Using repeat photography for hazard and risk communication

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This document discusses repeat photography (often known as rephoto, https://en.wikipedia.org/wiki/Rephotography), in particular its use in communicating hazard and risk to the general public and decision makers. Rephoto consists of combining two photographs taken at exactly the same location and with the same viewpoint at two or more times. This combination of photos (often using a software tool that allows the viewer to switch between the images easily or by showing the newer photo as an insert within the older one) provides the viewer with an understanding of how a location has changed over the period covered by the images (Figure 1). The concept of rephoto has a long history but it has become increasingly used in the past decade with the advent of cheap digital cameras, particularly those on smartphones, and initiatives that allow people to display their photos online to encourage creation, continuation and sharing of rephoto sequences.

Figure 1: Example of a rephoto for a street in Glasgow (Kilmarnock Road). Original photo is scanned from a postcard from the early 20th century and the modern photo was taken by the author (https://www.re.photos/en/compilation/4971/)

Burton et al. (2011) summarise the benefits and limitations of repeat photograph (their Table 1) as well as the use of this technique to investigate changes in landscape. Burton et al. (2011) use the approach to study recovery of the area affected by the Katrina hurricane in the state of Mississippi (USA) over a three-year period every six months. The purpose of this repeat photography was not to create images for communication but to calculate metrics showing how 131 locations survey recovered from the impact of the hurricane.

In the following section, a brief summary of previous uses of rephoto is provided. In particular, the focus of this summary is the use of rephoto to communicate hazard and risk, particularly in the field

of natural hazards. Based on this survey of the literature, the final section of this document provides some guidance about how to undertake rephoto and best practice.

Summary of previous uses of rephoto

Rephoto is being used in many different fields and for many purposes to show the impact of time on, for example, a landscape, city or a person. In this section, a brief survey of different uses of rephoto is provided and then some examples of its use for natural hazards are given.

Uses of rephoto outside the field of natural hazard and risk communication

One common special case of rephoto is overlaying georeferenced maps or aerial/satellite images to see how land-use has changed in the period between the maps/images. For example, the website Pastmap https://www.pastmap.org.uk), which is managed by Historic Environment Scotland, allows overlaying Ordnance Survey maps for Scotland from four dates as well as aerial photographs. Such vertical overlays are interesting and useful for people trained in cartography but do not have the visual impact that overlaying normal photos do. This special case is not discussed more here.

A type of landscape change that has been the subject of much rephoto is the retreat of glaciers as this change has mainly occurred over the past century and hence there are numerous historical images available showing the original extent of the glaciers. An example of such a project is https://www.hassanbasagic.com/projects/glacier-rephoto-project. This type of rephoto would be a useful communication tool concerning climate change. Another example of such a project, with a large selection of well-documented high-quality rephotos showing landscape changes, is https://library.nau.edu/speccoll/exhibits/scaexhibits/hanks/.

Although rephoto is by definition something that uses two or more images of the *past*, a variant of it considering the *future* has been proposed in the context of urban design. “Future Walks” have been held using images of the past and what a location looks like now to consider how the location may become in the future (https://portfolio.waveparticle.co.uk/charrettes). Such a “Future Walk” could be considered in the context of risk communication. The general public or stakeholders could be provided with a rephoto composed of two images: one from the past showing the impact of the natural hazard and one showing the same image now, and they are asked to consider the potential impact if that event (or a worse one) occurs again.

Uses of rephoto within the field of natural hazard and risk communcation

Rephoto has been the basis of various citizen science/history projects that seek to document changes in landscapes (e.g. https://www.bbc.co.uk/scotland/landscapes/rephotographs/) and monuments (e.g. https://www.monumentmonitor.co.uk/). There are a number of websites where users can share their rephotos. One of the most active ones is re.photos (https://www.re.photos/en/), which has been online since 2015 in three languages (English, French and German) and currently provides access to over 2,500 rephotos mainly from central Europe. Although re.photos does not have an explicit citizen science/history aim and users can upload the images they want, it does provide images that could be useful for science/history. For example, there are twenty rephotos with the tag “flood” (Figure 2), which could be useful for risk communication about floods.

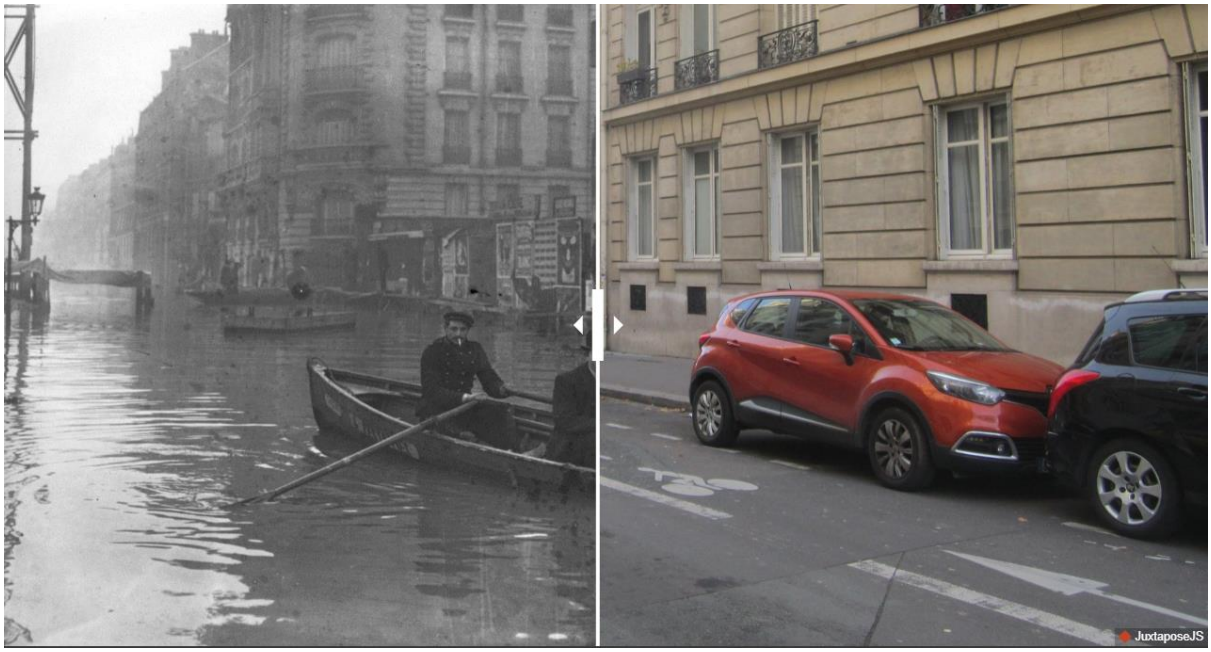

Figure 2: Example of an image of the image of the impact of a natural hazard (in this case a flood in Paris in 1910) from a rephoto portal (https://www.re.photos/en/compilation/1997/).

A set of powerful rephotos showing the impact of the 1906 San Francisco earthquake combined with modern images of the same locations were created by the photographer Shawn Clover (https://shawnclover.com/fadeto1906). These rephotos are skilfully created to merge the old and modern image to create dramatic juxtapositions (Figure 3). The contrast between the old clothes in a modern setting increases the impact of this image. Such complex rephotos would take many hours to create and much skill in photo editing software so they are not likely to be feasible for many people.

Figure 3: Rephoto showing the damaged caused by the 1906 San Francisco earthquake juxtaposed with a photograph of the same location in the early 2010s. Source: https://shawnclover.com/fadeto1906

Guidelines on its use for hazard and risk communication

A basic how-to guide is provided on the re.photos website (https://www.re.photos/en/how_to/), which discusses in particular how to find the location and viewpoint of a photo taken by someone else. This is particularly important for projects where photos taken from social media are used as the image showing the impact of the natural hazard (flood, earthquake or landslide) and the location where this photo was taken needs to be determined by the team undertaking the fieldwork.

The focus of re.photo is using historical images (late 19th and first half of the 20th century), often scanned from postcards, to show how cities, in particular, have changed over many decades. Using images from many decades ago has complexities that are unlikely to be faced by projects focussing on recent events, where the time between images will only be a few years and so most of the buildings and landscape will be the same. Therefore, it should be easier to identify and reach the location where the photo was taken and identify the same viewpoint. In addition, modern digital cameras (e.g. those on smartphones) will generally have different focal lengths to those used to taken the historical images used for postcards that are often the basis image on re.photos. This difference makes finding the same location and taking a modern image that is compatible with the old one without manipulation more difficult than is the case for two images taken on smartphones, for example. It is likely that a citizen taking a photo of the impact of an earthquake, flood or landslide on their home city on a smartphone to post on social media would just use the default settings of the smartphone and not zoom in or edit the image. This should make it easier to take a compatible photo.

Some general advice for the person taking an image to match an existing one:

- Follow the how-to advice from the re.photos website mentioned above about lining up reference points.
- Consider using a tripod so that the photo can be lined up exactly and to improve image quality. However, it is unlikely that the photo taking the original photo would have used a tripod so you should make sure that the height from which the photo is taken is the same.
- Take lots of photos from slightly different locations and viewpoints so that the best one can be found back in the office.
- Consider the corners and edge of the photo to check that you are cover exactly the same viewpoint and that you do not need to change position or zoom in or out. If it is not possible to have exactly the same coverage then it is best to crop the images back in the office so that they do show exactly the same area. Otherwise the software may stretch the image and create artefacts that make the rephoto look strange

Once the photos are collected and/or taken there are online tools to help overlay images, e.g. the Re.photos portal, which is based on the Juxtapose software (https://juxtapose.knightlab.com/), as well as standalone apps such Photobond (https://apps.apple.com/us/app/id1449234268). For someone skilled in photo-editing it is possible to use software such as Photoshop or GIMP to line up the images and create a bespoke rephoto such as those of the 1906 earthquake shown above.

References

Burton, C., Mitchell, J. T. and Cutter, S. L. (2011), Evaluating post-Katrina recovery in Mississippi using repeat photography, *Disasters*, 35(3), 488-509, doi:10.1111/j.1467-7717.2010.01227.x.