**Linking Tasks 4, 5 and 8:**

**Land use impacts of solar and nuclear plant locations and afforestation**

**Context Setting.**

1. **Task 4 (Ag-Forestry Markets)** will deliver agricultural and forestry land use data for the baseline case and the 4 energy paths, including afforestation. This data will be delivered to **Task 5** **(Land-Water)** and **Task 8** **(Socio-Demographics)** as 30-meter grids that align with the National Land Cover Dataset (NLCD). The land use changes are expected to come from the footprint of the solar and nuclear infrastructure obtained from **Task 2 (Siting**) and **Task 3 (TEA-LCA)**, and from the impacts that the price of carbon can have driving afforestation on pastureland and crop land as estimated by **Task 4 (Ag-Forestry Markets)** itself.
2. **Task 4** expects that **Task 3** will receive from **Task 2 (Siting)** the set of points representing suitable locations for solar PV and nuclear plants. **Task 3** will winnow down the number of potential locations based on cost considerations **Tasks 4 and 5** will translate this list of installation locations into land footprint sizes to model for each scenario.
3. **Task 4** will then provide **Task 5** and **Task 8** with 30-meter land use grids reflecting the changes in cropland and forestland for each scenario, as well as tillage practices and the changes in production and net returns (revenue minus cost).
4. In a future interaction, **Task 4** will also provide **Task 5** with crops inputs use (fertilizers, chemicals, machinery time) so it could back from **Task 5** the impacts of water quality and carbon emissions, to integrate them into the land use decision making through the valorization of natural capital. This will require a more specific definition of the data exchange in terms of variables and corresponding units. This will generate a new iteration in land use as described in step 1.
5. If the project goes to full phase, **Task 4** will plan to provide **Tasks 2 and 3** with potential changes in land value to consider when making the siting decisions.

**Task 4 Workflow and Handoffs**

1. POLYSYS (Policy Analysis System Model) and ForSEAM models estimate land use at the county level using USDA and Forest Service baseline data and assumptions. For years beyond the baseline USDA and Forest Service projections, assumptions of growth in Population, GDP growth, inflation, and crop yields are considered to endogenously estimate future changes in demand, supply and prices. The result is county level land use in cropland, pastureland, and timberland.
2. The county level land use will be downscaled to the 30x30m resolution by employing a procedure we are developing based on three datasets: Cropland Data Layer, Crop Boundaries, and SSURGO soils data as well as additional considerations of slope and yield.
3. From **Task 2**, and for each scenario, a set of points representing the location of solar and nuclear infrastructure are received. An annual implementation path needs to be assumed.
4. In collaboration with **Task 5** those points are converted into land footprints to estimate the land use that will be displaced by the infrastructure.
5. The technology infrastructure footprints will be layered on 30x30m downscaled baseline data baseline of POLYSYS and ForSEAM to determine the land uses displaced, and then aggregate them at the county level. These changes will be introduced POLYSYS and ForSEAM to estimate the market impacts driven by the land use displaced. Secondary land use changes are expected, as they will be driven by the adoption of afforestation activities induced by an assumed carbon price path. The footprint of the PV and nuclear locations will be fixed based on Tasks 2-3 results; afforestation activities will not impact them.
6. The resulting changes in land use and tillage practices, annual or for the year 2038, will be transferred to **Task 5** in the form of 30x30m grids for their analysis of changes in water quality and carbon.
7. After **Task 5** estimates the water and carbon impacts they would eventually be introduced in Task 4 models, as drivers of land use for crops and agricultural practices as water and carbon variables are integrated as constraints of value of ecosystem services to trigger a new optimal land use change impact. In a follow-up series of iterations, these results would be sent to **Task 5.**
8. The **Task 4** output that be transferred to **Task 8** is: changes in acreage by crop, changes of cropland and pastureland acreage, changes in timberland, changes in production, market prices, net revenues in dollars, and quantity and value of inputs used. used. ￼