



Integrated EST framework (EST-Frame)

*An FP7, Science in Society, Collaborative Project,
Small or medium-scale focused research project.*

EST-Frame deliverable 6.7 An integrated framework for assessing societal impact of emerging science and technologies

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Preface

This deliverable is produced as a component of the research work conducted within the European EST-Frame project on integrated assessment of emerging science and technologies. The report provides a bottom-up justification of the approach to integrated assessment developed in the project, called the TranSTEP approach (*TranS-domain Technology Evaluation Process*). The reasoning behind this approach is spelled out in EST-Frame deliverable 1.3. A preliminary version of the TranSTEP approach was laid out in deliverable 6.1. This report shows how the preliminary approach (at this time called the Integrated EST Framework) developed into the TranSTEP approach in a dialogical process with end users. Experiences from four of these workshops (the 'testing workshops') are presented as separate deliverables (deliverables 6.2, 6.3, 6.4 and 6.5). This deliverable reflects on the experiences from the testing workshops, as well as a workshop with risk, economic and impact assessment professionals, and summarises the experiences from the last end user workshop.

The details of the TranSTEP approach are published online on <http://transtepapproach.wordpress.com/> representing deliverable 6.6. We do not repeat them here. We chose to publish the final approach as a web page believing that this will better facilitate wider adoption by potential users than a pdf report.

The public EST-Frame deliverables are available at the project website (www.estframe.net).

If you have any comments on or questions regarding this report please contact the project coordinator:

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Executive summary

This deliverable has two main components. It first reports on four workshops where parts of the initial integrated approach developed in the EST-Frame project (preliminarily called the Integrated EST Framework) were tested, as well as a workshop with Brussels policy officers discussing the same version of the approach. These five workshops were conducted in the period from February to May 2014. Based on reflections from these workshops the Integrated EST Framework was further developed into the TranSTEP approach: *Trans-domain Technology Evaluation Process*. The report also reports on an end user workshop organised in Oslo in October 2014 where the participants discussed the implementation of the TranSTEP approach, providing recommendations on how the approach can be finalised in order to meet user needs. The final version of TranSTEP is found on <http://transtepapproach.wordpress.com/>, and is summarised in this report. In this report we justify the details of the TranSTEP approach in a bottom-up fashion. The theoretical justification of the approach will be presented in a scientific article to be finalised and submitted for peer-reviewed publication.

From the first round of workshops we received feedback related to the intended participants in the approach, the conceptualisation of the approach, the specific elements of the approach and how the approach could be used. We also gained experience on challenges in carrying out the integrated assessment process and on how to facilitate the discussions. This allowed us to reflect on how the approach succeeded in integrating in practice.

The participants in the workshops seemed to particularly appreciate the focus on transparent dialogue and situation analysis, but the workshops showed that this was a demanding step. In response, the consortium has developed several tools that can be used in this phase. The testing workshops did not provide sufficient time for full method reflection and assessment review. Nevertheless, we learnt that our concepts of methods and domains need to be presented at an early stage of the TranSTEP process. The integration dimensions developed and presented in the earlier deliverables were unanimously recognised as important. On the issue of facilitation, group composition, and the outcome of the process, we learnt both in the case studies and the end-user workshops that these should be reflected upon and discussed in the TranSTEP process.

The workshops showed that there are several potential clients for TranSTEP and that TranSTEP needs to be applied in a practical setting to prove its value as a cost-effective and informative approach. The TranSTEP approach was characterised in both rounds of workshops as being of potential use outside of the context of emerging science and technologies.

The end-users in the workshops were generally supportive of the potential for TranSTEP to structure dialogue between different domains. Nevertheless, for a conceptual approach as TranSTEP, the value and the impact of the process depend on the commissioning institution, the executing agency, the participants, and the political room for implementation of advice. In practical terms, the end-users proposed to seek both commercial and non-commercial partners to further develop, refine and



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implement TranSTEP and recommended that the project team should establish a network for continued learning, training and experience sharing.



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1. Introduction

In the EST-Frame project we have developed an approach to integrated assessment based on empirical studies of current assessments of emerging science and technologies (EST), literature review and interviews and workshops with assessment practitioners, policy makers, researchers and stakeholders. This approach (initially simply called the Integrated EST Framework) was presented in the EST-Frame deliverables D1.3 and D6.1. In D1.3 criteria for an integrated approach were presented, and details of the preliminary approaches were described in D6.1. Parts of the assessment approach were during the spring of 2014 tested in four testing workshops corresponding to the project's case studies. These are reported in the EST-Frame deliverables 6.2, 6.3, 6.4 and 6.5. Principles of the approach were also discussed with civil servants working on economic, impact and risk assessment at a European level. This allowed us to further develop the approach. During this process of development, the name of TranSTEP: *Trans-domain Technology Evaluation Process* was proposed as a more appropriate representation of the approach. From early summer 2014, this name has been used within the project work to refer to the approach. TranSTEP fulfills the three criteria for an integrated approach outlined in EST-Frame deliverable 1.3. Compared to the approach as it was presented there TranSTEP has a slightly different emphasis, but the main elements remain.

The content of TranSTEP is detailed in deliverable 6.6, which we have decided to publish as a website (<http://transtepapproach.wordpress.com/>) as a result of feedback on the importance of usability and accessibility. We have opted for a website as a more accessible way to disseminate the approach to potential users and to a general interested audience, as well as allowing us to include direct hyperlinks to other online resources. For details of the approach we refer the reader to this website and will below only summarise the main philosophy of TranSTEP.

The following chapter presents the main aspects of the TranSTEP approach, as it is after the revisions accounted for here. Chapter 3 discusses experiences from the testing workshops and shows how we responded to comments and suggestions. Chapter 4 reports on the feedback from the final end user workshop and again how we have responded to the feedback. Chapter 5 presents the overall conclusion of the report.

2. The TranSTEP approach

TranSTEP is a conceptual assessment approach targeted towards policy makers commissioning assessments and professionals conducting assessments. TranSTEP is an approach to the assessment of technologies or technological applications that present challenges related to complexity, uncertainty and controversy over facts and values. In such situations the legitimacy of any assessment may be



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challenged with respect to who participates, how the assessment is conducted and the quality and meaning of the results.

TranSTEP offers an approach where the range of participants is widened, the assessment process itself is made transparent and the output has been subject to broad review. In this respect TranSTEP aims to confront the difficult discussions as an integrated part of the assessment, conducive to better robustness and legitimacy of its output.

TranSTEP is a conceptual guide for practical work. It gives commissioners and facilitators the necessary leeway to blend tools and methods from different assessment traditions in a flexible manner without sacrificing transparency and accountability in the process.

TranSTEP focuses on the enhancement of communication and interdisciplinary learning between different domains of expertise, because fragmentation of expertise is one of the main barriers to integrate factual evidence, values and normative perspectives across these domains.

The objectives of TranSTEP are:

1. To broaden the scope of assessments of complex technology issues to account for all relevant dimensions, such as economic, environmental, ethical and social aspects;
2. To disclose different aspects and assumptions that are part of the problem framing such as the socio-economic context, the uncertainties and the interests of the actors involved and affected by the technology under analysis;
3. To integrate the knowledge and findings of previous and new assessment studies.

WHO should use TranSTEP?

TranSTEP may be used if decision makers or other actors identify a need for dealing with an issue in an integrated and transdisciplinary way.

Several actors may want to use TranSTEP:

- government agencies
- established assessment institutions wanting to broaden their scope
- private actors
- public-private alliances or networks
- NGOs or other interested parties

TranSTEP is a flexible approach that can be adjusted to fit the needs of the individual users. That is why we present some key elements of TranSTEP and leave the methodological details as optional resources.



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TranSTEP is likely to be less useful for institutions with a specific disciplinary mandate, where broad discussions on the design of assessments may be regarded as potentially compromising the validity of the results according to the specific mandate.

On WHAT issues is TranSTEP a useful approach?

TranSTEP is developed specifically with regard to assessing emerging science and technologies (EST). These are often characterised by complexity, uncertainty and controversy of facts and values; for instance with regard to potential market demand, reactions by the public, health and environmental risks, regulatory relevance, etc. However, this holds not only for EST, but also for other technology issues. Ultimately, the scope of TranSTEP might be even wider since it is determined by the perception of a user that a broad range of perspectives needs to be integrated in assessing the knowledge basis for making decisions on a given issue.

In order to motivate participation the issue to be assessed in TranSTEP must be related to an identifiable problem, for policy makers, industry or other stakeholders. Such a problem can be related to:

- general technology trajectories (such as nano food)
- particular technology applications (such as a genetically modified insect)
- particular policy/governance issues (such as the development of a 'European cloud')

A 'problem' does not have to be a negative or undesirable state of affairs; rather, it denotes that some kind of actions are required. As such, someone (a decision maker, the public, NGOs) must have identified and given a preliminary definition of the problem.

WHEN should TranSTEP be used?

TranSTEP can be used earlier or later in the development of a technology, application or policy issue. At an **earlier** stage the focus will likely be on situation analysis and new assessment activities. At a **later** stage more attention will be devoted to reviewing existing assessments and integrating their findings for the problem formulation at hand.

Success criteria

Having success in using TranSTEP depends on a few factors:

1. In order to recruit participants to the TranSTEP group there must be a shared understanding among a sufficiently broad set of potential participants that the issue needs an integrated assessment.
2. The initiator of the TranSTEP process, or the targeted user of its results, needs to have sufficient openness to learn from the TranSTEP group. Such openness can be triggered by public controversies, but is sometimes restricted by institutional mandates, hierarchies or cultures.



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3. The robustness and credibility of the outcome of the TranSTEP process will crucially be affected by the quality of deliberation. An experienced facilitator, a good discussion climate and sufficient time for discussion must be ensured.

4. There must be sufficient amount of resources (time and money) in the secretariat to host the meetings and potentially pay the travel and accommodation costs of the participants.

Doing TranSTEP

Doing TranSTEP involves convening a TranSTEP group for dialogues across institutional and disciplinary domains; collaborative situation analysis and problem framing; transparent method reflection; assessment review and potential organising of new assessments, ending up in an integrated conclusion.

The process is focused on creating learning processes between the participants. In the process, there needs to be a continual process reflection to adapt to the situation under scrutiny. As such, the assessment process allows for both the integration of existing assessments and the initiation of new trans-disciplinary or disciplinary assessments or deliberative events to fill knowledge gaps. It ends up with an original trans-disciplinary assessment, through dialogue between people involved in earlier assessments, in interaction with decision-makers, stakeholders and the public.

Situation analysis

Situation analysis is a key step in TranSTEP. It is a fundamental and critical stage of the approach, in which the problem will be further defined, relevant actors will be identified, perspectives and interests explored and the social and political contexts described in detail. Since different members of the TranSTEP group are likely to hold differing views on the problem to be addressed in the assessment process, the objective of situation analysis is to collaboratively construct and agree on problem framing to a degree that allows for further action. The TranSTEP group will have a preliminary mandate or initial problem formulation from the initiator of the process (problem owner). Situation analysis builds on this initial formulation and it is the role of the TranSTEP group to challenge it and/or elaborate on it in close dialogue with the problem owner.

Method reflection

Method reflection involves discussing what methods would be appropriate for providing knowledge on the problem, as framed in the collaborative situation analysis.

This is necessary firstly for searching for current and available evidence that may help to address the problem (see assessment review), and secondly if the TranSTEP group decides that new assessments or dialogical activities are needed, since then they will also have to design such new actions.

Assessment review



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Once there is a common understanding about what characterises the issue to be assessed and there is agreement upon the problem formulation and upon suitable methods to provide knowledge on the problem, there can be an assessment of whether existing evidence (previous assessments including deliberative initiatives) can provide the foundation the group needs to conclude on the issue.

This should be done in three steps:

1. Asking the participants to provide to the secretariat their input about existing assessments, research or deliberative events they are aware of.
2. Desk-top research by the secretariat to be presented to the TranSTEP group.
3. Review by the TranSTEP group of the existing assessments

The review will end up with a judgment on whether there is sufficient evidence for integrating existing knowledge into a conclusion on the problem. If the group believes that it is not, then new assessment activities will, if possible, be initiated by the group. If the group cannot initiate new assessment activities it will integrate the review into a statement of the current knowledge status, with recommendations for further assessment activities to be initiated by other relevant actors.

Results integration

By drawing lessons from earlier assessments and initiating new assessments/deliberative events to fill knowledge gaps (including clarifying the extent of uncertainties that will have to be addressed by decision makers), assessment practitioners and commissioners will produce integrated conclusions to support the creation of responsible policies for research and innovation.

The TranSTEP group will decide to end the process when a) they believe there is sufficient evidence (on facts, values, perceptions or alternatives) for concluding on the issue they have defined; or b) when practical constraints (such as available funding) makes it impossible to continue. At this point a report should be written integrating the results and deliberations of the process.

Outcomes of the TranSTEP process

There are two main outcomes of TranSTEP:

- TranSTEP leads to mutual learning between the different communities that participate in the process. This involves learning about others' perspectives and self-reflective learning about ones' own practices and assumptions. As such the TranSTEP will support practitioners from various assessment domains and other communities to recognise and deal with complex situations, in particular by engaging in broader assessment dialogues.

- TranSTEP provides an integrated knowledge base on the technology issue under scrutiny and recommendations for policy or decision making that reflect a range of societal concerns, depending on



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the problem formulation at the beginning of the process. It broadens decision makers' perceptions of the science and technology-related situation into which their decisions intervene. These recommendations can be targeted at different decision making or policy making actors related to the issue. The recommendations will also serve as a vehicle to stimulate socio-political debates.

Transparency in TranSTEP

Transparency is crucial to provide legitimacy for the outcomes of the TranSTEP group. However, transparency must be balanced with need to create a protected space for open dialogue.

Map of TranSTEP process

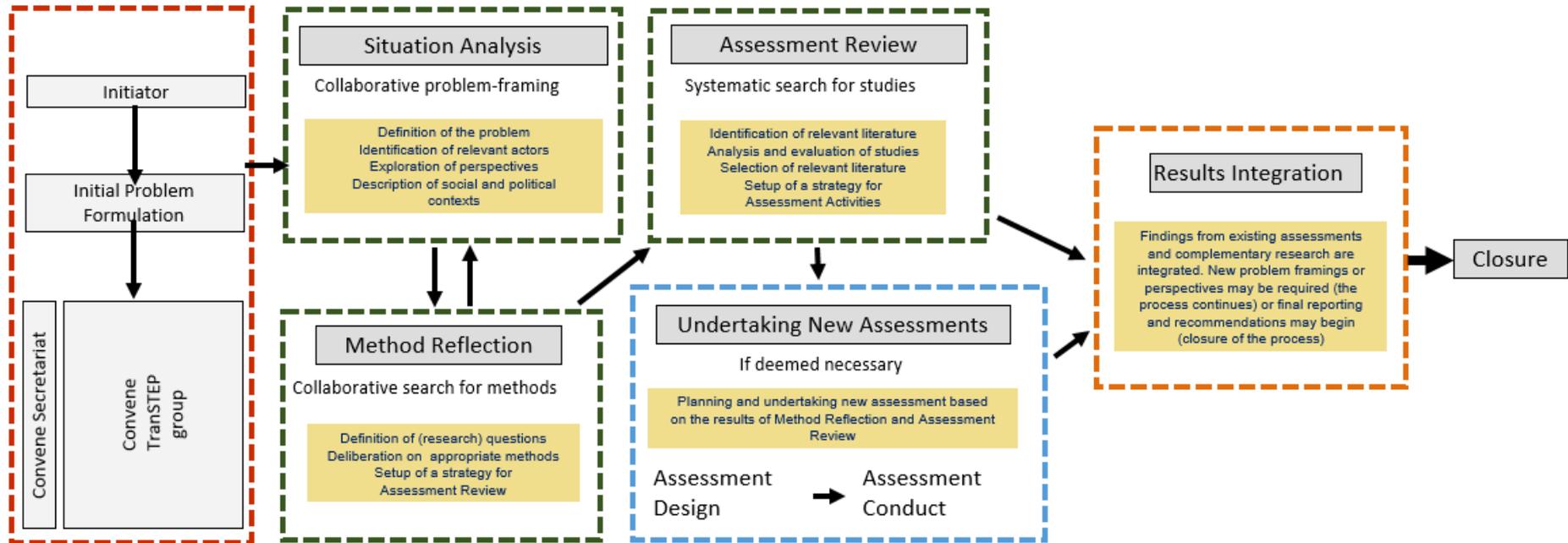


Table 1. Map of the TranSTEP process



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3. Experiences from the testing workshops

The approach tested in these workshop was presented in the EST-Frame deliverable D1.3 and D6.1 and is there referred to as the Integrated EST Framework. The participants at the testing workshops offered feedback on the method and gave the project teams occasion for systematic and practice oriented reflection. This feedback and reflection was documented in the deliverables 6.2, 6.3, 6.4 and 6.5, which used a common template (see annex A). In the following we structure the feedback and reflection into nine sub-sections that have been useful for the revisions and further development of the approach.

3.1 Participants

Experience/Feedback

- a) The workshops were inter- or trans-disciplinary¹. Trans-domain participation was sought in all the workshops, but some of them had few representatives from what we refer to as assessment domains (economics, risk assessment, ethics, foresight, impact assessment or technology assessment). Either because the invited practitioners did not prioritise the workshop, because the different established domains were not relevant for the topic, or because the most relevant people involved in assessments and policy on the topic were not related to a domain. This indicates that the convening of trans-domain group can be challenging and needs to be carefully considered and suggests the need to relax the trans-domain focus. Process organisers should still systematically explore representation of the established domains, but other actors can also be important members.

In several of the workshops it has been mentioned that policy makers (and other decision makers) should be part of the trans-domain team. This would ensure that policy makers' framing is discussed and would make it easier to ensure learning also with the initiators or problem owners who are likely to be ultimately making the decisions. It might also lead to more energy in the trans-domain team if those with a stake in the outcome are there to assist in driving the process forward (an example of this was seen in the nano food workshop).

Organisers of the testing workshops in general found it difficult to involve NGO representatives. This issue was raised in some of the workshops and at least one of the workshop groups discussed whether ethicists/social scientists could or should step in as representatives of societal concerns, but there was no common recommendation on this issue.

¹ By interdisciplinary we mean the dialogue between several disciplines and by transdisciplinary we mean dialogue that goes beyond established disciplines and includes also practical knowledge.



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Response

- a) We have opened up the description of the trans-domain team, so that it may involve a more heterogeneous range of participants (see <http://transtepapproach.wordpress.com/doing-transtep/convening-a-trans-domain-group/>). NGOs should be included, if possible, otherwise there is a need to involve experts or others that might represent a wide range of societal concerns. Because of the assessment review element and institutional learning there should still be a specific focus on including representatives of relevant established domains. The importance of including relevant policy makers should be emphasised.

In some cases an open consultation process may be valuable. Here, the trans-domain group might elicit responses to the work in progress in between the meetings. It might be useful to do a Delphi with a wider group of experts on the proposal by the trans-domain team in order to have wider quality control.

3.2 Conceptualisation of the integrated EST Framework

Experience/Feedback

- a) Some of the concepts were not entirely clear to the participants. In particular this regards the concepts 'assessment', 'meta-assessment', 'framework' and 'integration'. This is partly a glossary problem, but also partly based in a certain ambiguity in the way we regard our approach: On the one hand we see the proposed approach as a structured procedure that integrates assessments into specific advice, and on the other we see the approach as a learning and investigative process.

The assessment concept: 'Assessment' has technical, often quantitative, connotations. Even if assessment refers to measuring by a yard stick we do speak of ethical assessment, so we are justified in using it in a broader sense. 'Appraisal' appears to be less well-known outside the UK.

'Assessment'/'meta-assessment: This distinction was in several workshops not clear. The groups tended to start doing the assessment, and not only designing an assessment. In the testing workshops TranSTEP was only applied at the meta-assessment level, so this signalled a problem with communicating this distinction properly. In the full process the distinction will be more easily blurred because the trans-domain group might also be part of assessment activities. Moreover, in order to design an assessment you would also need to imagine what this assessment will look like in reality, so some substantial discussion might be needed. However, logically, these steps should be kept separate.



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The framework concept: Some participants expected something more structured due to the way they understand the term 'framework'. Therefore it is proposed that this term should perhaps not be used for the TranSTEP approach.

Our approach is implicitly *ex ante*. Both in the biofuels, cloud computing and Brussels workshops the need for 'ex post assessment', 'iteration' and 'monitoring' was mentioned. There is no reason why a trans-domain dialogue approach could not be used also in such a setting, because also here there needs to be interdisciplinary criteria/indicators for the monitoring.

- b) Scope: We have wanted to be modest in what our proposal is able to achieve. We have presented it as an approach specifically for emerging science and technologies, and only for issues that are contested and uncertain. However, we have been asked, for instance in the Brussels workshop, about why we want to limit it this way. Moreover, it has been suggested that our approach is very close to traditional policy evaluation.

Response

- a) We have developed a glossary (<http://transtepapproach.wordpress.com/doing-transtep/glossary/>).

We discussed whether TranSTEP should be presented as an approach for societal assessment or social appraisal of EST, or an approach for assessment in general. However, a basic assumption in EST-Frame is that there is a general need for increased deliberation and dialogue on situation analysis and method choices – across the domains and as such we should avoid to imply that TranSTEP only holds for societal assessments. Taking into account that 'assessment' is more generally used, also in the context of more qualitative domains such as ethical assessment and technology assessment (TA), we decided to keep this term. However, we have provided a clear explanation on the website, and will aim to clearly define this term whenever we use it. This explanation will include briefly presenting what we believe can be included in this term (from risk assessment, to ethical assessment, to consumer studies and participatory methods). We now avoid using the term 'framework'. Even if we attempt to clarify the concept, it appears that some confusion at the start of the process is probably unavoidable. Moreover, because the participants are expected to co-create the process, there needs to be a certain flexibility in process, which extends to some conceptual flexibility as well.

- b) We have relaxed the requirements for when the EST-Frame integrated approach can be used and mention also that it can be used *ex post* and outside the scope of contested emerging science and technologies.



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3.3 Situation analysis

Experience/Feedback

- a) It appears that in particular people with a background in STS are sympathetic to the situation analysis and framing part of the process, arguing that even if a trans-domain process does not achieve anything else but a common problem definition, this is an achievement in itself.
- b) In none of the workshops was there any systematic discussion of situation analysis. The situation analysis checklist was not used (see Deliverable 6.1., Checklist A: Answer these questions for the Integrated EST Framework process). The groups discussed general issues. Many of the issues that were raised were related to situation analysis, but they were not discussed as part of a systematic analysis. In the nano-food workshop a pre-defined structure was used for identifying key concerns in the field (i.e. HSE, consumer acceptance, transparency, etc.). These would apply to any particular case. In the synthetic biology and biofuels workshops the participants themselves made such a structure. The situation analysis and problem framing part of the workshops were observed to take a long time. In all of the workshops there was a certain feeling (in some cases weak, in other cases strong) of uncertainty about whether this was so open and negotiable that it would not end up with anything useful.
- c) The workshops varied with regard to how much the topic was framed from the organisers' side. Where the topic was kept very open the starting discussions were at points quite confusing and the participants were at times a bit bewildered. But even where it had been quite specifically defined (the European cloud strategy) this was opened up a lot by the participants.
- d) A client: We were in the biofuels workshop encouraged to take into account the client's needs (and regulatory context). This also resonates with feedback from members of the EST-Frame advisory committee and the Brussels meeting. Not least is this necessary if the integrated assessment is to have real impact and not only be yet another assessment in the heap.

Response

- a) We do not need to recommend always a full scale integrated assessment process (all the way to making an unanimous recommendation). Just bringing people together to discuss and work towards achieving a joint understanding of problem definition and assessment needs and designs is a good achievement in itself. As long as decision makers are involved in this process there might be several decision points down the line, and these will not necessarily be taken by the trans-domain team.
- b) We have developed more concrete guidance on how to facilitate situation analysis (). We accommodate both the users that wish to improvise more and those that prefer more structured tools by including further resources as optional and not an essential part of the method.
- c) It is important to allocate sufficient time for this initial discussion. Therefore, it is proposed that situation analysis would require a two-day meeting in a full process.. It is also important to allow for

sufficient open discussion in this section, but at the same time guide the group towards a workable problem definition.

- d) We recommend that an integrated workshop should be related to a specific actor, which arguably needs to take an integrated view (e.g. an expert committee, a ministry, an industry consortium, a council, etc.). This will ensure that there is a perspective from which to start the situation analysis, creating more clarity for the participants. However, the client's initial perspective should not limit the freedom of the participants to explore and challenge this perspective.

3.4 Problem orientation

Experience/Feedback

- a) The biofuels workshop did not present a very specific problem to the participants. In the synthetic biology and nano workshops the participants wanted a more specific topic for doing an integrated assessment, and therefore proposed a case. In the cloud workshop the case was redefined and the problem ended up being about data security and privacy governance instead of the original problem framing. Both from a theoretical and practical point of view our problem concept is problematic. On the one hand the problem focus is necessary in order to avoid ending up in abstract discussions that mainly express disciplinary perspectives; on the other we need to clarify what we mean by a problem.
- b) Should the TranSTEP approach start with a focus on technological solutions or on societal needs? This question was brought up, e.g. in the nano workshop, with reference to the need to avoid leaving the agenda setting to the technologists, and rather let technology choices be driven by societal needs.

Response

- a) In order to clarify our understanding of a problem we conducted a literature review. Jan Schmidt (who attended one of our testing workshops) provides in his article 'What is a problem?' (2011) a useful definition of an interdisciplinary problem:

"Interdisciplinary problems are regarded as being external to disciplines or to academia. They are primarily societal ones that are (pre-) defined by society, e.g., lay people, politicians, and stakeholders. This approach to the societally relevant starting point of research activities comes close to today's science-based enterprises such as technology assessment (TA), sustainability science, and global chance science, which can be considered as examples of this type of [interdisciplinarity] [...]. Problem-oriented [interdisciplinarity] reflects on and revises the problem perception; the starting points of science and technology programs are at the focus. This is interlaced with problem-framing and agenda setting [...]"² (p. 257).

² See Schmidt, J. (2011) What is a problem? *Poiesis and Praxis*, 7(4): 249–274.

In this sense we do not necessarily regard a problem as a negative state of affairs, only as an issue that some institutional actor wants and needs to have enlightened as a step towards taking decisions. Someone with agenda-setting authority must formulate the situation as one that needs resolving and there must be potential decisions that ultimately needs to be taken. The focus should then be on assessments/actions that would allow one (or more) decision maker(s) to arrive at decisions, on developing policy, legislation, funding, marketing, purchasing, or otherwise. Something needs to be at stake for someone who will make a decision, and this needs to be at a level where there are identifiable benefits and risks.

A lack of a perceived decision to be taken will likely create confusion in an integrated assessment process because it will appear to lack practical implications. In the EST-Frame workshops the discussion became more constructive once a decision situation was identified.

With this approach we could also answer the question of how long a trans-domain group should exist. In the nano food workshop it was highlighted that there is a need for a certain group continuity in order to build up trust. At the same time the group must have a concrete function. A general answer to question of the duration of the trans-domain group is that it should exist as long as there are relevant identifiable decision points to which the group could assist.

- b) The consortium agreed that our approach does not start with identifying societal needs and then looking to solutions. In practical terms, such an approach would make it much harder to identify the potential participants in the trans-domain groups, because the nature of the options for solving the societal need (political, economic, technological, spiritual, etc.) might be extremely diverse. We acknowledge that such need-defined processes are valuable, but the approach we have developed in the EST-Frame project is tailor-made primarily to technological evaluation. This means that we allow the issue to be defined as technological, - but then it is still possible to do a critical benefit assessment of whether this technology indeed contributes to meeting societal needs at all. It might in the end turn out that a specific technology project/application is not justified compared to other (non-technological) options.

3.5 Method reflection

Experience/Feedback

- a) There was no systematic method reflection in any of the workshops. There was no presentation of a range of methods from the start.
- b) Late in the cloud workshop a list of methods were generated using the Doingforesight tool³ developed by the Danish Board of Technology as a support instrument for technology assessment activities/projects. It appeared that this was too specific for the group. The group had reached a

³ <http://doingforesight.org/>

sophisticated situation analysis and the list of methods presented from Doingforesight did not connect with this.

- c) In none of the workshops was there any specific analysis of existing assessments. This is due to time restrictions in the testing processes.

Response

- a) In the assessment design meeting the full range of potential methods (expert based and deliberative) should be briefly presented, opening up for more creative reflection on methods in the group and avoiding the slip into the default methods that are most familiar to the group. Describing the range of methods we have in mind at an earlier point in the process may help broaden the discussion, and might make up for limited participation in the workshops from some domains. At least when it is clear that not all domains will be represented in the integrated workshop a presentation of the range of methods should be given emphasis.
- b) In a full TranSTEP procedure there might be sufficient time to use resources, such as DoingForesight, in a more productive way, and at an earlier point in the method reflection process. However, DoingForesight and similar resources cannot substitute for the value of sophisticated situation analysis. In many cases considering a list of methods might be sufficient for method reflection.
- c) This will be feasible in the full TranSTEP process.

3.6 The workshop process and facilitation

Experience/feedback

- a) Workshop participants commented that what was brought up (in terms of content and process suggestions) reflected the interests of the participants, so that the result in a sense would be arbitrary (since it is dependent on the composition of the group).
- b) Sub-groups: In all the workshops using sub-groups worked really well. This was particularly apparent when the plenary discussion got stuck because of confusions, etc. it was helpful to make smaller groups with clear task descriptions.

Response

- a) This is necessarily so and that is why it is important to have a wide range of participants so that different visions, perspective and values are present in the discussion and so individuals can challenge each other. However, in particular controversial cases it might be advisable to explicitly ask for input on the minutes from the meetings, so that the group can consider challenges also from the audiences outside the trans-domain group.
- b) This is recommended as a process design option.



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3.7 Other issues

Experience/feedback

- a) The role of foresight / anticipation / monitoring: It has been mentioned that foresight should have a more central part of the approach. The 'emerging' aspect of 'emerging science and technologies' seems to call for some kind of anticipation. Moreover, including an anticipatory element would also be called for if we want to position our approach within the current paradigm of responsible research and innovation (RRI). On the other hand, it has also been mentioned (in the biofuels, cloud and Brussels workshops) that assessments should be dynamic, responsive and iterative and perhaps even be used for monitoring, identifying best practices, changing courses along the way, etc.
- b) Institutional issues: This approach can function in many cross-cutting settings. It can also be used to open up established disciplinary assessment institutions. In the Brussels workshop we were advised to look into detail about how we could open up the institutions, what would be the barriers to doing this and how would it be possible to open windows for more trans-domain dialogue. Barriers could be of a legal character, to which we would need to adapt. For instance, it might not be possible to open up risk assessment to all kinds of integrated designs because this conflicts with the risk assessment / risk management distinction. When we recommend our approach to policy makers we need to take into account the legislative and policy dimensions shaping the possibilities to carry out an integrated approach.
- c) To what extent do we want to give detailed advice on what the trans-domain group should do, for instance, whether they should consider alternatives to the technology options, whether they should do a benefit assessment, etc.? There appeared to be different preferences in this regard.

Response

- a) Foresight is seen to be a valuable approach but it is potentially too specific a tool to give particular prominence in the approach, i.e. above other approaches that are available.. However, it is one of the domains that should be represented. Moreover, we do encourage iteration and monitoring in order to be anticipatory and responsive. However, this depends on the problem to be addressed in the group.
- b) We highlight that there are some success criteria for such an approach. Where there are legal barriers it cannot be used in full. We also addressed this issue specifically in the last end user workshop (please see next chapter).
- c) There might be good reasons to recommend certain specific elements, but the approach need to be open so that each group can decide. We have therefore solved this tension by providing resources (<http://transtepapproach.wordpress.com/doing-transtep/situation-analysis/situation-analysis/>), but not presenting them as mandatory elements of the approach.



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3.8 Suggested outputs/use of EST-Frame

Experience/feedback

In the different workshops a number of different requests and suggestions were put forward by the end users about how our approach can be useful:

- Produce a practical guide on how the different domains work and how information from the different domains can be balanced and integrated.
- Produce a guide on ethical review for nanotech and biotech projects in Horizon 2020.
- OECD is currently developing impact assessment guidance. They always include the benefit side in assessments. EST-Frame should develop a standardised model.
- The Trans-Atlantic trade negotiations: Integrated sustainability impact assessment (SIA) must be in place before any deal can be made. In this international activity there are high ambitions but very few tools (and even very few agreed upon definitions). The SIA is supposed to refer to shared values between the parties, but in these relations there is a governance gap. EST-Frame could provide guidance.
- The UN international integrated assessment is another potential client. UN Institute for Crime (UNICRI) published in 2011 a report on biosecurity in NanoBio (incl. synthetic biology) where they ask for joint assessment methodologies. Joint here refers to inter-governmental. Joint assessment methodologies already exists for radiation in the International Atomic Energy Agency (IAEA). EST-Frame could contribute to these discussions in the nano-bio field.
- EST-Frame's approach could be used to analyse what questions have been posed and answered in a research and innovation process.

Response

These are all very interesting suggestions from the workshop participants, however, it is outside the scope of the EST-Frame project to pursue these possibilities. The project members will explore the options for developing this work further and how such work could respond to the suggestions above.

3.9 Integration dimensions

During the first phase of EST-Frame work (Deliverable 1.3), we developed a matrix for different integration dimensions that allowed us to position the Integrated EST Framework. We also analysed all the testing workshops on this table. Table 1 below summarises the observations and reflections from the testing processes related to each dimension.



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Integration dimensions	Focus in Integrated EST Framework	Observations and reflections from the testing process
Not isolating one topic at the expense of the whole (problem-orientation)	Essential to the approach	See discussion of a problem above. Three of the workshops started by asking the participants about what they saw as the crucial issues in the field. These then turned out to be the dimensions on which the case was assessed, and the integration aspect was exactly this considering of all dimensions of the problem.
Integration among assessments (integration)	Essential to the approach	This was achieved through inclusion of experienced participants, but there was no explicit discussion of the assessment basis. It is not surprising that we did not succeed in integrating existing assessments in the nano and synthetic biology workshop (where there were specific, new cases). In general it was not realistic to include specific consideration of the existing assessments in a one session workshop like the testing workshops. But in an iterative workshop format the secretariat could investigate the current assessment status in between meeting and present to the trans-domain team.
Explicating assessment framing (transparency & reflection)	Essential to the approach	Very much of the discussion of biofuels and cloud computing revolved around framing the problem.
Reflective use of methods in assessment (transparency & reflection)	Essential to the approach	See reflections on methods above. Because of the time restrictions in the testing workshops they varied with regard to how far they came in discussing methods.
Inclusion of values into assessments	To be considered in each case	Human rights were important in the cloud workshop. Consumer values important in the nano workshop. Philosophical questions came up about synthetic biology.
Inclusion of narratives into assessments	To be considered in each case	The workshops revealed that there is a need for being sensitive towards a plurality of lay ethics; including visions, scenarios, narratives, hypes, etc. justified. Focusing specifically on narratives is too narrow.
Integration of broader experts/stakeholders/the public into assessments	To be considered in each case	There was a call for including stakeholders and policy makers, but not so much the public. Though several recommended public engagement activities.
Integration of governance concerns into assessments	To be considered in each case	Several of the workshops recommended including policy makers. Policy trends did not come up, and there was no real prompt to discuss how assessments could be responsive to trends. However, several suggested that assessments should be iterative because of quick changes in the technological and political context.



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There has generally been overwhelming support for the idea of trans-domain integration at the start of assessment.

Even if it is possible that the trans-domain team could end up with making an integrated recommendation that a disciplinary assessment (such as a risk assessment) needs to be carried out, it would be important not to simply commission out such an assessment. Members of the trans-domain team should take a part in this risk assessment, so that it is carried out in line with the trans-domain problem understanding.



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4. Feedback from the final end user workshop

Based on the reflections and feedback we received in the testing workshops and the Brussels workshop the Integrated EST Framework was modified into the TranSTEP approach. In a two-day workshop in Oslo in October 2014, the EST-Frame consortium discussed the TranSTEP approach with twelve end-users from different countries and domains (see Annex B for programme).

The version of TranSTEP discussed in the Oslo workshop was a preliminary version, but it was close to the one presented in the introduction of this deliverable and the final deliverable 6.6 (the TranSTEP website). The focus of the discussion in the workshop was on implementation, but we also received feedback on the approach itself and the website. Below we present the most important learning points from the workshop. We do not report all comments or opinions that were voiced by individual participants, but focus on those that seemed to be shared by several. The feedback on the design of the website will not be reported here, but has been taken into account in the final design of the website. We focus here on feedback that has motivated adjustments of the TranSTEP approach. The purpose is to justify in a bottom-up fashion the final approach presented in EST-Frame.

4.1 The TranSTEP concept

TranSTEP was seen as useful and important in different respects. There was broad support for the need for bringing together different assessment perspective into integrated assessments that are responsive to a wider range of societal concerns. Moreover, it was seen as useful in that it aims both at opening up for participants to investigate and connect to each other's agendas and disciplines through situation analysis and in being orientated towards a decision-maker or institution that has to decide upon a course of action. The explicit weight on pluralities of framings opening up for a multitude of viewpoints was also recognised as a positive and integrating feature.

Experience/Feedback

- a) There was a general opinion that TranSTEP need not be limited to controversial new and emerging sciences and technologies. The approach might be equally valid and useful for new situations involving uncontested technologies, but where the policy relevant issues are rendered difficult to respond to because the traditional assessment bodies and domains lack mandate and/or methods to provide relevant advice.
- b) TranSTEP consists of features that were known to all. This allowed the participants to easily understand and relate to the approach, but it also requires that the added value of TranSTEP need to be clearly communicated.
- c) The approach seemed idealised. For instance, the description of "integration of results" might be too simplistic and does not accommodate for the difficulty of integrating different values, perspectives and accumulated uncertainties.



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d) For some participants the approach appeared time-consuming and costly.

Response

a) The empirical basis of TranSTEP is from the fields of emerging science and technologies, but the consortium agreed that this delimitation should not take a prominent role in the communication of the approach.

b) We have added a section called 'What is new about TranSTEP'.

c) We have added some practical, realistic examples to illustrate how this may work out in real applications of the process. We have also added some boxes referring to challenges in implementing the different elements of the approach.

We have also provided links and reference to more tools as optional resources to provide help in carrying out the different elements of the approach, such as integration of results. However, our experience from the testing processes reveal that groups may want to solve these challenges simply by dialogue, and not by following detailed guidance. In this case an experienced facilitator is important.

Finally, we also stress on the website that the result of the process will always be an intermediate step in a broader epistemological process where 'the truth' will never be reached. There needs to be a humility about the results, where the results mirrors the qualities of the dialogical process. The quality of this process will determine the validity of the integrated result, and will vary according to the problem or issue being examined. In this respect the TranSTEP approach is equal to any other committee deliberation process.

d) We discuss at the website the flexibility of the approach related to the use of time and resources. However, it must be clear that resources must be available to organise meetings in the group.

4.2 Specific feedback on the approach

Experience/Feedback

a) Engineered consent should be addressed and thematised as a potential problem in the TranSTEP. TranSTEP should also address how to proceed with participants voicing fundamental opposition and refusing to acknowledge the contributions from other domains: How can strong and continuous minority dissent be accommodated within the current approach?

b) TranSTEP needs rules, guidelines or procedures for selection of participants.

c) In general more clarity is needed in the way that it is presented. This could be around 'practical aspects' to things like the situation analysis or other steps, presenting clearly how, why and what should be done. Alternatively, it could be in general terms of just being more explicit and enriched.



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d) One major priority, as indicated by several participants, is the need for more explicit detail on the added value of TranSTEP. Elements that should be highlighted according to participants: what TranSTEP is for, define the value proposition for potential users, what is the difference from other approaches, what are its main pitfalls and barriers, identify institutions who might find this useful (considering the value proposition).

e) Participants asked for more clarity about the process: how flexible is it, for example, how much money would it need, who should be involved. Also, how fixed are these supposed to be? They suggested more clarity around 'practical aspects' to things like situation analysis, and argued that the presentation of TranSTEP should be more explicit and detailed. Participants argued in one of the sessions that most of the barriers to TranSTEP relate to the clarity of the approach and being clear also about what it is and what it adds.

Response

We have taken all these points into account when finalising the approach as it is presented on the website.

a) Engineered consent is directly addressed as an issue under the final step of TranSTEP, 'Results Integration' (<http://transtepapproach.wordpress.com/doing-transtep/results-integration/results-integration/>)

b) More information is added on <http://transtepapproach.wordpress.com/doing-transtep/convening-a-trans-domain-group/convening-a-transtep-group/>.

c) Examples from the case studies are integrated into the different steps and specific challenges to the different aspects of TranSTEP are highlighted in boxes on the website. At the end of each page on the website, we have included a special section describing the intended outcome of the described phase.

d) More information is added on <http://transtepapproach.wordpress.com/why-transtep/why-transtep-2/>.

e) An improved version of the process map, description of the TranSTEP approach, and why use TranSTEP have been provided to the website. These updates are based on the feedback from the end-users and should be sufficient to cover earlier lacunas concerning practical aspects.

4.3 The uses of TranSTEP

Experience/Feedback

The end users discussed different ways that TranSTEP could be applied and were encouraged to consider TranSTEP:



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- as a special cross-domain project in the established domains (such as in an ethics committee or risk assessment committee)
- as a project in a ministry, a governmental agency, or the like
- as an ad hoc group established in different public (for instance a ministry) or public/private settings (for instance a technology network)
- as a project in private organisations or NGOs
- other

There was a general sense that TranSTEP processes should be conducted by independent committees and organisations in order to have sufficient public legitimacy in the outcomes. Organisations such as the Institute for Technology Assessment and Systems Analysis (ITAS) in Germany, the Danish Board of Technology, the Norwegian Board of Technology were all suggested. These committees were seen as being one step removed from the political process, but still close enough to policy and technology decision making to have impact.

Other institutions (consultancy firms, governments, advisory bodies, companies involved in public consultations) were all mentioned as possible clients. Such institutions would likely be needing resources for training or executive assistance in using TranSTEP.

Some NGOs (those they were not direct lobbying for one particular interest) would be a target user, but for most such institutions costs would be a problem.

Some end user suggested that TranSTEP could be used

- as a corporate social responsibility (CSR) or responsible research and innovation (RRI) approach
- as an approach for ex post evaluation and monitoring
- as a form of horizon-scanning activity where issues that might become controversial are surveyed and screened;
- as a preparation of impact assessments
- in situations where there is a question of prioritization of different kinds of risks that are not easily quantifiable or comparable.
- as a tool to find a consensus that there is an issue or a topic to be discussed – even if the different perspectives merge or consensus on action is reached
- as a communication tool aiming at creating an forum for discussion rather than guiding an assessment process
- as a conflict resolution tool
- as a checklist for quality control of assessment processes
- in preparedness organisations



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TranSTEP can be used by regulatory agencies, but these often have a specific mandate and a standard operationalised method. The role of TranSTEP here would rather be to fulfil specific public functions of the agencies.

The participants at the workshop suggested that a practitioners' forum could be established with the aim of developing training and shared learning activities. Future experiences with TranSTEP should be included in an experience base. These cases can contribute to increased understanding and identification of issues that ought to be addressed. Examples here were 'black swan technologies'/events and industrial security training. In order for this to happen someone needs to champion the approach and be a driver for new developments.

Response

This input will be important for the follow-up strategy of EST-Frame. We have also included more examples of potential uses on the website (<http://transtepapproach.wordpress.com/when-should-transtep-be-used/who-what-and-when/>) and we have included more detail for how the EST-Frame partners may assist in future TranSTEP processes.

4.4 Enablers and barriers to successful application of TranSTEP

Experience/Feedback

There are different enablers and barriers for the start-up of a process and for the process itself. In the start-up phase, TranSTEP will be most useful for issues that are not too much locked into a societal dead-end such as the discussion of genetically modified organisms has been. Moreover, the use of the approach is driven by the need to make a decision and a policy or decision-making context where the results can be implemented. The start-up of TranSTEP might also be hindered by a negative view on more regulation and a possible risk aversion amongst problem-owners when handling difficult issues.

Resources such as time and money may be barriers to using TranSTEP, but we have seen from established advisory institutions that such barriers are often overcome if there is a perceived need. The legitimacy of the organisation organising the TranSTEP process will also either be a barrier or an enabler.

A barrier for applying TranSTEP may be if its position is perceived to be in competition with other established advisory structures. Its relative position and mandate may need to be clarified at the start of the process.

As TranSTEP is not yet a well-known concept it has no prima facie legitimacy other than the legitimacy we are able to provide it with through the EST-Frame project's work, as well as how it relates to other similar developments in science, technology and innovation policy. Further validation can only come from doing TranSTEP and analyses of the processes and outcomes of these applications. Successful validation will be an enabler for TranSTEP.



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TranSTEP would also benefit from showing that it can add to the professional development of its participants.

Further enablers for TranSTEP would be

- good diagrams
- prescriptive details for practitioners and problem-owners
- toolboxes for different audiences
- additional resources (forums, training, partners)

Response

Some of this feedback (as better descriptions of the process) is addressed in the website. More information on success criteria has also been added (<http://transtepapproach.wordpress.com/doing-transtep/what-are-success-criteria-of-a-transtep-process/>). Lessons from this feedback also informs the action plan for the further use of the approach.

5. Conclusion

The EST-Frame consortium believes that the workshops have validated the main concept and have helped us develop an approach that is workable and well-justified. The TranSTEP approach is not a revolutionary new approach, but is a specific proposition to make assessment and governance of technologies more integrated. This has been called for through decades, but is still not widely carried out. The TranSTEP approach will need to be put into use in order to prove its long-term validity. We believe that the EST-Frame project has provided the necessary basis for such future use.



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Annex A: Template for reporting from testing workshops

1. Preface (1/3 page)
 2. Contents
 3. Summary (1/2 page)
 4. Introduction (1 page)
 5. Description of the process (1-2 pages)
 6. Experiences from the process (1-2 pages, input from 1st order analysis)
 - a. What worked well? What can explain this?
 - b. What did not work well? What can explain this?
 7. Results from feedback forms (1-2 pages)
 - a. All numbers to be reported
 - b. Reflections on the numbers and open questions
 8. Analysis on the integration dimensions (1-2 pages) – input from 2nd order analysis)
 9. Reflection on the Integrated EST framework (1-2 pages)
 - a. Strengths
 - b. Weaknesses
 - c. Suggested revisions for next trial
 10. Conclusions (1 page)
 11. Summary/recommendations (1 page)
- Appendix 1: Agenda
- Appendix 2: Participant list



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Annex B: Program for end-user workshop

Program EST-Frame end user workshop, Oslo, 29. – 30. October 2014:

October 29

11.30 – 12.30: Registration and standing lunch

12.30 – 13.30: Introductions

- Welcome and presentation of the participants
- Presentation of TranSTEP and of how TranSTEP may be applied in the cases of nanotechnology in food, synthetic biology, biofuels and cloud computing.

13.30 – 14.30: First group work session

- In your opinion, where would an approach like TranSTEP be most useful?

14.30 – 15.00: Plenary presentations

15.00 – 15.30: Coffee/tea and fruit

15.30 – 16.30: Second group work session

- What are barriers to and enablers for implementing an approach like TranSTEP?

16.30 – 17.00: Plenary presentations

17.00 - 17.30: General discussion of the implementation of such an approach.

19.00 Dinner

October 30

09.00 – 09.10: Introduction day 2

09.10 – 10.30: Third group work session

- If you were to organise a TranSTEP process, would you have a need for additional material or practical resources on the TranSTEP website? Are there changes you believe should be made to make the approach more useful?

10.30 – 11.00: Coffee/tea

11.00 – 11.45: Presentation + discussion

11.45 – 12.15: How to continue the work on integration in assessments of emerging science and technology in the future? Plenary discussion.

12.15 – 12.30: Evaluation of the meeting

12.30: Adjournment and lunch