

# Stories can change the world – citizen science communication in practice

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In: Hecker, S., Haklay, M., Bowser, A., Makuch, Z., Vogel, J. & Bonn, A. 2018. *Citizen Science: Innovation in Open Science, Society and Policy*. UCL Press, London. <https://doi.org/10.14324/111.9781787352339>

## Highlights

- There has been a paradigm change from a one-way transfer of science information to a paradigm of exchange that demands adequate science communication.
- Communication in citizen science projects is key to motivating and retaining participants and exchanging information.
- Stories can play an important role in translating the abstract and logic scientific discourse into a concrete, emotion-related narrative of societal relevance.
- Communication and media coverage improves the chance of scientific expertise and knowledge influencing policy-making.
- Innovative collaboration between science and the media can benefit both partners – attracting participants to citizen science projects and generating media stories.

- Storytelling and visualisation are powerful communication tools, affecting the brain and emotions more effectively than words.

## Introduction

Societies are facing global environmental and social challenges, such as the loss of biodiversity, environmental damages and climate change (Owen & Parker; Ballard, Phillips & Robinson, both in this volume). Simultaneously, social transformations mean that global society is connected in new ways (Novak et al. in this volume). Facing a world of uncertainties and threats, people need to redefine their way of life and ways of living together in society and with nature.

At the same time, people also dispose of knowledge and scientific evidence in new ways (see Mahr et al. in this volume). Global human knowledge currently increases at high speed, but this is not solving the various environmental and societal challenges. Millions of scientific papers are published every year without leading to a significant change in behaviour. Scientific knowledge is needed to make sound political decisions and enable meaningful conversations, but there is a lack of communication from the scientific community to wider society (Shirk & Bonney; Nascimento et al., both in this volume). Innovative methods are needed to bridge the gap from science to society and policy, generating changes in everyday lives and behaviour (Smallman in this volume).

The communication of science to diverse audiences and the engagement of scientists with all parts of society, including policymakers, are key factors in this process. Studies have shown that scientists communicating outside of the scientific community, for example, with the media, have a higher chance of being noticed and taken seriously by society and policymakers (Peters et al. 2008). Research is legitimised when the perception of its social relevance is reinforced, making it more likely to be used in the policy-making process. The media – as part of the process of science communication – influences policy agendas by communicating and discussing deliberately chosen topics. Media and news programmes are influential as they not only report problems, but also seek to analyse them and present possible solutions, thus turning into advocates for particular policy solutions (Howlett & Ramesh 2009). The process of making news means that journalists and editors choose stories or issues that they consider important. This selection follows its own rules of interest and means that not all stories are told.

From a scientist's point of view, communicating science to audiences is not enough. New forms of interaction between scientists and society are needed, going beyond the so-called 'deficit model' of science communication (Snow 1974). The deficit model assumes that the wider public lacks knowledge, interest and the ability to think scientifically and process data (Bauer 2016). Still, these deficits could be overcome and the public educated, gaining some scientific literacy through science communication (Snow 1974). The deficit model also assumes one-way communication, transmitting information and knowledge from science to the public. It is important to state that science and society are not two worlds apart with science being 'elsewhere', but rather that science is part of society's culture (Irwin 1995; Trench 2006; Schiele 2008).

Citizen science can be part of the larger process of engaging people in new forms of interaction, challenging scientists and citizens whilst enlarging scientific knowledge and providing learning opportunities for all parties involved (Bonney et al. 2014; Bela et al. 2016; Peltola et al., all in this volume). These diverse interactions require innovative forms of multiway science communication.

Stories can play an important role in bridging the discourses between science and society, and translate the abstract and logic scientific rationale into a concrete, emotion-related narrative for non-specialists that can easily be linked to existing knowledge and experience (Constant & Roberts 2017). This chapter discusses the innovative potential, limits and opportunities of science communication with a focus on storytelling through the framework of citizen science, illustrated with case studies and best practice examples.

## Changing paradigm in science communication

A paradigm change (Kuhn 2012) can be observed in the field of science communication as basic scientific concepts and practices are challenged. In recent history, scientists were legitimised by creating and possessing knowledge and the public was deemed unable to understand scientific concepts, methods and findings (see Mahr et al. in this volume). However, there is now a shift from this simplistic understanding of one-way knowledge transfer, which is reflected in the change from a deficit paradigm to an engagement paradigm (Schiele 2008). The engagement paradigm understands science communication as also involving identity, democracy and scientific citizenship (Davies & Horst 2016). At the same time,

the reference frame is rapidly changing from passive to active knowledge, influencing science communication and the interaction of science and society.

Engaging volunteers in research both requires and offers multiway communication between different actors in the scientific process. Actors in citizen science projects can be scientists, citizens, mediators or communicators, and they take on different roles, such as research managers, information providers or data providers (see Haklay in this volume). To make this collaboration successful, there must be adequate communication. The aim of communication in citizen science therefore goes beyond outreach and the one-way diffusion of information. Communication can have multiple aims and must be considered and designed according to the project goals. Long-term citizen science projects need ongoing collaboration and, therefore, communication to inform, motivate and engage participants. Other projects might want to raise awareness of their project issue at a local level, introducing it to the policy agenda. They therefore need to address a different target group and use other methods of communication. Educational projects need to consider training tools and might need to communicate them to different age groups (see Harlin et al.; Makuch and Aczel; Wyler & Haklay, all in this volume).

The border between *science communication*, understood as external communication from scientific actors to the public, and *scholarly communication*, understood as communication between those involved in the scientific process (usually only the scientists), is becoming increasingly blurry as citizens are becoming part of the process in multiple ways. Issues of democracy, local empowerment and community identity should be included in the concept of citizen science communication, thus enlarging the framework of science communication (Smallman in this volume). Communication can develop into multiway exchanges driven by technical tools but also by feedback possibilities.

The success of communication in citizen science is more relevant than in conventional science because it might motivate people to get or stay involved (or not) and thus contribute to the project's scientific success. More engaging formats of communication are needed to make these complex interactions possible. In addition to traditional channels such as broadcast media and newspapers, social media are gaining in importance, allowing science to reach its audience directly (Mazumdar et al. in this volume).

## Science-media exchanges and co-operation

Citizen science projects often attract media attention as they deal with topics of societal relevance and provide good stories; and citizen science projects profit from media presence for the recruitment of participants. Innovative collaborations between science and media can therefore benefit both partners (see [box 30.1](#)) with the potential of even changing the journalistic perspective on how to explore a good media story ([box 30.2](#)).

### Box 30.1. Foxes in Berlin: Science meets media for mutual benefit

In 2015, the public broadcasting corporation rbb (Rundfunk Berlin-Brandenburg) started a media campaign on red foxes in the city of Berlin, Germany, designed to operate as the starting point for a citizen science project on the ecology of foxes run by the Leibniz Institute for Zoo and Wildlife Research (IZW). The topic ‘Foxes in Berlin’ was covered in numerous TV and radio shows, and audiences were asked to send in photographs, videos and narratives of fox encounters, which were published on a dedicated website. The response exceeded all expectations: More than 1,000 ‘fox watchers’ submitted contributions. The resulting publicity was used to kick-start a citizen science project asking volunteers to take over various tasks in the IZW’s research project on foxes.



**Fig. 30.1** A citizen photograph for the ‘Foxes in Berlin’ campaign. (Source: Margit Schröter)

*(continued)*

The joint campaign benefited both partners. For the IZW, it provided access to a large audience and a valuable starting point for the recruitment of citizen scientists. For the rbb, the combination of scientific information and the 'human dimension' in the interesting and amusing stories people contributed generated excellent audience ratings.

### Box 30.2. Media needs a novel approach

*I got interested in citizen science some time ago. We started by producing a broadcast of 30 minutes about citizen science and placed several features in the live programme of the Berlin-Brandenburg broadcast rbb. Then we started the foxes in the city programme with the Leibniz Institute for Zoo and Wildlife Research. We wanted to find out whether people were actually willing to participate continuously. Nowadays when planning a science feature, I always try to find a citizen science approach for the very research question, for example, for the Mars mission. In conventional media reporting we would tell the story from the scientist's perspective. But now I ask editors to go find citizen science approaches and participating citizens in the region to let them talk about it. That way we not only have a regional approach but also a level reaching our audience. With topics like the death of bees or soil quality, our colleagues already ask for the expertise of non-scientific experts. But when it comes to more complex and not everyday life topics, we have not done this so far. So my main message from a media point of view is not only that science needs to better communicate. But we as media also need to redefine our premise.*

Ilona Marenbach, Rundfunk Berlin-Brandenburg (rbb)

Working together with scientists and citizen scientists also led to self-reflection on the part of the media partner, who reconsidered their involvement in, and practices of getting, science stories (see [box 30.2](#)). Thus, communication may improve not only from the science side, but also from the media side. Instead of only including scientist perspectives, media may also try to actively involve citizen scientists.

## Connecting policy and citizen engagement

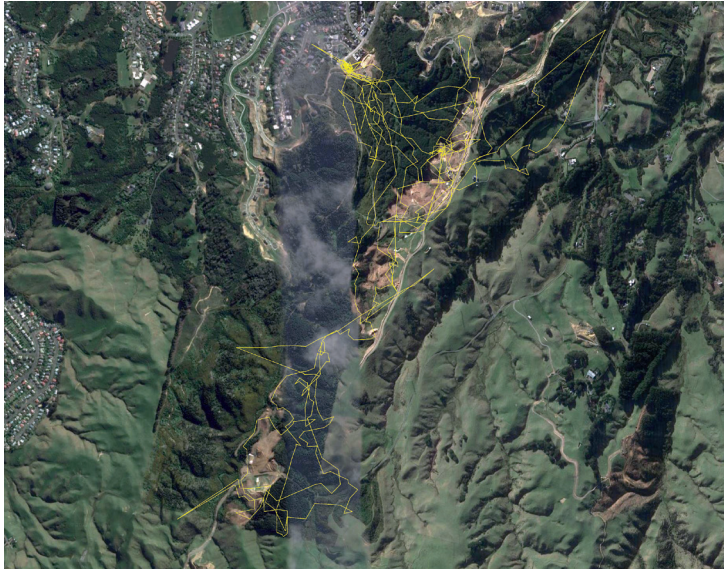
Members of society are likely to participate in citizen science projects when they address issues of relevance to their lives and experiences (see [box 30.3](#)). Policy, on the other hand, deals with concerns and problems of society that call for solutions. Collaboration between science, policy and society in citizen science can fulfil multiple needs for all actors (Shirk & Bonney in this volume) and produce meaningful results.

### **Box 30.3. Cat Tracker: International citizen science project exploring the movement and management of cats**

Cats are one of the most popular pets worldwide, providing their owners with enjoyment and companionship, but they can also be a nuisance to neighbours and may have a negative impact on native wildlife. A citizen science project, Cat Tracker, was initiated to collect both environmental and social data exploring the relationship between cat management and cat behaviour. The project combines a social survey and GPS tracking to turn cat owners into researchers. It aims to help better understand cats' home range, how much time they spend in different kinds of habitat, and how owners can manage pet cats to reduce their impact on wildlife. This project was established in the United States and has expanded through collaborators to other countries. In New Zealand, information collected via the Cat Tracker project – from public attitudes towards the management of cats to distances travelled by individual felines – has been used to inform local government. The social survey of the New Zealand public indicated a high level of support for mandatory microchipping of pet cats. In August 2016, the Wellington City Council voted to make microchipping of pet cats compulsory – a first in New Zealand. It is hoped that the public involvement in this project will encourage responsible pet ownership and improve the welfare of both domestic cats and native wildlife.

Source: [www.cattracker.nz](http://www.cattracker.nz)

*(continued)*



**Fig. 30.2** *Image A* – A domestic cat wearing a GPS tracker on a harness as part of the Cat Tracker New Zealand citizen science project. *Image B* – an example of a cat’s movements over a one-week period. (Source: Heidi Kikillus)



## Connecting and saving worlds

Science communication can help to connect complex issues like climate change with the changes in nature that people can see in their own backyards. Connecting complex issues with concepts that are familiar to people can result in lots of media attention – if communication is planned and managed in the right way (see [box 30.4](#)). Researchers in citizen science have a good chance of reaching larger audiences and communicate during the whole process.

Communication plays an important role in citizen science projects that apply an oral history approach with the aim of safeguarding cultural heritage. In this approach, participants communicate and interview other participants about historical events, traditions or daily life. Oral history is a way of giving history back to people in their own words ([Thompson 2017](#)). Involving members of society in this process and the subsequent research, leads to a citizen science project. Communication can thereby lead to social cohesion, connect generations, encourage the valuing of cultural heritage and create cultural resources, as case studies show (see [box 30.5](#)).

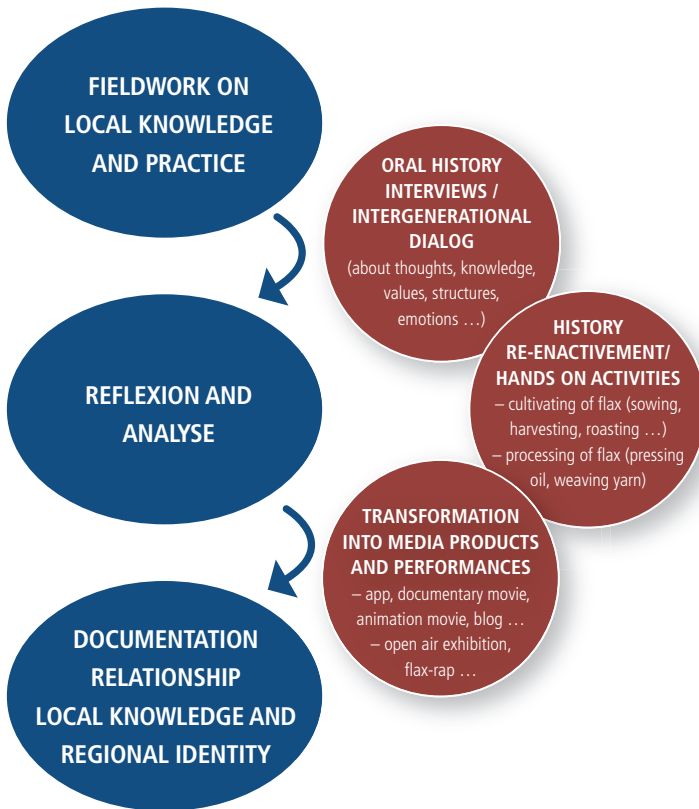
### **Box 30.4. *De Natuurkalender*: New communication tools and technologies**

New communication tools and technologies allow individual scientists to more easily take the responsibility and initiative to communicate to society at large or to specific stakeholders. *Nature Today* (*De Natuurkalender*) experienced this by letting experts write stories on topical developments in nature in an understandable way and by actively informing journalists and interested people about these stories, generating mass outreach. This would not have been possible if the initiative of writing and publishing these stories had been the responsibility of communication officers alone. Citizen science projects are well suited to this type of frequent communication as they often continuously produce interesting, newsworthy data. The fact that already many volunteers are involved makes the topics even more attractive. Communication fulfils multiple objectives from which scientists and society/stakeholders benefit.

**Box 30.5. Intergenerational dialogue as a research tool to save cultural heritage**

Cultural heritage in all its components is a valuable, if not vital, factor in the reorganisation of societies on the basis of dialogue between cultures, respect for identities and a feeling of belonging to a community of values. BreadTime (2015–2017) focuses on the cultural sustainability and the agricultural and manual practices of the cultivation and processing of grains and the production of bread in the rural region of Lesachtal, Austria. The goal of

**FIELDWORK ON LOCAL KNOWLEDGE AND PRACTICE**



**Fig. 30.3** Enabling process conducting research through fieldwork on local knowledge and practice. (Source: Andrea Sieber)

the project is the analysis, protection and documentation of local knowledge and practice related to the immaterial cultural heritage of 'Lesachtal bread', which is part of the UNESCO Intangible Cultural Heritage list. How could this local intangible cultural heritage be saved and transferred from one generation to the next? Citizens can participate in narrative dialogue groups as an open communicative space to collect and discuss local knowledge, or write down and send their experiences to the collection of biographical records. Furthermore, students from secondary schools were instructed in the method of oral history and interviewed local elders about the traditional cultivation and its significance in their daily rural life. In this way, oral history interviews not only served as a tool of communication and mutual learning, but also as the empirical basis for several research outputs, such as a documentary of local narratives and local practices related to flax. Using this method of intergenerational communication could access and secure local narratives and traditional knowledge, and communicate interest and curiosity between the youngsters of the valley and elders of the community. This form of intergenerational oral history brings together people of different generations in a socially integrating way, with mutual interest and emotional bonds. As opposed to passive learning, oral history is very engaging and hands-on, not only collecting stories but also creating social bridges between generations.

[www.lesachtalerbrot.wordpress.com](http://www.lesachtalerbrot.wordpress.com)

## Storytelling and visualisation – tools touching the brain

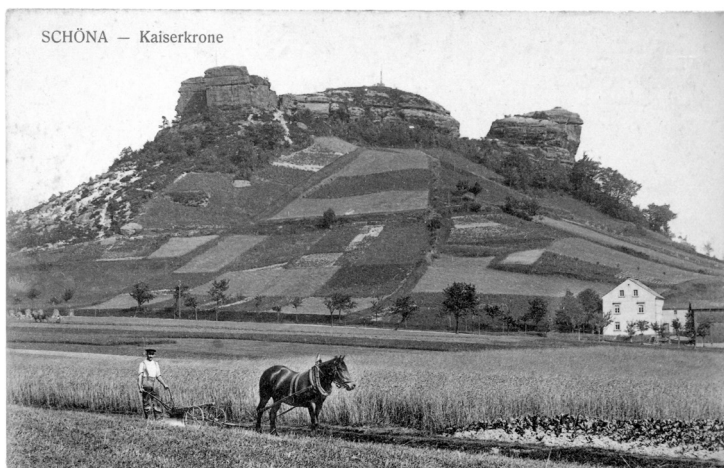
Science information needs to be translated and this can be done by using tools like storytelling and visualisation. Visuals reach human brains many times faster than words and connect information with emotions (see [box 30.6](#)). Interesting citizen science stories translating policy issues to the public tend to be viewed as more relevant and of higher importance than those with a less developed narrative structure ([Howlett & Ramesh 2009](#)).

Storytelling is a powerful tool: it affects the brain and emotions in different ways with different effects. Information is likely to be transformed into personal ideas and experiences in the brain if it is told as a story (Gerrig 1993). This process is called neural coupling, which is mirrored by the same experience in listeners and the speaker (Stephens, Silbert & Hasson 2010). The neurotransmitter dopamine, released by the brain in emotionally charged events like an engaging story, helps people to remember and ensures that memories are relevant and accessible

### Box 30.6. Creating a landscape memory

Can you still remember the landscape of your childhood? Landscapes undergo change; they become ever more homogenous. Yet we are generally unaware of this process. Changing Landscapes is a citizen science pilot project to foster public interest in landscape research and to jointly create a collective memory of the landscape. Citizens are asked to rummage through boxes of photos and family albums in order to find old snaps of landscapes. Then they go to the original location of the photo and, from the same perspective, take a new photo of the landscape. Furthermore, participants are encouraged to evaluate how they interpret the changes to the landscape, for example, positively or negatively, and which ecological effects they connect with these changes. From a scientific viewpoint, such as at the Leibniz Institute of Ecological Urban and Regional Development as well other partner institutes, the transformed landscapes are linked to data on biological diversity to investigate the relationship between changing landscapes and the impact on biological diversity. In some cases, landscapes are now used more intensively and the level of biodiversity is lower, but the opposite can also be found. In the study area of Saxon Switzerland we can say that 'everyone' is involved. Whether old or young, experienced photographers or absolute beginners, our project has managed to reach wide swathes of the public. In this way we can say that landscapes not only seem to be accessible to local people but also comprehensible, and indeed something tangible in their lives.

[www.landschaft-im-wandel.de](http://www.landschaft-im-wandel.de)



**Fig. 30.4** How would you evaluate this landscape change? Matched landscape photos from citizen science pilot project, Changing Landscapes. (Sources: Postcard top, 1908 collection Walz; photo bottom, Walz 2014)

for future adaptive behaviour, a concept called ‘adaptive memory’ (Shohamy & Adcock 2010). Many areas of the brain will also be activated by a good story (Barraza et al. 2015). All of this can happen if the story is about things that matter to people and stimulates listeners to care about the characters (see box 30.7).

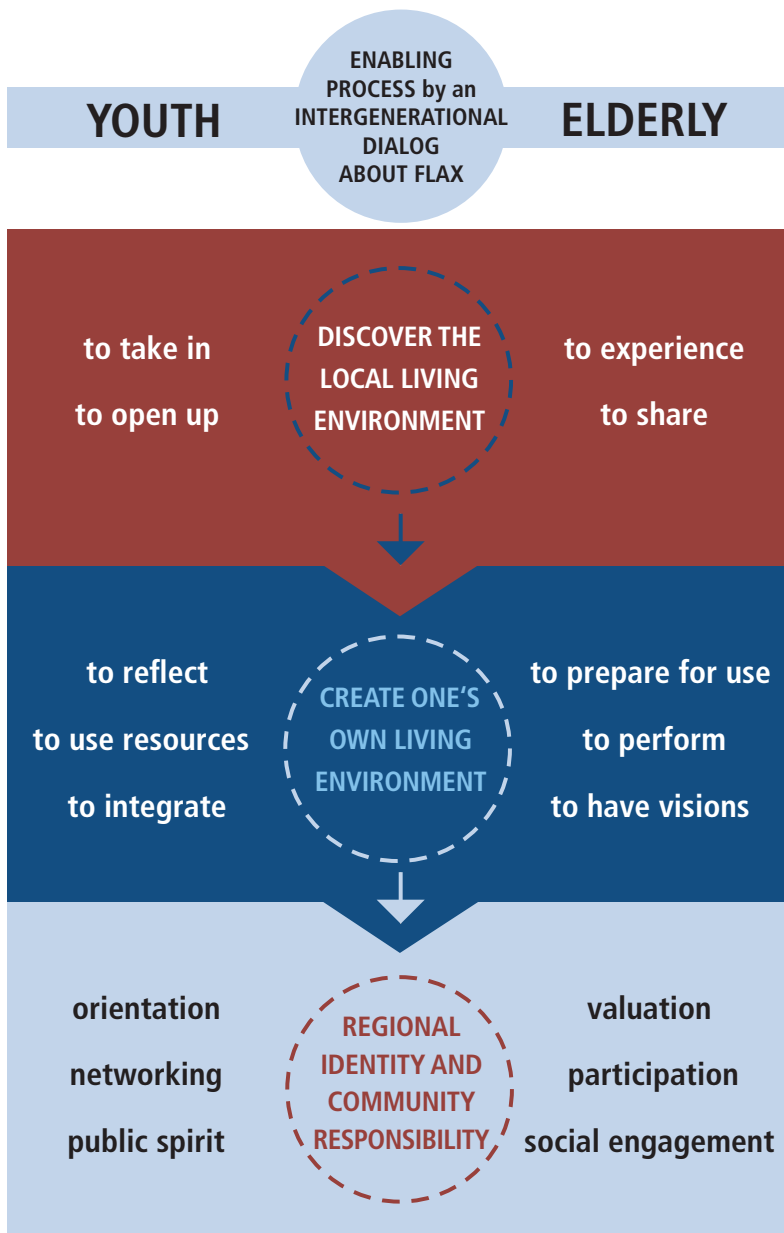
### Box 30.7. 'Blossoms' produced by the Flax project

The Framework Convention on the Value of Cultural Heritage for Society (Council of Europe 2005) highlights the need for local communities, citizens and civil society to take ownership of heritage to bring it alive and make it meaningful. Awareness-raising, identification, upkeep, development and knowledge and skills transmission are therefore essential and should be based on dialogue between the wider population and professionals with a view to mutual enrichment. But how could cultural heritage be conceived as a shared responsibility by citizens? And how could local knowledge be transmitted by contemporary media? 'Landscape and You-th – Tracing Flax' (2012–2015) is an oral history research project that explored the relationship between local knowledge, landscape and regional identity based on the cultivation and manufacturing of the plant flax. Several media outputs and performances, including an app, documentary film and rap song, were generated by students as part of this creative project. The project should enhance landscape awareness and sustainable tourism in the region and offer added value for all stakeholders.

The project runs in three steps: fieldwork on local knowledge (history re-enactment and oral history interviews), reflection and documentation of the results. In all steps, the residents of the rural region of Lesachtal, Austria, were the main researchers, accompanied by scientists from a university. The local young people decided which insights were important to show to the public and especially to tourists.

Connecting older people and students through historical re-enactment and its transfer into media outputs are increasingly regarded as factors in promoting local understanding and identity.

[www.lesachtalerflachs.wordpress.com](http://www.lesachtalerflachs.wordpress.com)



**Fig. 30.5** Participative project process steps. (Source: Andrea Sieber)

## Clash of two worlds – challenges in citizen science communication

One of the main challenges for science communication is bridging the values, expectations and needs of the research system, and the world of members of the public or policymakers (see [box 30.8](#)). Although anyone working in science is also part of the social system, being in a science role means living and acting within this system, which is defined by logics and aims that sometimes diverge from mainstream society ([Weigold 2001](#)). Science communication is therefore not a passive and linear process, but is characterised by complex transformative processes with the potential to influence both scientific discourse and societal debates ([Bucchi 2008](#)).

### **Box 30.8. City foxes – challenges in the co-operation between a research institute and a public broadcasting corporation**

The co-operation between the Leibniz Institute for Zoo and Wildlife Research (IZW) and the Rundfunk Berlin-Brandenburg (rbb), an overall success, was also a clash of two worlds, with significant divergence in the partners' respective expectations and constraints. For the rbb, promoting a topic entails focusing on entertainment, storytelling and linking information with emotions. In contrast, the IZW's top priority is scientific quality, with the accuracy of the disseminated information taking precedence over emotionality. The two partners also work on very different time scales. The media cannot tell the same story twice, but need to keep the audience interested by continuously providing new angles. Scientific research, on the other hand, is often slow, visually unimpressive and does not produce novel results daily, making the constant requirement for new stories a challenge. Despite such conflicts, both partners consider this an exciting and worthwhile experience. The main lesson is that it is vital to make assumptions and expectations explicit from the start when working with partners in different sectors.

[www.rbb-online.de/fuechse](http://www.rbb-online.de/fuechse)



## Conclusions

Public engagement in citizen science provides unique opportunities to bring people together, learn from each other through multiway dialogue and make change possible. Science communication can benefit from these opportunities beyond more straightforward outreach. However, there is much more potential for societal outreach if scientists are better trained and thus able to explain their research in a narrative way. This applies not only to research results, but also to research background, problem formulation and research processes. Yet, these opportunities need appropriate skills and require openness from scientists.

The exposure of ideas and scientific assumptions to members of communities with unique knowledges, gaps, experiences and constructions of meaning is one innovation for science communication coming from citizen science. Here, innovation refers to the result of putting knowledge into a different frame and allowing it to be adopted, changed and filled

### **Box 30.9. Tips and helpful practices for communicating citizen science**

1. Actively communicate your citizen science project outside the scientific community to increase visibility, raise awareness and stimulate participation.
2. Establish a good relationship with the media and take advantage of media attention.
3. Identify the aims of your communication, for example, motivate participation, inform about the project and provide educational information.
4. Identify what is relevant to people's life in your citizen science project and link to it when communicating, for example, stories to locality, issues of broader societal concern.
5. Plan and manage your communication accordingly, for example, understand your partner's needs, choose appropriate media and exchange information in adequate language.
6. Use visualisations and storytelling where possible to achieve people's understanding.
7. Allocate attention, time and resources to communication in citizen science.

with new meanings. This can result in unexpected developments, which might no longer be under the control of scientists. Citizen science, as with all science, can be an adventure because the results are unknown, and scientists should be open to a project changing in unexpected ways.

Communication in citizen science projects can also be challenging when there are different expectations, time frames or needs, which might not be explicit. Experience shows that focusing on the target audience and understanding and addressing their needs throughout the whole process can add to a project's success – both in a scientific way as well as for researchers as ambassadors for science (Druschke & Seltzer 2012). Careful project management and communication are key components in citizen science projects. Citizen science therefore demands advanced communication skills to master these interactive and innovative processes (Treise & Weigold 2002). It requires adequate flexibility on the part of scientists as dialogue and interaction with citizens and/or the media might develop in unforeseen ways.

At the same time, it offers the opportunity to contact other audiences, share knowledge, and create visions and emotional bonds; this is especially the case when communication is shaped as storytelling or other creative forms that are easy to grasp and to remember. Methods for external communication include newspapers, television and radio, social media and the internet, as well as classical forms of scientific knowledge dissemination such as journal articles and books. New technologies and the proliferation of information availability are drivers for this paradigm of exchange and active knowledge (see also Mazumdar et al. in this volume). These technologies make it easy to generate large-scale impact and outreach with relatively little effort when required in citizen science, for example, for a nationwide monitoring project.

To respond to the challenges of an open collaborative process, as well as maximise the effectiveness of projects, a concept of science communication is therefore integral to the practice of citizen science (see box 9 for communication recommendations).