

Impact assessments and response assessments

Toby Ord & Owen Cotton-Barratt

We were very interested by the discussion on Wednesday about the aims of the NRA and NSRA and whether they should explicitly consider evaluating how bad various risks are as well as evaluating what would be required to respond to them. Here are our current thoughts.

Two types of risk assessment

Risk assessments have two principal audiences:

- Those who make decisions which might reduce the probability or severity of risks;
- Those who prepare for the risks, in case they occur (or begin to occur).

In both cases:

1. The risks must be identified.
2. The probability of the risks must be estimated.
3. The consequences of the disaster occurring must be understood.

For those who may be able to avert or mitigate the risks, the consequences need to be translated into an understanding of how bad the event would be, were it to occur, which we could call an impact assessment. For those who must make preparations, the consequences of the risk must be analysed to understand how much preparation is required, and of what type: a response assessment.

Impact and response assessments can in principle be carried out entirely separately. However a large amount of the work is common to both assessments (steps 1–3 above), so there is a substantial saving to conducting them together. In particular, a response assessment will need to assess the magnitude of the different types of impact. This includes almost all of the information necessary for an impact assessment; the only remaining step is to determine how to compare different impacts against each other in order to summarise the impact in a single number. On the other hand an impact assessment may not consider what response is needed, so it may be more work to extend an impact assessment to a response assessment.

Outputs

For an impact assessment, it's useful to have a single aggregate measure of the size of impact together with a measure of the probability. Decisions about reducing or mitigating risks will largely depend on these numbers, together with an understanding of what the possible actions for reducing or mitigating the risk are. Detailed understanding of the consequences are likely to be superfluous.

For a response assessment, there is no single measure which is so useful. Decisions about response plans will depend on what responses would be helpful and to what degree, and how much advance preparation will help them. These facts in turn depend on the details of the likely consequences. Since different types of consequence will demand different responses, aggregating them is not necessarily helpful.

Aggregate measures may still be helpful in a developing a response assessment, in that they can inform decisions about where to concentrate resources on further assessment. In increasing order of how far through the analysis procedure they occur, some aggregate measures which might be useful include: total impact of the event; the size of response that would be required; the size of preparation that is required for the response.

The National Risk Assessment

At the moment, the National Risk Assessment is primarily a response assessment. However it doesn't seem to be a pure response assessment, as one of the five dimensions on which the risks are assessed is economic harm, which is important for understanding the impact of risks but rarely relevant for response.

The National Risk Register includes an aggregative measure (a way of combining several measures into a single number). Our previous document explored some desirable properties in the construction of aggregate measures. There are a few possibilities for what the NRR might want to do on this front:

1. Include no aggregate measures.
2. Have one aggregate measure, tracking the impact of the risk.
3. Have one aggregate measure, tracking the size of response required.
4. Have two aggregate measures, one tracking impact and one tracking size of response required.

While a case can be made for any of these options, we currently think that (2) has the strongest case.

Measuring the impact means that for very little extra work it will also serve as an impact assessment. Measuring the impact may also be useful for the response assessment, in that events with sufficiently low impact may not need any further analysis of the specifics of response that would be required.

Other people looking at an aggregate measure (for example as in the current NRR chart) are likely to assume that is an impact assessment. This argues for making the impact numbers the primary outward-facing measure.

It is unclear whether it is useful to have a published aggregate measure of size of response required. This is currently used internally to judge which risks deserve individual response plans. External uses are less clear but may exist. If two aggregate

measures are published, it may be better (for reducing confusion) if the measure of impact is more prominent.

It seems to us that a measure tracking the impact would ideally:

- Denote terms in £, measured in equivalent societal cost
- As they would be measured in a cost-benefit analysis as per the Treasury Green Book.
- Include economic harm in its natural units.
- Value fatalities via the statistical value of a life.
- Value injuries and illness via the QALYs lost, and translate this into £.
- Value psychological impact and social disruption via the willingness-to-pay of the groups affected (though there is less information on how to do this).

In contrast, it seems to us that a measure tracking the size of response required would ideally:

- Denote terms in £, measured by the cost of the response or the cost of preparing for the response.
- Value fatalities, illness and injuries by the cost of clean-up and treatment.
- Value psychological impact and social disruption by the cost of measures put in place to deal with them.
- Not count economic harm.

We'd be very happy to talk further about any of this, or about our original points on how to combine the dimensions into a single number, or on concerns about measuring different types of impact in terms of money.