EKLIPSE
Knowledge & Learning Mechanism
on Biodiversity & Ecosystem Services

Developing a mechanism for supporting better decisions on our environment based on the best available knowledge.

EKLIPSE Document of Work Health request

"Types and components of natural or man-made urban and suburban green and blue spaces affecting human mental health and mental well-being"

This document is the output of the scoping phase. It provides all information available for the Expert Working Group to start writing the Protocol of the assessment they will conduct.

Content:

GENERAL INFORMATION

This request was initially put to EKLIPSE by Expert Working Group Biodiversity & Health, 3rd National Plan on Health and Environment (PNSE3) – Ministry in charge of the Environment (MTES), France. This group includes members of different governmental and non-governmental organizations as follow:

French Ministry in charge of the Environment, Ministry in charge of Agriculture, Ministry in charge of Health, ANSES, ONCFS, ADEME, Ecole et Nature, Plante et Cité, Santé Publique France, IRSTEA, FNSEA, Onema, AFB, INERIS, IRD, APCA, Mairie de Nantes, EDF, MEDEF, FEBEA, SAPV, Aquitaine arb., ATMO Alsace, IREPS Bretagne, Ecole Nationale Supérieure vétérinaire, France Nature environnement,

Fondation pour la Nature et l'Homme, CPU (universities), Ville de Rennes, APHP (hospitals), Université de Lyon, Parcs Naturels régionaux, Institut du verre, Chambre d'agriculture.

The contact people from the PNSE3 that act as direct requesters are:

-GIULIANI Laurence (Adjointe au chef de bureau Faune et Flore sauvages) - laurence.giuliani@developpement-durable.gouv.fr,
-GALIBERT Thierry (Conseil général de l'Environnement et du Développement durable ; mission Milieux, Ressources et Risques) thierry.galibert@developpement-durable.gouv.fr,
-COUDERC-OBERT Céline (Adjointe au chef de la mission Risques Environnement Santé) celine.couderc-obert@developpement-durable.gouv.fr

In order to refine the request, scoping activities have been carried out:

a. Literature screening in order to identify already existing publication/projects/reports on the request
b. Call for Knowledge open and public call in order to identify existing knowledge on the request
c. Evaluation of the policy and stakeholder relevance via bilateral telephone interviews, personal meetings and email requests to ensure the policy relevance of the request detailed below and to refine the request.

This document of work describes the results of the scoping activities as well as the background of the request and has been the basis for the call for experts.

Summary:
Requesters: *Expert Working Group Biodiversity & Health, 3rd National Plan on Health and Environment (PNSE3) – Ministry in charge of the Environment (MTES), France*
Date request received: *27/09/2016*
Date of first meeting with requesters and EKLIPSE KCB[1] and methods experts: *15/02/2017*
Expected deadline for deliverables: *18 months, end of 2018*

The topic of the original request was refined during the scoping phase (see below). The questions as phrased originally by the requester were:
Main question on the importance of nature for mental health: is there a specific benefit of being in contact with green spaces?
Secondary questions:
1. Can we discriminate different components of nature or type of natural spaces and identify the ones that have a greater impact on mental health than others?
2. What are the correlations, if exist, between mental health attributed to nature and physical health attributed to nature
3. Are the results consistent with those of the systematic review involving Ruth Garside (Mckinnon et al. 2016) on well-being effects of biodiverse environment?

BACKGROUND OF THE CALL

Context and justification

Even though the impact of the quality of the environment on human health is well described and increasingly taken into account for urban and peri-urban design and policies, this is not the case for

[1] The EKLIPSE KCB is the Knowledge Coordinating Body responsible for the oversight of requests for knowledge.

the impact of biodiversity on mental health and well-being. Biodiversity may have a great impact on our well-being and mental health. A systematic review of the health and well-being benefits of biodiverse environments has been published in the Journal of Toxicology and Environmental Health (Lovell et al. 2014). It shows that a biodiverse nature has positive effects on mood and is good for health and that disturbed ecosystems might have a negative effect on human well-being. Bowler et al (2010) also show evidence of the added benefits to health of exposure to natural environment by conducting a systematic review that compares measurements of health or well-being in natural and built environments, but it did not explicitly mentioned biodiversity as such. In 2010, a study of the Faculty of Public Health showed that green spaces are able to lower the incidence of hyperactivity or depression, but most of all, that people without access to green spaces are more likely to develop stress or anger (FPH 2010, Gidlofgunnarson & Ohrstrom 2007), again not referring to biodiversity. The importance of natural elements and their impact on mental health can be demonstrated in initiatives such as the development of therapeutic gardens aiming to help Alzheimer patients (FPH, 2010). Those studies suggest that there may be some evidence available to enable the design of green spaces for the benefit of human mental health and mental well-being.

Knowledge gaps on the impacts on mental health

A systematic review on green spaces and mental health was published by Bowler et al. in 2007. As new studies have been published since then, an update could be of great interest for policy makers and urban stakeholders. Bowler et al. (2007) provided evidence of an improvement in mental health after activity in green space compared with activity in built environments, but they did not identify what characteristics of green spaces had an effect. Furthermore, they were not able to provide robust evidence of a link between green space and physical health due to heterogeneity of research approaches, contexts and measurements, as well as numerous confounding factors. While there are numerous studies available (see results of the literature scoping) there is currently no systematic review on the relationship between types or components of green and blue spaces and mental health or mental well-being. The present request aims to contribute to fill this gap.

Population of interest

The request concerns human beings of all age, gender, nationalities, educational backgrounds and income. The knowledge assessment will include studies on people affected by mental diseases requiring psychiatric supervision (such as schizophrenia, autism, bipolar and borderline, psychosis, Alzheimer, dementia and neurodegenerative illnesses linked to age, etc.), and includes stress, depression and negative mood (anger, aggressiveness, fear…) as well as positive mood (happiness, sense of place, etc.).

Types of interventions to be considered

The assessment will include any action that is related to the design, management and creation of natural spaces in urban or suburban areas to promote human mental health and mental well-being (e.g. feeling of wellness, lowering stress, fatigue and repression, etc.; see search terms in Annex). Management actions will include absence of intervention (e.g. leaving wilderness unattended), traditional maintenance of green and blue space (e.g. mowing, removing algae) and policies that result in any change of management interventions (e.g. stopping pruning trees, not weeding, planting flowerbeds, setting up green walls, etc.). Any sort of exposure to green or blue space in an

urban or suburban area will be included, whether planned (going for a walk in a forested park) or not (e.g. when experiencing the sight of weeds when walking in cities). The assessment will not include exposure to green or blue components indoors (e.g. plants in pots) or seen from inside a building (e.g. from a workplace) but the assessment will take into consideration outdoor gardens (such as therapeutic gardens).

The assessment will not address the generic relationship between greenness and mental health/well-being. It will rather focus at collating, assessing and synthesizing the evidence related to the types of habitats (green, blue) and the components of nature (e.g. trees, odours, landscape features) that have a significant impact on mental health and mental well-being. There is no limitation to what those types of habitats or components may be.

The aims of the request are to provide recommendations regarding the design, management and creation of natural spaces in urban or suburban areas in order to promote the mental health of urban inhabitants. Such recommendations need to be applicable by various practitioners (such as managers, city-planners…) and may be taken into account in policies such as the French Code de l'Urbanisme et Code de l'Environnement, in accordance with European regulations currently in practice or to be developed in the future.

REFINED REQUEST QUESTION

Based on the results of the discussion between the KCB and the requesters, and an open call for knowledge, it was agreed to refine the request question, particularly to include the uptake of measures designed to have an impact on mental health and mental well-being. It should be noted that the requester has a specific interest in positive impact in order to design recommendations.

Therefore, EKLIPSE via its Call for experts No.2/August 2017 will invite applications for an expert group to address the question:

Which types of urban and suburban blue and green spaces and which characteristics (components) of such spaces have a significant impact on human mental health and well-being?

SUGGESTED METHODS

During the scoping process the EKLIPSE methods group and the KCB-Health discussed potential methods of knowledge synthesis which can be applied for this request (Dicks et al 2016). The selection process was defined by "the characteristics of the type of question" seeking for a more comprehensive understanding of the information required by the requester (see the full questionnaire and selection process in Annex 6). In the Table 1, the five most appropriate methods identified are summarized, each with its justification and input on how to proceed with the analysis.

Method appropriate to 'Type of question'	Justification and notes	Who and how?
1. Cochrane-style systematic review	This is possible according to time resources available and fits well with the type of information needed.	Contracted students, librarians or support staff should do searches, with guidance from expert group

	Not in options for Q10 but is applicable because the question is actually well-defined. It is expected to be a lot of work because the volume of literature is very large, although the relevant portion may be relatively small.	
2. Solution scanning	Useful to identify the components of urban and suburban green spaces expected to influence mental health and well-being.	Expert group
3. Meta-analysis	As part of the systematic review or rapid evidence assessment.	Not clear
4. Rapid evidence assessment	This is a less rigorous option if resources are constrained.	Contracted students, librarians or support staff should do searches, with guidance from expert group
5. Causal Chain analysis	Requires a conceptual framework to understand how urban and suburban blue and green spaces influence mental health and well-being. The evidence from the systematic or rapid review is added to appropriate causal links. This is work for the expert group work	Expert group + possible contacted support staff (for literature review included in this method)

Table 1. Description of suggested methods and its justification

All the methods suggested aim for a structured step wise approach that should lead to a comprehensive identification of the existing evidence (Figure 1). Figure 1 show how these methods can be combined if appropriate.

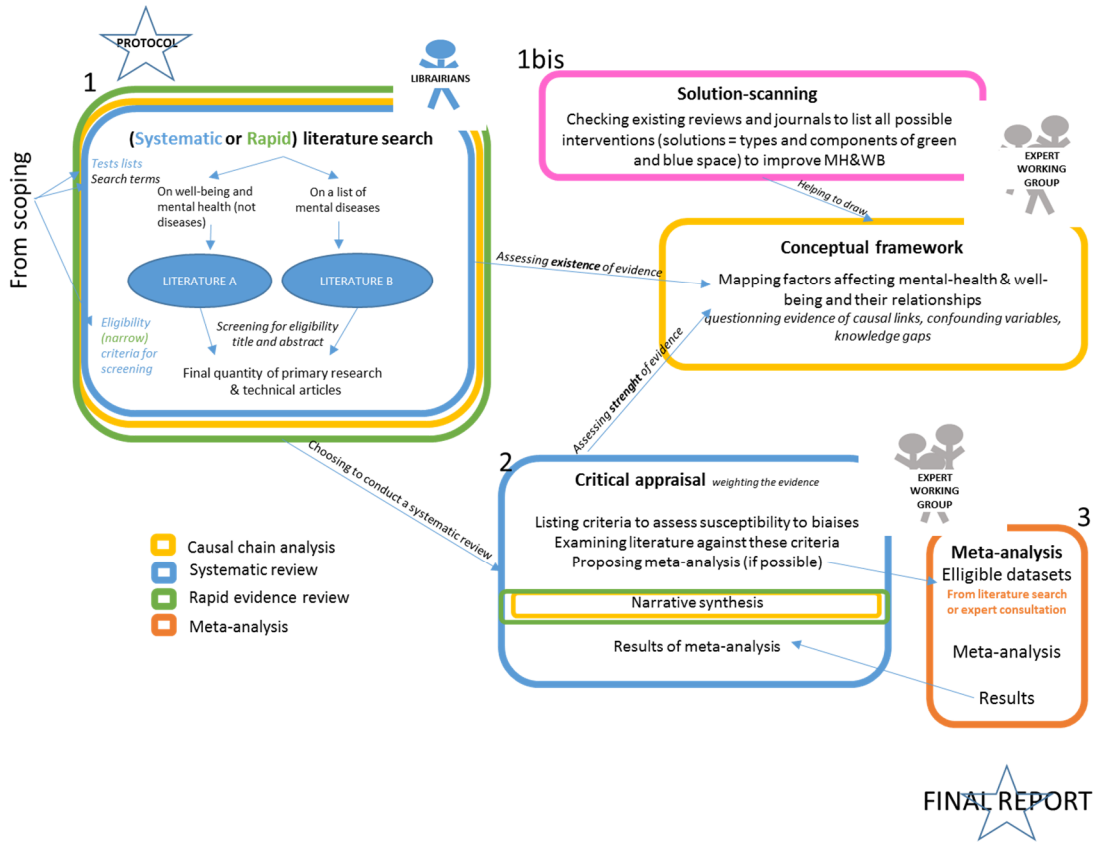

Figure 1. Workflow of suggested methods and their possible combination

LOGBOOK

The logbook describes the agenda of exchanges with the Requester, KCB Heath and the Methods group and the contents discussed during the meetings.

Date	Participants	Topic	Platform
15.02.2017	KCB Health-Ch* Requester (H. Soubelet)	Exchange about relevance, added value, expected outcomes, level of controversy, etc.	Face-to-face
24.02.2017	KCB Health-Ch* Ruth Garside (mentioned by the requester)	Advice about prioritisation of topic towards mental health as physical health is well known but less up-to-date knowledge for mental health	Skype
24.02.2017	KCB Health-Ch* KCB Health (3) KCB -Method (1) EKLIPSE secretariat (2)	Request scoping, exchange about the call for knowledge and the policy relevance of the request	Visimeet
06.03.2017	KCB Health-Ch* Requester (H. Soubelet)	Exchange about the results of the first scoping	Face-to-face
17.03.2017	KCB-Ch* Horst Korn Aletta Bonn	Exchange about BfN-iDiv project , Agreement to keep in touch to avoid duplication of work	Skype

	Melissa Marselle EKLIPSE secretariat (2)		
21.03.2017	KCB Health-Ch* Karin Zauberger (EC)	Policy relevance and to identify contacts at the European Commission	Telephone
19.04.2017	KCB Health-Ch* EKLIPSE secretariat (2)	Cancelled due to technical problems	Visimeet
12.05.2017	KCB-Ch* 2 Members EKLIPSE secretariat New requester representative(Laurence Giuliani , Thierry Galibert)	Exchange to report about advancement and try to narrow the request on the basis of preliminary results of scoping	Face-to-face
15.05.2017	KCB Health-Ch* KCB Health (1) KCB -Method (1) EKLIPSE secretariat (4)	Update of the meeting with the French requester, improving scoping process ad policy-stakeholder relevance, suggested methods	Visimeet
23.05.2017	KCB Health-Ch* New requester representative (C. Couderc-Obert)	Exchange to brief her about the meeting with L. Giuliani, T. Galibert, and advancements.	Telephone
28.07.2017	Conference Biodiversity and Human Health	Presentation of the request and outreach	Face to face
16.06.2017	Requester KCB Health-Ch*	Presentation of advancement	Face to face
07.07.2017	KCB Health-Ch* KCB -Method (3) EKLIPSE secretariat (1)	Discussion on potential methods to reply the request	Visimeet
18.07.2017	Herta Adams (DG Sante) KCB Health-Ch* EKLIPSE secretariat (2)	Evaluation of the policy relevance of the request	Telephone conference
12.09.2017		PNSE3 meeting	

* Chair

REFERENCES

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Bowler, D. E., Buyung-Ali, L. M., Knight, T. M., & Pullin, A. S. (2010). A systematic review of evidence for the added benefits to health of exposure to natural environments. BMC public health, 10(1), 456.

Dicks LV, Haddaway N, Hernández-Morcillo M, Mattsson B, Randall N, Failler P, Ferretti J, Livoreil B, Saarikoski H, Santamaria L, Rodela R, Velizarova E, and Wittmer H. (2017). Knowledge synthesis for environmental decisions: an evaluation of existing methods, and guidance for their selection, use and development– a report from the EKLIPSE project.

Faculty of Public Health, Great outdoors: how our natural health services uses green space to improve wellbeing, 2010.

Gidlofgunnarson, Ohrstrom, 2007, étude montrant qu'un accès trop restreint aux espaces verts était relié à des symptomes de stress.

Lovell, R., Wheeler, B. W., Higgins, S. L., Irvine, K. N., & Depledge, M. H. (2014). A systematic review of the health and wellbeing benefits of biodiverse environments. Journal of Toxicology and Environmental Health Part B, Critical Reviews, 17(1), 1e20. http://dx.doi.org/10.1080/10937404.2013.856361.

McKinnon, M. C., Cheng, S. H., Dupre, S., Edmond, J., Garside, R., Glew, L., Holland, Margaret B., Levine, E., Masuda, Y., Miller, D., Oliveira, I., Revenaz, J., Roe, D., Shamer, S., Wilkie, D., Wongbusarakum, S & Woodhouse, E. (2016). What are the effects of nature conservation on human well-being? A systematic map of empirical evidence from developing countries. *Environmental Evidence*, *5*(1), 8.

ANNEX 1: Text of original requests

Documents providing justification of the request, brought by the requester:
- « French National Plan on Environment and Health (PNSE3) – action 89 "Réaliser une expertise collective sur les effets positifs des espaces verts et des espaces de nature urbains sur la santé »
- « Document de cadrage en vue d'une revue systématique biodiversité et santé » (August 2017)

Context and justification (as presented by the requester)

Even if the impact of the environment on human health is well described and more and more taken into account, this is not the case for positive impact of biodiversity on health. Biodiversity can have a great impact on our health. A systematic review of the health and well-being benefits of biodiverse environments has been published in the Journal of Toxicology and Environmental Health (Lovell et al. 2014) and shows that a biodiverse nature has positive effect on mood and is good for health and that disturbed ecosystems might have a negative effect on human well-being. Bowler et al (2010) also showed evidence of the added benefits to health of exposure to natural environment by conducting a systematic review that compares measurements of health or well-being in natural and synthetic environments. In 2010, a study of the Faculty of Public Health shows that green spaces are able to lower hyperactivity or depression, but most of all, that people without access to green spaces are more likely to develop stress or anger (FPH 2010, Gidlofgunnarson & Ohrstrom 2007). The importance of natural elements and their impact on mental health can be demonstrated in initiatives like the development of therapeutic garden aiming to help Alzheimer patients (FPH 2010). Those aspects can promote the development of green spaces.

There is already knowledge on the relationship between mental health and green space although it is often scattered. As an attempt to synthesize it, at least one systematic review has been published specifically on this topic (Bowler et al. 2007) but some new studies have been published since 2007 and an update with new outputs could be of great interest for policy makers and urban stakeholders. Bowler et al. (2007) showed that evidence exists of an improvement of mental-health after activity in green space rather than activity in built environments, but did not identify what characteristics of green space contributed to the effect. Bowler at al. (2007) were not able to highlight robust evidence of a link between green space and physical health due to heterogeneity of research approaches, contexts, and measurements, as well as numerous confounding factors. Other authors have linked improvement of mental health and well-being to activity in green space but again, without mentioning the specific effects of some green features or components.

An exchange with Ruth Garside (February 2017) highlighted that it would be more relevant to prioritize mental health as new primary research papers have been published recently and it may be easier to demonstrate evidence now (Annex 2).

METHOD / APPROACH

Method proposed by the requester:

Initially the requester asked for "a systematic review of the literature on effects of green spaces on mental health and physical health". The main request is to update the question asked in 2007 by Bowler et al. After consulting different experts on the subject (including one author of the very recent McKinnon et al. 2016 systematic review), and given the available resources, focusing on mental health would be of interest as there is enough robust evidence about effects of green spaces (allowing activity) on physical health. The number of scientific papers included in the study by Bowler

et al. (2007) on the topic of mental health was low and experts expect that more research has been done since then on this subject.

DETAILS OF THE REQUEST

What is the geographical range? (e.g. all Europe, biogeographical areas, some countries or sites…)
Europe

What is the population of interest? The request concerns human beings of all age, gender, nationalities, educational backgrounds and income. The knowledge assessment will include people affected by mental diseases requiring psychiatric supervision (such as schizophrenia, autism, bipolar and borderline, psychosis, Alzheimer, dementia and neurodegenerative illnesses linked to age, etc.), and DOES INCLUDE stress, depression and negative mood (anger, aggressiveness, fear…) as well as positive mood (happiness, sense of place, etc.)

Which specific interventions are of interest here? Any action that is related to the design, management and creation of natural spaces in urban or suburban areas to promote human mental health and well-being (feeling of wellness, lowering stress, fatigue and repression, for instance, see search terms in Annex). Any action that consists in maintaining "wild" nature in cities, which may imply stopping some interventions (such as removing weeds growing on pavement, mowing lawns, not pruning trees anymore, building nests-boxes for wild birds in cities, etc.). Any sort of exposure to a green or blue space in an urban or suburban area (see search terms for the scope of those spaces).

People mentioned above are exposed to various types of nature and components of nature. The assessment will NOT address the generic relationship between greenness and well-being/mental health but will try to focus on the evidence related to which types of habitats (green, blue) and components of nature have a significant impact on mental health and well-being. There is no limitation to what those types of habitats or components may be. This exposure can be planned (going for a walk in a forested park) or not (e.g. when experiencing the sight of weeds when walking in cities). The knowledge assessment will NOT include exposure to greenness indoors or from inside a building (e.g. workplace, even though openings) but outdoor gardens (such as therapeutic gardens) should be included including their effect on the mental-health and well-being of patients, workers and helpers.

Should we prioritise on comparisons? Priority should be given to literature and knowledge comparing the effects of different types of natural spaces (incl. landscapes), and/or the variation in components of green/blue spaces (before/after studies, or control vs treatment).

What are the results of interest? Priority is given to changes (with a special interest for significant evidence of improvement or stabilization) of mental-health and well-being. Both mental health and well-being will have to be defined by the Expert Working Group. As a preliminary indication, well-being is used here to characterize psychological assessment and is it opposed to ill-being (e.g. negative feelings or perception of self). Well-being, as a result of interest, does not include wealth or socio-economic criteria (although they may influence psychology) but may include behaviour and abilities (e.g. to cope, to learn, to take care).

The assessment will have to conclude whether there is evidence of positive impacts of green/blue spaces (and specific components) in some situations, and which are those situations, in order to provide recommendations.

What confounding variables could affect the results? There are many variables that may influence the effect of green and blue habitat types and their components on mental health and well-being. They will have to be listed and if possible examined by the Expert Working Group to be taken into account in their conclusions. For instance, the time and frequency of use/exposure/contact with those spaces may influence the results, which depend on accessibility. The intensity of activity (e.g. just sitting, or running, or sailing), age, physical health may also affect the results. This assessment aims to go further by precisely focusing on green and blue components that allow better mental health and well-being, not addressing interventions facilitating activity (e.g. pathways for walking) even if they can contribute to mental health and well-being. Finally, there are many socio-economic aspects linked to neighbourhood, sense of security, that have been studied and published and probably interfere with mental health and well-being as well. Age, sex, recreational activities, access to greenness, level of environmental awareness and engagement, are potential confounding variables.

EXPECTED DELIVERABLES (quantitative, qualitative… means, ratios…)

Evidence of knowledge gaps
Evidence of small number of papers on the topic and more precisely on some aspects of the request
Evidence of effects, with a special interest for significant positive effects, with level of confidence based on explicit criteria
Recommendations for future research, practice and policy based on evidence and strength of evidence
Conceptual framework showing the interrelationships between factors affecting mental health and well-being and highlighting the level of evidence based on the assessment of knowledge.

EXPECTED OUTCOMES FOR POLICY, NEGOCIATION, MANAGEMENT and SOCIETY.

The requester aims at providing recommendations regarding the design, management and creation of natural spaces in urban or suburban areas in order to promote health of urban inhabitants. Such recommendations need to be applicable by various practitioners (such as managers, city-planners…) and may be taken into account in the French Code de l'Urbanisme et Code de l'Environnement, in accordance with European regulations currently in practice or to be developed in the future.
Other outcomes would be the development of recommendations to use and design of green spaces in order to alleviate mental health diseases and ill-being, as done already in Korea or Finland; and the development of educational programmes to promote such solutions.

ANNEX 2: Contacts and people involved in the request

During the scoping phase different people was contacted in order to evaluate the relevance of the request:

Horst Korn, Horst.Korn@BfN.de Agency for Nature Conservation, Germany.

Karin Zaunberger , Karin.Zaunberger@ec.europa.eu DG ENV European Commission.

John Ryan John, F.Ryan@ec.europa.eu DG Santé European Commission, Directorate of the Directorate-General for Health and Consumers.

Matthias Braubach, braubachm@who.int World Health Organization, Technical Officer Environmental Exposures and Risks: Housing and urban planning, division of Communicable Diseases, Health SECURITY AND Environment.

Ronan Uhel, ronan.uhel@eea.europa.eu European Environment Agency Denmark.

Herta Adam, Herta.ADAM@ec.europa.eu DG Santé Unit C1, Health programme and chronic diseases, Deputy Head Unit.

Katrin Seuss, secretariat EPA network, katrin.seuss@eea.europa.eu (European Network of the Heads of Environment Protection Agencies)

Amy McDougall, secretariat ENCA network, amy.mcdougall@jncc.gov.uk (Head of European Nature Conservation Agencies),

Potential key contacts not addressed yet.

Michael Gödde, michael.goedde@senuvk.berlin.de Senate Department for the Environment, Transport and Climate Protection, Germany

Julie Raynal, Julie.Raynal@ec.europa.eu Biodiversity Unit (ENV D2) European Commission

Sofia Pachini, Sofia.Pachini@ec.europa.eu Nature Unit (ENV D3) European Commission

Anni-Riitta Virolainen-Julkunen (STM), anni-riitta.virolainen-julkunen@stm.fi (Ministry of social and health affairs, Finland government, see Eeva Furman)

Militza Malmelin (YM), militza.malmelin@ym.fi (Ministry for the environment, Finland government)

Marjukka Mähönen, (MMM), marjukka.mahonen@mmm.fi (Ministry for forestry, agriculture and food, Finland government)

Biljana Aljinovic, CEEweb network, aljinovic@ceeweb.org (Centre for research on Environment, society and health - CRESH, info@cresh.org.uk)

EXPERTS contacted:

The requester did not suggest any names

The KCB suggests: Melissa Marselle, Horst Korn, Hans Keune, Kevin Gaston, Sarah Lindley, Patrick ten Brink, Catherine Ward Thomson, and Katherine Irvine.

Persons involved at the EKLIPSE Knowledge Coordinating Body (KCB) level:

KCB-Health: *engages the dialogue with the requester, help the expert working group in understanding the request and suggests methodological options, so that tailored methodology choice can ensure. KCB-Health is supporting the steps related to the analysis of the request and scoping stages.*

Barbara Livoreil (focal point), barbara.livoreil@fondationbiodiversite.fr, FRB, France

Valerie Kapos (deputy), val.kapos@unep-wcmc.org, WCMC, UK

Heidi Wittmer (KCB-Health), heidi.wittmer@ufz.de, UFZ, Germany

Eeva Furman (KCB-Health), eeva.furman@ymparisto.fi, Finland

Petr Petrik (KCB-Health), petr.petrik@ibot.cas.cz, Czech Republic

Sebastian Villasante (KCB-Health), s.villasante.arg@gmail.com,

Isabel Pinto (KCB-Health), ispinto@ciimar.up.pt, Portugal

Pierre Failler (KCB-Health-Methods group), pierre.failler@port.ac.uk, UK

Johanna Ferretti (KCB-Health-Methods group),johanna.ferretti@zalf.de, Germany

Romina Rodela (KCB-Health-Methods group),romina.rodela@sh.se

Lynn Dicks (KCB-Health-Methods group),lynn.dicks@uea.ac.uk, UK

EKLIPSE Secretariat: supports the consultation of the Network of Knowledge.

Karla Locher, karla.locher@ufz.de, UFZ, Germany

ANNEX 3: Evaluation of the policy and stakeholder relevance

Policy relevance:

Karin Zaunberger (DG Env) was contacted by phone and she confirmed that Health and Biodiversity was of great interest, the impact of components and type of nature has not been addressed as such to her knowledge.

Matthias Braubach (WHO) was contacted during the Biodiversity and Health conference (ECBCC-Bonn 2017), confirmed the importance of the topic and the need for more information about the components of nature which impacts mental human health. Although he pointed out that the term peri-urban areas needs to be clearly defined to ensure the extrapolation of the results in different European cities.

Herta Adam and Monica Strey (DG Sante) were contacted by Skype in July 2017. From this meeting the EKLIPSE team became aware of the initiatives running in DG Sante related with the topic of the request. They have cooperation between the members states focus on the de development of the European framework for action on mental health and well-being (https://ec.europa.eu/health/mental-health/framework_for_action_en). The progress on implementation of this initiative is carried out by the EU Compass on Mental Health and Well-being, which is a mechanism that collects exchange and analyse information on policy and stakeholder activities in the area of mental health (https://ec.europa.eu/health/mental_health/eu_compass_en).

She also mentioned that in both processes "mental health in all policies" is addressed and the Compass round in 2018 is dedicated to mental health governance which will have a link to mental health in all policies. At this stage work is still in progress how to develop this work for next year. In this context environmental aspects related to mental health may be envisaged. She provided the following options in order to connect:

- contact their partners in the Compass consortium because they may have an overview whether such evidence exists at national, regional or local level.
- contact their governmental experts on mental health, they would need to have clear indication from the team about how they could contribute
- the Commission has established scientific committees (in particular the one on health, environmental and emerging risk) which includes also a database of experts, for details please see: https://ec.europa.eu/health/scientific_committees/scheer_en .

Stakeholder relevance:

France: high relevance for Humanité & Biodiversité and France Nature Environment, member of PNSE3 as well as other stakeholders. No consultation has been engaged so far at a larger level (but this can easily be done in France)

Finland: Hanna Kekkonen from LUKE- Natural Resources Institute Finland (Research center under the Ministry of Agriculture and Forestry): The issue is very topical at the moment: Securing ecosystem services as residential areas become denser and the main environment of people shifts from the rural areas to urban ones distancing the majority of the population from nature and its health benefits (lots of research on health benefits exist). As new residential areas also take space from natural areas our responsibility towards not only the pleasantness of our lived environment but also the natural diversity and maintaining the virginity of natural areas and ecosystem services becomes highlighted. No research on exactly what components add to human wellbeing or recreational value come to mind, but it is known for instance that forests have better recreational value than e.g. parklike landscapes. For example in Japan in green roofs they support planting trees on them based on the fact that forest has bigger recreational value. They probably have more research on the topic, also to be noted that they are a more urban people as well.

ANNEX 4: Call for Knowledge

EKLIPSE
Knowledge & Learning Mechanism on Biodiversity & Ecosystem Services

Developing a mechanism for supporting better decisions on our environment based on the best available knowledge.

EKLIPSE is a European Mechanism to answer requests from policy makers and other societal actors on biodiversity related issues.

More information on the processes and the EKLIPSE project funded by the EU in H2020 is available at *www.eklipse-mechanism.eu*

CALL FOR KNOWLEDGE, EKLIPSE – MARCH 2017

Deadline to answer the Call: April 18th, 2017

Which types of urban and peri-urban natural spaces (blue and green) and which characteristics (components) of such spaces have a significant impact on human mental health and well-being?

Invitation to share existing knowledge EKLIPSE invites scientists, policy, practitioners and other societal actors to share their knowledge on the question stated above. This question was proposed by the Working Group Biodiversity & Health of the French National Action Plan Health & Environment, at the French ministry of Environment. The goal of the WG B&H is to provide recommendations for the conservation, creation, design and management of natural spaces that would benefit urban citizens,by maintaining or enhancing their well-being and mental health.

The objective of this call is to assess whether similar work has already been conducted, how large the quantity of literature may be, and if current programmes are studying this question. This "scoping exercise" primarily aims to ensure that the EKLPSE expert group that will be in charge of answering the question is aware of existing relevant knowledge and programmes that should be taken into account in order to avoid duplicating work and provide the best possible answer. Quantifying the amount and type of knowledge available will also ensure that the resources allocated to the Expert Working Group will be sufficient.

Please contribute with comments and relevant knowledge on the topic by contributing information and/or participating in the discussion on this topic in the KNOCK forum at http://www.eklipse-mechanism.eu/forum_home (click on the Discussion Forum box)

1 What are we looking for?

We are seeking to know what type of knowledge is available to answer the question stated in the front page. Scoping the literature using databases is a task currently undertaken by our team, but in addition to this we are also looking for:

- Your **feedback on other current similar projects that are conducted or will be conducted soon** (in order to merge forces and avoid duplicate work)
- Your feedback on **existing reviews, synthesis, assessments** that address the question of "Which types of natural spaces and which characteristics (components) of such spaces have a significant impact on mental health and well-being?"
- Your knowledge about **grey literature, in any language**, that has addressed the question "Which types of natural spaces and which characteristics (components) of such spaces have a significant impact on mental health and well-being?"

There is a lot of literature and knowledge about health and the environment, so we are calling upon your **attention to this question that precisely addresses types of nature and characteristics (or components, features…) of nature,** that affect well-being and mental health (physical health is not prioritized right now although we acknowledge that physical activity affects mental health). **You can signal your publications, current work on the topic, and grey literature, or any information that would help us in our Forum** (see below).

We are not interested in the effects of alien invasive species, GMOs or pollutants or allergens, as **the ultimate goal of the requester is to set up actions that will trigger positive impacts on well-being and mental health of urban citizens based on the knowledge synthesis provided by EKLIPSE.** And the requester does not aim to use invasive species or elements detrimental to biodiversity and health for such initiatives.

This call for knowledge aims at helping us assess the amount of existing work on this question, the relevance of such work and align it with resources that will be allocated to the Expert Working Group in charge of answering the question. You may be interested in contributing to this EWG (a call will circulate, see below). You may also be interested in peer-reviewing the work that will be implemented, or to contribute as a knowledge-holder, a knowledge user or a decision-maker to this mission. Please get in touch with us.

How to contribute:

Please find the Health and Biodiversity request on our EKLIPSE KNOCK FORUM, where you can register and post comments and inputs. This forum is moderated and only relevant and constructive contributions will be retained.

http://www.eklipse-mechanism.eu/forum_home (click on the Discussion Forum box and then select Health impacts in the Theme Summary box)

2 What is EKLIPSE?

EKLIPSE is an EU-funded project that started in February 2016. The project aims to establish a robust and flexible long-term mechanism to provide knowledge for policy support on biodiversity and ecosystem services. It aims at communicating and engaging a wide set of knowledge holders in its work to ensure tailor-made results to knowledge requesters and society more broadly.

The success of EKLIPSE and its resulting mechanism is in everyone's hands:

- the 'requesters' from policy and society who need to know what knowledge is out there to answer their policy or societal decision needs;
- the knowledge holders (be they scientists or other citizens) who want their knowledge to be useful for decision-making; and
- the networks of people working on biodiversity and ecosystem services who can ensure a good dissemination of the knowledge, recommendations and decisions.

EKLIPSE coordinates innovative and transparent approaches for science, policy and societal actors to jointly provide the best available evidence leading to better informed decision-making.

3 How EKLIPSE answers requests

The outcomes of this Call for Knowledge will be taken into account in the discussions with the requester, in order to define the scope and scale of the question that matches the resources and expectations of the requesters (scope of the answer, level of confidence…). All the elements resulting from these discussions will be grouped into a Document of Work that will set up the agreement between Eklipse and the requester including the calendar, the resource, proposed methodologies to answer the request (based on recommendations of Eklipse Method Group).

Once the document of work is finalised, Eklipse will then organise a **Call for Experts** to form an expert working group in charge of answering the request, using the information provided during the scoping phase (this call for knowledge is part of the scoping), and recommendations provided by the Methods group regarding the range of methods for knowledge synthesis that would meet the requirement of the requester (in terms of timeframe, risk of bias..) and the resources.

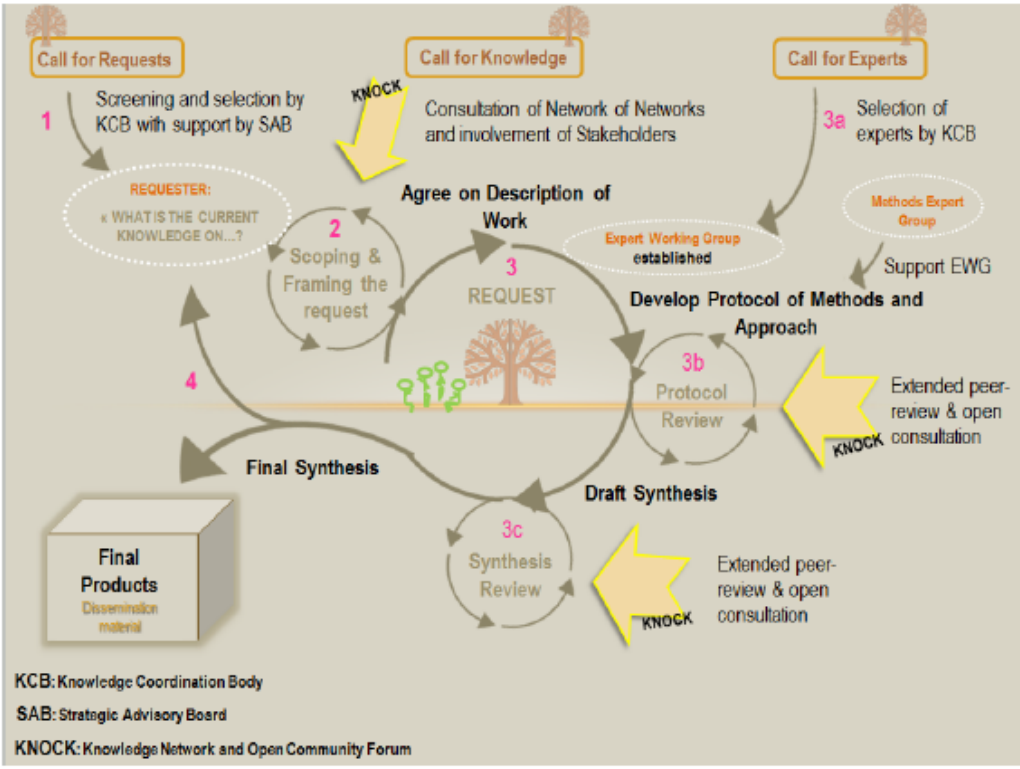
The selected expert group will, together with the Knowledge co-ordination body and the requester, finalise the choice of the methodology and will add all the details about how they will intend to answer the question into a Protocol that will be made publicly available and peer reviewed. The knowledge assessments conducted by Eklipse to answer a question rely on existing available evidence that this call for Knowledge helps to identify. Eklipse is neither conducting research, not conducting site-specific impact studies.

Finally, the results will be peer reviewed before being communicated in to the requester (e.g. as a report or brief or other output to be discussed with the requester), as well as relevant decision-makers, the knowledge community and the general public (see figure below).

4 Next step: Call for Experts

The expert working group will include diverse and complementary skills (including multidisciplinary skills and a broad geographical coverage) and will interact with relevant stakeholders to ensure appropriate uptake of outputs.
The Call for Experts will be widely publicized on the EKLIPSE website, on the Forum and other dissemination channels to ensure a broad coverage of disciplines and geography. The selected group will be supported financially by the EKLIPSE project for travel expenses and in certain cases through honorary contracts.

Figure 1: the different stages of the EKLIPSE mechanism to answer a request



ANNEX 5: Results the Scoping process (including the call for knowledge)

SCOPING OF LITERATURE:

It is important to examine published reviews and synthesis, and to identify current programmes working on a similar question to avoid duplication of and benefit from existing work. Several methods have been put into place in this respect, and the results of this scoping phase are reported in the file <COMPILED REFERENCES.XLS > and can be found on own cloud.

Literature provided by the requester

The requester provided a list of 34 documents that should be relevant to the request. Yet they encompass mental and physical health and should be screened. Many of them are grey literature, often in French, that may require some help with translation.

Documents identified by EKLIPSE

Some documents where identified by various members of the KCB.

6 reviews, 18 articles and about 30 other references were provided by consulting our EKLIPSE Network of Knowledge (KNOCK forum).

A specific search on Web of Science was conducted to identify existing reviews and synthesis. This syntax will be revised and refined depending on other searches on bibliographic databases, if decided to do so:

1. Types of green and blue spaces

beach*	blue space*	campus	canyon*
Cascade*	coast*	CORINE LAND COVER	cultural landscape*
Delta	Desert*	flowerbed*	Forest*
garden*	grass	grassland*	green space*
Greenness	habitat type*	hay	hedgerow*
hill*	IUCN category	lagoon*	lake*
Landscape*	Mangrove*	maquis	marine
mountain*	natural setting*	natural space*	nature
NDVI - normalized difference vegetation index		ocean*	Orchard*
park*	pond*	pool*	prairie*
recreational area*	reef*	river bank*	sand dune*
Satoumi	satoyama	satoyama-satoumi	Savannah*
sea*	seashore*	slop*	stream*
tree*	vegetation layer*	Verge*	watercourse*
waterfall*	wave*	wetland*	wild space*
Wilderness	wood*	woodland	

2. Components/features/characteristics of natural spaces

odor*	OR abundance	OR attribute*	OR biodiverse*
OR characteristic*	OR complex*	OR component*	OR composition
OR contact*	OR diversity	OR feature*	OR feel*
OR flower*	OR hear*	OR landscape	OR lush*

OR noise	OR openness	OR pattern*	OR richness
OR scenery	OR scenic	OR sight*	OR signal*
OR slop*	OR slopiness	OR smell*	OR song
OR sound	OR structur*	OR taste	OR touch
OR trait*	OR tree cover	OR vision	OR visual
OR water*			

3. Mental-health and well-being

acceptance	achievement	aesthetic	affective response*"
affordance	agreeableness	ail*	alive
alleviat*	Amenity	anger	angry
anxiety	anxious	appreciat*	attention
attention restoration"	beneficial	benefit*	calm*
care	cheer*	compassion	conscientiousness
consequence*	cost*	creativity	curiosity
deficit disorder	depress*	detrimental	dismal
distress	distress*	efficien*	emotion*
emotional react*	empt*	engagement	enthusiasm
excite*	extraversion	fatigue	fear
fed-up	feel*	frighten*	glad
grief OR grieving	happiness	happy	Heal*
helpless*	Insomnia	Inspiration	joy*
light-heart*	lively	lonel*	meaning
melancholy*	mental health"	miser*	mitigat*
mood	negative feeling*"	nervosity	nervous
openness	Openness	peaceful*	performance
perseverance	pleas*	pleasant	positive feeling*"
psychologic*	psychological health"	psychotherapeut*	power*
regret*	relax*	respite	purposeful*
restoration	sad*	satisf*	restor*
scar*	self-confidence	self-esteem	satisf*
seren*	Social isolation	sorrow*	sense of place"
spiritual*	stress	sympathy*	spirit*
threat*	thrill*	tranquillity	tear*
turn$down	unhappy	upset*	trouble*
warm-heart*	well-being	withdrawal	vitality
worry			worri*

* stands for any termination of the word. For instance slop* includes slope, sloppiness, sloppy

Results of the literature scoping phase

We discovered that many reviews and syntheses have been already conducted on this topic, although it is unclear whether they really answer the request or not. Moreover, the search conducted in WoS is not exhaustive as some reviews mentioned by the Requester or KNOCK forum were not identified (the search will have to be improved and tested for performance against a test-list). There is a potential for finding more existing relevant reviews.

A set of 17 reviews are currently retained as highly relevant and should be carefully assessed for the robustness of their work and conclusions, to see whether they can answer the request (part of it or entirely). This set encompasses systematic reviews as well as literature reviews. Medium and low relevance reviews should not be read but the list of references they refer to can be very useful to identify other relevant pieces of primary research, if needed. The references provided at the end of each review could be used to establish a relevant test-list, a tool which can be used to develop an efficient search strategy to identify relevant literature, if a systematic map or review was undertaken. Perusing these reviews as well as articles allowed us to identify a list of search terms, descriptors or mental health and well-being, descriptors of natural spaces and components, which are provided in Annex 4. They can facilitate the design of a more thorough search strategy to identify relevant scientific and grey literature, if ever a systematic review or map was considered as a recommended methodological approach.

The number of available scientific articles about mental health, well-being and blue and green spaces is very high (more than 150,000 papers retrieved in WoS when using the list of search terms listed in the tables above, but this does not provide information about the proportion of relevant papers). To target relevant specific papers to answer the request, we would need to develop a very efficient search strategy and eligibility criteria. This takes time and resources and may not be useful to cover the broad range of the request if existing reviews have already compiled the evidence.

The number of existing reviews means that we should be careful at not duplicating existing synthesis and those reviews should be carefully examined as a first step. Depending on the outputs, a narrow search may then be decided to focus on some aspects of these reviews that would benefit from a new or amended analysis, or from an upgrade.

It is suggested to proceed in a stepwise approach: 1/ to critically appraise existing reviews and provide a "review of reviews" with insights about knowledge gaps, map of knowledge, strengths of existing evidence. A tool to assess the content, robustness of existing reviews has been developed recently by the Collaboration for Environmental Evidence (Woodcock et al. 2014, Biological Conservation 176) and could be used by an Expert Working Group; 2/ depending on the results of this review of reviews, a decision could be made with the Requester whether 3/ a full search of the literature would be appropriate, in order to establish a systematic map of the existing knowledge, or 4/ some systematic search(es) of precise subsets of literature could be identified and assessed systematically (critical appraisal exercise), in order to provide answer to the request on some specific aspects to be determined from the review of reviews and the Requester.

If a systematic search of the literature was to be conducted, the list of articles provided by the reviews identified during the scoping phase would constitute a perfect independently-designed "test-list" to develop a rigorous systematic search of relevant scientific articles. Grey literature may be added although this would take more time and resources.

As a conclusion of the scoping phase, based on a very preliminary examination of the literature, there are lots of papers linking natural spaces and mental health or well-being. This is why the initial recommendations to update the Bowler et al. (2007) made sense. Yet, there does not seem to be many papers specifically comparing types of habitats or components of green spaces. If true, this would allow to conduct a full systematic review, but to do so, an efficient and focused search strategy must be designed to limit the potentially huge number of irrelevant papers retrieved by a search. This may be feasible with the help of a professional documentarist and careful refining of the test-list and list of search terms identified during this scoping phase. A group of expert scientists could work on the review of reviews and subsequent critical appraisal of primary research if needed.

It could also design recommendation for future research in terms of materials and methods needed to build a robust evidence base and minimize bias. This could help promote research projects at the national and European level (future call Biodiversa on Health and Biodiversity for instance).

ANNEX 6: Method selection process

Request: **Which types of urban and suburban blue and green spaces and which characteristics (components) of such spaces have a significant impact on human mental health and well-being**?

Table 5.1 Responses to the 10 questions for this request. Notes explaining or commenting on the answer selection are shown in brackets.

QUESTION TO REQUESTER	OPTIONS
1. Type of question	• Seeking measures of effectiveness of interventions
2. What sources of knowledge should be included?	• Scientific • Technical know-how
3. What types of information are useful or acceptable?	• Qualitative data • Quantitative data
4. Time available? When do you need the results?	• 8 months - several years
5. Over what time horizon does the question recur?	• May recur in the future, at unpredictable times
6. What financial resources are available (willingness to pay)?	• High (full time mid-range salary for 8 months or more PLUS specialist expertise available) • Medium (salary for 4-8 months) LEVEL OF RESOURCE IS UNCLEAR, SO WE WILL PRESENT OPTIONS
7. What is the level of controversy?	• Low controversy
8. What are the consequences of getting it wrong?	• medium (e.g. a wrong policy/decision can be adapted/adjusted later
9. What existing knowledge is the Network of Knowledge aware of?	• Research outputs that may be limited in scale/scope/relevance
10. How narrow could the question get before it stops being policy-relevant?	• Intermediate (Broader than a single well-defined response, ecosystem, but not across more than one policy area) IN THIS CASE, IT IS A WELL-DEFINED QUESTION, BUT IT DOESN'T FIT THE DEFINITION FOR NARROW, BECAUSE IT IS MORE THAN ONE ECOSYSTEM TYPE AND MORE THAN ONE POLICY AREA (NATURE AND HEALTH).

Process

- Start with methods appropriate to 1) Type of question. Go through each of these methods and discuss whether appropriate in this context or not, and why. These are shown in the Table 2 below, with notes about each.
- Compare the resultant short list with sets of methods constrained by questions 4, 6 and 10. Any that are not included in those lists should also be excluded, unless the specific circumstances make them applicable.

Table 5.2 Methods selection process

Method appropriate to 'Type of question'	**Justification and notes**	**Who and how?**
RECOMMENDED		
Cochrane-style systematic review	This is possible according to time resources available and fits well with the type of information needed. Not in options for Q10 but is applicable because the question is actually well-defined. It is expected to be a lot of work because the volume of literature is very large, although the relevant portion may be relatively small.	Contracted students, librarians or support staff should do searches, with guidance from expert group
Solution scanning	Useful to identify the components of urban and suburban green spaces expected to influence mental health and well-being.	Expert group
Meta-analysis	As part of the systematic review or rapid evidence assessment.	?
Rapid Evidence Assessment	This is a less rigorous option if resources are constrained.	Contracted students, librarians or support staff should do searches, with guidance from expert group
Causal Chain Analysis	Requires a conceptual framework to understand how urban and suburban blue and green spaces influence mental health and well-being. The evidence from the systematic or rapid review is added to appropriate causal links. This is work for the expert group work	Expert group
NOT RECOMMENDED		
Summaries and synopsis	The question is not broad enough to warrant this.	
Scoping review	Not relevant because the requester wants an actual answer.	
Systematic map	Not relevant because requester wants an actual answer.	
Non-systematic literature review	Not recommended due to high perceived risk of bias	
Expert consultation (both types)	Requester does not want this - too close to opinions.	
Bayesian Belief Network	Opinion-based (not scientific enough)	
Focus groups	Opinion-based (not scientific enough)	
JFF	opinion-based (not scientific enough)	
Adaptive management	Lots of work, too site-based and not generic enough.	