3rd INTERNATIONAL WORKSHOP
ADVANCES IN CLEANER PRODUCTION

''CLEANER PRODUCTION INITIATIVES AND CHALLENGES FOR A SUSTAINABLE WORLD''

Health Impact Assessment in Southern Brazilian EIAs: Too Far Away from Recommended Practices

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Abstract

Health Impact Assessment (HIA) practice, although listed as mandatory under Brazilian legislation on Environmental Impact Assessment (EIA), is still in its infancy mainly because it lacks the support of detailed tools that can enable it as a systematic process. In this paper, we investigate how far away health assessment stands from best practice, taking two departures points. The first one is a theoretical basis for advised practices in HIA that we propose from a literature review and compilation. This comprises 25 requirements for analysis, divided in three categories: theoretical lines of argumentation (biomedical/risk, promotion, and social/political features), broad measurability (which includes impacts magnitude and mitigation), and detailed measurability (going deep into biological, behavioral, circumstantial, environmental and institutional aspects). The second one is a set of six EIAs documents delivered by practitioners in Southern Brazil, that we take as a case study in order to assess their performance in relation to the international best practices outlined. EIAs selected are two from landfills, performed in 1992 and in 2006 by the same consulting firm; two from Small Hydropower Facilities (SHF), finalized in 1997 and in 2005, both by the same consulting firms; and two from a road (2004) and from an industrial plant (2007) projects, each one carried out by different consulting firms. Descriptive results are divided into three: a requirements' conformity analysis; a gap analysis, in which we assess the level of full, partial and non-completion of requirements; and a peer analysis, in which we compare, respectively two landfills and two SHF EIAs between each other, in order to highlight differences in health assessment in EIAs performed by the same consulting firms. With respect to theoretical lines of argumentation, we find that: biomedical risks are common but not considered in detail in all EIAs; epidemiological and toxicological models are rarely used; cause-effect relationships for environmental-health issues are only partially described; quantification is poor, but not so much in more recent documents; health promotion is not targeted by practitioners, and collective health is of more concern in EIA's landfill projects; regarding social aspects, they are partially considered in just two documents. Concerning broad measurability aspects, EIAs performed before 2000 have neither magnitude description nor investigation parameters, and wellbeing indicators are absent in all documents. With respect to detailed measurability, we highlight that health data are not accurate and/or reliable in all cases; biological issues are disregarded, as well as equity issues, which implies that there is no understanding of how the same impacts can affect different profiles of people.

Keywords: *Health Impact Assessment; Environmental Impact Assessment; Social Impact Assessment; best practice; evaluation.*

1 Introduction

"Health impact assessment (HIA), a methodology that aims to facilitate the mitigation of negative and enhancement of positive health effects due to projects, programmes and policies (…)" (Erlanger *et al*., 2008: 349), is strengthening its importance in the face of the enforcement of sustainability methodologies designed to integrate environmental and human aspects. Although just recently traceable (in the last 20-30 years) as a type of systematic process, it is clearly overlooked in developing countries, where HIA methodologies, even where legally required, lack detailed step-by-step procedures, and furthermore fail to influence the already well established decision-making processes for impact assessment (Erlanger *et al*., 2008). This paper outlines the fragility of health impact assessment in Brazil, where it is far from shaping itself as a detailed, self grounded and integrated methodology. In section 2, we systematize recommended aspects for HIA conduct, considering the development of studies in this field. We identify three main aspects from HIA research: theoretical lines of argumentation on which HIA has been based (biomedical, promotion, and social/political); broad measurability (considering initiatives for measuring magnitude, population broad profiles, parameters given by legislation, and mitigation/enhancement of respectively negative/positive impacts); and detailed measurability (focused on very detailed investigation of biological, behavioral, circumstantial, environmental, and institutional aspects). In section 3, we summarise this work as a methodological frame in order to analyse six cases of health assessment initiatives embedded in EIA documents elaborated in Rio Grande do Sul, Brazil Southern State – all of them briefly described in the same section. Results are presented in section 4, in three stages: a requirements conformity analysis; a gap analysis, in which we assess the level of accomplishment of requirements (full, partial and none); and a peer analysis, in which we compare EIAs from the same activity field performed by the same consulting firm. Conclusions are presented in section 5.

2 Recovering the recommended theoretical and practical features for HIA

In order to assess the extent to which completed HIAs differ from best practice, we firstly considered the bulk of research already available in this field, taking as a departure point recurrent issues that HIA researchers deem as relevant. The main studies on this subject are published in journals such as Environmental Impact Assessment Review (EIAR) and Impact Assessment and Project Appraisal (IAPA). In order to contextualize the investigation specifically for Brazil, we also looked for referential papers in SciELO, the most relevant knowledge data base on public health issues in Latin America. We have found 53 results in EIAR, from 1994 (first available record) to 2011, 6 in IAPA journal, from 2003 to 2010 (first and last available records, respectively), and 3 in SciELO (from 2003 to 2009, idem). Therein we concentrate on the papers that expressed the most organised features or classification for HIA, stressing similarities according to classificatory keywords recurrent among the papers. This had as an outcome a selection of 12 papers from whose content we built our summarized checklist embracing 25 aspects. They were split under three main evaluation unities: a theoretical one, and two addressed to practical aspects of measurability, a broad and a detailed one. In the following subsections we describe aspects we took as being relevant regarding this step by step refinement in order to proceed with our analysis.

2.1 Theoretical lines of argumentation behind HIA

We found three main routes through which HIA is theoretically stated in academic literature: biomedical (strongly anchored in risk assessment and technical procedures), from promotion (addressed to preventive rather than palliative ongoings), and from social/political aspects (designed to gather people involved in

decision making processes related to health impacts). In a wide sense, these three routes work as a *continuum* for HIA understanding and schematizing, so that we consider that each one completes the others.

2.1.1 Biomedical/technical/risk approach

This is closely bound to the establishment of cause-effect relationships considering environmental exposure and health outcomes. Four aspects can be highlighted as recommended for a good HIA in this sense: (a) the clear consideration of potential harms envisaged by exposure to chemical, biological and/or psychological agents (Steinemann, 2000); (b) the use of epidemiological and toxicological models in order to provide a proper follow up of the likely damages caused by human exposure to environmental stress (Kemm, 2005; Harris-Roxas and Harris, 2010); (c) the assurance of well established cause-effect patterns related to exposure-damages (Putters, 2005); (d) and the search for models that enable accuracy in damage quantification (Petticrew *et al*., 2007; Bhatia and Seto, 2010; Slotterback *et al*., 2011).

2.1.2 Promotion aspects

Once the health implications are understood and at the same time outlined for damage prevention, promotional aspects will be prioritised. The main advice in this respect is to (a) promote health and wellbeing instead of simply minimizing harms and (b) to bear in mind the collective needs of affected populations in terms of access to healthy environmental conditions, whatever the needed resources: water, soil, air to ensure not only minimal surviving conditions but wellbeing (Freitas, 2003; Kemm, 2005).

2.1.3 Social/political aspects

There are diverse routes in which social and political issues can cross health assessment, and these kinds of intersections are critical for integration in impact assessment. We found the following relevant aspects in literature: (a) HIA as a means of social learning based on stakeholders' views (Kemm, 2004); HIA as a participation process in which related parts look for (b) transparency (Harris-Roxas and Harris, 2010) and (c) influence on decision making improvement (Kemm, 2005; Harris-Roxas and Harris, 2010); (d) HIA as policy (Putters, 2005); (e) HIA as knowledge especially addressed to capacity building (Erlanger *et al*., 2008; Harris and Spickett, 2010; Morgan, 2010), which depends ongathering enough expertise from multidisciplinary teams; and (f) HIA based on partnerships involving health professionals and other stakeholders (Morgan, 2010; Slotterback *et al*., 2011).

2.2 Broad measurability approach

With "broad measurability" we intent to characterize aspects whose quantification can be outlined to some extent but which are more prone than others to uncertainties, subjectivity, or which lack objective provisions. We list the following aspects of broad measurability: (a) magnitude of impacts – described and assessed in consideration with both the number of people affected and the severity of effects (Kemm, 2005); (b) investigation and tracking of counterfactual issues to confirm or deny the relationship between exposure to harms and onward effects (Petticrew *et al*., 2007); (c) integration of different parameters given by legislation (Birley, 2003; Rigotto, 2009); (d) presentation of measures of mitigation supported by monitoring, through, at least, basic indicators (Morgan, 2010; Slotterback, 2011); (e) enhancement of positive impacts, translated through wellbeing indicators (Harris *et al*., 2009; Pennock and Ura, 2010).

2.3 Detailed measurability approach

With "detailed measurability" we mean to highlight features of individuals, families or communities that can be tracked using simple quantification, as well as environmental and institutional indicators. We found the following to be relevant in the literature: (a) assessment of biological, behavioral and circumstantial aspects (Birley, 2003), and (b) health data, accurately and precisely recovered (Harris and Spickett, 2010; Morgan, 2010). Under the umbrella of individual/family/community features, we deem relevant to detail: (a) biological variables such as nutrition, age, gender, alcohol/drugs consumption, sexual practices, ethnicity, immunity and diseases data (Birley, 2003; Bhatia and Seto, 2010; Harris-Roxas and Harris, 2010; Pennock and Ura, 2010); (b) behavioral variables such as risk acceptance, accident likelihood, lifestyle, occupation and education (Birley, 2003; Harris-Roxas and Harris, 2010); circumstantial aspects such as (c) income, poverty, employment context (Birley, 2003), and (d) equity issues, related to how the same impacts affect different people considering their different socioeconomic background and current situation (Harris-Roxas and Harris, 2010; Harris and Spickett, 2010).

Finally, detailed measurability can also be addressed towards two other health determinants: (a) environmental/physical aspects such as air, water, soil conditions, housing, consumption, land using, crops and food, green space available, traffic, climate (Birley, 2003; Harris-Roxas and Harris, 2010); (b) and institutional data, such as access to primary health care, specialists health care availability, NGOs role and work, security, transport, violence rates, cultural and emergency services (Birley, 2003; Pennock and Ura, 2010).

We summarise these descriptions in the next section, depicting a methodological frame. Also in the next section we present a brief of the six EIAs' cases we use as a case study for our research.

3 Methodological research frame

Methodological design of the research can be represented on a theoretical basis in Fig.1. This is the frame we took to assess the six EIA cases described in the next subsections, given the already quoted features delivered as recommended practices for HIA by the selected studies.

3.1 Selected cases description

Six cases of health impact assessment performed inside respective EIAs were selected: two from landfills projects delivered in 1992 and in 2006, respectively, by the same consulting firm; two from SHF available since 1997 and 2005, respectively, and carried out by an unique consulting firm; and other two – from a road project (2004) and from an industrial plant (2007), each one designed by different consulting firms. All these studies refers to projects placed in Rio Grande do Sul (Southern Brazil), under the responsibility of Fepam, which requires health impact assessment under the Law 11.520/2000 (Rio Grande do Sul, 2000).

Aspects	Authors
Theoretical lines of argumentation	
Biomedical/technical/risk	a. Steinemann (2000)
	b. Kemm (2005) Harris-Roxas and Harris (2010)
	c. Puttters (2005)
	d. Bhatia and Seto (2010)
Promotion	a.Freitas (2003)
	b.Kemm (2005)
	a.Kemm (2004)
	b.Harris-Roxas and Harris (2010)

Social/political	c.Kemm (2005) Harris-Roxas and Harris (2010)
	d.Putters (2005)
	e.Erlanger *et al*. (2008) Harris and Spickett (2010) Morgan (2010)
	f.Morgan (2010) Slotterback *et al*. (2011)
Broad measurability	
Magnitude of impacts	a.Kemm (2005)
Population/control group profiles	b.Petticrew *et al*. (2007)
Parameters provided by legislation	c.Birley (2003) Rigotto (2009)
Mitigation of negative impacts	d.Morgan (2010) Slotterback *et al*. (2011)
Enhancing of positive impacts	e.Harris *et al*. (2009) Pennock and Ura (2010)
Detailed measurability	
Individual/familiar features	a.Birley (2003)
	b.Harris and Spickett (2010) Morgan (2010)
Biological features	a. Birley (2003) Harris-Roxas and Harris (2010) Bhatia and Seto (2010) Pennock and Ura (2011)
Behavioral features	b.Birley (2003) Harris-Roxas and Harris (2010)
Circumstantial features	c.Birley (2003) d.Harris-Roxas and Harris (2010)Harris and Spickett (2010)
Environmental features	a.Birley (2003) Harris-Roxas and Harris (2010)
Institutional features	b.Birley (2003) Pennock and Ura (2010)

Fig 1. Main directions for recommended practices in HIA

We briefly characterize the cases:

3.1.1 Landfill project of 1992

This project was designed to take hazardous industrial wastes from an industrial shoe cluster in the neighborhood of a small city in the inner of Rio Grande do Sul State. Health assessment is limited to statements about the likelihood of air and water contamination because of chrome compounds and other dangerous substances found in leather wastes. Health impacts, including cumulative ones, are not quantified.

3.1.2 Landfill project of 2006

This project brings a detailed description on the health effects of chrome compounds on human health (specifically on skin, kidneys, nose), although quantification of possible health damages is not provided. It does not mention cumulative effects, but it provides a survey of 148 community members about environmental, health and socioeconomic issues related to the project.

3.1.3 SHF project of 1997

This study underwent several modifications due to environmental agency requests. It only describes likely effects of environmental damages on the health of

community members or people employed in dam building. Health consequences of environmental harms are posed as issues to be monitored after the project building is over, so detailed descriptions and quantifications are not expressed.

3.1.4 SHF project of 2005

In this project, the range of environmental impacts able to bring negative effects on health is clearly wider than that indicated in the first SHF study, including solid wastes, noise, fuels use, agrotoxics, and dust besides water effects. Social and economic issues are used just to justify the project, with no relationship between these issues and health aspects explained.

3.1.5. Road project of 2004

This project does not offer a link between environmental impacts and health effects. Although it underpins a significative level of integration between parts of diagnostic and prognostic, it reveals clashes once it proposes monitoring of provisions that are not earlier forecasted and defined as impact factors. Nevertheless, positive effects are highlighted as a trade off to justify the need for project implementation.

3.1.6 Industrial plant of 2007

This project shows a heavy bulk of technical content in order to enable a detailed and, as far as possible, a complete environmental impact assessment, including very consistent monitoring plans. Nevertheless, the detail of this assessment is not reflected in associated health aspects. Technical references are given just as scientific parameters in order to establish limits for pollutants release, without presentation of experimental relationships between pollutant levels and likely health damage in the context of the assessment.

4 Results

Assessments performed can be divided into three parts: a first whole set of results, considering theoretical lines of argumentation, broad and detailed measurability (Fig. 1); level of fulfillment of requirements (Fig. 2); and comparison of two peers (for landfills and SHF EIAs, Fig.2).

4.1 Whole assessment

4.1.1 Biomedical/technical/risk

All EIA documents make it clear that exposure to hazardous agents, whether chemical, biological, physical or psychological, can harm health, although this is not so evident in the road and industrial plant EIAs. Actually, these EIAs present the argumentation that giving up the project execution can imply economic, social and environmental damage. Epidemiological and toxicological models are not used in the evaluated EIAs. However, the EIA of industrial plant presents some secondary data on toxicological substances. Well established cause-effect relationships involving environmental causes and consequent health harms are partially covered in the 2006 landfill EIA, and in the older documents (1992 and 1997) rather than in the more recent ones (2004, 2005). Quantification and accuracy of the health issues are unregistered in all documents except in the 2006 and 2007 EIAs, where attempts at quantification are developed.

4.1.2 Promotion

No health assessment embedded in the analysed EIAs explicitly promotes health, although it can be indirectly realised in the case of the 2006 EIA, because practitioners had stressed the benefits for soil, water, air and public health of the neighborhood of the projected landfill *vis-à-vis* the possibility of doing nothing with

leather and shoes wastes. Collective health is considered in all landfill EIAs and in the oldest SHF EIA, and is partially covered in the 2004 and 2007 EIAs, but is overlooked in the 1997 document.

4.1.3 Social/political aspects

Issues of health mentioned in EIAs generally do not entail any social learning consequences based on stakeholders' views, although this can somehow be indicated in the 2004 and 2006 EIAs because both present opinions from affected populations regarding the project execution. Participation with transparency aimed at better decision-making is partially apparent only in the 2006 EIA as it reproduces the whole survey carried out with community members affected by the project, showing the pros and cons of landfill development for public health. There is no clear guidance for health assessment in any of the analysed EIAs. As a consequence of the dearth of any HIA policy, knowledge about this type of assessment is overlooked, and capacity building is still needed for many practitioners. Partnerships involving health professionals are not registered at all.

4.1.4 Magnitude of impacts

Older EIAs (of 1992 and 1997) have no description of impacts magnitude; the 2004 and 2006 EIAs present partial fulfillment of this requirement, and the 2005 and 2007 EIAs are the only ones that apply tools enabling the evaluation of the severity and range of impacts with regard to health status.

4.1.5 Counterfactual aspects of exposure X effects investigation

Counterfactual aspects of exposure to unhealthy agents X health effects are not investigated in any analysed EIA. To convey this type of assessment, consultants must have support from health professionals and be underpinned by policies for health, which is not the case. Furthermore, it demands epidemiological and toxicological models for being scientifically grounded, what we did not register.

4.1.6 Parameter integration from several institutional sources

This is not found at all in EIAs carried out before 2000 and only partially found in the others. This is likely due to lack of knowledge of integration approaches involving different sources, and such integration does not appear to be concerning consultants or public authorities, and so is limited to data gathering and presentation.

4.1.7 Effective mitigation measures supported by monitoring

This requirement is partially fulfilled by 50% of the analysed EIAs, and missed by the other 50%. EIAs with partial accomplishment of this requirement had simply indicated monitoring parameters, but avoided detailing them.

4.1.8 Wellbeing indicators

Wellbeing is not considered by consultants and public agents.

4.1.9 Individual, family and community features

Individual analysis regarding biological, behavioral and circumstantial aspects are absent from most EIAs. The exception is the 2006 document, where we can find a survey including basic psychological/behavioral assessments of a selected range of likely affected people. Health data quoted in the EIAs are mainly secondary, where they exist, and there is no consideration of their accuracy. Biophysical issues, such

as nutrition, genetics, age, gender, alcohol/drugs consumption, sexual practices, ethnicity, immunity, diseases are not investigated in any of analysed EIAs. Behavioral issues, such as risk acceptance, accident likelihood, lifestyle, occupation, education are partially covered in all EIAs, except in the 1992 example. Circumstantial issues related to socioeconomic aspects are fully present in three EIAs (2004, 2005, 2007). Equity assessment is missed in all documents.

4.1.10 Environmental/physical issues

Issues related to air, water, soil conditions, housing, energy availability/consumption, land use, crops and food, green space, food, traffic, climate are partially detailed in four EIAs and not at all in other two.

4.1.11 Institutional issues

Subjects such as access to primary health care, specialists health care, NGOs role, social support networks, security, transport, crime rates, cultural aspects, emergency services are missed in all EIAs, except in that for the industrial plant (2007), which just provides recommendations for institutional programs.

4.2 Level of fulfillment of requirements

To carry out this analysis, we considered the sum of requirements (25) with the same weight applied to each one, and expressed as a percentage the rates of fulfillment, partial fulfillment and omission (Fig. 2). We can realize that the average fulfillment is 10,7%, while the best individuals scores are from the latest EIAs: of 2006 and 2007, respectively, both with 12% fulfillment.

4.3 Peers' comparison

According to a net comparison of peers (Fig. 2), we notice a substantive progress in the case of landfill EIAs, with improvement in partial fulfillment and a decrease in omission from 1992 to 2006. However, this is not the case for the SHF EIAs: although the whole fulfillment requirements have shown some increase, from 8% to 12%, partial fulfillment has fallen, what have put down the total performance.

5 Conclusions and recommendations

From the analysis performed, we can conclude that the lack of policies and therefore of specific guidelines for HIA are leading to shallow health assessments in Southern Brazilian EIAs. We realise that these documents present a low level of fulfillment of recommended requirements, even though some of them show some signs of recognition of links between social issues and health impacts, especially in the case of the recent landfill EIA. Nevertheless, the lack of epidemiological and toxicological models, and poor accuracy, harm isolated efforts to bring about what could be called professionals HIAs. We observe that EIAs performed before 2000 have neither considered the magnitude of health impacts nor have they investigated health determinants. We conclude that the assessed Southern Brazilian's EIAs are far from representing best practice, and recommend more detailed research through the analysis of a greater number of documents in order to get a better representation of the evolution of HIA practice in Brazilian EIAs.

Aspects	Sector	Landfill		SHF		Road	Industrial
	Year	1992	2006	1997	2005	2004	2007
Theoretical lines of argumentation							
Biomedical/ technical/risk	a	F	F	F	F	PF	PF
	b	**NF**	**NF**	**NF**	**NF**	**NF**	PF
	c	PF	F	PF	NF	NF	PF
	d	NF	PF	NF	NF	NF	PF
Promotion	a	NF	PF	NF	NF	NF	NF
	b	F	F	F	NF	PF	PF
Social/political	a	NF	PF	NF	NF	PF	NF
	b	NF	PF	NF	NF	NF	NF
	c	NF	PF	NF	NF	NF	NF
	d	**NF**	**NF**	**NF**	**NF**	**NF**	**NF**
	e	**NF**	**NF**	**NF**	**NF**	**NF**	**NF**
	f	**NF**	**NF**	**NF**	**NF**	**NF**	**NF**
Broad measurability							
Magnitude	a	NF	PF	NF	F	PF	F
Population profile	b	**NF**	**NF**	**NF**	**NF**	**NF**	**NF**
Legal parameters	c	NF	PF	NF	PF	PF	PF
Mitigation	d	F	PF	PF	PF	F	F
Enhancing	e	**NF**	**NF**	**NF**	**NF**	**NF**	**NF**
Detailed measurability							
Bio+behavioral	a	NF	PF	NF	NF	NF	NF
Health data	b	**NF**	**NF**	**NF**	**NF**	**NF**	**NF**
Nutrition...	a	**NF**	**NF**	**NF**	**NF**	**NF**	**NF**
Risk acceptance...	b	NF	**PF**	**PF**	**PF**	**PF**	**PF**
Income, poverty...	c	NF	PF	PF	F	F	F
Equity	d	**NF**	**NF**	**NF**	**NF**	**NF**	**NF**
Environmental	a	NF	PF	PF	NF	PF	PF
Institutional	b	**NF**	**NF**	**NF**	**NF**	**NF**	PF

Fig 2. Results of health assessment in six EIAs cases of Southern Brazil
F= Fulfills; PF = Partially fulfills; NF = Does not fulfill the requirement

EIA	Landfill 1992		Landfill 2006		SHF 1997		SHF 2005		Road 2004		Industrial 2007	
Status	N	%	N	%	N	%	N	%	N	%	N	%
Fulfills	3	12	3	12	2	8	3	12	2	8	3	12
Partially Fulfills	1	4	12	48	5	20	3	12	7	28	9	36
Does not Fulfill	21	84	10	40	18	72	19	76	16	64	13	52

Fig 3. Rate of best practices fulfillment for each analysed EIA

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