The authors tackle the difficult and important task of summarizing the range of definitions used in the literature for defining "land use change emissions". Clearly, this work must be published but after the concerns of all reviewers are addressed.

My first comment is that in my opinion, in context of this manuscript, the term used should be "land use CHANGE emissions" and not "land use emissions" as the authors have done. It is the effect of anthropogenic CHANGE in land use that we attempt to quantify through land use change (LUC) emissions.

The task of summarizing LUC emissions definitions is indeed difficult and this is reflected in the complexity of Section 2 of the manuscript. Despite authors' best intentions, this section comes out as something that is very difficult to grasp especially on the first reading. This section, in my opinion, therefore requires a fair bit of work. Section 3 of the paper is much better written and relatively easier to follow.

As a reader, I was also lost between definitions of managed (m), natural (n) and potential natural vegetation (p). p is defined as - the same areas as “managed land”, but assuming hypothetically that the vegetation state is the potential undisturbed vegetation instead of actual managed. I wasn't able to follow this and the necessity for this distinction.

Similarly, the terms u, f, l, labmda and gamma are not straight forwardly understood. I believe there is a much simpler way for expressing the nine definitions of LUC emissions and I suggest one way of doing this further down this review.

The manuscript also lacks the basic carbon budget equations that should form the foundation of any attempt for seeking clarity for multiple ways in which LUC emissions are defined and calculated. For example, on page 679, line 10 the terms “net biosphere flux” and “net land use change flux” are defined but in absence of any equations it is not clear what they mean.

I attempt to express the simple cases and without worrying about the distinction between m, n and p lands.

The vertically integrated global carbon budget can be expressed as

$$\frac{dH_A}{dt} = F_O - F_L + E_F = -\left(F_O + F_l\right) + \left(E_F + E_L\right)$$

$$\frac{dH_L}{dt} = F_L = F_l - E_L\,; \quad \frac{dH_l}{dt} = F_l$$

$$\frac{dH_O}{dt} = F_O$$

$$\frac{dH}{dt} = E_F$$

$H = H_A + H_L + H_O$ is the sum of carbon in the atmosphere, land and ocean components (Pg C), F_L and F_O are the global atmosphere-land and atmosphere-ocean CO_2 fluxes (Pg C yr^{-1}) , F_l is the natural global atmosphere-land CO_2 flux in absence of LUC (also referred to as the residual land sink), and E_F and E_L are the rates of global anthropogenic fossil fuel and LUC CO_2 emissions (Pg C yr^{-1}) into the atmosphere.

The net global atmosphere-land CO_2 flux is

$$\begin{aligned} F_L &= \frac{dH_L}{dt} = \frac{dH_V}{dt} + \frac{dH_S}{dt} \\ &= (G - R_A) - R_H - E_L \\ &= N - R_H - E_L \\ &= F_l - E_L \end{aligned}$$

where $H_L = H_V + H_S$ is the global land carbon (Pg C) which is made up of live vegetation biomass (H_V) and dead carbon in soil and litter pools (H_S). N is the terrestrial net primary productivity obtained as the difference between gross primary productivity (GPP) (G) and autotrophic respiration (R_A), and R_H is the heterotrophic respiration. These equations will also help understand the reader the imbalance between photosynthesis and respiration.

In practice, E_L is not straight-forwardly calculated and, at least, two simulations are required that calculate E_L by differencing atmosphere-land CO_2 flux from simulations with and without LUC.

I would define F_L from these two simulations as follows …

$F_L(CO_2, X)$ from simulation in which CO2 and X (climate) change. X thus includes changes in temperature, precipitation etc.

$F_L(CO_2, X, LUC)$ from simulation in addition to CO2 and X (climate) changes, changes in land cover are also prescribed.

So LUC emissions can be defined as …

$$E_L = F_L(CO_2, X, LUC) - F_L(CO_2, X)$$

… and the terms in brackets make it clear what the forcings are that are driving F_L. And, as the authors clarify in Section 3, researchers have used studies in which CO2 is fixed or time varying, X is fixed as in offline simulations and time varying as in a climate model.

Of course, this is easier said than done and this is one way to making things clear. I haven't been terribly thorough in the equations above. Authors need to take into account comments from all reviewers in the end to come up with an easy to follow set of equations.

The paper should also mention upfront the two ways in which land use change affects the climate (biophysical and biogeochemical). This is done, for example, on page 683 without the use of the biophysical and biogeochemical terms which are used later in the manuscript (e.g. line 11 on page 685).

Page 686, line 11. I am unclear what does "environmental changes may be simulated in a realistic transient way" means since climate models also have biases in simulated climate.

Please change Arora et al. (2010) reference to Arora and Boer (2010) in the text.

Finally, the manuscript doesn't actually show the uncertainty in LUC emissions, as the title of the paper suggests, when they might be calculated in nine different ways. May be a title of the manuscript along the lines "On the multiple ways of calculating carbon emissions from anthropogenic changes in land use" would be more appropriate so that it is clear that the manuscript talks about the multiple ways but doesn't actually quantify the uncertainty.