Rethinking communication: Integrating storytelling in systematic reviews and maps for stakeholder engagement

Anneli Sundin[1], Karolin Andersson[2] and Robert Watt[1]

[1]Stockholm Environment Institute, Stockholm, Sweden, [2]Mistra-EviEM, Stockholm, Sweden.

Storytelling holds an untapped potential for communicating evidence from systematic reviews and systematic maps for increased stakeholder engagement. It is time for researchers and research networks to support and emphasize the importance of exploring new tools for effective science communication. Storytelling may be one such tool.

STORYTELLING FOR STAKEHOLDER ENGAGEMENT

Scientific knowledge has traditionally been communicated as isolated logical ideas with little context given to the target audience. This poses the risk of audiences placing new knowledge into preconceived understandings of the world. Storytelling is a well-known and powerful means of communicating messages and engaging audiences but has historically not been commonly used in communication of science, let alone in evidence syntheses. Stories can be useful for developing trust with an audience and increasing knowledge retention as well as the ability and willingness to learn and take action. Storytelling can be integrated in the stages of the systematic review process where stakeholders are involved, and it can be a highly beneficial means of communicating the review findings (Figure 1).

Photo: Neal Haddaway.

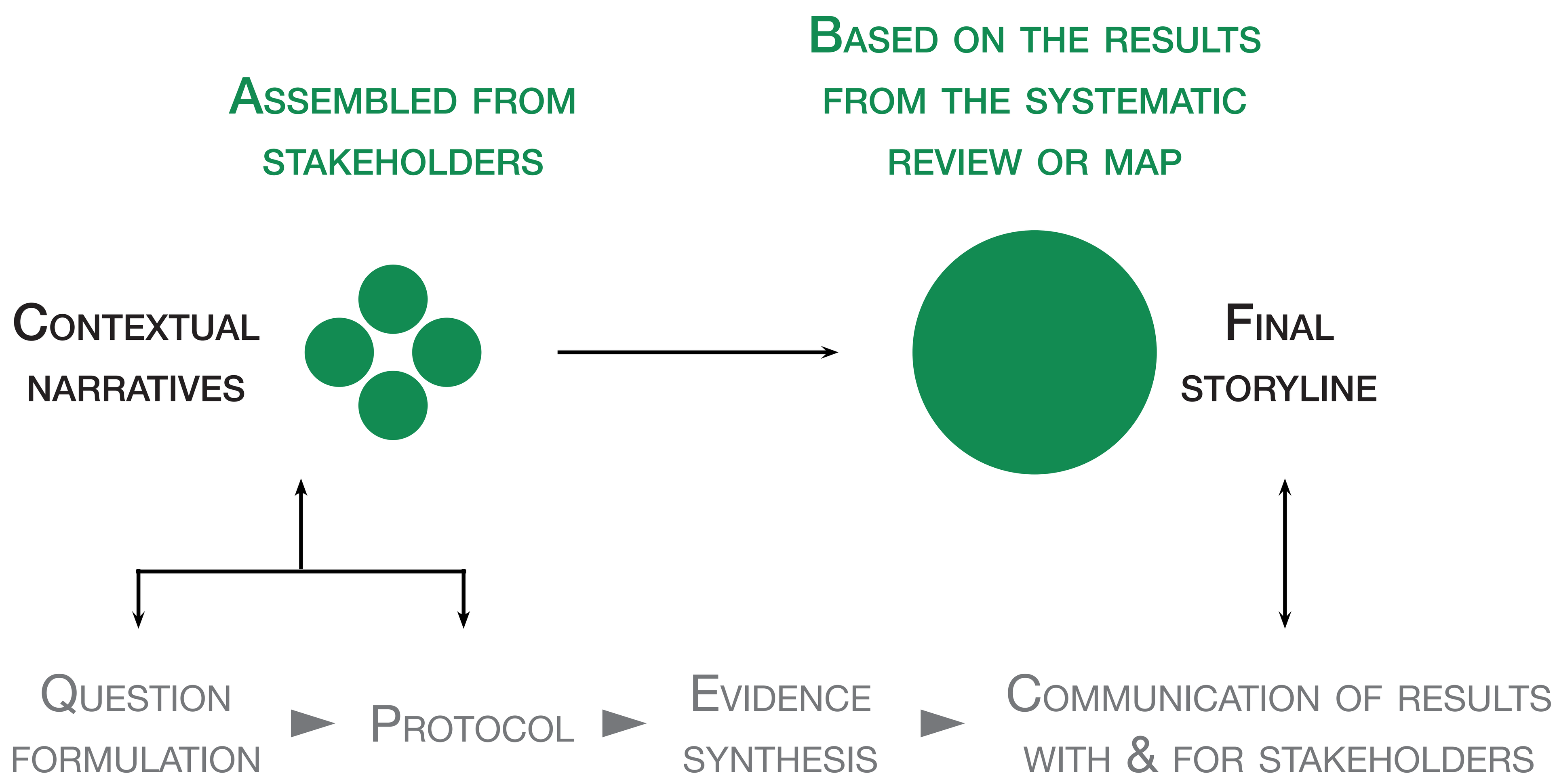

Figure 1. Uses of narrative storytelling in systematic reviews and maps.

UNTAPPED POTENTIAL FOR THE USE OF STORYTELLING IN EVIDENCE SYNTHESIS

The use of storytelling to communicate results from systematic reviews and maps in environmental management has been sporadic, if used at all. The guidelines for conducting systematic reviews in environmental management, developed by the Collaboration for Environmental Evidence (CEE), highlight the need to communicate results through easily digestible products such as policy briefs. However, these often have the same structure as the full report; traditional logical-scientific. The full potential of innovative tools for effective science communication is yet to be explored and put into practice in evidence-based environmental management. We argue that storytelling can be one such tool.

As the figure suggests, stakeholder engagement is likely to increase if review teams collect narratives based on stakeholders' experiences and context-specific knowledge in the early stages of the review. These contextual narratives play a key role in helping to situate the review results into a coherent and applicable final story. This story can be adapted for a range of communication formats.

Reference

Sundin A, Andersson K, Watt R. 'Rethinking communication – Integrating storytelling for increased stakeholder engagement', under review (August 2017) in *Journal of Environmental Evidence.*

Collaboration for Environmental Evidence

MISTRA EviEM EVIDENCE-BASED ENVIRONMENTAL MANAGEMENT

SEI STOCKHOLM ENVIRONMENT INSTITUTE

Climate change impact on human migration: mapping the complex and heterogeneous evidence

Biljana Macura and Neal Haddaway
Mistra-EviEM, Stockholm Environment Institute, Stockholm, Sweden

Anthropogenic climate change has and will continue to have an increasing impact on human welfare whilst possibly inducing movement of people from environmentally stressed areas within or across national borders[1,2,3]. The topic of climate-related migration is becoming a growing concern as effective policy responses, plans for adaptation and investments are yet to be developed[4]. Nevertheless, causal links between climate change and human migrations are often unclear or complex and the notion of a "climate migrant" is argued to be a social construction[5].

Are today's internally displaced people tomorrow's refugees and migrants?

Displacements by disasters (2008 to 2016): weather-related in blue, geophysical in yellow. Source: IDMC[6]

OBJECTIVES

We aim to 1) systematically identify and catalogue all available qualitative and quantitative empirical evidence on the impact of climate change and extreme weather events on people's movements; 2) determine if the current perceptions of climate change impacts on migration are built on evidence.

Identify **Question** (with stakeholder engagement) 〉 Generate & publish **Protocol** 〉 **Search** studies 〉 **Include** relevant evidence 〉 (Critically **appraise**) 〉 **Meta-data extraction** 〉 **Systematic map report** – **Communication** of results

METHODS

To describe the state of knowledge on the topic and to identify knowledge gaps in this field, we will use a relatively novel method in the field of environmental management - systematic mapping7. Systematic mapping is based on the core principles of transparency, objectivity and repeatability and it is used for collating and cataloguing evidence on a broad and heterogeneous subject. The main output of this exercise will be a database of available evidence climate-related human movements. We will identify knowledge gaps (areas of the evidence base without evidence or with underrepresented evidence) and knowledge clusters (areas of the evidence base with the sufficient evidence to attempt a full synthesis).

THE IMPORTANCE OF NON-CONVENTIONAL SOURCES OF LITERATURE

Apart from peer-reviewed literature, a significant amount of relevant evidence may be available from the grey literature sources as climate change and migration is an area of work of many international agencies, including the International Organization for Migration and the United Nations High Commission for Refugees[5].

1. IPCC, 2014: Climate Change 2014: Impacts, Adaptation, and Vulnerability. Part A: Global and Sectoral Aspects.
2. McMichael C, Barnett J, McMichael AJ (2012) An Ill Wind? Climate Change, Migration, and Health. Environmental Health Perspectives 120:646-654
3. Raleigh C, Jordan L, Salehyan I (2008) Assessing the Impact of Climate Change on Migration and Conflict. Social Dimensions of Climate Change, Social Development Department, The World Bank
4. Wilkinson E, Kirbyshire A, Mayhew L, Batra P, Milan A (2016) Climate-induced migration and displacement: closing the policy gap. ODI Briefing
5. Baldwin A (2017) Climate change, migration, and the crisis of humanism. WIREs Clim Change 2017, e460
6. http://www.internal-displacement.org/database/
7. James, K. L., Randall, N. P., & Haddaway, N. R. (2016). A methodology for systematic mapping in environmental sciences. Env. Evidence, 5(1)

The Mistra Council for Evidence-Based Environmental Management (**EviEM**) works for environmental management to be placed on a scientific foundation. Through systematic reviews of environmental issues, we aim to improve the basis for decisions in Swedish environmental policy. MISTRA-EviEM is a centre of Collaboration for Environmental Evidence – a coordinating body for environmental evidence synthesis, currently financed by the Swedish Foundation For Strategic Environmental Research.

MISTRA EviEM
EVIDENCE-BASED ENVIRONMENTAL MANAGEMENT

Collaboration for Environmental Evidence

The known knowns and known unknowns: A database of evidence gaps and clusters in environmental management

Biljana Macura, Neal R Haddaway and Karolin Andersson
Mistra EviEM, Stockholm Environment Institute, Stockholm, Sweden

Policy and practice decisions in environmental management should be based on the best available evidence. Better use of evidence in decision making can improve effectiveness of conservation interventions, avoid ineffective actions and justify spending of limited conservation funding. However, there is a problem when research evidence on a specific topic does not exist or if available evidence is insufficient or too scattered to inform environmental policy and practice. *Evidence gaps* **are the areas in the evidence base with little or no evidence, and** *evidence clusters* **are subsets of the evidence base where sufficient research evidence exists to allow full synthesis. Whilst evidence syntheses identify evidence gaps and clusters, there is as yet no systematic effort to collate them to better focus primary research efforts or support funding decisions.**

Objectives

The aim of this work is to collate evidence gaps and clusters from systematic maps[1], and to produce a first edition of searchable database of evidence gaps and clusters across environmental management.
We aim for this database to be primarily used by funders, researchers, reviewers and decision makers in environmental policy and practice.

Methods

We searched the official Collaboration for Environmental Evidence (CEE) journal *Environmental Evidence* (www.environmentalevidencejournal.org) for all CEE-registered systematic maps published. They were examined for evidence gaps by extracting any any suggestions for topics needing further research, and for evidence clusters by extracting references to suggested full systematic review topics or questions.

Benefits of collating evidence gaps and clusters

Results

The database contains over 50 evidence gaps and 39 evidence clusters collated from all 13 systematic maps in following broad subject areas: forestry, fisheries, agriculture, and ecological, social and economic aspects of biodiversity conservation. Four maps could not identify any evidence clusters as evidence base on their subjects was too limited, but they highlighted several gaps and provided recommendations for more primary research.

1. James, K.L., Randall, N.P., & Haddaway, N.R. (2016). A methodology for systematic mapping in environmental sciences. *Environmental Evidence*, 5(1).

The Mistra Council for Evidence-Based Environmental Management (**EviEM**) works for environmental management to be placed on a scientific foundation. Through systematic reviews of environmental issues, we aim to improve the basis for decisions in Swedish environmental policy. MISTRA-EviEM is a centre of Collaboration for Environmental Evidence – a coordinating body for environmental evidence synthesis, currently financed by the Swedish Foundation For Strategic Environmental Research.

MISTRA EviEM EVIDENCE-BASED ENVIRONMENTAL MANAGEMENT

Collaboration for Environmental Evidence

The *not-so-systematic* reviews: challenges with misunderstanding definitions in environmental sciences

Neal Haddaway, Biljana Macura and Magnus Land
Mistra-EviEM, Stockholm Environment Institute, Stockholm, Sweden

When conducted well, systematic reviews can offer 'gold standard' evidence for use in decision-making. However, when done badly or when misunderstood, the evidence from a not-so-systematic review could be biased and incorrect. Here we discuss the problem with sub-standard reviews in conservation and environment management.

COMMON PROBLEMS IN (NOT SO) SYSTEMATIC REVIEWS

It is widely accepted that systematic reviews that have 'added value' compared to a traditional review, but many researchers still have a limited understanding of the necessary steps and safeguards needed to ensure a systematic review is truly reliable. Many evidence reviews in conservation and environmental management lack transparency and repeatability, performing little critical appraisal, failing to attempt comprehensiveness and often performing vote-counting. We have identified a series of recently published reviews that claim to be 'systematic reviews' in the field of conservation and environmental management[1,2,3]. Through our analyses we have identified the following critical pitfalls.

Lack of comprehensiveness

Studies were either cherry-picked or a limited number of resources were searched

Subjectivity in decisions

Critical decisions are made without a priori criteria, by only one reviewer, or without consistency checking amongst reviewers

Lack of critical appraisal

Validity of included studies is not assessed and equal weight is assigned to studies with different level of methodological rigour

Selecting the wrong synthesis method

Synthesis method not appropriate for the set of studies identified

Assuming a lack of evidence is a lack of effect

Lack of studies showing a particular results taken to mean there is no effect

Vote-counting

Direction or significance of study findings is tallied in synthesis, e.g. more positive than negative studies used to demonstrate a positive summary finding

Errors in supplementary information

Where detailed methodological information is provided in supplementary information this contains errors or inconsistencies

Lack of transparency & repeatability

Review methods are often not reported in sufficient detail to allow replication/verification. Where detailed methodological information is provided it frequently contains errors or inconsistencies.

Ignoring grey literature

Searches only performed in academic journals, risking publication bias and reducing comprehensiveness

STEPS FORWARD

Careful gatekeeping is needed by journal editors, peer-reviewers and/or endorsing bodies to ensure a minimum standard is attained before reviews can be truly seen as being 'systematic reviews'. Since endorsing bodies (e.g. CEE, Cochrane, Campbell) already perform this role, we call on editors and peer-reviewers to assist in ensuring substandard systematic reviews are not published and that authors (future reviewers) are aware of systematic review guidance available to help them.

1. Haddaway, N.R., Land, M. and Macura, B., 2017. A little learning is a dangerous thing": A call for better understanding of the term 'systematic review. Environment international, 99, pp.356-360.
2. Haddaway, N.R. and Watson, M.J., 2016. On the benefits of systematic reviews for wildlife parasitology. International Journal for Parasitology: Parasites and Wildlife, 5(2), pp.184-191.
3. Haddaway, N.R., 2017. Response to "Collating science-based evidence to inform public opinion on the environmental effects of marine drilling platforms in the Mediterranean Sea". Journal of Environmental Management.

MISTRA EviEM
EVIDENCE-BASED ENVIRONMENTAL MANAGEMENT

Collaboration for Environmental Evidence

"Quality is not an act, it is a habit"
- Aristotle

What is the effect of phasing out long-chain per- and polyfluoroalkyl substances (PFAS) on the concentrations of perfluoroalkyl acids and their precursors in humans?

Magnus Land[1*], Cynthia A. de Wit[2], Anders Bignert[3], Ian T. Cousins[2], Dorte Herzke[4], Jana H. Johansson[2], Jonathan W. Martin[2,5]

[1] Mistra EviEM, Stockholm Environment Institute, Box 24218, SE-104 51 Stockholm, Sweden, [2] Department of Environmental Science and Analytical Chemistry, Stockholm University, Sweden, [3] Swedish Museum of Natural History, Stockholm, Sweden, [4] Norwegian Institute for Air Research, Tromsø, Norway, [5] Division of Analytical and Environmental Toxicology, University of Alberta, Edmonton, Canada. *Corresponding author

1. BACKGROUND

Toxicological and refractory properties of PFASs, in combination with their widespread occurrence and bio-availability, have raised concerns about the environment and human health. Consequently, the use of some PFASs have been regulated or voluntarily phased-out by the industry in parts of the World. Here we summarize the findings of a systematic review on global temporal trends of perfluoroalkyl acids (PFAAs) and their precursors in humans.

2. METHODS

A systematic review was conducted in compliance with the guidelines by Collaboration for Environmental Evidence (CEE) and according to a previously published protocol (Land et al. 2015). The systematic review included both human and environmental samples. Temporal data were reanalysed using the same statistical methods across all datasets. As meta-analysis was not feasible, the synthesis is mainly narrative but includes graphic visualizations of study results (examples shown in Figure 1).

Example A. No detected change-point and no significant trend. The power to detect a trend is low which means that a trend may be present, but given the inter-annual variability the dataset is insufficient to detect that.

Example B. A significant change-point (CP) is detected, but the trends are in-significant with low power to detect a trend both before and after the CP. There is a significantly decreasing trend if the entire study period is considered (indicated by green marker).

Example C. A significant change-point (CP) is detected. Before the CP the trend is insignificant and the power to detect a trend is high. It is unlikely that there is a significant (undetected) trend before the CP. After the CP there is a significant decreasing trend.

Example D. No change-point analysis was performed (<7 time-points). There is no significant trend and the power to detect a trend is low.

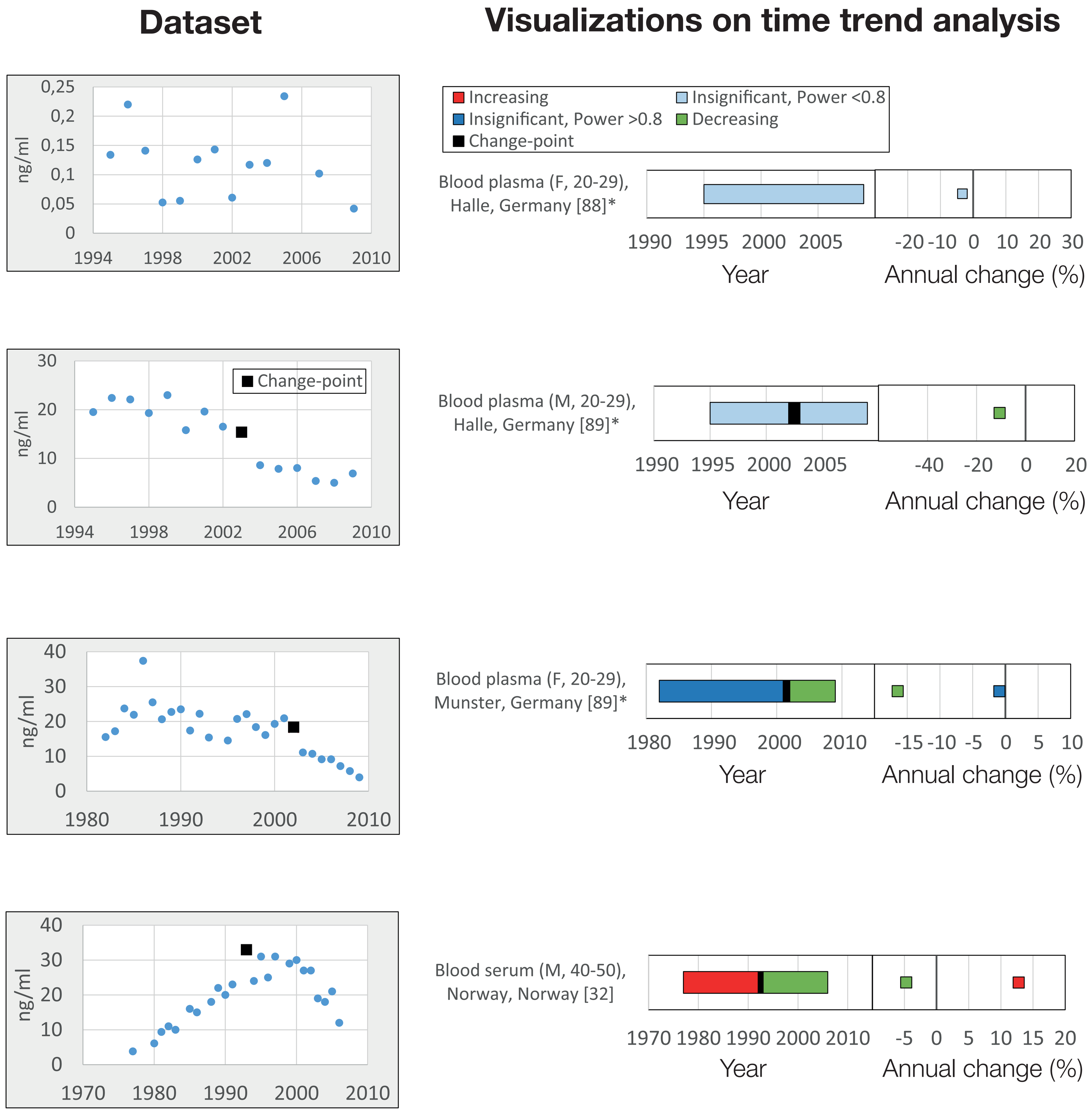

Figure 1. Four examples showing how results obtained in time trend analyses are visualized.

3. RESULTS

The systematic review includes 13 PFASs. Figure 2 shows study results for PFOS in humans.

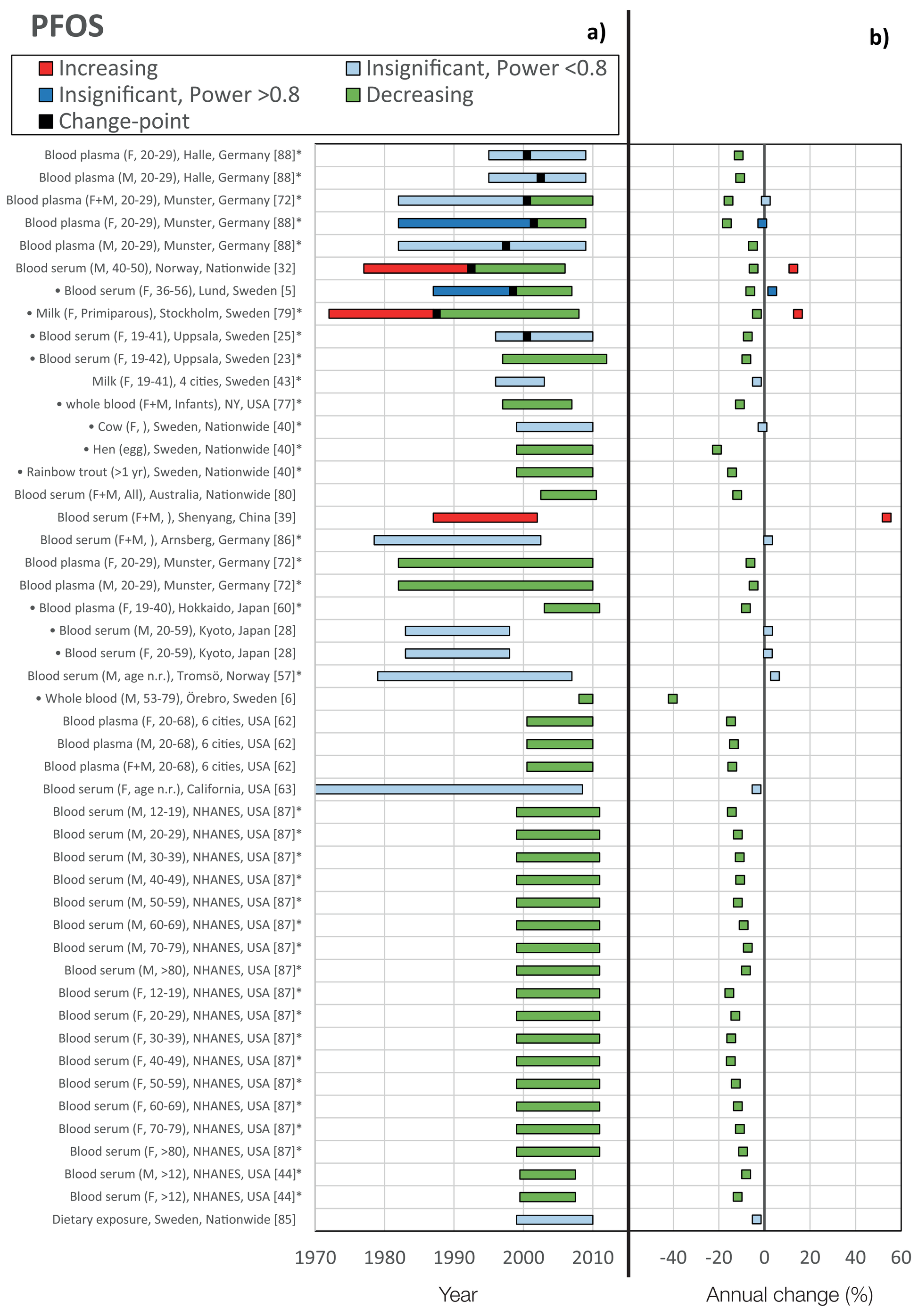

Figure 2. Temporal trends of PFOS in humans and dietary exposure.

4. CONCLUSIONS

In regions where regulations and phase-outs have been implemented, concentrations of **PFOS**[1], **PFDS**[2], and **PFOA**[3] in humans are generally declining, as are some **PFOS-precursors** (e.g. **PFOSA**[4]).

In contrast, limited data indicate that concentrations of PFOS and PFOA are increasing in China where the production of these substances has increased.

Concentrations of perfluorinated carboxylic acids (**PFCAs**) with 9-14 carbon atoms are generally increasing or show insignificant trends with low power to detect a trend.

Declining **PFOS**, **PFOS-precursor** and **PFOA** concentrations in humans likely resulted from removal of certain PFASs from commercial products or from food packaging. Increasing concentrations of **long chain PFCAs** (C9-C14) in most matrices, and in most regions, is likely due to increased use of alternative PFASs.

	PFAS acronym	Chain length	Group	PFAS full name	Chemical formula
1)	PFOS	C8	PFSA	Perfluorooctane sulfonic acid	$C_8F_{17}SO_3H$
2)	PFDS	C10	PFSA	Perfluorodecane sulfonic acid	$C_{10}F_{21}SO_3H$
3)	PFOA	C8	PFCA	Perfluorooctanoic acid	$C_7F_{15}COOH$
4)	PFOSA	C8	Precursor	Perfluorooctane sulfonami de	$C_8H_2F_{17}NO_2S$

Reference

Land, M., de Wit, C.A., Cousins, I.T., Herzke, D., Johansson, J., Martin , J.W., 2015. What is the effect of phasing out long-chain per- and polyfluoroalkyl substances on the concentrations of perfluoroalkyl acids and their precursors in the enironment? A systematic review protocol. Environmental Evidence 4, 1-13.

The Mistra Council for Evidence-Based Environmental Management (**EviEM**) works for environmental management to be placed on a scientific foundation. Through systematic reviews of environmental issues, we aim to improve the basis for decisions in Swedish environmental policy. MISTRA-EviEM is a centre of Collaboration for Environmental Evidence – a coordinating body for environmental evidence synthesis, currently financed by the Swedish Foundation For Strategic Environmental Research.

MISTRA EviEM
EVIDENCE-BASED ENVIRONMENTAL MANAGEMENT

Collaboration for Environmental Evidence