

**Video 4: Calculating losses and gains: How to estimate the amount of gain from an offset**

Offsets are defined as actions designed to achieve at least no net loss of the target biodiversity. That means that not only do the offsets have to benefit the same biodiversity that suffered the loss, but the benefit, or gain, has to be at least as large as the loss. Estimating the size of an anticipated gain from an offset action is not as straightforward as it might seem.

First, we need an estimate of the losses caused by the development. We do not describe this in detail in these videos, as this is usually done through an environmental impact assessment. However, these losses do need to be measured using the same indices of biodiversity that we will use to estimate the gains – this ensures that our offset is like-for-like, and that it makes sense to compare the sizes of the loss and the gain. This was discussed in video 3.

Second, we need to understand how to estimate the size of the gain resulting from the offset action. This requires three steps.

The first step is to estimate what we think will happen to our biodiversity index if we do a proposed offset action. This is called the outcome from the offset action scenario. For example, if our biodiversity index is the number of individuals of a threatened plant, and our offset action involves implementing a new fire regime that is beneficial for that plant, the outcome would be the number of plants we expect the site will have at some point in the future, under the offset action scenario. To estimate this outcome, we need to think about how many plants are at the site now under the current fire regime, how quickly and to what extent the plant’s numbers are expected to respond to the new fire regime, and what other threats are present that might affect the future size of the plant population. For example, we might expect about 20 plants on the site in the future, under the offset action scenario.

Our job is not done yet, because this on its own doesn’t tell us about the gain that we can attribute to the offset action itself. That's because there would probably have been some plants there even if we didn’t do the offset action. The offset gain is defined as the difference that the offset action has made to the outcome. In other words, the gain is the difference between what happens if we do the offset action, and what would likely happen if we don’t. This scenario – in which the action does not occur – is called the counterfactual scenario. So, the second step in working out the offset gain is estimating this counterfactual scenario – in our example, how many plants would have been at the site even without the offset action?

So how do we go about estimating this? One simple way is to consider what has been happening at similar sites, on average, under the current management regime. We might consider whether the numbers of our threatened plant species have recently been declining at similar sites, in which case we might estimate that there would be fewer plants in the counterfactual scenario at our site, or whether the populations are more or less stable. For example, we might have seen a 5% loss of plants over the past ten years due to inappropriate fire regimes. Therefore, we might guess that a further loss of 5% over the next ten years might be expected, were the fire regimes to continue. Using average outcomes at a range of similar sites in the recent past is a good way to think about this because it’s important that the counterfactual scenario reflects the most plausible outcome for plants at our site, if we do not do the offset action.

What about a worst-case scenario at the site, in which all the plants could be lost if we do not do the offset action? Well, it’s usually not appropriate to use the maximum loss that is possible, or legally permissible, as the counterfactual scenario. This would result in overstating the offset benefit, because the counterfactual scenario described a greater loss than is most likely, making the offset action scenario look like it is making an even bigger difference, or gain. Overestimating the gain from offsets is highly problematic, as the overestimate of gain allows the offset to be used to compensate for an real loss of the same size - resulting in a net loss of biodiversity

Another important factor to consider is that the counterfactual scenario should not include declines or losses caused by actions that, if they occurred, would themselves trigger a requirement for an offset. So, if other similar sites where our plant occurs are being impacted by road development, this might make us think that if we didn’t protect and manage our offset site, there is (for example) a 50% chance that over the next 10 years our site would be lost for road development. But, if road developments that impact this species themselves trigger an offset requirement, then these new offsets should compensate for the losses from road development, which means that the net gain from preventing the road development isn’t avoidance of a 50% risk of loss – instead, the net gain is actually zero, because any losses would have to be compensated anyway. So, this type of risk of loss should be excluded when estimating our counterfactual scenario.

Now that we have estimated our offset action scenario and our counterfactual scenario, the third step to is to compare these two scenarios, and the gain is then determined by the difference between the two. For example, we may estimate an outcome of 200 plants in the offset action scenario after the new fire regime has been implemented for 10 years, while we may estimate there would be 80 plants in 10 years’ time under the current fire regime – the counterfactual scenario. Comparing these two scenarios reveals an expected gain of 120 plants in 10 years – a gain that can be attributed to the offset action. Calculating the offset gain in this way ensures that the offset benefits are ‘additional’—meaning that the offset delivers a gain that would not otherwise have occurred.

One important point to note is that in our offset gain calculations, we are making predictions of what would occur at some future point in time. Because of this, there are two additional factors that need to be considered. One of these is that there is inherent uncertainty in these predictions, and so the estimate of the gain resulting from the offset is also uncertain. The other is the issue that the losses from development occur much sooner than the predicted gains from the offset, which can take decades to occur. So the point in the future at which we predict our offset gains to occur makes a big difference to our estimates. In the next video, we consider how to deal with these issues.