Proposal of science & research abstract for the conference sessions at EWEA 2015,
Topic : Environnemental impacts & social acceptance

Implementation of ecological mitigation installations of wind turbines in farming landscape : a win-win project for farmers and a wind farm developer

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1. Introduction

Space consumption due to land development projects (eg transport infrastructure, power generation infrastructure, urbanization) is a major driver of biodiversity loss. Wind farm developers have to provide an effective avoidance and a reduction of the negative impacts on biodiversity, and to implement offset measures when residual effects persist. Offsetting consists in implementing measures that counteract the residual loss of biodiversity and generate gains through management measures in order to achieve a no net loss of biodiversity or a net environmental benefit. Indeed, due to constraints resulting from cultural or natural heritage and the reluctance of local people to install wind turbines near their homes, project developers often attempt to install wind energy facilities on agricultural land, particularly in arable land dominated by open fields. However, intensive agriculture is recognized as one of the greatest current threats to worldwide biodiversity even without wind turbines. Thus, there is a need to find measures that have positive impacts on biodiversity in order to improve biodiversity-friendly farming and to offset the negative impacts of wind turbines close to impacted areas. However, offsetting close to the impacted area through safeguards of semi-natural habitat might be difficult to find due to their rarity in such landscape. A second approach that respects "On-Site" offsetting is to exempt cultivated areas to create favorable habitats for biodiversity (i.e. converting cultivated fields in agricultural fallows). This approach is currently being implemented in Champagne-Ardenne, France (our study area), with an initial negotiation that every turbine should be compensated by the creation of 2 ha of agricultural fallow. But this measure is socially and ecologically inappropriate: Environmental NGO are not fully satisfied with this single measure, wind farm developers failed to find enough agricultural surfaces to convert to fallow, farmers have the feeling of being penalized twice: they are already affected by the installation of wind farms and they must withdraw land that was previously used for the agriculture production.

2. Approach

We purposed to assess the feasibility of alternative ecological mitigation installations of wind turbines in farming landscape. Firstly, a community with all the local stakeholders was constituted: the wind farm developer, a biodiversity offsetting organization (InVivo AgroSolutions), farmers through regional Chamber of Agriculture and agricultural cooperatives, Environmental NGO, hunting association, Regional Directorate for the Environment and the National Museum of Natural History (NMNH). This community identified a set of potential alternative offset measures already existing in the landscape (hedgerows, bushes, grass strips…). Such measures were considered acceptable by all stakeholders to complement the current offset measure (fallows). Secondly, the NMNH evaluated species abundance of bird and bat on both current and potential alternative offset measures. Local stakeholders were involved during group workshops in the conceptualization of the ecological equivalence model and scenario.

3. Main body of abstract

We assess the difference of bats and birds species abundance between control site (Crops without offset measure and Crops without offset measure with wind turbine) and current offset measure (fallows) or crops with potential alternative offset measures (hedgerows, grass strips, bushes and grass strips with bushes). The second step consisted in aggregating the estimates produced in the first step for each protocol. After all gains and losses were calculated for the same metric of offset measures for each protocol, means of those gains and losses per offset measure were calculated. The numbers of species or group of species taken into account and their weight varied among scenario tested. In the first scenario Ecological equivalences were assessed considering that all taxa had the same weight. In the second scenario ecological equivalences were assessed considering a double weight for taxa being identified as negatively impacted by the wind farms. Finally, to ensure a good implementation and approbation of the compensation measures in a farming landscape, a third scenario took in consideration the point of view of the farming stakeholders. This scenario was developed in group workshops, where NMNH opened up discussions on potential developments but tried to remain within the perimeter of “a neutral facilitator” and attempted to not influence stakeholders. In the third scenario, Ecological equivalences were assessed considering a selection of taxa identified by the stakeholder community as species of interest: a priority was given to the bird farming species in a way that the offset measures would be more profitable to the landscape ecosystem. Second, the weight of the bird species that were impacted by the wind farming was doubled. Third, in order to give more weight for the bat’s reproductive season (that is more important if we want to keep a local persistent population), the results from the first visit of the bat inventory were also weighted double. Then, the last step was to determine the length of hedgerows, grass strip or grass strip with bushes and the number of bushes (i.e. alternative offset measure) needed to get the same ecological gain than the fallow (i.e. current offset measure).

4. Conclusion

This study helped to better assess the indirect impacts of wind turbines on birds and bats local (i.e. impact in terms of density of bats foraging activity and breeding birds within site with wind turbines).

In addition, this study allowed defining and quantifying alternative measures for biodiversity offsetting, effective for biodiversity, and socially and economically acceptable by local stakeholders (particularly the farming community). That is, to our knowledge, the first project of its kind in France, so it is highly innovative.

From a qualitative point of view hedgerows or grass strip stood out as the alternative offset measures to implement in term, in order to complement the actual offset measure (fallows). However from a quantitative point of view our results showed that from the same set of field data, we can get to different ecological equivalences conclusions based on the choice of weighting. Even if differences between scenarios are slight this is not negligible when dozens of wind turbines need to be offsetting.

That highlight the need of consultation with stakeholders, and this project also aid to set up a dynamic of cooperation between local actors to better offset the residual impacts of wind turbines.

Finally, this scientific based project led to the establishment of positive compensatory measures in the territory, whereas previously the situation was in stalemate. So this work is notably relevant to the wind farm developer, who can use the results or the methodology for others wind farms, in order to improve his biodiversity offsetting, and to pay farmers for ecosystem services.

5. Learning objectives

The final ecological equivalences found here were strongly dependent of the decision in the assessment chosen. However scenario choice depended of the community of interest involved, underlining the legitimacy of stakeholders that composed such group. This limitation is inherent in the operation of mitigation in France, where the burden of designing and implementing mitigation is shifted down to local and regional authorities or to developers themselves, and with an approach based project per project. At this stage our framework did not include in the ecological equivalence calculation the influence of landscape structure on gains and loss. However the importance of heterogeneity and connectivity of semi natural element in agriculture landscape have been widely recognize. The interactions between agriculture practices and offset measures tested such as hedgerow, grass strip have been documented as well. Can we envisage offsetting wind turbine by favorable agricultural practices such as less aggressive soil labor, more diverse mixtures of seeds? Is it still offsetting? How this approach could be combined with other schemes such as Common Agricultural Policy (CAP), which induced the concept of eco-conditionality, where the allocation of financial support depends on the fulfilment of certain environmental standards?