

High speed rail comparative strategic assessments in EU member states

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ABSTRACT

The present dissertation explores to what extent opportunities for strategic level assessments have been taken in high speed rail network in Europe by determining if SEA has been addressing strategic issues and influencing the decision-making process in three different cases of high speed rail – High Speed Rail 2 (HS2) in the UK, High Speed Rail Network (RFAV) in Portugal and European Gauge Railway Line Kaunas in the Lithuanian-Latvian Border.

A state of the art review of the environmental and sustainability assessments is developed in order to better understand the process of implementation of instruments such as Strategic Environmental Assessment (SEA) and Sustainability Appraisal (SA) to policies, plans and programs. A literature review on the concept of SEA effectiveness was also made, along with a collection of frameworks that establish the criteria or factors that can be used to define it according to several authors. These frameworks are analysed to determine which criteria or factors are better aimed at answering the present dissertation's research questions which results in a proposed framework that intends to explain how environmental and sustainable assessments were undertaken in the three aforementioned European high speed rail case studies.

It can be concluded that an SEA would be most beneficial if it was carried out before the development of any HSR project to first determine if HSR is really necessary and justifiable, which did not happen in the three case studies, thus ensuring the sustainability of the project and avoiding public controversy. Even though the SEAs of the three cases in study did influence the decision-making, they did not do so in a strategic manner, merely helping the planning process with almost entirely project-level decisions instead of being used to develop a high level strategy for HSR that addresses several strategic issues before options were already undertaken.

KEYWORDS: Strategic Environmental Assessment, Appraisal of Sustainability, High Speed Rail, Strategic Issues, SEA effectiveness

RESUMO

A presente dissertação explora até que ponto oportunidades para avaliações estratégicas foram tomadas na rede ferroviária de alta velocidade Europeia ao determinar se a AAE tem abordado assuntos estratégicos e influenciado o processo de tomada de decisão em três casos diferentes de redes de alta velocidade – High Speed Rail 2 (HS2) no Reino Unido, Rede Ferroviária de Alta Velocidade (RFAV) em Portugal e Linha Férrea de Bítola Europeia Kaunas na fronteira Lituânia-Letónia.

Uma revisão do estado de arte sobre avaliações ambientais e de sustentabilidade é desenvolvida de forma a melhor entender o processo de implementação de instrumentos como Avaliação Ambiental Estratégica (AAE) e Avaliação de Sustentabilidade a políticas, planos e programas. Uma revisão de literatura sobre o conceito de eficácia de AAE foi também desenvolvida, juntamente com uma coleção de *frameworks* que estabelecem critérios ou fatores que podem ser utilizados para o definir, de acordo com diversos autores. Estas *frameworks* são analisadas para determinar quais os critérios ou factores mais apropriados para responder às perguntas de pesquisa da presente dissertação, o que resulta numa proposta de *framework* que tenciona explicar como as avaliações ambientais e de sustentabilidade foram desenvolvidas nos três casos europeus de rede ferroviária de alta velocidade mencionados anteriormente.

É possível concluir que a AAE seria mais benéfica se fosse elaborada antes do desenvolvimento de qualquer projeto de alta velocidade para primeiro determinar se este é realmente necessário e justificável, o que não se verificou nos três casos de estudo, garantindo assim a sustentabilidade do mesmo e evitar a controvérsia pública. Embora as AAEs dos três casos em estudo tenham influenciado o processo de tomada de decisão, não o fizeram de uma forma estratégica, apenas auxiliando o processo de planeamento com decisões ao nível de projeto em vez de serem utilizadas para desenvolver uma estratégia de alto nível para alta velocidade que abordasse diversos assuntos estratégicos antes de opções serem escolhidas.

PALAVRAS-CHAVE: Avaliação Ambiental Estratégica, Avaliação de Sustentabilidade, Rede Ferroviária de Alta Velocidade, Assuntos Estratégicos, Eficácia da AAE

LIST OF ACRONYMS AND ABBREVIATIONS

AAE – Avaliação Ambiental Estratégica

AoS – Appraisal of Sustainability

DfT – Department for Transport

EIA – Environmental Impact Assessment

EIS – Environmental Impact Studies

GHG – Greenhouse gas

HS2 – High Speed Rail 2

HSR – High Speed Rail

IA – Impact Assessment

IDAD – Instituto do Ambiente e Desenvolvimento (Institute of Environment and Development)

PPP – Policy, plan or programme

RFAV – Rede Ferroviária de Alta Velocidade (High Speed Rail Network)

SA – Sustainability Appraisal

SEA – Strategic Environmental Assessment

SI – Strategic Issues

SRF – Strategic Reference Framework

T&T – Tools and Techniques

UIC – International Union of Railways

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1. INTRODUCTION

1.1. Background

Thanks to transport systems, access and mobility have vastly improved which allowed the development of modern societies and economic growth. However, these transport activities come with negative impacts related to CO₂ emissions, accidents, land use changes and others. With many challenges arising, such as demographic development, urbanisation, the scarcity of natural resources, increases in oil and energy prices and increase in travel demand, there is a need for more efficient, sustainable solutions, one of which could be Rail, especially High Speed Rail (HSR) (Jehanno et al. 2011).

In fact, even though transport accounts for about a quarter of all greenhouse gas emissions (GHG), rail is responsible for significantly less than 1% of transport's total share. Almost all the emissions arise from modes of transport that are dependent on fossil fuels such as car use, aviation and shipping (ERRAC 2014).

The European Union therefore believes that the rail network is the key to reinforce the economic and political cohesion of the Union by integrating peripheral regions in the longer term, thus being part of a global transport policy to improve territorial integration (Jehanno et al. 2011).

The European Commission's 2011 White Paper sets ten goals for a competitive and resource efficient transport system by establishing benchmarks for achieving a 60% GHG emission reduction target (European Commission 2011: 9), some of which were related to HSR:

- By 2050, complete a European high-speed rail network. Triple the length of the existing high-speed rail network by 2030 and maintain a dense railway network in all Member States. By 2050 the majority of medium-distance passenger transport should go by rail.
- A fully functional and EU-wide multimodal TEN-T 'core network' by 2030, with a high quality and capacity network by 2050 and a corresponding set of information services.
- By 2050, connect all core network airports to the rail network, preferably high-speed; ensure that all core seaports are sufficiently connected to the rail freight and, where possible, inland waterway system.

A European high speed rail network would be an infrastructure of immense magnitude. Given its repercussions on the environment, economy and population's lives, assessing its sustainability using a strategic¹ dimension is absolutely crucial. In order to do that, an instrument such as Strategic Environmental Assessment (SEA) is needed in order to support the decision-making process.

¹ (Partidário 2012) defines strategy as "intended means that aim to achieve long-term objectives driven by a vision, accommodating its pathway to changing circumstances".

Instead of an operational nature SEA which focuses on addressing environmental impacts at decision-making level, a strategic nature SEA would instead address more strategic issues thus allowing the integration of long term broader sustainability issues at early stages.

It is therefore important to understand what makes a transport system such as HSR sustainable and what strategic issues should be addressed in the SEA.

A policy statement by the European Council of Ministers of Transport lists the characteristics of a sustainable transport system (Jehanno et al. 2011):

- Allows the basic access and development needs of individuals;
- Supports safety and human health;
- Promotes equity within and between successive generations;
- Is affordable, fair and efficient;
- Offers choice of transport mode;
- Supports a competitive economy and balanced regional development;
- Limits emissions and waste within the planet's ability to absorb them;
- Uses resources at rates which permit renewal or substitution;
- Minimises impacts on the use of land and the generation of noise.

The International Union of Railways (UIC) also believes that sustainable mobility means combining different transport modes in a “smart” system where all modes have an effective contribution (Jehanno et al. 2011).

With these considerations in mind, it is possible to identify several strategic issues (SI) that should be addressed in order to ensure a strategic decision-making process that takes into consideration the broader idea of a European HSR network rather than only focusing on national HSR:

Social and economic competitiveness: Establishment of links between main political and economic European centres having positive impacts on employment, business and economic activities, tourism and others.

Intermodality and accessibility: Assurance of accessibility to HSR services, which should not be developed at the expense of the existing transport services, promotion of mobility and coordination with other transport modes as well as a modal shift away from road resulting in fewer accidents.

Safety and quality of service: Guarantee of passenger safety as HSR is considered the safest mode of transport that promotes reduction of road accidents by reducing its congestion. It needs to be an affordable and reliable service that decreases nuisance factors such as noise and vibration thus providing a comfortable journey to customers and that facilitates physical accessibility for disabled people.

Natural resources and risks: Reduction of the transport environmental footprint by providing a more energy efficient mode of transport that reduces GHG emissions and air pollution. Promotion of a modal

shift to rail, away from more polluting modes, namely aviation and road, thus addressing the issues of climate change.

Biodiversity and nature conservation: Avoidance of the potential conflict with major biodiversity and nature conservation areas.

Regional development: Promotion of regional development at a national level decreasing the disparities between regions.

Spatial planning: Avoidance of conflicts with sensitive areas and highly populated areas due to the design of HSR routes.

Additionally, there is one fundamental issue that definitely needs to be addressed before the development of a HSR project: Is there really a need for HSR?

These large HSR infrastructures have high costs associated with construction and operation as well as a vast number of consequences and there is no way to answer certainly to the question of whether or not the benefits will exceed the costs (Glaeser 2009). Furthermore, problems may arise with the introduction of HSR, namely the elimination of slower but more affordable alternatives (conventional rail) thus forcing passengers to use this more expensive service. Most of the passengers might then choose other modes of transport such as cars or low-cost airplanes (Decker 2013) simply because the higher costs do not justify a faster service. These issues, therefore, need to be carefully assessed in order to understand if such a massive investment in HSR can actually bring long-term benefits to the economy, society, as well as the environment.

1.2. Objectives, methodology and dissertation's structure

The main goal of this dissertation is to explore to what extent opportunities for strategic level assessments have been explored in high speed rail network in Europe. In order to do so, a comparative analysis of strategic level assessments is made regarding three different cases of high speed rail – High Speed Rail 2 (HS2) in the UK, High Speed Rail Network (RFAV) in Portugal and European Gauge Railway Line Kaunas in the Lithuanian-Latvian Border.

This analysis, using a common framework of comparison, attempts to answer two research questions. Is SEA addressing strategic issues? How is SEA influencing the decision-making process?

In order to address these questions one needs to determine if there were only operational issues considered or there were strategic issues addressed as well and if the SEAs were useful for making a decision regarding the plans.

The research methodology is based on a state of the art review of the environmental and sustainability assessments in order to better understand the process of implementation of instruments such as Strategic Environmental Assessment (SEA) and Sustainability Appraisal (SA) to policies, plans and programs. Additionally, a review of literature on the concept of SEA effectiveness is made in order to

understand the views of several authors on what characterises an effective SEA and what criteria or factors can be used to define it.

The frameworks for assessing SEA effectiveness found in the reviewed literature are studied in order to understand which criteria were better aimed at answering this dissertation's research questions. After this analysis, a framework is established to determine how environmental and sustainable assessments were undertaken in the European high speed rail network and a collection of viable case studies is therefore made. Considering the purpose of this dissertation, all case studies must be European and have their assessments publicly available.

As a result, three different environmental and sustainability reports of high speed rail from EU members states are collected and analysed, these being:

- Portugal: Strategic environmental assessment of the high speed rail network;
- UK: Appraisal of sustainability (AoS) of HS2 (London to the West Midlands);
- Lithuania-Latvia: Strategic Environmental Assessment Report of the European Gauge Railway Line Kaunas – Lithuanian-Latvian Border.

Even though one of the case studies is an AoS and the other two are SEAs, they are being considered as similar instruments in this dissertation due to the fact that their scope of assessments are also similar.

Lastly, a comparison of the three case studies is made with the established framework in order to answer the research questions and the results are thus analysed accordingly (Figure 1-1). Since not all the information required to develop this analysis is available online, interviews and questionnaires with the agents involved in those processes are required.

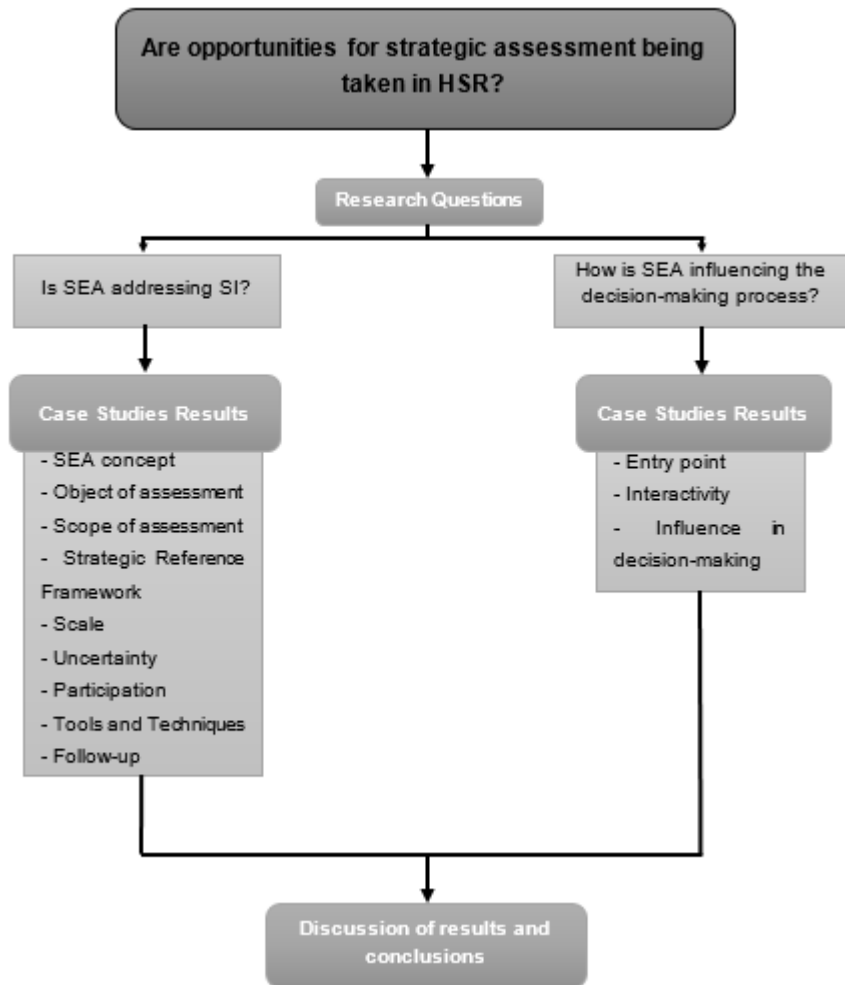


Figure 1-1 - Explanatory diagram of the methodology undertaken in the present dissertation

The present dissertation can therefore be divided in the following chapters:

Chapter 1 – Introduction – where the background for this dissertation is presented, as well as the objectives, methodology and its structure;

Chapter 2 – Strategic Environmental Assessment – chapter where a review of literature is provided concerning the concept of SEA, its purpose and benefits, its forms and effectiveness. Additionally, a few considerations on the concept of sustainability are made along with some development regarding a similar assessment instrument to SEA (in this context) named sustainability appraisal;

Chapter 3 – Development of an assessment framework – by collecting the frameworks for SEA effectiveness found in the reviewed literature and analysing their criteria in order to determine which were relevant in this context, this chapter provides with the proposed framework for addressing this dissertation's research questions;

Chapter 4 – Case study results – this chapter presents the results of analysing the three case studies against the proposed framework by addressing eleven common criteria that allow to answer the research questions;

Chapter 5 – Interpretation and discussion of results – in this part of the dissertation, an assessment of the results is made regarding the established objectives and a table is presented with the synthesis of the comparison between the three case studies. This analysis helps understand the importance of SEA in addressing strategic issues and influencing the decision-making process of HSR projects;

Chapter 6 – Conclusions – in this final chapter, a critical analysis regarding the strategic nature of SEA is made, especially when applied to European HSR projects. Finally, suggestions are made for improvements in terms of integrating strategic issues in the decision-making process of such major projects of strategic nature.

2. STRATEGIC ENVIRONMENTAL ASSESSMENT

2.1. Introduction

The concept of environmental impact assessment was first established in the 1969 US National Environmental Policy Act (NEPA) and has thereafter resulted in numerous impact assessment instruments (Tajima & Fischer 2013).

One of these instruments was Environmental Impact Assessment (EIA) which was introduced in the member states of the European Union in 1985 with the Directive 85/337/EEC (European Commission, 1985) that only applied to projects. However, it was believed that Impact Assessment should also consider environmental impacts in decision-making other than at the project level (Fischer 2007).

The concept of Strategic Environmental Assessment was then introduced in 1989 as “the environmental assessments appropriate to policies, plans and programmes [...] of a more strategic nature than those applicable to individual projects and [...] likely to differ from them in several important respects” (Wood & Djeddour 1989).

Due to the fact that initially the concept of SEA was still based on the principles of EIA, there was an understanding that whereas EIA focuses on identifying and minimising negative environmental impacts of a certain development, SEA should address environmental consequences of proposed PPP initiatives together with economic and social considerations at early stages of decision-making (Sadler & Verheem 1996 cited in Tetlow & Hanusch 2012).

Therefore, a generally agreed upon overall concept of SEA is that it is “a structured, proactive process to strengthen the role of environmental issues in strategic decision-making” (Verheem & Tonk 2000: 177).

However, there have been great developments in the concept of SEA with new strategic approaches defending “the need for new practices of SEA beyond the simple analysis and reporting of information on the environmental consequences of decisions being made” (Lobos & Partidário 2014: 34).

Partidário (2012) proposes a more strategic and effective approach to SEA which would be more beneficial by asserting itself as “a strategic framework instrument that helps to create a development context towards sustainability, by integrating environment and sustainability issues in decision-making, assessing strategic development options and issuing guidelines to assist implementation” (Partidário 2012: 11).

Despite these theoretical developments, EIA-based SEA is still widely practiced (Bidstrup & Hansen 2014; van Doren et al. 2013; Lobos & Partidário 2014). According to Lobos and Partidário (2014), the gap between theory and reality can be accounted for two main reasons: resistance to change of practitioners and challenges created by inevitably complex systems. Bidstrup and Hansen (2014) also considered reasons for this paradox of a non-strategic SEA and stated that the institutional reality in which practitioners work doesn't always allow broad strategic considerations and that because of the

iterative and ongoing process of strategic assessment, planners have difficulties in addressing plan alternatives. This leads to an SEA which focuses mostly on identifying potential impacts, assessing its effects and developing mitigation measures (Lobos & Partidário 2014).

In fact, this EIA-based approach can be associated with the European SEA Directive – Directive 2001/42/EC on the assessment of the effects of certain plans and programmes on the environment (Dalal-Clayton & Sadler 2005 cited in Partidário 2015), which was established in July 2001, having become an active part of the law in several European Member States (João & McLauchlan 2014) as well as being recognised and set as a standard for SEA across the world (Partidário 2015).

2.2. Purpose and benefits

The purpose and aims of SEA change depending on the planning and decision-making context in which it is applied (Tetlow & Hanusch 2012).

According to the SEA Directive, the purpose of the SEA is “to provide for a high level of protection of the environment and to contribute to the integration of environmental considerations into the preparation and adoption of plans and programmes with a view to promoting sustainable development, by ensuring that, in accordance with this Directive, an environmental assessment is carried out of certain plans and programmes which are likely to have significant effects on the environment” (Article 1).

Fischer (2007) states that the role of SEA is to take environmental and possibly other sustainability aspects into consideration in PPP making above project level, while João and McLauchlan (2014) believe SEA “has as its broad aim the inclusion of environmental considerations into strategic decision-making” (João & McLauchlan 2014: 87).

With a more strategic approach, Partidário (2015) believes SEA should be “an instrument of change towards more sustainable patterns of behaviour and development, by following strategic thinking and constructive approaches” (Partidário 2015: 1). The author also states that SEA must incorporate environmental issues early on, integrating them in the strategic decision-making process and formulating and discussing strategic alternative options.

The application of the SEA is then considered to result in several benefits. Fischer (2007) has defined the SEA characteristics, based on which benefits are thought to result (Table 2-1).

Table 2-1 - Characteristics of SEA, based on which benefits are thought to result (Source: Fischer 2007: 7)

Characteristics of SEA, based on which benefits are thought to result Source: adapted from Fischer (1999a) and Dusik et al (2003).	
1.	SEA allows for a more systematic and effective consideration of wider environmental impacts and alternatives at higher tiers of decision-making, leading to more effective and less time-consuming decision-making and implementation.
2.	SEA acts as a proactive tool that supports the formulation of strategic action for sustainable development.
3.	SEA increases the efficiency of tiered decision-making, strengthens project EIA and identifies appropriate and timely alternatives and options; in this context, it helps to focus on the right issues at the right time and aims to uncover potentially costly inconsistencies.
4.	SEA enables more effective involvement in strategic decision-making, creating knowledge at low costs.

Furthermore, if a truly strategic thinking SEA could be attained, it could “facilitate decision-making by involving key actors, enabling dialogues towards mutual understanding, offering flexibility, [and] ensuring a long-term and large scale perspectives when considering development options that help to meet sustainability aims” (Partidário 2015: 6).

2.3. Concept of sustainability

The concept of sustainability is commonly present when discussing the purpose of the SEA, particularly the integration of sustainability issues in the decision-making process and the pursuit for sustainable development. The most well-known definition of sustainable development is from the Brundtland Report (WCED 1987):

“Sustainable Development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs. It contains within it two key concepts:

- *the concept of ‘needs’, in particular the essential needs of the world’s poor, to which overriding priority should be given; and*
- *the idea of limitations imposed by the state of technology and social organisation on the environment’s ability to meet present and future needs.” (WCED 1987: 43)*

The most conventional view on this concept is that sustainability stands for the interaction between social, economic and environmental aspects (see 4.3.7) which is represented in the left side of Figure 2-1. Because of this method, social, economic and ecological considerations have been addressed separately and their interdependence has been overlooked which results in a failed integrative approach of sustainability (Gibson 2006).

The three pillars or triple bottom line approach seem to put more weight on balancing and making trade-offs in sustainability assessment, which should only be done when there are no other options left (Gibson 2006).

Additionally, according to Cato (2009), the factors of society, economy and environment should not be equally represented because economy is actually more relevant in decision-making with “society bearing the costs” and the environment suffering the negative consequences. The author believes that the view illustrated in the right side of Figure 2-1 is more appropriate by showing that society persists inside the environment and that the economy is a part of society which signifies that both society and economy are dependent on the environment (Cato 2009).

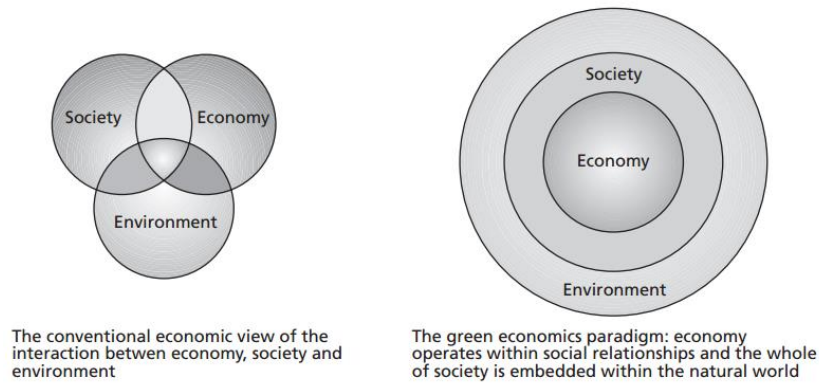


Figure 2-1 - Different views of the interaction between economy, society and environment that stand for sustainability (Source: (Cato, 2009: 37)

The solution would be “to take sustainability as an essentially integrative concept and to design sustainability assessment more aggressively as an integrative process” (Gibson, 2006: 259) by building it into a larger overall governance regime that is designed to respect interconnections among issues, objectives, actions and effects, through the full interrelated set of activities from broad agenda setting to results monitoring and response. Assessment processes should be designed with an iterative conception-to-resurrection agenda, aiming to maximise multiple, reinforcing net benefits through selection, design and adaptive implementation of the most desirable option for every significant strategic or project level undertaking. Trade-offs should be discouraged as much as possible, while guidance needs to be established in the decision-making on those that are unavoidable. Also important, is the need to avoid the three conventional categories by redefining the driving objectives and consequent evaluation and decision criteria, ensuring attention to usually neglected sustainability requirements (Gibson 2006).

2.4. International practice

Tetlow and Hanusch (2012) state that the SEA procedures have been widely introduced across the world and have developed Table 2-2 that summarises the snapshot state-of-the-art analysis from countries with formal SEA provisions:

Table 2-2 - Selected countries with legal SEA provisions and snapshot state-of-the-art analysis (Source: Tetlow & Hanusch 2012: 18)

Country/group of countries	SEA provision	Snapshot state-of-the-art analysis [building on Sadler (2011a) based on contributions of national experts, CEC (2009) and Lam et al. (2009)]
27 Member States of the EU	SEA Directive 2001/42/EC (entry into force 2004) and its national legal transposition	The Directive has triggered the establishment of SEA EU-wide slowly but successfully. There are differences in the number and the quality of completed SEAs among Member States. There are ideas to extend the scope of the Directive to cover policies and to better address certain issues such as climate change and biodiversity.
USA	National Environmental Policy Act (NEPA, 1969)	Despite being the place of origin of SEA, only a “handful” of SEAs are completed each year. However, there are some innovative examples of SEA practice.
Canada	Cabinet Directive on Environmental Assessment of Policy, Plan and Programme Proposals (introduced 1990, various amendments)	The flexible approach to SEA established in Canada is generally considered to have resulted in patchy compliance with provisions, weaknesses in process implementation and poor follow-up.
Australia	Australian Environment Protection and Biodiversity Conservation (EPBC) Act of 1999 (plus a range of other federal and state legislation)	There is considerable experience with mandatory SEA of fisheries and emerging practice of other discretionary applications of SEA following the 2006 amendments to the EPBC Act.
China	Environmental Impact Assessment Law of 2003	Fast and varied evolution of SEA; however, the practical application has remained somewhat limited, potentially due to unspecific legislation.

2.5. Approaches to SEA

There are currently numerous approaches to SEA that vary depending on the context of each country in which it is established (Chaker et al. 2006). Dalal-Clayton and Sadler (2000) have identified three general approaches that have been adopted:

- SEA has been introduced as a relatively separate, distinct process – typically as an extension of EIA;
- SEA has been established as a two tier system with formal SEAs required for specific sectoral plans and programmes and an environmental “test” applied to strategic policies;
- SEA has been incorporated into policy appraisal and regional and land use planning.

Partidário (2012) has also identified the following SEA models (Figure 2-2) that describe the linkage between SEA and the planning process:

1. Single opportunity model: SEA that often follows the EIA approach and uses similar tools.
2. Parallel model: Most frequently used EIA-based SEA approach where the SEA process runs in parallel but independently from the planning process.
3. Integrated model: More strategic approach of SEA where it is part of the planning process.
4. Decision centred model: The planning process determines the SEA framework, which is tailored to meet with the requirements of strategic decision-making (Chaker et al. 2006).

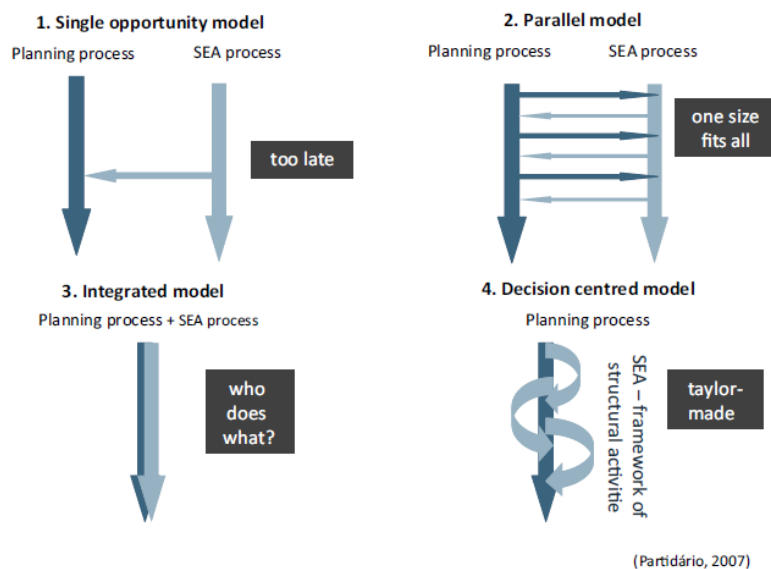


Figure 2-2 - Models for linking SEA and the decision process (Source: Partidário 2012: 20)

The author developed a Decision Centred Model entitled Strategic thinking model of SEA whose aim is “to help find environmental and sustainable viable options to achieve strategic objectives” (Partidário 2012: 28). This model establishes the following principles for good practice SEA (Partidário 2012):

- SEA is a strategic facilitator of sustainability processes;
- SEA should ensure focus on the few relevant issues that really matter;
- SEA works primarily with conceptual processes (policy formation and formulation in planning) and not with results;
- SEA applies to decisions of strategic nature and is used strategically in relation to decision-making.

2.6. Sustainability Appraisal

It is relevant to mention the particular form of SEA named Sustainability Appraisal, because that was the other instrument used in one of the case studies beside SEA, namely in the HS2 London to the West Midlands.

The UK Government has introduced the Planning Act 2008 in order to speed up the process for approving national significant infrastructure projects (NSIPs). Due to this process, the Government first introduced national policy statements (NPSs) which establish objectives and policies for matters of national significance. These require SEA, however, the Government uses a broader process named Appraisal of Sustainability (AoS) that addresses environmental aspects in addition to social and economic, ideally meeting the requirements of the SEA Directive (Sheate 2015). The author additionally explains that “the term Appraisals of Sustainability refers solely to those assessments undertaken for NPSs, though in all other respects they are the same as Sustainability Appraisals undertaken for spatial plans in the UK and need to be screened for applicability of the SEA Directive” (Sheate 2015: 2).

The former Department of the Environment, Transport and the Regions (DETR) defined sustainability appraisal (SA) as “a systematic and iterative process undertaken during the preparation of a plan or strategy, which identifies and reports on the extent to which the implementation of the plan or strategy would achieve the environmental, economic and social objectives by which sustainable development can be defined, in order that the performance of the strategy and policies is improved” (DETR 2000 cited in Smith & Sheate 2001: 265).

By taking into consideration all aspects of sustainable development, sustainability appraisal supports the decision-making process in a more integrated approach (Smith & Sheate 2001) whereas the SEA Directive focuses mostly on the environmental assessment.

2.7. SEA effectiveness

The task of assessing the effectiveness of SEA is a difficult one (Sheate 2010). Initially it was perceived that an SEA was effective if it resulted in changes in the PPPs. However, as SEA evolved, the concept of effectiveness shifted to refer to the process of SEA itself (Tetlow & Hanusch 2012). That means that, in order to evaluate the effectiveness of SEA, one cannot solely consider its influence on the final decision but also its contribution throughout the decision-making process (van Doren et al. 2013) thus requiring a holistic approach (Wang et al. 2012).

Additionally, Fischer (2007) stated that an SEA is thought to be effective when it:

- provides decision-makers with better information;
- enables attitudes and perceptions to change through participation and involvement;
- changes established routines.

Therefore, when referring to the concept of SEA effectiveness, a distinction is made between substantive and procedural effectiveness (van Doren et al. 2013; Zhang et al. 2013). Procedural

effectiveness evaluates whether the SEA “is undertaken in line with established procedures and criteria” (Cashmore et al. 2004; Sadler 1996 cited in van Doren et al. 2013: 120) whereas substantive effectiveness assesses “environment- or sustainability-related changes in the plan as a result of the SEA (Retief 2006; Thérivel & Minas 2002 cited in van Doren et al. 2013), changes in the environment as a result of the SEA (Retief 2006 cited in van Doren et al. 2013), modifications in the knowledge base of decision-makers regarding the environmental implications of the decision and other forms of “learning” (De Jong et al. 2012 cited in van Doren et al. 2013), and the extent to which environmental issues were considered during decision-making processes (Morrison-Saunders & Arts 2004; Retief 2006; Ten Heuvelhof & Nauta 1997; Thérivel & Minas 2002 cited in van Doren et al. 2013: 20)”.

Chanchitpricha and Bond (2013) defined four categories of effectiveness based on their review of the literature on the subject:

- **Procedural effectiveness:** It “considers the principles and practice of the impact assessment process (Baker & McLelland 2003; Sadler 1996 cited in Chanchitpricha & Bond 2013: 67) and can be measured based on the practice of impact assessment which shows how the policy is applied in the process” (Baker & McLelland 2003 cited in Chanchitpricha & Bond 2013: 67).
- **Substantive effectiveness:** It “can be considered based on the extent to which set aims can be achieved when applying something, such as impact assessment tools or policy, in practice” (Baker & McLelland 2003; Sadler 1996 cited in Chanchitpricha & Bond 2013: 68).
- **Transactive effectiveness:** It “is achieved when resources in term of human resources, cost and time are invested at the minimum level to achieve the objectives set or efficient outcomes” (Baker & McLelland 2003; Sadler 1996 cited in Chanchitpricha & Bond 2013: 69).
- **Normative effectiveness:** It “is related to the sense of principles that society (or a community) agrees, as well as the sense of accepted behaviours within society (or a community)” (Chanchitpricha & Bond 2013: 69).

The authors then state that IA effectiveness can be defined based on “the process of the impact assessment; the required resources (i.e. staff, time, cost); the purposes of the impact assessment; the involved actors/stakeholders; the values/interests of decision makers; its contribution to policy development; the learning gained from the process; the changing of perspectives through gained knowledge; and the expectations of interested/involved parties/or stakeholders” (Chanchitpricha & Bond 2013: 66).

There have been increasing researches on SEA effectiveness through criteria-based assessment in the international professional literature (Wang et al. 2012; Fischer & Gazzola 2006). The IAIA (2002) established SEA performance criteria which state that the SEA process should be integrated, sustainability-led, focused, accountable, participative and iterative.

van Buuren and Nooteboom (2009) have defined three criteria to evaluate the effectiveness of an SEA:

1. The SEA enables decision-making based on authoritative and undisputed information on the environmental consequences of each alternative choice (content);
2. The SEA contributes to the inclusiveness of the collaborative dialogue, and thus to the realization of support and legitimacy by achieving consensus and frame-reflection (process);
3. As a procedural device, SEA contributes to the timeliness, transparency, and quality of the overall decision-making process (procedure).

Hanna and Noble (2015) conducted a study where the participants were asked to identify the four most important criteria themes that evaluate the effectiveness of IA, which are: stakeholder confidence, integrative and linked to decision-making, promotes long-term substantive gains in environmental quality and comprehensiveness.

Fischer and Gazzola (2006) gathered the main elements of the effectiveness criteria found in reviewed professional literature (Table 2-3):

Table 2-3 - SEA effectiveness criteria advertised in the professional literature (Source: Fischer & Gazzola 2006: 401)

SEA effectiveness criteria advertised in the professional literature
<ul style="list-style-type: none">• SEA should be effective in ensuring environmental aspects are given due consideration in policy, plan and programme (PPP) making;• SEA should be integrated and sustainability-led, supporting a pro-active planning process that is driven by clear goals and objectives; apart from environmental aspects, SEA should also consider economic and social aspects;• SEA should be carried out with professionalism and those conducting it should be made accountable; SEA should document and justify how environmental and sustainability objectives are considered in PPP practices in a transparent and simple manner; in this context, quality control is said to be of great importance;• SEA should be stakeholder-driven, explicitly addressing the public's inputs and concerns, ensuring access to relevant information of the PPP making process;• SEA should provide sufficient, reliable and usable information in a cost and time efficient manner;• SEA should be iterative, being part of an ongoing decision cycle; it should inspire future planning through the potential amendment of strategic decisions; in this context, SEA needs to be applied in a tiered manner with effective project EIA within an established PPP framework;• SEA should be flexible and adaptive to the PPP process.

After reviewing the literature on the subject of SEA effectiveness criteria, Fischer and Gazzola (2006) summarised that an ideally effective SEA should relate to objective-led, efficient, relevant, accountable, transparent, iterative, adaptive, flexible, integrated and sustainable decision making. Although, it is unlikely that all these criteria could be equally delivered due to eventual SEA constraints such as budget, time, resources, etc.

These criteria were, however, defined based on practices and experiences of a particular set of countries, including the UK, The Netherlands and NGOs/international organisations. One fundamental characteristic is that each SEA process is unique as it adapts to each context, this being cultural, social, political, etc. Therefore, one might ask if these criteria are applicable to all countries, including the ones whose SEA system is undeveloped and not widely implemented. Fischer and Gazzola (2006) studied the case of Italy where a flexible approach to SEA, which is one of the effectiveness criteria, could instead have negative effects as it would “mean to leave the highly political, non-transparent and non-accountable nature of PPP making unchanged” (Fischer & Gazzola 2006: 406). The authors then stated that an SEA system “based on clear, rigid and prescriptive government provisions” (Fischer & Gazzola 2006: 407) with accountable responsible actors and “subjected to strict controls, possibly by an independent body” (Fischer & Gazzola 2006: 407) would be quite more effective in Italy.

Therefore it is important to know the context in which SEA operates because its effectiveness will vary from one context to the other (van Doren et al. 2013; Acharibasam & Noble 2014; Zhang et al. 2013; Hanna & Noble 2015), causing the need for SEA to be tailored to each case. In order to do so, information on the country’s legal and institutional framework and their decision-making culture must be known (Fischer & Gazzola 2006). However, Hanna and Noble (2015) believe that, regardless of context, general criteria for IA effectiveness could potentially be developed.

3. DEVELOPMENT OF AN ASSESSMENT FRAMEWORK FOR EFFECTIVENESS

3.1. Introduction

After reviewing the literature on the subject of SEA effectiveness, it is possible to proceed to the analysis of the existing frameworks of assessment in order to propose a framework that can evaluate, at the end of the decision-making process, whether or not a strategic and effective SEA process was carried out and if the considerations it proposed are reflected in the changes on the PPPs.

3.2. Collection of effectiveness frameworks

In 2002, IAIA (International Association for Impact Assessment) published a set of performance criteria with the purpose of evaluating SEA effectiveness, represented in Table 3-1.

Table 3-1 – SEA Performance Criteria (Source: IAIA 2002)

SEA:	
Is integrated	<ul style="list-style-type: none"> - Ensures an appropriate environmental assessment of all strategic decisions relevant for the achievement of sustainable development. - Addresses the interrelationships of biophysical, social and economic aspects. - Is tiered to policies in relevant sectors and (transboundary) regions and, where appropriate, to project EIA and decision making.
Is sustainability-led	<ul style="list-style-type: none"> - Facilitates identification of development options and alternative proposals that are more sustainable.
Is focused	<ul style="list-style-type: none"> - Provides sufficient, reliable and usable information for development planning and decision making. - Concentrates on key issues of sustainable development. - Is customised to the characteristics of the decision making process. - Is cost- and time-effective.
Is accountable	<ul style="list-style-type: none"> - Is the responsibility of the leading agencies for the strategic decision to be taken. - Is carried out with professionalism, rigor, fairness, impartiality and balance. - Is subject to independent checks and verification. - Documents and justifies how sustainability issues were taken into account in decision making.
Is participative	<ul style="list-style-type: none"> - Informs and involves interested and affected public and government bodies throughout the decision making process. - Explicitly addresses their inputs and concerns in documentation and decision making. - Has clear, easily-understood information requirements and ensures sufficient access to all relevant information.
Is iterative	<ul style="list-style-type: none"> - Ensures availability of the assessment results early enough to influence the decision making process and inspire future planning. - Provides sufficient information on the actual impacts of implementing a strategic decision, to judge whether this decision should be amended and to provide a basis for future decisions.

Wang et al. (2012) have gathered a list of crucial indicators that constitute an evaluation framework which “considers the political context, the institutional arrangements, the SEA processes, and the SEA methods that contribute to the effectiveness of a SEA system for comprehensive plans” (Wang et al. 2012: 414) represented in Figure 3-1.

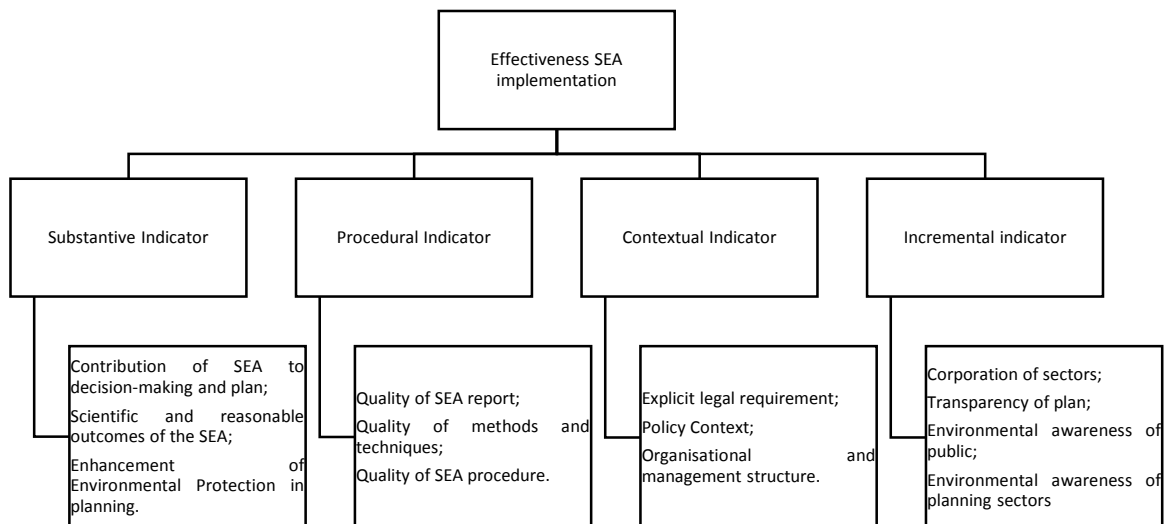


Figure 3-1 - Structure for SEA effectiveness indicators (Source: Wang et al. 2012: 414)

The authors believe that in order to assess the effectiveness of an SEA one must not only look into the quality of its procedures (procedural effectiveness) and its contribution to the decision-making process (substantive effectiveness) but also to its context, which can be political, legal and administrative, and incremental influences, that are said to be the influences of the SEA process on environmental awareness, pursuit of sustainability and institutional values (Wang et al. 2012).

Zhang et al. (2013) have identified a great variety of critical factors to assess the effectiveness of an SEA and divided them into two main groups: stage factors (factors that can be related to a specific stage in the SEA process) and general factors (factors that broadly influence the SEA). As seen in Figure 3-2, the stage factors are linked with the systematic process comprising five heuristic arenas:

- The pre-SEA stage (includes agenda setting, initiation/deciding to decide and policy/plan formulation);
- The SEA stage “preparing the ground” (includes screening, scoping, identification of alternatives);
- The SEA stages “assess and protect” (includes prediction, mitigation);
- The SEA stage “wrap it up” (includes documentation, review EIS and monitoring);

- The post-SEA stage (includes application and implementation, feedback and evaluation, policy maintenance, succession or termination).

Public participation is analysed separately besides the five aforementioned arenas as it is present in all stages.

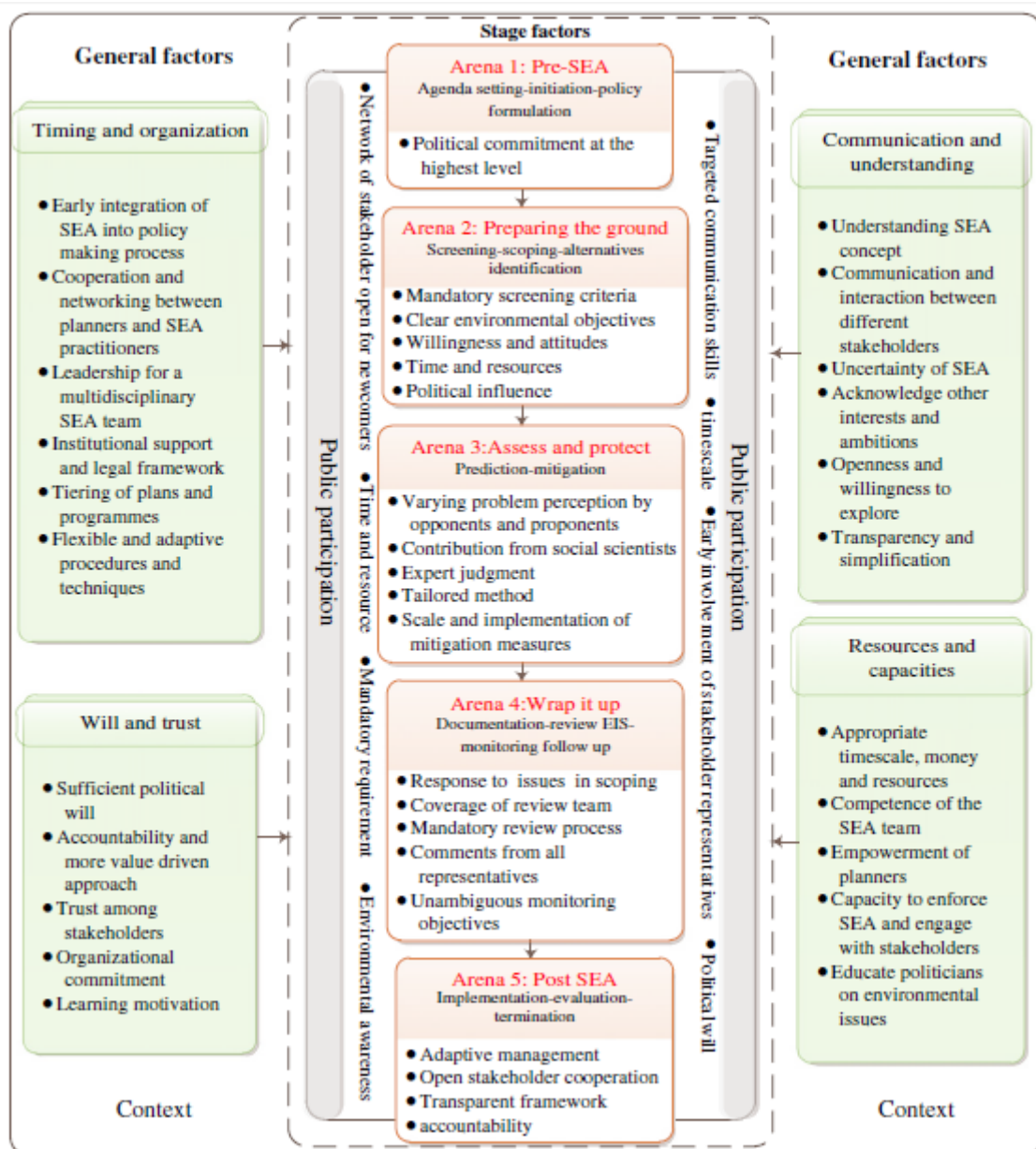


Figure 3-2 - Visualising stage factors and general factors for direct environmental effectiveness of an SEA
(Source: Zhang et al. 2013: 96)

Partidário (2012) created a checklist of criteria (Table 3-2) to assess SEA practice which is an improvement of the criteria defined by (Partidário et al. 2009).

Table 3-2 – Ten checking points for a successful strategic thinking SEA (Adapted from: Partidário 2012: 58)

Assessment parameters	
Object of assessment	Strategic Reference Framework
Entry point	CDF assessment framework
Interactivity	Strategic options
Problem framework	Participation
Governance framework	Guidelines for planning, management and monitoring

In 2014, Acharibasam and Noble developed a set of criteria which evaluates the direct and indirect impact of SEA in the Canadian context (Table 3-3). The authors' goal was to assess not just the SEA procedure itself but the indirect and long-term effects on PPPs (policy, plan or programme) and decisions.

Table 3-3 - Criteria for evaluation of SEA efficacy (Source: Acharibasam and Noble 2014: 179)

Criteria for evaluating the direct impacts of SEA on a PPP	Criteria for evaluating the indirect impacts or influence of SEA beyond the PPP
<p>The SEA</p> <p>A1. Identified the potential impacts (positive or negative) of the PPP.</p> <p>A2. Identified strategies for avoidance or reduction of potentially adverse impacts, or strategies for enhancement of positive impacts.</p> <p>A3. Was either integrated with the development of, or provided assessment results/information early enough to inform the development of the PPP.</p> <p>A4. Incorporated sustainability considerations (e.g. relationships between human-ecological systems; intra- and inter-generational equity; precaution and adaptation) into the PPP development or PPP approval/decision-making process.</p> <p>A5. Ensured that stakeholder interests, including public and Aboriginal interests (if applicable), were represented in the final PPP.</p> <p>A6. Ensured compliance of the PPP with the agency's/organisation's mandate, regulations or higher level policy commitments.</p> <p>A7. Gave sufficient consideration to viable alternatives, if applicable, to the proposed or existing PPP.</p> <p>A8. Resulted in modifications and improvements to the PPP.</p> <p>A9. Provided clear direction or standards to facilitate implementation of the PPP, including guidance for post-implementation monitoring or evaluation.</p> <p>A10. Ensured greater transparency and accountability in the development/implementation of the PPP.</p> <p>A11. Did not cause undue delay, without good reason, to decisions or PPP processes.</p> <p>A12. Contributed to improved efficiency (timeliness) in the PPP's development and/or implementation process.</p>	<p>The SEA</p> <p>B1. Provided easily accessible information (e.g. baseline data, thresholds, etc.) for use in subsequent PPP process, monitoring programmes or project-based impact assessment.</p> <p>B2. Helped realise broader organisational or institutional goals and objectives beyond the scope of the PPP itself.</p> <p>B3. Improved actual environmental or socioeconomic conditions or raised environmental or socioeconomic standards.</p> <p>B4. Identified or stimulated new research directions or needs (e.g. policy or programme gaps).</p> <p>B5. Changed or influenced institutional norms or management practices.</p> <p>B6. Improved overall awareness of the agency's or organisation's actions, PPPs.</p> <p>B7. Improved public awareness of the agency or organisation as a result of SEA application (e.g. transparency and accountability).</p> <p>B8. Led to improved efficiencies in "next level" assessments or decisions (e.g. time or cost savings on subsequent plans or project assessments).</p>

Hanna and Noble (2015) conducted a Delphi study to develop a framework for evaluation of effective IA (Impact Assessment) comprising nine criteria themes:

1. Stakeholder confidence

- a) The IA process is known by stakeholders to be objective, and there is confidence that other processes do not predetermine the IA decision.
- b) The process is understood by stakeholders, and information about the process, proceedings and its authority is accessible and clear;
- c) The intent of the process is acknowledged and clearly stated, whether it is to advise, decide, or to only identify baseline conditions and determine impacts.

2. Integrative and linked to approval decision-making

- a) The results of the IA process are clearly accounted for in the decision (the eventual approval, rejection or approval with conditions).
- b) The process demonstrably informs, and the results are integrated into, other subsequent or coincident environmental approval and review processes.
- c) There is capacity to integrate the knowledge and results of other processes into the IA process without unduly influencing its outcomes (see also 1 a)).
- d) An initiative may not proceed through other approval processes or receive other approvals until the IA process is complete and the initiative approved.
- e) The process considers impacts beyond the immediate time scale of the policy, plan or programme, when applying strategic assessment.

3. Promotes betterment and longer-term and substantive gains to environmental management and protection

- a) The IA process and its outcomes minimise or eliminate adverse environmental effects that may result from the initiative.
- b) The process seeks betterment of the environment, when possible, by ensuring net benefits to the environment.
- c) The process seeks to identify and sustain social and biophysical systems that interact and may be affected by assessment-subject activities.
- d) The process prevents imposition of significant adverse effects onto future generations.
- e) There is mandatory follow-up and monitoring, including a supporting audit and public reporting system to ensure compliance with approval conditions.
- f) The process provides follow-up provisions to assess the efficacy of mitigation requirements and reports on environmental benefits (e.g. provision of compliance schedules, mitigation reports and post implementation audits, evaluation of immediate and longer-term gains to environmental management and protection).

4. Comprehensiveness

- a) The definition of “environment” and “environmental effects” encompasses social/cultural and ecological/biophysical factors and their interrelationships at multiple scales.
- b) IA is applied to the range of initiatives/activities that significantly affect the environment, whether the proponent is from the public or private sector (see also 1 d)).

- c) Initiatives may be “screened out” (exempted from IA) if there is sufficient information to determine that impacts are insignificant, or otherwise addressed by an alternative process, but listed exemptions are limited to emergency or similar initiatives (e.g. urgent flood control works).
- d) There is a mandatory scoping stage that occurs early in the assessment process to focus the assessment on key issues and identify opportunities for environmental protection and improvement, and there is opportunity to deal with new information or issues identified throughout the assessment process or during project implementation (see also 3 e), f) and 9 e)).
- e) The process requires identification and reasonable consideration of alternatives, including “alternatives to” the initiative and “alternative means” of carrying out or implementing the initiative.
- f) The process assesses cumulative effects.

5. Evidence-based

- a) The decisions that follow the IA process clearly and directly reflect the evidence presented in the assessment and/or review proceedings, and the process is open to hearing and considering all relevant and opposing evidence.
- b) Uncertainties and assumptions about data, system behaviours and future conditions are disclosed and acknowledged in the decision.
- c) Impact predictions are formulated in such a way that they can be tested or used for follow-up.
- d) The process requires monitoring and follow-up, and the data and reporting from those activities are made publically accessible and retained for use in subsequent assessments and decision-making processes.

6. Accountability

- a) There is a requirement for regular, independent public review of the assessment system, its performance and effectiveness (e.g. a five-year review of process, legislation and regulations).
- b) Documentation and information disclosure requirements are binding on the process and its administrators, proponents and all other stakeholders.
- c) There is open and easy access to timely, accurate and full and complete information early and throughout the assessment process through formats that provide extensive access and acknowledge different forms of access need (multiple formats are used: electronic, print, languages, verbal and other).
- d) The process is independent, and where needed multidisciplinary organisations exist to hear requests for exemptions and inclusions, conduct hearings (when they are required) and review assessment documents and reports.
- e) Roles and responsibilities in the assessment, review and decision-making processes are clearly identified.
- f) Roles and responsibilities for post-IA, including implementation of the initiative and follow-up on mitigation and monitoring and reporting, are clearly identified.

7. Participation

- a) There is a requirement for stakeholder participation throughout the process.
- b) Participation opportunities are made well known, while recognising that such engagement will vary in scale and method according to the nature and scale of the initiative being assessed, the stage of the process and the social-cultural context.
- c) Sufficient resources and time are provided to support participation.
- d) The participation approach is designed to improve the quality of the proposal, affect the assessment and influence the decision.

- e) There is a requirement to broadly consider, use and respect multiple forms of knowledge where applicable and available (e.g. scientific, applied-technical, aboriginal, local and culture-specific).
- f) Hearings and other similar deliberations are open to the public and there are no unjustified limitations to open deliberation and presentation of evidence (whether through the imposition of place, time of day, time allowed, insufficient resources, or cultural or social barriers, or other unwarranted limitations).
- g) There is a requirement to publically report on stakeholder engagement, including how it was undertaken and what was said, and how it was accounted for in the assessment and decision.
- h) There is a requirement to explain how participation was accounted for in the decision.

8. A legal foundation for IA

- a) IA must be codified in law.
- b) The legal foundation for IA must provide clarity for stakeholders with respect to applicability, assessment requirements, disclosure requirements, and process components, reporting and decision-making.
- c) The process contains a legal base for participation and accountability requirements.
- d) The process must outline provisions for enforcement and addressing with noncompliance with assessment requirements or subsequent decisions.
- e) The IA system must provide decisions (for approvals, conditions, rejections, exemptions and inclusions) that may be appealed by stakeholders or other affected parties based on questions of process veracity or interpretation of law.

9. Capacity and innovation

- a) The IA process must be administered by competent and impartial authorities with sufficient staffing, skills and qualifications to administer the process, and to review and evaluate technical, social and scientific data.
- b) The process must provide sufficient financial resources to review agencies to ensure the integrity, effectiveness of, and confidence in, the process.
- c) Mechanisms exist in the process for the early consideration of assessment-subject initiatives and the provision of advice to proponents.
- d) Information accessibility and participation are enhanced by the use of innovative technologies and formats for communication, stakeholder capacity building and information access.
- e) The process and the supporting institutional framework are flexible, adaptive, and open to new and innovative tools and approaches to assessment and evaluation.

Lobos and Partidário (2014) established a framework of ten assessment criteria that assesses SEA practice, which was modified from Partidário et al. (2009) and it is summarised in Table 3-4.

Table 3-4 - Framework for reviewing SEA practice (Source: Lobos and Partidário 2014: 36)

Assessment criteria	Key-question	Category
SEA concept	What was the purpose and role of SEA?	Delivering sustainable development at a strategic level Validating the environmental quality of PPP proposals Identifying and communicating the potential environmental consequences of PPP proposals
Object of assessment	What was assessed?	Strategic objectives Strategic options Proposed model Scenarios Alternatives Measures or actions
Entry point	At what stage of planning did SEA start?	Visioning and establishment of strategic objectives Scenario building Choosing of strategic options Specific development proposals
Strategic reference framework	How was the strategic reference framework defined and used?	Used in the assessment Only identified Ignored
Interactivity	What was the degree of integration and feedback between assessment and planning activities?	High Medium Low
Scope of assessment	What was the scope of assessment?	Holistic and integrated Social + biophysical + economic + political Physical and territorial
Tools and techniques	What kind of tools and techniques were prioritised during diagnosis and assessment?	Favoured tools to deal with uncertainty, complexity and value commitment Favoured tools to deal with a deterministic (causal) approach
Uncertainty	Were uncertainties recognised explicitly and dealt with adequately?	Integrated into analysis Only identified Ignored
Participation	What was the degree of participation?	Enlarged and in an inclusive way Strict legal fulfilment Punctual No participation
Follow-up	What was the focus of guidelines for follow-up?	Guidelines for governance, planning, and management Only environmental impact monitoring No follow-up guidelines were designed

3.3. Discussion

After reviewing the collected frameworks of assessment of SEA effectiveness one must first look into the criteria that were mentioned by most authors, meaning that these were generally agreed upon criteria for SEA effectiveness and also look into their differences to better understand which criteria allow to address the research questions of the present dissertation.

One of the most fundamental indicators for an effective SEA is **Public Participation** which contributes to the quality of the SEA process (Wang et al. 2012) and must occur as early as possible (Zhang et al. 2013). An open consultation process with both stakeholders and affected public throughout the decision-making process guarantees their interests and concerns are represented in the final PPP (Acharibasam & Noble 2014; van Buuren & Nootboom 2009; IAIA 2002), improving the quality of the proposal, affecting the assessment and influencing the decision (Hanna & Noble 2015). The interaction between stakeholders with different interests and strategies allows a stronger SEA (Lobos & Partidário 2014) with a shared vision and a discussion on strategic priorities, problems and rules for sustainable development (Partidário 2012).

It is also consensual that the **Entry point** and the **Timing** of the SEA are crucial for its effectiveness (Wang et al. 2012; Acharibasam & Noble 2014). If SEA is involved at the start of the planning process, stakeholders feedback will be integrated in the process and changes in the PPPs will be made (van Buuren & Nootboom 2009) and the information resulting from the assessment in the early stages will also influence the decision-making process (IAIA 2002). If the SEA is involved too late, the PPP would have been already made and changes would not be implemented (Zhang et al. 2013), instead, the SEA would evaluate specific development proposals resulting in the preparation of a report. If, in fact, the SEA is introduced early it can discuss the definition of strategic aims and influence the development alternatives considered (Lobos & Partidário 2014).

Interactivity is another critical indicator of SEA effectiveness which relates to the communication and cooperation between SEA and planning practitioners throughout the decision-making process (van Doren et al. 2013). This process can ensure an adequate environmental assessment of all strategic decisions relevant to achieve sustainable development (IAIA 2002) as well as considering impacts beyond the immediate time scale of the PPP when applying strategic assessment (Hanna & Noble 2015). The interactivity and synchronisation between SEA and planning is essential for both processes to succeed and it can influence changes that SEA applies to the PPP (van Buuren & Nootboom 2009; Lobos & Partidário 2014). This integration needs to occur at an early stage in order to facilitate a process of collaborative governance, consensus building and joint fact finding (Zhang et al. 2013).

Another factor that was mentioned by most authors on the subject of evaluating SEA effectiveness is **Legal foundation/requirements**. SEA must be backed up by existing legislation (Zhang et al. 2013) which provides clarity for stakeholders and constitutes a legal base for participation and accountability requirements (Hanna & Noble 2015) and ensures the compliance of the PPP (Acharibasam & Noble 2014). Wang et al. (2012) believe this indicator is also important because each SEA system operates differently depending on the political, legal and administrative context which signifies that the SEA

effectiveness will depend on the context it is in. With a more strategic approach of SEA in mind, Partidário (2012) considers the **Strategic Reference Framework**, which is a framework of strategic macro policies of the SEA, as a critical factor of SEA effectiveness. This indicator sets the referential for strategic assessment in PPP processes by considering the objectives and targets of long-term macro-policies thus setting a strategic direction for SEA (Lobos & Partidário 2014).

In a more strategic SEA, the **Scope of assessment** would include biophysical, social and economic aspects (IAIA 2002) “in an integrated and holistic way” as opposed to being restricted to biophysical aspects of the environment by focusing only on the identification of environmental impacts, which is a current practice (Lobos & Partidário 2014). In a strategic thinking approach, Partidário (2012) resorts to Critical Decision Factors (CDF) to “materialize the concept of scoping at strategic levels” (Partidário 2012: 38). The CDF are ideally holistic key themes that can be described “as windows of observation to focus attention on the strategic environment and sustainability issues that matter in the assessment” (Partidário 2012: 61). In order to answer one of the research questions of the present dissertation, one needs to determine if **strategic issues** were addressed in the scope of assessment. These issues can be defined as “critical challenges associated to the object of assessment, that must be addressed to achieve long-term vision” (Partidário 2012: 63).

Tools and techniques can be a good indicator of the SEA practitioners’ aptitude to strategic assessment (Lobos & Partidário 2014). If deterministic analysis tools and techniques are being used to describe environmental factors and predict environmental consequences then a more EIA-based SEA is being carried out. On the contrary, one is in the presence of a more strategic-thinking ²SEA if techniques and tools “are used for strategy making in complex, dynamic, and uncertain settings” thus improving cooperation, communication and collective learning (Lobos & Partidário 2014: 41). Wang et al. (2012) consider ‘the quality of methods and techniques’ to be an indicator for procedural effectiveness asserting they should be flexible, innovative (Hanna & Noble 2015) and adaptive (Zhang et al. 2013).

It is recognised that there is always **Uncertainty** associated to assessments due to the involvement in complex systems (Lobos & Partidário 2014) which can serve as an obstacle to an effective SEA (Zhang et al. 2013). It is therefore important that all uncertainties and assumptions are disclosed and considered in the decision (Hanna & Noble 2015) by creating a dynamic PPP which can respond to changes over time (Lobos & Partidário 2014).

The SEA process requires **Monitoring and Follow-up** (Zhang et al. 2013) to assess the efficacy of mitigation requirements (Hanna & Noble 2015), stressing that it should include guidance for post-implementation monitoring or evaluation (Acharibasam & Noble 2014). However, follow-up should instead understand changes occurred in the implementation of strategies as well as its context. Hence, follow-up needs to analyse the governance and processes of action instead of focusing only on monitoring environmental and sustainability indicators (Lobos & Partidário 2014). This would therefore

² Strategic-thinking can be defined as having a vision over long-term objectives, flexibility to work with complex systems, adapting to changing contexts and circumstances, as well as being strongly focused on what matters in a wider context (Partidário 2012).

be an on-going process of facilitating environmental and sustainability issues in the decision-making process (Partidário 2012).

Wang et al. (2012) consider the contribution of SEA to decision-making and plan as well as the scientific and reasonable outcomes of the SEA to be indicators of substantive effectiveness. In order to understand the influence SEA had on the decision-making process one needs to look not only into the integration process but at the **Outcome of the SEA** as well. According to certain authors, the results of the SEA must be clearly accounted for in the decision (Hanna & Noble 2015) meaning that the SEA process must provide assessment results/information early enough to influence the development of the PPP (Acharibasam & Noble 2014).

Although the following two criteria were only present in the framework set forth by Lobos and Partidário (2014), it is believed that they better evaluate the effectiveness of strategic- thinking SEA and therefore allow to determine to what extent strategic issues were addressed in the assessment of the three case studies.

- **SEA concept:** By knowing the concept practitioners attribute to SEA one can understand the role it plays in a strategic assessment process. If the SEA role is simply to identify the potential environmental consequences of the PPP proposals and inform the planners then opportunities for a more strategic assessment in which changes are made in the PPP design and the final proposal are missed (Lobos & Partidário 2014).
- **Object of assessment:** It identifies what is going to be assessed (Partidário 2012) which is important to understand, because if the object of assessment were the planning objectives and defined strategic options then there would be no involvement of the SEA in the formulation of options which means the SEA wouldn't have the capacity to influence the decision-making process nor the strategic direction of PPPs. However, if the object of assessment were options then SEA would most likely influence the decision-making process (Lobos & Partidário 2014).

Having taken all the reviewed frameworks into consideration, it is believed that the framework of Lobos and Partidário (2014) better evaluates the effectiveness of a strategic-thinking SEA because it is broader, addressing all the criteria listed in Table 3-5 referenced by several of the reviewed authors, while also incorporating other criteria such as SEA concept, object of assessment and SRF that can better assess whether or not strategy was included in the assessment.

Table 3-5 - Common criteria between collected frameworks and the proposed framework of SEA effectiveness assessment

		Collected frameworks of assessment						
		IAIA, 2002	Wang, Bai, Liu, & Xu, 2012	Zhang, Christensen, & Kørnøv, 2013	Partidário, 2012	Acharibasam & Noble, 2014	Hanna & Noble, 2015	Lobos & Partidário, 2014
Assessment criteria of proposed framework	SEA concept	✓						✓
	Object of assessment				✓			✓
	Entry point			✓	✓	✓		✓
	Legal foundation	✓	✓		✓	✓	✓	✓*
	Interactivity	✓		✓	✓		✓	✓
	Scope of assessment	✓			✓			✓
	Tools and techniques		✓	✓			✓	✓
	Uncertainty			✓			✓	✓
	Participation	✓		✓	✓	✓	✓	✓
	Follow-up			✓	✓	✓	✓	✓
	Outcome of assessment		✓			✓	✓	

* Lobos & Partidário (2014) refer to Strategic Reference Framework rather than Legal foundation.

3.4. Proposed framework

The proposed framework is almost entirely based on the framework established by Lobos and Partidário (2014), however, in order to address the present dissertation's research questions, two other criteria were included, scale and influence on decision-making. **Scale** is a relevant criterion because during impact assessment wide ranging temporal and spatial scales (long-term to short-term temporal scale; global to site-specific spatial scale) can be involved in the process which can difficult the identification of the problem if the right scale(s) are not used (Partidário 2007). The scales applied in SEA are quite important because they can fundamentally change the outcome of the assessment, since processes and parameters that are important at one scale may not be important at another scale (João 2002). **Influence on decision-making** is also a relevant criterion that helps determine if opportunities for strategic assessment were taken by determining if SEA had, in fact, a role in the decision-making process, and how important it was. As a result, a framework for SEA effectiveness adopted for comparing the three case studies is presented in Table 3-6:

Table 3-6 - Proposed framework of SEA effectiveness assessment

Assessment criteria	Key-question	Category	
1. SEA concept	What was the purpose and role of SEA?	1. Delivering sustainable development at a strategic level 2. Validating the environmental quality of PPP proposals 3. Identifying and communicating the potential environmental consequences of PPP proposals	
2. Object of assessment	What was assessed?	1. Strategic objectives 2. Strategic options 3. Proposed model 4. Scenarios 5. Alternatives 6. Measures or actions	
3. Entry point	At what stage of planning did SEA start?	1. Visioning and establishment of strategic objectives 2. Scenario building 3. Choosing of strategic options 4. Specific development proposals	
4. Strategic reference framework	How was the strategic reference framework defined and used?	1. Used in the assessment 2. Only identified 3. Ignored	
5. Interactivity	What was the degree of integration and feedback between assessment and planning activities?	1. High 2. Medium 3. Low	
6. Scope of assessment	What was the scope of assessment?	1. Holistic and integrated 2. Social + biophysical + economic + political 3. Physical and territorial	
7. Scale	What was the temporal and spatial scale?	1. Short-term 2. Medium-term 3. Long-term	1. Regional 2. National 3. International
8. Tools and techniques	What kind of tools and techniques were prioritised during diagnosis and assessment?	1. Favoured tools to deal with uncertainty, complexity and value commitment 2. Favoured tools to deal with a deterministic (causal) approach	
9. Uncertainty	Were uncertainties recognised explicitly and dealt with adequately?	1. Integrated into analysis 2. Only identified 3. Ignored	
10. Participation	What was the degree of participation?	1. Enlarged and in an inclusive way 2. Strict legal fulfilment 3. Punctual 4. No participation	
11. Follow-up	What was the focus of guidelines for follow-up?	1. Guidelines for governance, planning, and management 2. Only environmental impact monitoring 3. No follow-up guidelines were designed	
12. Influence on decision-making	Did SEA influence the decision-making process?	1. Assessment influenced decision-making process 2. Assessment did not influence decision-making process	

4. CASE STUDIES RESULTS

In this chapter, a comparative analysis of the three case studies of high speed rail is conducted using the assessment framework for SEA effectiveness and the proposed set of criteria listed in Table 3-6, in order to obtain the results whose analysis will allow to answer the research questions defined in this dissertation.

4.1. Portugal: Strategic environmental assessment of the high speed rail network

4.1.1. Context

The first studies regarding high speed rail were commissioned in the late 80's due to the need to assess the change of the current gauge to the European gauge (1,435 m) and to plan the high speed network (IDAD 2003).

Following the development of several studies regarding the viability and the layout of such network, in 2000, a company named RAVE, SA (Rede de Alta Velocidade, SA) was created with the purpose of developing and coordinating the necessary studies and works in order to make decisions regarding the implementation and development of a Portuguese High Speed Rail Network (IDAD 2003).

RAVE, SA then developed various studies, including Preliminary Studies and Environmental Impact Studies (EIS) that were subject to Environmental Impact Assessment (EIA) proceedings according to the legislation (REFER 2015a).

In 2003, RAVE, SA requests an SEA study of the RFAV to the University of Aveiro. This study was therefore conducted by the Institute of Environment and Development (Instituto do Ambiente e Desenvolvimento - IDAD) that developed an Environmental Report whose structure was proposed by the SEA Directive (Directive 2001/42/EC), which, at the time, hadn't been transcribed into national law.

This procedure was a voluntary process of SEA implementation in Portugal (Coutinho et al. 2004a) due to the fact that the national legislation does not establish when SEA is legally required and how it should be applied (APA 2015).

In 2011, RAVE, SA was incorporated into REFER, a public company responsible for the management of the national railroad network (REFER 2015b), however, in 2012, the RFAV was cancelled due to its financial unviability (Sol 2015).

4.1.2. SEA concept

The purpose of the SEA was to identify the most sustainable alternative and therefore ensure the sustainability of the RFAV in the transport sector as well as the environment sector in Portugal. The SEA also provided measures to mitigate potential negative impacts resulted from the project (IDAD 2003).

4.1.3. Object of assessment

The SEA assessed the project of the High Speed Rail Network plan, particularly the route alternatives (TT or T) and its stations (IDAD 2003).

The goal of the future RFAV would be to connect the main mobility centres of people and goods in the coast of the Iberian Peninsula (Lisbon, Porto and Vigo) and Lisbon and Madrid. The RFAV is essentially based on a vertical structure between Vigo and Lisbon, passing by Leiria or Entrocamento, depending on the alternative connection to Spain, and namely to Madrid (Figure 4-1) (IDAD 2003):

Alternative TT – It presupposes three transversal connections: one between Aveiro and Almeida/Salamanca, one between Lisbon/Ota and Elvas/Badajoz, and another between Évora and Faro/Huelva. The connection Porto/Lisboa is done passing by Leiria.

Alternative T – It only presupposes one transversal connection between Lisbon/Ota and Marvão/Cáceres, passing by Entroncamento. The connection Porto/Lisbon is done passing by Entroncamento.

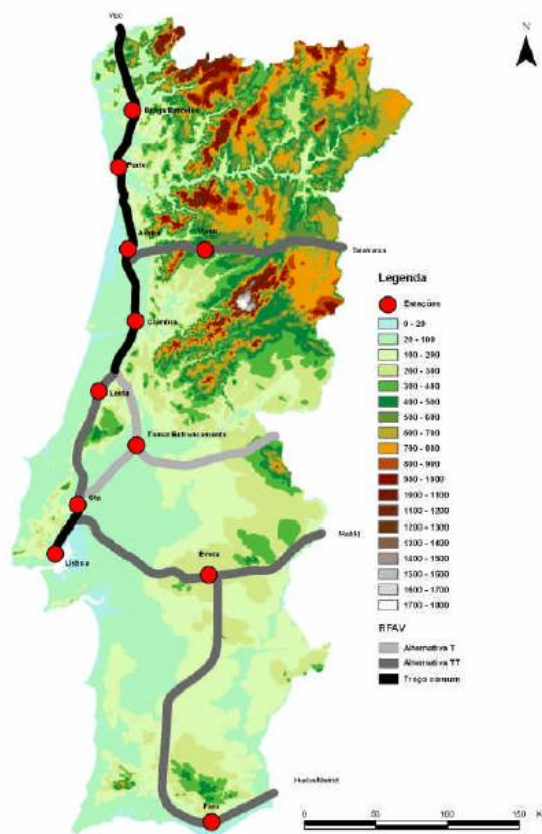


Figure 4-1 - General structure of the High Speed Rail Network in Portugal analysed in the SEA (Source: IDAD, 2003: 12)

4.1.4. Entry point

The SEA started at a plan level, where the plans for the border connections were still undefined (IDAD 2003). Table 4-1 shows the several stages of the decision-making process of this project and the shaded area what was assessed in the SEA:

Table 4-1 - Decision-making and environmental assessment (Source: IDAD, 2003: 3)

Strategic Decision	Project RAVE	Instrument	Environmental assessment
Shall we do it or not?	Does Portugal need high speed rail?	Policy	SEA
Where?	Which corridors will be adopted? TT or T? Which cities will be served by stations? Passengers and/or goods?	Plan	
What is its typology?	What is its layout? What is the dimensioning velocity?	Programme	
How will it be?	Definition of the constructive and operational technical characteristics Approach to critical points	Project	EIA

4.1.5. Strategic reference framework

The SEA acknowledged that institutional cooperation is essential to the development and implementation of integrated transport and environment strategies (IDAD 2003). However, the SEA confined itself to mainly identifying plans and programmes related to the project rather than establishing a SRF that could serve as a referential for strategic assessment by determining how the infrastructure could contribute to strategic macropolicies. Therefore, the SEA mainly identified the existing plans and programmes that the project should integrate and/or be integrated into (Table Annex I-1) (IDAD 2003).

4.1.6. Interactivity

There was a very limited interactivity in the SEA process except for the acknowledgement in the *Environmental Report* (IDAD 2003) that “the integration with the planning process is highly recommended in the follow-up activities” (Coutinho et al. 2004b: 7).

4.1.7. Scope of assessment

According to the *Environmental Report* (IDAD 2003), in order to allow an integration of sustainability objectives with the project of RFAV, the SEA identified the main effects on the environment and territory for each of the environmental components to assess whether they constitute problems or opportunities on achieving said objectives. Even though the SEA did acknowledge the importance of integrating sustainability aspects, in the end, it mainly identified biophysical aspects. The objectives defined for each environmental component are summarized in Table 4-2 (IDAD 2003).

Table 4-2 - Environmental objectives for each component (Source: IDAD, 2003: 7)

Component	Objective
Biodiversity	Avoid habitat fragmentation
	Maintain biodiversity through a sustainable territorial management
Air Noise	Decrease private transport
	Encourage the use of rail transport
	Reduce air emissions
	Decrease percentage of population exposed to high levels of noise with danger to health and quality of life
	Decrease consumption on non-renewable energies
Accidents	Decrease the number of road accidents
Territorial and urban dynamic	Integrate spatial planning with the transport sector
	Optimise the capacity of existing infrastructures of access to stations
	Linkage with existing transport infrastructures
	Avoid uncontrollable urban occupation and situations of real estate speculation and of land asymmetries
	Create new working posts
	Promote conditions of local self-esteem and attractiveness

The scoping stage of the SEA, which included the gathering and preliminary analysis of the existing information regarding the project and its area, preliminary assessment of sensitive areas, opportunities, critical issues and potentially significant environmental impacts, intends to identify and select actions associated to the project that may cause significant environmental and territorial effects and that therefore need to be taken into consideration when comparing alternatives. The following actions were thus identified (IDAD 2003):

- Location of stations;
- Location of layout;
- Circulation of high speed train (HST).

Consequently, the main opportunities and constraints of the project when it comes to achieving the sustainability objectives and assessing the impacts resulting from its implementation were identified (Table 4-3).

Table 4-3 - Constraints and opportunities by component (Source: IDAD 2003: 8)

	Effect	Component
Constraint	Population exposed to high levels of noise	Noise
	Perturbation of sensible areas Habitat fragment	Biodiversity
	Territory fragmentation: barrier effect	Urban and territory dynamics
	Increase of the value of the soil in the vicinities of new stations	
	Increase of road traffic near stations and need of parking space	
Opportunity	Reduction of the emissions of greenhouse gases (CO ₂ , CH ₄ e N ₂ O)	Climate change
	Reduction of the emissions of atmospheric pollutants (NO _x , COV's, PM ₁₀ , SO ₂)	Air quality
	Reduction of road accidents	Accidents
	New economic activities	Urban and territory dynamics
	New urban fronts	
	Urban regeneration development	
	Increase of the fiscal benefits to the municipalities	
	Increase in the qualifications of the active population	
	New conditions to attract big structures and equipment	
	Articulation with other transport infrastructures Plan the land use transformation Creation of new urban centralities	

The SEA acknowledges the fact that the effects of one action are not solely limited to the correspondent components, identifying the relation between the aforementioned actions and the most affected components, from global to local, as represented in Figure 4-2.

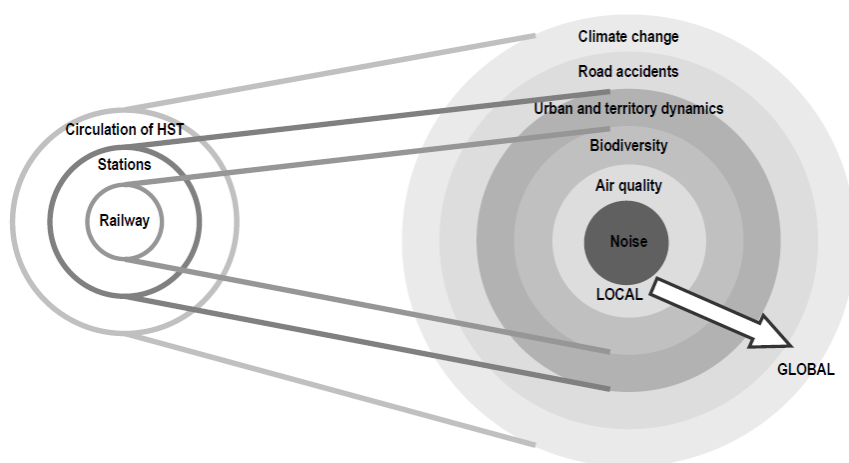


Figure 4-2 - Main actions and affected components (Source: (Coutinho et al. 2004b: 6)

4.1.8. Scale

The process was developed in two interrelated scales according to the *Environmental Report* (IDAD 2003). The first scale, a strategic level one which in a geographic perspective corresponds to the European space and in a project perspective to the assessment of the transport-environment relation which is fundamentally based on the distribution of means of transportation. This allows to justify the effectiveness of the project when facing the EU objectives for transport policies. The second one, a plan level scale, which is therefore national, allows the determination of this project's contribution to the development of several regions of Portugal. The SEA considers the most important elements of this scale to be the location of the stations of each corridor (TT or T) (IDAD 2003). However, despite assessing the European transport systems, their impacts and its cost-benefit analysis, it failed to integrate the RFAV in a European context and explain how the project would help achieve the goals of the European transport strategy.

When it comes to the time scale, the SEA focuses on a period of assessment of 15 years, between 2010, the base year, and 2025 (IDAD 2003).

4.1.9. Tools and techniques

According to the *Environmental Report* (IDAD 2003), the SEA made a survey and preliminary analysis of the existing information about the project and its inherent area and a preliminary assessment of sensible areas, opportunities, critical points and potentially important environmental impacts which resulted in the definition of the scope of assessment of the SEA, which allows the identification and selection of the most sustainable alternative. This environmental characterisation focused on seven components: climate change, accidents, territorial and urban dynamic, biodiversity, air quality, noise and infrastructures (IDAD 2003).

Additionally, a preliminary assessment of the costs/benefits of the externalities associated with the project was also done in the SEA, in which the calculation of the external costs were based on the following cost categories: accidents, air pollution, climate change, noise, urban effects and upstream processes associated with the following transport modes: road (car and bus), rail and air. A calculation of the total external costs was also made to the transport of goods and to the transport of passengers in order to assess their benefits for each alternative. These analysis lead the SEA to conclude that the implementation of the HSR in Portugal will have positive effects such as the contribution to the reduction of external costs related to accidents, air pollution, climate change, nature and landscape and upstream processes. On the other hand, the project may have negative effects, particularly when it comes to noise and biodiversity (IDAD 2003).

Finally, a trend analysis was applied to a scenario in which the RFAV doesn't get built where it was assumed that there would be an increase on the passenger and goods transport as well as an increase on the road infrastructures. The following effects were expected when compared to the situation at the time of the SEA (IDAD, 2003: 116):

- Increase of greenhouse gas emissions with negative consequences regarding climate change;
- Increase of air pollutants leading to a decrease in local air quality;
- High accident rates concerning road transport, particularly passenger cars;
- Increase of the population exposed to high levels of noise originated by the closeness of road traffic to urban areas that are close to the existing infrastructures;
- Higher intensity of the barrier effect and habitat and ecosystem fragmentation associated to the increase of land use resulting in biodiversity loss;
- Higher territorial dispersal and weak consolidation of urban areas as a consequence of "continuous" accessibilities along the road infrastructures;
- Increase of the periphery in the face of Spain and Europe and the non-existence of new competitive factors of the production sector.

4.1.10. Uncertainty

There was mention nor consideration of uncertainties associated with the assessment throughout the SEA process and therefore they were not considered in the decision-making process.

4.1.11. Participation

Although public consultation is a fundamental element, it was not integrated in the SEA process due to the fact that the process was a "voluntary exercise" (Coutinho et al. 2004a).

4.1.12. Follow-up

The SEA, which is based on the precautionary principle, presents mitigation and control measures to ensure a better achievement of the established environmental objectives (IDAD 2003).

The mitigation measures could be divided into (Coutinho et al. 2004a):

- Layout design measures: these measures would address constraints, enhancing the identified opportunities. Because the project's layout crosses a great extent of the Portuguese territory it is relevant to highlight the potential negative effects on the most vulnerable areas regarding biodiversity and urban centres.
- Measures to manage in a timely manner with municipalities (integration with the planning process): these measures would be associated with the new characteristics of spaces that are directly associated with the project's physical infrastructure as well as the infrastructures required for its operation (railway line, high voltage lines and substations), and with the effects caused by the circulation of the HST (new road infrastructures and new expansion areas).

A monitoring system was also recommended whose control measures had the purpose of timely identifying the significant unforeseeable negative effects of the project. This system would monitor several indicators (Table 4-4) that are often used when assessing environmental performance in the transport sector (IDAD 2003).

Table 4-4 - Indicators of assessment of environmental performance (Source: IDAD 2003: 128)

Environmental components	Indicators
Climate change	Passenger transport per transport mode
Air quality	Cargo per transport mode
	Air emissions
Accidents	Number of accidents per transport mode
Biodiversity	Fragmentation of habitats and ecosystems
	Proximity of transport infrastructures to classified areas
Noise	Population affected by high levels of noise
Territorial and urban dynamic	Duration and average distances of travels per mode and purpose
	Land pockets for residential purposes (location)
	New structures and equipment
	Volume of road traffic on the access roads to stations
	Rate of change of the population of the affected municipalities
	Rate of change of the number of enrolled students in secondary and university levels
	Number of establishments and employees
	Number of granted building permits

Based on these indicators, the monitoring system then presents itself in the form of an environmental strategic map (Figure 4-3) whose purpose is to monitor and assess the environmental performance of the RFAV project in Portugal as well as to contribute to the project's sustainability. The map identifies several objectives that allow the monitoring and verification of the project's efficiency and efficacy at each of its stages (IDAD 2003).

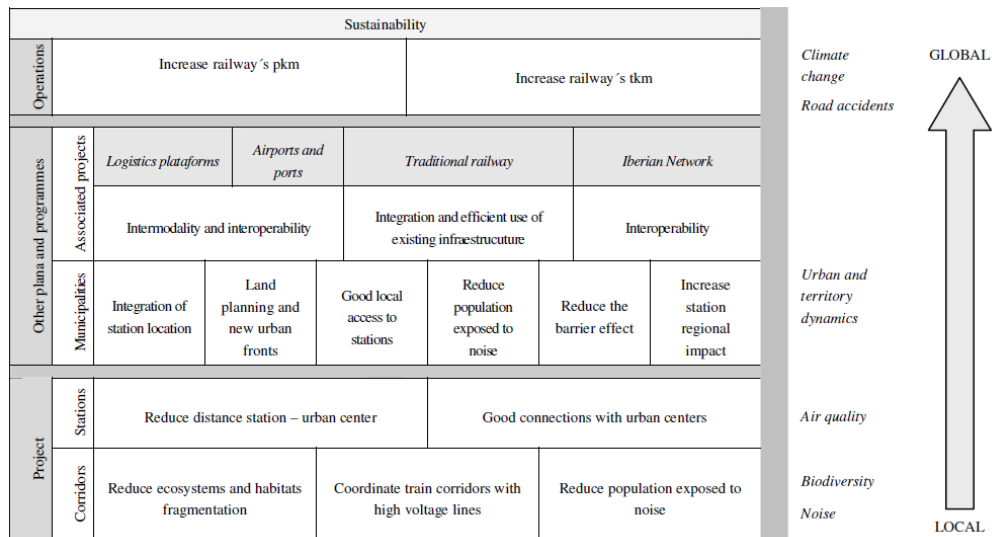


Figure 4-3 - Strategic control map (Source: Coutinho et al. 2004b: 7)

4.1.13. Influence on decision-making

Although it was not legally required to develop an SEA of the RFAV project, RAVE, SA requested it to compare two plan alternatives and determine which was the most preferable.

4.2. UK: Appraisal of sustainability of HS2 (London to the West Midlands)

4.2.1. Context

Whereas other countries, such as France and Germany, have already invested in new high speed rail lines and network, the UK has focused solely on improvements to existing lines that were built during Victorian times (DfT 2012a). However, the first high-speed railway in the UK (Channel Tunnel to London – HS1) began partly operating in 2003 and along its entire length since 2007 (HS1 Ltd. 2015). As a result, HS1 became an immediate success, according to the *Department for Transport*, cutting journey times and continued seeing an increase on the passenger numbers, in 2009, even despite the challenging economic environment (DfT 2010). This project supported the UK Government's vision for a transport system which would be a safer and greener engine for economic growth that improves quality of life in the communities (DfT 2012a).

High speed was considered to be preferable to conventional rail with additional benefits in terms of connectivity and economic growth. For instance, by having the potential to attract travelers from more polluting modes, it would allow for the reduction of carbon emissions. In addition, quicker journey times would put high speed rail in a competitive position in relation to air travel (DfT 2012a).

Because there appeared to be an increasing demand for inter-city rail travel that meant increasing pressure in the rail network, the economy would suffer if sufficient capacity for efficient and rapid

journeys failed to be provided, which is why the Government believed a new high speed rail network would support economic growth for the long-term (DfT 2012a).

Therefore, in 2009, the Government established High Speed Two Ltd (HS2 Ltd) to examine the case for a new high-speed rail line between London and the West Midlands, although at later phases it is intended to extend the network in order to reach Scotland (DfT 2010). HS2 would therefore have two phases: Phase 1, which would span from London to Birmingham, and Phase 2, which would span from Birmingham to Manchester and Leeds (Sheate 2015).

The UK Government subjected the proposals for HS2 to the hybrid bill procedure, which combines features of public bills and private bills (UK Parliament Website 2015), and considered it inappropriate to undertake any further site surveys on the various route options at the AoS stage, a more strategic level assessment, because a full EIA would be undertaken along with the introduction of the hybrid bill (Sheate 2015).

The Supreme Court then considered that the proposed high speed rail line between London and the West Midlands and on to Manchester and Leeds, which is a large infrastructure scheme, did not meet the screening criteria for the SEA Directive (Sheate 2015).

However, it was acknowledged that because constructing a new high speed line would have significant financial costs as well as it would impact the environment and local communities, a careful assessment should be carried out to ensure the viability of the project (DfT 2010). A voluntary form of SEA, Appraisal of Sustainability, was therefore requested by HS2 Ltd and was managed by *Booz & Co. (UK) and Temple Group Ltd* in order “to help decision-makers understand the implications for sustainability of different plans and projects” (Booz & Co. (UK) & Temple Group Ltd, 2009: 5) and has applied the principles for the European SEA Directive.

However, despite all the benefits publicised by the Government and the results of the Appraisal of Sustainability, a large number of protesters are against this project. The *HS2 Action Alliance* states that the cost of the project represents “an unprecedented level of expenditure for a single project ever proposed by a British Government in peacetime” (HS2 Action Alliance 2015). The group also states that the claims that HS2 is needed for capacity are poorly founded and that the project will become an “environmental catastrophe” by having a negative impact on ecosystems and landscape as well as increasing carbon emissions (HS2 Action Alliance 2015).

In fact, recently, new evidence came to light that bring doubts on whether or not the project “can keep within its £42bn budget and provide the promised economic stimulus” (The Guardian 2015).

4.2.2. SEA concept

The purpose of the AoS was “to provide design guidance to the development of the route (and stations) options; to enable differentiation to be made between options in terms of their sustainability performance relative to each other; and to identify mitigation that can improve the preferred route option that became the proposed scheme” (Booz & Co. (UK) & Temple Group Ltd 2011c: 24) by informing the design team and providing recommendations to HS2 Ltd (Figure 4-4).

It assesses how HS2 would support or conflict with objectives for sustainable development. These objectives as well as the definition for sustainable development were taken from the *UK Sustainable Development Strategy: Securing the Future* (HM Government 2005) and formed the basis of the AoS. The objectives were (Booz & Co. (UK) & Temple Group Ltd 2011b: 39):

- Reducing greenhouse gas emissions and combating climate change;
- Natural resource protection and environmental enhancement;
- Creating sustainable communities; and
- Sustainable consumption and production.

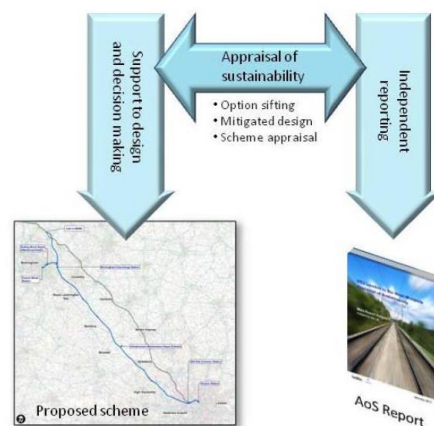


Figure 4-4 - Explanatory diagram of the role of AoS (Source: (Booz & Co. (UK) & Temple Group Ltd 2011b: 28)

4.2.3. Object of assessment

The Appraisal of Sustainability assesses the scheme proposed by the Government between London and the West Midlands for the new high speed railway, High Speed Two (HS2) (Figure 4-5). Table 4-5 lists the aspects included in the proposed scheme besides 225 km of new railway (Booz & Co. (UK) & Temple Group Ltd 2011b: 1):

Table 4-5 - Aspects of the proposed scheme of HS2

A redeveloped station at Euston serving both high speed and conventional speed (classic) services

A rail connection linking HS2 with the existing High Speed 1 Channel Tunnel Rail Link (HS1) line*

An interchange with Crossrail and other services at Old Oak Common allowing access to Heathrow, as well as connections to the West End, the City and Docklands areas of London

Provision to allow future connection to Heathrow directly off the high speed line

A new interchange station near Birmingham Airport

Depots at Washwood Heath (in Birmingham) for rolling stock and at Calvert (northeast of Bicester) for infrastructure maintenance

A spur into Birmingham alongside the existing Tamworth & Nuneaton line west of Water Orton, with a terminus at Curzon Street

A route which joins the West Coast Main Line (WCML) at a new junction north of Lichfield

*The link between HS2 and HS1 has been removed from the hybrid bill due to the resulting local impact. HS2 Ltd is currently exploring how and when such a link might be achieved.

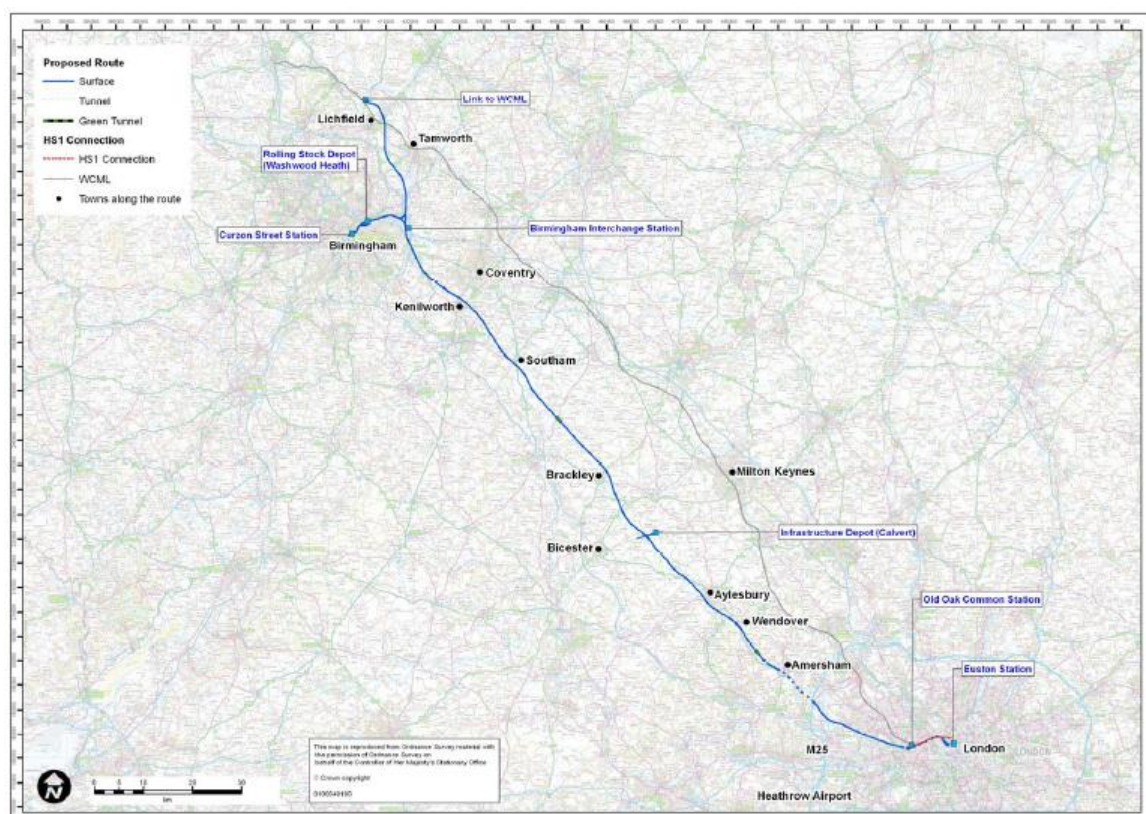


Figure 4-5 - The proposed scheme (Source: (Booz & Co. (UK) & Temple Group Ltd 2011b: 10)

4.2.4. *Entry point*

The AoS work commenced at the early beginning of the planning process of the project, in December 2009, with the establishment of the sustainability objectives for HS2 (Booz & Co. (UK) & Temple Group Ltd 2011b).

4.2.5. *Strategic reference framework*

The AoS assesses the project's impacts considering the policy context it is in, looking into national priorities for sustainability and the sustainability policy framework, as well as local development policies in the UK.

Rail transport is considered by the Government to be an essential key element to sustainable development, which is fundamental to land use planning, transport, social and economic policy in the UK (Table Annex I-2).

The UK Government acknowledges that a relationship between good quality transport and economic growth can result in financial benefits across the nation (Table Annex I-3).

The HS2, as well as any other proposed scheme, should consider the national objectives for sustainability and the need to promote and redistribute economic growth (Table Annex I-4).

Tables Annex I-5 to Annex I-8 contain sustainability drivers as they relate to HS2. The objectives defined by relevant policies and regulations are reflected in the AoS.

The AoS also outlined the framework for both current and emerging land use planning in the UK due to the drive for economic benefits generated by new transport schemes to be achieved locally (Table Annex I-9 and Table Annex I-10).

Policy drivers for regional and local development planning were also identified in the AoS. A wide range of planning policies were developed by local authorities along the HS2 route which cover every aspect of sustainable development from landscape and nature conservation, through to cultural heritage, flood protection, environmental protection and economic development (Booz & Co. (UK) & Temple Group Ltd 2011b). The *AoS Report* stated that a detailed review at this stage of the AoS was not made due to its strategic nature and the early stage of project development.

4.2.6. *Interactivity*

The AoS was managed by Booz-Temple (BZT), who prepared the *AoS Report*, and included HS2 Ltd, the planning practitioners, as well as specialist advisors for each of the sustainability issues (Figure 4-6) (Booz & Co. (UK) & Temple Group Ltd 2011c).

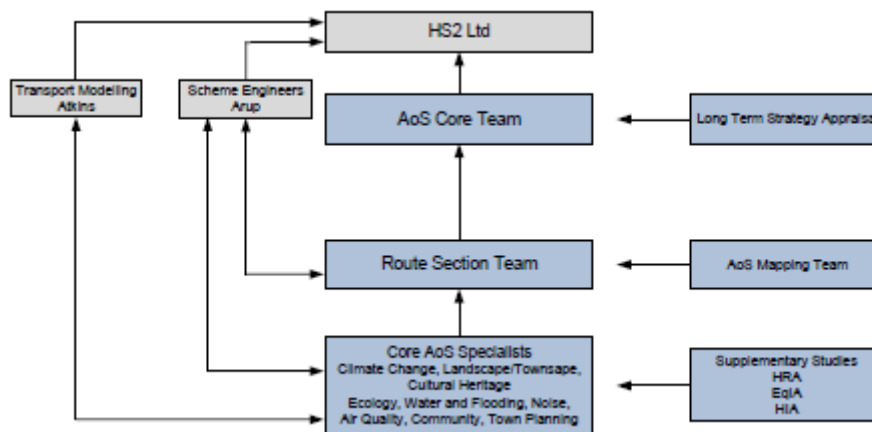


Figure 4-6 - The AoS Team (Source: (Booz & Co. (UK) & Temple Group Ltd 2011c)

According to the *AoS Report*, this multi-disciplinary team first emphasised the role of sustainability in the scheme development (Booz & Co. (UK) & Temple Group Ltd 2011c) by establishing sustainability design aims, based on the aforementioned four UK priorities, which were relevant to all stages of scheme development and defined essential principles for the design of the options, namely focusing on aspects that would have a negative effect on route and station engineering.

4.2.7. Scope of assessment

In order to determine if HS2 “reflects and promotes sustainable development” (Booz & Co. (UK) & Temple Group Ltd 2011b: 2), the AoS sets to integrate environmental, social and economic issues. The sustainability objectives and the issues which they are related to form the basis of the AoS (Table 4-6) (Booz & Co. (UK) & Temple Group Ltd 2011b).

Table 4-6 - Key sustainability issues for HS2 and sustainability objectives for the AoS (Source: Booz & Co. (UK) & Temple Group Ltd 2011c: 4)

Key Sustainability issue	Sustainability objective
Reducing greenhouse gases and combating climate change	
Climatic factors and adaptability	Improve resilience of rail network against extreme weather events
Greenhouse gases	Contribute to the reduction of greenhouse gas emissions by facilitating modal shift from road and air to rail Reduce relative contribution made by rail to greenhouse gas emissions by promoting energy efficient technologies
Natural and cultural resource protection and environmental enhancement	
Landscape and townscape	Maintain and enhance existing landscape character Maintain and enhance existing townscape character
Cultural heritage	Preserve and protect archaeological assets Preserve and protect historic buildings Preserve and protect historic landscapes
Biodiversity	Maintain and enhance biodiversity
Water resources	Protect surface water resources Protect groundwater resources
Flood risk	Conserve and enhance the capacity of flood plains
Creating sustainable communities	
Air quality	Maintain and enhance local air quality
Noise and vibration	Maintain and enhance the local noise environment Maintain and enhance the local vibration environment
Community integrity	Maintain and enhance community integrity
Accessibility	Maintain and enhance pedestrian access Maintain and enhance access to public transport Maintain and enhance public transport interchange
Health and well-being	Maintain and improve mental well-being Maintain and improve physical health Reduce health inequalities
Security and safety	Contribute to the reduction of road traffic accidents Protect against crime and fear of crime
Economic prosperity	Support economic competitiveness and make efficient use of public funds Support wider economic growth and maintain and enhance employment opportunities
Economic welfare	Support wider economic welfare growth Support planned developments Maintain and enhance regeneration
Sustainable consumption and production	
Soil and land resources	Maintain and enhance land resources Encourage the use of brownfield sites
Waste generation	Prevent and minimize waste production
Resource use	Conserve and protect primary material resources

4.2.8. Scale

The AoS established a baseline against which the effects of the proposed implementation and operation of HS2 have been appraised. This baseline would include the area between London and the West Midlands as well as the following dates of assessment: 2017, the predicted date of commencement of the construction of HS2; 2026, the year high speed services would start; and 2040, the year in which the HS2 would've been operating for 15 years (Booz & Co. (UK) & Temple Group Ltd 2011b).

4.2.9. Tools and techniques

According to the *AoS Report* (Booz & Co. (UK) & Temple Group Ltd 2011b), the instrument first established a baseline against which any changes resulting from the proposed implementation and operation of HS2 have been appraised. The described baseline represents the baseline at December 2009 when the AoS work started but it also includes considerations regarding a future baseline that accommodates changes to the existing one due to natural or human influences. Additionally, it considered a projection of how the baseline might be expected to change beyond the assessment dates in the absence of HS2, which it refers to as the reference case (Figure 4-7). The AoS considered it to be relevant to better understand the changes that occur for each of the identified sustainability issues (see 4.2.7) between the time of the AoS and the assessment dates (see 4.2.8), therefore it describes current and future baseline conditions for each of the four UK sustainability priority areas, previously mentioned (see 4.2.2) by, for instance, providing projections for CO₂ emissions, air quality, population growth, water quality in river catchments, etc. (Booz & Co. (UK) & Temple Group Ltd 2011b).

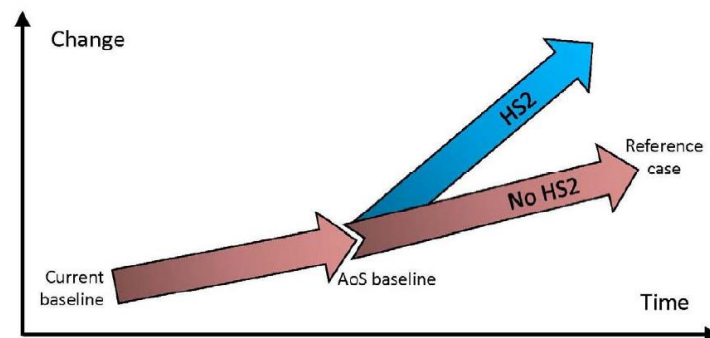


Figure 4-7 - The Reference Case is a continuation of the baseline (Source: Booz & Co. (UK) & Temple Group Ltd 2011b: 53)

The AoS also identified the possible effects of HS2 on each of the 18 sustainability issues by creating appraisal frameworks which included 66 evaluation criteria that underlie the objectives of the AoS (Annex II – Summary Framework Table .

4.2.10. Uncertainty

The only mention of uncertainty was when AoS have recognised that their projections were uncertain due to the fact that their baseline was actually done in December 2009 when the AoS work commenced and that the identified effects should be considered to be provisional at this stage and further work should be carried out in case HS2 progresses, as part of an EIA (Booz & Co. (UK) & Temple Group Ltd 2011b).

4.2.11. Participation

The AoS established a Reference Group that, through a series of meetings, discussed the methodology of the appraisal, the sustainable design aims and accompanying guidance and, at a later stage, the emerging findings. This group gathered members from (Booz & Co. (UK) & Temple Group Ltd 2011b: 33):

- Environment Agency;
- Natural England;
- English Heritage;
- Government Office Network Lead: Planning and Housing;
- Department for Environment, Food and Rural Affairs;
- Department for Culture, Media and Sport;
- Department of Health;
- Department for Energy and Climate Change;
- Department for Transport; and
- Scottish Government (through the SEA Gateway as a link with Scottish SEA Consultation Authorities).

HS2 Ltd did not limit consultation to the Reference Group having contacted all relevant local authorities that could be directly affected by the proposed scheme. In addition, after the publication of the *Appraisal of Sustainability Report* referenced in this document, a public consultation was launched on 28th February 2011 with a closing date for responses of 29th July 2011 regarding *The High Speed Rail: Investing in Britain's Future* (DfT 2012a). In addition to covering the new route between London and the West Midlands, it also covered the Government's broader strategy for high speed rail. HS2 Ltd then created a report for the Government with the review of responses obtained on said consultation named *Review of HS2 London to West Midlands – Appraisal of Sustainability: A report to Government by HS2 Ltd* which considers (DfT 2012b: 5):

- General comments about the approach to environment and sustainability;
- Energy, greenhouse gas emissions, combating climate change and issues of modal shift in relation to the consultation route;
- Air quality;
- Natural and cultural resources: protection and enhancement of the environment in relation to the consultation route;

- Specific impacts to species and habitats;
- Community related route impacts;
- Jobs and regeneration; and
- Monitoring.

The consultation obtained 55,000 responses that were then analysed by an independent response analysis company. The questions that were asked are the following (DfT 2012b: 7):

- Do you agree that there is a strong case for enhancing the capacity and performance of Britain's inter-city rail network to support economic growth over the coming decades?
- Do you agree that a national high speed rail network from London to Birmingham, Leeds and Manchester (the Y network) would provide the best value for money solution (best balance of costs and benefits) for enhancing rail capacity and performance?
- Do you agree with the Government's proposals for a phased roll-out of a national high speed rail network, and for links to Heathrow Airport and to the High Speed 1 line to the Channel Tunnel?
- Do you agree with the principles and specification used by HS2 Ltd to underpin its proposals for new high speed rail lines and the route selection process that HS2 Ltd undertook?
- Do you agree that the Government's proposed route, including the approach proposed for mitigating its impacts, is the best option for a new high speed line between London and the West Midlands?
- Do you wish to comment on the Appraisal of Sustainability of the Government's proposed route between London and the West Midlands that has been published to inform this consultation?
- Do you agree with the options set out to assist those whose properties lose a significant amount of value as a result of any new high speed line?

As a result, according to the *Review of HS2 London to West Midlands – Appraisal of Sustainability* (DfT 2012b), HS2 Ltd has identified a number of areas that would need to be addressed further in a next stage as well as recommended a number of changes to the line of route in order to mitigate sustainability impacts (Booz & Co. (UK) & Temple Group Ltd 2011b).

However, although the consultation was carried out on the broader strategy for high speed rail seeking feedback concerning both Phase 1 and Phase 2, the assessment information provided to the public related only to Phase 1 meaning that the public could not have participated in an effective manner because they were not provided with all the information related to entire strategy (Sheate 2015).

4.2.12. Follow-up

The AoS acknowledges that because it was involved in the options sifting process it had identified potential impacts early on and helped refine the scheme and introduce specific mitigation features such as tunnels and green bridges. It also established a mitigation hierarchy in which general types of mitigation were set out (Figure 4-8) without forgetting the need for further mitigation which an EIA would help establish (Booz & Co. (UK) & Temple Group Ltd 2011b).



Figure 4-8 - The mitigation hierarchy (Source: (Booz & Co. (UK) & Temple Group Ltd 2011b: 129)

The mitigation measures that have been included in the HS2 proposals focused on avoiding or minimising impacts resulting in various refinements being carried out in the scheme. Table 4-7 shows an example of mitigation measures for climate resilience proposed by AoS.

Table 4-7 - Summary of generic mitigation measures for climate resilience (Source: (Booz & Co. (UK) & Temple Group Ltd 2011b))

Incorporated mitigation:	
<ul style="list-style-type: none"> - Design assumes that all sections of proposed surface route that cross Flood Zone 3 would be on viaduct (track raised on piers) to ensure its protection. 	
Mitigation options:	
<ul style="list-style-type: none"> - On critical sections of the proposed route such as tunnel entrances, consideration to be given to increasing flood protection to deal with 1 in 1000 year events. - Adopting highly permeable construction form, such as numerous culverts or viaduct, across all Flood Zone 2. - Where cuttings would cross areas of moderate landslip potential, engineering to ensure protective measures, such as shallow cutting slopes or reinforced cutting faces. - Detailed design to consider implications of rising temperatures; e.g. measures to mitigate against settlement to structures or rail buckling. - Detailed design to consider how potential for wind damage to infrastructure assets could be reduced to a practicable minimum. - Vegetation management processes that reflect changing climate may be required in the long term. 	

The monitoring stage would be HS2 Ltd's responsibility which would monitor the relevant effects of the project's implementation so that unforeseen adverse effects could be identified and properly handled

with. After the incorporation of mitigation measures, the AoS states that an EIA would identify the significant residual effects of HS2 and establish the process by which they could be monitored as part of the routine project planning process.

4.2.13. Influence on decision-making

After the publication of the AoS, a public consultation was held. Its responses resulted in the proposal of line of route alignment changes to HS2 London to West Midlands. HS2 Ltd then developed a programme of local studies to consider options for mitigating impacts and enhancing the line of route. Therefore, if it was decided to proceed with HS2, certain changes would have to be considered in the scheme and taken forward to preliminary design and EIA. These changes were the following (Booz & Co. (UK) & Temple Group Ltd 2011b):

- Increase the clearance of HS2 over the Trent and Mersey Canal near Lichfield to ensure that it remains navigable. It is also recommended a slight alteration to the alignment to ensure that it would be compatible with a future extended high speed network;
- Move the route slightly further away from Middleton to reduce local impacts;
- A shallower cutting and longer green tunnel at Burton Green to further mitigate local impacts and reduce spoil generation;
- Mitigation of impacts on Balsall Common;
- Move the route slightly further east to avoid Kenilworth Golf Club, lower it further into cutting through the Natural Agricultural Centre, and introduce a retained cutting through South Cubbington Wood to reduce impacts on this ancient woodland;
- Introduce a longer bores tunnel at Long Itchington Wood;
- Introduce a longer green tunnel past Chipping Warden and Aston le Walls, and to curve the route to avoid a cluster of important heritage sites at Edgcote;
- Lower the alignment and introduce a green tunnel past Greatworth, and a short green tunnel at Turweston;
- Move the route further away from Twyford;
- Lower the alignment past Aylesbury and Stoke Mandeville to reduce local impacts and eliminate the need for larger scale works to local roads and the Chiltern Line;
- Introduce a longer green tunnel to reduce impacts around Wendover, and an extension to the green tunnel at South Heath;
- Introduce a longer, continuous tunnel from Little Missenden to the M25 through the Chilterns AONB to reduce the need for deep cutting and to avoid an aquifer; and
- Introduce a 2.75 mile (4.4 km) bored tunnel along the Northolt corridor to reduce impacts on local communities and avoid major works to the Chiltern Line.

4.3. Lithuania-Latvia: Strategic Environmental Assessment Report of the European Gauge Railway Line Kaunas – Lithuanian-Latvian Border

4.3.1. Context

Due to the EU accession of Estonia, Latvia and Lithuania, a need for the three Baltic States to be integrated into a wider rail transport system became pressing since the Baltic rail system was not completely compatible with the continental European standards. Therefore, the Rail Baltica Project would be integrated in the Trans-European Transport Networks (TEN-T) which would improve the national networks of the three countries, as well as contribute to their economic growth (Sweco Lietuva UAB 2013b).

A strategic study on the Rail Baltica railway line named “Cowi Study” was prepared in the period from November 2005 until December 2006 with the purpose of assessing the strategic demand for the Rail Baltica and its potential development, as well as providing recommendations for the implementation of the project and the selection of the best development option. Based on the findings of this study, the construction of the European gauge railway line between the Lithuanian-Polish border and Kaunas began developing and the existing Russian gauge section between Kaunas and the Lithuanian-Latvian border was upgraded, establishing Rail Baltica 1 (Sweco Lietuva UAB 2013b).

In 2011, AECOM developed a study (“AECOM Study”) on the selection of the optimal route of the European gauge line Rail Baltica in Lithuania, Latvia and Estonia, referred to as Rail Baltica 2, which identified four main route options and consequently defined the optimum route, henceforth known as Option A (see 4.3.3), by analysing expected revenues and freight volumes (Sweco Lietuva UAB 2013b).

However, the AECOM Study would amend the Master Plan of the Republic of Lithuania in which another route for the Rail Baltica Corridor has been provided for, which is hereafter identified as Option B. In 2012, the Ministry of Environment of the Republic of Lithuania acknowledged the need for a comparison between the route option recommended by AECOM, which crosses Panevėžys, and the route established in the Master Plan, which crosses Šiauliai. An SEA would have to be developed to explicitly conclude whether or not it is more beneficial to amend the Master Plan considering time and cost factors (Sweco Lietuva UAB 2013b). The SEA was carried out according to the SEA Directive 2001/42/EC, which has been transposed to the following Lithuanian acts (Sweco Lietuva UAB 2013b):

- The SEA Procedure;
- The Procedure for the Public Involvement in the Procedure for the Strategic Assessment of Impact of Plans and Programmes on the Environment and for Informing Stakeholders and the European Union Member States.

4.3.2. SEA concept

The objectives of the SEA were to (Sweco Lietuva UAB 2013b: 11):

- Establish, describe and assess the potential significant consequences of implementation of the solutions upon the environment;
- Ensure that consultations with certain state and local authorities and the public are held and results of such consultations and other publicity measures are taken into consideration;
- Ensure that the organisers have detailed and reliable information on the potential consequences of implementation of the solutions upon the environment and take it into consideration.

4.3.3. Object of assessment

The SEA aimed to assess and compare the alternative options of the European Gauge Railway Line from Kaunas to the Lithuanian-Latvian Border, represented in Figure 4-9, which are (Sweco Lietuva UAB 2013b):

- Option A: Kaunas – Panevėžys – Border (“Border” hereinafter meaning the Lithuanian-Latvian Border);
- Option B: Kaunas – Šiauliai – Border.

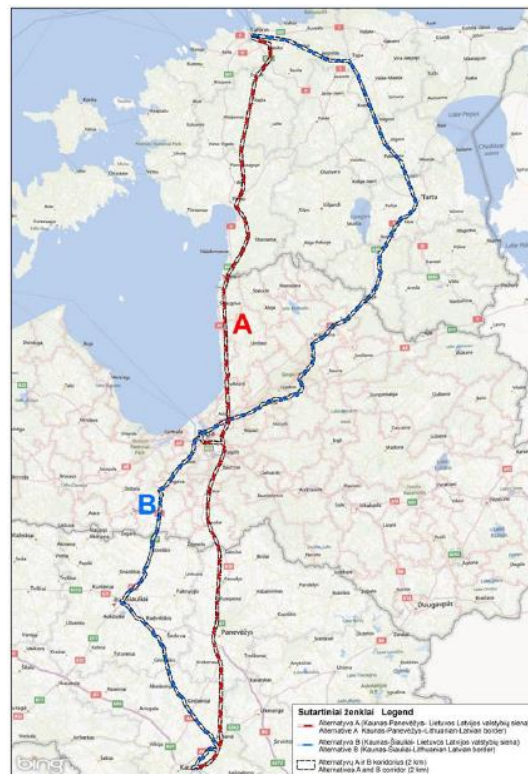


Figure 4-9 - Territorial - administrative arrangement of the Options of Rail Baltica solutions (in the territories of the Republic of Lithuania, the Republic of Latvia, the Republic of Estonia) (Source: Sweco Lietuva UAB 2013a: 11)

4.3.4. Entry point

The SEA procedure commenced on June 7 of 2013 when previous works, namely the AECOM Study, have led to the need to decide between the before mentioned Options A and B and therefore to the assessment of the alternatives (Sweco Lietuva UAB 2013b). The schedule of SEA procedures is depicted in Table 4-8.

Table 4-8 - Schedule of SEA procedures (Source: Sweco Lietuva UAB 2013a: 15)

	2013					
	June	July	August	September	October	November
Setting scope of SEA						
Publicity: Notice of the start of SEA procedure						
SEA scoping document coordination with authorities/institutions						
SEA report						
Preparation of SEA report						
Publicity: publication of SEA report						
Publicity: Public hearing, presentation of SEA report						
SEA report coordination with authorities/institutions						
Decision on SEA						

4.3.5. Strategic reference framework

The SEA assessed the compliance of the Options in the context of current territorial planning and also whether international, Community or national environmental objectives related to the project were taking into account in the planning (Sweco Lietuva UAB 2013b).

The importance of compliance with the territorial planning documents (Table Annex I-11) is acknowledged in the SEA that finds the project's compliance with the main principles of sustainable development of the country, as well as its regions and municipalities, to be essential (Sweco Lietuva UAB 2013b).

The SEA additionally assessed compliance with EU law, which is summarised in Table Annex I-12.

4.3.6. Interactivity

The SEA was only carried out once the alternatives of the plan were established, merely assessing them and providing the planners with the identification of the optimal option as well as providing mitigation measures and a monitoring programme.

4.3.7. Scope of assessment

The SEA was formulated according to the principles of sustainable development, which signifies that it assesses aspects of economic, social and environmental nature, according to the SEA (Sweco Lietuva UAB 2013b).

The SEA practitioners for this project believe that a sustainable solution is one where all three sustainable development factors (Figure 4-10) have equal importance (Sweco Lietuva UAB 2013b).

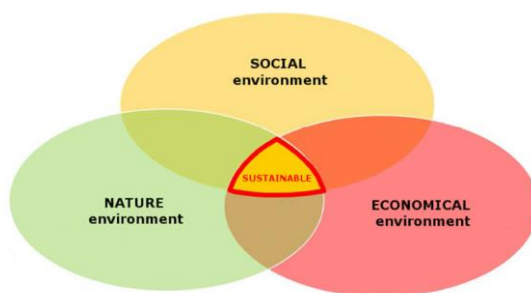


Figure 4-10 - The sustainable development concept and the relationship between assessment factors (Source: Sweco Lietuva UAB 2013b: 98)

These factors, which are natural environment, social environment and economic environment, are assessed from certain aspects, such as (Table 4-9):

Table 4-9 - Scope of SEA (Sweco Lietuva UAB 2013b)

Factor	Aspects
Natural Environment	Consequences for surface waters; Consequences for the Earth interior; Consequences for soil; Consequences for landscape; Consequences for protected areas and natural framework; Consequences for biodiversity: flora; Consequences for biodiversity: fauna; Consequences for cultural heritage.
Social Environment	Consequences for human health; Compliance with territorial planning documentation and international treaties; Consistent/sustainable development of regions and improving quality of life.
Economic Environment	Economics of the project.

4.3.8. Scale

The SEA operates at a national level, taking into consideration the effects of the project on the Republic of Lithuania. However, when analysing the environmental impacts caused by the implementation of the

Rail Baltica transport corridor, the assessment was limited to a 2 km wide strip of land (1km to both sides from the axis of each Option) (Sweco Lietuva UAB 2013b).

When referring to the time scale, the SEA considers the status of the environment of the year 2012 to be considered the zero status, meaning that if the project were not implemented, the environmental status indicators would therefore reflect the situation in that year. The SEA then takes into consideration the construction and operation stages of the project until 2025, which is linked to the *Long-Term Lithuanian Transport System Development Strategy by 2025* approved by the Government of the Republic of Lithuania in 2005 (Sweco Lietuva UAB 2013b).

4.3.9. Tools and techniques

The SEA resorted to a comparative multi-criterion analysis of the Options that have been formulated according to the principles of sustainable development (Sweco Lietuva UAB 2013a). In order to assess each aspect of the scope (see 4.3.7), the SEA uses a six-point system with the purpose of comparing the Options. The best option is, therefore, assessed in a six-point scale where one is the lowest and six is the highest assessment. The overall score of an Option is calculated as the arithmetic average of the scores of all the aspects, with experts in the relevant area determining the relative weight of each aspect forming a factor (Sweco Lietuva UAB 2013b).

4.3.10. Uncertainty

There was mention nor consideration of uncertainties associated with the assessment throughout the SEA process and therefore they were not considered in the decision-making process.

4.3.11. Participation

The process of participation began with consultations with SEA stakeholders, members of the public, as well as municipalities whose territories were crossed by the Options in order to obtain and evaluate their proposals and comments on the SEA quality, which were included in the SEA Report. The SEA stakeholders were the Ministry of Environment; the Ministry of Health; and the Ministry of Culture and State Protected Areas Service under the Ministry of Environment (Sweco Lietuva UAB 2013b).

After the publication and subsequent presentation of the SEA Report to the members of the public, a collection and evaluation of their proposals and comments on the solutions and the quality of the report was made. This procedure was also carried out during consultations with the SEA stakeholders (Sweco Lietuva UAB 2013b).

4.3.12. Follow-up

The SEA Report provided with measures to mitigate and monitor the effects of the implementation of the Options. The mitigation or compensation measures that were proposed involved the search for better locations for the planned railway line, with technical measures being only considered when finding better locations happened to be impossible. This idea was reinforced by the stakeholders in scoping document (SD) phase who proposed changes to the plan “in order to minimise the potential negative

consequences for their socio-economic environment, recreation potential, economic and urban development” (Sweco Lietuva UAB, 2013b: 226). These measures were to be applied to the following aspects:

- Surface water bodies;
- Interior of the Earth;
- Soil;
- Landscape;
- Flora;
- Fauna;
- Cultural heritage;
- Public health.

The SEA also established environmental monitoring measures for both construction and operation phases (Table 4-10).

Table 4-10 - Monitoring programme proposed by SEA (Adapted from: Sweco Lietuva UAB 2013b)

Purpose of monitoring	To observe changes in the components of the environment on a systematic basis, during construction and operation period, in order to minimise the negative impact upon natural and social environment.
Tasks of monitoring	<ul style="list-style-type: none"> - conduct observations and accumulate information on the condition of the components of the environment; - on the basis of data analysis, assess the condition of the environment and, if necessary, make recommendations on the implementation of the impact mitigation measures; - inform members of the public and stakeholders about the results of the monitoring.
Length of monitoring	<p>The monitoring programme must be prepared to take account of both short- and long-term impact of specific activities, the changed environmental conditions, and the significance of the invasion of a technogenic object into an urban, agrarian or natural landscape.</p> <p>Construction: Short- and long-term negative impact is anticipated due to the construction of temporary access roads, use of heavy machinery, and cutting of trees and bushes in the construction zone.</p> <p>Operation: It is recommended to conduct monitoring of animal deaths near the structure, unless all the measures to avoid, mitigate or compensate for the impact are implemented.</p> <p>In the first years of operation, momentary noise measurements in the residential areas should be performed.</p> <p>Next phase: EIA phase, the environmental monitoring programme based on the investigations into the natural environment must be prepared.</p>

4.3.13. Influence on decision-making

The SEA deliberated Option A to be the preferred option as it was considered to be more balanced concerning each of the environments (natural, social and economic) which resulted in the rejection of Option B by the decision-makers. In addition, the SEA proposed rerouting the gauge in two different locations in Option A in order to avoid or mitigate negative consequences resulting from the implementation of the project. These proposed alterations were then implemented in the plan's layout (Tomas Varneckas, personal communication, July 9, 2015).

5. INTERPRETATION AND DISCUSSION OF RESULTS

After reviewing the three case studies with the proposed framework for strategic-thinking SEA effectiveness it is relevant to compare them in relation to the strategic level of the SEAs for high speed rail projects by determining whether strategic issues were addressed and if the SEA has influenced the decision-making process (Table 5-1).

Table 5-1 – Summary of the results of the assessment framework for the three case studies

Assessment criteria	Portugal	UK	Lithuania
SEA concept	Identifying and communicating the potential environmental consequences of PPP proposals	Delivering sustainable development at a strategic level	Identifying and communicating the potential environmental consequences of PPP proposals
Object of assessment	Alternatives	Alternatives	Alternatives
Entry point	Specific development proposals	Specific development proposals	Specific development proposals
Strategic reference framework	Only identified	Used in the assessment	Only identified
Interactivity	Low	High	Low
Scope of assessment	Physical and territorial	Holistic and integrated	Social + biophysical + economic
Scale	National Medium-term	Regional Medium-term	National Medium-term
Tools and techniques	Favoured tools to deal with a deterministic (causal) approach	Favoured tools to deal with a deterministic (causal) approach	Favoured tools to deal with a deterministic (causal) approach
Uncertainty	Ignored	Only identified	Ignored
Participation	No participation	Enlarged and in an inclusive way	Strict legal fulfilment
Follow-up	Only environmental impact monitoring	Only environmental impact monitoring	Only environmental impact monitoring
Influence on decision-making	Assessment influenced decision-making process	Assessment influenced decision-making process	Assessment influenced decision-making process

The SEA of the RFAV project was not legally required because the European SEA Directive had not been transcribed to national legislation at the time, yet it was undertaken following it, thus being a voluntary process requested by RAVE, SA. The AoS of the HS2 was also voluntarily requested in order to ensure the project's sustainability and even though it was considered that HS2 did not require SEA,

the AoS states that it integrates the requirements of the SEA Directive nonetheless. In the case of the Rail Baltica 2, on the other hand, the requirements of the EC Directive 2001/42/EC were incorporated in the national legislation of both Latvia and Lithuania. With one legally required and two voluntary SEAs, were these three case studies strategically assessed?

The SEAs of both Rail Baltica 2 and RFAV were only carried out to assess the plan alternatives that were already developed during the planning process, which translates into a poor interaction and cooperation between the planning team and the SEA practitioners, resulting in several missed opportunities for making strategic decisions that could lead to a sustainable process.

Granted, because the SEAs carried out for the RFAV and Rail Baltica 2 were intended to address a plan, particularly already laid out alternatives, there was no room for strategy so, perhaps, EIAs were more actually adequate to the planners' purpose.

Therefore it can be concluded that an SEA strongly depends on the object of assessment, which means that the SEAs for the RFAV and Rail Baltica 2 should have been developed to assess options when they were still open during the strategy development in order to consequently partake a more strategic nature.

On the other hand, the AoS for HS2 has indeed started with the development of the project's sustainability objectives and had a crucial role throughout the entire decision-making process by attempting to minimise its adverse impacts with a team made up with both AoS practitioners and the planners (HS2 Ltd) which allowed an iterative and participatory process that discussed the different design options. However, although the AoS assessed different route alignments at different design standards in order to decide on a preferred route, it did not assess the likely significant effects of strategic alternatives to the national high speed strategy (Sheate 2015). According to Sheate, the AoS for HS2 "was in too much of a hurry to get to the route alignment, rather than spend a little more time on getting the strategy right in the first place and wider consensus on the role of high speed rail should play in the nation's transport policy" (Sheate, 2015: 14).

The scale of the three assessments is also worth discussing. The SEAs did not explicitly detailed the scales applied to the case studies but from what it said in the reports analysed, they focused entirely in medium-term scales with periods of assessment between 13 and 23 years and mainly limited the area of assessment to regions directly affected by the planned routes. Therefore, it is important to evaluate the scales to be used in SEA in the beginning of the assessment, because, due to the magnitude of infrastructures such as HSR, medium-term and regional scales do not fully encompass its cumulative impacts and the strategic issues that arise from them.

Additionally, participation does seems to be of a large degree in the AoS of the HS2 where a Reference Group was established that, along with other stakeholders, participated throughout the process and whose feedback was considered and resulted in changes in the plan's layout. However, the consultation did not provide all the information regarding the entire high speed rail strategy, i.e. both Phases 1 and 2, which led to an uninformed feedback of the public.

The SEA of the Rail Baltica 2, on the other hand, carried out consultations with stakeholders, members of the public and affected municipalities in two separate occasions: in the beginning of the process so that their feedback was included in the SEA Report and after its publication to inquire about its quality. In the RFAV case, however, there was absolutely no participation which meant that the stakeholders concerns were not considered in the SEA. In order to contribute to a strategic nature SEA, participation cannot be limited to only consultations, focusing also in discussions concerning strategic and environmental issues that involve stakeholders and interested members of the public in an inclusive way throughout the entire SEA process, particularly at an early stage.

The Strategic Reference Framework which is a framework of strategic macro policies that would therefore contribute to a strategic nature SEA was merely identified on the SEAs for the RFAV and the Rail Baltica 2 and yet, they focused more on existing plans and programmes that the project should integrate and/or be integrated into, particularly territorial planning documents, as opposed to long-term strategic macro-policies. The AoS of the HS2 has actually included in its assessment the four objectives for sustainability established in the *UK Sustainable Development Strategy: Securing the Future* (HM Government 2005). Even so, all three cases failed to establish a solid SRF where strategic macropolicies were identified and integrated in the process as referential for assessment.

The RFAV and Rail Baltica 2 case studies' view on sustainability consisted basically on addressing environmental, social, and economic aspects without integrating them into a holistic perspective where, along with the integration of institutional aspects, strategic issues could be addressed and the origin of problems identified.

The SEA of the RFAV mainly addressed biophysical aspects regarding the environmental impacts of the project and few strategic issues were identified. It considered that the RFAV would articulate with other transport infrastructures thus providing intermodality and would also promote modal shift and therefore reduce the impact of the transport sector in Portugal on climate change and air quality, in addition to a reduction in road accidents.

However, instead of working to find a new alternative that avoids certain negative impacts on the environment, namely on biodiversity with affectation of sensitive areas and habitat fragmentation, the SEA merely identified the impacts and proposed mitigation measures.

On the other hand, the SEA for the Rail Baltica 2 aside from the environmental and economic aspects also addresses social aspects, particularly the sustainable development of regions and improvement of quality of life. The SEA acknowledges that a main objective for Lithuania is to reduce the socio-economic disparities of regions and maintain their peculiar features while promoting an even development of the country. It also recognises that, on the national scale, disparities in the development of regions lead to social problems and underused human capital in the long term (Sweco Lietuva UAB 2013b). Therefore, the Rail Baltica transport corridor would help address this issue by attracting investments to the affected regions during the stages of construction and operation. Additionally, the presence of the high speed rail would enable the development of related economic activities (i.e. tourism) and would become a competitive mode of transport. The SEA also focused on the fact that the project is international,

connecting the markets of Western Europe and Northern Europe increasing its financial viability in the long term (Sweco Lietuva UAB 2013b).

The AoS of the HS2 also addresses aspects regarding four sustainability objectives which were:

- Reducing greenhouse gas emissions and combating climate change;
- Natural resource protection and environmental enhancement;
- Creating sustainable communities; and
- Sustainable consumption and production.

These objectives address different strategic issues apart from the environmental, social and economic aspects such as the reduction of greenhouse gas emissions due to the modal shift from road and air to rail, which the AoS predicted would happen, the increase of accessibility by, among other factors, enhancing public transport interchange; the improvement on the rail network's resilience against extreme weather events; etc.

In fact, the case studies generally tend to focus more in making predictions about the future of the projects and the possible impacts of their actions, with a certain level of certainty, as opposed to establish a plan to solve problems in a sustainable way and help achieve the best future scenario. The techniques and tools used in the case studies were predominantly deterministic used to describe the environmental conditions and the possible effects on the environment of the plans' actions as opposed to *T&Ts* that could provide an approach to deal with such complex systems and promote a more strategic SEA. These systems are associated with uncertainty that is important to acknowledge. Only the AoS of the HS2 mentioned uncertainty, and even so, it was related to the projections it developed concerning the future effects of the project.

Additionally, because we are dealing with complex systems, a follow-up programme should not focus entirely on environmental monitoring, but also on dealing with such uncertainty and providing guidelines to analyse governance and processes of action, which did not happen in either of the three case studies.

With the SEA processes of both RFAV and Rail Baltica 2, in which the objective was to assess two alternatives for the plan's layout, the results of both assessments indicated which would be the preferable alternative and merely provided guidelines on how to monitor its environmental impacts. The SEA of Rail Baltica 2 actually recommended a few changes which were later implemented in the plan. On the other hand, the AoS of HS2 had actually a crucial role in the plan because it was carried out since the very beginning of the planning process implementing sustainability and environmental concerns throughout the entire process of establishing sustainability objectives and choosing the options for the rail network layout. However, the AoS focused entirely in determining the route alignment instead of working on the broader strategy for HS2, both for Phases 1 and 2.

It is fair to conclude that, even though the SEAs of the three cases in study did influence the decision-making, they did not do so in a strategic manner, merely helping the planning process with almost entirely project-level decisions instead of addressing important strategic issues before options were

already undertaken. Furthermore, an SEA should have been developed before the development of any HSR project to address a bigger and more important question: is HSR really necessary and justifiable? In the cases of RFAV and HS2, the costs of the projects were higher than projected, resulting in public outrage who questioned the need and purpose of such infrastructures. An SEA would therefore be more beneficial if it was used to develop a high level strategy for HSR that addresses several strategic issues thus ensuring the sustainability of the project and avoiding public controversy.

6. CONCLUSIONS

The objective of this dissertation was to determine to what extent opportunities for strategic level assessment have been explored in high speed rail network in Europe, which required a comparative analysis of strategic level assessments regarding three cases of high speed rail: High Speed Rail 2 (HS2) in the UK, High Speed Rail Network (RFAV) in Portugal and European Gauge Railway Line Kaunas in the Lithuanian-Latvian Border.

A state of the art review of the environmental and sustainability assessments was therefore developed with the purpose of understanding the process of implementation of instruments such as Strategic Environmental Assessment (SEA) and Sustainability Appraisal (SA) to policies, plans and programs.

The changing and evolutionary nature of SEA was identified and, although it is becoming more strategic as opposed to being just an EIA-based tool, it is believed that it is still falling short of its full potential. The SEA ideally would need to play a greater role in a flexible decision-making process by involving stakeholders early on and integrating and discussing environmental concerns as well as strategic issues which would result in increased awareness of the process and its benefits.

Furthermore, a review of literature on the concept of SEA effectiveness was made so as to understand what qualifies an effective SEA, what is its purpose and what criteria or factors can be used to define it. The truth of the matter is that SEA effectiveness varies from case to case, depending on the PPP's purpose.

In the case of a European High Speed Rail Network it is crucial that SEA influences the decision-making process by integrating environmental and sustainability concerns from the early stages of the process and also takes into consideration the feedback of stakeholders and interested public by providing an interactive and open participation process.

Keeping these ideas in mind, the frameworks of assessment of SEA effectiveness that were proposed by several authors were then collected and analysed in order to develop a framework that could be applied to the aforementioned SEAs for HSR plans and answer this dissertation's research questions.

In order to do so, an assessment was made to determine which were the generally agreed upon criteria for SEA effectiveness as well as to look into the differences in opinions of the authors regarding this subject, to better conclude which criteria best assess the three case studies.

One of the generally agreed upon criteria for an effective SEA was public participation, a process which is most useful when it is developed throughout the decision-making process with both stakeholders and affected public to ensure the integration of their concerns and interests in the final PPP. The entry point and timing of the SEA are also considered crucial to ensure an effective SEA. The earlier the SEA is involved in the decision-making process the more influence it will have by ensuring the integration of sustainability issues in the process.

Another factor mentioned by several authors is integration because communication and cooperation between SEA and planners throughout the decision-making can guarantee that the decisions aimed to achieve sustainability in the final PPP. Indeed the results of the SEA need to be clearly accounted for in the decision to confirm its contribution to decision-making which is why the outcome of the SEA is also a good indicator for SEA effectiveness.

Being backed up by existing legislation is also important for an SEA to ensure the process is accountable and compliant. For a more strategic nature SEA, however, the identification of strategic macro-policies, that constitutes the Strategic Reference Framework, helps setting a strategic aim for SEA by taking into consideration its long-term objectives and targets. Additionally, several authors believe that an integrated and holistic scope of assessment where biophysical, social, economic and institutional aspects are included is fundamental to an effective SEA.

Tools and techniques is also considered to be a good indicator for SEA effectiveness because if they are of deterministic nature that can mean that an EIA-based SEA is being carried out whereas if they are undertaken to deal with complex, dynamic and uncertain systems they can contribute to a flexible, adaptive and, therefore, strategic SEA. Indeed, uncertainty that is associated in these complex systems needs to be recognised in order to force the SEA to come up with the means to deal with such complexity by creating a dynamic PPP that can respond to changes over time.

A few authors also believe that follow-up can also contribute to the SEA effectiveness but only if it analyses the governance and processes of action rather than focusing only on monitoring environmental and sustainability issues.

Lobos and Partidário (2014) additionally propose two criteria that evaluate the effectiveness of strategic-thinking SEA which are the concept of the SEA and the object of assessment. By understanding the concept that practitioners attribute to SEA one can know its purpose it to solely identify the potential environmental consequences of the PPP or to integrate sustainability concerns and address strategic issues in the decision-making process. It is also relevant to know what is going to be assessed in order to understand how much involvement in the formulation of options, and consequently how much influence it had in the process.

After taking all the reviewed frameworks into consideration, the framework of Lobos and Partidário (2014) was chosen to be the basis of this dissertation's proposed framework because it is believed that it better assesses the effectiveness of a strategic-thinking SEA while being itself based on literature review. Aside from the criteria aforementioned, scale was also included in the proposed framework because if the scales (time and spatial scales) involved in the process are not adequate then it can be difficult to identify the problems.

As a result, the proposed assessment framework for SEA effectiveness was used to analyse and compare each of the three case studies of high speed rail addressing each of the criteria to understand the level of strategic assessment involved.

Since European high speed rail projects have major implications not only on the environment but also on the affected communities' quality of life, the economy of the countries as well as sustainability issues that come from being a part of an integrated European transport network, using SEA to address strategic issues that arise with projects of this magnitude is crucial.

However, when analysing three European case studies one can conclude that the AoS of the HS2 was the assessment with the most strategic nature (although there is much room for improvement) due to the nature of the AoS itself, which allows for an assessment that integrates environmental and sustainability considerations early on and influences the decision-making process in an iterative manner with the enlarged participation of stakeholders as well as the affected public.

Although it follows the requirements for the SEA Directive, the SEA for the RFAV was not a legal requirement but a voluntary process required by the planners to assess two plan alternatives for the high speed rail layout that were already designed, with no participation and little interaction with the decision-making process, merely considering environmental and economic concerns in its scope of assessment and merely identifying few strategic issues.

The SEA for the Rail Baltica 2 that also follows the requirements of the SEA Directive, which was transposed to national legislation thus becoming a legal requirement, also assessed two final alternatives of the plan, yet, due to its results and the feedback of the consultations with stakeholders and affected public, changes were implemented in the plan, particularly the layout of one of the routes. Even so, the SEA mainly addressed environmental and economic aspects with no room for uncertainty although it has considered social aspects with a certain level of strategy.

Both the RFAV and the Rail Baltica 2 would benefit more if the SEAs were carried out earlier on with the definition of sustainability objectives and in close and iterative interaction with the planning process thus incrementing sustainability aims in every step of the decision-making process. An enlarged and inclusive participation throughout the entire process would allow integration of the stakeholders and public's concerns in the outcome of the PPP.

SEA is an instrument of assessment with great potential to integrate strategy in high levels of decision-making and it should not be used merely to assess environmental impacts of the PPPs but to look at the bigger picture and evaluate if benefits of HSR outweigh its costs and address issues related to the pursuit of sustainable development.

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ANNEXES

Annex I – Strategic Reference Frameworks of the case studies

- **Portuguese High Speed Rail Network**

Table Annex I-1 - Plans and programmes the RFAV project must integrate or be integrated into (IDAD 2003)

Sector	Plans and programmes	Observations
Environment	National Programme for Climate Change (PNAC - Programa Nacional para as Alterações Climáticas)	The RFAV project will improve environmental performance because it is associated with a more sustainable mean of transport (rail).
Transports	National Network of Logistic Platforms (RNPL – Rede Nacional de Plataformas Logísticas) Conventional Railroad Network Iberian Railroad Network (Future) National Rail Plan National Road Plan	There must be cooperation between the RFAV and other modes of transport in order to ensure the intermodality and interoperability of the project at a strategic level.
Spatial Planning	Regional Plans of Spatial Planning (PROT's – Planos Regionais de Ordenamento do Território): - PROTAML – PROT of the Metropolitan Area of Lisbon (RCM 68/2002 of April 8, 2002); - PROZOM – PROT of the Mármores Area (RCM 93/2002 of May 8, 2002); - PROTAL – PROT of Algarve (under review) - PROTCL – PROT of Central Coast (in preparation) - PROTAM – PROT of Alto Minho (in preparation) - PROTO – PROT of Oeste (in preparation)	There needs to be a better political integration of territorial planning and land use at a mobility and intermodality level and, therefore, at an environment level by integrating the spatial planning sector.
	Municipal Master Plans (PDMs – Planos Directores Municipais)	The PDMs of the crossed municipalities must be considered in the RFAV project as well as the PDMs of the municipalities that could eventually be affected by the project.

- **HS2 (London to the West Midlands)**

Table Annex I-2 - Policy drivers for the scheme

Policy	Description
National Infrastructure Plan (October 2010)	The Plan aims to channel investment to help rebalance the economy across all regions. It identifies investment in a high speed rail network as a way of rebalancing the economy.
White Paper “European Transport Policy for 2010: A Time to Decide” (2001)	It proposes about 60 measures whose aim is to develop a European transport system capable of shifting the balance between modes of transport, revitalising the railways, promoting transport by sea and inland waterways and controlling the growth in air transport.
Draft White paper on Transport: A Single Transport Area, Smart Mobility for People and Business (August 2010)	The Commission of the European Communities developed this draft which envisages a radically different transport system by 2020, with a single European transport area, open markets, greener infrastructure and low carbon technologies.

Table Annex I-3 - Policy drivers for sustainable transport

Policy	Description
Towards a Sustainable Transport System: Supporting Economic Growth in a Low Carbon World (2007)	TaSTS sets out measures to improve the contribution of transport to economic growth and productivity, and ensure that it will help deliver reduction in carbon emissions.
Delivering a Sustainable Transport System (2008)	It explains how the TaSTS is being implemented in a way that addresses both immediate problems and longer term challenges that are critical to economic development and quality of life.

Table Annex I-4 - Drivers for sustainable development (National Priorities)

Policy	Description
UK Sustainable Development Strategy: Securing the Future (2005)	<p>It aims to tackle the problems of climate change, poverty and environmental degradation, enabling people to satisfy their basic needs and enjoy a better quality of life for future generations. The key priority areas for action are:</p> <ul style="list-style-type: none"> - Reducing greenhouse gas emissions and combating climate change; - Natural resource protection and environmental enhancement; - Creating sustainable communities; and - Sustainable consumption and production.
Measuring Progress: Sustainable Development Indicators 2010	It gathers an extensive range of indicators to measure the country’s progress on sustainable development and meeting the key priorities areas outlined in the previous policy.

Table Annex I-5 - Drivers for sustainable development (Climate Change)

Policy	Description
Kyoto Protocol to the UN Framework Convention on Climate Change (ratified by the UK in 2002)	It commits the UK to reduce greenhouse gas emissions by 12.5% below 1990 levels by 2012.
Climate Change Act 2008	It commits the UK to reduce emissions from greenhouse gases by at least 80% (compared to 1990) levels by 2050.
UK Low Carbon Transition Plan	It sets a path towards 40% of UK electricity coming from low carbon sources.

Table Annex I-6 - Drivers for sustainable development (Natural and cultural resources)

Policy	Description
Natural Environment White Paper (2011)	It outlines the Government's priorities for the natural environment, setting out a framework for practical action by Government, communities, businesses and other organisations to deliver on that ambition.
Making Space for Nature (2010)	It identifies the continued threat to wildlife sites which are deemed vulnerable owing to their small size and isolation.
The Habitats Regulations	The Habitats Directive establishes a European ecological network known as "Natura 2000". The Habitats Regulations, which implement the Directive in the UK, require competent authorities to restrict development that adversely affects the integrity of such European sites. They also require that plans that may adversely affect the integrity of such sites be subject to specific assessment under the Directive. The Regulations also make it an offence to harm listed species of animals and plants.
UK Biodiversity Action Plan (1994)	It aims to conserve and enhance biological diversity within the UK having species action plans, habitat action plans and local biodiversity action plans with targeted actions.
Planning Policy Statement 9 (PPS9) Biodiversity and Geological Conservation (2005)	It outlines Government's planning policies for protection and enhancement of biodiversity and geodiversity through the planning system. (PPS replaced by the National Planning Policy Framework (NPPF)).
PPS7 Sustainable Development in Rural Areas (2004)	It sets out Government's planning policies for rural areas, particularly, for schemes affecting nationally designated areas such as Areas of Outstanding Natural Beauty, where any assessment of impacts should address the need for the development in terms of national considerations and public interest. (PPS replaced by the National Planning Policy Framework (NPPF)).
PPS5 Planning for the Historic Environment	It aims to conserve the country's heritage, particularly, heritage assets (those of historic, archaeological architectural or artistic interest). (PPS replaced by the National Planning Policy Framework (NPPF)).
Vision Statement on the Historic Environment 2010	It complements and underpins PPS5 and its supporting Practice Guide.
Environment Agency Catchment Flood Management Plans	They recommend the best ways of managing the risk of flooding within named catchments over the next 50 to 100 years.
European Water Framework Directive	It aims to bring about planning and delivery of a better water environment. It includes objectives to achieve good ecological status and good surface water chemical status by 2015, and to achieve good groundwater quantitative and chemical status by 2015.

Table Annex I-7 - Drivers for sustainable development (Sustainable communities)

Policy	Description
Sustainable Communities Act 2007	It aims to promote the sustainability of local communities.
Noise Policy Statement for England (15 March 2010)	It sets out the long term vision of Government on noise policy and defines, within the context of this policy, specific aims, namely to: avoid significant adverse impacts on health and quality of life; mitigate and minimise adverse impacts on health and quality of life; and where possible, contribute to the improvement of health and quality of life.
National Air Quality Strategy	It provides a similar if more detailed framework for work and planning on air quality issues, and defines air quality standards and objectives to be achieved.
Equality Act 2010	It provides a legislative framework to protect the rights of individuals that updates, simplifies and strengthens previous legislation.
Tackling Inequalities – A Programme for Action 2003 2007 Status Report	It sets out plans to tackle health inequalities in the UK and outlines how transport related policies and measures could address health inequalities.
Collaboration between Health and Transport Sectors in Promoting Physical Activity (2006)	It aims to increase the provision of sustainable travel to improve the health and well-being of citizens. Although this refers mainly to walking and cycling, rail provides an opportunity to support these modes through the integration of stations with cycle and pedestrian networks and provision of facilities such as cycle parks.

Table Annex I-8 - Drivers for sustainable development (Sustainable consumption and production)

Policy	Description
Sustainable Consumption and Production and Sustainable Industrial Policy (SCP/SIP) Action Plan	It includes a series of proposals on sustainable consumption and production that will contribute to improving the environmental performance of products and increase the demand for more sustainable goods and production technologies.
Thematic Strategy on the Sustainable Use of Natural Resources (2006)	It aims to ensure that the consumption of resources and their associated effects do not exceed the carrying capacity of the environment, and to break the linkages between economic growth and resource use.
Changing Patterns: UK Government Framework for Sustainable Consumption and Production (2003)	It sets out actions and measures to promote: <ul style="list-style-type: none"> - Better products and services, which reduce the environmental impacts from the use of energy, resources, or hazardous substances; - Cleaner, more efficient production processes, which strengthen competitiveness; and - Shifts in consumption towards goods and services with lower impacts.

Table Annex I-9 - Development planning in the UK (Current land use planning system)

Policy	Description
PPS1: Delivering Sustainable Development (2005)	<p>It sets out the framework for the delivery of sustainable development through the planning system. It states that policies and planning decisions should be based on:</p> <ul style="list-style-type: none"> - Up-to-date information on the environmental characteristics of the area; - The potential impacts, positive as well as negative, on the environment of development proposals (whether direct, indirect, cumulative, long-term or short-term), and - Recognition of the limits of the environment to accept further development without irreversible damage. (PPS replaced by the National Planning Policy Framework (NPPF)).
PPS4: Planning for Sustainable Economies (2009)	<p>It provides the policy framework for planning for sustainable economic development in urban and rural areas, including town centres and is a material consideration in the formulation of land use plans and decisions on development. It emphasises the delivery of sustainable transport infrastructure in order to support planned economic development. (PPS replaced by the National Planning Policy Framework (NPPF)).</p>
PPG13 (Planning Policy Guidance 13): Transport (2001)	<p>It has three objectives for integrating planning and transport: to promote more sustainable transport choices for carrying people and moving freight; promote accessibility to jobs, shopping, leisure facilities and services by public transport, walking and cycling; and reduce the need to travel, especially by car. (PPS replaced by the National Planning Policy Framework (NPPF)).</p>
2008 Planning Act	<p>It provides a framework for obtaining development consent for a range of national significant infrastructure projects.</p>

Table Annex I-10 - Development planning in the UK (The new approach)

Policy	Description
Cabinet Office Draft Structural Reform Plan (June 2010)	<p>It sets out the agenda for implementation of 'Big Society' policies, a concept which was introduced in the UK by the Prime Minister in 10 July 2010. Its focus is the redistribution of power from central government to local communities (effectively decentralisation), and the redistribution of wealth across the UK.</p> <p>It is a 'bottom-up' approach to land use planning looking at local aspirations for development. Measures will include a radical reform of the planning system and the transfer of power from central to local government.</p>
Localism Act 2011	<p>It is an Act of Parliament that aims to facilitate the devolution of decision-making powers from central government control to individuals and communities. It also includes provisions which would abolish Regional Strategies, support the development of neighborhood plans, allow communities to run local authority services, and hold local referendums where people request them. It is important to note that HS2 itself cannot rely on investment or decision-making at a local scale, being a project of national significance, meaning a Government intervention is required.</p>

- **European Gauge Railway Line Kaunas – Lithuanian-Latvian Border**

Table Annex I-11 - Links of Rail Baltica 2 with territorial planning documents

Links of Rail Baltica 2 with territorial planning documents
Master Plan of the Territory of the Republic of Lithuania approved by Resolution of the Seimas of the Republic of Lithuania No. IX-1154 of 29 October 2002 (Žin., 2002, No 110-4852);
Master Plan of the Territory of Kaunas City Municipality 2003-2013 approved by decision of the Kaunas City Council No. T-242 of 29 May 2003;
Amendment I to the Plan of the Territory of Kaunas City Municipality approved by decision of the Kaunas City Council No. T-312 of 20 July 2006;
Amendment I to the Plan of the Territory of Kaunas City Municipality approved by decision of the Kaunas City Council No. T-462 of 23 July 2010;
Master Plan of the Territory of Kaunas District Municipality approved by decision of the Kaunas District Council No. TS-1 of 29 January 2009;
Master Plan of the Territory of Kaišiadorys District Municipality approved by decision of the Kaišiadorys District Council No. V17-1 of 28 January 2010;
Master Plan of the Territory of Jonava District Municipality approved by decision of the Jonava District Council No. TS-236 of 23 October 2008;
Master Plan of the Territory of Kėdainiai District Municipality approved by decision of the Kėdainiai District Council No. TS-68 of 27 February 2009;
Master Plan of the Territory of Radviliškis District Municipality approved by decision of the Radviliškis District Council No. T-677 of 16 April 2009;
Master Plan of the Territory of Panevėžys District Municipality approved by decision of the Panevėžys District Council No. T-154 of 3 July 2008;
Master Plan of the Territory of Panevėžys Town Municipality approved by decision of the Panevėžys Town Council No. 1-25-1 of 30 October 2010;
Master Plan of the Territory of Šiauliai District Municipality approved by decision of the Šiauliai District Council No. T-199 of 3 July 2008;
Master Plan of the Territory of Šiauliai Town Municipality approved by decision of the Šiauliai Town Council No. T-1 of 29 January 2009;
Master Plan of the Territory of Joniškis District Municipality approved by decision of the Joniškis District Council No. T-61 of 8 April 2010;
Master Plan of the Territory of Pasvalys District Municipality approved by decision of the Pasvalys District Council No. T-47 of 26 March 2008.

Table Annex I-12 - Compliance of Rail Baltica 2 with EU law (Sweco Lietuva UAB 2013b)

Policy	Observations
Treaty on the Functioning of the European Union	It sets out the objectives to create trans-European networks in areas of transport, energy and telecommunications in order to link together all regions of EU.
The Maastricht Agreement (1992)	It aims to establish and develop the international infrastructure networks (TEN) in the areas of transport, energy and telecommunications thus developing the internal market and strengthening the economic and social cohesion.
White Paper Growth, Competitiveness, Employment (1993)	The European Commission highlighted the importance of TEN for the internal market regarding the creation of new jobs: in both constructing infrastructure and considering their future role in economic development.
Decision No 1692/96/EC of the European Parliament and of the Council of 23 July 1996 on Community guidelines for the development of the trans-European transport network.	It establishes the specific network characteristics for each mode of transport and the projects of common interest and priority projects to be financed.
Decision No 661/2010/EU of the European Parliament and of the Council of 7 July 2010 on Union guidelines for the development of the trans-European transport network (new version)	It establishes the guidelines for the development of the trans-European transport network that would integrate land, sea and air transport infrastructures networks in a sustainable manner

Annex II – Summary Framework Table

Table Annex II-13 - Summary Framework Table (Source: Booz & Co. (UK) & Temple Group Ltd 2011a)

	Impacts	Overall	Euston Station	Tunnel from Euston to Old Oak Common	Old Oak Common Station	HS1 connection	Old Oak Common to West Ruislip	West Ruislip to Aylesbury	Aylesbury to Brackley	Infrastructure Maintenance depot	Brackley to Kenilworth/ Coventry Gap	Kenilworth/ Coventry Gap to Berkswell RS	Berkswell RS to Middleton	Birmingham Interchange station	Birmingham Spur	Rolling Stock depot	Birmingham Curzon Street station	Middleton to West Coast Main Line
REDUCING GREENHOUSE GAS EMISSIONS AND COMBATING CLIMATE CHANGE																		
1. Climate Factors and Adaptability																		
1a) Improve resilience of rail network against extreme weather events	Length of cutting through geology vulnerable to landslip	-	o	o	o	o	-	-	-	-	-	-	o	-	o	o	-	
	Length of line at risk of climate change flooding	-	o	o	o	o	o	o	o	o	o	o	o	o	-	-	o	o
2. Greenhouse Gases																		
2a) Contribute to the reduction of greenhouse gas emissions by facilitating modal shift from road and air to rail	Change in CO ₂ emissions as a result of modal shift	U	This criterion has been assessed across the whole scheme, not by route section. U*: There is a wide range in uncertainty associated with potential modal shift, which may result either in a net positive or net negative benefit.															
	Carbon emissions from construction (tunnel boring)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2b) Reduce relative contribution made by rail to greenhouse gas emissions by applying energy efficient technologies	Relative efficiency in operations b/t high speed and classic trains	U	This criterion has been assessed across the whole scheme, not by route section. U*: There is a wide range in uncertainty associated with operational Impacts, which may result either in a net positive or net negative benefit.															
NATURAL AND CULTURAL RESOURCE PROTECTION AND ENVIRONMENTAL ENHANCEMENT																		
3. Landscape and Townscape																		
3a) Maintain and enhance existing landscape character	Landscape of national importance	--	o	o	o	o	o	--	o	o	o	o	o	o	o	o	o	o
	Landscape of regional importance	-	o	o	o	o	-	-	o	o	o	o	-	o	-	o	o	o
3b) Maintain and enhance existing townscape character	Townscape resources	-	-	-	o	o	-	-	o	-	-	-	-	o	-	-	-	-
	Strategically important views	-	-	o	U	o	U	-	U	U	-	U	U	U	o	o	o	U
4. Cultural Heritage																		
4a) Preserve and protect archaeological assets	World heritage sites	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o
	Scheduled monuments	-	o	o	o	o	o	-	o	o	-	o	-	o	o	o	o	-
4b) Preserve and protect historic buildings	Character of heritage resources (national importance)	-	-	o	o	o	-	-	-	o	-	o	-	-	o	o	-	o
	Character of heritage resources (regional importance)	-	-	o	o	-	-	-	-	-	-	-	-	o	-	o	-	-
4c) Preserve and protect historic landscapes	Coherence and distinctiveness of historic landscapes of international and national importance	--	o	o	o	o	o	--	o	o	-	o	o	o	o	o	o	o
	Coherence and distinctiveness of historic landscapes of regional importance	-	o	o	o	o	o	-	o	o	-	o	o	o	o	o	o	o

Table Annex II-14 - Summary Framework Table (continuation) (Source: Booz & Co. (UK) & Temple Group Ltd 2011a)


Impacts		Overall	Euston Station	Tunnel from Euston to Old Oak Common	Old Oak Common Station	HS1 connection	Old Oak Common to West Ruislip	West Ruislip to Aylesbury	Aylesbury to Brackley	Infrastructure Maintenance depot	Brackley to Kenilworth Coventry Gap	Kenilworth Coventry Gap to Berkswell RS	Berkswell RS to Midsanton	Birmingham Interchange station	Birmingham Spur	Rolling Stock depot	Birmingham Curzon Street station	Midsanton to West Coast Main Line	
5. Biodiversity																			
5a) Maintain and enhance biodiversity	Sites of International Importance	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	
	Sites of national Importance	-	o	o	o	o	o	-	-	-	-	o	-	o	o	o	o	o	
	Sites of regional Importance	-	o	-	o	o	-	-	-	-	-	-	-	o	-	o	o	-	
	Area of new habitat creation	o	+	+	+	o	+	o	+	+	+	+	+	+	+	+	+	+	
6. Water Resources																			
6a) Protect surface water resources	Impacts to river catchments	-	o	o	o	o	-	-	-	o	-	o	-	o	-	-	-	-	
	Surface waterbodies	---	o	o	o	o	o	---	-	o	-	o	---	o		o	---	-	
6b) Protect groundwater resources	Groundwater resources (SPZs)	---	o	-	o	o	---	---	o	o	o	o	-	-	o	o	o	o	
	Groundwater flow in strategic aquifers	---	o	o	o	o	o	-	---	o	---	o	-	-	-	-	o	---	
7. Flood Risk																			
7a) Conserve and enhance the capacity of floodplains	Extent of infrastructure in a 1 in a 100 year flood zone	-	o	o	o	o	o	o	o	o	o	o	o	o	-	o	o	o	
	Extent of infrastructure in a 1 in a 1000 year flood zone	-	o	o	o	o	-	-	-	o	-	o	-	o	-	-	o	o	
CREATING SUSTAINABLE COMMUNITIES																			
8. Air quality																			
8a) Maintain and enhance local air quality	Change in total emissions (with and without options)	U	These criteria have been assessed across the whole scheme, not by route section.																
	Stations on traffic air quality	U	U*: The proposed route would potentially be unsupportive of the objective of maintaining and enhancing local air quality, however there is sufficient uncertainty about design details to assign 'unknown' to these criteria.																
9. Noise																			
9a) Maintain and enhance the local noise environment	Change in population potentially annoyed by operational noise	-	U	U	o	U	-	-	-	U	-	-	-	U	-	U	U	-	
	Present value benefits for daytime operational residential	-	U	U	o	U	-	-	-	U	-	-	-	U	-	U	U	-	
9b) Maintain local vibration environment	Residential properties at risk of vibration and reradiated noise	-	N/A	-	N/A	-	-	-	N/A	N/A	o	-	N/A	N/A	N/A	N/A	N/A	N/A	
10. Community integrity																			
10a) Maintain and enhance community integrity	Properties demolished or affected by land take	---	---	-	-	o	---	-	-	o	-	o	-	o	---	---	-	-	
	Properties at risk of isolation	-	o	o	o	o	o	o	o	o	o	o	-	o	-	o	o	o	
	Properties demolished in 20% most deprived areas	---	---	-	o	o	o	o	o	o	o	o	o	o	o	-	-	o	
	Properties with high proportion of equality groups demolished	---	---	o	-	o	o	o	o	o	o	o	o	o	-	-	-	o	
11. Accessibility																			
11a) Maintain and enhance pedestrian access	Footpaths, nature trails and cycle paths severed	-	o	o	o	o	o	-	-	o	-	-	-	o	o	o	o	-	
	Areas of open access	-	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	-	

Table Annex II-15 - Summary Framework Table (continuation) (Source: Booz & Co. (UK) & Temple Group Ltd 2011a)

	Impacts	Overall	Euston Station	Tunnel from Euston to Old Oak Common	Old Oak Common Station	HST connection	Old Oak Common to West Ruislip	West Ruislip to Aylesbury	Aylesbury to Brackley	Infrastructure Maintenance depot	Brackley to Kenilworth Coventry Gap	Kenilworth Coventry Gap to Berkswell RS	Berkswell RS to Midleton	Birmingham Interchange station	Birmingham Spurr	Rolling Stock depot	Birmingham Curzon Street station	Middleton to West Coast Main Line
11b) Maintain and enhance access to public transport	Improved access to public transport	o	o															
	Improve option value	+	These criteria have been assessed across the whole scheme, not by route section. +*: The proposed route is potentially supportive of the objective to maintain and enhance public transport access.															
	Deprived areas (20%) with improved access to transport	+																
11c) Maintain and enhance public transport interchange	Potential to improve public transport interchanges	+	This criterion has been assessed across the whole scheme, not by route section. +*: The proposed route is potentially supportive of the objective to maintain and enhance public transport interchange.															
	Ability to accommodate mobility impaired	U																
12. Health and well being																		
12a) Maintain and improve mental well-being	Impacts on key determinants of mental well being	-	This criterion has been assessed across the whole scheme, not by route section. -*: The proposed route is potentially unsupportive of the key determinants of mental well being.															
	No. Residential dwellings within 100m of surface sections	-	-	o	-	o	-	-	-	o	-	-	-	o	-	-	-	-
	Areas with highest 20% tranquility	U	U*: There was insufficient data on areas of tranquility available at the time of writing this report to appraise this criterion.															
12b) Maintain and improve physical health	Potential to encourage a more healthy lifestyle	o	These criteria have been assessed across the whole scheme, not by route section. o*: The proposed route is potentially neither supportive nor unsupportive of the objective of maintaining and improving physical health.															
	Key determinants of physical health	o																
12c) Reduce health inequalities	Key determinants of health inequality	o	This criterion has been assessed across the whole scheme, not by route section. o*: The proposed route is potentially neither supportive nor unsupportive of the objective of reducing health inequalities.															
13. Security and Safety																		
13a) Contribute to the reduction of road traffic accidents	Change in likelihood of accidents	o	This criterion has been assessed across the whole scheme, not by route section. o*: It is not anticipated that the Proposed route would either contribute to or counteract the reduction of road traffic accidents.															
13b) Protect against crime and fear of crime	Features that might increase crime	U																
14. Economic Prosperity																		
14a) Support economic competitiveness and make efficient use of public funds	Business Impacts for transport users	++	This criterion has been assessed across the whole scheme, not by route section. ++*: The proposed route would be highly supportive of economic competitiveness (information has not been available with which to assess the scheme in terms of whether it represents an efficient use of public funds).															
14b) Support wider economic growth and maintain and enhance employment opportunities	Changes in agglomerated market competitiveness	+																
	Labour market	+	These criteria have been assessed across the whole scheme, not by route section. +*: The proposed route would be supportive of wider economic growth and maintaining and enhancing employment opportunities.															
15. Economic Welfare																		
15a) Support wider economic welfare growth	Benefits for consumers and commuters	++	This criterion has been assessed across the whole scheme, not by route section. ++*: The proposed route would be highly supportive of the objective of supporting wider economic welfare growth.															
	Planned regional growth	o																
15b) Support planned developments	Planned major housing and sustainable housing development	-	o*	o*	o*	o*	o*	o*	o*	o*	o*	o*	o*	o*	o*	o*	o*	o*

Table Annex II-16 - Summary Framework Table (continuation) (Source: Booz & Co. (UK) & Temple Group Ltd 2011a)

	Impacts	Overall	Euston Station	Tunnel from Euston to Old Oak Common	Old Oak Common Station	HS1 connection	Old Oak Common to West Ruislip	West Ruislip to Aylesbury	Aylesbury to Brackley	Infrastructure Maintenance depot	Brackley to Kenilworth/ Coventry Gap	Kenilworth/ Coventry Gap to Berkswell RS	Berkswell RS to Middleton	Birmingham Interchange station	Birmingham Spur	Rolling Stock depot	Birmingham Curzon Street station	Middleton to West Coast Main Line
	Other planned major developments	-	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*
15c) Maintain and enhance regeneration	Defined regeneration areas	+	+	0	+	0	0	0	0	0	0	0	0	+	0	0	+	0
SUSTAINABLE CONSUMPTION AND PRODUCTION																		
16. Soil and land resources																		
16a) Maintain and enhance land resources	Grade 1 and 2 agricultural land	-	0	0	0	0	0	-	0	0	-	-	-	0	0	0	0	-
	Length of Green Belt crossed	-	0	0	0	0	-	-	0	0	-	-	-	-	-	0	0	-
	Land designated for mineral extraction	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Waste disposal	-	0	0	0	0	0	0	-	-	0	0	0	0	0	0	0	0
16b) Encourage the use of brownfield sites	High risk brownfield sites bought back into beneficial use	+	0	0	0	0	0	+	+	+	+	0	+	0	+	0	0	0
17. Waste Generation																		
17a) Prevent and minimise waste production	Volumes on inert and non hazardous materials potentially requiring off line disposal	-	0	-	0	-	-	-	0	0	-	0	0	0	0	0	0	0
	Volumes of hazardous waste potentially requiring treatment	U	U: At this stage, there is insufficient data on hazardous materials and information on detailed design to evaluate volumes of hazardous waste to be treated.															
18. Resource Use																		
18a) Conserve and protect primary material resources	Potential to make more efficient use of resources	U	U: At this stage, insufficient information is available on detailed design (including possibilities for reuse of materials and use of recycled materials) to evaluate the extent to which the Proposed route is either supportive or unsupportive of the objective to conserve and protect primary material resources. However, as it would require thousands of tons of steel and concrete, it can be assumed that the Proposed route would be unsupportive of this objective overall.															
	Potential to re-use materials	U																

Note: All evaluations in this Table must be read in conjunction with the AoS frameworks (Volume 2) and relevant subsections of Section 7 of this AoS main report (Volume 1). Items marked (*) should be read with particular caution and considered in the context of data limitations associated with these criteria.

