Contents lists available at ScienceDirect



Environmental Impact Assessment Review

journal homepage: www.elsevier.com/locate/eiar

Strategic health assessment for large scale industry development activities: An introduction



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ABSTRACT

Attention to the determinants of health and health equity in impact assessment remains under-utilised at the project, Environmental Impact Assessment, level. Determinants focussed health impact assessment has developed at an upstream, policy level, but tends to assess draft proposals rather than form the basis of policies and plans. Project level health (risk) impact assessment tends to focus on a project by project basis, and generally eschews a broad model of health. One answer to this 'health and impact assessment' problem is to shift attention to the strategic level, in a similar manner to, and learning from, the development of Strategic Environmental Assessment and its theoretical and practical derivatives. In this article we explain the need for this shift both conceptually and practically by navigating the literature. Our analysis derives specifically from developing the Strategic Health Impact assessment and policy analysis for the past decade. We develop characteristics of conducting strategic health assessments for multiple industry development activities at the supra national, na-tional or regional level. Our intended audience are public administrators, industry planners and financial sector investors. A particular focus is low and middle income countries, now seen by industry as emerging markets.

1. Introduction

This article focusses on developing strategic level health focussed assessments as part of planning for and decisions about large scale industry investments. The pressing need for this comes from industry openly acknowledging a global shift in activity away from developed economies to 'frontier markets' and 'rapidly emerging economies', which are mostly lower and middle income countries (Harris et al., 2015). Often these countries do not have statutory or strategic mechanisms in place for considering the impact of large scale industry activities. Our audience is industry, government and financial lending institutions. We do however feel that initially industry could take the lead, consistent with International Oil and Gas HIA guidance, our contribution to which informs some of the ideas presented here (IPIECA, 2016). By industry we principally focus on extractive industries, although our arguments can be usefully applied to the global infrastructure industry more broadly. Our arguments are also pertinent to international financial institutions (IFI) which contribute capital to both private developers and governments for infrastructure and industrial development, and require a good understanding of the risks associated with multiple investments. .

The article offers untested ideas, albeit ones that are gleaned from experience and grounded in the existing relevant literature. Practice is however required to test and further develop strategic health assessment ideas we present here. Related, we wish to avoid being stuck by terminology. We refer throughout to 'strategic health assessments' but our intent is to present core ideas, drawing across the experience of Impact Assessment (IA) (see also Appendix A), rather than naming another form of IA practice.

Conceptually there have been significant shifts in the understanding of Health Impact Assessment (HIA) practice and use from the last decade or so such that offering a 'strategic' process for large scale industry activity is now possible. Firstly the industry has more widely embraced the process; both mining and oil and gas industry associations have specific HIA guidelines for operators (International Council on Mining and Minerals, 2012; IPIECA, 2016). For a long time the focus of the extractive industry sector has been on the inside the fence risks, mainly the health and safety aspects of the workforce. However this has shifted and the sector has become more aware of the larger health dimensions associated with their projects. "HIA" and "Public health

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http://dx.doi.org/10.1016/j.eiar.2017.10.002

Received 14 June 2017; Received in revised form 8 September 2017; Accepted 2 October 2017 Available online 01 November 2017 0195-9255/ © 2017 Elsevier Inc. All rights reserved.

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interface and promotion of good health" are now two of the eight leading health performance indicator for the oil and gas sector (IPIECA, 2007). Simultaneously, recent efforts to develop Health in All Policies approach (Kickbusch, 2013) that explicitly accepts messy and value laden nature of policy development also reveal lessons for industry planning. Before we dig down into these particular areas, stressing the importance of population health considerations health for industry planning is warranted.

2. Population health and industry planning

Health is both a product of and a pre-requisite for development (World Health Organisation, 2008). Human health is shaped by wider determinants stemming from decisions and activities usually outside the control of the health sector. One of the biggest risk management challenges currently facing industry project developers and public administrators in emerging markets is the appropriate assessment and management of interlinked and cumulative human health impacts and risks related to composite industrial activities. Factors such as climate change and unpredictability of climate patterns, increasing and competing water use demands, degradation of ecosystem services, and changing socio-economic circumstances all add complexity to assessing and managing the health impacts and risks to population health from projects at a strategic level. Multiple projects, often from different developers, are assessed in an uncoordinated and unplanned manner and their interactions or cumulative impacts are not always considered (Morello-Frosch et al., 2011; Solomon et al., 2016). However multiple industrial development has the potential to lead to consequences to the health, both negatively and positively, of individuals, communities and entire regions which then, in turn, seriously compromise the ability of those projects to deliver benefits to companies and communities or to adequately protect their workers.

There are shifts in IA practice to focus on cumulative impacts and cumulative impact assessment or strategic environmental assessments as processes to do this. Similarly these type of impacts should form a core part of strategic land-use or transport planning. However, health is not routinely considered within these largely government led processes. Indeed, we would welcome both cumulative impact assessment, SEA, and strategic planning borrowing heavily from the population health focussed ideas we present here.

Considering health as a population issue requires a broad definition that goes beyond disease to include wellbeing. Health is also unevenly distributed among different population groups and therefore the impacts associated to industrial projects might further increase inequality in health and reduce the possibilities of certain groups to benefit from the project. These are some of the reasons that led the financial sector to develop principles and standards for protecting the health and safety of local communities from industrial development (International Finance Corporation, 2010; Equator Principles, 2012).

These industry and financial standards are however developed for assessing the impacts of one single project – 'the asset' – at the engineering/project design phase, and not for looking at the interactions among several industrial projects, even less are designed for assessing the impacts associated with a full industrial sector development. From a planning perspective however, considering these determinants is best achieved at an early, strategic level.

Before introducing how to go about this, we highlight supporting arguments from four relevant strands of literature for an IA audience: EIA, Health Impact Assessment, Health in All Policies, and Strategic Environmental Assessment.

3. The limits of EIA

There is a long standing recognition that Environmental Impact Assessment (EIA), and thus considering health within EIA, comes too late to influence high level strategic decisions, and is most often conducted as a compliance process through which projects themselves are improved and approved (Morgan, 2012). For example, the decision point is not whether or not for a project to proceed in a particular region and be of a particular type and size, but rather that how to best design and construct such a project given its investment potential (Richardson, 2005). By the time projects are at the compliance stage, the focus is on risks and facts to reduce uncertainties (Bond et al., 2015) rather than negotiation about different positions and fundamental decisions about concept design, options and alternatives, and cumulative considerations that embody the broad determinants of health (Harris et al., in press).

EIA has also been criticised for its positivistic, rationalistic basis that is at odds with established knowledge about policy decision making. This preferences objective positioning of 'facts', rather than negotiating different values, positions and substantive goals that the EIA is, in fact, being used to achieve (Richardson, 2005; Elling, 2009; Morgan, 2012). These rules are established at a societal level (Haugaard, 2003; Cashmore and Richardson, 2013), for instance whether society accepts a focus on capital growth and market competition over and above other concerns (Weston, 2010). Political institutions such as governments or industries often mirror these concerns and align their goals, interests and practices to these mandates (March and Olsen, 1996).

4. Health impact assessment at the policy level

HIA similarly suffers from not matching up with the often incremental nature of decisions made within, and because of, particular institutional rules and power dynamics (Carmichael et al., 2013; Harris et al., 2014b; Berensson and Tillgren, 2017). At a strategic policy and plan level HIAs can and have been conducted (see for example Dannenberg et al., 2008, Haigh et al., 2013) but they are often time limited and static, external to the policy process, rather than flexible and responsive within policy and planning (Harris et al., 2014a,b; Berensson and Tillgren, 2017; Roué-Le Gall and Jabot, 2017). HIAs even at a policy level tend to assess an already drafted plan or set of objectives, rather than directly inform policy and planning as it happens. HIAs are no doubt useful activities, particularly to provide an external check and influence on policy and planning, but the intent is to provide decision-makers with an 'objective' set of predictions about the already drafted policy or project, rather than to integrate health issues within those decisions and institutions that make these. In short, HIAs come too late.

5. Health in all policies approaches

'Health in all policies' is the most recent of a long series of attempts at influencing macro-level decision making about health and its determinants. HiAP has some sound conceptual underpinnings that are lessons from its long history and that mirror the concerns with EIA and HIA (Kickbusch, 2013). Borrowing from HIA, the HiAP approach in some contexts has developed the 'health lens' as the core process of policy engagement (Delany et al., 2014). This works across the policy cycle rather than as an external input into a draft proposal; specifically for our purposes here the health lens engages in agenda setting whereas HIA does not (Ibid). However, HiAP has largely developed as an activity conducted within government on particular policies rather than externally with industry. While there are essential lessons for strategic level health assessments from the HiAP approach, we contend that influencing industry development is more likely to be achieved by making a definitional and conceptual connection to an existing approach, Strategic Environmental Assessment.

6. A brief history of SEA

Many of the points behind our thinking presented here have been raised in the SEA literature over the past 20 years. Over time SEA developed in response to the technical and theoretically imitations of EIA (Lawrence, 1997, 2000) and the wider institutional conditions that surround strategic planning and policy development (Bina, 2007). Similar findings have been raised about HIA as a mechanism for addressing health in public policy, where the focus to date has largely been technical rather than strategic (Harris et al., 2014b). The core of SEA has been critically checked on occasion and through this criticism particular elements of what SEA actually is have emerged. First, SEA comes in at the earliest decision making points (Verheem and Tonk, 2000; Fundingsland Tetlow and Hanusch, 2012). This emphasises the need to develop alternatives, options and scenarios (Jay, 2010) to help frame the issues and decision making points surround the determinants of health and health equity. While this core is indisputable, there is the recognition that the actual practice of SEA may vary from context to context - this is because the 'holy grail' of influence is not actually the SEA itself, but the 'integration' of SEA into the planning process (Jay, 2010). These processes necessarily vary due to regulatory context and also the technical decisions that need to be made within specific regions (Sánchez-Triana and Enriquez, 2007). In some instances this means that SEA runs alongside other processes (Jay, 2010).

This flexibility distinguishes SEA from other IA processes like HIA or EIA, which as already explained tend to come in at a certain point to assess projects within boundaries already laid out. Jay (2010) suggests strategic assessments 'run alongside' the preparation of a strategic planning action and ensure that impacts associated with that action are carefully assessed 'before project level assessment begins'. The role of project level assessment, Jay argues, is then to 'fine tune' project proposals 'which already respect the parameters drawn up through the [strategic assessment]'. This is achieved by SEA becoming an indicative rather than prescriptive framework for planning (Partidario, 2000).

All this potential ambiguity necessarily brings into play the role of actors and range of stakeholders involved in planning (for instance across different agencies and sectors, and with potentially affected communities). A crucial task of SEA is to create policy learning among multiple actors across varying belief systems (Kørnøv and Thissen, 2000; Bina, 2007). Rather than taking a rational-technical approach where knowledge is based on presentation of facts, it is through these actors and their negotiation about core goals as well as the technical issues, that institutional change comes about (Bina, 2007). White and Noble (White and Noble, 2013) provide a useful overview of the SEA literature by presenting evaluative criteria for SEA practice concerning sustainability.

One core issue that is recognised in the SEA literature is the need for conceptual clarity over the purpose of SEA and the value this adds to the planning process. This revolves around the need to define and pay attention to 'sustainability' as a fundamental goal at the outset for all policy decisions e.g. (White and Noble, 2013). These arguments, from the health perspective, highlight the need to make early decisions that emphasise the 'determinants of health and health equity' as crucial entry points to decisions about industry planning. Crucially, SEA practice might focus on sustainability but not necessarily, and definitely not routinely, on health. For example an SEA of the Oil and Gas sector conducted in Ghana did not undertake a health assessment. Nevertheless of 24 key issues the SEA identified of high importance, 18 were either health impacts or concerned known health determinants. The SEA concluded that health was a crucial consideration and the health system a key stakeholder in Oil and Gas expansion in Ghana. The SEA therefore recommended carrying out a health focused strategic assessment given these health implications had not been addressed by the SEA process. We were then involved in the subsequent scoping of that strategic health assessment.

In the next section we attempt to turn some of these rather abstract dimensions from the literature into practical ones that allow strategic level planning to focus in on the determinants of health and health equity.

7. Strategic health assessment

What strategic health assessment offers, then, is a structured proactive process to strengthen the role of health issues in strategic decision making and planning (adapted from Verheem and Tonk, 2000). Crucially, because of its focus on decision making as well as providing evidence, a strategic health assessment is both a technical document AND a tactical strategic engagement process, both of which are aimed at informing decisions to improve industry practice. We now outline several reasons for this.

Strategic health assessments should be iterative over time allowing decisions to occur that are not necessarily fixed at a certain point in time or geographic area. The emphasis is on the decision about investment and its effects, not the technical project concept design. This shifts attention away from providing the 'best' technical evidence, which remains a crucial focus for HIA or Health in IA, to one that weighs and considers different types of evidence at different points in strategic planning. The emphasis is on negotiating complexity as early as possible in strategic thinking and planning, not providing a fixed rational-deductive assessment relatively late when (asset driven) planning has already occurred.

Multiple industry decisions and practices combine to influence health equity, which makes equity particularly tricky to assess in a IA. Health equity, put simply, requires considering the unequal health impacts for who wins and who loses from decisions, whether losing out is fair, can be avoided and, if not, can be mitigated. Planning for transport infrastructure associated to large industrial development, for instance, necessitates a good understanding of housing demand and supply just as it does demand for health services. A new road system because of regional investment in oil and gas can link urban or regional centres to bring positive opportunities for access to goods, services and employment. But that road might also exacerbate spatial inequalities by ignoring the current circumstances of rural or peri-urban communities; for example through a simultaneous increase of the risk of traffic accidents without an adequate provision of emergency care and cutting off access to or polluting traditional food sources.

Further, at a strategic level uncertainty about context, exacerbated by limited existing data and multiple stakeholder perspectives, is very high. When not accounted for at an early stage, these uncertainties creep into the IA process implicitly. Narrow focus of consultations on specific issues aimed at garnering support for already made decisions about the project concept design, the reductionist assessment of individual projects (or segments of a single project) cannot possible take on the range of industry activities that impact on health. For project IA the challenge of causality and attribution from a single project to the many determinants of health subsequently leads to difficulties with assigning mitigation or management activities to particular stakeholders and projects. Early strategic planning through a strategic health assessment process enables collective decisions to be made in a proactive rather than reactive manner, and where clear lines of responsibility can be made and crucially revisited at later points in time.

For example, during the scoping work we supported in Ghana, macro decisions were needed to protect and promote the health of the communities. In particular positive impacts from investment required an improved road connection between the capital, Accra, and the area where most where industry activity was likely to occur. From a comprehensive health perspective this meant considering the road, prior to the IA of each project, over time and across issues such as the safety of those living in close proximity, access to services and employment, impacts on biodiversity and its effect on zoonotic diseases, and vector disease control. This type of analysis must extend way beyond each single project and its immediate impacts.

7.1. Core characteristics

Several crucial and interconnected characteristics have been thus

far identified which we now develop as core characteristics of an strategic health assessment .

7.1.1. A range of decisions or proposals can be included

Proposals and decisions which are the basis of the strategic assessment are wide and varied. Examples of proposals that could be strategically assessed and planned for include (adapted from Partidário, 2000): international industry sector policies or business models, regional-scale development plans and policies, large-scale industrial development and associated infrastructure, fire, vegetation/resource or pest management policies, plans or programs, water extraction/use policies, infrastructure plans and policies.

7.1.2. Scale and scope: geography and size

Strategic assessments operate at a different scale and scope to projects (Fundingsland Tetlow and Hanusch, 2012). They can be applied to a particular geographical area (e.g. national, regional, local), a particular sector or sub-sector (e.g. oil and gas, construction, infrastructure, housing). Whereas projects necessarily are concerned with a particular project in a particular geographic area, strategic assessments are not so bound. In this way strategic assessments can assess the impacts at a whole geographic regional area or focus on the impacts of a whole or part of the industry across a whole country or region. This is particularly useful where multiple projects can be planned across areas where the majority of health impacts are felt away from the specific project site (for example across a coastal region) and may be the responsibility of different stakeholders as discussed below.

7.1.3. Timing: early and continuing

Strategic assessments have different timing dimensions to projects. Strategic assessments can occur at the earliest point of planning for industry activity where ideas and options are forming in response to specific demands, whereas projects necessarily occur at a point in time when there is a proposal to assess. Given this focus on early decisions, strategic assessments should also aim to occur alongside other planning procedures to inform project assessments conducted at a later stage. Ideally strategic health assessments will align with strategic planning processes of other agencies and organisations; governments at different levels will have planning procedures concerning industrial, transport and land use development (for example regional plans); other development organisations will have strategic planning processes. While an individual strategic assessment can be conducted separate to these it also can inform, and be informed by, them. Also as the geographic scale of a strategic assessment is larger than but connected to projects, strategic assessments can be conducted over time while feeding into more focussed project assessment and approvals processes. This is what is meant by 'flexibility' where strategic assessments inform decisions at a high strategic level while linking in with plans and projects.

7.1.4. Process: flexible and adaptive

Importantly as the strategic health assessment occurs it should not be seen solely as a linear process, particularly over time when findings from the stages may begin to merge into an overall strategic planning process. One of the main benefits from the structured, linear, steps of an impact assessment is that it allows a task focus for activity as well as the opportunity to develop stakeholder relationships for future, task focussed, engagement. However if IA is conducted as linear and one-off the core recommendations may not align with the realities of non-linear and incremental strategic decision making and planning. The best approach over time is to adapt the core aspects of the strategic health assessment to the decisions that need to be made in response to findings (possible through monitoring and evaluation) from the regions impacted on by development (Elvin and Fraser, 2012; Carey and Harris, 2016). Over time some parts of the process and indicators generated from this will become more or less important than others as new evidence emerges or is required.

7.1.5. Inputs: options and alternatives, and scenarios

Strategic assessment intends to be part of early decision making where it is often less clear about what course of action needs to be taken. Such decisions require addressing a perceived need or demand for example, providing energy access in the context of growing populations. Strategic assessment, by following the steps of an impact assessment (see Appendix A), provides a structured process of bringing information to inform those decisions. However, unlike traditional project assessment or HIA, the 'input' which is assessed is different to a specific project proposal or activities identified in a draft plan. Rather than a specific project activity which is then assessed in terms of its health consequences, early decision making is principally concerned with emphasising population health issues, costs or benefits within the options and alternative courses of action. Developing different scenarios are recognised as one useful strategy when policy decisions are yet to be made or are opaque (Partidário, 2000). Such scenarios in a strategic health assessment have health components built in, for instance, access to existing health facilities, providing multi-modal transport options to reduce injury, improve air quality, and maintaining green space.

7.1.6. Stakeholders: many and varied

Strategic assessments also provide the opportunity to proactively engage with a wide range of stakeholders early on in planning and decision making. As the scale and size of an assessment increases the range and type of input required often increases. For example one region of an area may have a different cultural or ethnic history to another, or different ways of governing with different rules and regulations. Transport planning, for instance, requires navigating a range of stakeholders from regional and local government, representatives from different communities, and housing, education, and health services providers.

7.1.7. Information: accept complexity

As the size of the area assessed increases and more people may be impacted on it is likely that the number, size and type of potential health impacts will increase. This requires an open approach to scoping and assessment where the impacts considered are not reduced to various sentinel health 'issues' but considered broadly through the determinants of health and their distribution among the populations affected. The types of information required to inform strategic decisions is also necessarily broad, ranging from quantifiable evidence of impacts if these exist, estimates of costs and benefits of varying options, to an informed understanding of stakeholder and community responses to particular options or alternatives or courses of action.

This necessarily connects complexity analysis as a core method within strategic health assessments. Core to complexity oriented analysis is to focus on and develop causal loops, rather than linear (X leads to Y impact), across alternatives or scenarios to inform a 'map' of potential activities and policy and planning options (Cavana and Mares, 2004). This causal loop approach (Medema et al., 2014) emphasises collaborative critical thinking and learning about a particular problem, such as demand for industry activity and the need to improve health equity, as a rationale for a policy option (such as integrating transport infrastructure with employment opportunities), turning these into conceptual diagrams or models, and using these models to further refine the planning solution (multi-modal transport facilities near regional employment hubs for instance).

7.1.8. Summary

From this analysis, the core ideas we have presented strategic health assessments are shown in Figs. 1 and 2 below. These dimensions are fundamentally different from HIA or project focussed IA. The intent is not to undertake an HIA on an existing draft proposal or plan, focussed on specific health impacts as linearly predicted consequences of that proposal, and deliver the findings to proponents in a standalone report.



Fig. 1. Triggers/dimensions of strategic health assessment and its outcomes/outputs (IPIECA, 2016).



Fig. 2. The core adaptive dimensions of a strategic health assessment.

Rather the intent is to develop plans that integrate health considerations at the earliest possible points within planning across geographic scales. A mosaic of potential health enhancing actions and options are the focus, not a presentation of the health consequences of what has already been drafted up and recommendations to mitigate these. At the same time the trigger is to build relationships to inform health focussed decisions in the plan and over time. The outputs are not tied up in a report or impact statement that sits on a shelf. Rather the outcomes are to develop indicators to monitor and further adapt to, direct influence on management plans as well as specific project level IAs, and the required collaborative relationships over the long term that mean the plan can be revisited.

Strategic health work also is different to HIA in that it is not provided at a specific point in time but rather should adapt over time and when circumstances change. Conceptually the process over time works iteratively (Fig. 2) in a similar manner to adaptive management processes, where continual monitoring informs new strategies or the need to consider and review project planning and modifications. The strategic assessment is developed to inform health focussed planning about a specific problem – gold mining in an area where informal gold mining has been occurring for decades for instance. The assessment process will produce a report, indicators and ongoing relationships to work from.

Appendix A

Table 1 The strategic health assessment mapped against the core IA steps. The findings should inform project specific IAs, and management plans at a regional level to be developed by other stakeholders such as governments. As more projects come on line, change, or are decommissioned over time, the regional context is likely to change, requiring an adapted plan. Thus the strategic health assessment evolves to both inform and respond to changing regional conditions.

8. Conclusion

This article has detailed how to consider health at a strategic level for industry activities, with a particular focus on emerging markets in low and middle income countries. We have offered the core dimensions of conducting a strategic health assessment, based on a navigation of the relevant literature (particularly from SEA that has evolved to consider these dimensions from a sustainability perspective). These are: do the work at an early point in planning, accept that complexity needs to be navigated, emphasise collaboration and negotiation early and throughout, and focus attention on the geographic scale that multiple industry activities occur at.

Situating the article in the existing literature throughout we have largely taken an upbeat approach to these persistent conceptual challenges that health issues have faced in IA (Fehr et al., 2015). However, there are major challenges with shifting existing institutional thinking and practice into new areas (this is termed 'path dependency' in institutional analysis where the default is keeping things the same way until a crisis creates the opportunity for change). There is a cautionary tale here from adaptive management. Implementation of full adaptive management over time, which is essential for the process to work, has been difficult to achieve. This is because of various institutional reasons: the high costs of information gathering and monitoring; managerial resistance through fearing increased transparency; political risk due to the uncertainty of future benefits; and difficulties in acquiring stable funding over time; and fear of failure (Walters, 1997). Shifting to a strategic health assessment approach will mean overcoming each of these. The benefits of doing so, we contend, are essential for industry and country alike. Practice must move to a sustainable model that strategically acknowledges how ideas that emphasise innovation and economic development necessarily impact, for better and for worse, human health.

Funding sources

Patrick Harris is funded by the Australian National Health and Medical Research Council (APP1090644). Both authors received funding as advisors for the IPIECA HIA guidance referenced in the paper and for providing training for Strategic Health Impact Assessment in Ghana in 2014. The intellectual property for this work rests with the authors and has not been published elsewhere.

Step	Task	Who involved	Outcome/output
Screening	Identify if triggers exist:	In house	Whether an <i>strategic health</i> assessment is appropriate or
	- New region		not
	- Early decision making		
	- Potential for impacts beyond the company's individual		
	control		
	- New relationships required		
Scoping	Identify potential stakeholders.	In house initially.	Plan for strategic health
	Conduct a regulatory and legislative review	Multiple stakeholders for	assessment

	Map the institutional and planning context for the region where activity (options/scenarios) is planned for over time. Articulate governance structures and mechanisms (Steering groups, reference groups, and other forms of governance - e.g. technical input, stakeholder engagement.) Identify learning objectives which can be returned to throughout the process to inform priorities as these are developed or changed Terms of reference should be developed and signed off by the steering committee.	governance and terms of reference.	Map of strategic context Terms of reference Initial stakeholder relationships Learning objectives
Options and scenario development	Develop options and scenarios for industry activity across a region	Multiple (led by in house team if this is preferred)	Concrete options to base strategic decisions on
Baseline and additional stakeholder engagement	Develop regional baseline indicators Undertake additional stakeholder mapping and data collection to inform decisions about impacts	In house/multiple	Understanding of likely health effects of regional industry activity
Appraisal	Technically appraise impact information Discuss information and relevance to strategic industry activity Link to scoped learning objectives to identify whether impact warrants action and what this action would entail and who is responsible	Multiple	Mapping of impacts and consequences for industry activity Identify required actions and responsibilities
Reporting and indicator development	Develop report Develop indicators for informing future strategic planning and project activity, and monitoring	Multiple	<i>strategic health assessment</i> report Indicator report
Evaluation	Process evaluation Impact evaluation (once industry activity begins)	Multiple Multiple	Report of process utility and fit for purpose against learning objectives Impact of strategic health assessment decisions on subsequent activity

References

- Berensson, K., Tillgren, P., 2017. Health impact assessment (HIA) of political proposals at the local level: successful introduction, but what has happened 15 years later? Glob. Health Promot. http://dx.doi.org/10.1177/1757975916683386.
- Bina, O., 2007. A critical review of the dominant lines of argumentation on the need for strategic environmental assessment. Environ. Impact Assess. Rev. 27 (7), 585–606. Bond, A., Morrison-Saunders, A., Gunn, J.A.E., Pope, J., Retief, F., 2015. Managing un-
- certainty, ambiguity and ignorance in impact assessment by embedding evolutionary resilience, participatory modelling and adaptive management. J. Environ. Manag. 151, 97–104.
- Carey, G., Harris, P., 2016. Developing management practices to support joined-up governance. Aus. J. Public Admin. 75 (1), 112–118.
- Carmichael, L., Barton, H., Gray, S., Lease, H., 2013. Health-integrated planning at the local level in England: impediments and opportunities. Land Use Policy 31, 259–266.
- Cashmore, M., Richardson, T., 2013. Power and environmental assessment: introduction to the special issue. Environ. Impact Assess. Rev. 39, 1–4.
- Cavana, R.Y., Mares, E.D., 2004. Integrating critical thinking and systems thinking: from premises to causal loops. Syst. Dyn. Rev. 20 (3), 223.
- Dannenberg, A.L., Bhatia, R., Cole, B.L., Heaton, S.K., Feldman, J.D., Rutt, C.D., 2008. Use of health impact assessment in the U.S: 27 case studies, 1999–2007. Am. J. Prev. Med. 34 (3), 241–256.
- Delany, T., Harris, P., Williams, C., Harris, E., Baum, F., Lawless, A., Wildgoose, D., Haigh, F., MacDougall, C., Broderick, D., 2014. Health impact assessment in New South Wales & health in all policies in South Australia: differences, similarities and connections. BMC Public Health 14 (1), 699.
- Elling, B., 2009. Rationality and effectiveness: does EIA/SEA treat them as synonyms? Impact Assess. Project Apprais. 27 (2), 121–131.
- Elvin, S.S., Fraser, G.S., 2012. Advancing a national strategic environmental assessment for the canadian offshore oil and gas industry with special emphasis on cumulative effects. J. Environ. Assess. Policy Manag. 14 (3).

Equator Principles, 2012. The Equator Principles III.

- Fehr, R., Viliani, F., Martuzzi, M., Nowacki, J., 2015. Health in impact assessments. Opportunities not to be missed. European Association of Public Health and IAIA, WHO Europe.
- Fundingsland Tetlow, M., Hanusch, M., 2012. Strategic environmental assessment: The state of the art. Impact Assess. Project Apprais. 30 (1), 15–24.
- Haigh, F., Baum, F., Dannenberg, A.L., Harris, M.F., Harris-Roxas, B., Keleher, H., Kemp, L., Morgan, R., Chok, H.N., Spickett, J., 2013. The effectiveness of health impact assessment in influencing decision-making in Australia and New Zealand 2005-2009.

BMC Public Health 13 (1), 1188.

- Harris, P., Haigh, F., Thornell, M., Molloy, L., Sainsbury, P., 2014a. Housing, Health and Master Planning: rules of engagement. Public Health. http://dx.doi.org/10.1016/j. puhe.2014.01.006.
- Harris, P., Sainsbury, P., Kemp, L., 2014b. The fit between health impact assessment and public policy: practice meets theory. Soc. Sci. Med. 108, 46–53.
- Harris, P., Viliani, F., Spickett, J., 2015. Assessing health impacts within environmental impact assessments: an opportunity for public health globally which must not remain missed. Int. J. Environ. Res. Public Health 12 (1), 1044.
- Harris, P., Riley, E., Sainsbury, P., Kent, J., Baum, F., 2017. Including health in environmental impact assessments of three mega transport projects in Sydney, Australia: a critical, institutional, analysis. Environ. Impact Assess. Rev (in press).
- Haugaard, M., 2003. Reflections on seven ways of creating power. Eur. J. Social Theory 6 (1), 87–113.
- International Council on Mining and Minerals, 2012. Mining's contribution to sustainable development: October 2012. International Council on Mining and Minerals, London.
- International Finance Corporation, 2010. Performance Standard 4: Community Health Safety and Security. World Bank Group.
- IPIECA, 2007. Health performance indicators. from. http://www.ipieca.org/resources/ good-practice/health-performance-indicators/.
- IPIECA, 2016. Health impact assessment. A guide for the oil and gas industry. from. http://www.ipieca.org/resources/good-practice/health-impact-assessment-a-guidefor-the-oil-and-gas-industry/.
- Jay, S., 2010. Strategic environmental assessment for energy production. Energ Policy 38 (7), 3489–3497.

Kickbusch, I., 2013. Health in all policies. BMJ 347.

- Kørnøv, L., Thissen, W.A., 2000. Rationality in decision-and policy-making: implications for strategic environmental assessment. Impact Assess. Project Apprais. 18 (3), 191–200
- Lawrence, D.P., 1997. The need for EIA theory-building. Environ. Impact Assess. Rev. 17 (2), 79–107.
- Lawrence, D.P., 2000. Planning theories and environmental impact assessment. Environ. Impact Assess. Rev. 20 (6), 607–625.
- March, J.G., Olsen, J.P., 1996. Institutional perspectives on political institutions. Governance 9 (3), 247–264.
- Medema, W., Wals, A., Adamowski, J., 2014. Multi-loop social learning for sustainable land and water governance: towards a research agenda on the potential of virtual learning platforms. NJAS Wageningen J. Life Sci. 69, 23–38.

Morello-Frosch, R., Zuk, M., Jerrett, M., Shamasunder, B., Kyle, A.D., 2011. Understanding the cumulative impacts of inequalities in environmental health:

P. Harris, F. Viliani

Implications for policy. Health Aff. 30 (5), 879-887.

- Morgan, R.K., 2012. Environmental impact assessment: the state of the art. Impact Assess. Project Apprais. 30 (1), 5–14.
- Partidario, M.R., 2000. Elements of an SEA framework—improving the added-value of SEA. Environ. Impact Assess. Rev. 20 (6), 647–663.
- Partidário, M.R., 2000. Elements of an SEA framework improving the added-value of SEA. Environ. Impact Assess. Rev. 20 (6), 647–663.
- Richardson, T., 2005. Environmental assessment and planning theory: four short stories about power, multiple rationality, and ethics. Environ. Impact Assess. Rev. 25 (4), 341–365.
- Roué-Le Gall, A., Jabot, F., 2017. Health impact assessment on urban development projects in France: finding pathways to fit practice to context. Glob. Health Promot. 1757975916675577.
- Sánchez-Triana, E., Enriquez, S., 2007. Using policy-based strategic environmental assessments in water supply and sanitation sector reforms: the cases of Argentina and

Colombia. Impact Assess. Project Apprais. 25 (3), 175–187.

- Solomon, G.M., Morello-Frosch, R., Zeise, L., Faust, J.B., 2016. Cumulative environmental impacts: science and policy to protect communities. Annu. Rev. Public Health 37 (1), 83–96.
- Verheem, R., Tonk, J., 2000. Strategic environmental assessment: one concept, multiple forms. Impact Assess. Project Apprais. 18 (3), 177–182.
- Walters, C., 1997. Challenges in adaptive management of riparian and coastal ecosystems. Conserv. Ecol. 1 (2), XI–XII.
- Weston, J., 2010. EIA theories—all Chinese whispers and no critical theory. J. Environ. Assess. Policy Manag. 12 (04), 357–374.
- White, L., Noble, B.F., 2013. Strategic environmental assessment for sustainability: A review of a decade of academic research. Environ. Impact Assess. Rev. 42, 60–66.
- World Health Organisation, 2008. Closing the gap in a generation: health equity through action on the social determinants of health. Final Report of the Commission on Social Determinants of Health. World Health Organization, Geneva.