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Publisher: Routledge

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## Health, Risk & Society

Publication details, including instructions for authors and subscription information:

<http://www.tandfonline.com/loi/chrs20>

### Living alongside hazardous factories: risk, choice and necessity

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Published online: 16 Dec 2013.

To cite this article: Hervé Flanquart, Anne-Peggy Hellequin & Pascal Vallet (2013) Living alongside hazardous factories: risk, choice and necessity, *Health, Risk & Society*, 15:8, 663-680, DOI: [10.1080/13698575.2013.855714](https://doi.org/10.1080/13698575.2013.855714)

To link to this article: <http://dx.doi.org/10.1080/13698575.2013.855714>

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## Living alongside hazardous factories: risk, choice and necessity

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(Received 11 June 2013; accepted 13 August 2013)

A questionnaire survey conducted in Mardyck, a small town in northern France, surrounded by hazardous Seveso plants provided an opportunity to test various models which explained why individuals lived in these risk areas. In this article, we examine which of three different approaches: economic pressures and inequalities, biased risk perception, and ‘good reasons’ best explained individual decisions to live in this hazardous area. We found that none of these three approaches fully accounted for past and present decisions but the ‘good reasons’ approach enabled us to explore individual reasoning most effectively. While our findings indicated that individuals who live in the Mardyck area are subject to economic and social constraints as well as cognitive and cultural biases (distorting risk perception), they had made a conscious choice to move to and stay in Mardyck. They had ‘good reasons’ to live in Mardyck; they could afford to live in attractive area with good community facilities. Thus, their decisions were rational, albeit their rationality was bounded or restricted. Having made the decision, some residents dealt with the cognitive dissonance of living in a dangerous area by disregarding or denying the dangers, others, a worried minority, dealt with this same dissonance by highlighting their ‘good reasons’, that is, the ways the benefits of living in Mardyck outweighed the possibility of a catastrophic event.

**Keywords:** risk; risk perception; restricted rationality; Seveso installations; daily life in industrial area

### Introduction

In 2007, a special issue of *Annales des Mines* asked ‘how can we live with industrial risks after AZF? There have been a series of major accidents in which people living near major industrial plants have been killed or seriously injured, for example, the explosion of Total-AZF (AZote-Fertilisants) in September 2001 in Toulouse, France: 30 people died and 2500 suffered from injuries; the release of caustic red sludge in Ajka (Hungary, October 2010); the accident in Seveso in Italy and the exposure to dioxin of the residential populations (July 1976); or the explosion of 40 tonnes of cyclohexane leaked from a pipe in Flixborough (1974): 28 people died and 1800 buildings were damaged. These sorts of disasters raise the question of why individuals continue to live near industrial facilities that are known to be hazardous. The current orthodoxy is that individuals live near such plants either because they are effectively forced to do so by social or economic circumstance and/or because they do not understand the risks, in other words, they must have no choice as no rational individual would chose to live in such circumstances. However, in this article, we will critically examine this orthodoxy drawing on interviews

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with individuals who live in one hazardous area in the north of France. We examine the decisions which individuals made to live this risky environment, drawing on the work of Tulloch and Lupton (2003), which considers the ways in which individuals respond to risk in their everyday life. We do not focus explicitly on residents' perceptions of industrial risks, but explore the broader context of the quality of the environment and amenities.

We divide this article into four sections. In the first section, we provide a brief overview of how other researchers have studied daily life in industrial environments and their main conclusions. In the second section, we describe the municipality of Mardyck and the method we used to explore residents decisions and their perceptions of living in this area. In the third section, we draw on our survey of residents in Mardyck, to examine why they chose to live and continue to live in the area. In the fourth section, we shall reflect on how residents managed the risk of living near hazardous plants. In the conclusion, we highlight the main findings.

### **Three alternative explanations for why people chose to live near hazardous industrial plants**

#### ***Explanation 1: lack of choice due to economic constraints and ecological inequalities***

As early as the nineteenth century, analysis of everyday life in industrial towns focussed on the impact of industry on the environment (Engels 1891). Industry created new urban landscapes with workers housing next to noxious factories. As Henwood and her colleagues (2010, 2008) have noted, social scientists have studied these issues, for example, Wakefield *et al.* (2001) or Bush *et al.* (2001). Within specific disciplines there have been different areas of interest. Geographers have tended to examine the spatial structure of towns focussing on travel and employment (see Lussault 2000). Sociologists focussed on the conditions of the working-class (Leroy 2001), while historians have examined housing and economic history rather than living conditions (Massard-Guilbaud 2002). Anthropologists have also started to examine experiences of living with risk and hazards. For example, Zonabend (1993), in his study of *The Nuclear Peninsula*, examined the everyday experience of people living beside hazardous nuclear facilities in France, the nuclear power station in Flamanville and the centre for nuclear waste treatment in La Hague (Cotentin, France). She showed that despite official attempts to reassure, those who lived in these situations were aware of and feared the hazards even if they did not articulate their anxieties.

In the 1970s, a new approach to daily life in industrial towns around the idea of environmental inequalities was adapted. It originated and was initially developed in the United States, before spreading to Europe, in particular in France and the United Kingdom. This approach developed out of 'grassroots movements' which, among other things, campaigned against the setting up of polluting industries. In the United States, this approach focussed on the question of the relationships between populations, especially deprived social groups and degraded environments (with natural, industrial or health risks...) and raised issues of environmental justice (Davidson 2003, Charles *et al.* 2007, Laigle and Tual 2007). Most of the research that underpinned this approach was epidemiological-type. For example, Liu (2001) showed a high correlation between concentrations of Black and Hispanic populations and degraded environments. Similar research is evident in Europe: in the United Kingdom, Walker and colleagues (2005) have shown a correlation between polluted sites and underprivileged social groups. The British work has focussed on socio-economic status rather than ethnicity, highlighting the clear relationship

between the localisation of Industrial Pollution Control sites and low incomes. Walker and colleagues (2005) have shown that Industrial Pollution Control sites are all the more numerous, polluting and hazardous when they are found in zones containing under-privileged populations.

In France, environmental injustice has been an issue since the late 1990s (see Bailly 1996 for geographical analysis), and has developed since the beginning of the 2000s, but it rarely focuses on industrial environments. The work of Emelianoff (1999), Laigle and Oelher (2004) and Charles *et al.* (2007), focusses on social and not ethnic categorisations examining with the ways in which deprived groups tend to live in degraded environments. Similarly, the Observatoire des Zones Urbaines Sensibles (ZUS), in its 2004 report, showed that the inhabitants of these zones were more exposed than others to degraded environments (noise, adjacent pollution...).

Laurian (2008a, 2008b) examined the distribution of industrial sites across the whole of France (as Walker *et al.* 2005 had done for the United Kingdom) by bringing together in a Geographic Information System (GIS) the socio-demographic characteristics of French towns and the list of dangerous or polluting sites (for example, incinerators, Seveso industries and nuclear power stations). She showed that environmental injustice existed in France, and there was a high correlation between towns with inhabitants on low incomes or immigrants and those with the most polluted sites.

This type of research underpins the view that vulnerable groups live in hazardous areas because they have no choice. For example, Charles and his colleagues (2007) highlighted Beck's assertion (1992) that marginalised groups are more exposed to risks and have less capacity to protect themselves than other sectors of society though as.

### ***Explanation 2: irrational choice based on biased risk perception***

An alternative explanation for why individuals live in hazardous areas is based on biased risk perception, that is, individuals fail to recognise the risk (Bickerstaff *et al.* 2006). Researchers have identified two potential sources of bias, individual psychology and group sociocultural factors (Bickerstaff *et al.* 2006).

In terms of individual psychology or the 'psychometric paradigm', Fischhoff and colleagues (1978) and Slovic (1987) have shown how the perception of risks and their acceptability vary according to different types of risk, voluntary versus involuntary, known to those exposed, equitable or inequitable, immediate or delayed. These findings come from questionnaire surveys. This type of research has identified cognitive biases (see Kahneman *et al.* 1982), which are almost impossible to get rid of: the tendency to overestimate the likelihood of low probability high-consequence risks such as aircraft accidents. In contrast to these psychological approaches, the cultural theory approach (Douglas and Wildavsky 1984, Douglas 1992) emphasises the role of sociocultural factors in shaping risk perception (Pidgeon and Beattie 1998). Individual risk perceptions are shaped by cultural context (historical time and space), social groupings and particular living conditions (Heimer 1988, Teuber 1990, Beck 1992, Zonabend 1993, Peretti-Watel 2000, Siegrist *et al.* 2000, Gilbert 2003, Luhmann 2005, Coanus *et al.* 2007). For example, the perception of a risk or pollution depends on the time horizon of the social group in question (poverty and precariousness reducing the capacity of individuals to project themselves into the future, and thus of perceiving future risks). Researchers using this approach have used ethnographic methods including interviews, focus groups and participatory observation (Bickerstaff 2004 cited Sjöbert 1997).

The sociocultural approach to risk has provided insight into the ways in which social groups identify hazards in their local environments. Marginalised groups often have more pressing problems than long-term health hazards caused by pollution or the low probability of a devastating accident so that such risk may be disregarded or bracketed out from everyday life (Tulloch and Lupton 2003). As a result, in-depth interviewing with residents living near to major hazard sites such as nuclear power stations suggests that they disregard the risks and they are ‘an unthreatening part of everyday life’ (Parkhill *et al.* 2010, p. 46). Social science researchers have identified a ‘neighbourhood halo effect’ (Bickerstaff 2004): individual perceptions are distorted by their residential location.

While it is possible that individuals are subject to perception biases and that either psychological process or sociocultural factors make them disregard major threats to their wellbeing, it is important to consider the broader context within which individuals make their choices and decisions, and we consider this broader context in the next subsection.

### ***Explanation 3: bounded rationality and strong reasons***

The starting point for the third explanation is that individuals try to act rationally and make the best choices within their circumstances. This approach is based on a cognitivist theory of action, outlined by Boudon (1997, 2001, 2003a) in his attempt to construct a synthetic theory of rationality (Lins Hamelin 2002). Underpinning this approach is the acceptance that if individuals believe in something (scientific theories, religious dogmas and magical practices) or behave in a certain way, this is because they have ‘strong reasons’ to believe or act in this way. If individuals are considered to be rational, then these beliefs and actions must make sense to them, even if this is not in a completely conscious manner. However, this does not deny the importance of a cultural context and cognitive bias, given that Boudon considers that any individual has only limited information and knowledge, with objectives and values that can be different from those of others (some people’s strong reasons are not necessarily the same strong reasons for others). The cognitive rationality of Boudon draws Simon’s (1982) theory of bounded rationality, in which individual’s circumstances result in adequate or reasonable decisions not optimum.

In this approach, the aim of the social scientists is to understand why an ideal typical individual (Weber 1949) chooses to live near hazardous Seveso sites and what are their reasons (Boudon (2003a, 2003b)). The strong reasons of an ideal typical individual are fairly close to the type of rationality which the anthropologist Stoczkowski (1999) has called ‘restricted’ and which he opposes to ‘efficient rationality’. The former is less demanding and less formal than the latter, and is the one that lay persons, even scientists, apply on a daily basis when thinking or when executing the tasks that need to be executed, or when expressing the feelings that are expected of us. Even if it features a number of failings (Ross and Anderson 1982, Piattelli Palmarini 1995), it allows us to decide, act, express feelings and opinions, etc. in everyday life. The second form of rationality – efficient rationality – applies more specifically to scientific thought, and the reasoning that must be adopted by researchers so as to analyse the world as clearly as possible and produce knowledge which is the least fragile. This type of rationality is nearly always too complex, too demanding and also too long to apply in everyday life, whether you are a scientist or not (Kahneman 2011). It should be noted that this distinction between restricted rationality and efficient rationality coincides also to a great degree with that made by J. Elster (2009) between ‘reason’, which has an objective character, while tending to lead people to act for the common good, as opposed to personal interest and passions, and ‘reasons’ which are instead driven by desires, and are clearly subjective

(though without being irrational, as in absurd or insane decisions): ‘Desires and beliefs are reasons for action. A rational actor chooses the action that will realize his desires as well as possible, given his beliefs and the totality of his other desires’ (Elster 2009, p. 16).

These alternative explanations or reasons for why individuals live in hazardous areas raise important issues that we will examine in this article. We will start by examining the extent to which individuals in Mardyck, near hazardous zone Seveso<sup>1</sup> plants felt that they were compelled by their socio-economic circumstances to live in the area and if they want to leave as soon as they can. We will then consider whether there is evidence of cognitive or cultural bias so that they fail to recognise the hazardous nature of their situation. Finally, we focus on the rationality of the individuals who live in Mardyck drawing on our survey data to examine what ‘strong reasons’ they have for living near hazardous plants.

## Methodology

### *The case of Dunkirk*

The urban area of Dunkirk (France) is a good place to study why people live near hazardous factories as it is an area which is both densely populated and urbanised, and has one of the highest concentrations of industrial sites in France (Zwarterook 2010). There is also a good body of background research on the area in terms of the relationship between the State and local authorities (Ratouis and Segaud 1996, 2000), as well as between the urban fabric and industrial interests (more previous research: Coing and Ferry-Bercoff 1973, Castells and Godard 1974).

The urban area of Dunkirk has 200,000 residents. The survey was carried out in Mardyck, a ‘village’ of 360 inhabitants. After an extension of the industrial-port zone of Dunkirk and the urbanisation of much of the area during the 1970s and 1980s, Mardyck lost much of its rural nature. It can be considered as a community or a village within a broader urban area. With the exception of a small building of five flats – two of which were unoccupied at the time of the survey – this community or this village is made up of around 100 detached houses. The ones in the centre are quite old, while others date back to the 1980s (social housing) or the 1990s (an essentially private estate). The residential zone is quite compact, and bordered on two sides by hazardous Seveso-classified sites. One of these belongs to a large European chemical firm which involves the use of a steam cracker equipment that ‘cracks’ at very high pressure, using evaporated water, molecules of hydrocarbon to obtain other products (alkenes) for the chemical industry. The second site belongs to the firm and stocks the raw materials required for the steam cracker, as well as products before delivery to customers. A high-capacity refinery belonging to a French petrochemical company occupies the third site.<sup>2</sup> From most of the houses in the village, either from indoors or outdoors, it is possible to see a chimney or a hydrocarbon or LNG (Liquefied Natural Gas) vat. In an attempt to screen Mardyck from this industrial environment, a four-deep line of trees was planted in the 1980s, but this fails to conceal the highest installations. Furthermore, about 8 km to the east of Mardyck is the largest nuclear power station in Western Europe (six reactors each with a power of 910 MW). However, some residents of Mardyck continue to have lifestyles that may be described as rural, for example, gardening, river fishing and hunting waterfowl. The Mardyck hunting association has a lodge established beside a pond, and several inhabitants raise ducks to use in hide hunting. Given its immediate proximity with polluting, dangerous factories, this community must be classified in the category of an urban area potentially generating illnesses linked to industry (and even deaths, in the case of a major accident), and thus not

at all somewhere where people would normally be advised to live. This residential area is affected by noise and smell, which are problems that can be added to these possible risks. The proximity of two factories, with a total of three flare stacks and a dozen other chimneys releasing steam and a variety of gases, explains the presence outdoors of nauseating smells and the regular hum of burning gases. When the wind is unfavourable, the metallurgy site situated a few kilometres away, in a nearby municipality, releases a red dust that settles on the garden furniture, window sills and any laundry drying outside.

### **Data collection**

Our research team (two sociologists and a geographer) used a social survey with quantitative and qualitative elements to access residents' perceptions of daily life beside factories. Our survey was designed to gather as much information as possible, but without overly raising the inhabitants' concerns. For this reason, the issue of risk was partly submerged among other concerns, dealing with local lifestyle, the availability of shops, opinions about major social issues such as the death penalty, immigration or the respect that should be given to your mother country.

We did not select a sample but instead attempted a complete census of the adult population (people aged at least 16). Finally, we interviewed a sub-population ( $n = 158$ ) representing a significant fraction of the total ( $n = 270$ ). We did not delegate the carrying out of the survey, and instead personally conducted all of the interviews across 89 households (80% of the households), over a period of just two weeks (so as to stop inhabitants from communicating too much between each other concerning the nature of the questions that were asked).

We went from door to door, conducting the survey at once where possible or else making an appointment for another day and time. With just a few exceptions, the interviews took place in the participants' homes, and when all the adults in the household were asked to participate, each occupant agreed to talk to us separately. While asking the questions (between 25 and 45 min), the researchers often noted down on the margins of the questionnaire the respondents' spontaneous declarations, which seemed to illustrate particularly well any given issue. These word-by-word citations were noted down between inverted commas, while any summaries of their words were not. Furthermore, the researchers attentively observed the accommodation in which they had been welcomed, identified the family connections between the inhabitants of the village, and observed its everyday life. All of this qualitative material was then used during the analysis phase so as to enrich, nuance and enlighten the quantitative data gathered during the survey. Thus, alongside the tables produced by the analysis of the answers to the closed questions in the questionnaire, this article also contains citations and fragments of life stories from open questions and from the researchers' note taking.

The data from the quantitative survey was analysed using Sphinx Lexica software, version 5 (Le Sphinx Développement, Chavanod, France). It should be noted that in a census inferential statistics cannot be used, and the classic formula for calculating the sample size (Dodge 2008) is not applicable. In the same way, checking the dependency or independence of two variables cannot be applied either.

It is important to consider whether there were possible biases that might derive from any important differences between the sub-population that was surveyed and the overall population to be surveyed, if certain categories of population were better covered than others. A critical analysis of the survey showed that for variables such as gender, occupation status of housing (owners versus tenants) or professional status, a comparison

between our survey's results and census data reveal few variations – although the study of the population underrepresents people working or studying at a distance (who may have been away at the time of the survey) and older residents who refused to answer the questionnaire more often than others.

## Findings

### *A population that generally grew until 1999*

One way of examining the type of population living in immediate proximity to Seveso factories, before exploiting the data gathered during the survey, is to examine its evolution. Our work will be based on a comparison of censuses in 1990, 1999 and 2007.

Mardyck had 343 inhabitants in the 2007 census, compared to 372 in 1999 and 363 in 1990. The population, which had slightly increased, has now gone down, but in a regional context which is lacking in dynamism, and characterised by outmigration. It should be noted that this drop in the population between 1999 and 2007 was at the same time accompanied by an increase in the number of households (+10%), and that 19 households set up home in Mardyck during the last four years of this period. The structure by age shows that the village has a large number of children and adolescents – almost a third of the population – and of households which are significantly larger than the national average (57% with three or more members, against 44% overall in France). However, there are few senior citizens, who can be explained by the lack of suitable accommodation and organisations.

What we thus have is a stable or growing village, with the demographic structure of a classic suburban village where young couples set up home. The presence of many families with adolescents and young children – young parents deciding to bring up their children in Mardyck, couples already living there with a growing family – indicates that the presence of factories does not seem to be perceived as an exceptional threat. The quality of life it offers to children is often mentioned as one of the attractions of local life (see below). This indicates that residents of Mardyck did not see it as a place they wanted to escape from (Flanquart *et al.* 2006).

### *A population with moderate standards of living*

If the number of households in the village is rising, this does not necessarily mean that this is the result of any particular attraction to it; it could be a place where people set up home by default, because they cannot go elsewhere. However, we found that the residents were not particularly deprived, even if they did not belong to the most privileged categories of the population. To evaluate the standard of living, we used the level of education, the socio-professional class, unemployment and homeownership.

In terms of education, the level is quite low. 69% of participants in the survey did not have the *baccalauréat* (A-levels or high-school diploma), even though the younger members of the population were not often surveyed, but they often have a professional qualification such as a Certificat d'Aptitude Professionnelle (CAP) or Brevet d'Etudes Professionnelles (BEP).<sup>3</sup> Of the 31% of participants with a *baccalauréat*, two-thirds had not undertaken any further studies; and only 9% went on to higher education (which was not always completed or led to a qualification). The spread of the inhabitants between the different professions and socio-professional categories as defined by the Institut National de la Statistique et des Etudes Economiques confirms this rather low level of



Table 1. Spread of the population of Mardyck and of France by profession and socio-professional categories.

SPC (professions et socio-professional categories)	Mardyck		Département du Nord 2005 (%)
	Number	% of respondents	
Farmers, artisans and shopkeepers	13	12	2.7
Executives and higher intellectual Professions	3	3	14.7
Intermediate professions	13	11	23.2
White-collar workers	62	54	29.1
Blue-collar workers	23	20	23.9
Total	114 <sup>a</sup>	100	100

Source: IMN survey, 2006, and the Population Census of 2005.

Note: <sup>a</sup>This figure was obtained from a compilation of the answers; it includes active adults in work or out of work as well as retired people who stated their former profession.

qualifications. The most frequent social categories are intermediate employees and professions, which collectively accounted for 62% of the participants. One of the unanticipated findings was that, despite the close proximity of the factories, workers were less likely to work in Mardyck than in other parts of the Département du Nord, while white-collar workers were proportionally more numerous (Table 1). Finally, the low presence of executives and higher intellectual professions can also be noted; these categories were underrepresented compared to the overall French population.

Fifty-five per cent of inhabitants of Mardyck were homeowners, which was just two percentage points below the regional average. Their homes were often recent, attractive detached houses, even if older houses still exist in the village centre. Furthermore, while social housing (one-third of the households) was of poor quality and often in disrepair, it included only detached houses, and not the less desirable blocks of flats.

Unemployment in Mardyck was higher than the French average (12 versus 9.9% in 2005), but it was slightly lower than the average in the north of France (Nord-Pas-de-Calais), which was over 13% (2005). The working population of Mardyck included a high percentage of employees working for the local authorities (Mardyck town hall: 21.5%; Dunkirk town hall: 4%; Dunkirk Urban Community: 2.5%), either on full- or short-term contracts, which was a far greater proportion than for the rest of France (INSEE 1999).

While the population of the village included a mix of upper working class and lower middle class, according to the definitions generally used in France, it generally could not be described as being deprived. While the population of Mardyck was moderately well off albeit poorly qualified, it did still have at its disposal resources which are both social and economic, and which are quite clearly superior to the deprived populations of Antinéa (Chavier 2007) or those described by Walker *et al.* (2005). So, it did not seem that residents of Mardyck were forced, by economic circumstance, to live there, and this was confirmed by the way the inhabitants of Mardyck project themselves into the future.

### **Living in the long term in Mardyck**

At early stages of families' lifecycle, it is possible to neglect, underestimate and even ignore the health dangers posed by the Seveso industrial sites beside the village, so as to

take advantage of certain amenities; but when the family income increases, and economic constraints diminish, such things may be thought out afresh, with different priorities leading to different choices. In this sub-section, we will examine whether such considerations affected participants in our survey.

We found that the majority of the participants in our survey planned to remain in Mardyck for at least 10 years, while a slight majority (51% planned to leave within 10 years; this was comparable to figures from other North France towns).

The youngest participants (16–29-year-old) were the ones who most frequently planned a future away from the village (67%), while the age bracket immediately above them (30–39-year-old), mainly from families with young children, together with oldest participants (60-year-old and more) were those who tended to envisage staying in Mardyck for at least 10 years (respectively 70% and 67%).

Thus, apart from younger people who wanted to move on, participants in our survey tended not to see Mardyck as a ‘transit’ village, where people set up home for particular reasons and for a short time, and which is left without any regret as soon as the opportunity presents itself.

#### *A high-risk village but one with amenities*

To understand why some families were willing to live and continue living in a zone where the technological risks were high, it is necessary to bear in mind that the choice of a place of residence was not based solely on criteria of health risks and safety concerns. Other factors and other reasons applied. Mardyck was far from being a village without qualities.

We asked the participants in our survey about Mardyck’s main attractions. With only a few exceptions, participants do not find this question to be out of place, and found little problem in choosing three attractions. Most indicated that they appreciated living quietly amongst people they knew, and who could be asked for small favours, when necessary. The main attractions were tranquillity (66% of participants), the village life (46%) and having good neighbours (44%) (Table 2). Interaction, both in terms of frequency and intensity, between individuals and families was important for the inhabitants of Mardyck.

Table 2. The main attractions of Mardyck as seen by its inhabitants.

The attractions of Mardyck (three possible choices)	Number of mentions	% of respondents
Its tranquillity	104	66
Village life	72	46
Good neighbours	70	44
Its public facilities	56	35
Closeness to Dunkirk	40	25
Closeness to the beach	28	18
The opportunity to garden (and raise animals)	18	11
The beauty, charm of the place	41	9
Closeness to the A16 (motorway)	13	8
Low local taxes	2	1
Other	17	11
Total		

Source: IMN survey, 2006.

Note: What do you appreciate the most in Mardyck? Three possible answers, not in order of preference.

However, unsurprisingly, when asked what they like least about the village, participants indicated they disliked the ‘gossip’, confirming the power of sociability in Mardyck.<sup>4</sup> Participants also appreciated the public facilities of the village (the swimming pool, football pitch with bright floodlights at night, solarium, sports and leisure facilities, mountain bike track, children’s play area), as well as the closeness of the major urban centre (Dunkirk) and its businesses suggesting that participants appreciated most is the life in a peri-urban village.

Participants’ description of what they like most about Mardyck suggests rather what might be called a rural lifestyle, as opposed to an urban lifestyle, as described by Louis Wirth (1990): familiarity with persons crossed in the daily life rather than anonymity human relationships based on segmented roles and mutual reserve between individuals.

Thus, some participants identified benefits of living in Mardyck. With a poor access to some types of capital (especially economic, but also social and cultural),<sup>5</sup> while not being completely deprived, they realised, more or less consciously, that the choice of their residence was constrained – essentially by income – and that Mardyck was an acceptable solution to their accommodation problems. In this way, Table 3 shows that participants from families on low incomes (under 2000 euros/month) or average incomes (from 2000 to 3000 euros/month) were those most likely to say that they appreciated the tranquillity and neighbourliness that existed in the village (in Table 3, these three factors have been grouped together, which explains why some figures exceed 100%). Members of families on incomes over 3000 euros a month (13 families among those in the survey) were far less likely to say that they appreciated the tranquillity, neighbourliness and life of the village, but instead tended to emphasise the level of public facilities in Mardyck.

Thus, for participants in our survey leaving the village surrounded by dangerous factories (frequent air pollution and risks of major accidents), would obviously provide greater safety, and improve the quality of the air they breathe, but it might mean losing out on other levels. A man in his thirties, who lived in a mobile home with his wife and three children, said that he liked the life he led in Mardyck between the trips he makes for his work. He particularly appreciated its calm and the ease of access to the beach at Braek (Flanquart 2012), even though this beach was in front of an artificial seawall, built to protect the ore basin from the industrial port:

Table 3. Declared attractions of Mardyck to the household’s monthly income.

	Good neighbours, village life and tranquillity (3 factors together) (in %)	Good public facilities (sports facilities, swimming pool...) (in %) (one factor)	Closeness of the beach (in %) (one factor)	Other (6 factors + ‘other – please specify’) (in %)
Under 2000 euros	157	33	25	63
2000 to 3000 euros	183	29	10	56
+ 3000 euros	108	62	8	100
Total	156	35	18	66

Source: IMN Survey, 2006.

Note: Same question Table 2, but certain answers were analysed under the same leading.

You can find a little bit of nature there, hidden behind a seawall.

When he compared his own environment in Mardyck to the large mining town where he grew up, he did not hesitate for a second:

Compared housing in Lens, I prefer Mardyck!

Rather than living in an area of urban deprivation, of towers and high-rise blocks, without shops and located far away from the centre of an average-sized town, he has chosen a village, which lacked some shops but was peaceful and near the beach. An elderly woman, who was the tenant living in an old house in the centre of the village, explained that she did the maintenance and renovation work herself in exchange for a relatively low rent, and that she did not want to leave, despite the lack of comfort. She was the daughter of a gamekeeper and had been born in a house among the dunes before the construction of the industrial-maritime complex. She has been in the same house for the past 50 years, and could see no reason to move. According to her, Mardyck was still attractive, continued to attract new inhabitants, and its houses sold like 'hot cakes' if and when they come onto the market:

Yes people like it here, the houses don't stay empty for long [when they become free]!

Thus, if we accept Cavailhès' (2005) approach to pricing in which multiple factors, such as local service and amenities, not just nature of the accommodation are taken into account when deciding where to live, Mardyck can be seen to be quite attractive. There are an unusual number of public amenities (mainly sports facilities, with a swimming pool, a football pitch), and it is seen as a quiet village, albeit one which is a short distance from a major urban centre with all its facilities. The village seemed highly protective to its inhabitants. There were extended family networks in which families with children lived near and supported their older relatives. Some participants indicated that they had moved to the village because a relative already lived there, and they wanted to be near them.

Furthermore, the reasonable prices (though they could not be described as being 'cheap') of the housing in Mardyck attracted people looking for an attractive detached house in a calm location, but without having quite enough financial means to satisfy their ambitions. For example, a young couple (the woman worked in a hairdressing salon and the man was unemployed) recently bought a newly built house. When interviewed, they did not want to say how much they had paid though the woman admitted it was 'a bargain'. This couple was not unique; Mardyck enabled working class, or economically fragile families to live in middle-class houses. Thus, to participants in our survey, the benefits of affordable and nice houses was clear while the danger next to a refinery and a petro-chemical are mere possibility could easily be forgotten, for these participants tangible advantages outweighed the hypothetical dangers.

All of the 'qualities' of a 'village', were strong reasons for living in Mardyck and explained why participants in our survey tended to minimise risks and worry, so as to justify to themselves their choice of living there (Heimer 1988, Peretti-Watel 2000). For example, an elderly retired man, who has lived most of his adult life in the village and who does not intend to leave it 'except on his last journey', explained that Mardyck is less polluted than the centre of the nearby town:

The factories spout out at a height of 100 meters; it ends up with the neighbours. [On the other hand, in the nearby town centre,] the cars pollute as low down as the asphalt.

This old man was aware of the dangers of living in Mardyck, but as he was born and has always lived in Mardyck, and one of his sons had also chosen to live there, he minimised them. Thus, the rather dubious argument that he presented about factory smoke is an integral part of the blinkers he had constructed for himself so as not to see what could disturb him, an integral part of his denial of the reality of risks and nuisances to which Mardyck's inhabitants were subjected. He had 'strong reasons' for staying there, which overwhelmed the weaker reasons which he might have to leave, and resolving what psychologists call, after Festinger (1957), his cognitive dissonance – conflict between two forms of knowledge.

### *A worried minority*

In our survey, there was a minority of people who worried about the dangers of their environment.<sup>6</sup> For example, a 40-year-old woman from Normandy, who was divorced and the mother of two adolescents, was offered accommodation in Mardyck at a low rent by the social housing services. When asked about what she least liked in Mardyck, she immediately mentioned the factories and pollution they created. She even asked the researcher to go and see for himself that chimneys and a flare stack were visible from her window, which she found rather worrying. Especially as, in her words, these installations are very old, and thus unsafe:

They've been patched up too often; these factories don't want to spend money.

She admitted being 'constantly worried about explosions' and stated that:

I don't like leaving Mardyck and knowing that my children are still there.

She said that once, in the middle of the night in 2001, she had heard sirens and did not wait to find out what was going on but left immediately, 'I took a bag and my kids, and I left!'

Similarly, a former farm worker aged 70, who was born in a nearby village, and had lived with her husband and adult son in a chalet since 1969, after the compulsory purchase of her home for the construction of the refinery, said that she was concerned about the pollution from the factories. She spontaneously mentioned the obvious symptoms: burning eyes, her mop that went black when she cleaned her patio, and the barrel containing rain water that became covered with reddish particles. Furthermore, she said her family no longer grew vegetables because of the pollution. Given her age and state of her housing, she felt that leaving the village was not an option but she was very worried about the hazardous environment:

If there was a problem, I don't think we could get away. [...] It's a bomb, a bomb! We'll be in our graves! [...] It could also blow up at night, while we're asleep.

She said that she kept a bag ready, containing all the family's papers, if they needed to leave in a hurry.

In both these cases, there was element of duress and lack of choice relating to living in Mardyck. The woman from Normandy had not chosen to live in Mardyck, her divorce and loss of income meant that she has had to accept an offer of social housing in the village. In the second case, the elderly woman had been born near Mardyck and had married and moved to the village before the hazardous factories were built. She did not feel able to move away after the village.

Thus, there is an anxious minority for whom the dangers of the nearby plants are only too evident. However, while they acknowledge the dangers, they do not feel able to move away for the village.

## Discussion

### *Choosing the risks to be undergone*

The risks run by each person are multiple and concern various fields; and they may be social, natural and technological (Castel 2003). They make up a sort of ‘bouquet’, on whose composition each person can act more or less, with the proviso that, in contrast to a florist’s bouquet, the lower the income, the larger the bouquet. Some individuals may lean towards a better protection against certain risks, and ‘pay for’ their choice by increasing their exposure to other dangers. For example, a tenant of cheap accommodation in Mardyck, and the mother of three teenagers, said that she ‘preferred’ the proximity of factories, whose hazardous nature she recognised, to the dangers which she thought her sons and family would be in if they lived in a tower block in Grande-Synthe, a nearby town mainly made up of high-rise accommodation with a poor reputation. The low income of the household meant that this was the only alternative. Paying for a better protection against delinquency and against the nuisances of life in the suburbs of the Dunkirk area, by accepting a greater exposure to pollution and industrial risks, was the reasonable choice made by many inhabitants of the village, consciously or unconsciously. Furthermore, in a society in which consumption is given importance, or success means owning one or more cars, a detached house – with a garage and garden – or going away on holidays in the sun, etc., it can seem logical and, in a certain way, rational to opt for employment and affordable accommodation rather than technological safety and pure air.

Thus, as we have shown in this article, the relationships between inhabitants and an industrial environment were complex, and could be reduced to a simple correlation between polluted sites and underprivileged populations. If, in the choice of a residence, constraints obviously applied, there was still – at least for populations that were not really deprived – a genuine choice. Living a few 100 meters away from Seveso sites could mean experiencing a sort of ‘civil security’. Following the work of Coanus *et al.* (2007), it is important to examine the whole range of relationships between inhabitants and their environment, and not limited merely to industrial risks. This desire for ‘civil security’, which covers in part the quest for self-segregation, is today one of the main dynamics of city life in an urban-sprawl, as can be seen in most developed countries. The inhabitants of Mardyck tended to overemphasise the ‘civil’ security of a public space – the streets, sports facilities, play areas, etc. – and to underplay the dangers and pollutions from the factories that surround the village, in particular, by creating a break between what was very close – the garden – and further away – the industrial sites. And this break between what was ‘close’, familiar, green and reassuring, and what was ‘far away’, though familiar, was partially screened out by four closely planted rows of trees that have surrounded the village for over 20 years.

While there is in our participants' responses some evidence of environmental inequalities, this failed to provide a full explanation of why they were living in Mardyck. The inhabitants of Mardyck were living in a locality in which industrial sites were both a form of familiarity and important sources of economic activity, and thus of employment. While most of them seemed less aware of or sensitive to the risks, it seemed their residual concerns were counterbalanced by other factors or reasons that made them willing to live near Seveso sites.

While the cultural theory does recognise that collectively individuals may choose to disregard certain types of threat, and would therefore 'explain' why some individuals, such as our worried minority, might recognise a major threat but choose to accept and live with it. Both socio-economic circumstance and cultural preferences can be seen to shape individual choices but not in themselves provide a full explanation, and to do this we need to consider the whole range of reasons and the rationality of choosing to live in Mardyck.

### *The 'rationality' of choosing and continuing to live in Mardyck*

The majority of the participants in our study wanted to carry on living in Mardyck and saw it as a 'rational choice' made in the context of risk. They accepted the threat of living in a village surrounded by potentially dangerous factories so that they could enjoy the benefits of village life, good amenities and proximity to the seaside and countryside. It also enabled some of them to avoid the hazards of living in a socially dangerous urban environment.

So, they saw themselves as individuals who had chosen rationally, albeit in a context of constraints (of income). Their average or low incomes, their preferences for a certain type of housing as well as their social lives give many of them strong reasons to live in Mardyck and can be seen as form of restricted rationality (Stoczkowski 1999) that enables individuals to deal with the uncertainty and complexity of everyday life. Thus, participants used this type of rationality when, even though they realise that they run industrial risks, they tended to minimise or put them to one side. Such minimisation was grounded in trust (Siegrist *et al.* 2000), participants rather trusted corporations that owned the factories and even more regulators that inspected them to manage the risk on their behalf (Table 4).

In this way, the participants in our study did not deny reality and its dangers, but they framed these in a way that was compatible with their desire to live in a 'village', despite their generally low income. In this respect, their behaviour is not dissimilar from the Sámi women involved in reindeer herding in Northern Norway (Gjernes 2008), who are not ignorant of the risks highlighted by Norwegian health authorities about eating too much meat, not consuming enough fruit and vegetables, as well as not taking physical exercise, but instead affirm that reindeer meat is healthy and necessary for outdoor work in low temperatures, that the berries they traditionally gather can easily replace expensive, poor-quality fruit and vegetables, and that walking when watching over their herd is good exercise. Both groups negotiate with the possible, and find compromises with the reality that surrounds them so as to construct a life that seems worth living and is marked by acceptable risks.

### **Conclusion**

Our survey of the village of Mardyck has shown that, as opposed to what might have been expected, its inhabitants do not constitute an especially deprived population, who had no





other choice than to live beside dangerous, polluting industries. Even if most of the inhabitants were lower middle class or upper working class, they were not living in wretched poverty and still had a certain margin for manoeuvre in the choice of their residences. Many of them had decided to set up home in a place which, despite its proximity to a large town and several dangerous sites, still resembled a village. Furthermore they described the positive experiences of living in Mardyck with its amenities, tranquillity and easy personal relationships with neighbours (which can also at times be a drawback), as well as other amenities linked to its specific location, such as easy access to the sea or the possibility to hunt water game. Apart from a worried minority who were more adverse to industrial risks than others, these amenities were enough to offset the pollutions and dangers of industry. Our survey provided a better understanding of how the inhabitants realised their desires in terms of their housing, by placing such desires among all of their other wishes, and in the light of their beliefs. Having arrived in the village with the idea that there must be little 'reason' to live there, or stay there in the long term with a family, we – three researchers – left convinced that there are many 'strong reasons' (Boudon 1997, 2001) to live in Mardyck. The inhabitants, even if they were not purely rational calculators, as described by neoclassical economists, still remained rational, even if this rationality was not efficient but remained restricted and effective on a daily basis, rather than being 'efficient' (Stoczkowski 1999).

### Notes

1. European directive on hazardous sites.
2. Since this research, in the context of a reduction of overproduction of refineries in the Total group, this site was closed in 2009. The present project is to transform it into a site for petrochemical storage and training.
3. CAP and BEP allow 15-year-olds who are not following a classic secondary education to gain a vocational qualification. The former provides, in 3 years, access to a particular trade, as a skilled worker or an employee. The latter, in 2 years, provides a more general training allowing the students who so desire to prepare a vocational diploma (also lasting 2 years).
4. In their famous research in the outskirts of a large British town, Elias and Scotson (1994) showed that gossip was both a way to establish connections between inhabitants and a way to target deviants.
5. Based on the types of capital according to P. Bourdieu (1984).
6. Without being able to draw any conclusions, given the small number in the sample, it would seem that women are very highly represented in this worried minority.

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