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TERRANOMICS

Advice on Running a Price Discovery Process

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Introduction

This document summarises ways in which to determine a price for environmental services which might be supplied by stakeholders in Section 8 of Cornwall AONB. Price discovery is an important stage in developing a new product or market and will be a crucial hurdle to overcome in attracting private investment into local landscapes. The document aims to provide guidance to the AONB team or its partners to take forward a price discovery process within a next phase of work on the PLIB initiative.

What price discovery means and involves generally

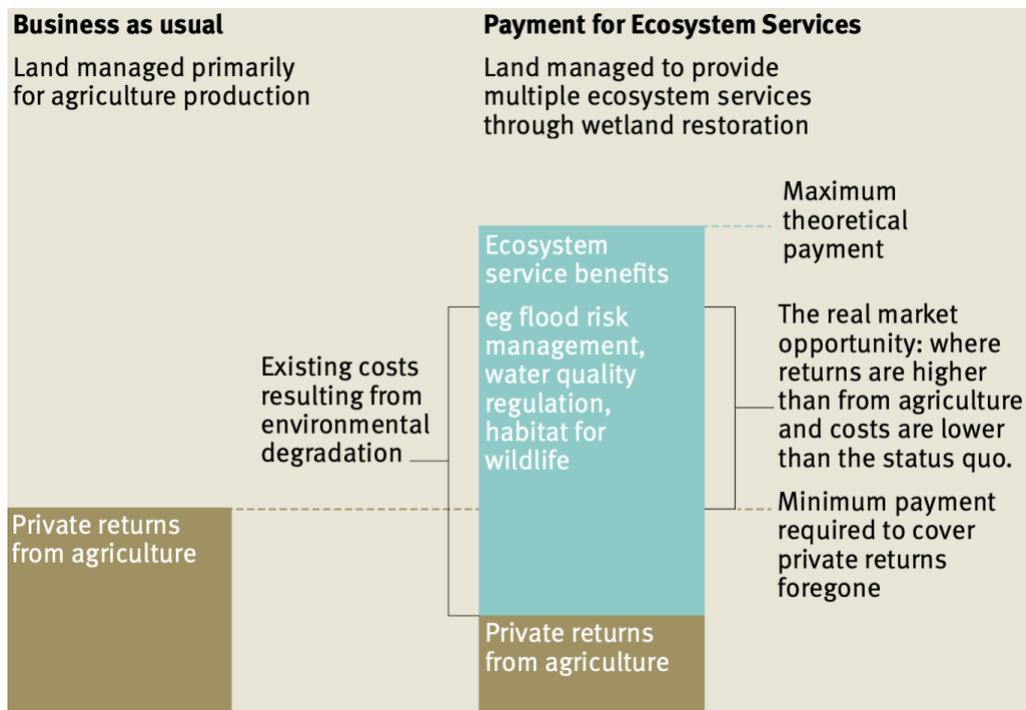
Price discovery is the process of finding out the price of an asset or commodity. This is a process that has been used in other projects in the UK to determine a price for environmental services.

Typically, the process involves an investment offer, or a project proposition detailing the services farmers and land managers can deliver from their land to start the negotiation of agreements between suppliers and buyers of environmental services, for example carbon credits or biodiversity credits. Buyers of environmental service credits can then determine their maximum willingness-to-pay based on the ability of the credits to reduce or avoid defined business costs, such as compliance costs with government regulation or other avoided costs from ecosystem services. Suppliers (i.e., farmers and land managers) could then work out what their required breakeven price of providing environmental services is, based on direct costs from required inputs to provide credits, and indirect costs such as the opportunity cost computed using known agricultural outputs per hectare. This could build on existing data from the AONB's ELMS Test and Trials Final Report in July 2021, where farmers considered the minimum 'asking price' for a range of proposed land enhancement actions (covering nine priority objectives). All farmers came to their asking price differently, averaging £556 per hectare per year to meet all these objectives.

The difference between the breakeven costs of suppliers and the willingness-to-pay of buyers, depicted in Figure 1 below, creates the space from which negotiations of agreements can confer additional "profits" for either the buyer, the seller, or both parties. The trading space (in blue above the dashed line) in Figure 1 is where buyers can save more from avoided costs than suppliers need to breakeven. This is a process that has been used in other projects in the UK to determine a price for environmental services, such as the Eden Trust Model in Cumbria.¹

¹ Eden Trust (2021). Building local markets for sustainable land management with the Eden Model A toolkit for practitioners. Available online: https://green-alliance.org.uk/wp-content/uploads/2021/11/Building_local_markets_for_sustainable_land_management_with_the_Eden_Model.pdf

Figure 1 Lower and upper bounds for pricing ecosystem services²



How price discovery works for carbon and other ecosystem services

Price discovery has been a critical component of historical Payment for Ecosystem Service (PES) markets in the UK, including carbon, biodiversity net gain (BNG) and various water credits. A study (Gosal et al., 2020) documented PES schemes included Defra Biodiversity Credit Metric 2.0 used in BNG policies, Wessex Water’s scheme for cover crops (Nitrogen credits), Affinity Water’s scheme for Oil Seed Rape Substitution (Pesticide Credits), and United Utilities’ Maize under-sowing scheme (Nitrogen Credits), the Peatland Code (PC) and the Woodland Carbon Code (WCC).³

Carbon credits

For the WCC, landowners and farmers generally initiate the project development and sale process. In both instances, initiatives on the ground have often stimulated farmer/landowner interest and awareness, encouraging farmers/landowners to develop project propositions and register on the respective online platforms. However, the level of payment for credits has historically often been driven heavily by demand and the willingness-to-pay of buyers. An exception has been the Woodland Carbon Guarantee in England wherein the government offered a contract for the option to sell WCC credits to them via an auction. In the case of the WCC, the price discovery process has generally occurred on a one-to-one basis between suppliers and buyers depending on the specific needs of buyers and characteristics of proposed projects. The WCC uses the IHS Markit Request For Information (RFI) Platform, which is an anonymous platform to display credit quantities and price. Upon interest in any credits, the sellers or buyers can send an "Expression of Interest" to the counterparty, whereby the counterparty can permission the interaction. Introduction through the IHS Markit RFI platform then enables the two

² Ibid

³ Gosal et al. (2020). Exploring Ecosystem Markets for the Delivery of Public Goods in the UK. Available online: https://eprints.whiterose.ac.uk/164709/1/UK_ecosystem_markets_report_082020.pdf

parties to discuss the terms of a potential bilateral transaction.⁴ Evidence from WCC indicates that market demand drives the price up when available carbon is low, and when demand increases farmers and landowners sometimes hold out on projects to benefit from higher carbon prices. Furthermore, the marketing of WCC projects have often included a descriptive narrative of other benefits conferred by interventions beyond simply carbon sequestration, which are not quantified but often used to justify price premiums above traditional commercial forestry projects. This approach could be used for any carbon codes that are currently under development (i.e soil, hedgerow, agroforestry).

Biodiversity Net Gain

The price of Biodiversity Units (BUs) will vary according to the specific context – for example, the type of biodiversity preserved, the associated costs with enhancing biodiversity, the opportunity costs associated with not developing the land, and the market dynamics and scarcity of Bus. All these factors will contribute to price. In addition to opportunity costs and transaction costs, the price of BUs is also expected to integrate a small premium to reward providers of BUs for internalising the delivery risk of biodiversity-preserving or enhancing projects in the local area.⁵ Pricing of BUs is further complicated by the fact that specific habitat types that will be offset as part of the BNG scheme are difficult to predict – for example, each hectare of land, according to estimates from Defra's Biodiversity Metric 2.0, can lead to two to three BUs. It is typically the local authorities who will calculate appropriate biodiversity unit prices for offsite gains delivered on their land or sold by them on behalf of a third party. The prices will need to be sufficient to allow the farmer to cover the costs of creating or enhancing the habitat and maintaining it for a minimum of 30 years.⁶ Based on modelling of habitat delivery and transaction costs, forecasting attempts at BU prices indicate they may cost anywhere from £15,000 to £25,000 with an average of £20,000.⁷

Trading platform for multiple ecosystem services

Platforms important to the functioning of ecosystem services markets were also identified in the previously mentioned study (Gosal et al., 2020). One example, EnTrade, was considered to have helped create a market for ecosystem services beyond carbon sequestration⁸. EnTrade allows farmers to propose land use change projects, convert propositions into environmental credits using pre-established rules for schemes, and then assist in the brokering process for contracts and payments between land managers and credit purchasers. Depending on the preferences and needs of buyers and suppliers, a trading platform such as EnTrade or NatureBid⁹ could be used to match buyers and suppliers. In such platforms, supply aggregators and individual sellers upload propositions, which may be further aggregated between many suppliers. Alternatively, direct negotiations can also occur between buyers and supply aggregators, wherein buyers would select propositions which best meet their needs at the most competitive price. Negotiations may take several rounds, with details and logistics to be agreed upon including price, timeline, monitoring and verification processes, and liability. As a platform, EnTrade operates through reverse auctions, with all trades to date taking a price discovery approach wherein farmers and landowners compete to tender ecosystem services at the most affordable price. Previous

⁴ WCC (2020). UK Woodland Carbon Code and UK Peatland Code User Guide. Available online: https://woodlandcarboncode.org.uk/images/PDFs/Markit_Guidance/How_to_navigate_the_different_pages_on_the_registry_30November2020.pdf

⁵ TNC (2021). Biodiversity Net Gain in England: Developing Effective Market Mechanisms. Available online: https://www.nature.org/content/dam/tnc/nature/en/documents/TNC_BiodiversityNetGain_England.pdf

⁶ PAS (n.d.). Biodiversity Net Gain FAQs - Frequently Asked Questions. Available online: <https://www.local.gov.uk/pas/topics/environment/biodiversity-net-gain-local-authorities/biodiversity-net-gain-faqs> [Accessed September 2022].

⁷ Ibid.

⁸ See more info here: <https://www.entrade.co.uk/>

⁹ See more info here: <https://www.naturebid.org.uk/faq>

consultations with the Lizard Farmer Group found that they are “reluctant to engage with any kind of reverse auctioning process”, meaning that a trading platform might not be of interest to them.¹⁰

Group/aggregated approach for multiple ecosystem services

The Landscape Enterprise Networks (LENs) approach developed by 3Keel follows a similar conceptual framework to that shown in Figure 1, where evaluations of the PES unit price are conducted independently by suppliers and buyers. This is done at a group level (in the case of LENs), where both the buy side and supply side are aggregated together based on business needs of the buyers and the interventions that the suppliers are willing to carry out. For buyers, the evaluation represents an identified willingness-to-pay for a given ecosystem service, and for suppliers the evaluation represents the cost of delivering the service. A project is then viable if the cost to potential buyers avoided from the ecosystem service is larger than the cost of implementing the ecosystem service by the farmer or landowner, acting as the lower and upper bounds of the ‘trading space’ in the negotiation (shown in Figure 1). Once this trading space is established, there is a conventional bilateral price negotiation between the supplier and buyer to settle on a final value for the PES unit price, this is somewhere between the buyer’s willingness-to-pay and supplier’s cost of delivering the service.

¹⁰ Cornwall AONB (2021). The Cornwall Area of Outstanding Natural Beauty Lizard Test/Trial. Available online: <https://static1.squarespace.com/static/54e6ffe7e4b0663b4a777e12/t/6113a8e12aea584297d4d9a1/1628678388065/The+Cornwall+AONB+Defra+Trial+Final+Report+July+2021.pdf>

Initial price indications for ecosystem services in a UK context

Through the UK's WCC initiative, companies are paying between £7 and £20 per tonne CO₂e for Pending Issuance Units (PIUs) (advance purchases of carbon credits), and up to £40 per tonne CO₂e for actually delivered (as opposed to promised in the case of PIUs) Woodland Carbon Units (WCUs)¹¹. It has also become apparent that some companies are willing to pay a premium price for earlier PIU vintages (the time period for verification), which will be verified as a WCU before 2050. Examples of £30 per PIU offers for projects being verified before 2030 are likely reflective of an urgency among companies to fulfil commitments to achieve net zero by 2030.¹²

Soil Carbon markets indicate that the estimated market price is about £20-£30 per tonne CO₂e, and BNG is valued at about £20,000 per Biodiversity Unit (BU). Catchment markets yield heterogeneous prices, but based on an example in Cambridge, farmers were paid £109 per hectare on average by water companies to grow cover crops for the 2020/21 growing season.

PES Transaction type	Estimated market price
WCC	£7-£20 per tonne CO ₂ e for Pending Issuance Units (PIUs) ¹³ , up to £40 per tonne CO ₂ e for Woodland Carbon Units (WCUs)
Soil Carbon	£20-£30 per tonne CO ₂ e ¹⁴
BNG	£20,000 per Biodiversity Unit (BU) ¹⁵
Catchment agreement/Catchment markets	Based on an example in Cambridge, farmers were paid £109 per ha on average by water companies to grow cover crops. ¹⁶

¹¹ Carbon Store (2022). Monthly Report 2022. Available online: <https://carbonstoreuk.com/wp-content/uploads/2022/01/CarbonStore-Report-Jan-22.pdf>

¹² Carbon Store (2021). Woodland Carbon Update – July 2021. Available online: <https://carbonstoreuk.com/publications/woodland-carbon-update-july-2021/>

¹³ A PIU is a promise to deliver and is not a WCU which is how much has been delivered once verified. Most WCC transactions to date have been based on PIUs as it can take 5-15 years to generate WCUs. <https://woodlandcarboncode.org.uk/landowners-apply/how-do-i-sell-my-carbon-units>

¹⁴ https://green-alliance.org.uk/wp-content/uploads/2022/01/The_opportunities_of_agri-carbon_markets.pdf

¹⁵ <http://randd.defra.gov.uk/Default.aspx?Menu=Menu&Module=More&Location=None&ProjectID=20608>

¹⁶ <https://www.cambridge-water.co.uk/news/farming-scheme-to-benefit-the-environment-drinking-water-and-soil-health>

What might affect prices in the medium-term

There are several factors that can affect prices in the medium term, some of these are:

- The **impacts of forgone earnings** by landowners and farmers unable to undertake agricultural production in conserved areas determines the minimum price at which a landowner or farmer would offer ecosystem services. Therefore, if there is an increase in the private returns from agriculture (i.e. crop prices increase), the minimum payment to cover the forgone earnings will be higher.
- **Maintenance costs** associated with maintaining the asset (e.g., a woodland) increase the price. These maintenance costs could increase because of climate change and increased threats to the asset such as drought, fire and disease. For example, in California the buffer pool for carbon credits (the insurance mechanism if carbon is released unexpectedly), has almost been wiped out due to wildfires.¹⁷
- **Transaction costs**, such as the cost of negotiation, modelling, validation, verification, and monitoring impact the price of ecosystem services.
- **The integrity and quality of the credits generated**, as shown in previous sections, buyers are willing to pay for higher prices for verified credits.
- The **benefits from ecosystem services** accrued for beneficiaries and buyers of credits dictate the maximum price they are willing to pay for credits. These co-benefits (usually the benefits beyond just carbon) can be marketed to buyers. For example, if the intervention were to be incrementally improved to confer additional benefits (increased biodiversity, improved water quality) to buyers, then it is expected that the price of credits will increase.
- The **visibility of the interventions and enhancements**, some regions such as Cornwall and other tourism hotspots have the advantage of being able to market these activities and showcase the multiple benefits more clearly than secluded areas and projects. This visibility could increase the price of the credits.
- Buyers will typically pay more for **credits generated closer to their market and/or customers**. Local buyers in Cornwall will have confidence that investments in this project will deliver high-quality, and measurable impact for nature.
- The **cost of alternatives** dictates the price of credits as well. For example, if the price of implementing water treatment plants decreased, there would likely be less demand for 'Nature-based Solutions' geared towards cleaning water, which could reduce credit prices.
- **Competition in both the supply and demand of credits** will alter the medium-term price. For example, if supply of credits is low and demand were to increase, then the price of credits would also likely increase.
- **Bundling of multiple ecosystem services** from interventions can increase the willingness-to-pay of buyers.
- **Regulatory changes**, for example if carbon moves from a voluntary to compliance market, for example the ETS, then we can expect demand for credits to increase substantially, thus increasing the price of credits.

¹⁷ Financial Times (2022). Wildfires destroy almost all forest carbon offsets in 100-year reserve, study says. Available online: <https://www.ft.com/content/d54d5526-6f56-4c01-8207-7fa7e532fa09>

Ways in which Cornwall AONB could help farmers, landowners and buyers through the price discovery process

A price discovery process can take 6-18 months to gather all the information required from both the supply and buy side, carry out the market testing, and negotiate the agreements. As this project has already begun to carry out some of this information gathering, it might be possible to accelerate the process to one year. A possible process for price discovery and timeline for Cornwall AONB to consider could include:

- Late 2022 {
 - Continue to develop the supply proposition with the farmers, or investment offer (as per the Landscape Management Framework already developed).
 - Inform farmers how they may be impacted by the different environmental interventions and agreements. This could include getting an understanding of how these agreements could impact the public payments that the farmers will receive from ELMs.
 - Work with farmers to understand the initial capital costs, ongoing maintenance costs, and opportunity costs of any land taken out of production for the agreement period to deliver on an intervention. This can help to develop an updated asking price from the farmers and landowners
- Early 2023 {
 - Marketing the investment offer with prospective buyers (which has already begun with some 'soft' market testing for this project). This later stage market testing can focus more on the proposition of the buyers, including the pricing and willingness to pay
- Late 2023 {
 - Negotiation of agreements on behalf of the farmers with the prospective buyers, through market testing and developing Expression of Interests and Memorandum of Understanding with buyers.

Reflections on price discovery challenges for AONB and the Environment Agency for their work going forward

The supply side engagement to date with a group of farmers has allowed for enough information to develop a supply proposition (the investment offer) that has been used for early-stage market testing. A more up to date and specific asking price might be required from the farmers to move this work forwards in 2023.

The market testing with potential buyers has not been as successful, with buyers being less aware or less interested in engaging in this process. Therefore, it has been difficult to develop any idea of willingness to pay for these ecosystem services from buyers. There are some nascent examples of UK PES projects that have carried out some sort of price discovery process, but there is a lack of transparent data on market rates and returns that might help to engage more of the buyers. More analysis and information on this might encourage more suppliers and buyers to engage in PES projects and make for an easier price discovery process.