

Dear Reviewer, we would like to thank you for your detailed feedback on this piece of work. The table below attempts to summarise the major concerns that were outlined. We have numbered these, however, they do not completely align with the original numbering as we have broken a few comments into separate responses for clarity within the reference table. We have not included specific responses to the minor comments, but we will ensure that each is addressed in the next draft.

Each row in the table below includes an issue number, a summarised reviewer issue, a response and action to be taken by the authors.

Table of Requested Edits: Reviewer 1

Reviewer Major Requests			
Number	Issue	Response	Actions
1	Principal concerns relate to broader applicability of the model itself or the underlying approach to other jurisdictions where in many cases the land-use considerations will differ quite widely from an Irish context	<p>The model is, with additional contextual parameterisation, transferable to other regions.</p> <p>Where possible, we have ensured that parameters are not hard-coded and a regionalised database for each of the modules has been used.</p> <p>We have failed to highlight this sufficiently, and the reviewer makes an important point, there are contexts in which the parameterisation will take significantly less effort. It is worth pointing out that the methodology is Tier 2 (in some cases Tier1) compatible for the most part. The forestry component is Tier 3, and this would take time to adjust to</p>	<ul style="list-style-type: none"> • Additional section on global transferability

		<p>differing contexts. However, the framework is built to accommodate this.</p> <p>The authors propose a section on global transferability potential that will highlight limitations, but also illustrate linkages and insight identified at national level that are transferable to other countries i.e. the model generates new insight into specific trade-offs and complementarities at national level that should stimulate targeted analysis of similar issues in other countries with related land uses).</p>	
2	<p>The validation is also inherently circular in nature in that validation is performed against the training dataset.</p>	<p>There is a clear need to address the short-comings in our elaboration of the validation and the methodological approach.</p> <p>The GOBLIN model utilises Emissions Factors that are Irish specific from the National Inventory Report (NIR) but uses independent energy calculation for livestock from the IPCC. It is these livestock numbers that determine the grass area utilised. The forest component is also independently built.</p>	<ul style="list-style-type: none"> • National Herd validation • Additional validation elaboration •

		<p>The intention here was to recreate the emissions calculation functions of the NIR for AFOLU activities, but in a way that allowed for the generation of multiple scenarios for back-casting.</p> <p>The utilisation of emissions factors specific to the national inventory is necessary, given the objectives of the GOBLIN model.</p> <p>To assess whether this objective has been met, it is also necessary to utilise real world activity data input from the NIR.</p> <p>NIR activity-emission relationships through time is an appropriate type of “validation” in terms of the emissions computation and forest model output.</p> <p>However, there are additional areas of validation that can be expanded upon beyond that of the emissions/removals calculations. The authors suggest additional validation mechanisms related to the extrapolation of the national herd numbers. In addition, further elaboration on the validation to be added in text,</p>	
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		as well as a more detailed explanation of purpose and functionality of GOBLIN in the methods and discussion.	
3	More circumspect about potential use in other contexts, at least without some pretty substantial modifications being undertaken to the model as it stands.	This links back to issue #1, and can be addressed in the proposed additional section on model global transferability.	<ul style="list-style-type: none"> • Additional section on global transferability (from issue #1)
4	It is implied that there is a hard wired condition in the model that neutrality must be reached in 2050? This is implied in several places and would constitute a major limitation for its universal application where different jurisdictions may wish to set earlier or later dates for a condition of neutrality in LULUCF to be reached consistent with their NDCs	<p>This is a misunderstanding, which we must address in the text. Identifying climate neutrality pathways was the motivating factor for development of GOBLIN, and is an important use.</p> <p>However, the “target year” is adjustable by the user. The only reason that 2050 was selected in this illustrative piece is due to the climate objectives within the Irish context. This is not a limitation, and flexibility is build-in.</p> <p>Further, randomised simulation model means it will generate many non-neutral scenarios that can then be objectively screen according to different criteria (e.g. climate neutrality definitions)</p>	<ul style="list-style-type: none"> • Elaboration of adjustable “target year” in the methodology

5	For international applications it is unclear to what extent a number of the parameters in the model are specifically hardwired to the Irish context. Be explicit in this regard.	This links to issue #1 and can be addressed as part of the proposed new section.	<ul style="list-style-type: none"> Table to be included as part of the new section on global transferability
6	Some of the assumptions seem a little ad hoc. For example, the fertiliser leaching is assumed to be 10% in line 378. Is it correct to infer this is a fixed assumption in the model? If so presumably the model is underdispersive? It would be important to note such limitations comprehensively.	This is a weakness linked with the NIR, and explicit acknowledgment is necessary. This can be addressed in future versions of the model utilising an N-balance approach to leaching.	<ul style="list-style-type: none"> explicit acknowledgment in text
7	The land-use allocation module is highly optimised to an Irish context. For global applicability it would be required to apply numerous additional module features presumably?	Again, this can be acknowledged in the new section dealing with issue #1. Limitations and scale of reparameterization necessary can be highlighted there. The level of reparameterization necessary will depend on the departure from the Irish context. However, the most important aspect will be highlighting any fixed assumptions.	<ul style="list-style-type: none"> Table to be included as part of the new section on global transferability
8	In all figures careful attention is required regarding the font size – in many figures the font is illegible in the printed copy owing to small font sizes	Noted	<ul style="list-style-type: none"> Adjust figure font size
9	In the model validation piece, the NIR numbers are taken as ‘truth’ but in reality these are highly uncertain. What danger is there of overtuning having occurred whereby if the NIR numbers are wrong then so is the GOBLIN model output?	The purpose of GOBLIN was to contribute to the policy context within Ireland, so there was not getting away from the fact that NIR data had to be utilised to some degree	<ul style="list-style-type: none"> Acknowledge QA/QC procedures in text

		<p>regarding the validation approach. However, this makes the model a valuable policy tool.</p> <p>In terms of accuracy, NIR is subject to external and internal review. There is a detailed QA/QC procedure in place. External reviews of the agriculture sector and the entire ETS have been conducted involving both the department of agriculture and, in a separate bilateral review, UK agriculture experts. In addition, the transparency, robustness and accessibility of the inventory data was assessed by Aether (environmental data specialist).</p>	
10	<p>would expect more on validation and a more critical assessment of the suitability of NIR numbers for the task.</p>	<p>Agreed that more detail on limitations and a greater degree of consideration regarding validation is necessary. Additional validation have been elaborated in #2.</p> <p>However, given the purpose of the model, and the fact that the NIR have quality control and assurance procedures, and are audited, the authors would assert that country specific factors are appropriate.</p>	<ul style="list-style-type: none"> • Additional detail on validation approach and suitability in text

11	scenarios used in Figures 8-12 and associated text short names rather than using numerical identifiers for ease of reader comprehension.	Noted	<ul style="list-style-type: none"> • Numbers replaced with short-names
12	It is very clear from Figures 8-10 but particularly 8 and 9 that the GOBLIN model fails to capture real-world interannual variability yet this goes unremarked. This would raise concerns in readers minds as to the veracity of the model.	The author is correct that the projection to 2050 does not include the interannual variation generated by exogenous factors. This will be explicitly noted. The suggestion of a stochastic noise generator can also be considered for future iterations.	<ul style="list-style-type: none"> • Explicit acknowledgement re interannual variation