



Training Showcase: Knowledge for Climate

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1 Introduction

This showcase will describe key points of collaboration between science, industry, and government on the basis of the Dutch Knowledge for Climate (KvK, from the Dutch name Kennis voor Klimaat) research programme with the aim of providing insight in how to put Responsible Research and Innovation (RRI) into practice. Characteristics of this programme are that it was question-driven, transdisciplinary, and that much effort has been put into the practical application of the resulting knowledge.

The KvK programme was started in order to make the effects of climate change comprehensible and manageable for the Netherlands. Protection against flooding from rivers and the sea has always been the number one priority in the Netherlands. In addition, other incidents that result from changes in weather extremes have detrimental social and economic impacts. There are many gaps in the knowledge about the vulnerability, exposure, flexibility, and the resilience of physical and social systems. Since the 1990s, these gaps have been increasingly highlighted, with particular emphasis on the local and regional impact of climate change (www.ipcc.ch/). The Knowledge for Climate programme wanted to confront this problem by identifying and addressing knowledge gaps, and developing reasonable options to deal with the necessary adaptation to climate change. Without looking at ways to slow climate change, the aim was to identify how 'we' should deal with the changes that we know will happen. In other words, the focus of the Knowledge for Climate programme was not on climate change mitigation (eliminating the causes of climate change) but on climate change adaptation (adapting to the new conditions).

The learning points that shall be discussed within this showcase are:

1. A research programme of €80 million can fulfil the role of a knowledge broker.
2. Soft skills are indispensable for successful RRI projects.
3. That a temporary programme without vested interests in its own continuity can deliver results (and perhaps better than programmes with vested interests).

This document retrospectively describes the design and implementation of the KvK programme from an RRI perspective. Interviews were conducted in order to determine the interviewees' reflections about the programme through questions such as: "What parts of the Knowledge for Climate programme make you proud?", and "What would you do differently in the next programme?" It is important to stress that at the time this showcase was written the research programme had been concluded for several years. Thus discussing detailed information about the programme with the interviewees was not possible, nor was it the purpose of the interviews. Detailed information about the programme to put this showcase within the necessary context is provided by the following report: Driessen et al., 2015, Knowledge for Climate 2008-2014, accountability and results; Knowledge for Climate Foundation, Utrecht. For training purposes, we have deliberately put the story of KvK into a process and outcome framework developed by the RRI Tools project, even though this framework post-dates KvK itself.

2 Knowledge for Climate

2.1 Vision, mission, and objectives

The Knowledge for Climate programme envisioned increasing knowledge and knowledge organisation for climate proofing the Netherlands. It sought to transform the vulnerability of the Netherlands into opportunities to make the Netherlands more resistant to climate change, and to use the accompanying knowledge and experience gained to attract businesses to the Netherlands. The programme also aimed to improve the export position in climate and delta technology.

Co-creation was central to the Knowledge for Climate programme's vision: formulating the research, solutions, and results through a dialogue between practicing professionals and scientists working side-by-side was key. The underlying idea was that the scientists' and professionals' work would complement each other. Scientists are more capable of looking beyond the near-future and contributing to the design of scalable solutions that do not simply address a specific problem or locality. Professionals would be able to keep the scientists on topic and ensure that there is not too much focus on theoretical models and abstractions.

The mission of the Knowledge for Climate programme was described in the proposal adopted in 2007 by the third Balkenende Government as:

Making available scientifically-based and practically-relevant knowledge that supports governments and businesses together – in the context of the effects of climate change – to make informed spatial planning and investment decisions.

These three central objectives were derived:

1. Developing knowledge to protect of spatial planning investments from climate change.
2. Strengthening of the knowledge infrastructure in the field of adaptability to climate change.
3. Development of business opportunities in collaboration with the private sector.

The purpose of developing this new knowledge was not solely to influence policy in the short term but to offer different approaches to all those who want to, or simply need to, decide on the future spatial planning of the Netherlands. Research and innovation should serve as instruments to support policy.

2.2 Organisation, funding, and instruments

The government proposed a budget of €50 million in 2007 for a national research programme that was to achieve the objectives described above. One demand was that at least another €23 million would be co-financed by the private sector. The programme ultimately managed to raise in excess of €30 million through co-financing. The Knowledge for Climate Foundation was established in 2008 to oversee and manage the programme.

The research programme looked at eight hotspots (Phase 1) and 8 central themes (Phase 2) (see Section 2.3 for more information). The programme focused on the development of adaptation strategies in eight areas, called hotspots, which are vulnerable to the impacts of climate change. The knowledge that was to be generated and applied was determined together with the hotspot stakeholders. Each hotspot represented a policy institution (see Section 2.3 for more information).

More than 75 groups participated in the programme, including almost 60 PhD students, over 20 postgraduate students and more than 150 senior researchers. Moreover, more than 800 scientific papers have been published, 30 national conferences held, workshops and meetings have been organised. The website averaged 700 visitors per week and more than 17,000 Knowledge for Climate TV and other videos have been viewed.

2.3 Design and execution of the research programme

The research programme underwent an iterative process to formulate themes and distributing grants to achieve the set targets.

The approach was comprised of three main directions:

1 Development of regional adaptation strategies: hotspots.

The programme started with the formulation of the so-called hotspots: a municipality or region of great economic and/or ecological significance that is particularly vulnerable to the impacts of climate change. The board of the foundation selected these hotspots in collaboration with scientists and policymakers. The eight hotspots represent the most important area types in the Netherlands: Schiphol mainport, Haaglanden region, Rotterdam Region, major rivers, South-West Netherlands Delta, shallow waters and peat meadow areas, dry rural areas and Wadden Sea. The aim was to identify problems that are caused by climate change and, for each area, develop an adaptation strategy.

Hotspot project teams. Each hotspot coordinator – in most cases a representative of the local municipal or regional government – formed a hotspot team with representatives from water authorities, municipalities, provinces, universities, and other stakeholders.

Articulation of enquiries. At the start of the programme, the members of the hotspot teams determined their most urgent knowledge needs in the area of climate adaptation. To assist in the formulation of these knowledge needs, the Knowledge for Climate Foundation organised debates and meetings with experts. In addition, the hotspots organised stakeholder-meetings where, 1) Interested parties were informed about Knowledge for Climate and knowledge co-creation, 2) climate change adaptation in the region was put on the agenda, and 3) specific questions on climate change and local/regional adaptation strategies were discussed. In total, this phase included 42 projects.

“We, as a company, are focused on a specific, useful result. The result is more accurate meteorological information that contributes to the safety of air operations”.

Peter van den Brink, coordinator of the Schiphol hotspot

However, the articulation of enquiries was more local and more limited than expected and hoped. This led to a change of approach in the next phase of the research programme.

2 Extension of knowledge development: selection of themes.

This second phase of the research programme focused on more innovative research on adaptations to climate change. To promote integration in the research programme, eight research themes were formulated by knowledge institutes. In addition, the hotspots were asked to draw up a list of important research questions that were then compared to the research themes. This created a list of almost 200 questions and themes. Hotspot representatives and scientists condensed that list to the eight relevant research themes, which have been crucial in the drafting of regional and national adaptation strategies:

- Climate Proof Flood Risk Management.
- Climate Proof Fresh Water Supply.
- Climate Adaptation for Rural Areas.
- Climate Proof Cities.
- Infrastructure and Networks.
- High-quality Climate Projections.
- Governance of Adaptation.
- Decision support tools.

There were five substantive themes and three ‘cross-cutting themes’ that arched over and linked the substantive themes (Figure 1).

The hotspots decided which of these themes they would focus on and how they would distribute the available budget over them. The generic funding and co-financing was dependent on the interest of the hotspots; the greater their commitment, the more money available. In this way, the input of region-specific questions was guaranteed. In other words, the co-financing supported the involvement of ‘knowledge seekers’, here mainly policymakers, in the execution of the research. The researchers were forced to direct at least part of their activities towards the questions raised of co-financing institutions. Simultaneously, this resulted in the consortia having access to more resources for the generation and implementation of their research ideas. Governments, businesses, and NGOs were able to benefit, through a relatively small contribution, by participating in, and the resulting outcomes of, major research projects.

Universities, research institutes, and consultancy firms were invited **to submit joint pre-proposals for the research themes as consortia**. Entries were judged by a Dutch review committee, composed of scientific (scientists) and social (policy) experts. These committees selected one proposal per theme and asked the applicants to further develop their proposal in consultation with the hotspots. Based on these further developed proposals, the hotspots decided on the co-financing of their chosen themes. As a consequence, hotspots altered their selection of themes that, in turn, resulted in changes in their budget.



Figure 1. Hotspots and themes.

The developed proposals were then evaluated by internationally renowned scientists on their scientific worth, and by policy experts (senior employees of government agencies) on their social relevance and applicability. Through co-financing the researchers were forced to focus part of their activities on the questions of co-financing institutions.

In this second direction, the programme implemented a number of measures and deployed a number of operations, such as setting up steering committees (to assist and adjust where necessary), organising science-practice workshops, and conducting case studies. This stimulated knowledge co-creation and further aided realising the goal of generating knowledge that is not only scientifically practical, but also practically applicable.

3 Value creation.

To gain insights into the social impact and economic value of the knowledge developed, the 'value model' was developed. It distinguishes three distinct domains that are related to the three key objectives of the programme (Figure 2).

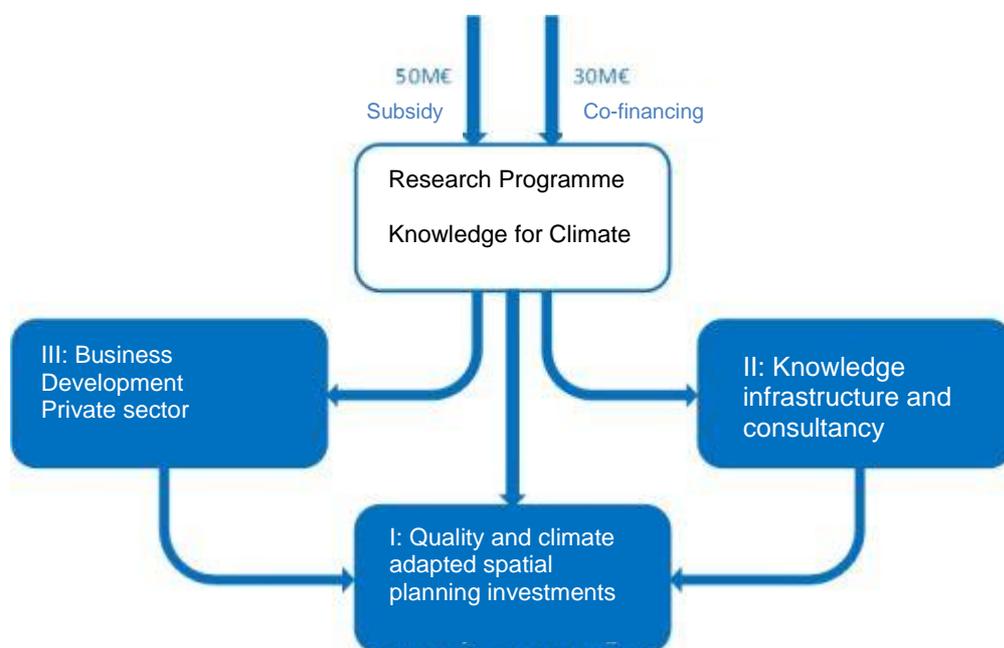


Figure 2. The Value Model

Within these three domains, government investments and co-financing by other public and private parties were transferred through the research programme into societal and economic value.

The first domain focused on contributing to high quality and climate proof spatial planning, which was an essential part of the original main aim of the KvK research programme. By

combining and integrating knowledge of climate adaptation with spatial planning and linking these to other (investment) issues, high costs in the long run could be prevented and investments recovered in other areas, such as quality of the living environment.

Through the second domain, the research programme contributed to strengthening the knowledge infrastructure and the quality of consultancy in the area of climate adaptation. This happened through building a good knowledge foundation via the researchers and those who were directly involved in the research. Through joint (multidisciplinary) knowledge development within the programme, universities and knowledge institutes could strengthen and increase their international position which created new business opportunities for engineering and consultancy firms.

The third domain of value creation was business development in collaboration with the private sector. Including businesses in KvK was an important step towards knowledge application. Therefore, there was a big focus on the translation of knowledge to businesses in the last phase of the programme.

3 Knowledge for Climate from a RRI perspective

This section will reflect on the Knowledge for Climate programme from the perspective of process requirements and outcomes developed in the framework of RRI Tools.

3.1 Reflection based on the process criteria

3.1.1 Diversity & inclusiveness

To promote intersectoral and multidisciplinary knowledge development, Knowledge for Climate projects were executed by consortia of parties: universities, applied research institutions, consultation firms, and corporations. They all participated as knowledge partners in the research. Scientists, policymakers, and administrators were the main participants. It is important to flag up that the focus was on scientists and on stakeholders who had invested in the projects rather than on the private sector or the general public. More interaction with the private sector is seen as important to the practical application of Knowledge for Climate, and Knowledge for Climate change adaptation more generally. In the mid-term evaluation of 2012, it was suggested that when citizens are themselves considered responsible for taking adaptation measures, awareness for these measures could be created by involving them in the research as researchers, sounding boards, or through other roles. From an RRI perspective it can be added that employing citizens as researcher could also contribute to the formulation of different or new knowledge questions.

Diverse actors were included at the start of the programme, so at a relatively early stage. Although the hotspots were defined before the start of the programme, the members of the hotspot teams articulated their knowledge questions based on the design of the study (see Section 2.3, articulation of enquiries). Reflections on the progress of the research programme by all interviewees show that the first phase was perceived as inclusive; the articulation of common questions was seen as a crucial part of this process. The second phase of the research (selection of themes) was seen as less inclusive and collective particularly by the policymakers. With hindsight, the policymakers felt that the eight themes ‘suddenly’ appeared and that the hotspots were asked to provide cases that fitted within the eight predefined themes.

learning points:

By involving a variety of actors in the early stages of the KvK programme:

- Knowledge questions addressed in the hotspots related to the needs of involved actors.
- This, in turn, resulted in commitment of these actors towards the programme.

Involving citizens could possibly have resulted in for example:

- The formulation of new knowledge questions.
- Raising awareness of the research subject, i.e. adaptation measures, and consequently stimulating citizens to take responsibility for taking these measures.

More involvement of the private sector could possibly have resulted in:

- More opportunities for cooperation, which in turn might have resulted in:
- long-term strategies in for example producing and up-scaling green roofs.

Designing the second phase to include actors (in a similar way to phase one) could have resulted in an inclusive second phase of the programme being experienced, resulting in:

- Commitment of involved actors.
- Less inferior results; results in accordance with the wishes and needs of a practical application.

3.1.2 Openness & Transparency

The research programme had, since its inception, both a Dutch and an English website which explained the programme, and its research themes and hotspots. The website also contained the results from the projects and a database with the acquired publications. Weekly posts, such as news and agenda messages, were put on the website, both from the programme and from the climate research community. Subsequently, the distribution of information was assisted by the use of social media: Twitter (2,800 followers in 2014), LinkedIn (820 members), and Facebook. On average, 700 visitors visited the website every week, consulting a weekly average of 4,000 pages. The number of requested publications grew during the course of the research: starting at 2,000 a week and growing to 10,000 per

week. This was partly due to the completion of a major series of publications as well as through increased website referrals to the online database of Knowledge for Climate due to the publications being well indexed on Google. Every quarter, an electronic newsletter was sent out with more than 3,000 recipients. On the advice of the mid-term evaluation, the programme invested additional resources to ensure the Knowledge for Climate's publication database would be available after the programme had ended.

Knowledge for Climate was focused on communication and the exchange of knowledge. To facilitate the transmission of scientific knowledge to practice and practical knowledge to science, national and international meetings were organised, training courses were prepared, books were written, films were made, and brochures, leaflets, and newsletters were widely distributed. The premise of Knowledge for Climate was that the results should be made public. For this purpose, the above-mentioned database was developed and made available after the programme had ended.

Although knowledge transfer and dissemination played an important role in the programme, the board admits that in future programmes additional approaches can be adopted as well. For example, the involvement of policy makers and politicians in processes of knowledge co-creation, communication of the sense of urgency for developing certain strategies, and the up-scaling of good practices to other practices.

Learning points:

- Having the website in both Dutch and English since the start of the programme resulted in open and clear communication about the practice details, processes of decision-making, and the results.
- More coordination and further exchange of information was desirable to strengthen the coherence and linkages between the research themes and to communicate the sense of urgency to develop strategies.
- Involvement co-creation.

3.1.3 Anticipation & Reflection

The goal of the project was anticipation; how could the Netherlands adapt to climate change? As a result, analysis of the current situation and context, and the envisioning of plausible futures and its variety of impacts was underlying the programmes' research. During the programme various workshops, conferences, and dialogue meetings were organised in which the exchange between scientists and practice had a central place. Based on these meetings, the course of the research was influenced; for example, new perspectives on how to act on climate adaptation and new ways in how to proceed with research were based on the reflection of actors from practice on preliminary results.

According to the reviewers and the hotspots, there was a lot of focus on technical measures, and significantly less on their implementation. Advice from these parties, is that communication between science and policy actors can lead to the relevant information reaching the policy makers and administrators.

Learning Points:

- A programme in which the objective/aim is to anticipate future change, and make this comprehensible and manageable results in:
 - Analysis of the current situation and context in order to:
 - envision plausible futures and the variety of impacts.
- Facilitation of dialogue between actors can lead to the information required to make the choices and investments reaching policy makers and administrators.

3.1.4 Responsiveness and adaptive change

During the course of the programme, the progress of the consortia was discussed twice a year and in 2012, Knowledge for Climate organised a mid-term evaluation. The eight consortia presented their research and (expected) results. Hotspots were asked to present the outlines of their adaptation strategies showing how the acquired knowledge would work in practice. Both the consortia and the hotspots described their interim and expected results

in a mid-term report. A team of national and international social and scientific reviewers assessed the reports in order to optimise the end result in 2014 in terms of scientific excellence and social impact. These reports and reviews formed the basis of the mid-term evaluation. Moreover, these reports and reviews were not only presented and discussed within the Knowledge for Climate community; they were also presented to, and discussed with, representatives from the scientific community, government, civil society, and business. According to the Knowledge for Climate Foundation, this process generated a lot of information and input for optimising the research and the impact of the acquired knowledge in the last two years of the programme, it also in increased participation from researchers and stakeholders inside and outside of the Knowledge for Climate community.

The approach of Knowledge for Climate based on knowledge co-creation – knowledge development through a dialogue between researchers and stakeholders – was praised by reviewers and seen as progressive. However, this innovative research also brought many challenges along with it. The mid-term evaluation criticised the knowledge co-creation process and made recommendations for its improvement. Most of the problems were related to the ambitious nature of the research, which attempted to deliver excellent scientific research, which was simultaneously directly applicable. This balance was often the source of friction in the research; for example, in the selection of case studies. Researchers preferred case studies, which would yield the most useful results from a scientific perspective, while other stakeholders wanted to see their most pressing problems solved in the short term with concrete solutions. In the second phase, hotspots were not always able to deliver appropriate case studies, possibly due to the fact that the hotspots did not feel that they had been involved in the design of the eight themes. Due to a lack of suitable case studies within the hotspots, some researchers found case studies in locations outside their own hotspots.

Learning points:

- Flexible process management, involving, for example, mid-term evaluations and the possibility to act on the outcomes, i.e. adjust the programme towards the outcomes of the evaluations, results in:
 - Input, feedback, and feed-forward from actors involved.
 - Change of the course of the research in response to actors' needs.
- Exchange of expectations between different actor groups and of possibilities within the structure, culture, and practice of actors involved, and understanding hereof is essential in order to have a shared and realistic view of potential outcomes (to avoid friction and disappointment).

3.2 Reflection on the effects, controversies, and challenges

3.2.1 Co-funding and research results

Issues surrounding co-funding:

“Regarding co-funding having to wait four years, while one case out of the scope, without fee, will yield short term results”

Interviewee 3

Sharing research results also caused friction. Policymakers asked for specific knowledge in the short term, while researchers sought excellent scientific, generic results. This was especially visible in the programme's PhD students. They were judged in particular on the scientific quality of their results, and (therefore) it was a big challenge to find good links to the Knowledge for Climate stakeholders.

“The scientist tells me that it is going to be so hot, like burning a 60-watt bulb on the asphalt. Well, how does that help?”

Interviewee 3

Even though the theoretical frameworks for integration of the thematic research were solid, applying these in practice in different consortia was difficult. However, one of the PhD

students demonstrated that producing scientifically solid results that are simultaneously valuable to stakeholders is not impossible. She successfully and continually involved stakeholders in the scientific research. According to all the interviewees, this was especially due to the so-called soft skills; the social skills needed to deal with different actors and to know when to act.

“Iterative process to incorporate insights throughout the research programme / steer towards initial target (contradiction?)”

Learning point:

- Soft skills are essential in establishing RRI practices.

3.2.2 Effects/impacts

The ‘hotspot’ approach has demonstrated how many of the actors, including road authorities, farmers, urban planners, and water and nature administrators, can cope with the impacts of climate change. They have been handed tangible adaptation options, providing them with practical options.

The research programme acted as a knowledge broker where different parties, (local) governments, policymakers, researchers, the Delta project, and so on, came together with questions. A success factor here was the network effect: the foundation became a big spider web in a relatively short time.

Positive outcomes from the programme include:

- Infrastructure (knowledge and skills; 50 PhD students who are now consultants, project managers, top administrators, etc.)
- Better investments (dams, water storage, etc.: better than if there had been no Knowledge for Climate.)
- Climate as ‘profit’- theme in sight within businesses

3.2.3 Controversies and tensions

- Hotspots had expected to get 1/7 of available resources.
- Some hotspots did not feel involved and sometimes simply felt like investors.
- Conflicting personalities: though not necessarily bad a bad thing as this also aided the group process.
- There was no insight/consideration for people utilising different systems and requiring different demands and results

3.2.4 Key challenges

- To change (political) context, bringing the process to a successful conclusion required responsiveness, vision, flexibility, etc.

3.2.5 What would you do differently if you could do it again?

- More time should have been taken to articulate the questions.
- Drawing up the questions should have been started earlier and involved more/ other stakeholders.
- Continuous connection between science and policy should have been established.

4. Workshop training exercises

Reading the showcase Knowledge for Climate as described above should prepare workshop participants for the training exercises described below. Ideally, participants are asked to have read the policy brief and the showcase in preparation for the workshop, but if the time schedule allows, this can also be done during the workshop. Since these workshop training sessions are intended for a semi-informed audience, a preceding plenary training session on ‘what is RRI?’ might be necessary to (re-) introduce the concept of RRI to the participants. A PowerPoint presentation is available to guide the training host and the participants through the workshop.

4.1 Exercise 1: Learning and Reflecting

Learning outcomes

At the end of this session participants:

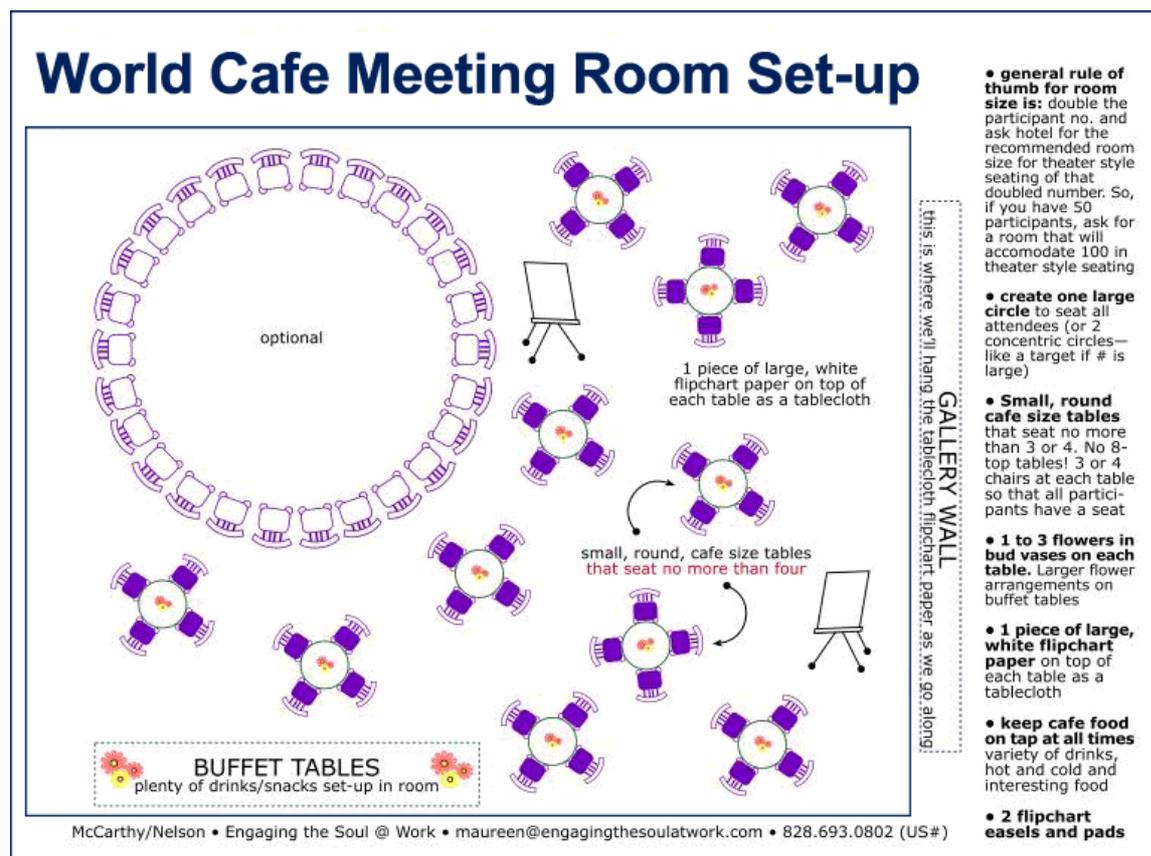
- Are familiar with the KvK showcase.
- Are familiar with the quality criteria for RRI practices.
- Are able to apply the quality criteria for RRI practices to the KvK showcase.
- Have gained insight in RRI and how to implement it in a research context.

Necessary materials and setting

Materials:

- screen
- computer/laptop
- training PowerPoint presentation
- hardcopies of kvk showcase
- hardcopies of RRI quality criteria (see appendix)
- tables
- chairs
- flip chart
- pens

setting:



The room should be organised so that a plenary setup is adjacent to a world café setting, with four tables.

1. Participants (re-)read showcase (15 min):
 - They pay particular attention to the section ‘Knowledge for Climate from an RRI perspective’
2. Participants (re-)read the RRI quality criteria (15 min):
3. The training host will assign one set of RRI quality criteria to each one of the four tables as follows:
 - Table A → diversity and inclusion
 - Table B → openness and transparency
 - Table C → anticipation and reflection
 - Table D → responsiveness and adaptive change

4. Participants read the assigned set of RRI quality criteria and apply it to the KvK showcase. They use the criteria in order to make an assessment of the showcase and its strong/weak points. They write down their findings on flip chart sheets (15 min).
5. When they are done, the tables rotate clockwise and repeat step 3 until all participants have applied all four sets of RRI quality criteria to the KvK showcase (45 min).
6. Plenary wrap up (20 min):
 - Participants reflect on what they have learned from this exercise and discuss briefly the most striking learning points.

Time	What	Who	Comment
30 min	Read the showcase KvK.	Individual	Preparation before start of the workshop.
30 min	Identify and reflect on learning points, including points that stood out and points for improvement.	Individual	Preparation before start of the workshop.
Exercise 1			
30 min	Presentation PowerPoint.	Trainer	
15 min	(Re-)read and discuss the showcase KvK.	Individual/group	
15 min	(Re)read and discuss the RRI quality criteria.	Individual/group	
60 min (4x15 min)	Participants read the assigned set of RRI quality criteria and apply it to the KvK showcase. The four groups rotate so that all groups have applied all four sets of RRI quality criteria.	Group	
20 min	Plenary wrap up.	Trainer and group	

4.2 Exercise 2: Programme Simulation

Learning outcomes:

At the end of this session participants:

- Are able to reflect on their own practice from an RRI perspective, having learned from the KvK showcase.
- Have made an action list to make their own practice more RRI.

In this part of the workshop the participants will simulate the Knowledge for Climate by playing a role in the KvK programme. Participants reflect and identify how the learning points are applicable to their own practice.

When the session is done with a homogenous group of stakeholders (i.e. policy makers), the group can be divided in several subgroups who play the same role (policymaker), while several roles can be simulated when representatives of two or more stakeholder groups are present. Participants will always simulate the stakeholder role that closest resembles their function in real life. After the simulation the participants will present their findings to each other.

Roles: [further description to be added by Trainer, if needed]

- Policymaker
- Researcher
- Business & industry
- Educational practitioner
- Civil society organisation

Time	What	Who	Comment
30 min	Read the showcase KvK.	Individual	Preparation before start of the workshop.
30 min	Identify and reflect on learning points, including points that stood out and points for improvement.	Individual	Preparation before start of the workshop.
30 min	Jointly reflect on learning points.	Group	Positive and negative points of the case.
120 min	Simulation.	Group	
30 -60min	Reflection – take home messages.	Group	

5. Useful resources

- (1) Driessen et al., 2015. Kennis voor Klimaat 2008-2014; verantwoording en resultaten. Stichting Kennis voor Klimaat, Utrecht

Appendix 1: RRI Quality Criteria

1. Diversity and Inclusion				
Criteria	Specification		PA	Outc.
	Indicators/sub-criteria	Questions that invite thinking about indicators and criteria		
Engaging a variety of stakeholder groups	Wide range	Is there a wide range of stakeholders involved, such that there is a diversity of values and a diversity of types of knowledge/ expertise (i.e. experiential knowledge, scientific knowledge) represented and/or generated? (Rowe & Frewer, 2000)		2ac 3f
	Relevant voices	Is there diversity in the stakeholders engaged such that all relevant voices are heard – silent as well as loud (i.e. stakeholder groups that might not feel immediately empowered to let their view know and stakeholder groups that do)?		2ac
	Demographic Diversity	Is there diversity within the stakeholder groups involved in terms of gender, ethnicity, class, age, and Other demographics?		2ac
	Sufficient amount	Are sufficiently many perspectives and participants included, such that eventual outcomes are robust? (ScienceWise 2013)		2ac
Variety of means of stakeholder engagement	Early involvement	Are relevant stakeholders involved from early stages of the R&I trajectory onwards?		2c
	Engagement methods	Are different methods and techniques for engaging specific stakeholder groups in dialogue taken into consideration? (E.g. is terminology adjusted to interlocutors; is the method for deliberation – interviews, focus groups etc. – tailored to the target stakeholder?)		1b
	Commitment	Are all stakeholders committed to the practice throughout all stages of the R&I trajectory and do they feel empowered to challenge directions of research and innovation?		1b
Engagement of public(s)	Facilitating deliberation	Are there (new) deliberative forums on issues involving science and innovation, moving beyond engagement with stakeholders to include members of the wider public? (Stilgoe et al., 2013)		1a
	Pertinent engagement	Are the right publics involved in the right phases of the R&I trajectory?		1a
	Development of capabilities	Are different possibilities explored or activities undertaken to facilitate the development of capabilities of publics to contribute to a science-literate society (i.e., become scientific citizens)?		1
Attention and respect for individual and	Internal social differences	Is there attention and respect for group/social differences within the R&I practice (e.g. gender, race/ethnicity, class, sexual orientation, country		2c

group differences		of origin, and ability as well as cultural, political, religious, or other affiliations)?		
	Minority recruitment strategies	Are there minority recruitment strategies in place to increase, within the practice itself, a balance in race/ethnicity, class, gender, sexual orientation, country of origin, and ability as well as cultural, political, religious, or other affiliations)?	♀	2c
Attention for appropriate methodologies	Diversity of methods	Are methods for research and innovation being developed or discussed with different stakeholders such that they respond to the needs and expectations of the different stakeholders? (I.e. considering a wide range of methods and employing an inter- or transdisciplinary process.) (Wickson and Carew, 2014)		
	Research objects	Is there diversity within the objects of research, in terms of gender and other demographics? (E.g. are not only male animal models used?)	♀	

2. Openness and Transparency				
Criteria	Specification		PAs	Outc.
	Indicators/sub-criteria	Questions that invite thinking about indicators and criteria		
Honest and clear (re)presentation of the practice details	Objectives	Are all objectives, aims, and goals honestly and clearly represented?	 	1bc 2a
	Finances	Is there a transparent overview of financial means/expenditure?	 	1bc
	Interests	Is there a declaration of interests and affiliations of all actors?	  	1bc 2a
	Methods	Are all methods honestly and clearly represented?	 	1bc
	Communication policies	Are there policies on open access and information sharing and are they accessible to stakeholders? (Wickson & Carew, 2014)	 	1bc
Open and clear communication about the processes of deliberation and decision-making	Actor roles	Is there an explanation of the exact role of actors in both the deliberative and decision-making process? (I.e., is there a description and explanation of all the actors involved and at which phase of the trajectory they are involved? Is there clarity about the extent to which actors will be able to influence decisions? (ScienceWise 2013))	  	1abc 2a
	Use of input	Is there feedback on how the input of different actors is used or what the impact of their input was in the practice?	  	1abc
Open and clear communication about the results of the practice	Results	Are preliminary, intermediate and final results shared with all actors involved and/or affected? (RRI Tools)	  	1abc
	Limitations	Are uncertainties in and limitations of the practice identified and shared? (Wickson & Carew, 2014)	  	1bc 2a
	Ownership and accountability	Is there clarity about ownership and accountability not only of positive but also of negative outcomes and impacts? (Wickson & Carew, 2014)	  	1bc 2a
Appropriate means and content of communication and education per actor	Means of communication and education	Are alternative ways of communicating or educating, appropriate to the diversity of actors involved and affected, being taken into consideration? (For instance, sharing raw data without interpretation is often inappropriate when communicating to non-scientists, as is the use of jargon; or exploring possibilities and means to contribute to education programs not only to disseminate results of research, but also to spread RRI competencies.)	   	1abc
	Content	Has it been considered what information can and should be shared with whom? (For instance, sometimes not all data can be shared with all	 	1bc

		actors due to intellectual property rights. In such contexts openness is only meaningful within so-called safe havens (i.e., communication is open and transparent only within a restricted community.)		
Openness to critical scrutiny from all stakeholders (Wickson & Carew, 2014)	Scepticism	Is the value of organised and disorganised scepticism acknowledged and are conditions created to put it into practice? (E.g., does the practice facilitate provision of feedback by stakeholders on the practice, and is there transparency about what happens with feedback?)	 	1abc

3. Anticipation and Reflection				
Criteria	Specification		PAs	Outc.
	Indicators/sub-criteria	Questions that invite thinking about indicators and criteria		
Analysis of the background, current situation and context of the (planned) research or innovation. (Nordmann, 2014)	Up-to-date information	Has content research been done on relevant background knowledge and up-to-date information?		1abc 2abc
	Influence other R&I	Has the influence of other innovations/research on the course of this practice been taken into consideration (e.g. alternative R&I and complementary R&I)?		1bc 2b
	Actor analysis	Did an actor analysis take place, identifying all whom the practice might impact on, might have an interest in and might have relevant expertise for the practice, and identifying how these actors relate to each other?		2ac
	Diverging problem definitions	Have efforts been put into addressing potentially diverging definitions of the problem at stake in the practice?		2ac
	Societal role in problem definition and course of practice	Have efforts been put into giving a role to societal values, perceptions, and interests in defining the problem addressed in the practice and the further course of the practice?	 	2ac
Envisioning of plausible futures (Nordmann, 2014)	Variety of future parameters and impacts	Is there active identification and consideration of immediate, mid-term and long-term social, environmental, and economic impacts and consequences of the practice – intended and unintended – identified?	 	2ab 3
	Variety of established methods	Did a well-considered selection and implementation of the methods for anticipation take place (based on previous experience)? (E.g. scenario development, real-time technology assessment, etc.)		3
	Variety of R&I trajectories	Have alternative research and innovation trajectories been considered? (process of RI)		3
Variety of impacts	Ethics	Are ethical aspects and impacts of the practice sufficiently addressed? (E.g. are research ethics honored, by protecting objects of research, approval from an ethical committee and documented compliance with research ethics and voluntary codes of conduct – in which for example fraud and plagiarism are prohibited? (Wickson & Carew, 2014))		1bc 2a
	Legislation	Are legal aspects and impacts of the practice sufficiently addressed? (E.g. is there documented compliance with highest-level governance requirements (Wickson & Carew, 2014))		1bc 2a
	Society	Are societal aspects and impacts of the practice sufficiently addressed?		2c
	Environment	Are environmental aspects and impacts of the practice sufficiently addressed?		2b
	Grand Challenges	Are one or more of the Grand Challenges set by the European Commission addressed in the practice?		3
Facilitating deliberation on values, perceptions, needs,	Integrated reflection and deliberation	Has room for reflection and deliberation on e.g. impacts, alternatives, possibly changing societal values, perceptions and needs/ interests and choices made during the practice, been built-in? (Stilgoe et al., 2013)	 	1abc 2abc

<p>interests, choices, and definition of the problem at issue in the practice</p>	<p>Deliberating values</p>	<p>Do the actors involved regularly engage in a critical analysis of the values, perceptions, needs, interests, choices, and definition of the problem at issue underlying their practice?</p>		<p>1abc 2abc</p>
<p>Addressing roles in RI trajectories</p>	<p>Awareness of differences</p>	<p>Do the actors involved develop an awareness of their own assumptions, values, and purposes in relation to the perspectives of others?</p>		<p>1b</p>
	<p>Awareness of responsibilities</p>	<p>Are actors involved aware of and open for reflection on their role responsibilities and accountability? (Stilgoe et al., 2013)</p>		<p>1bc</p>

4. Responsiveness and Adaptive Change				
Criteria	Specification		PAs	Outc.
	Indicators/sub-criteria	Questions that invite thinking about indicators and criteria		
Structure for seeking and incorporating feedback	Appreciation	Is critical input, feedback, and feed-forward from a range of stakeholders actively being sought?		1abc 2c
	Methods	Are methods for incorporating feedback being explored and implemented?		1abc 2c
Flexible process management	Stakeholder needs	Is it possible to change the course of the research and innovation practice in response to changing stakeholder's needs/ interests/ values/ perceptions?	 	1bc 2abc
	Results	Is it possible to change the course of the research and innovation practice in response to interim results or conflicting data?		
	Context	Is it possible to change the course of the research and innovation practice in response to contextual changes? (E.g. results by competing R&I groups; judicial changes.)		2abc
	Methods	Is it possible to change methods in the course of the research and innovation practice in respond to needs and expectations of stakeholders?		1bc
Development and implementation of evaluation strategies (Regeer 2009)	Evaluation framework	Are objectives concrete enough to develop an internal evaluation framework?		
	Performance indicators	Are (preliminary) critical performance indicators identified?		
	Strategy	Are evaluation strategies or frameworks actively being developed and implemented?		
	Deliberation	Are the evaluation strategies or frameworks developed through interaction and engagement with all participants?	 	2c
	Open-endedness	Are indicators used in evaluations sufficiently dynamic and context dependent to deal with all sorts of changing circumstances (ranging from changing stakeholder perspectives, unanticipated (interim) results, or changes in contextual factors)?		2abc
Flexible attitudes to revise views and actions	Individuals	Are the individuals involved willing and able to revise their views and actions?		1b
	Organisations	Do the organisations involved offer adaptive space to respond flexibly to changing circumstances, changing needs, and values of other stakeholders and organisations involved? (For example, are research organisations open to rewarding their staff for non-scientific output, such as popular media appearances.)		1c
Changing responsibilities	Role responsibilities	Are actors involved prepared to take, enlarge and/or redefine their role responsibilities? (Stilgoe et al. 2013)		1bc
	Acceptance of accountability	Are actors prepared to accept, through processes of dialogue, accountability fitting their role for potential positive and negative impacts, choices, and processes? (Wickson & Carew		1bc

		2014)		
Application of results	Stakeholders	Are (affected) stakeholders willing and equipped to apply new knowledge, values/norms and competencies? (E.g. the use of results of a research practice for educational purposes)		1bc
	Organisations and systems	Do the organisations and systems involved offer adaptive space to respond flexibly to changing knowledge, values/norms and learned competencies?		

Training Showcase: Knowledge for Climate