either restricted or completely banned. Both these measures are time-consuming and slow-moving. The end result in itself, in the case of the Candidate List, is not the legal restriction of a substance but rather hypothetical pressure on the industry to find a safer alternative. What makes things especially problematic for the SCA, however, is that this whole process is devoted to individual substances, which may often be replaced, if indeed a replacement is enforced at all, by a similar substance whose effects are even less known (I-3; I-6; I-9). So while the work of identifying a problematic substance, arguing for and eventually enforcing some kind of restriction is slow and arduous, the introduction of a new chemical onto the market is relatively easy and quick for a chemical company (SCA 2010). It is clear that while strict enforcement of the precautionary principle may have far-reaching consequences when applied to a generic phenomenon such as GMO, it loses much of its power when it is applied on a case-by-case basis, as is the norm in the regulation of chemicals (e.g. Johansson 2009).

Substitution Principle

The substitution principle incorporated into REACH was modelled on the Swedish original, which in the case of chemicals regulation goes back as far as 1972 (Löfstedt 2014). [1] Despite its long history, however, certain foundational problems associated with its implementation have never been adequately resolved. These were analysed in depth by the SCA between 2006 and 2008, when the agency was tasked by the government to investigate the practical implementation of the principle in the field of chemicals regulation and how it could be improved (Beijer 2007; SCA 2008b, SCA 2007; SCA 2008c).

First, just as with the precautionary principle, there is a fundamental problem in implementing a principle that is inherently vague. While there are diverging definitions of the substitution principle, the one supplied by Ahrens et al. (2006) will suffice for the purpose of discussion: ‘The substitution of a hazardous substance or product signifies its replacement by a less hazardous substance, product or process.’

From this definition, it is immediately obvious that the regulating agency responsible for the implementation needs sufficient knowledge to make accurate judgements regarding both the chemical product to be replaced, and about the chemical to replace it. In reality, as the SCA explains in their reports, this is rarely the case. The lack of knowledge regarding most chemicals in use often means that when the substitution principle is actually implemented, it results in a relatively well-investigated chemical being replaced by a chemical whose effects are largely unknown (SCA 2008b; SCA 2009; SCA 2008; SCA 2007). This fact also has obvious implications for the precautionary principle, since an application of the latter would usually entail substitution rather than a total and immediate ban of a certain chemical.

Secondly, the idea of substitution in Sweden rests on company responsibility as a crucial factor, i.e. the companies themselves are expected to keep track of which substances are problematic and should be phased out, and which substances could be used for replacement. This idea is very difficult to put into practice since the companies very rarely have the scientific expertise to make such judgements (SCA 2009b; SCA 2011c; Beijer 2007). Even if they do have such knowledge, there is a lack of incentives for companies to pinpoint risks and proclaim a need for substitution (SCA 2008b; SCA 2007; I-6; EPA 2011). In other words, the paradox in environmental regulation noted by Wagner (2004), by which 'actors who create externalities are best situated to access and produce information on the nature of the harms that their activities cause, but they also stand to lose from providing such information', is only partly applicable in the case of chemicals control. Furthermore, the research and development needed for the development of an adequately tested replacement chemical is typically resource intensive, and not something an individual company could always be expected to initiate. Substitution would therefore usually necessitate industry-wide effort (SCA 2009).

Thirdly, the lack of required knowledge and expertise is mutual. To be legally enforceable, the substitution principle requires that the SCA (or another supervisory authority, such as a county administrative board or a municipality) be able to identify the existence of a plausible alternative, which necessitates deep industry-specific insight and knowledge about product functionality that it rarely possesses (SCA 2008b). The SCA expert at risk assessment within REACH also expresses 'doubts' about whether the socioeconomic group of experts in REACH tasked with weighing the economic value of a certain substance against its potential environmental risk is capable of making an adequate judgement (I-9; see also Brouwer, Cauchi & Verhoeven 2013).[2]

REACH

The European chemicals legislation (Registration, Evaluation, Authorisation and restriction of Chemicals) was developed out of an identified need for a harmonised regulatory framework within the union. The issue that was identified as most acutely in need of redress was the discrepancy between regulations covering new and old

chemicals. This was due to a history of piecemeal regulatory efforts, which meant there was a great lack of knowledge regarding chemicals introduced before 1981 (see for example, Fischer 2008; Krämer 2000; Commission of the European Communities 2001, for descriptions of the permutations on the chemicals market prompting the introduction of new legislation). The people interviewed about the SCA and the EPA unanimously agreed that the law was a step in the right direction, but certain descriptions also highlight features of the new landscape of chemicals control brought on by REACH, which nuances the picture of progression.

The one aspect of REACH that is identified as the most significant at the EPA and the SCA is the information prerequisite for the production of all chemicals (e.g. I-3, I-4; I-7; I-8). This requires a company to provide information on the chemicals to be produced prior to any production. In theory this will guarantee that no dangerous substances are put on the market. In practice, of course, there is a large gap between the supply of a set of basic test data on a chemical and the actual identification of hazardous substances from that data. First, there is the issue of who will actually manage all the data that is flowing into the ECHA database in Helsinki, and how. The sheer quantity of data is highlighted by several of the informants at the SCA as a fundamental problem. One of them likened the situation to the famous search for a needle in haystack (I-5; I-7; I-8; I-9). Secondly, the same problems that apply to the implementation of the substitution principle (see above) apply here, pertaining to companies' lack of incentive and/or ability to provide the information required. A potentially important difference lies, again, in the scope of the database, which reduces the possibility of detecting flaws in the information provided by companies as compared to a strictly national system of control (I-6; I-7; I-8). Thirdly, the data supplied through REACH suffer from the same limitations as all data regarding chemicals, which means that only certain basic parameters are detailed, from which only certain limited conclusions can be drawn (SCA 2010c). Finally, the framework has as yet failed to incorporate certain dimensions that the SCA identified as being of possibly crucial importance for the future, such as the diffusion of chemicals through the importation of products from countries outside the union (SCA 2011c; SCA 2009). In one of their reports, the SCA conclude, bluntly, that REACH is 'insufficient as regards the demand on companies to provide adequate knowledge about the hazard of chemical substances in order to guarantee a good level of protection' (SCA 2011c, p.12; my translation).

Thus, while there is an agreement at the SCA and the EPA that REACH is an important step forward in theory, primarily due to the information proviso, there remain important question marks regarding the practical value of the information that will be supplied by companies. The dominant attitude at the two agencies is that REACH is an absolute prerequisite for adequate chemicals control within the EU, but that it is far from sufficient.

Apart from the issues pertaining to the data requirement, however, there are also two aspects in which the implementation of REACH might actually mean a retreat on chemicals control for Swedish agencies, rather than a step forward, no matter how small. The first has to do with the harmonising effect of the legislation,

which means that a country may not enforce stricter regulations (except in rare circumstances) than have been decided by the Commission. For a relatively progressive country such as Sweden, this may result in unwanted compromises (SCA 2011b; SCA 2012; I-9). The second has to do with the regulatory process, which has slowed down, having been largely moved from the national to the supranational level. Not only will the path to an eventual regulatory measure be longer within the EU than it would have been if only Swedish actors were involved, but the measure, once in place, will also be more difficult to reverse or alter (SCA 2010d; SCA 2011; I-9). The latter point is especially significant, since knowledge of chemicals is inherently uncertain and prone to frequent and substantial revision.

Discussion

The analysis above has revealed how the central tenets of Swedish chemicals control are fraught with difficulties. There is nothing interesting in this observation in itself: A discrepancy between official policy and practical implementation is, one would assume, a reality to some extent in all professions and fields of state activity. What is relevant in the case of chemicals control is that these difficulties, on closer reflection, seem to undermine the whole superstructure, this superstructure being a system that promises control over the anthropogenic substances released into the urban and natural environment. The difficulties identified above are symptoms of what Beck calls ‘the Gordian Knot’ of modern risk society, a knot that is tied ever tighter with the triple threads of technological, scientific and economic expansion which are the source of the environmental evils that confront us, but which are at the same time identified as the only solution (Beck 1995). In what follows, the author will discuss three ways in which the underlying instability and uncertainty of the whole system of chemicals control is reflected at an institutional level at the EPA and the SCA.

An institutional subconscious

The reflections about fundamental problems made by the agencies themselves, as analysed above, always surface as occasional flashes of uncertainty in an overall picture expressing a well-functioning system of control. Statements that logically must be taken to completely undermine this image of control are thus shunted to the periphery, as it were, and made the exception to the rule, rather than the rule itself. Terms such as ‘the chemical jungle’ are used to describe the situation (EPA 2007, p.33); the head of the environmental monitoring unit says, somewhat despairingly, that ‘she does not even want to know’ how many new substances are brought into production each day (I-1). The SCA may conclude that ‘despite growing knowledge, the situation gets increasingly difficult to manage’ (SCA 2010, p.37). Despite this, the conclusions of the agencies’ reports always end up in an ideal world, leaving the

fundamental problem descriptions behind and arguing *as if* the precautionary principle works well in practice, *as if* the substitution principle works well, *as if* the uncertainty permeating all chemicals control could actually be managed (see Renn 2014 and Olofsson 2014 for a similar point).

This should not be taken as an attempt to disparage the way these agencies go about their business, or to suggest some kind of cover-up. Indeed, the identification of these problems comes from the agencies themselves, so any suggestion of a cover-up would be highly misplaced. Rather, a likely assumption is that any regulatory regime would have little to gain from laying too much stress on uncertainty and lack of knowledge (see Jasanoff 1992; also Brysse et al 2012). Instead, this point is made in order to highlight the way this splintered image of what chemicals control might actually achieve, results in what can be called an institutional subconscious. This subconscious is a separate level of problem definitions, where the effects of ever-increasing chemical production are in fact deemed to be out of control. This level of awareness is not allowed to penetrate into final conclusions or policy recommendations, but also cannot be kept down. This subconscious reveals itself as cracks in an overall picture of systematic control, and the effect is a crucial gap between the image of control that is generally portrayed by the agencies and the reality of uncertainty that is occasionally hinted at.

The same pattern repeats itself throughout the documents produced by the agencies, as in the investigation by the SCA into the possibility of making the substitution principle a working rule for action. Having concluded that in cases where there is uncertainty regarding the toxicity of a substance, the regulatory agencies should use a ‘risk neutral default’, the authors mention, in passing, that ‘the difficulty in applying it in practice is, of course, to find an adequate variable and an adequate probability distribution for it’ (SCA 2007, p.36). Logically, this problem would seem to be insoluble, yet in the report it is simply brushed aside, or rather left uncommented. Even though no systematic analysis of REACH documents has been made for this article, the same observation tends to be valid for that level also. For example, Article 60(2) specifies as a target for chemicals regulation that ‘the risk to human health or the environment from the use of a substance arising from the intrinsic properties specified in Annex XIV is adequately controlled’; where ‘adequately controlled’ is defined in Article 60(4). Read Article 60(4), and you discover that the definition does not give much help in deciding what ‘adequate control’ is, since the concept is vacuous in a situation where uncertainty permeates all testing.

Again, it is not the objective of the author to criticise the work performed by regulatory agencies or the phrasing of the REACH legislation. Neither is it the point to claim that definitions for regulatory principles of the kind just quoted are unnecessary. Rather, the point is to draw attention to the fact that these attempts at defining elusive regulatory terms testify to the fundamentally impossible situation of the regulatory agencies tasked with producing rules and principles for the control of chemical production that is inherently uncertain and that is allowed to expand rapidly without any significant political opposition. The attempt to define terms such as ‘adequate control’ are certainly necessary for the regulatory purposes of the

professional chemical agencies in Europe, but such definitions will never come to grips with the underlying problem of an ever-expanding chemical society. Terms such as ‘the precautionary principle’ are suggestive of highly active chemicals regulation, where substances are barred from entering the market on the mere suspicion of their carrying potential threats to human health or the environment, but when analysed more closely, such principles risk evaporating into thin air.

Productive Uncertainty and Scandal Beauties

There is also another point that must be made regarding this tendency, namely its productive effect. Uncertainty is always swept to the margin and construed as the exception within the overall representation of chemicals control, the Swedish system of chemicals control is portrayed, on a general level, as adequate to the task, a well-adapted system with certain flaws that may be remediated in the future. This is a result of the phenomenon that is explained by Jasanoff by referring to Bauman’s identification of a ‘gardening instinct’ within the modern state, an impulse to suppress every tendency to uncertainty and to always maintain control (Jasanoff 2005, p.27). Jasanoff writes of the way modern risk regulation approaches nature with certain preformed formulas that render it always controllable, even while its fundamental uncertainty is, superficially, acknowledged (Jasanoff 2005). In the same vein, Beck argues that by treating as calculable risks processes and phenomena in nature that are inherently unstable and unknowable, modern risk regulation radically transforms and disarms the dimension of uncertainty, rendering it ‘safe’ and unthreatening (Beck 1992, 1995; see also Adam et al. 2000; van Loon 2002; March 1994).

It would be highly unfair to suggest that the EPA and SCA are in any way falsifying reality, painting over the cracks of a dysfunctional control system. Indeed, the system is in fact working according to its premises, premises that are set politically and, since the establishment of REACH, mostly outside the jurisdiction even of Swedish policymakers. The identification of the fundamental problems of chemicals control that have been highlighted in this article are to be found in the agencies’ own reports, and they could therefore hardly be accused of not acknowledging uncertainty. Rather, productive uncertainty becomes an institutional logic almost by necessity, since a regulatory agency that allows too much focus on the uncertainty that lies behind its decisions and suggestions will undermine its own authority (see Jasanoff 1992).

Productive uncertainty, as explained by Jasanoff, refers to the promise of control inherent in the admission of a current lack of knowledge: What we do not know today we will know tomorrow (Jasanoff 1999). To this explanation should be added two further aspects. First, the way uncertainty is taken as a precondition for not implementing systemic change. No matter how practically impossible the idea, it deserves to be stressed that a precautionary principle taken to its logical conclusion would mean that the vast majority of the anthropogenic substances circulating in society today would have to be taken out of production. Second, the way uncertainty

allows for a proliferation of symbols that indicate control. It is precisely because of the high uncertainty involved in chemicals control that these symbols are loaded with meaning, since it obfuscates their lack of practical significance for today's chemicals control.

This latter, symbolic dimension of productive uncertainty works on several levels within the system of chemicals control. It is constituted and reinforced firstly by what could be called 'scandal beauties', substances such as DDT, PCB and mercury that have been successfully regulated[3] in the past and that therefore stand as symbols of a successful regulatory regime. These were the substances that led to the realisation that anthropogenic substances needed monitoring, and for which the whole system of control is still set up. They remain as representatives of what is often promoted as one the world's most advanced systems of environmental monitoring. However, as already stated, that kind of classic toxin forms only a small and relatively well-monitored part of the chemical production of today. Secondly, productive uncertainty works through the propagation of principles such as the precautionary principle and substitution principle, mantras that imply a highly active and progressive chemicals regulation but have no or little real practical effect. Still, as long as they are repeated and occasionally evoked, they give the impression that they are functional. These are similar to what environmental historian Lundgren identifies as central 'myths' in Swedish environmental politics, by which he means certain ideas that have been established as facts but have had no real impact in practice (Lundgren 1989). Thirdly, official environmental policies and targets such as the environmental objective 'A Non-Toxic Environment' serve to create the wholly counterfactual impression that Swedish society is moving in the direction of fewer chemicals, when the opposite is in fact true. Finally, it should also be stated that the very existence of a system of chemicals control holds the implicit promise of control, even when the system is permeated by uncertainty. Thus, through these four dimensions, uncertainty is made into something either controllable or irrelevant, and therefore always subjugated to the overall impression of control.

At a national symposium for chemicals control, the concluding discussion took the form of an exchange between a professor of environmental chemistry and the head of an environmental NGO. The exchange showed how the cracks in the overall picture of the Swedish chemicals control allow for two radically different interpretations. While the premise for the whole symposium was that chemical production today was a significant problem, the chemistry professor maintained that the current regulatory regime was adequate to the task, that incremental modifications were the recommended path for the future and that, crucially, regulatory agencies 'must not base their judgements on guesses, but only on sound science'. The reply from the head of the NGO was that the regulation of today is fundamentally based on guesses; guesses arrived at through sound science, but guesses, nevertheless. The position of the chemistry professor is premised upon the phenomenon of productive uncertainty: the marginalisation of uncertainty under the paradigm of control hides the fact that the effects of the proliferation of chemicals under the current environmental policy are themselves shrouded in uncertainty. It is a

view that runs through all the empirical material studied for this article and forms the core of the Swedish system of chemicals control. In the concluding remarks, the article will return to this, the character of productive uncertainty and how, more precisely, it may be explained. Suffice it to say, for now, that it is a phenomenon that actually legitimises the rapid expansion of the chemicals market by allowing for the idea of constant control, or more accurately, by disallowing for the idea of uncontrollability.

The Mythical Consumer and Ambivalence of Agency

The double consciousness at the EPA and SCA that was identified and analysed above also has the effect of creating an ambivalence of agency. The large uncertainties inherent in the system of control and the lack of knowledge regarding most of the chemical substances that are introduced into the consumer market each year has created a situation where regulatory agencies have no possibility of giving consumer advice regarding chemical risks, except regarding a small minority of existing substances. At the same time, the move towards consumer power in state governance during the last decades, or what is often termed *post-politics* (see Swyngedouw 2007; Bludhorn 2007; Mouffe 2005) has established, almost as a fact of nature, which the individual consumer must always be allowed to make their own decisions regarding what to consume and what not to consume. According to political dogma, the transformation into an environmentally sustainable society must be driven by consumer decisions, not political directives.

In the case of chemicals, this means that individual consumers are expected to make informed decisions regarding substances that not even experts know very much about. This engenders an ambivalent attitude at the EPA and the SCA towards the transformative power of consumers. On the one hand, the crucial role of consumers is frequently highlighted in reports and by the respondents, as well as the importance of consumer awareness and an effective system of product information (SCA 2009b; SCA 2008b; I5). On the other hand, the idea of a consumer-driven substitution policy is undermined by the fundamental problems regarding knowledge about chemical risks that were identified in the preceding section of this article. Whereas one report may applaud the pressure being exerted by consumers on companies using hazardous substances, another may point out that there is a lack of environmental awareness among the public (Beijer 2007). Furthermore, it could be argued that the vague concept of ‘environmental awareness’ in itself is troublesome. It seems unclear how a general sense of awareness of environmental problems can be translated into practical action and make a lasting impact on the chemical society as a whole. Certainly, a focused campaign like a consumer boycott could plausibly result in the phasing out of an individual substance, but on an aggregated level it is difficult to see individual consumer choices affect the tendency towards an increasing social dependence on chemical substances, the effects of which are shrouded in uncertainty.

There is an ambivalence in this system regarding what agency the ideal consumer owns. Either she is a highly active and informed consumer, well aware of the risks associated with certain substances and products, in which case the regulatory work of agencies would seem to be superfluous, or she is merely a machine responding to clear warning signals printed on products, in which case the detour around the consumer would seem to be unnecessary and direct regulation would suffice (see further Klintman & Boström 2007 about green labelling). This ambivalence about who has the power to make an actual change runs through the whole system of control and not only as regards the individual consumer. For example, a report on the functionality of the substitution principle states as a condition for its effectiveness that 'companies must inform, educate and make people aware of environmental problems and really care about their solution' (Beijer 2007, p.9). Thus, commercial companies with no interest in raising awareness about environmental dangers associated with their products – and not much knowledge about such dangers either – are identified as responsible for educating consumers about precisely that. Similarly, an important idea underlying REACH is that so called downstream consumers – i.e. companies or individuals making professional or industrial use of a substance that has been produced elsewhere – should be able to exert upstream pressure when they identify a risk in a certain substance. However, the same lack of incentive to act and lack of knowledge regarding chemical substances on the part of companies identified by the SCA in their investigation of the substitution principle (see above) must logically be taken to undermine such a system.

Again, the purpose here is not to identify illogical arguments or contradictions for the simple purpose of fault-finding but to highlight these contradictions as the result of a system logic by which the EPA and the SCA are tasked with overseeing and controlling a chemical production that is uncontrollable. Thelander & Lundgren (1989) as well as Anshelm (1995) have identified a shift in Swedish environmental history whereby a highly technocratic and assertive approach towards environmental problems in the 1960s was eventually replaced by a more uncertain and pessimistic outlook, resulting from the realisation of the width and complexity of the problems. Jasanoff makes a similar point in her analysis of the EPA in the USA, where she argues that the agency went from being confident about the possibility of identifying safety limits for all dangerous chemicals to approaching chemical regulation as an activity that allows for no certain judgements (Jasanoff 1992). The ambivalence in the Swedish system of chemicals control regarding who is responsible for what is the result of a collision between logically incompatible policies, as a neoliberal market ideology and idealised understandings of consumers are mixed with unfounded visions of a non-toxic environment.

Concluding Remarks

In this article, a distinctly bleak prospect has been painted of the possibility of keeping control of the increasing chemicals production. This prospect is visible only

at a general level, where the author finds that distinctions that may be highly relevant on a more detailed level, such as the existence or non-existence of a precautionary principle, are made more or less irrelevant in relation to the magnitude and complexity of the chemicals market. The downside to making such a broad generalisation is of course that nuances get lost; however, the risk with focusing too much on singular instances of regulation, as is the norm in articles about risk regulation, is that it 'won't allow you to see the wood for the trees'. The point with this article has been precisely to make visible the wood and disregard the individual trees, and indeed, one of the main arguments is that it is by focusing on separate details that we lose sight of the overall picture: a chemical society built on a marshland of uncertainty.

This is not to say that focusing on details is wrong; on the contrary, it is probably necessary in order to make possible the incremental progress in chemicals regulation that is indeed possible.[4] Society learns from its mistakes, and chemicals regulation is of course no exception. From the regulatory agencies' point of view, there is usually little to gain from focusing on the general level of the problem, a circumstance which reinforces the phenomena of productive uncertainty highlighted above.

These concluding remarks will highlight the two closely related theoretical perspectives of post-political sustainability policy and post-ecologism, as framed by Swyngedouw and Blüdhorn, respectively, and discuss their relevance for chemicals control. According to Swyngedouw (2007; 2014), the environmental politics of today, and climate change politics in particular, is an empty affair, a vacuous play of hollow signifiers that can never lead to actual change. The reason for this emptiness is that the language of sustainability has been stripped of social conflict and has instead positioned humanity as a universalised and homogenised group united against a vague and unnamed enemy, the depersonalised ecological hazard, that always, in this configuration, lies outside the political-economic paradigm of liberal capitalism. By positing an idealised Nature – a mythical idea of an unspoiled environment – as the state to which nature must be returned through sustainability policies, these policies are made politically impotent, since no such Nature exists. Thus, from Swyngedouw's perspective, environmental threats become constituted as at the same time apocalyptic and as a matter of consensus, as catastrophes that should be averted using the same instruments that made it arise in the first place; in other words, they are depoliticised. Similarly, Blüdhorn argues (2007) that environmental politics in late-modern society are characterised by superficial efforts to change social and economic structures that most people know lead to ecological catastrophe, but concerning which there is a deep-rooted consensus that not too much should be altered. The impossibility for both politicians and their constituents of envisioning the change that is needed for sustainability to be a real phenomenon and not merely an empty signifier leads to a situation where the performance of politics is everything and real political action does not exist. Blüdhorn draws a distinction between symbolic politics and politics of simulation. The former concept, he argues, implies the existence of two levels, one of performance and one of actual change,

whereas from the latter the possibility of real action is vacant. Late-modern environmental politics, he claims, is pure performance.

To a certain degree, these analyses of post-political and post-ecological environmental politics may explain the aspects of Swedish chemicals control that have been discussed in this article. In particular, Swyngedouw's identification of an idealised Nature that is completely separate from the environmental politics actually performed serves well to explain how the Swedish government can adopt unfounded visions of a future without anthropogenic substances. However, the apocalyptic overtones characteristic of climate politics are almost completely missing in this context. Rather, a fundamental point to be made about chemicals control is that there is no evidence that the uncontrollable expansion of the chemicals market will lead to disaster; instead, no one knows what the effects in the future upon environment and human health will be. Without a doubt, anthropogenic chemicals form an important part of most consumer industries, whereas the downside to this dependence is highly uncertain.

As compared to the situation in climate change politics described by Swyngedouw and Blüdhorn, the author of this article would claim that it is precisely the lack of a coherent vision about future effects that allows for the status quo in chemicals policy. Blüdhorn writes about the politics of simulation as a politics 'by means of which late-modern society manages to sustain – at least for the time being – what is known to be unsustainable' (Blüdhorn 2007, p.253). In the case of chemicals control, that statement is not valid, because no such knowledge about unsustainability exists. Rather, there is a vague unease about the path society has taken in its forever increasing dependence on anthropogenic chemicals, an unease that may result in promises about a future toxic-free environment, but not in any actual change in policy.

Thus, this author would argue that the concept of symbolic politics, which Blüdhorn deems to be inadequate to describe environmental politics in the post-ecological condition, is actually perfectly apt for categorising the official chemicals policy in Sweden. The environmental objective 'A Non-Toxic Environment' is nothing but a hollow symbol, a vacuous promise that has absolutely no relevance for the work being performed by the EPA and the SCA. Blüdhorn sees simulative politics as arising from a situation where calls to 'get serious' about climate action are rendered hollow by the fact that no one, neither decision-makers nor their constituents, is willing or able to fathom the sacrifices necessary for social transformation, except on a purely theoretical level. However, it is important to stress that in the case of climate policy, such sacrifices are indeed articulated, action plans are drawn up and research on renewables is conducted. In the case of chemicals, no calls for politicians to 'get serious' are even heard. Political promises such as 'A Non-Toxic Environment' exist on a purely symbolic level and are, according to the respondents at the EPA and the SCA, more of a burden than a support in their work (I-1; I-6). In these circumstances, it seems that the best way forward would be an official recognition of the facts that have been highlighted in this article: Anthropogenic substances are a fundamental part of consumer society and will only continue to increase in volume and numbers;

the uncertainty inherent in knowledge about chemicals, coupled with the sheer volume of the chemicals market, seriously limits the capacity of agencies such as the EPA and the SCA to maintain control of the production of chemicals; no political attempts are being made to actually decrease society's dependence on anthropogenic substances. To conclude, there is no reason for the formulation of apocalyptic visions, but neither is there ground to claim that the chemical society is anything but an uncontrollable, or at least uncontrolled, experiment.

Notes

[1]There is a slight difference in definition between the concept of product choice, which has historically been used in Sweden, and the concept of substitution, which is used in REACH. The former is more restricted in its application and implies only the replacement of one product with another, whereas the latter could be applied to necessitate the replacement of a product for a totally new technical solution.

[2]For a good review of international literature on the dilemmas and implementations of the substitution principle, see (Löfstedt 2014).

[3] Measurements indicate that the downward trend of PCBs, consistent since the 1970s, has levelled off or even trended upwards in recent years (EPA 2005b).

[4] Indeed, it may well be true, as is sometimes suggested in the risk assessment literature, that incremental changes in a regulatory framework that does not incorporate uncertainty to any significant degree, is not only sufficient but also the best option available (e.g. Goldstein 2011).

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