

Introduction

Achieving 'just sustainabilities' (Agyeman and Evans, 2004) depends on environmental justice activists' ability to produce knowledge to support their claims. While distributional approaches to environmental justice have demonstrated the unequal distribution of environmental harms and opportunities, critical analyses of the social and institutional processes that lead to such unequal distribution direct attention, among other factors, to the discursive production of knowledge (Schlosberg, 2007, Holifield et al., 2009).

Environmental justice activists are specifically concerned with "power as it plays out in the (mal)distribution of harms and opportunities related to the environment with special attention to race and class" (Sze and London, 2008):1348). In every case, power depends on the generation of suitable explanations to legitimate its operation. This, a *raison d'être* of environmental justice movements is the need to contest dominant forms of knowledge that justify and reproduce environmental injustices.

Perspectives that focus on relationship between power and knowledge portray environmental conflicts not only as conflicts about land and resources, but also, as conflicts over meaning and over the capacity of certain actors to establish the 'rules of the game' (Martinez-Alier, 2001). Gramsci's notion of cultural hegemony recognises that class dominance is associated with dominance over cultural production. The development of explanations- in the form of knowledge- is a fundamental aspect of such cultural hegemony. In conflicts over knowledge, however, "one has to distinguish between conflicts which reproduce the existing order of meaning and those in which meaning is contested" (Haugaard, 2007; p. 126). Typically, in environmental conflicts, local residents challenge dominant discourses about the environment not merely over outcomes (i.e. the putative pristine condition of their landscape), but also over the meanings that confer legitimacy to certain actors claiming specific power positions (Aronoff and Gunter, 1992, Capek, 1992). The institutional and political dimensions of environmental conflicts unfold in quotidian experiences and interactions whereby the environment comes to be known and understood. Quotidian interactions between different actors lead to the construction of conflict narratives. Of these, scientific discourses of the environment are hegemonic: the claims of objectivity and disengagement embedded in scientific discourses point at their

exceptionality and thus, their predominance over alternative narratives of environmental conflict. In an attempt to achieve predominance, environmental justice movements may rely on scientific discourses when bringing their claims to public attention. They may enrol scientific discourses through the support of experts within the movement. Local action may also require situated forms of knowledge to contest scientific arguments in relation to specific social and environmental contexts. Social research has demonstrated the potential of contextual knowledges to provide plausible representations of socio-environmental interactions (Harrison et al., 1998, Brown, 1992). However, enrolling scientific discourses in environmental justice movements- whether locally or in broader debates- requires direct engagement with dominant discourses of environment, both in terms of concepts (e.g. risk analysis) or methodologies (e.g. measurement techniques for pollutant concentrations). Ultimately, this implies acceptance of the predominance of scientific discourses over alternative forms of understanding the environment.

Is there any possibility to ground environmental justice discourses outside conventional hegemonic discourses of environmental science? The traditions of social constructionist and symbolic interactionist in sociology have challenged the notion that experts can identify objective conditions in society, and instead, they propose to study social problems *as the actors see them* (Blumer, 1998 [1969]). This body of theory offers a toolbox for deliberate engagement with the experiences of the environment of disadvantaged groups without engaging with claims about research objectivity (Burningham and Cooper, 1999). Rather than overlooking how knowledge is constructed within predetermined cultural hegemonies, the ontological scepticism claim implicit in social constructionism draws attention to the lack of neutrality of knowledge production and how it leads to social inequality and cultural domination.

Bourdieu's understanding of symbolic violence highlights the social practices that constitute cultural hegemonies (Bourdieu, 1979, Bourdieu, 1991). Both social constructionist approaches to environmental justice and the concept of symbolic violence highlight that social order is constituted in the production of knowledge. Taken together, these approaches emphasise that there cannot be equality of perspectives if the capacity of actors to put forward their interpretation of a problem is already shaped by their position in

society and the forms of symbolic violence which emerge within established hegemonic discourses on the environment.

This paper has two main parts. The first one proposes an assemblage of theoretical tools to understand the production of cultural hegemonies focusing on Bourdieu's concept of symbolic violence and the implicit and explicit dialogues of Bourdieu's theory with the traditions of symbolic interactionism and social constructionist studies of science. Second, these tools are examined empirically, from a social constructionist perspective, in a case of pollution from the coal industry in Bosnia and Herzegovina. In doing so this paper raises central questions about how symbolic hegemonies are constructed and maintained and opens up question about the potential to develop emancipatory knowledge-practices while engaging strategically with environmental sciences discourses of the environment.

Symbolic violence and the production of knowledge

Symbolic violence and definitions of the situation

One of the strategies of social constructionist has been asking what does constitute a collective problem in society. Spector and Kitsuse defined social problems as "the activities of individuals or groups making assertions of grievances and claims with respect to some putative conditions" (1977; p. 75), implying that social problems are activities of the members of the society, rather than 'objective conditions' in a static form to be discovered by the sociologist (Spector and Kitsuse, 1977). Who makes a claim and what is the relationship between those who make a claim and those who are affected by it is crucial to understand the politics of the construction of social problems. The next step is to ask what confers objectivity to social conditions and how a collective view on a problem can emerge from an heterogenous set of situated views.

The emergence of a collective view should be understood within "*the generally accepted definition of the situation, whether expressed in public opinion and the unwritten law, in a formal legal code, or in religious commandments or prohibitions.*" (Thomas, 1923); p. 43).

From metaphors to rhetorical devices, social interaction depends on a symbolic system that enables the reproduction of the generally accepted (dominant) definition of the situation. Definitions of the situation rely on the transmission of knowledge for their reproduction. Thus, inasmuch as the generation of knowledge leads to the generation of social and

political institutions associated with structural social and environmental inequalities, the constitution of knowledge is a form of violence for determined groups in society.

The term symbolic violence is used to refer to the discriminatory agency that is practiced in the enactment of everyday life conventions, and the misrecognition of power relations that generate the possibility of such discrimination. According to Bourdieu, this is a form of domination that requires that those being dominated accept the symbolic conditions where the symbolic violence is enacted. Seemingly inspired by Gramsci's ideas of cultural hegemony, Bourdieu writes:

"The different classes and class fractions are engaged in a specifically symbolic struggle to impose the definition of the social world that is most consistent with their interests; the field of ideological positions reproduces the field of social positions, in a transfigured form. They may pursue this struggle either directly, in the symbolic conflicts of daily life, or vicariously, through the struggle between the specialists of symbolic production (full-time producers), for the monopoly of legitimate symbolic violence, i.e. the power to impose (and even inculcate) instruments of knowledge and expression (taxonomies) of social reality, which are arbitrary but not recognized as such" (Bourdieu, 1979) p.80).

Instruments of communication and knowledge used within specific symbolic systems fulfil their political function not just as instruments of domination, but also as instruments of *legitimation* of domination because symbolic violence requires individuals to accept it often without recognising it as a form of violence (Bourdieu, 1991). Symbolic violence relates to the imposition of meaning but "it is not only about the interpretation of specific symbols, the meaning, but also about which tools and mechanisms are legitimated as producing knowledge" (Parker, 1999); p. 1208). Those controlling the mechanisms of cultural production will likely benefit most from the social ordering enacted through symbolic violence.

Symbolic violence is associated both with a will to dominate and with a disposition to accept certain terms of reference by those who are being dominated. Symbolic violence operates insofar as individuals accept it as legitimate, so that the symbolic apparatus becomes part of everyday life and social interactions. Through socialisation, symbolic violence is "successfully masked as natural and inevitable" (Sanli, 2011), p. 287) and it becomes integrated in socially

inculcated beliefs and collective expectations (Bourdieu, 1998). Symbolic violence is instrumental in the production of a collective definition of the situation. Maintaining a collective definition of the situation also relies in an *habitus*, that is, a set of predispositions that orientate social interactions and practices (Bourdieu, 2005).

For symbolic interactionism scholars, symbolic violence is often identified as a constitutive element of society. For example, subtle forms of violence embedded in routine symbolic interactions- such as making a scene- are recognised as having a regulatory function in social life (Frank, 1976). In Bourdieu's interpretation, however, symbolic violence comes to be linked with the class ordering at a given moment and thus, it is the preserve of dominant classes. Symbolic power is concealed in so that, for example, "the devotion a worker feels towards his/her employer, or a wife feels towards her husband may conceal the domination upon which the employer/worker or husband/wife relationship is based" (Sanli, 2011), p. 287).

Turning attention from the active construction of symbolic hegemonies to their silent acceptance, Bourdieu's concept of symbolic violence highlights "the way in which individuals can contribute toward their own subordination by gradually accepting and internalising those very ideas and structures that tend to subordinate them" (Connolly and Healy, 2004); p. 513), as it is shown, for example, in the reproduction of gender identities among working class girls through the mother-daughter bonds. Springer (2010; p) has highlighted, following Butler (1997), that "the capacity to name and thereby constitute what results from subjectivation, marks a disruption in the circuitous pathways of discursive reproduction" and ultimately, contributes to a particular rational project which justify the reproduction of established socio-natural orderings.

Haugaard (2007) emphasises the denial of agency of the 'other' in symbolic violence. He argues that "[w]hat is normatively reprehensible about this is the imposition of meaning upon others without any regard to their self-perception. It is an action upon them, about them, which disregards them as reciprocal social beings. It is an act where a group insist upon constituting a ring of reference which those at the centre of the ring of reference reject" (Haugaard, 2007); p. 124). Symbolic violence results in the characterisation of specific groups of population as "the other" and in their exclusion from the construction and production of social lives and natural worlds.

Symbolic violence and the production of space

The role of symbolic violence in the reproduction of existing order points at the linkages between social structuration and the everyday practice of social life. Understanding how the social construction of environmental knowledge plays out in environmental justice struggles, requires explaining the specific mechanisms whereby established powers are able to appropriate the process of knowledge production, structuring socio-natures and establishing principles for social life.

Studies of the professionalisation of knowledge, especially within the context of development, have described how symbolic violence operates in the neo-colonisation of marginal spaces, for example, in terms of the integration of indigenous exchange and knowledge systems into the capitalist economy. The neo-colonisation impulse is inherent to symbolic violence because it becomes more effective the further it reaches. For example, Bolton (2007) has described how enumerative procedures carried out by experts in counting llamas in the Bolivian Altiplano are effectively a means to produce “certain kinds of people within particular economic realities” (Bolton, 2007); (p. 5). Bolton argues that, not only “the economy” is a social construction but also “the economy is produced as a material reality through specific representational devices” (ibid; p. 15). Thus, counting llamas is recognised as a form of symbolic violence because it is “part of a process of redistribution of knowledge about camelid herding through which knowledge is taken away from local herders and relocated with NGOs and government entities” (p. 16). In the context of “ethnodevelopment”, the professionalisation of indigenous knowledge and indigenous experts is enacted in an attempt to govern spaces of indigeneity (Laurie et al., 2003). While this is portrayed as an example of governmentalities at work in the control and regulation of populations, it also points out at processes of social and political ordering and the symbolic violence associated to the production of “the other” in development discourses. Kothari (2006) characterises development experts as agents who consolidate the unequal relationship between those who see themselves as developed and those who are to be developed. According to this work, the last decades of development practice have seen a movement away from the imposition of traditional scientific expertise to the establishment of the development professional as a generalist who brings local knowledges and values into the development conversation. These practices fail to truly recognise localised forms of

knowledge as legitimate grounds for development interventions and instead focus on training local experts who eventually reproduce the principles and values of mainstream development discourses in practice (Kothari, 2005).

These examples highlight that the professionalisation of indigenous knowledge, far from challenging established social orderings, constitutes an attempt to adapt hegemonic discourses of science and development and promote their acceptance. Symbolic violence thus requires the implicit acceptance of the grammar of development by local residents and practitioners who are initiated into the development discourse through training manuals and educational programmes. Neo-colonisation depends on the establishment of the means to produce meaning rather than on the meanings produced. For example, Nightingale (2005) argued that the distinction between professional and local knowledge serves to support claims of authority and power. In her example of community forestry in Nepal “the symbolic way in which only literate people are considered legitimate forest managers serves to effectively exclude the poorest of the poor from the community forestry management process” (Nightingale, 2005) p. 600).

Environmental science confirms the exceptionality of science as sanctioning processes of knowledge production. Wynne’s classical study of shepherds coping with technoscientific practices of radioactivity management explains how, after the Chernobyl accident in 1986, scientists assumed that observations of radioactive caesium in clay soils, in which it is chemically immobilised, were unconditionally applicable in the upper hills of North Cumbria. Scientists’ projections led to restrictions in sheep grazing, which caused farmers considerable hardship when applied, only to find later that in the acid peaty soils in which these sheep grazed, radioactive caesium remained mobile (Wynne, 1996). In North Cumbria, policy-makers misunderstood the multidimensional complexity of the problem and ignored socio-economic considerations (Wynne, 1996). Leach and Fairhead provided another example of science sanctioning processes of knowledge production about human-ecological interactions in the Guinean savannah. They showed that the small patches of forest were created and maintained by the agricultural practices of local villagers, instead of being relict forest remnants threatened by the locals, as scientists and policy-makers characterised them (Fairhead and Leach, 1996). Both studies coincided in showing that scientists’ ideas about the immediate environment where- at least- not as accurate as those of shepherds in

North Cumbria or local residents in the Guinean savannah. The misrecognition of local knowledge was exposed because scientists were ultimately demonstrated to be wrong. Examples such as these have led to arguments about the need to revisit both the production of science and the interaction between science and policy-making, particularly in the context of complex environmental problems. Calls for post-normal science, for example, have proposed the direct participation of stakeholders in science when dealing with environmental problems which are both contentious and uncertain (Funtowicz and Ravetz, 1993, Ravetz, 1999).

However, the project of bettering science turns attention away from a fundamental critique about the role of science in facilitating the reproduction of social order institutions and structural inequalities. An added difficulty is that symbolic violence is enacted as a constitutive element of social life. It draws attention not only to the specific methods which produce it- the counting of llamas or the production of indigenous professionals- but also to taken-for-granted processes of knowledge production and tacit assumptions about how the world works which explicitly or implicitly reproduce power structures and social relations. For example, the expert and lay knowledge distinction looming at the heart of the aforementioned critiques is also reproduced in more quotidian spaces of intervention. Symbolic violence is also reproduced actions, which are naturalised in everyday life.

Bourdieu's toolkit in the Theory of Practice has another analytical concept, doxa, which relates the production of knowledge which its operation in society (Bourdieu, 1998). Doxa comprises the principles and values- tacitly held assumptions- which inform a particular definition of the situation and organise the social field both limiting the space of inquiry to inform practices and decisions and providing them with legitimacy. Understanding the operation of symbolic violence requires explaining "the underlying doxas around governance practices" (Ojha et al., 2009); p. 372), and how they foreclose the possibility of bringing up alternative arguments which may contradict dominant definitions of the situation. Definitions of the situation are constructed according to specific symbolic systems of belief in which knowledge is a tool to develop and legitimise specific claims about the dominant definition of the situation. Understanding an environmental conflict requires both analysing competing definitions of the situation and the underlying doxa that legitimate some accounts over others, drawing attention to the discursive production of symbolic

violence. The empirical analysis that follows explores these aspects from a social constructionist perspective, explaining alternative definitions of the situation and then to their insertion in the local political context.

Coal ash disposal in Bosnia and Herzegovina: Defining the problem, defining the politics

Haraway (1997) has argued that the embeddedness of semiotic and material components in the production of technoscientific discourses means that their analysis requires an ethnographic and sustained engagement, involving personal commitment. Following Haraway, the next sections develop a personal tale of cultural hegemony production around the production of energy in Bosnia and Herzegovina that emerges from a long-term engagement with the case.

Tuzla is a city in North-East Bosnia, with a strong industrial heritage, ever since the Turks started exploiting its salt resources in the middle ages. With the advent of the coal industry in the twentieth century, built on abundant reserves around the city, Tuzla became one of the energy hubs of Bosnia and the western Balkan region. The area developed further during the 1960s and 70s, when the availability of energy fostered industrial development and the immigration of people in search of employment from all across former Yugoslavia.

In 1959 a coal-fired power plant, TEP, was established in Tuzla. This plant is currently the largest energy production unit in BiH with a net production of 2,806 gWh in 2006, which accounts for 58% of the thermal energy production and 44% of the total energy production in the country (RECOAL, 2009). In addition to pollutant and carbon emissions inherent to the combustion processes, TEP produces large quantities of wastes, ashes and unburned coal, which are mixed with water and disposed of in lagoons, covering an area of more than 170 Ha in peri-urban areas of Tuzla, directly affecting about 4000 people.

People in Tuzla claim that they have a multi-cultural heritage and pride themselves on the lack of dominance of nationalist parties in local politics. The presence of an asset such as TEP made the city a strategic objective during the civil war in 1992-1995. After the war, the end of the 1990s in Tuzla was dominated by an effort to rebuild infrastructure coupled with the industrial decline of the area as a result of the introduction of competition and capital attraction principles to running the local economy. Energy utilities, previously organised as

vertically owned central utilities, were divided in three institutions limited to an ethnically determined territory.

An environmental justice movement has emerged in Tuzla, whose members claim the difficult living conditions of residents in the immediacies of the plant and the coal ash disposal sites. They have organised campaigns involving NGOs, local academics and the media, to demonstrate the impact of energy production on their health and livelihoods and their limited access to representative political structures where their claims could be heard. For the most part, their claims focus on the coal ash disposal sites, the visible and lasting outburst in the landscape directly attributable to energy production in Tuzla.

In 2005 TEP joined an international consortium, RECOAL, concerned with developing sustainable and low-cost solutions for the regeneration of coal ash disposal sites in the western Balkans. The project ran from January 2005 to December 2007 and was funded by the 6th Framework Programme for Research and Technological Development of the European Union. The consortium included research organisations in Bosnia and Herzegovina, Croatia, Austria, Germany and the UK. The project was specifically concerned with integrating local perspectives into the project, to ensure that solutions proposed were appropriated for the Tuzla context and thus, that they were sustainable.

The research presented here started within a RECOAL Work Package, a piece of qualitative research to analyse local perspectives on coal ash disposal finalised in 2006. Through further negotiations, all RECOAL members accepted to participate in ethnographic research, which documented the project operations alongside its impact in the local environment. After RECOAL finished further ethnographic research was conducted in the area in August 2008 and October 2011, with semi-structured interviews exploring the legacy of RECOAL among industry managers, local politicians, NGOs and activists and local residents. Overall, the narrative presented here was developed in over six years of sustained engagement with the case in which the research objectives moved from finding solutions for coal ash remediation, to understanding the potential in local accounts of the environment to reinvent their landscape and their relationship with local institutions and the industry.

The conclusion of this work is that despite some minor achievements, local residents' capacity to develop effective forms of activism is hindered by the dominant scientific discourses about environmental pollution confined to the realms of expertise and

technological management. The co-opting of environmental justice action in environmental discourses is predicated on a form of symbolic violence, which implicitly contributes to the reproduction of discourses legitimating the unequal distribution of environmental pollution. To unpack this conclusion, the following three sections explain: 1) the definition of an environmental issue as a problem; 2) the negation of individuals' experiences and understandings of the place; and 3) the performance of symbolic hegemonies in local political debates, and in particular, how RECOAL's discourses were appropriated by the industry to advance their own interests.

Defining coal ash disposal as a problem

To define coal ash disposal as a problem, RECOAL researchers participated in a brainstorming session during a project meeting in Vienna, in November 2005. A schematic representation of RECOAL's model is provided in Figure 1. The project team identified three main pathways for exposure to risks associated with the coal ash disposal sites (see also (BOKU, 2008):

- The deposition of large amounts of coal ash and the consequent dispersal of ash particles by wind and water, polluting air, water and soil;
- The food chain pollution due to trace elements uptake into crop and fodder plants; and
- The leaching of microelements, such as metals and trace elements, from ash disposal sites, and their subsequent arrival in potable water supplies and other important ecosystems.

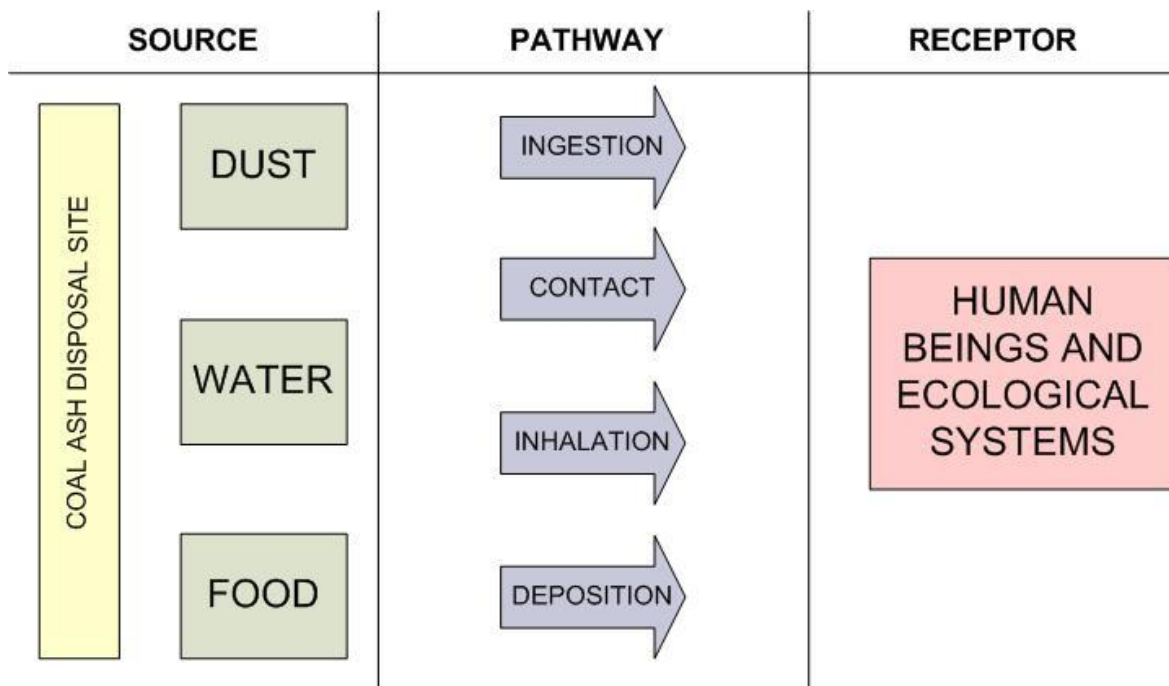


Figure 1: Schematic representation of RECOAL's delimitation of the problem.

According to some RECOAL members, this analysis follows a 'static approach' because it gives an account of a snapshot in time of the pollutant linkages on the site. However, the dust dispersion and leaching processes are highly influenced by the age of the ash because of the physical-chemical conditions in the disposal sites in Tuzla, in particular the elevated pH (around 10-11), and thus, they argued for the need of more research to develop a 'dynamic approach', that is, an approach that can explain the evolution of coal ashes composition over time (BOKU, 2008).

Moreover, the ash composition varies at different depths due to weathering processes. The distribution of pollutants within the disposal sites is a function of the flow of water through the ash. Water is expected to dissolve soluble salts which will be discharged in the outflow. The salts precipitate in the discharge canalisations that bring the water from the disposal sites to the canals. The extraction of salts is likely to lower the pH of the ashes, increasing acidity. Greater acidity facilitates the mobilisation of potential pollutants immobilised at higher pHs, such as cadmium and nickel, which will migrate from the upper to the lower layers of the disposal site following the flow of water to the discharge waters (BOKU, 2008). The consequences of this process are threefold:

- reduction of pollutant concentration in the upper layers of the disposal sites due to migration downwards, mitigating the problems of dust evolvment and direct contact with the sites;
- reduction of the concentration of soluble salts washed away by water and thus reduction of the pH in the effluent water; and
- increase of the concentrations of metals, and thus the toxicity, of the effluent water.

Consequently, RECOAL identified areas of intervention in relation to this diagnosis, including tackling dust dispersion of the outer layers, evaluating and the impact of the effluent in water resources and its treatment and the potential migration of pollutants through the food chain, either by the uptake of elements by the vegetation from the water available or by deposition of pollutants through air. Overall, the definition of the problem of coal disposal bounded the problem and linked the diagnosis with ready available solutions which were subsequently evaluated in the development of the project.

In contrast, local residents accounts of coal ash disposal situate the problem within a wider context with multiple dysfunctional aspects. Pollution, lack of infrastructure, unemployment, massive migration, poor health and political abandonment are the most prominent difficulties that local residents experience in this particular context. Pollution and unemployment were portrayed as two facets of the same problem: industrial decline. Local residents consider health and ecological risks together with the economic situation. The economic difficulties of local residents affect their capacity to deal with the risks of pollution and protect their environment. Lack of resources, whether at the individual or at the municipal level, has prevented actions to protect the local communities and ecosystems from the spread of dust (e.g. wind barriers, erosion protection works), from the pollution of underground waters (e.g. the establishment of filtering stations), or even from any interaction with the disposal sites (e.g. adequate signalling and fencing of the sites and associated water). In summary, local residents' accounts of the environmental risks are embedded in parallel accounts of the economic and political situation. This differs from RECOAL's accounts of the coal ash disposal sites that present them as isolated systems in which the input is the slag coming from the sites and the output is the water, dust and food chain transfers (Figure 1).

Figure 2 offers a schematic representation of local accounts of pollution. The figure does not aim to be exhaustive or exact: instead, it contains an accumulative interpretation of multiple accounts that coexist simultaneously within the local communities in Tuzla (this is different from RECOAL whose problem definition is presented as consensual in project reports and meetings). Figure 2 shows how the problematic focus is shifted from the coal ash disposal sites in the accounts of scientists to the overall socio-environmental situation in the accounts of local residents. Their conclusion is that solving the problem of pollution requires both environmental remediation solutions and political economic actions targeted at the root causes that create the conditions of pollution and prevent local communities from taking appropriate measures to deal with coal ash disposal and the remediation of the sites.

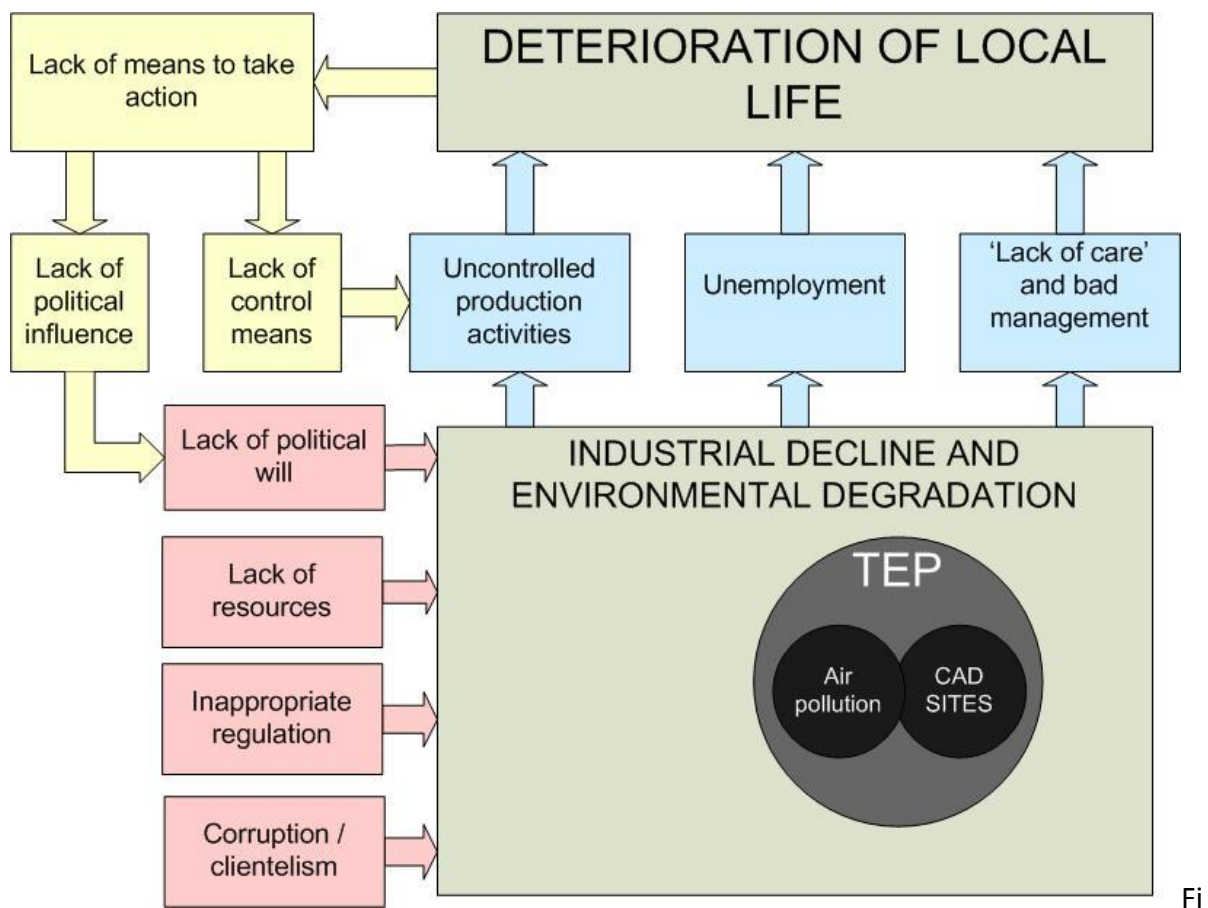


Figure 2: Schematic representation of local residents' delimitation of the problem

RECOAL's characterisation limits the problem to the disposal sites. Establishing boundaries around the object of study is the first doxa of technoscientific practices. In contrast, local residents' accounts include additional environmental aspects regarding the disposal sites

and the environmental consequences of the dust and the pollution of water resources that transcend the boundaries fixed by RECOAL, both spatially and politically.

A boundless problem definition allows local residents to extend the causal chain indicating both causes and consequences of the environmental pollution. For example lack of political will, lack of standards and corruption are all considered causes of the environmental pollution in the area. On the other hand, unemployment, lack of care and the general deterioration of local life are considered consequences of the same processes that result in environmental pollution. The local model shows inherent feedback loops (e.g. the lack of political influence of the local people fails to stir the political will to do something in the sites, perpetuating pollution and continuing the deterioration of local life that reduces the local residents' capacity to exert political influence). Both the energy needs and the health and environmental impacts of energy production are implicit in this causal chain.

Local models of problem definition refer to dynamic relationships between different actors and agents (the current political system, the decline of the industry, the lack of political action). In contrast, the RECOAL model is fixed to a timeless moment overlooking the history and geography of the sites. Moreover, the results of RECOAL only take into account the evolution of the disposal sites when developing solutions to remediate the coal ash pollution. For instance, the project focuses on farming on the disposal sites but this is an activity locally in decline which has become marginal during the life of the project, and that is likely to be substituted by commercial or recreation facilities on the sites. A simplified model of the disposal sites allows RECOAL to describe pollutant relationships in detail but has limited capacity to describe the complex network of relationships through which the pollution was created, of which the disposal sites are only one of many consequences.

Evidence and the negation of the local knowledge

Participatory research among communities in 2005 and 2006 suggested that the main concern of residents was the radioactivity associated with the coal ash disposal sites and its health impacts. This issue has been at the heart of controversies between local residents and TEP, with TEP arguing that radioactivity is not an issue of concern and local residents claiming that TEP is deceiving them regarding the radioactivity levels on the sites. The issue of radioactivity was considered in RECOAL's research proposal even though the possibility of

the ashes being radioactive is highlighted in the literature about coal ash (e.g. (Alper, 2002); (Francis, 1990)). RECOAL's original proposal focused on metals and metalloids. The reasons for this were not clearly specified in the proposal but it is likely that the choice of topic was motivated by the considerable larger body of literature studying metals and metalloids (rather than radioactive elements) in coal ash and the professional experience of RECOAL researchers.

In a stakeholder assessment written for RECOAL in 2005, the local activist NGO Centre for Urban Ideas (CUI) stated (in a footnote) that “[a]ccording to the statements of heads of [the] local community Sički Brod and the citizens, certain number of people are becoming ill with cancer, particularly lung cancer, and the number seems to be higher every year. The citizens claim that the animals are getting sick as well; they are giving an example of local hunters bringing 50 pheasants to disposal sites Divkovići. After few days all pheasants died” (CUI, 2005); p. 3). In the body of the report they explained that radioactivity levels had been measured by ‘the authorised institute’ (unspecified), and the results showed that radioactivity levels were ten times less than the levels allowed in relevant regulations.

Further qualitative research among local residents in 2006 showed that despite institutional and industrial reassurances from the industry and the government, the belief that the sites were radioactive was widespread among local residents (Table 1).

Alija¹: “we thought that when the lye was mixed with the soil this could bring some radioactivity.”

Edin: “people are forced to cultivate these slag sites which are also radioactive, so they cover the slag sites with a thin layer of soil and then grow potatoes, grains and other crops. In that way, they get radiated themselves.”

Elma: “How healthy is it? I believe it’s not healthy, I think it’s radioactive.”

Evad: “Fruit didn’t grow on the sites. I think this is because the sites are radioactive. We call it radioactive.”

Halid: “[T]hat slag from the incineration, which has some kind of radiation. (...) And now, does it really radiate or it doesn’t radiate, and in which proportions, and in which units of measurement? (...) I’ve heard... the slag emits radiation, and then it causes cancer, and then... this is what somebody said. I have heard that slag sites cause some radiations.”

Branka: “I’ve heard on television that there is a slag site somewhere

and that it causes radiation. "

Hamid: "We have certain problems because an opinion circulates that it's radioactive, and it is partly, I know as a civil engineer that that slag is partly radioactive."

Muhammed: "You see, apart from that soot which is surely radioactive, and no one wants to tell us in which percentage, but it surely causes cancer. (...) No expert raised the question of the quality of a crop that grows on radioactive ashes, how much radioactivity it absorbs from the land, how healthy it is, even for cattle to eat..."

Alana: "Because my sister works in a mine. And she says to me: "don't sow there." She says: "it's radioactive, " you know? "It can harm you in 5 years from now, those vegetables, you know,"- she says. She works as the secretary in the mine. She says: "don't you sow there." She says it's dangerous to eat that. That's a slag, you know?"

Table 1: Selected sample of local residents' quotes about radioactivity fears

Many interviewees avoided mentioning radioactivity during the interview and waited until the interviewer turned off the recorder to ask about whether the interviewer knew if the sites were radioactive. Most interviewees explained that they had heard about it on TV or through word-of-mouth, but they were not sure about the truth of the claims. In their numerous meetings to convince local residents about the safety of the sites, TEP argues that radioactivity levels on the disposal sites are comparable with naturally occurring levels of radioactivity. For example a local resident explained that *"when I mention the radioactivity to the director of TEP he says: "Well any ordinary object is radioactive, it's normal, the sites are radioactive but this is not worrying." What does he care when he lives in Sarajevo?"*

Some local activists argue that the mere presence of radioactivity, regardless of the measured level, is dangerous and susceptible to cause damage to the community and that experts and industrial managers regard radioactivity levels as negligible because they are not exposed to them. In this case, the question is not whether radioactivity levels are low enough to be safe, but rather, who cares enough about the community to determine which level is low enough.

On the other hand, local residents highlighted that radioactivity on the sites is a problem insofar as it has detrimental health consequences for the community. As a local resident explained: *"for so many years now, there has been a hypothesis about the possibility of radioactivity. (...) But all these stories derive from the fact that we have a large number of*

people here who have or had cancer.” Saying that the radioactivity levels are normal is only acceptable as long as there are alternative explanations for the high local incidence of cancer (and other diseases and environmental impacts attributed to the radioactivity).

When the results of the participatory research and subsequent qualitative interviewing among local residents were raised within RECOAL, TEP representatives mentioned their efforts to measure radioactivity and explained that they have always found measures of concentrations of radioactive elements within normal thresholds. Yet, other RECOAL members took on this challenge and undertook steps to investigate further whether there was any evidence of radioactive pollution. RECOAL partners at the University of Life Sciences in Vienna (BOKU) initiated tests to measure and evaluate radioactivity levels. This research concluded the following:

“For all sites under study activities of ^7Be , ^{134}Cs and ^{137}Cs were below detection limits. Activities of other radionuclides (^{40}K , ^{210}Pb , ^{226}Ra , ^{228}Ra , ^{228}Th , ^{238}U) in ash and cover soils did not exceed the background load known from naturally derived soils ((Ivanovich, 1982)). In contrast, total concentrations of up to $11,700 \text{ Bq kg}^{-1}$ were reported for coal ashes in other regions of the West Balkans (IAEA, 2003). The low activities measured in Tuzla are very important to dissipate the existing distrust of the local population regarding the possible radioactive contamination of ash disposals.” (Dellantonio et al., 2008); p. 680

RECOAL’s results reinforced the argument that radioactivity was not an issue of concern in the coal ash disposal sites in Tuzla. These results were presented during a public local meeting held in Tuzla on the 11th of July 2007. Most members of the RECOAL team expected that the evidence gathered, particularly the results from an ‘independent laboratory’, would add legitimacy to the results among local stakeholders. Indeed, at the workshop, stakeholders appeared confident about the results of RECOAL, regarding the contamination of water and the potential solutions for remediation of the coal ash disposals. However, questions were raised regarding health concerns related to the alleged radioactivity of the coal ash. The RECOAL Workshop report said:

“Despite reassurances from the RECOAL team that measurements and analyses of the samples taken from the sites were totally independent, some scepticism was expressed about the results that showed the level of radioactivity to be within legal

limits. This scepticism reflects widespread belief, as expressed frequently by informants in the interviews and informal meetings with the locals conducted for RECOAL, that radioactivity of the coal ash deposits presents a serious health risk to the local population, particularly a concern over perceived high rates of cancer. This belief was reiterated by some participants during the group sessions.”

Initially, the ‘factual’ evidence about the absence of radioactivity on the disposal sites failed to convince the local population of the safety of the sites; the construction of the environmental problem as a radioactivity problem remained within the imagination of the local population.

Further interviews in the local communities around the disposal sites in Tuzla during July and August 2008 showed that, although local residents maintained their belief about the sites being radioactive, they were battling to find arguments to contest the analysis of radioactivity as an observation. Three interviewees had identified a minor but steady rise in radioactivity levels according to the measures taken in 2002, 2003 and 2005. The increase alone, they said, was a concern regardless of whether this increase is within tolerable levels or not. They contested the idea that radioactivity has to be measured according to tolerable levels. Instead, they proposed to use minimum possible levels, that is, the minimum level of radioactivity that could be achieved in the sites. They had gone great lengths compiling official certificates of radioactivity levels, as issued by the local municipality, and developing their own analysis to establish the causal link between radioactivity and high cancer incidence.

In October 2011 local discourses of environmental justice appeared to have lost their momentum. Local residents emphasised recent achievements such as, for example, TEP’s contribution to local infrastructure and a district heating system. The conflict has softened (although it may be reawakened soon by the siting of a new disposal site). The discourse on radioactivity is plainly avoided in interviews. Both local activists and NGO representatives knew of RECOAL’s work and some had read the final report, which was provided in Bosnian. The intervention of RECOAL caused fundamental changes in the beliefs of local residents. For example, during our last interview in October 2011, the leader of a local environmental grassroots movement avoided mentioning radioactivity, despite having previously been relentless in putting forward the radioactivity hypothesis. Only towards the end he

explained that although he now believed that radioactivity levels were within acceptable levels, he felt unsatisfied by the lack of explanation about why cancer appeared to be more prevalent in the area. It was this line of reasoning that led him to explain his own experiences of diagnosis and living with cancer. RECOAL results were not conclusive about the link between the presence of chemical compounds in the ashes and the local health problems. Yet, the results were conclusive in terms of denying the local hypothesis of radioactivity. By denying this hypothesis without developing an alternative, local residents were dispossessed from their claims.

What remained violent about RECOAL's attempt to settle the radioactivity issue is the lack of recognition of local residents' agency to develop plausible understanding of their spaces and landscapes. RECOAL's analysis measured radioactivity on the sites but overlooked the observations made by local residents, including the higher incidence of cancer among the local population. Local residents put forward radioactivity as an explanation- not as an observation. RECOAL's work focused on radioactivity as observation. The results of examining radioactivity as observation did not provide an explanation for the health-related observations of local residents in Tuzla. As the case of TEP shows, simply assessing the problem of radioactivity and local health by measuring the concentrations around selected areas does not address the fundamental claims about the injustice inherent to current economic and political orderings in the conceptualisations of environmental problems presented by local residents.

The politics of technoscience in local planning disputes

Symbolic violence is constructed either in the framing of the problem or in the disproof of alternative explanations put forward by non-scientists. However, its impact is mostly felt when science is appropriated in local planning disputes.

According to the chemical analysis, RECOAL concluded that there were some elements that do not pose a risk (e.g. lead), some elements that posed a risk for humans and the environment (e.g. sulphates, arsenic, boron), and some elements that could be causing a serious problem (e.g. molybdenum, chromium, nickel). The acceptability of these risks was evaluated with reference to the background concentrations of pollutants in the environment of Tuzla and with reference to European standards. For example, RECOAL

found that the concentrations of pollutants in the local river Jala were significantly higher than in discharged waters from the disposal sites. Soils in the immediate areas of the disposal sites had high concentrations of nickel, as did soil covers at the disposal sites, so scientists postulated that there were other sources of soil pollution aside the coal ashes.

While these results suggested that local residents around the disposal sites are exposed to environmental risks, they were not conclusive about the pollution sources, and especially about whether pollution could be attributed to TEP only. The restructuring of the industrial economy supports the lack of accountability of TEP with regards to both environmental impacts and economic development. Moreover, additional risks posed by the disposal sites seem minor in comparison with risks emerging in the surrounding landscape, such as the chemical contamination of the river Jala, the low air quality or the magnitude of landslides caused by salt and coal mining. Another doxa tacitly implied in the results is that the acceptability of risks in an already polluted area may be higher than in pristine areas, which turns attention away from the cumulative effect of pollutants in higher polluted areas.

RECOAL provided a range of potential solutions to reduce risks associated with the disposal sites. Soil covers and amendment additions were thought to stabilise the disposal sites and prevent dust dispersion. Crop covers were introduced to prevent erosion and provide a source of income to local residents. Mechanical and biological filters were expected to improve the quality of the discharged waters before being returned to the river Jala. The tests and analyses refined the solutions but the solutions proposed remained in essence the same as those envisaged at the outset of the project. They did not incorporate either local citizens' demands or governmental plans for the sites. Moreover, recommendations for implementation were inconclusive. For example, experiments demonstrated that the addition of amendments was a 'competitive option' with respect to the establishment of a soil cover (Reppman, 2007). However, researchers could not anticipate how solutions could be implemented and the practical constraints that managers or policy-makers could face (e.g. availability of necessary information, quality and condition of the materials, local supply of materials needed, qualified personnel to implement the solutions).

RECOAL carried out experiments that TEP alone could not do because of the lack of resources. At that time, the Municipality, local residents and TEP were fighting a 'battle of evidence', that is, they were bringing into the fore different pieces of evidence to support

their case regarding the existence of risks associated with the disposal sites (Author's reference to be added after review). RECOAL found evidence of 'some risks', but overall, the results were 'better than expected'. TEP managers adopted RECOAL's recommendations for recultivation and argued that they were doing as much as possible to deal with the pollution on the sites. In the on-going negotiations with local authorities, the results from RECOAL served to reassure the local municipality, which moved from a confrontational approach in August 2008 to a more conciliatory tone in October 2011 (provided that TEP collaborates with the municipality in on going infrastructure projects for the local communities, such as district heating).

The way RECOAL dealt with local claims about radioactivity helped TEP to put their case in a positive light. Local residents argued that radioactivity is the main cause of deterioration of their quality of life. TEP argued that radioactivity is not a cause of concern, and thus, local claims were unjustifiable. The results of RECOAL contributed to portray local claims as partisan and misinformed. Although the relatively low concentrations of radioactive elements found on the sites did not disprove the potential health risks caused by non-radioactive elements found on the site (sulphates, arsenic and heavy metals) or the effect of the combination of several pollutants present in the air, water and soil (the latter has never been properly assessed or analysed), the 'battle of evidence' focused on radioactivity only. Framing the issue in this particular way resulted in TEP benefiting from the 'unbiased' results of RECOAL's radioactivity assessment. Local claims were dismissed on the grounds of being unreasonable. Ultimately, the use of RECOAL results by TEP justified and reproduced existing social orderings, that is, the prioritisation of TEP and a national economic interest and engine of regional development, over the concerns of local residents about their health and their future.

RECOAL was relatively successful in meeting the project objectives and developing a research network in the western Balkans. They argued that the impact of the project on improving local livelihoods and wellbeing depended on whether the solutions developed were relevant for the context of Tuzla and whether there were institutions capable of implementing the solutions proposed. However, RECOAL's capacity to improve the quality of life of residents was hindered by RECOAL's definition of the situation, which failed to incorporate local understandings of pollution, specifically, regarding the social and political

responsibilities of different organisations and institutions in configuring the pollution landscapes in which they live.

Conclusion

The case of coal ash disposal in Tuzla shows an environmental justice issue where the struggle is centred on the establishment of meanings that organise the symbolic order and determine the status quo. Local residents' challenges to the symbolic system supported by science are attempts to bring to the fore the politics of economic development and landscape transformations in a system of production which worsens the quality of life in their communities. In the case of Tuzla, TEP is not only challenged for disposing coal ash, but also, together with other industries and government institutions, it is challenged for failing to bring about an economic fabric that makes life desirable or even possible in those areas. The fundamental transformations of the landscape caused by TEP's activities not only cause physical hardship and a reduction of availability of resources, but also, threaten the relationship between local residents and the setting where their lives take place (Author's reference to be added after review). However, the contestation of meaning alone is not enough to bring about broader socio-economic changes, because contestation processes are embedded in specific assumptions about how knowledge should be produced and legitimated.

There is something compelling in RECOAL's idea of being able to develop a risk assessment and technological solutions which automatically would improve the local quality of life in Tuzla. The suggestion is that a research project may indeed provide socially just solutions for pollution and generate institutional reactions to implement them. This potential to fulfil visions of better societies, tacitly assumed in science, enables the development of hegemonic discourses and the willingness of different social groups to accept a definition of the situation, which may or may not be in accordance with their own view on the problem. In the case of Tuzla, that vision justified RECOAL's work, the institutional acceptance of scientific views and the legitimisation of TEP as a powerful economic player in Tuzla. The scientific project was an instrument to support hegemonic definitions of the situation and reproduce the status quo.

Symbolic violence intervenes in the adjustment and maintenance of new forms of cultural hegemony inscribed in the deployment of scientific techniques, which deny the agency of local voices to construct their own pollution concerns. The dismissal of pollution on these grounds not only overlooks the uncertainties surrounding coal ash disposal but also it obliges local residents to renounce their claims on the grounds that they are not formulated appropriately. In this case, while it is true that the RECOAL team made an effort to take seriously local claims about radioactivity beyond the scope of the project, the articulation of research results in scientific terms and the failure to draw practical recommendations which recognised local residents concerns (specially about their health) highlights how symbolic violence acts between the conscious and unconscious as enacted in the processes that determine the truth of any given statement.

Strategically, environmental justice movements have often established alliances with technoscientific discourses to transfer environmental justice concerns beyond the sphere of activism. However, the challenges to established powers posed by such alliance will always remain semantic, and in the best cases pragmatic: they fail to challenge the principles which organise meaning, from the definition of the situation to the articulation of solutions in specific planning contexts. The expert and lay distinction automatically silences and forecloses experiential and emotional arguments in planning and policy-making debates. Who is capable of producing knowledge and whose knowledge has a place in public debates is predetermined by the social distinctions established before meaning itself is produced. Symbolic violence follows- not precedes- the implicit acceptance of hegemonic definitions of the situation and their doxa not only by those who benefit from the existing knowledge order, but also by those who are oppressed by it. As the symbolic interactionists explained, symbolic violence is inherent to social life and experience.

The question here is how can environmental justice movements challenge the principles of technoscience without accepting the very grammar that structures the production of socionatures? Are activists to develop alternatives to technoscience or should they work within it? And, in developing alternatives, can we ever move away from technoscience as the fundamental mechanism to produce discourses of socio-natural ordering? In this on going project, in which responses look more like sketches than fully articulated and consequential theories, I glimpse a glimmer of hope in the everyday articulation and

coexistence of multiple visions of what the world is and how it should be as it is highlighted in social constructionist analyses of environmental problems.

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ⁱ Names are pseudonyms.