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Theory and practice to integrating health in environmental assessment: Synthesis of an experience with stakeholders to deliver a national HIA guideline

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ABSTRACT

Private or public developers, including local authorities and government agencies, have limited operational guidance to include case-relevant health information in environmental reports. In Italy, the absence of technical indications prompted the Ministry of Health to construct a new model of Health Impact Assessment (HIA) for health integration in Environmental Assessment (EA) processes. A coordinating committee set within an inter-institutional working group was assisted by public and private key stakeholders to deliver guidance on HIA. The three research stages of framing, production and delivery were carried out to: (1) frame the context for HIA guidance implementation; (2) produce the operational guideline and tools; (3) train and disclose the guideline to final users. The guideline and the operational procedures were informed by core criteria to achieve a health standard in environmental reporting. The procedures guide the user to carry out a comprehensive assessment of

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the population health based on the broad determinants. The environmental reporting integrates health through functional components, divided into levels and supported by related flowcharts and checklists. HIA knowledge and skills were provided to facilitate the guideline utilization within the health departments. The guideline embedded the existing EA national legacy, normative and technical. The entire decisional cycle, from strategic planning to project development was covered in the guideline including the screen of proposals. The experience triggered the definition of an environmental health collaborative platform under the Ministry of Health coordination to fill gaps in competence building, sector operational tools development, methodologies harmonization on the national territory.

1. Introduction

Containing environmental impacts and protecting human health from unwanted impacts is currently regulated in the European Union (EU) by Strategic and Environmental Impact Assessment (SEA and EIA) legislation on plans and projects development (EC, 2001; EC, 2014). Nonetheless, the application of environmental legislation not effectively addressed the consideration of the potential impacts on human health and well-being (EC, 2009a, 2009b). Frequently, health protection is approached by governments through environmental compliance, with the minimum expenditure and poor coverage of health concerns (NRC, 2011). In this situation, better approaches to delivering health promotion and protection within multisectoral policies, plans and projects are needed (Shankardass et al., 2015). Environmental impacts of developments activities affect multiple determinants of human health within broad interrelated categories of personal, social, economic, and environmental factors (Bhatia and Wernham, 2008; Fehr et al., 2014). Therefore, targeting political interventions on the multiple determinants of health is as effective approach in order to improve individual well-being and public health (Spickett et al., 2015; Steinemann, 2000; WHO, 2013).

Ranges of methods for environmental assessment provide stakeholders with useful information to assist them in the development of better public policies and decision-making. However, existing methods are complementary and a combination of different approaches is needed to perform a holistic assessment encompassing also the health impacts (Loiseau et al., 2012). At first, governments and private companies promoted a powerful synergic combination of Health Impact Assessments (HIA) along with a whole-of-government and whole-of-society approach (ECHP, 1999; WHO, 2013). Both approaches enhance the effect on health and well-being directly minimizing the potential health impacts and indirectly strengthening the collaboration among different sectors (Harris and Spickett, 2011; Vohra et al., 2016). The debate went on focusing new conceptual models to create a comprehensive and more consistent integration of human and environmental health impact analyses (Reis et al., 2015). Academics and practitioners contributed to the growth of the HIA practice as it addresses strengthening collaboration among different sectors and tackles health inequalities (Vohra et al., 2016). HIA concrete examples illustrate the potential to create synergies between public health and environmental planning and to act as positive factor on community health promotion (Bias and Abildso, 2017; Negev et al., 2012).

State law does generally not require HIA, but it is increasingly seen as one aspect of a “best practice” approach by developers (Harris-Roxas et al., 2012). HIA advancement is specially reported in resource development projects such as mining, oil extraction and dams (Barron et al., 2010; IFC, 2009; IOGP, 2016).

Where statutory HIA regulation exists, it proved insufficient to widen the practical application and improve effective consideration of health in environmental compatibility assessment of plans and projects (Lee et al., 2013; NRC, 2011). Context specific factors were suggested to limit its advancement. Likely, they include the structural weakness in the political commitment to enhance HIA within health frameworks, and the lack of operational conditions as guiding technical indications to integrate health within environmental reporting (Linzalone et al., 2018; Vohra et al., 2016). Mainly, the European Commission (EC) considered explanatory documents of primarily necessity to assist Member States in the transposition of the Environmental Impact Assessment Directive (EIAD), including guidance for drafting and reviewing population health information (EC, 2012; Nowacki et al., 2010). Detailed indications are needed to describe and assess the direct and indirect significant effects of a project on ‘*population and human health*’ to comply with Article 3 of EIAD (EC, 2014).

However, specific protocols to integrate the adequate health information into environmental assessment reports are underdeveloped (Gibson et al., 2013a, 2013b). Furthermore, standardized procedures on how to integrate HIA are limited, spanning from simpler to more technical approaches (http://gezondheid.commissiemer.nl; ADHSS, 2015; Hashim and Hashim, 2009; Rodríguez Rasero et al., 2015). HIA integration in Environmental Assessments (EAs) should focus on defining standards of evidence, balancing rigor and practicality, and developing a set of analytical HIA tools (Bhatia and Wernham, 2008). Indications about the minimum requirements for health information should encompass the identification of human health effects, the consultations with health authorities or experts in the health field, and the assessment of the human health effects (COWI, 2009).

In Italy, the development of a rapid HIA tool advanced the consistency of assessment methods and quality of health advice when multiple public interests are involved within simplified EAs procedures (NCDPC, 2010). However, comprehensive health assessment in environmental reporting did not satisfy the minimum requirements yet. The analysis of the environmental reports over time showed increasing requirements focused on biophysical factors (e.g. air, water, noise) and not on public health, thus not directly addressing the reduction of health effects (ISPRA, 2016a, 2016b). Lacking an adequate institutional engagement some specific factors still obstacle the health compliance to minimum quality standard. The public health teams and EA practitioners need improved knowledge on HIA and experience on the public health implications of key development sectors Linzalone et al., 2014. Additionally, support by minimal technical regulation is needed (Linzalone et al., 2018).

Since the national health plan endorsed the HIA approach, the Italian Ministry of Health supported the project of drafting a specific guidance document (NCDPC, 2013). This was the first step to set collaboration among higher-level institutions toward the provision of a coordinated regulatory framework on environmental health issue. Currently, the environmental legislation formally requires HIA in EIA of large productive plants of national interest and recommends a health expert to be included in the EIA process (Italian Republic, 2016, 2017).

In this paper, we outline the three-stages approach used to develop a guidance on how case-relevant health information can be detailed in the environmental reports within regulated EA procedures. The guidance aims to aid plans and projects developers and public health teams to identify the potential health impacts through a systematic and standardized procedure. We describe the fundamental criteria behind processing the document and the stepwise procedure for health reporting.

2. Methodology

Three national institutional partners and two regional departments, involved in environmental health research and public health policy, worked collaboratively from March 2014 to June 2016. A coordinating committee was established to identify a stepwise strategy. Based on a mixed method design, different quantitative and qualitative methods were combined to generate multiple data (Gaber and Overacker, 2012). Three different stages were implemented to integrate the scientific literature with the stakeholder knowledge and the coordinating committee expertise. Following on the framework proposed in Fig. 1, the stages of evidence building (framing), production, and delivery of new contents were covered. Along the framework stages, the overall number of 48 stakeholders were engaged as internal (experts from the coordinating committee) and external (e.g. professionals and consultants from public or private sectors and enterprises; national and local organizations, institutions, public media) through different collaborative methods as Metaplan, World Cafè and Open Space Technology. Supplementary materials provide the composition of stakeholder groups. They contributed to the co-production of outputs and products as recommended by Nowacki et al. (2010).

Starting from the research questions and through the objectives and methodologies utilized, the contribution of each project stage to the final findings is described in Table 1.

2.1. Stage 1. Framing the context for the HIA implementation

Starting from a comparative review of the international literature, documenting experiences in different countries, the mechanisms that enhance the implementation of HIA where focused (see methodology and findings in Linzalone et al., 2018). Hereafter, according to selected international and national documents (enHealth, 2001; Harris et al., 2007; ISPRA, 2016b; Lombardy Region, 2014) the general practices, terminology, procedural steps and evaluation tools were agreed. The overall theoretical background was used to inform a workshop with 11 national EA professionals and consultants (see the consultants' profiles in Supplementary data, Table S1). Aim of the experts' panel engagement was to understand the factors that facilitate or hinder the health impact studies reporting activity. During the workshop, the Metaplan technique (http://de.metaplan.eu/metaplan/geschichte/) was used for collecting and processing ideas and opinions from participants (Schnelle, 1978). All participants in two groups wrote down on cards their own ideas or opinions on selected topics. All the cards were collected and fixed on a pin board and ideas were processed. The cards were organized according to categories and ranked. In a Metaplan, the clusters of ideas may yield insights or reveal connections that people were not aware. The thought processes elaborated within the work groups were structured by a professional facilitator. The full description of the consultation, including methodology and products, is published separately (Linzalone et al., 2018). Findings from "framework" stage were used to describe core principles categories. The coordinating committee used them to shape the guidance and tools in the production stage.

2.2. Stage 2. Production of the operational guideline and tools

The coordinating committee held a two-day retreat of 16 participants in total. According to roles and field of discipline of each institutional partner, the tasks of defining: 1. guidance index; 2. content of the document; 3.fit for purpose tools, were assigned. Then, small groups seated around a table (4–5 people) implemented a session of "World Cafè"™ (http://www.theworldcafe.com) to collect inputs from three 20-min rounds of conversation. Rounds were prefaced with questions based on the expected objectives of each worktable, respectively "guidelines", "tools", "integration with other national guidelines and regulations". The results were then represented in graphs at the front of the room, and their diverse perspectives were connected through listening and sharing in a large conversation (Stewart, 2005; Stöckigt et al., 2013). The project coordinator identified a deadline for the first version of the document and the main points to be addressed:

1. implementing the leading criteria, previously identified, within the new approach;
2. integrating indications from the existing technical regulations used within the Environmental Agencies (ISPRA, 2016b);
3. integrating the technical norm in force in the Lombardy region

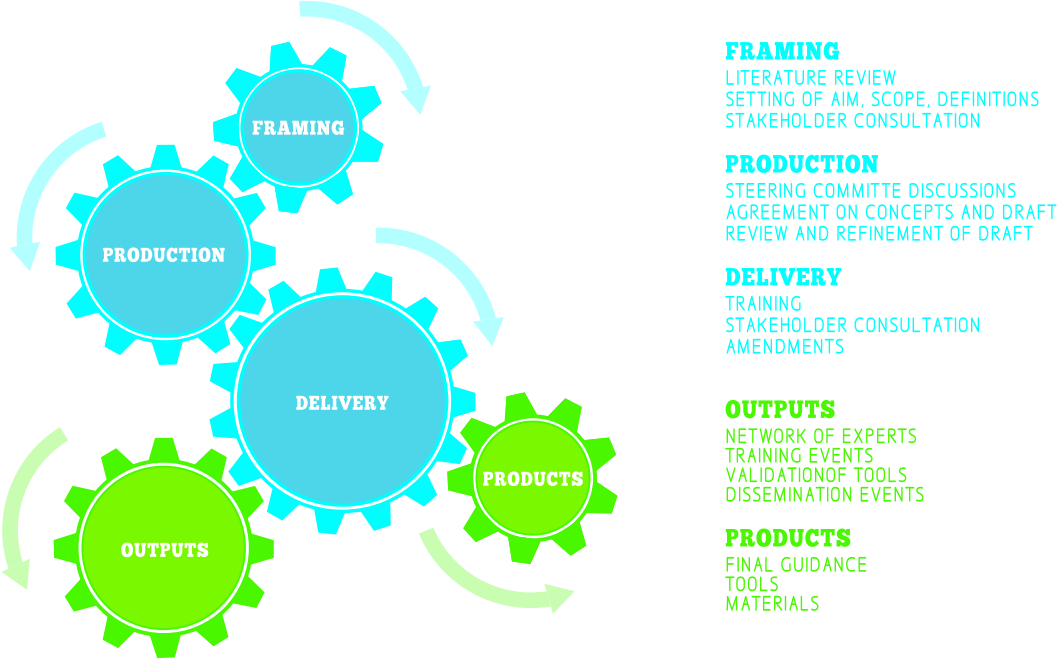

Fig. 1. Engagement process in the framework development of the"Tools4HIA" project. Main activities, principal outputs and products are indicated by each framework stage (NCDPC, 2013).

Table 1
Contribution of each project stage to the findings achievement starting from the defined research questions.

	Research questions	Objectives	Methods and stakeholders involved (n = 48)	Findings
Stage 1. Framing the context for HIA implementation	1. How to define the content of an operational guideline for health integration in EA procedures?	1. Outline the mechanisms that enhance the implementation of HIA in the national context 2. Define leading principles to advice proponent and assessors about health integration in EA procedures	• Literature review about: Guideline to health integration • Stakeholder consultation by Metaplan (n = 11)	• National and international context clarification (Linzalone et al., 2018) • Theoretical criteria to shape the guidance content
Stage 2. Production of the operational guideline and tools	2. How to structure the guidance to incorporating the theoretical criteria and detailing health assessment within EIA and SEA steps as to?	3. Structure the HIA guidance focusing the population health 4. Provide details and operational steps to carry out the assessment from high to deep level	• Analysis of existing national norms by the coordinating committee • World Café with internal stakeholders (n = 15)	• Guidance structure draft, revision and tools finalization • Detailed operational procedure in EIA and SEA
Stage 3. Training and disclosure of the guideline	3. Are the background skills and competence enough to advance the guidance utilization?	5. Create awareness and skills about utilizing the guidance approach through the rapid HIA applications	• Workshop and training sessions for public health officers • Open space with external stakeholders (n = 22)	• Building HIA knowledge and specific skills in IA • Testing of a web platform for the key informants consultation in rapid HIA procedures • Presentation of the guidance the relevant actors and stakeholders

(Northern Italy) and the current EAs regulation.

2.3. Stage 3. Training and disclosure of the guideline

Thirteen regional public health institutions expressed an interest in HIA training accomplishing with mandatory indications in their health plans. From September 2015 to September 2016, the coordinating committee held five training events with 153 public officers. In each training session, the participants completed 18 selected case studies using the available rapid tool. Aim of the exercise was to create competence and comprehension about the broad approach to health within HIA. For this purpose, the participants were required coping with the following items:

1. filling a screening-scoping checklist to evaluate if it is useful or necessary to proceed further with the rapid HIA;
2. filling a double entry table to collect information on the context of the proposal, strength of scientific evidence, health profile of the population;
3. filling a double entry table to provide comments playing the role of external informant;
4. complete an appraisal table with all the useful contributions playing the role of assessor, to describe and classify the impacts by each determinant of health;
5. assign a probability of occurrence of each impact;
6. provide reporting and advice.

The rapid HIA were purposively implemented on a web platform specifically developed. Specific training aims were to: (1) test the validity of the web platform to extend the scoping and assessment to a group of key informants; (2) test the feasibility of the determinants of health quali-quantitative analysis; (3) improve and standardize the health advice issuing in simplified EAs procedures.

Secondly, the first version of the new guidance was disclosed to national stakeholders to improve their acceptance. During an Open Space Technology workshop, the first draft was presented to selected actors from government, universities, consulting companies, local authorities, non-governmental organizations, and the national mass media (see stakeholders profile in Supplementary data, Table S2). For proofreading, the document was sent to the participants 1 month before the scheduled meeting. During the workshop, the participants were allocated to three workgroups dealing with different parts of the guide. They were asked to comment on a form regarding “general HIA part”, “EIA tool”, “SEA tool” within the three categories “context”, “tool use” and “remarks”. Overall, 32 comments were collected to improve the document. The delivery of the final guideline occurred in the conclusive project workshop held by the Ministry of Health in Rome in summer 2016.

3. Results and discussion

Participated methods promote the wider health perspective (Simera et al., 2010). To fasten this achievement, the consultation processes should evolve toward methods that are more sophisticated within a well-conceived structure (Mahboubi et al., 2015). Answering to this methodological need, we structured a multistep consultation process with stakeholder within the research framework to incorporate the national context characteristics and set the condition under which performing HIAs. An initial literature analysis aimed at disclosing the structural factors that facilitate or obstacle the HIA advancement. Then, findings were used to stimulate the participants in a first consultation process to find possible solutions to improve HIA adoption in EAs in the national context. Coherently, the coordinating committee articulated in the guideline draft a few emerging criteria to drive the integration of health in the EA practice. The first version of the document was delivered during a wider consultation process for final agreement and to

build technical skills in the public health teams.

3.1. Definition of the national context

Existing literature suggests that the coherent and complete consideration of the general national context (collaborations, roles, regulations, EA pathways, data monitoring level, etc.) provides the procedural details for the health integration (Mahboubi et al., 2015). For example, Mahboubi et al. (2015) stated that the government deliberated intervention in applying HIA within EIA legislation was at the main motivation for adequate health protection. In their analysis, the collaborative and intersectoral approach was the key to the fragmented examination of the analytical complexity of the comprehensive assessment of environmental health issues. In the "framing" stage, we collected evidences about structural and theoretical needs to implementing an HIA plan in the national context, including the definition of available technical skills and data, the active institutional network cooperating with local agencies and other stakeholders. In the present research, the experiences reviewed in the scientific literature provided an exhaustive list of "priority interventions" in order to integrating HIA and health in environmental assessment (Linzalone et al., 2018). Among principal indications, the adoption of a suitable framework in a supportive political system ensures that additional operational activities are realized and maintained: providing capacity; defining a leading subject for HIA; providing technical guidance; coping with the funding need; adopting the determinants of health approach; building partnership.

Considering the national context, the involved experts proposed that structural interventions should aim at:

- reinforcing the competencies and awareness of local health departments in relation to a broad health definition based on the Determinants of Health (DofH) approach;
- improving the dissemination and understanding of the HIA methodology as opportunity to advice on health issues in the planning cycle;
- reinforcing the perspective on population health within the EA procedures.
- ensuring that any significant effects have been appropriately considered by strengthening the engagement of the public health authority and the stakeholder, and appointing an health expert.

The recommendations to the HIA advancement in the Italian national context have been exhaustively presented in Linzalone et al., 2018.

3.2. Core criteria informing the guideline

The coordinating committee drafted the guidance supported by practitioners, institutional subjects and academic partners in the co-construction process. This approach was important to enucleate the values informing the HIA as a field (Harris-Roxas and Harris, 2013). Four leading principles enlightened the guiding document.

3.2.1. Including the human health factor early in the planning cycle

Environmental legislation identifies plans and projects requiring SEA or EIA in an annex and prescribes that those excluded should be screened for a few environmental criteria. Among screening criteria identified in the norm (MELSP, 2015) the "inhabitant density per area" was considered insufficient to safeguard the existing populations from potentially significant risks. To reinforce the "'population and human health' perspective, the coordinating committee recommended that during the screening phase a qualitative description of the direct and indirect effects on health of the potentially affected populations should be duly provided. A clear description of the project, plan or proposal and the rationale for undertaking the HIA were considered relevant input since the screening stage as well as the social, economic and demographic profile and the urbanization rate in the area. This pressing recommendation was based on existing limitations in the current practice. The assessment is based on environmental reporting anticipating the health consideration and comparison and technical explanation by the competent authority is not allowed concurrently. If EIA ends with final negative judgment or a request for substantial environmental information, the health assessment is unnecessary or postponed. Acting this way the opportunity to consider the effects on human health is missed. Anticipating the health screen of proposals can help overcoming this limitation. Sufficient population information included early allows envisaging preventive measures. The consenting authority is enabled to ensure that relevant human health impacts are assessed. Additionally, time and resources are saved if the restructuring the proposal on the health side is not required in the conclusion.

3.2.2. Focusing the broad health and well-being

The monitoring system across Europe and the data exchange has been improved over the last two decades allowing for the construction of numerous tools for quantitative modeling to build evidence (WHO, 2010). However, these tools have been considerate adequate for specific well-defined problems but problematic when multiple determinants, both social and environmental, need to be integrated (Fehr et al., 2016). Rather, existing methods demonstrated to be complementary and their combined use allow for a holistic assessment encompassing also the environmental health impacts (Loiseau et al., 2012). Participants in our consultation objected to use of a technical/scientific approach and the quantification of hazard, considering the assessment of physical and environmental health unsatisfactory for the achievement of good health and well-being in the population. They concluded that identifying opportunities for enhancing health and well-being was among key outcomes of the assessment process. Consequently, the coordinating committee agreed on addressing a focus on factors indirectly affecting a community, such as lifestyle and socioeconomic conditions. In the guideline, the use of a comprehensive approach including the assessment of the wider determinants of health and well-being was endorsed. Moreover, based on the need of preserving the "right to healthy conditions", open consideration of health inequalities and health equity was agreed (Costa et al., 2014; Dahlgren and Whitehead, 1991). The estimation of a quali-quantitative effect of exposure to previously identified direct and indirect determinants was accomplished within dedicated modules in the guideline. Whenever EIA and SEA are required, the exploration of the interconnection of the impacts within the categories of health determinants should be preliminary to the assessment and a checklist is provided to judge whether they are positively or negatively oriented. As for the simplified EAs, the use of a quali-quantitative rapid HIA tool is recommended to judge impacts and in the assessment stage of EIA procedure, a module is purposively introduced to identify the populations indirectly affected by the development of new proposals. Accordingly, the following terminology was defined: a "directly exposed population" is potentially exposed to the emissions/discharge through environmental media; an "indirectly exposed population" is potentially exposed through socioeconomic component modifications.

3.2.3. Approaching the comprehensive health assessment

Learning form evidence is critical to advance community health through informed decision-making (Goodman et al., 2014). An HIA process helps overcoming limited knowledge providing the quantification of the link between the proposal and health, e.g. assessing the cause-effect relationship, or the identification of different implementation scenarios at local level. To serve this scope, the principal resources needed are accessible population and health data (Silveira et al., 2016). Involving the competent public health authority in the process of health information gathering is highly relevant. The Italian EIA transposition regulation requires the competent authority to

provide a preliminary analysis but it is permissive about basic information collection, not allowing for exhaustive health description and reporting (Italian Republic, 2017). However, the environmental consultants expressed concern about the loss of time for information retrieval, analysis and reporting activities out of the scoped issues. Therefore, they advised the coordinating committee to ensure that the data collection effort should be proportionate to the complexity of the estimated health risks. As for this, the guideline structured the "baseline building" step as continuing activity encompassing screening, scoping and assessment. In the procedure, the first courses of action required were to gather information from administrative data, collected for routine monitoring purposes. A supportive list of the health databases of public, updated and freely accessible was provided. However, the available data may not be sufficient and new data collection (e.g., ad hoc study) became necessary to further describe population-specific indicators and estimate the health risks in the study population. Evidence from literature recommends carrying out a comprehensive assessment to define the appropriate scientific design and measure and characterize risk factors within the community and the health status (Goodman et al., 2014; Harris-Roxas and Harris, 2013). Approaching the comprehensive assessment, the guideline proposed to use common analytical indicators, including the calculation of the fraction of disease rates in a population that can be attributed to the risk being analyzed and, whenever available, the application of exposure-response functions to quantify the cancer risk associated with incremental changes in exposure to carcinogens. Further methodological indications for the quantification of impacts under different development scenarios, included the adoption of a "system-dynamic" modeling tool developed in the Environmental Protection Agencies guideline (ISPRA, 2016b). Case examples are available in this document to carry out the quantitative assessment either based on HIA and on traditional Risk Assessment approach.

3.2.4. Engaging the stakeholder in the planning cycle

The consultation with stakeholders represents an effective advancement in current practice when transparencies on data and documentations are realized (NRC, 2011). It is among the main approaches to enhance a wider adoption of a health perspective in impact assessment (Simera et al., 2010). Moreover, combining the time for consultation and the project development phase allow concurrently modification and satisfying the expectation for deliberation in approval procedures (Bond and Pope, 2012).

Our panel of experts markedly encouraged the adoption of methodologies to engage key stakeholders, including external informants or the health authority. The guideline envisaged a consultation both in the screening of the potential health impacts of projects and plans, and in the assessment of the direct and indirect effects. Specifically, the rapid tool was recommended for contemporary consultation of numerous stakeholders in the simplified EAs. As for SEA procedure, in the absence of a legal framework, the guideline recommended a consultation with the competent health authority in order to provide a qualitative evaluation of which effects (low, medium, high) the proposal application could have on health and well-being of the communities. Regarding EIA, the guideline did not achieve a clear formalization of appropriate entry-points for engagement. This represented a major limitation to procedural effectiveness as the new Italian transposition regulation weakly suggests the consultation with stakeholders. Clarification of formal and informal roles of external stakeholder organizational arrangements would support an HIA being undertaken.

3.3. Elements and contents of the guideline

The guiding document delineated the standard components to drive the health reporting in EIA, SEA and the simplified EAs procedures. It provided instructions and supporting tools to carry out the steps of screening, scoping, assessment, reporting and monitoring. The document breakdown (Table 2) showed a good overlap with findings from Fakhri et al. (2016).

A conceptual evaluation framework of HIA processes identifies the specific decisional context, the conceptual domains and the conditions under which HIAs are done and for defined achievements. In HIA process evaluation the characteristics of the proposal, the experience of the experts involved, the resources and time available are relevant. Anticipated purposes, goals and values guide the HIA process and help setting organizational arrangements. (Harris-Roxas and Harris, 2013). Specifically, assessing the capacity and experience of those involved to undertake the HIA clarifies the direct impact of the HIA. Above all, improving capacity within the institutional human resource and clarifying their roles further contribute to enhanced effectiveness (Chanchitpricha and Bond, 2018). Chanchitpricha and Bond (2018) recommend the guideline revision after its application to real cases to strengthen the procedural effectiveness. However, the application of EIA or SEA was not in the scope of the research. In future, collecting cases applied in different sectors would be critical to affordability and

Table 2
Core elements of the HIA guide[a] and brief explanation. Questions guiding the HIA steps are detailed.

HIA guide elements	*Content*
Premise	
Conceptual framework	HIA definition by general purpose, methodologies, context, specific aims
Political and legislative framework	Existing soft and hard law, political frameworks and tools that support the utilization of HIA
Introduction	
Health and health determinants	Definition and source references
Impact, complexity and uncertainty	Definition and source references
HIA's different levels of complexity	From high to depth characterization based on nature of the risk and three other dimensions (level of information, nature of mitigations, engagement)
Forms of HIA	HIA utilization referred to the timing in the decisional cycle and to the voluntary or mandatory application
HIA process	
Screening	Is the proposal required to undergo an HIA? If yes, what is the depth level required?
Scoping	What are the key issues addressed by the HIA? What are the effects on health, and how are they relevant, persistent, highly probable and spread over the territory? What are the stakeholders interested in the process? What are the available data and sources? What are the alternatives for the proposal?
Assessment	What are the characteristics of potential health risks? Which population is affected by impacts? How are impacts classified by importance? What are the uncertainties of estimates? Whenever possible include quantitative measures.
Reporting	Is all the necessary information provided to the decision-maker? There exist conflicts unresolved? Are alternative proposals possible? Are mitigation measures identified for each impact? Are the recommendations drafted feasible?
Monitoring	Is the monitoring plan defined? Are monitoring indicators and subject responsible for implementation identified?
Participation and equity	Participation in plans and projects administrative procedures for approval and stakeholders' role. Equity dimensions, including broad health determinants, population vulnerability, geographical distribution of impacts

[a] Available at: http://www.isprambiente.gov.it/files/via-vas/Linea_Guida_VIS.pdf. In Italian. (Access on 31July 2018).

efficacy of the new method. Monitoring its field use would provide useful feedback on efficacy and usability linked to accessible health information.

3.4. Operational procedures and supporting tools

Procedural effectiveness of impact assessment is based on principles, procedures and robustness of information applied and provided in the assessment process. Guidelines need to be clear on how to conduct the assessment as to influencing effective inclusion of health. Clarifying how procedural elements are applied and conduced improves understanding and deciding (Chanchitpricha and Bond, 2018). The guideline detailed operational steps to achieve a health quality standard, including nature and weight of the evidence for the assessment of impacts independently on how the HIA itself has to be conducted. Mayor challenge was balancing the level of information at each specific assessment stage and the resources and time available during the environmental compatibility process. We identified core criteria that informed the definition of a pre-ordered sequence of health-tailored questions and related actions to comply. A modular approach for EIA and SEA procedures was built, and a module is each component of the procedure including necessary actions to answer a specific question (Table 3). The procedure articulated key functional configurations to carry out different health impact assessment processes within the environmental reporting activity. Going through the procedure, one can complete each modular component based on the level of information needed to scope the impacts.

A module provides an output when a set of tasks is completed (Fig. 2; Fig. 3). Therefore, EIA and SEA procedure are reorganized in "health steps". EIA is made of seven steps (0–6) broken down into tasks showed in the flowchart in Fig. 2. A quality standard for public health protection is devised initially defining the possible health effects on potentially exposed populations and after, complying with the request for more detailed descriptions of the directly affected population (Tasks T0-T7). During the assessment (Tasks T3-T7), fundamental activities (A-G) are listed to describe environmental emissions, define populations, analyze evidence, assess the impacts and estimate risks. If an indirectly affected population exists in the study area, the quali-quantitative tool is recommended or the checklist included. Lastly, some tasks are proposed to define mitigation measures and develop a monitoring plan (Tasks T8-T10). A checklist is provided to review the process once concluded.

The same modular approach is performed for the SEA procedure with a configuration in four steps (Tasks 0–3) (Fig. 3). A qualitative evaluation of the plan (or its modification) is anticipated in the screening phase (Task T0). Then, if SEA is required, consultation with stakeholders is fundamental to put a health perspective within the evaluation. The preliminary analysis is accomplished by completing three levels of information: a) consistency of the proposal with local health protection regulations and overall environmental planning acts; b) explicit definition of the pursued health "improvement goals"; c) description of the potential effects on the determinants of health in the community. Supported by a checklist, an array of health determinants are identified, specifying the potential vulnerable populations and subgroups (Task T1). Data collection and scenario building during the assessment phase (Task T2) depends on the typology of the plan, from strategic to more localized and narrow. Lastly, restoring actions are defined to avoid or reduce the environmental effects identified, and the parameters to monitor the effectiveness of the adopted measures are set (Task T3).

3.5. Capacity building and guideline delivery

Public officials need continuing professional improvements to share experience. On the other hand, EIA professionals are unfamiliar with assessing environmental-health interactions; they need to join the public health teams to be able to evaluate their significance. Specifically, they should develop appropriate skills oriented to quantitative and qualitative impact assessments in the EA reporting (Mahboubi et al., 2015). In the delivery phase, a training program was set up for public health teams, external to the partnership, aimed at building skills and capacity within the health authority. Training addressed a specific HIA knowledge gap and practical skills related to the 'quali-quantitative' rapid tool. The rapid HIA was used to review real cases selected based on geographical distribution, completeness and complexity of project information, and context of the proposal. The cases were analyzed into five sessions with didactic purposes. The typologies included and their relative figures were: power production N° 3; waste treatment, N°3; manufacture settlements, N°2; livestock, N° 1; infrastructures, N° 1; other categories, N°8.

Participants' contribution was relevant to achieve three different sub goals: standardization of advices, ability to include the health determinants, involvement of external informants in the process. The tool trained the operators about identifying environment and health interactions and the categories of the determinants of health they affect in different population subgroups. The tool was allocated on a web platform connecting environmental health experts during the assessment stage to test the feasibility of a multidisciplinary team-working attitude (Fig. 4). The Italian environmental regulation provides for the possibility of convening a "conference of the services" to get more opinions and authorizations in a single moment. Within this simplified procedure, the public health operator coordinates the participating experts from different sectors so that they complete a set of checklists and tables from their web stations. An automated calculation summarizes their contributions to support the coordinator in ranking and assessing the importance of the potential impacts. Operable tools should be

Table 3
The modular approach for health consideration in EA procedures.

EIA Modules	Actions	Questions
Module 0	Define the population	Q0 – Does the project require EIA?
Module 1	Describe the environmental situation	Q1- Does the project cause emissions/discharges into the environment?
Module 2	Characterize the exposed population	Q2 – Is there a population directly exposed?
Module 3	Provide the direct impact estimation	
Module 4	Define the indirectly affected population	Q3 – Is there an indirectly affected population?
Module 5	Provide the indirect impact estimation	Q4 – Are there any impacts caused by the proposal?
Module 6	Define monitoring actions	
	Define mitigations actions	

SEA Modules	Actions	Questions
Module 0	Define the population	Q0 – Does the project require SEA?
Module 1	Describe the environmental situation	
Module 2	Provide impact analysis	Q1- Are there any impacts caused by the proposal?
Module 3	Describe the plan implementation	

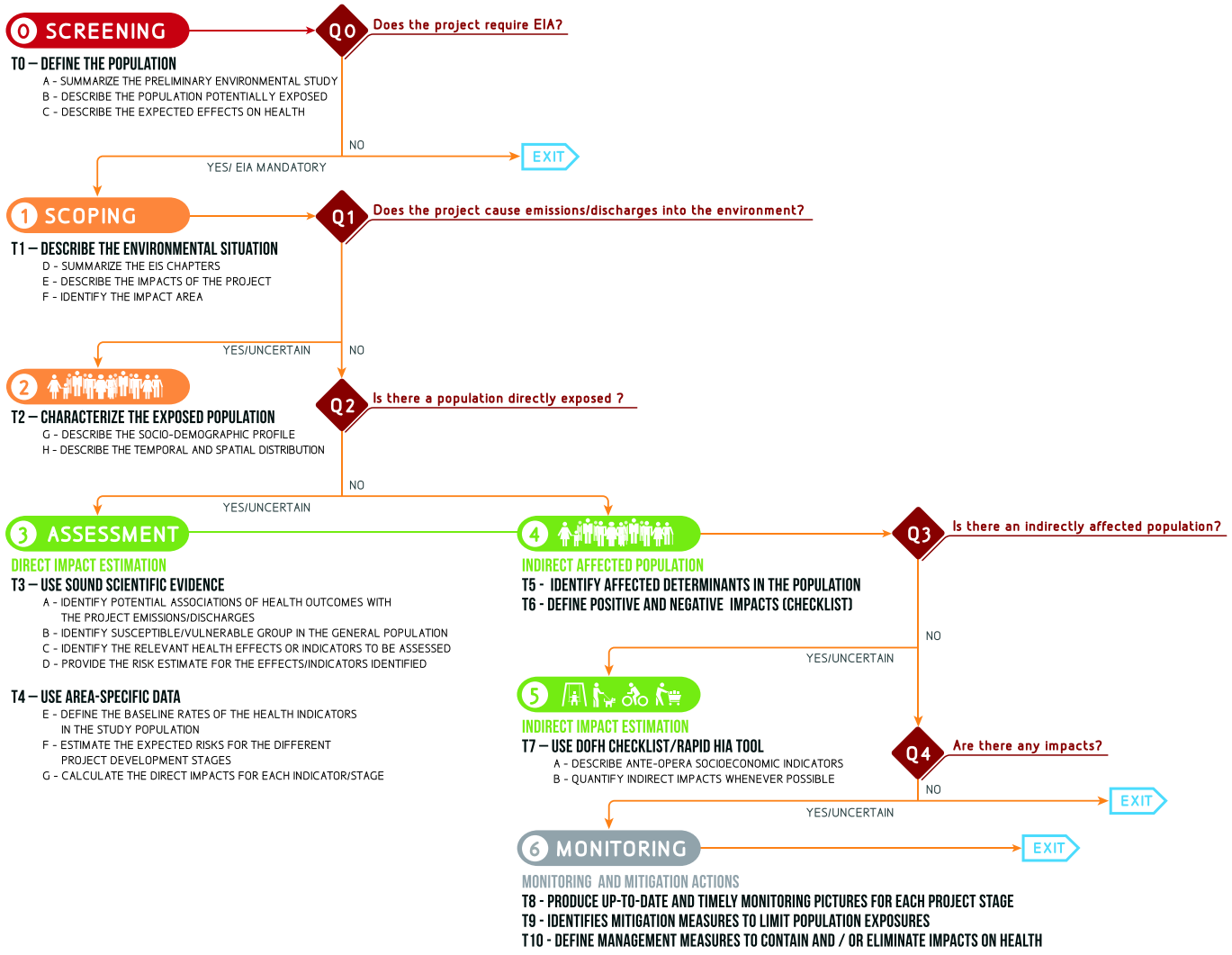

Fig. 2. The reporting tool for the health component development within EIA.

included into current practice to support the standardization of health advice and contribute to expand the national network of skilled professionals.

4. Conclusion

After initial academic effort to raise awareness and develop tools and competences on HIA, the Italian legislative and political context moved toward the integration of health in EA processes. A collaborative institutional partnership was in charge of a research to identify possible way of integration. They considered the existing EA approval procedures a suitable framework for HIA development, instead of independent HIA, where expert collaboration is available and the reporting charge is covered. In this context, an operational guidance to help the developers drafting a good quality health chapter was needed. A coordinating committee within the partnership developed a multimethod research framework to combine the international and the national experience on HIA to develop a guideline. The strategy was based on coproduction with stakeholders, including experts from the private and public sectors as well as developers of plans and projects and evaluators from the competent authority. They contributed substantially to identify core criteria and standardize the methodologies incorporating the consideration of the existing legal requirements and the EA current national practice. An already available tool for rapid HIA supported the guideline adoption enhancing professionals' abilities in environmental health issues.

The research provided a clear knowledge of the factors that hinder or facilitate the integration of health in authorization procedures in Italy. Building on these findings, system actions should cover gaps to:

- allow the sharing of skills and training activity on the environment and health relationship;
- promote and harmonize health prevention and environmental protection methodologies on national territory;
- promote environmental and health surveillance measures;
- ensure intersectoral action and the inclusion of social and economic dimensions to support sustainable development.

To consolidate the institutional relationship between national health system and the environmental network the Italian Ministry of Health endorsed the creation of a collaborative platform. Applying the indications emerged from the experience interdisciplinary thematic working groups will develop different operational tools in situations characterized by different risk factors.

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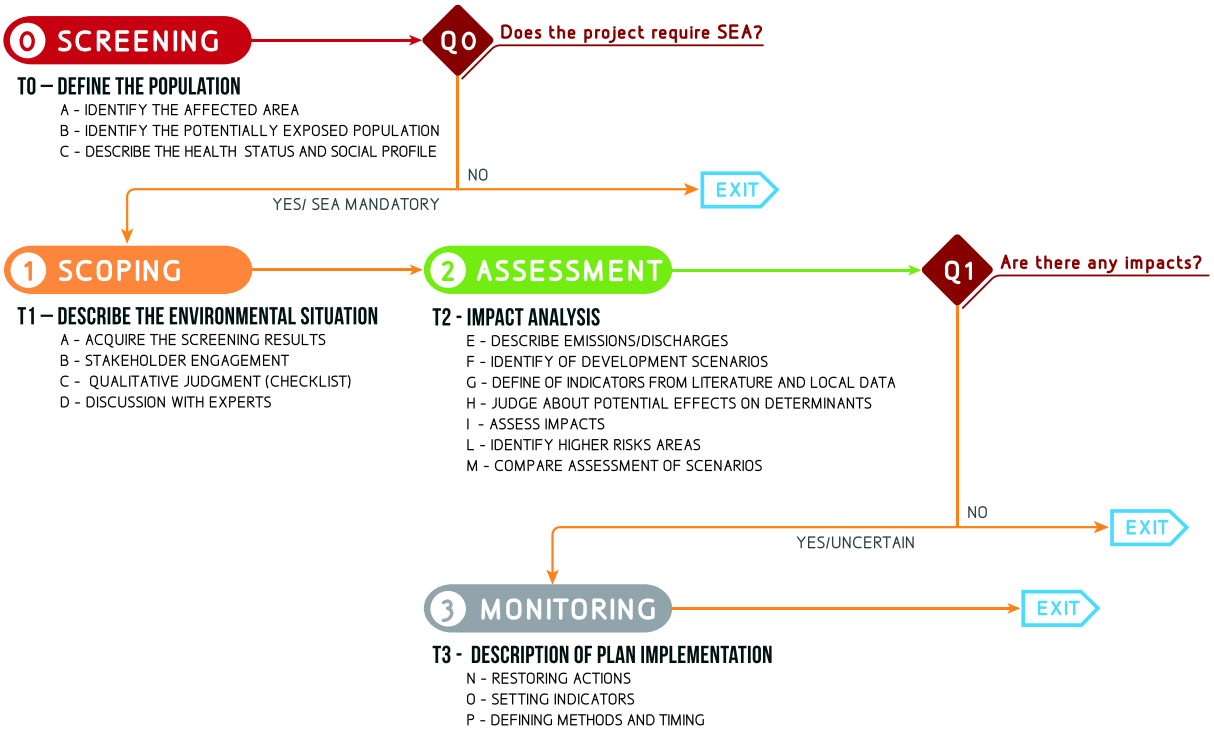

Fig. 3. The reporting tool for the health component development within SEA.

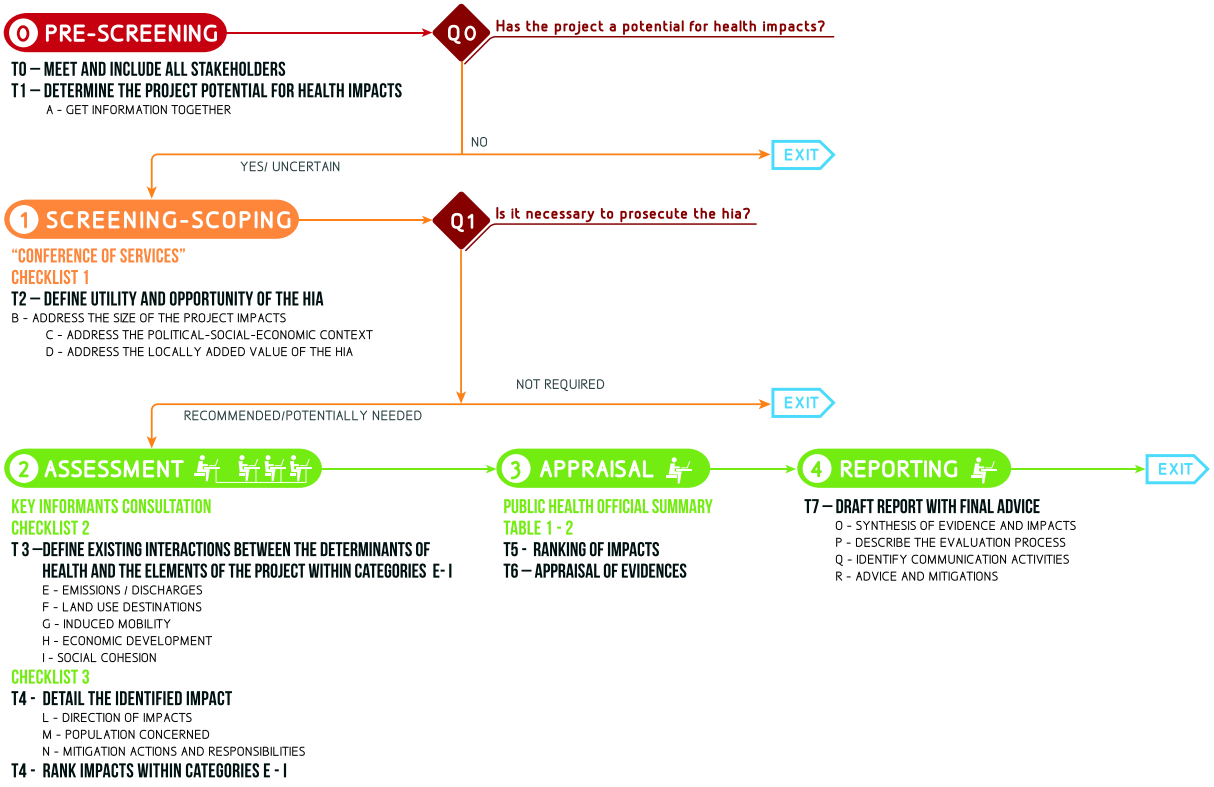

Fig. 4. The reporting tool for the health component development within simplified EAs procedures.

Authors' contribution

NL conceived and drafted the manuscript and OC contributed in organizing the research material. FB and MN conceived and designed the research, obtained funding and engaged stakeholders. NL conducted the literature review, analyzed and interpreted data and contributed to the conception of the research. LS provided technical assistance with the article structuring and professional graphic reproductions. All members in the coordinating committee were involved in the project development. All authors read and approved the final manuscript.

Conflict of interest

None declared.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.eiar.2019.03.004.

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