ECOSYSTEM SERVICE MODELLING

RULE-BASE DEVELOPMENT – SUGGESTIONS FOR USERS

Contents

Vegetation Carbon Storage

CICES Ecosystem Service Typology

Section	Division	Group	Class 1
Regulation and Maintenance	Maintenance of physical, chemical, biological conditions	Atmospheric composition and climate regulation	Global climate regulation by reduction of greenhouse gas concentrations

Vegetation Carbon storage description	Atmospheric carbon is sequestrated by, and stored in, vegetation through the process of osmosis and plant growth. The more biomass that is present in the vegetation layer the more carbon is stored, with mature woodland at one end of the spectrum and grasslands at the other end. It has been estimated that woodlands and forest vegetation hold up to 80% of the UK total carbon (Milne and Brown, 1997; Hagon et al., 2013) with those habitats managed for arable and horticultural crops storing the least carbon in their vegetation (Milne and Brown, 1997).

Factor 1a - Soil		
Soil Types		Soil type influences vegetation carbon storage by affecting the type of vegetation likely to be present. Mature woodland can develop on most soil types, even where shallow and very wet.
Mineral		Have an influence on the above ground biomass and therefore the amount of vegetative carbon which can be stored.
Organo-Mineral		Have an influence on the above ground biomass and therefore the amount of vegetative carbon which can be stored.
Organic		Have an influence on the above ground biomass and therefore the amount of vegetative carbon which can be stored.
Soil Systems		Have an influence on the above ground biomass and therefore the amount of vegetative carbon which can be stored.
Factor 1b - Geology		
		Underlying geology does not have a significant influence on vegetation carbon storage, except where it affects the thickness of the soil; such as areas with rocky outcrops and screes where the vegetation growth is limited.

Factor 2 - Habitat		
Biophysical properties of habitats		Habitat type is a key determinant of vegetation carbon storage. The more biomass contained within the habitat, the greater the amount of carbon that can be stored in the vegetation.
Below ground physical features	*Root depths*	Woodlands are known to have deep rooted systems and hold the majority of their carbon content in their trunks (Hagon et al., 2013).
Below ground biological features	*Species richness*	This has an indirect influence on the above ground biomass growing as for some habitats species variation increases the amount of woody species present.
Above ground physical features	*Biomass / Canopy Height*	Has a direct influence, the greater the amount of biomass present, the more vegetation carbon storage is possible.
Above ground biological features	*Species Richness*	Species composition has an influence on a habitats capacity to store carbon. Scrub species uptake more carbon than grasslands (Frank and Karn, 2005).
Other effects (How other data can be used as a proxy indicator)		Vegetation type can be used as an indicator for the potential amount of carbon in above ground biomass: When considering grasslands: • Most of the carbon stored in grasslands is in the soils. • Species composition of grassland influences the amount of carbon in the soil. • Is it a permanent grassland system or as part of a cropped system? Permanent grassland is likely to contain more carbon

Factor 2 - Habitat	
	in its vegetation than rotational grass which is re-sown. • Drainage effects lowland meadows and Molinia-Juncus pastures and can result in carbon losses due to oxidation of the organic matter (Natural England, 2010). When considering heathlands: • Heathland that has been recently restored and relies on soil removal disturbance are more likely to release carbon than heathlands reliant solely on vegetation change (Broadmeadow and Mathews, 2003). • Some species of heathland undergo net carbon gains during their growth phases. (Koptittke et al., 2013). When considering wetlands: • Wetlands are considered a terrestrial carbon sink (Kayranli et al., 2010). Wetlands store the majority of the carbon in the underlying soils rather than in vegetation (Ostle et al., 2009). When considering woodlands: • Their efficiency to store and sequester carbon is also determined by their age and species composition. • Woodland management regime characteristics. Management practices also affect how vegetation stores carbon and where data is available it should be utilised to understand the frequency and severity of the disturbance.

Factor 3 - Landform	
	Topography affects vegetation carbon storage as it influences the vegetation and habitat types which are likely to be present. In general mature woodlands and scrub are more likely to be present on steep slopes, while wetland communities only occur on areas with a flatter profile and marginal slope.

Factor 4 - How it is managed	
Negative Management	Negative management, leading to reduced vegetation carbon storage includes: • Clear felling of woodlands • Paving over of gardens and other areas creating larger areas of sealed land surfaces • Increasing cultivation productivity of agricultural land, thus reducing the amount of permanent pasture and permanent crops. • Overgrazing • Ploughing and re-seeding. • Rut creation, leading to increased soil erosion.

Factor 4 - How it is managed	
Positive Management	Positive management, leading to increased vegetation carbon storage includes: • Avoid disturbance when managing and restoring habitats. • Gradual management practices e.g. gradual felling • Planting of woodlands, although the vegetation storage impact of new plantings will take many years to reach its zenith • Maintenance of gardens and other areas of natural soils and therefore vegetation in urban areas • Reducing cultivations on agricultural land, increasing the area of permanent pastures and permanent crops. • Reducing the amount of fertiliser applied, possibly using legumes to fix nitrogen. • Increase the length of ley for non-permanent pasture.

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