After the green rush? Biodiversity offsets, uranium power and the ‘calculus of casualties’ in greening growth

Sian Sullivan, April 2012

Abstract
Biodiversity offsets are part of a new suite of biodiversity conservation instruments designed to mitigate the impacts of economic developments on species, habitats and ecosystems. Led by an international collaboration of representatives from companies, financial institutions, governments and NGOs, the Business and Biodiversity Offsets Programme (BBOP) of the market-oriented Forest Trends group, has created a global framework through which principles and standards for biodiversity offsets are being established. These enable the apparently unavoidable harm caused by development to be exchanged for investment in conservation activities both at different geographical locations and in the future. Offsets can also be traded via bespoke markets for environmental conservation indicators. Given a globalising ‘green economy’ discourse that conservation can be a profitable enterprise if guided by market-based mechanisms and the entwinings of ecological with economic categories, biodiversity offsets are becoming part of current entrepreneurial interest in biodiversity conservation. The green rush of my title refers to both this interest in conservation activities that can be marketised, and to an associated appetite in business and financial sectors for incorporating biodiversity offsets as part of a strategy for ‘greening’ the environmental harm caused by developments. Through a case-study connecting the extraction of uranium in Namibia for the generation of nuclear power in the UK, in which biodiversity offsets are invoked for the off-site mitigation of environmental harm at both ends of this commodity chain, I explore some implications of this new greening mechanism. I focus on 1. the (un)ecological assumptions guiding biodiversity offsets in organising complex ecological assemblages to serve ‘sustainable development’, and 2. some of the equity implications of the distributions and allocations of new environmental values that seem likely to arise from these.

Key terms: biodiversity offsets, uranium, nuclear power, Business and Biodiversity Offsets Programme (BBOP), Hinkley Point (UK), Namibia, EDF, Areva, value, mitigation hierarchy, conservation

The green rush?
In 2008 Zac Goldsmith, former editor of The Ecologist, member of the Goldsmiths merchant banking dynasty, and current Conservative MP for Richard Park and North Kingston in London, gave an interview in Times Online entitled The green rush. In this he valorises the market’s ability to effect positive ecological change. He states that ‘other than nature itself, there is no force more powerful in terms of changing things than the market’, but that ‘the market doesn’t yet understand or truly value the natural world’. He notes that it is precisely the scarcity that has been created by destructive marketised nature extraction that is fostering an emerging high value for conserved nature. This view is currently energising the creation of new markets in monetised measures of an increasingly scarce, and therefore valuable, nature health.
More recently, Olivier de Schutter, UN Special Rapporteur on Food, uses *The green rush* as the title for a long paper published in 2011 in the *Harvard International Law Journal*. 4 'The green rush' here is constituted instead by current land-grabbing in developing country contexts, particularly in Africa, for farmland for intensified food and biofuel production. De Schutter emphasises in particular the ways in which current perceived scarcity in food production, coupled with volatility in prices of agricultural commodities, is pricing out the poorest farmers from escalating markets for land rights. He expresses concern that various communal and collective forms of land tenure are being displaced by formalised leasehold exchanges between governments and corporate investors for newly privatised tracts of land. The effects of this are to erode long-established mixed food production systems that feed cultures variously embedded in rural areas.

In this piece I connect with aspects of both of these framings of ‘the green rush’. I emphasise current celebration of market-based policies and mechanisms to incorporate environmental harm into development activity and thereby turn conservation strategies into profitable enterprise; at the same time as noting concern for the possible displacement effects of these strategies for ‘valuing’, capturing and trading what is deemed to be ‘green’. My title *After the green rush* thus invokes Neil Young’s enigmatic song of 1970 entitled ‘After the gold rush’. This is a poignant evocation of the social and ecological displacements effected by the historical frontier rush for gold on the west coast of north America. I am using it here as a way into thinking about the possible distributive effects and fallouts associated with current excitement regarding the incorporation of environmental health and harm into development agendas and associated market-like exchanges.

Mechanisms for offsetting environmental bads with environmental goods elsewhere, rely on methods for making environmental health and harm in different places equivalent to each other. Through offset exchanges and trading mechanisms environmental harm is provided with the appearance of being environmentally good, or green. In what follows I focus first on some of the design principles informing biodiversity offsets as a key part of this process of trading environmental health and
harm. I then present a case study in which biodiversity offsets are proposed so as to mitigate the impacts associated with both the extraction of uranium and its use for generating ‘green’ power. I close with some comments regarding the conceptualisations of non-human nature that make offsetting mechanisms viable, noting the power dynamics infusing such proposals and drawing attention to some of their paradoxical effects.

Grabbing green

Variously marketised forms of environmental offsetting now constitute a prominent methodology for resolving contradictions between economic development and nature health, so as to enhance ‘green infrastructure’ while sustaining economic growth. Such exchanges between localities of environmental health and harm require the presence of measurable conservation and/or ecological restoration indicators. These are associated with material nature, including threatened species, biodiversity, and carbon sequestered in the biomass of forests or soils. Valued indicators of ecological health in turn need supportive land-based localities where they can be situated and accounted for. Places where such nature wealth is located and enhanced are becoming termed ‘banks’. In the presence of impact offsetting mechanisms they can become accredited so as to offer conservation units that may be exchanged with development impacts elsewhere. Conservation banks and associated offset trading mechanisms currently include forms such as wetland mitigation and species banking in the US, and emergent habitat banking and biodiversity offsets in the UK.

Conservation banking and associated markets manifest in different ways in different contexts, but share a few core design principles. These are all directed towards the stated ideal of ‘no net loss’ of the implicated environmental indicator. This means that the outcome of an offset trade in environmental harm and health should lead to the maintenance, or even enhancement, of the environmental measure that is affected and offset. Below I identify and outline five of the key design principles facilitating emergence of conservation offset exchanges, before moving to consider some ways in which a specific type of conservation offset, namely biodiversity offsets, are being invoked to ‘green-stamp’ the environmental harms associated with specific development impacts.

1. The mitigation hierarchy

The mitigation hierarchy is connected with the lineage of Environmental (and Social) Impact Assessments (EIA). This is a planning requirement proposing that some sort of independent scoping of the environmental and social impacts of a development project should occur prior to the approval and implementation of an intervention, so as to prevent, minimise and/or mitigate significant predicted environmental (and/or social) harms. It asks developers to consider how harm might be avoided and minimised, and how the ecology and landscape of a development site might be restored, perhaps after the lifespan of the development, so as to rehabilitate and reinstate remaining unavoidable harm. ‘Offsets’, including biodiversity offsets, are the last resort of the mitigation hierarchy. These are defined in the Biodiversity offsets design handbook of BBOP (The Business and Biodiversity Offset Programme of Forest Trends), as:

measures taken to compensate for any residual significant, adverse impacts that cannot be avoided, minimised and / or rehabilitated or restored, in order to achieve no net loss or a net gain of biodiversity.

The offsets part of the mitigation hierarchy is receiving great current attention because it is this that permits the rationalisation of aspects of both development, and
the environmental harm this causes, as *unavoidable*. This is creating development-led demand for environmental offset exchanges, and these exchanges potentially can be marketised.


It is the apparently unavoidable element of the mitigation hierarchy, denoted in the figure above as the *residual impact*, that permits the transformation of, and possibility of trade in, measures of environmental health and harm that can act as offsets. Relevant questions include who is able to decide what development, and what environmental damage, are unavoidable and where. As detailed in the case study below, such decisions are always made in contexts where different perspectives and power relationships mean that choices for offsetting that require development-related environmental harm may be legitimised even though they act to close off the options and values of other people (not to mention the individuals and populations of species affected on-site through development). It is thus relevant to understand the contexts, concepts and power dynamics that serve such choices and to consider their associated socio-ecological effects.

2. **Off-site mitigation**

Entwined with the principle of *unavoidability* as set out in the mitigation hierarchy, is the principle of *off-site mitigation*. This enables developers to offset their environmental impacts by investing in or purchasing apparently appropriate conservation measures elsewhere, as opposed or in addition to creating conservation options on the same site as the development. It is maintained that this will consolidate rather than fragment areas of ecological value. The Figure below provides a schematic representation of how such consolidation is envisaged. The planned development area indeed is consolidated and expanded in the bottom right diagram, with conserved habitat also consolidated to a narrow linear band cutting through the centre of the development. Whether or not there is more environmental conservation value present in the bottom right diagram than in the mosaic of
developed and conserved areas depicted in the so-called unplanned development of
the bottom left diagram is another question. Of course both of the lower trajectories
in which more development is favoured have greater environmental effects than in
the top diagram, which depicts a situation of relatively little development and
comparatively intact natures.

**Schematic representation of planned off-site mitigation of development impacts.**
Source: White, W. 2008 The advantages and opportunities, pp. 33-41 in , N. Fox, J., and Bayon,
R. (eds.) Conservation & biodiversity banking: a guide to setting up and running biodiversity

![Schematic representation of planned off-site mitigation of development impacts.](image)

3. **Ecosystem metrics to permit exchangeability**
The third principle identified here is the necessity of constructing some form of
ecosystem metrics that permit exchangeability. This is between both the locations of
development impact and conservation activity, and between temporal moments, such
that development impact might be traded with the future conservation value of a
designated offset area. It is this apparent exchangeability or constructed equivalence
between places and times that allows for both off-site mitigation of development-
related environmental harm and for temporal delay in offset provision, as outlined
further below.

The construction of ecosystem metrics to permit exchangeability requires conversion
of the affected nature aspect into a symbolic numerical signifier that can serve as an
abstraction of ecosystem aspects in different places and in different times such that
these abstractions become conceptually commensurable with, and substitutable for,
one another. It is this conversion into numerical units that creates the potential for
this exchange to also become monetised and marketised.

The current UK context provides a good example of the work that needs to be
done to facilitate equivalence creation between places and times. Here, from
April 2012 a series of biodiversity offset pilot areas will run in Devon, Doncaster,
Essex, Greater Norwich, Nottinghamshire, and Coventry Warwickshire and
Solihull. These are to follow DEFRA guidelines regarding application of a
standardised metric that will permit the conceptual substitution of development
impact into area replaced through habitat offsets. This requires the assessment
and standardisation of ‘habitat value’ in the development and offset localities, so
as to facilitate an exchange. The process requires that development sites are
‘mapped and divided into habitat parcels’ which are ‘pre-assigned to one of four
habitat type bands’ scored for condition and biodiversity distinctiveness, with good condition and high distinctiveness (incorporating aspects such as rarity and endemism) scoring more highly.\textsuperscript{13}

The Table below reproduces an often-referenced example of the scoring matrix to be used to numerically convey exchangeable habitat ‘value’. In this, habitat condition and biodiversity distinctiveness are scored using a scale of 1 to 4 for poor to optimum condition and 2 to 6 for biodiversity distinctiveness (nb. The most recently published version of this Table by DEFRA limits the habitat condition scores to only three possibilities, namely poor (1), moderate (2) and good (3)).\textsuperscript{14} High scores in both habitat condition and biodiversity distinctiveness would indicate a habitat of high conservation priority, and an equivalent number of high value credits of a suitable habitat would thus be required to offset any ‘unavoidable harm’ to such a locality.


<table>
<thead>
<tr>
<th>Condition</th>
<th>Biodiversity Distinctiveness</th>
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<tbody>
<tr>
<td></td>
<td>Low (2)</td>
</tr>
<tr>
<td>Optimum (4)</td>
<td>8</td>
</tr>
<tr>
<td>Good (3)</td>
<td>6</td>
</tr>
<tr>
<td>Moderate (2)</td>
<td>4</td>
</tr>
<tr>
<td>Poor (1)</td>
<td>2</td>
</tr>
</tbody>
</table>

This system allows for the possibility that conservation investments might be in measures of environmental health for habitats that are different to, and geographically distant from, the habitat that is being impacted by a development intervention. Scoring habitats in this way thus permits habitat exchanges to be guided by their numerical values such that like scores can be exchanged with like scores, and the ratios of exchanges can be seen to favour conservation by encouraging the exchange of poorer scoring habitats with higher scoring ones. For example, if an impacted habitat scoring six overall is offset with one of the same area that also scores six, then this would be a compensation ratio of 1:1. In theory, then, the replacing of one hectare of a habitat scoring six with only 0.33 hectares of a habitat scoring 18 would also mean a compensation ratio of 1:1.\textsuperscript{15}

In addition to the possibility of exchanging the scores of impacted habitats with those that are geographically distant, it is also proposed that impacted habitats may in effect be exchanged with the scores that are proposed to accrue in the future for an offset locality. In this instance, positive habitat scores (or credits) would be sold \textit{after} sites have been confirmed as a conservation bank or offset site, but \textit{prior to} being able to demonstrate ecological performance compliance.\textsuperscript{16} This situation is possible because ecosystem values have effectively been translated into numerical ones, which enables an array of additional scoring numerical multipliers to be added into the metrics mix so as to address (numerically at least) varied sources of risk. So, for example, multipliers can be introduced to account for a time-lag if the offset is created after the impact has occurred,\textsuperscript{17} a situation that seems to assume rather predictable, linear successional dynamics for habitats. In instances where a time-lag is built into the manifestation of the appropriate scoring offset for a development impact, financial insurance is proposed such that the offset...
provider could take out financial insurance against their possible failure to deliver the right number of units. This is particularly relevant if a ‘portion of a project’s mitigation credits are typically released before the physical work is complete’.

It seems relevant to note here that what is exchanged in these offsetting proposals are the numerical indicators proposed by metrics such as those described above. These may or may not provide a ‘good fit’ with the material natures they represent, and thus may or may not adequately represent the ecological measures being lost through development in specific places. Ecological theory and common sense suggest that offsets over large spatial and temporal distances are likely to fit less closely with specific impacts than those that are distance-near and with close temporal (i.e. successional) correspondence with impacted localities. Of course, no offset can fully replace the specific spatial and temporal ecological qualities of that which is harmed through development.

This conversion of nature aspects into numerical scores that can be proposed as exchangeable health and harm equivalents, and that can be associated with monetary payments, is further significant in that it enables the creation of markets for conservation indicators. To establish and service these new markets, voluntary market exchanges for environmental conservation measures are being created by nature brokers and environmental-financial entrepreneurs. Mission Market’s ‘Earth Exchange’, for example, is described as ‘the first online platform facilitating transactions for multiple environmental credits and conservation finance mechanisms’ (emphasis added) and whose founder and CEO has more than 20 years experience in capital markets on Wall Street, including a vice-presidency at Bear Stearns. From ‘Voluntary Carbon Credits’ to ‘Sustainable Commodity Certificates’ to ‘Wetland Mitigation and Habitat Credits’ the Earth Exchange is intended as an online platform for marketised exchanges in an expanding plethora of monetised environmental health and harm entities. Mission Markets™ has recently collaborated in the UK with the Environment Bank Ltd., to create an online conservation credit trading platform, hosted in the US, for the buying and selling of UK conservation credits, particularly biodiversity offsets. The Environment Bank is a private sector company established by professional ecologists who have been enthusiastic protagonists in stimulating a habitat banking and biodiversity offsets discourse in the UK. It is described as an independent broker for the delivery of ‘mitigation and compensation schemes associated with planned development’, and recently received £175,000 in 2011 from the Shell Foundation to assist with the development of ecosystem service markets. The Chairman of The Environment Bank, Prof. David Hill, who since 2011 has also been the Deputy Chairman of the UK government body Natural England, states that ‘[t]his is a definitive market mechanism’ and that ‘the purchase of conservation credits will explicitly and transparently demonstrate developers [sic] commitment to the environment, and will deliver truly sustainable development’. Offset metrics thus create the promise of offset markets. In these, numerical scores for nature aspects become purchased and exchanged as commodities bearing monetary value, with financial expertise required for the brokering of exchanges.

4. Additionality
The fourth principle is that of additionality, which with offsets basically affirms that the conservation activity would not have occurred in the absence of the offset arrangement. It is particularly relevant when offsetting is associated with payments
for the impacted and offset measure.\textsuperscript{27} In conservation banking markets, for example, a conservation activity is considered additional if it is thought that it would not have occurred in the absence of a payment.\textsuperscript{28} Payment here is thus deemed to have directly caused the measurable conservation effect, and therefore to have generated conservation additionality. In practice conservation additionality in association with offsets can be difficult to demonstrate. In part this is due to the inherent difficulty of ascertaining the difference between what has happened \textit{with} an offset designation, and the ‘counterfactual’, i.e. what would have happened (in environmental conservation terms) without the designation.\textsuperscript{29} It is also because to date many conservation banking and offsetting schemes designate localities of existing relatively untransformed or conserved habitat (although this can be explicitly prohibited, as is the case in UK policy regarding biodiversity offsets). Entwining conservation activity with payments can also generate perverse incentives. They can displace environmentally caring activities by reducing such practices to a monetary value, thus creating a context where such practices may cease to exist in the event that they are not paid for.\textsuperscript{30}

5. \textit{Enabling policy and governance frameworks}

The last principle I identify here is that conservation banking and offset establishment and exchanges, even if voluntary, can only come into being if they are accompanied by an \textit{enabling policy and governance framework}. This means that although a primary impetus in conservation banking is the maintenance of nature health through the institution of money-bearing privatised market exchanges, government regulation and public resources remain essential for both the creation and sustenance of these exchanges.\textsuperscript{31} Indeed, as Arild Vatn and colleagues note, ‘transaction costs are high and there are reasons to expect them to be largely borne by the public sector’.\textsuperscript{32} How this manifests is diverse with, for example, the role of the United States Fish and Wildlife Service (US FWS) being quite prominent in the allocation of species credits in species banking,\textsuperscript{33} whereas the UK currently has a system of more voluntary exchanges within planning recommendations set for development projects by local authorities.

\textbf{Case study: invoking biodiversity offsets in the greening of uranium power}

Having disaggregated some key principles in the creation of development offsets and their potential for encouraging variously marketised exchanges in conservation measures, I now move to a case study in which, in markedly different but connected contexts, habitat banking and biodiversity offsets are proposed as ways of mitigating significant environmental impacts of proposed major developments. I mobilise aspects of this case to illustrate ways in which environmental conservation discourse is being instrumentalised to ‘green(wash)’ development interventions that are significantly environmentally damaging.\textsuperscript{34}

My analysis is based on the study of two policy and planning documents, which appear to be disconnected, but are not. These are:

1. the 2011 West Somerset Council (WSC) \textit{Officer’s Report for the Application for Planning Permission, ref. 3/32/10/037}, which considers proposals by EDF (Electricité de France) Energy for site preparation works in West Somerset, prior to the construction of a third nuclear reactor at Hinkley Point;\textsuperscript{35}

2. the 2010-11 \textit{Strategic Environmental Impact Assessment} (SEA), commissioned by Namibia’s Ministry of Mines and Energy (MME), executed by the South African Institute for Environmental Assessment, and funded by the German
Federal Ministry for Economic Cooperation and Development, to consider the combined implications of the current ‘uranium rush’ in Namibia, southern Africa.\textsuperscript{36}

\textbf{Offsetting nuclear impacts in the UK}

French corporation EDF Energy has recently been granted permission by West Somerset Council (WSC) to begin the necessary site preparation works for the proposed construction of a new generation nuclear power station at Hinkley Point in West Somerset (see image below). Regardless of the environmental effects of the construction and operation of a new nuclear power station at this site, or of the impacts of any possible contamination through the further import and concentration of radioactive material, the site preparation works themselves will produce significant habitat harm. They involve:

\begin{itemize}
\item site clearance (including fencing, vegetation removal, demolition of existing structures, and creation of alternative footpaths);
\item earthworks (including soil stripping and storage, site levelling, spoil screening/storage for re-use on-site);
\item deep excavations; provision and relocation of drainage infrastructure …; [and]
\item site establishment works (including layover facilities, car parks, haulage roads, site access points and roundabouts).\textsuperscript{37}
\end{itemize}

The local authority planning permission for these preparation works is controversial because it has been granted \textit{prior} to the application to the Infrastructure Planning Commission (IPC) for approval to construct a third reactor at Hinkley. In other words, the works may cause massive landscape disturbance for a reactor that in theory may not actually be built. The case is currently receiving media attention for several reasons, not least because it is a key component of a much publicised ‘landmark agreement’ for cooperation on civil nuclear energy between Britain and France.\textsuperscript{38}
The proposed Hinkley C station heralds investment in a new wave of nuclear power stations, controversially claimed as ‘green’, low-carbon or even ‘zero carbon’ by the corporations involved, the UK government, and high-profile environmentalists (a point to which I will return below). It will require large-scale landscape transformation, and of course will increase the volume of radioactive material in the UK prior to the full decommissioning and making safe of the previous generation of nuclear power stations and their significant radioactive outputs (including at the two reactors already at Hinkley, of which Hinkley A is defunct and in the process of decommissioning, and Hinkley B is still operational). The proposed station and the planning process are currently being contested.

Critically, the application for the site preparation works rests on the promise that ‘in the event that Hinkley Point C is not consented all structures would be removed and the site reinstated’. EDF, however, would only be required by WSC to submit a detailed reinstatement plan in the event that the generating station is not approved. The organisations consulted in the site preparation works planning application, which include English Heritage, the Area of Outstanding Natural Beauty (AONB) service for the Quantock Hills, Natural England, Somerset County Council Spatial Planning and Historic Environment Service, the Royal Society for the Protection of Birds (RSPB) and the Somerset Wildlife Trust (SWT), all provide evidence of their dissatisfaction that this can be achieved in practice.
As can be seen from the images above, and as expressed by interested and concerned parties, the site preparation works and the proposed development itself will have significantly transforming effects on the site locality and associated habitats and species populations. Projected ‘unavoidable’ impacts generate a requirement for mitigation or compensation of some sort in accordance with European habitats regulations. EDF and WSC have proposed voluntary offsetting measures to satisfy this. Among the species and habitats affected, particular concern is that the site preparation works will prove rather disruptive for the barbastelle bat, *Barbastella barbastellus*. This species is considered ‘rare’ and ‘near-threatened’ under the designations of the International Union for the Conservation of Nature (IUCN) and is also protected under the European Habitats Directive. Populations of the species have long foraged and roosted on a diversity of habitats on the proposed Hinkley C preparation site, including mature woodlands, ancient hedgerows, and grasslands. The barbastelle bat thus receives a lot of attention in the site preparation planning application and Council responses. As stated in the Natural England comments on the planning application, ‘[w]e would expect to see a no net loss in the local population status of bats, taking into account factors such as population size, viability and connectivity – a robust mitigation strategy is required to be submitted’: particularly, and as noted by the SWT, because the barbastelle bats represent ‘a qualifying feature’ of the nearby Quantocks Special Area of Conservation, from which they travel to forage in the Hinkley site. The SWT notes additionally that: 

[w]hile the provision of compensatory bat boxes will assist in mitigating the impacts of some roost loss, the bigger issue is arguably the loss of foraging on site. There is a notable quantity of woodland and open habitat proposed to be lost through site clearance, and a question remains as to whether there is sufficient habitat of suitable quality to support displaced bats.

Since these consultations, proposals have been made for species-led biodiversity offsetting to mitigate the impacts on barbastelle bats of the proposed Hinkley site preparation works. It is instructive to trace these through as an example of emergent development-related offsetting thinking, both in the UK context and as part of a growing global discourse on the use of biodiversity and other environmental offsets as a means of mitigating, and perhaps trading, the ‘unavoidable’ harm associated with economic development. The following is based on proposals compiled by Somerset County Council ecologist, Larry Burrows, included as an Appendix to the officer’s report on the planning application by EDF. In this, the proposed offsets required to maintain the bat population with no net loss are based on ascertaining the Habitat Units (HU) required to offset loss of each habitat. These are calculated as the product of the ‘Habitat Suitability Index’ (HSI) (comprised here of numerical scores for the habitat quality and habitat area (i.e. quantity)) of each existing bat habitat. In this case, a panel of three barbastelle experts were independently asked to score the suitability of the main habitats on the site, although the location of the site was not given and it seems that this was done in the absence of a site visit. As indicated in Table below, the HU used in the final offset calculations frequently modifies the average score given by the independent experts, in a downward direction overall. This results in a third fewer recommended HU hectares requiring offsets (37.2 instead of 60.4). In these calculations a 2:1 compensation ratio is used.
When arable land habitat is included in the calculations, the total amount of relevant bat habitat unit hectares reported as subject to damage through the site preparation works is 47.4. EDF propose that they will create, enhance or restore relevant habitats on-site, to the tune of 38.7 hectares reported by Burrows and 45.3 reported in the subsequent Habitat Regulations Assessment (HRA). It is difficult to know what the bats should do during the time-lag between habitat impacts and on-site habitat creation. Burrows’ figures imply that an appropriate 8.7 habitat unit hectares will also need to be acquired off-site so as to offset the habitat impacts left after the 38.7 hectares have been created on-site. It is these hectares which in theory might be supplied through a biodiversity offsets trade with perhaps one or more habitat banks. Again, whilst these may supply appropriate bat foraging habitat and perhaps even be within the foraging range of the current bat population (their possible location is not specified), it is difficult to know how this will benefit the actual population of bats that currently forage on-site. In summary, then, biodiversity offsets here are invoked to ‘green’ a substantial transformation of habitat(s) associated with development through proposing that these will produce ‘no net loss’ of environmental value. But it remains hard to envisage how this will manifest in practice in this case, given the disruption to specific place-based habitats and mobile species effected by this intervention.

For EDF, the current Anglo-Franco agreement on civil nuclear energy production is additionally celebrated for providing ‘unprecedented opportunities’ for its supply chain partners. This connects the Hinkley-offsets story with a very different landscape where biodiversity offsets are also invoked so as to make nuclear energy development green. EDF’s ‘delivery of the nuclear supply stream’ is through the
French company Areva, with whom a Memorandum of Understanding (MOU) has been signed for the provisioning of Hinkley C.\(^5\) Areva source their uranium from countries such as Niger and Namibia, and Namibia is listed as a source country for UK’s uranium by British Energy (itself part of EDF Energy).\(^6\) It is to Namibia in southern Africa that this story now moves.

**Offsetting the ‘uranium rush’ in Namibia**

In the last few years Namibia’s central Namib desert has been subject to a veritable ‘uranium rush’, as termed by the Namibian Government and advisors.\(^5\) This involves companies from China, India, Russia, Japan, Korea, Australia and Canada as well as the French corporation Areva, all seeking to capitalise on recently high uranium prices, although these have fallen since the Fukushima reactor meltdown in Japan in March 2011. Thirty-six Exclusive Prospecting Licenses (EPLs) were granted for nuclear fuels in Namibia’s west-central Erongo Region (as shown in the Map below), with 30 more granted elsewhere in the country, until a moratorium on new licenses was instituted at government level in 2007.\(^5\) The Uranium Stewardship Council (USC) of the Namibian Chamber of Mines seeks to maintain Corporate Social Responsibility (CSR) standards, and has collaborated with the Namibian Stock Exchange (NSX) such that the NSX only lists companies with ‘good standing on the USC’.\(^5\) Nevertheless, exploration and operating licenses are located in and impacting on a landscape considered by biologists to be an arid-land biodiversity ‘hotspot’, which is notable for a high incidence of endemism. EPLs have been granted within two of Namibia’s iconic National Parks, namely Namib-Naukluft and Skeleton Coast.\(^6\) The industry will also impact on the numerous archaeological sites in the region.\(^6\) These are illustrative of layers of cultural landscape history, including extant cultural practices, and are, by their nature, irreplaceable.\(^6\)

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Areva, EDF’s uranium supplier, has been a key protagonist of this ‘rush’, with its CEO signing an industrial partnership with the Namibian Minister of Mines and Energy in the presence of Namibian President Hifikepunye Pohamba on 5 May 2009. It has established the third of Namibia’s three currently operating uranium mines at Trekkopje. This currently is ‘poised to become the largest [uranium mine] in southern Africa and the tenth largest in the world’, with an estimated mine life of 12 years. Production here was in fact suspended very recently in the wake of recent uranium price declines and the realisation that the ore is of lower quality than previously thought, but the intention remains that production will resume when prices rise, perhaps in conjunction with the operation of new build nuclear reactors elsewhere such as in the UK. Uranium mining in Namibia tends to be open-pit, resulting in the digging up of large swathes of landscape. To provide an indication, the proposed uranium mine at Etango, formerly the popular tourist location Goanikontes, whose name is indicative of the much older but displaced indigenous KhoeSân history in the area, is projected to be approximately 6km long by 1km wide, with a depth of up to 400m below the surface.

Uranium mining also requires a host of supportive industries and infrastructure. Areva has built a desalination plant at Wlotzkasbaken on the Skeleton Coast to provide the massive quantities of water required in the extraction process, and which may be expanded to assist with supplying other mines as they become established. Construction of an emergency diesel power plant and a coal or gas-fired power station of 400MW or above is proposed to support the energy requirements of the industry. Combined with the impacts of greatly increased road traffic to service the industry, this seems contrary to assertions in the UK context that nuclear power is ‘zero-carbon’.

In addition, there is the planned construction by the South African Gecko Group of Companies of three chemical production plants to produce the acid reagents required for leaching the metal from the ore. This will affect some 4,000 hectares, causing acid fogs devastating to local coastal ecologies. The proposed location of the plants in Walvis Bay has significant implications for the Walvis Bay Wetland, ‘considered the most important coastal wetland in Southern Africa and one of the top three in Africa’. The Walvis Bay Wetland is recognised as of International Importance under the intergovernmental Ramsar Convention on Wetlands, to which Namibia has been a signatory since 1995. Such effects have been contested by environmentalists to responses by Gecko that, they ‘pity... prophets of doom who lack the insight to grasp the spectacular future that lies ahead for this incredible country’, suggesting that they ‘should quietly move aside to allow those who have the vision, both in the public and private spheres, to grow Namibia to its real potential’. As the Gecko statement goes the surely/hopefully ironically named company goes on to say, ‘you ain’t seen nothin’ yet’. This statement seems rather crass in relation to the Gecko Group of Companies’ namesake, of which there are some 13 endemic species found in the Central Namib, with three species, Bradfield’s Namib Day Gecko, Namib Ghost Gecko and Banded Barking Gecko, of conservation concern (MME op. cit. p. 7.74). The proposed operations of the Group of Companies will almost certainly impact negatively on individuals and populations of the species used as their brand name.

As noted above, in 2009 a Strategic Environmental Impact Assessment (SEA) was
commissioned by Namibia’s Ministry of Mines and Energy (MME), executed by the South African Institute for Environmental Assessment, and funded by the German Federal Ministry for Economic Cooperation and Development. The intention is to propose a common approach towards the management of the ‘uranium rush’ such that the ‘Namib Uranium Province’ will be a living example of how mining can contribute to the achievement of sustainable development’. Under the most likely scenarios projected in this SEA, it is considered that in the near future Namibia will produce around a third of global uranium supplies. This will significantly enhance the country’s reputation in the mining world, but will also cause cumulative direct habitat loss due to mines and associated infrastructure of beyond 500 km², depending on which scenario unfolds. A large proportion of this is due to ‘the large areal extent of the Trekkopje mine’ established by EDF’s suppliers, Areva. Cognisant of the environmental implications of such an extractive industry, the SEA makes a range of recommendations so as to enable Namibia to position itself to capitalise on a “green” brand of uranium.

Various measures are proposed to mitigate anticipated and actualising environmental harm. These include giving specified biodiversity, tourism and heritage sites ‘Red’ or ‘Yellow Flag’ status that will make them off-limits to mining, although with the proviso of ‘unless an extraordinary mineral deposit of national importance occurs in the area’. The Map below shows the areas and locations conferred with such status. A cursory comparison between the Map below and the one reproduced above showing locations of uranium EPLs and existing mines indicates great overlap between actual and proposed mining areas and locations of significant value in terms of biodiversity and archaeology.

Already, in fact, the Etango uranium mine, to be run by the Australian company...
Bannermans Ltd., will be constructed in Red and Yellow Flag areas because its size means that it is of greater national economic importance than the protected landscapes already there. Of further concern is a weak legislative structure with, for example, the recently passed Environment Management Act (2007) including no requirement for companies to construct Environmental Management Plans (EMP) to guide their operations. The MME thus assert that:

It is clear that the developments considered in the three scenarios will be unable to avoid priority biodiversity areas and as there are limited mitigation measures that can be implemented in the desert and because restoration of arid ecosystems is essentially untested, a large residual impact on biodiversity is expected. For this reason it will be essential to include the establishment of sustainable offsets... for many of the proposed developments.

Through invoking the mitigation hierarchy, and the principles and standards recommended by the BBOP (see above), biodiversity offsets are proposed as a means of compensating for the ‘unavoidable’ direct loss of species due to projected landscape disturbance, as well as indirectly due to ‘habitat loss, degradation and fragmentation’ and through the proliferation of other related infrastructure such as roads. Thus, ‘[b]ecause certain impacts are unavoidable, offset areas will be set up and supported by the mining industry’, with ‘aggregated offsets’ proposed where mining companies pool rather than individualise their offset investments.

On top of the large habitat areas potentially lost due to the direct effects of mining, it is hard to see how such offsets would meet additionality criteria. This is because the offset locations proposed (which include the Brandberg, Messum Crater, Spitzkoppe and surrounding inselbergs and Namib areas in north-west Kunene) already exist as areas of high ecological and conservation value. As such, their designation as offset areas for the significant environmental harms produced by uranium extraction will not constitute added environmental and/or conservation value, and certainly not to a degree commensurate with the harms caused.

It is also suggested that communal area conservancies might offer potential ‘for the delivery of biodiversity offsets or compensation’, such as through the establishment of plant nurseries for the propagation of species that will assist with rehabilitation. Of course, problematic ethical implications arise from constructing rural Namibians as essentially providers of healthy environmental services to compensate for the environmental damage caused by others elsewhere. Finally, ‘no net loss in terms of tourism and recreation opportunities’ is proposed such that ‘the development of new tourism products (e.g. mine tours)’ will contribute to both environmental education and tourism, as if these are commensurable with visitor experiences of the biodiverse, open and little-industrialised landscapes currently associated by many with the Central Namib.

The MME states that through such measures ‘companies stand to have a net positive impact on the ecosystems’, although elsewhere it notes more candidly that ‘under any of the mining scenarios envisaged, ... [economic] benefits will be at the cost of the biophysical environment which will be a net “loser”’. Given both the impacts of extractive industry, and the sleight of hand suggesting existing localities of high biodiversity value can serve as offset localities for these impacts, it is hard to see how a net positive ecosystem value can in fact be the outcome of offsetting strategies in this case. It is additionally difficult to see how the projected environmental impacts of support industries such as the chemical reagent plants mentioned above, which will devastate local ecologies both through the production of acid fog and the dumping of production waste to sea, can be offset to engender anything like ‘no net loss’.
The commodity chain outlined here that connects nuclear power production in Hinkley, Somerset, UK with uranium extraction in the Namib Desert, southern Africa, would not be complete without some mention of the increase in above-ground radioactivity with which this assemblage is associated. To summarise and simplify, radioactivity is amplified in this process at three stages. The extraction of uranium brings to the earth’s surface radioactive material located naturally in the ground. Through application of toxic chemical agents the ore is precipitated into a uranium radioactive ‘concentrate’ known as ‘yellow cake’, leaving radioactive mine tailings and other toxic wastes at the sites of extraction, such as in Namibia. This yellow cake then goes through an enrichment process elsewhere, so as to separate out the more radioactive uranium 235 fuel, producing uranium 238 as a key by-product. Although referred to as ‘depleted uranium’, Uranium 238 is also radioactive and has a very long half-life. It is itself a valuable commodity, because its denseness makes it useful in the construction of artillery shells that can penetrate armour. DU shells vapourise on impact, dispersing radioactive DU dust over wide areas. Recent deployment of DU artillery in the US and UK’s war on Iraq has thus been associated with a devastating proliferation of cancers and extreme birth deformities. And finally, once uranium 235 fuel has been burnt in a nuclear power station, such as at Hinkley, it leaves a radioactive cocktail of waste-materials. One of these, plutonium, is used in the making of nuclear bombs, and as such is also a valuable commodity created through the nuclear power generation part of the uranium commodity assemblage. It is perhaps pertinent to recall that it was the creation and production of plutonium for this very reason during the Second World War arms race, that has driven the current legacy of nuclear power.

To conclude: some comments on the ‘calculus of casualties’ in greening growth

The above images depict a handful of the life-forms that are being harmed by proposed and current mining developments in the Central Namib desert, in the course of extracting uranium to supply global demands for uranium power, including
at reactors such as the proposed Hinkley C in Somerset. Image a. is of the endemic, *Adenia pechuelii*, known in English as Elephant’s Foot for its unusual growth-form; b. shows the succulent plant *Hoodia pedicellata*, an endemic to the coastal Namib. This is a species which is already under threat due to intensified harvesting in the wake of the commercialisation of associated *Hoodia* species for their appetite-suppressing qualities; c. depicts *Rhoptropus gecko*, one of the gecko species endemic to the central Namib; d. is the extraordinary plant *Welwitschia mirabilis*, an ancient gymnosperm constituting the only genus in the taxonomic order of *Welwitschiales*. Some *Welwitschia* individuals may be over 2,000 years old, and many are over 1,000 years. *Welwitschia* occurs only in the Namib desert areas of Namibia and southern Angola; e. is a Tenebrionid beetle, a constellation of endemic beetles whose innovative adaptations to the specific challenges of their Namib Desert home are the stuff of which natural history legends are made. Twenty-six species of Tenebrionid beetles are endemic to the central Namib, all considered ‘threatened’. Finally, and to join company with the threatened barbastelle bat affected by the site preparation works for Hinkley C nuclear power station (as detailed above), image f. is of the endemic Namib long-eared bat, *Laephotis namibensis*. Somewhat poignantly the IUCN Red Data list, which indicates the threat of extinction to known species, the Namib long-eared bat is listed the category ‘Least Concern’ because ‘most of the range is within well protected areas’ and ‘there are no significant threats’.

The instituting of biodiversity offsets in relation to development interventions clarifies the process whereby choices are made that will both affect and effect the continuing presence of such entities. They encourage the asking of questions such as how many of these are worth the maintenance of corporate mining wealth, the legacy of amplified above-ground radioactive material for management by future generations, the labour of untold workers, and the loss of diverse cultural values associated with these same species and landscapes? In the ‘calculus of casualties’ that greens development in the case(s) documented here, individuals and populations of these species, in combination with the places, relationships and cultural histories in which they are also embedded, constitute some of the casualties. As traced above, the mechanism of biodiversity offsets is invoked so as to provide a sense that such interventions are environmentally friendly, even though they are causing significant environmental harm to long-evolved socio-ecologies of species and local knowledges connected with selected and affected places. The mitigation hierarchy and proposed offsetting mechanisms seem to discursively reconfigure the place-based ecological (and social) casualties associated with specific developments, into positive environmental quantities entrained with the ideal of ‘no net loss’. As Rob Fletcher conveys, this strategy acts to foster the simultaneous acknowledgement and denial of real casualties in the *eco-socius*: it provides the fantasy that papers over the potentially disturbing gap between material and symbolic orders. Derrick Jensen makes the point more plainly in noting that ‘... in order for us to maintain our way of living, we must tell lies to each other, and especially to ourselves’.

To look beneath the green ‘no net loss’ rhetoric and pay attention instead to both the offsetting logic and its effects, is to witness the extension of an array of foundational assumptions that seem intrinsically problematic for the sustenance of both biological and cultural diversities. As Carolyn Merchant detailed in the 1980s, critical here is a conceptualisation of the earth as a deadened and objectified abstract machine, a perceptual reality that arose in conjunction with an increasingly industrialised mining endeavour justified intellectually by the elite European Enlightenment thinkers of the early modern era. This thinking is continued in the currently emerging mining-offsetting culture that conceives of life and land as numbers that can be exchanged through offsetting mechanisms. This very specific, yet universalising, worldview
fabricates equivalences between localities so as to effect an unecological (and commodifying) deterritorialisation of nature under the guise of enhancing environmental health. The accompanying commodification of new nature artefacts such as biodiversity offsets – adding to what Karl Polanyi called ‘fictitious commodities’⁹⁰² - completes this new incorporation of non-human nature. Through such processes the entrepreneurial corporate world extends its dominion over both environmental health and harm as money-bearing commodities.

Neil Young’s song ‘After the gold rush’, from which I take the title of this paper, contains the evocative line, Look at Mother Nature on the run.... This seems an apt thought to close with, although it appears to me more as if it is us very modern humans who instead are running from nature. In the examples considered here ‘nonhuman nature’, and the entities and relationships of which ‘it’ is comprised, are known only by proxy: as numbers, as scores, as interchangeable equivalences, as priced commodities, as resources to be radically transformed so as to conform with the apparently unavoidable dictatorship of economic growth and the market. The instrumentalised landscapes that are thereby created, to me are lonely places. Nature may be running from them; but ‘it’ also is being pushed out by contingently empowered decision-makers so as enhance particular growths.
A version of this paper was first presented for a series of panels with the title ‘Grabbing ‘green’: markets, environmental governance and the materialization of natural capital’, organised by Ken MacDonald, Catherine Corson and Ben Niemark for the American Association of Geographers annual conference in New York in February 2012. I am grateful to my partner, Mike Hannis, who has provided conversation and references in the piecing together of this story. Any errors of interpretation remain fully my own.


This is the title for a series of three panels organised by Ken MacDonald, Catherine Corson and Ben Niemark held at the American Association of Geographers annual conference in New York in February 2012, where the work summarised here was first presented. The subject of ‘green land grabs’, i.e. those occurring for newly priced environmental conservation assets such as carbon and/or biodiversity, is also the focus of a soon to be published special issue of the Journal of Peasant Studies, edited by James Fairhead, Melissa Leach and Ian Scoones and entitled Green grabbing: A new appropriation of nature?


See, for example, White, W. 2008 The advantages and opportunities, pp. 33-41 in Carroll, N. Fox, J., and Bayon, R. (eds.) Conservation & biodiversity banking: a guide to setting up and running biodiversity credit trading systems, London: Earthscan.


This means that a developer in theory can transform a much larger area of land than the area in which they invest in offsets, providing the compensation ratio as established through this scoring system. As noted in the text, the recently updated version of the DEFRA metrics (March 2012) revises this Table such that it is reduced to three rows, with the top row removed. In speculating on the reasons for this, it may be that this would reduce the discrepancy between area of development and area of offset that is possible in the former four-rowed Table (see DEFRA 2012 ibid.).
This is also the case in US wetlands mitigation banking, as documented in Robertson, M. and Hayden, N. 2008 Evaluation of a market in wetland credits: entrepreneurial wetland banking in Chicago. Conservation Biology 22(3): 636–646.


Ibid. pp. 9, 11.


Briggs et al. 2009 *


Ibid. p. 419.


Available online at http://www.westsomersetonline.gov.uk/hinkleypoint.

Available online at http://www.saleia.com/uranium/.

West Somerset Council (WSC) 2011 Officer’s Report for the Application for Planning Permission, ref. 3/32/10/037. Taunton: West Somerset Council, p. 3.


As noted in the Habitat Regulations Assessment in ibid., these are the Conservation of Habitats and Species Regulations 2010.


Ibid. This seems to further indicate that from EDF's perspective approval for the power station is considered a done deal, even prior to the IPC application process.


As per http://www.salea.com/uranium/.

MME 2010-11 Strategic environmental assessment for the central Namib uranium rush. Ministry of Mines and Energy, Windhoek, Republic of Namibia, ES-1, 1-1. This is in a context of a similar ‘uranium rush’ in other countries with Niger issuing more than 100 and 138 exploration permits issued by Niger and Botswana respectively between 2008 and 2010 (ibid. pp. 4-1).


MME op. cit. pp. 7-91-100.


Cf. Lynam 2012 op cit.


The list of recognised Ramsar wetlands can be viewed here: http://www.ramsar.org/cda/en/ramsar-about-sites/main/ramsar/1-36-55_4000_0___. Accessed 1 April 2012.


Integrated Coastal Zone Management Project 1999 Coastal Profile of the Erongo Region. Windhoek: Ministry of Environment and Tourism, online. http://www.the-eis.com/data/literature/Coastal%20profile%20of%20the
77 MME op. cit. p. ES-2.
78 Ibid. p. ES-15, 7-85.
79 Ibid. pp. ES-8, 7-85.
80 Ibid. p. 10-1, emphasis added.
81 Ibid. p. ES-11.
84 Ibid. p. 7-89.
85 Ibid. pp. ES-14-15. Areva’s Trekkopje mine, for example, affects the relatively undisturbed gravel plains of the Central Namib with concentrations of wildlife including springbok and ostrich, dense fields of the endemic succulent shrub Sarcocaulon marlothii Engl. (known colloquially as Bushman’s candle), as well as one of the most important lichen areas in Namibia (Ibid. pp. 7-79, 7-81, 7-83).
86 Ibid. p. 7-86.
87 Speciesbanking.com 2012, op. cit.
88 MME op. cit. p. 7-88.
90 MME op. cit. pp. ES-17, 7-89.
91 Ibid. p. 7-89.
96 Taken from MME op. cit. p. 7.75.
97 After Jensen op. cit. p. 65.
98 Also see Seagle, C. Biodiversity for whom? Local experiences and global strategies of land use and access near the Rio Tinto/QMM ilmenite mine in Fort Dauphin, Southeast Madagascar. Unpublished manuscript.
100 Jensen op cit. p. 65.