Detailed BAR-HAP Global Analysis Protocol, as Presented in "The costs and benefits of clean cooking policies in low- and middle-income countries under real-world conditions"

1. Prep work
    a. Extract list of all countries in six WHO regions (Southeast Asia, Western Pacific, Eastern Mediterranean, Africa, Americas & Europe)
    b. Identify countries where biogas is used – from WHO data.

2. Extraction of results (see Annex) – Transition scenario 1 (clean only)
    a. On Setup-Country tab:
        i. Select next country, choose 31-year time horizon, with scale-up phase of 3 years
        ii. Choose "Urban" scope
        iii. Determine the following by clicking on the "Detailed Fuel Breakdown":
            1. Obtain rates of change from 2015 to 2020
                a. Rate of change in LPG
                b. Rate of change in electric cooking
            2. If both 1a and 1b are positive, compute relative rates of change:
                a. ΔLPG/(ΔLPG+ Δelectric) ⟶ this is fraction assigned to LPG
                b. Δelectric/(ΔLPG+ Δelectric) ⟶ this is fraction assigned to electricity
            3. If not, obtain % of users in 2020:
                a. LPG and electric
                b. Compute LPG/(LPG + electric) ⟶ this is fraction assigned to LPG
                c. Compute electric/(LPG + electric) ⟶ this is fraction assigned to electricity
            4. Ensure that the LPG and electric fractions are maximum 0.75 for LPG and minimum 0.25 for electric. If LPG fraction is higher than 0.75 (or 75%), enter the fraction as 0.75 (or 75%) and enter electric fraction as 0.25 (or 25%).
            5. The electricity fraction can go higher than 0.75 (or higher than 75%).
            6. Record fractions for LPG and electricity (up to 1 decimal place) in output sheet ("Global output – BETA") and method applied (rate of change or share in 2020). Also record scenario (TS1, TS2, TS3) and policy (Stove subsidy, fuel subsidy, financing)
                a. If the sum of the LPG and electric fractions is more than 1 or less than 1 after adjusting to 1 decimal place, record the LPG fraction; subtract the LPG fraction from 1 to get the electric fraction.
        iv. Return to Setup-Country sheet, select "Traditional Biomass", "Traditional Charcoal" and "Kerosene" fuels for transitioning. Then advance to transitions.
        v. In transitions tab, select the "Stove subsidy" policy for all of the following transitions:
            1. Transition 6: Traditional stove to LPG
            2. Transition 8: Traditional stove to electric
            3. Transition 10: Traditional charcoal to LPG
            4. Transition 12: Traditional charcoal to electric

5. Transition 13: Kerosene to LPG
6. Transition 15: Kerosene to electric
7. Click “Advance to Multi-Transitions

vi. In the Multi-Transition tab, insert the fractions for LPG and electricity that were recorded in step a-iii-4 into each of the respective cells. So, if LPG was 60% and electricity was 40% for example, put 60% for each LPG proportion, and 40% for each electric proportion. Click on “Advance to Results”.

vii. Record outputs – Note to all – I need to work on completing the output sheet, but a Beta version is now in the tool, for protocol testing

1. Copy the full row of outputs into next row in output template.
2. Return to “BAR-Summary” tab and reset entire tool.

b. Repeat steps in 2a for “Rural” scope, except now, in step 2a-v, activate the following transitions (red one is new for rural only):

1. Transition 5: Traditional stove to biogas (only if used in the country – see list)
2. Transition 6: Traditional stove to LPG
3. Transition 8: Traditional stove to electric
4. Transition 10: Traditional charcoal to LPG
5. Transition 12: Traditional charcoal to electric
6. Transition 13: Kerosene to LPG
7. Transition 15: Kerosene to electric
8. Click “Advance to Multi-Transitions – then reduce share of LPG by 5% and increase the share of biogas by 5%. (Check that all portfolios add up to 100%, before clicking on “Advance to Results”).

c. Repeat steps in 2a for “Urban” scope, except now, in step 2a-v, select the “Fuel subsidy” policy for all of the transitions.

d. Repeat steps in 2a for “Rural” scope, again for the “Fuel subsidy” policy for all of the LPG and electric transitions, and “Stove subsidy” policy for transition 5 - biogas (if that one is applicable)

e. Repeat steps in 2a for “Urban” scope, except now, in step 2a-v, select the “Stove financing” policy for all of the transitions.

f. Repeat steps in 2a for “Rural” scope, again for the “Stove financing” policy for all of the transitions (including transition 5, if applicable).

3. Extraction of results – Transition scenario 2 (faster clean + transitional)

a. On Setup-Country tab:

i. Select next country, choose 31-year time horizon, with scale-up phase of 3 years

ii. Choose “Rural” scope (Urban is same as TS1)

iii. Determine the following by clicking on the “Detailed Fuel Breakdown”:

1. Obtain rates of change from 2015 to 2020
    a. Rate of change in LPG
    b. Rate of change in electric cooking
2. If both 1a and 1b are positive, compute relative rates of change:
    a. $\Delta LPG/(\Delta LPG + \Delta electric) \longrightarrow$ this is fraction assigned to LPG
    b. $\Delta electric/(\Delta LPG + \Delta electric) \longrightarrow$ this is fraction assigned to electricity
3. If not, obtain % of users in 2020:

a. LPG and electric
b. Compute LPG/(LPG + electric) ⟶ this is fraction assigned to LPG
c. Compute electric/(LPG + electric) ⟶ this is fraction assigned to electricity

4. Ensure that the LPG and electric fractions are maximum 0.75 for LPG and minimum 0.25 for electric. If LPG fraction is higher than 0.75 (or 75%), enter the fraction as 0.75 (or 75%) and enter electric fraction as 0.25 (or 25%).
5. The electricity fraction can go higher than 0.75 (or higher than 75%).
6. Record fractions for LPG and electricity (up to 1 decimal place) in output sheet and method applied (rate of change or share in 2020).
    a. If the sum of the LPG and electric fractions is more than 1 or less than 1 after adjusting to 1 decimal place, record the LPG fraction; subtract the LPG fraction from 1 to get the electric fraction.

iv. Return to Setup-Country sheet, select "Traditional Biomass", "Traditional Charcoal" and "Kerosene" fuels for transitioning. Then advance to transitions.
v. In transitions tab, select the "Stove subsidy" policy for all of the following transitions:
    1. Transition 2: Traditional stove to ICS Natural Draft
    2. Transition 4: Traditional stove to ICS Pellet
    3. Transition 5: Traditional stove to biogas (only if used in the country)
    4. Transition 6: Traditional stove to LPG
    5. Transition 8: Traditional stove to electric
    6. Transition 9: Traditional charcoal to ICS Charcoal
    7. Transition 10: Traditional charcoal to LPG
    8. Transition 12: Traditional charcoal to electric
    9. Transition 13: Kerosene to LPG
    10. Transition 15: Kerosene to electric
    11. Click "Advance to Multi-Transitions
vi. In the Multi-Transition tab, insert the following fractions:
    1. For traditional biomass to natural draft ICS, 45%
    2. For traditional biomass to pellet ICS, 5%
    3. For traditional biomass to biogas, 2.5% (only if applicable in country)
    4. For traditional biomass to LPG and electricity, half of the values recorded in step 3-a-iii-4 into each of the respective cells. So, if LPG was 60% and electricity was 40% for example, put 30% for LPG proportion, and 20% for electric proportion. Note: If biogas is used in the country, reduce this proportion of LPG further by 2.5%.
    5. For traditional charcoal to charcoal ICS, 50%
    6. For traditional charcoal to LPG and electricity, half of the values recorded in step 3-a-iii-4 into each of the respective cells. So, if LPG was 60% and electricity was 40% for example, put 30% for LPG proportion, and 20% for electric proportion.
    7. For kerosene to LPG and electricity, the full values recorded in step 3-a-iii-4 into each of the respective cells.

8. Check that all portfolios add up to 100%, click on “Advance to Results”.

vii. Record outputs

1. Copy the full row of outputs into next row in output template.
2. Return to “BAR-Summary” tab and reset entire tool.

b. Repeat steps in 3a for “Rural” scope, again for the “Fuel subsidy” policy for all of the LPG and electric transitions, and the “Traditional stove to ICS pellet” transition (Transition 4) and “Stove subsidy” policy for all other transitions

c. Repeat steps in 3a for “Rural” scope, again for the “Stove financing” policy for all of the transitions (including transition 5, if applicable).

4. Extraction of results – Transition scenario 3 (slower clean + transitional)

a. On Setup-Country tab:

i. Select next country, choose 31-year time horizon, with scale-up phase of 3 years

ii. Choose “Rural” scope

iii. Record same shares as just derived in 3-a-iii-4

iv. Select “Traditional Biomass”, “Traditional Charcoal” and “Kerosene” fuels for transitioning. Then advance to transitions.

v. In transitions tab, select the “Stove subsidy” policy for all of the following transitions:

1. Transition 2: Traditional stove to ICS Natural Draft
2. Transition 5: Traditional stove to biogas (only if used in the country)
3. Transition 6: Traditional stove to LPG
4. Transition 8: Traditional stove to electric
5. Transition 9: Traditional charcoal to ICS Charcoal
6. Transition 10: Traditional charcoal to LPG
7. Transition 12: Traditional charcoal to electric
8. Transition 13: Kerosene to LPG
9. Transition 15: Kerosene to electric
10. Click “Advance to Multi-Transitions

vi. In the Multi-Transition tab, insert the following fractions:

1. For traditional biomass to natural draft ICS, 75%
2. For traditional biomass to biogas, 1% (only if applicable in country)
3. For traditional biomass to LPG and electricity, one quarter of the values recorded in step 3-a-iii-4 into each of the respective cells. So, if LPG was 60% and electricity was 40% for example, put 15% for LPG proportion, and 10% for electric proportion. Note: If biogas is used in the country, reduce this proportion of LPG further by 1%.
4. For traditional charcoal to charcoal ICS, 75%
5. For traditional charcoal to LPG and electricity, one quarter of the values recorded in step 3-a-iii-4 into each of the respective cells. So, if LPG was 60% and electricity was 40% for example, put 15% for LPG proportion, and 10% for electric proportion.
6. For kerosene to LPG and electricity, the full values recorded in step 3-a-iii-4 into each of the respective cells.
7. Check that all portfolios add up to 100%, click on “Advance to Results”.

vii. Record outputs

1. Copy the full row of outputs into next row in output template.

2. Return to “BAR-Summary” tab and reset entire tool.

b. Repeat steps in 4a for “Urban” scope, except now, in step 4a-v, activate the following transitions with the following multi-transitions shares:
    1. Transition 2: Traditional stove to ICS Natural Draft – 33.3%
    2. Transition 6: Traditional stove to LPG – take two thirds of the value from 2-a-iv
    3. Transition 8: Traditional stove to electric – take two thirds the value from 2-a-iv
    4. Transition 9: Traditional charcoal to ICS Charcoal – 33.3%
    5. Transition 10: Traditional charcoal to LPG – take two thirds of the value from 2-a-iv
    6. Transition 12: Traditional charcoal to electric – take two thirds of the value from 2-a-iv
    7. Transition 13: Kerosene to LPG – full value from 2-a-iv
    8. Transition 15: Kerosene to electric – full value from 2-a-iv
    9. Check that all portfolios add up to 100%, click on “Advance to Results”.
c. Repeat steps in 4a for “Rural” scope, except now, in step 4a-v, select the “Fuel subsidy” policy for LPG and electric transitions, stove subsidy for others.
d. Repeat steps in 4b for “Urban” scope, again for the “Fuel subsidy” policy for all of the LPG and electric transitions, and “Stove subsidy” policy for others
e. Repeat steps in 4a for “Rural” scope, except now, in step 4a-v, select the “Stove financing” policy for all of the transitions.
f. Repeat steps in 4b for “Urban” scope, again for the “Stove financing” policy for all of the transitions.

Move to next country; restart step 2.