Module 1 HOA C, Student Instructions Worksheet - Low-Impact Diet Challenge
Grouping: Small groups (3–4 students)
Time Required: Multiple class periods; 20-minute introduction, a 1-week at-home experiment, a 10-minute mid-week check-in, a 20-minute wrap-up discussion, and 1 class period or homework time for report writing.

Purpose: In this challenge, you will explore how **changing your diet can promote sustainability**. Our food choices have a big impact on the planet, food production makes up about one-quarter of global greenhouse gas emissions ourworldindata.org and uses huge amounts of water and land. By making even small changes to what we eat, we can help address climate change (SDG 13: Climate Action), reduce waste (SDG 12: Responsible Consumption & Production), and improve health (SDG 3: Good Health & Well-Being). Module 1 has introduced ideas like climate-friendly diets, the Sustainable Development Goals (SDGs), circular food systems, and the **Menus of Change** principles. Now, you get to put those ideas into action with a personal experiment in sustainable eating!

Background: According to the Menus of Change principles from food industry leaders, shifting toward a more plant-based "**plant-forward**" diet is one of the most effective ways to make food systems sustainable menusofchange.org. Foods like beef and lamb have **high carbon footprints** because raising livestock generates a lot of methane and requires extensive feed and land static.ewg.org. Experts recommend eating **red meat less often**, at most two small servings per week menusofchange.org. On the other hand, plant-based foods (vegetables, beans, grains) generally cause far lower greenhouse gas emissions and use fewer resources to produce menusofchange.orgstatic.ewg.org. Additionally, highly processed and packaged foods contribute to waste and can undermine health. By choosing more climate-friendly, whole foods and minimizing single-use packaging, we support a **circular food system**, one that wastes less and keeps resources (like water, soil nutrients, materials) in use. This challenge will help you see how a simple change in your daily eating habits can make a difference, and how your individual actions connect to bigger global issues.

Your Task: Pick one **personal dietary action** that *reduces environmental impact*, and try it out for about a week (5–7 days). You will track your food choices, gather data on how much you reduce your carbon footprint, water use, or waste, and reflect on the experience. In the end, you will produce a **lab report** detailing your experiment and findings. The goal is to **learn by doing**: see what impact one person's diet change can have, and imagine what would happen if millions of people joined in.

Step 1: Choose a Low-Impact Diet Action

Think about the food you eat regularly and identify one change that would make your diet more sustainable. **Choose one of the following actions (or propose a similar one):**

- **Cut Out Beef (or Red Meat):** Beef and lamb have the largest carbon footprints. Swapping beef for chicken, plant-based protein, or skipping meat entirely can dramatically cut emissions

static.ewg.org. For example, you might commit to **no beef for a week** (if you normally eat beef) or no red meat at all. *(Menus of Change Principle: "Serve less red meat, less often" menusofchange.org.)*

- **Go Plant-Based or Vegetarian:** If you're up for it, try eating all vegetarian meals (or even vegan) for the week. This means emphasizing vegetables, fruits, grains, beans, and plant-based proteins instead of meat or dairy. Plant-based diets generally have much lower climate and water impacts menusofchange.org. *(Menus of Change Principle: "Plant-Forward Culinary Strategies" menusofchange.org.)*

- **Reduce Single-Use Packaging:** Maybe you notice you eat a lot of **packaged snacks or drinks** (chips in plastic bags, bottled sodas, etc.). For this challenge, you could **avoid all individually packaged snacks and beverages**. Instead, buy in bulk, make homemade snacks, use reusable containers, or just skip those items. This cuts down on plastic waste and the energy used to produce packaging. *(Aligns with SDG 12: reducing waste in consumption.)*

- **No Sugary Drinks / Junk Food:** Eliminate **sugary beverages** (sodas, energy drinks) and/or heavily processed "junk" foods for the week. These often come with both health costs and lots of packaging waste. You'll reduce waste (fewer bottles/cans or wrappers) and possibly discover healthier alternatives. *(Menus of Change Principle: "Reduce sugary beverages" encourages cutting soda for health menusofchange.org.)*

- **Eat Locally or Seasonally:** Commit to **choosing local or seasonal foods** over imported ones. For example, if you usually eat strawberries or avocados flown in out-of-season, try to eat produce that's grown closer to home this week. Local, seasonal foods can reduce "food miles" (transport emissions) and support local farmers, though remember, what you eat (plant vs. meat) usually matters more for climate than how far it traveled ourworldindata.org. *(This relates to creating a circular, regional food economy.)*

- **Minimize Food Waste:** Maybe your focus is on waste, you could challenge yourself to **generate zero food waste** for the week. That means eating your leftovers, using parts of ingredients you might usually toss, and composting any scraps. By preventing food waste, you save all the resources that went into producing that food ourworldindata.org. *(SDG 12 and circular system thinking: "waste-to-resource," as compost returns nutrients to soil.)*

Choose **ONE** main action that fits your situation and will meaningfully lower your diet's impact. Discuss your idea with your teacher if you're unsure. **Be specific**, e.g., "I will replace my usual daily beef burrito with a veggie burrito," or "I will stop buying bottled drinks and use a refillable bottle," not just "eat healthier." It should be something you can *track and measure* (in terms of quantity of food or waste).

Reality Check: It's best if you **actually attempt the change in real life**, that's how you'll learn the most. But if there's a barrier that makes it impossible (for example, your family's meals won't accommodate it, or a medical diet constraint), talk to your teacher. You are allowed to do a **"simulated" trial** where you *pretend* you made the change and track the hypothetical differences. In a simulation, you'd still record what you **would have eaten or done** differently and count that as if it happened. However, if you can, do it for real, you might be surprised by the experience!

Step 2: Baseline Tracking – What's "Normal" for You?

Before you start the new diet challenge, establish your **baseline**. This means figuring out how much of the targeted food or habit you usually consume *without* the change. You have two options for establishing baseline:

- **Track Your Normal Diet for a Few Days:** For 2–3 days *before* you start the challenge (or use the last 2–3 days if you already started), keep a log of everything you eat and drink. Pay special attention to the item you plan to change. For example, if your challenge is "no beef," count how many beef meals or servings you had in those days. If your challenge is reducing packaged snacks, count how many plastic wrappers or bottles you went through normally. This real data will be your "before" picture.

- **OR, Recall an Average Week:** If tracking beforehand isn't possible, **make your best estimate** of your typical consumption. For example, recall roughly how many times in a usual week you eat the item you're cutting out. It doesn't need to be perfect, just grounded in reality. (E.g., "I usually drink 5 bottles of soda per week.")

Record your baseline data in your **Data Collection Journal** under "Baseline Diet." Be as quantitative as possible: list the number of servings, approximate weights, or counts of items. Also note any details (e.g., "Beef: 3 burgers (quarter-pound each) + 1 steak (~8 oz) in a week" or "Snacks: ~1 small chip bag per day = 7 per week"). This will allow you to later calculate how much CO_2 or water was linked to your "old" diet.

Step 3: Implement Your Low-Impact Diet Trial (5–7 Days)

Now for the main experiment, change your eating habits according to your chosen action for at least **five days in a row** (a week is even better). During this period, **carefully log your food choices each day** in the Data Collection Journal (use the Daily Log section). Key things to record each day:

- **What You Ate:** Write down your meals and snacks, *focusing on the relevant details of your challenge*. If your focus is meat, note which meals were vegetarian or what meat alternatives you ate. If your focus is packaging, log whenever you avoided a package (and what you did instead). You don't have to write every ingredient, just enough to capture how you adhered to

(or deviated from) the plan.

- **Success or Slip-Up?:** Did you manage to stick to your planned change that day? For example, "Day 3: avoided beef successfully, chose bean chili at lunch instead of a burger," or perhaps "On Day 4 I caved and had a soda, breaking the no sugary drinks rule." Be honest. A challenge might not go perfectly, and that's useful data too! Mark down any *exceptions* if you had them, and why.

- **Observations & Reactions:** This is like a mini-journal entry each day. How did you feel physically and mentally? Note any **challenges** (cravings, inconvenience, social situations, cost issues) and any **positive effects** (felt more energetic, discovered a new recipe, saved money, etc.). Also record any comments from family or friends, did anyone notice or support your change? For instance, "Felt a bit hungry by late afternoon without my usual jerky snack, had to eat nuts instead" or "My family tried my tofu stir-fry and actually liked it." These reflections will be valuable when you analyze the results.

Try to be consistent with your log each day. It may help to carry a small notebook or use a notes app to jot things down in real time, then transfer them to the journal. **Remember:** It's only for a short time, stay committed and gather good data! If you slip, don't give up; note it and continue the experiment the next day.

Step 4: Calculate Your Environmental Impact

At the end of the week, it's time to **quantify the difference** your change made. Using your baseline and experiment logs, figure out **how much less** of the target item you consumed *thanks to your new behavior*. Then, convert that into estimated **environmental savings** (CO_2 emissions avoided, water conserved, or waste reduced).

How to Calculate: For whatever you reduced (beef, bottles, miles driven for food, etc.), we will use given **impact multipliers**, basically, factors that tell us the CO_2 or water per unit of that item. Below are some simplified reference values you can use in your calculations (based on scientific studies and reports):

- **Beef:** ~27 kg CO_2 per 1 kg of beef; ~15,000 liters of water per 1 kg of beef static.ewg.org, thepoultrysite.com. (That means one 4-ounce burger patty (0.113 kg) is about 3 kg CO_2 and 1,700 L of water in production!) static.ewg.org, thepoultrysite.com.

- **Other Meats:** Pork ~12 kg CO_2/kg and ~6,000 L/kg; Chicken ~7 kg CO_2/kg and ~4,300 L/kg static.ewg.org, thepoultrysite.com. *(Chicken's footprint is lower than beef, e.g., a 4-oz serving ~0.8 kg CO_2, 480 L water.)*

- **Plant Proteins:** Beans or Tofu ~2 kg CO_2 per kg (or less) static.ewg.org, and roughly ~2,000 L water per kg (much depends on irrigation). *(In other words, a serving of beans might be only ~0.2 kg CO_2 and ~200 L water, far lower than meat.)*

- **Dairy:** Cheese ~13.5 kg CO_2/kg static.ewg.org (~5 kg CO_2 for a pound of cheese) and ~5,000 L water/kg thepoultrysite.com. Milk ~1.9 kg CO_2/kg (about 0.5 kg CO_2 per liter of milk) and ~1,000 L water per liter thepoultrysite.com. If your change involved dairy (like drinking plant-based milk or eating less cheese), you can use these numbers.

- **Food Waste:** Wasted food carries the footprint of whatever it was. If you prevented, say, 1 lb of food waste, you effectively saved the resources that would have been wasted on that food. For example, preventing 1 lb of beef waste would save ~12 kg CO_2 (since 1 lb ~0.45 kg beef, with 27 kg CO_2/kg) static.ewg.org. Preventing 1 lb of mixed food waste might save on the order of 1–4 kg CO_2 (depending on the food mix, since veggies are lower impact and meats higher). You can make a rough estimate based on the types of food saved.

- **Packaging Waste:** It's a bit harder to put CO_2 numbers on packaging without detailed data, but you *can* count the physical waste. For instance, if you avoided 10 plastic snack wrappers, that's 10 fewer pieces of plastic in landfills or oceans. You could weigh one empty package to estimate total grams of plastic avoided. (Many chip bags or bar wrappers weigh only ~5 grams each, so 10 of those is ~50 grams of plastic saved.) For bottles/cans, you can count number avoided. Manufacturing a plastic water bottle has a footprint too (roughly 0.1 kg CO_2 per half-liter PET bottle, and about 3 liters of water used), not huge individually, but it adds up when you consider millions of them. So feel free to estimate CO_2 from packaging if you find info, but it's fine to just report the **count of packages** avoided as your impact metric for waste.

Using the above multipliers and any additional data provided by your teacher, calculate the following:

- **Total Reduction in Consumption:** How much of your target item did you **not** consume because of the change? (e.g., "avoided 4 servings of beef, totaling 1.5 lbs" or "avoided 7 plastic bottles").

- **CO_2 Emissions Avoided:** Multiply the reduction by the CO_2 per unit. *Example:* "Avoided 0.7 kg of beef over the week *× 27 kg CO_2/kg = ~18.9 kg CO_2 prevented." If your action was about waste and not directly about CO_2, you can skip this or note "N/A."

- **Water Saved:** Multiply reduction by water per unit. *Example:* "0.7 kg beef *× 15,000 L/kg ≈ 10,500 L water saved." (That's about 2,770 gallons of water!) thepoultrysite.com Again, if water doesn't apply to your action (like plastic waste), you can skip or note N/A.

- **Waste Reduced:** If applicable, how many fewer wrappers, containers, etc. did you throw away? You can also translate this into weight or volume if you want. *Example:* "Avoided ~10

plastic wrappers = ~50 g of plastic waste avoided."

Record these calculations in your journal's "Post-Experiment Calculations" section. Show your work, list the multipliers you used and the math, so you can double-check and refer to it in your report. It's okay to round to keep numbers simple (we're making estimates). The goal is to get a sense of scale: Did your change save 1 kilogram of CO_2? 10 kg? 50 kg? How many liters of water? Seeing the numbers will help you understand the impact.

Reference Chart: The diagram below provides a visual reference for how different foods compare in carbon and water footprints. It shows the approximate greenhouse gas emissions and water use to produce a single 4-ounce serving of various foods. As you can see, **beef** far exceeds the others in both CO_2 and water: a quarter-pound of beef can emit around 3 kg of CO_2 and use ~1,700 liters of water. **Chicken** and **pork** have moderate footprints (less than half of beef's emissions per serving), while **beans** (and other legumes) are very low impact, under 0.3 kg CO_2 for a serving and only a couple hundred liters of water static.ewg.org, thepoultrysite.com. This illustrates why plant-based eating is promoted for sustainability. (Data sources for chart: Environmental Working Group's Meat Eater's Guide static.ewg.org; Water Footprint Network/WWF studies thepoultrysite.com.) Use this chart and the multipliers above as a guide when doing your own calculations.

Estimated Greenhouse Gas Emissions per 4-oz serving of various foods. Beef has the highest carbon footprint per serving, while plant-based proteins (beans) are dramatically lower. Pork and chicken are intermediate but still substantially lower in emissions than beef static.ewg.org.

Estimated Water Use per 4-oz serving of various foods. Beef production uses enormous quantities of water per serving (much of it for growing feed crops) thepoultrysite.com. Chicken and pork use less water than beef. Plant-based foods like beans require the least water, especially when compared to beef.

(If you are curious for more detailed data on food footprints, you can refer to studies like Poore & Nemecek 2018 (Science) which analyzed the full lifecycle impacts of dozens of foods ourworldindata.org, or check resources from Our World in Data and EWG. These sources are the basis for the simplified numbers we're using.)

Step 5: Reflect and Connect to the Bigger Picture

With your data in hand, take some time to **reflect on the experiment as a whole**. This reflection will form a key part of your lab report (Discussion/Conclusion section), so think deeply and even jot down notes to these prompts:

- **Personal Experience:** What **challenges** did you encounter in trying to change your diet? Did you slip up at any point? What strategies helped you succeed (or what might you do differently

next time)? Consider factors like convenience, cravings, cost, time to prepare food, social settings, etc. For example, was it hard to find alternatives or did you discover new foods you enjoyed?

- **Health and Wellness:** Did the diet change affect how you felt physically or mentally? Note any changes in energy levels, mood, or other aspects of well-being. Also consider if the change influenced the nutritional balance of your diet (for better or worse). For instance, “After cutting out soda, I felt less jittery and saved money,” or “Eating vegetarian made me feel light, but I needed to ensure I got enough protein.”

- **Cost Impact:** Was eating in a more sustainable way cheaper, more expensive, or about the same for you? Sometimes buying fresh or specialty items can cost more, but skipping meat or avoiding packaged, processed foods can save money. Reflect on any noticeable change in your food expenses during the week.

- **Support Systems:** How did your family or peers respond to your experiment? Did you get support, interest, or resistance? Sometimes our food choices are influenced by culture and family habits, so describe any relevant interactions (e.g., “My parents were skeptical at first, but they agreed to try Beyond Meat burgers one night”).

- **Environmental Impact – So What?:** Look at the numbers you calculated for CO_2, water, or waste saved. **Are you surprised by the magnitude?** Put it in context: for example, “I saved ~20 kg CO_2, which is like not driving ~50 miles in a car businessinsider.com,” or “saved 10,000 L of water, equivalent to ~50 full bathtubs of water.” Do these savings feel significant? Why or why not?

- **Scaling Up (Systems Thinking):** Here’s the big question: *What if millions of people made this change?* Use your results to speculate on the **systems-level impact**. For instance, “If 1 million people each saved 20 kg CO_2 by eating less beef, that’s 20 million kg CO_2, equivalent to taking X cars off the road for a year” (you can estimate, or just say it’d be a huge reduction!). Or “If an entire city adopted zero-waste snacks, landfill waste would drop noticeably.” This helps you see the connection between personal actions and collective outcomes. Link it back to global goals: reductions in meat consumption could lower agriculture emissions and land use, contributing to climate mitigation (SDG 13) and preserving forests. Less demand for water-intensive foods means more water available in drought-prone areas (SDG 6: Clean Water). Less plastic waste helps marine life (SDG 14: Life Below Water). **In short, how does your personal experiment relate to global sustainability challenges and solutions?**

- **Circular Economy & Food Systems:** Reflect on how your change fits into the idea of a circular food system. Did your experiment help close a resource loop or reduce waste? For

example, by composting food scraps you created a nutrient loop (food -> compost -> soil for more food). By reducing packaging, you cut down on materials that would need recycling or disposal. Discuss any insights about how individual choices can support a more circular, regenerative system.

There are no “right” answers here, the key is thoughtful reflection. Use examples from your week to illustrate your points.

Step 6: Produce Your Lab Report

Finally, you will compile everything into a formal **Lab Report** (Hands-On Activity report). This report is the deliverable you will turn in for assessment. It should be well-organized, clear, and demonstrate what you learned. Use the following structure (which mirrors how we write up scientific investigations):

- **Title** – A descriptive title (e.g., “Low-Impact Diet Challenge: Reducing Beef Consumption for Climate Action”).

- **Introduction** – Explain the purpose of the experiment in your own words. Introduce your chosen dietary change and **why** you expected it to reduce environmental impact (cite facts from class or sources: e.g., “I chose to eliminate beef because I learned it has a high carbon footprint static.ewg.org. I hypothesized this would significantly lower my personal CO_2 emissions for the week.”). State any specific predictions: *How much* did you think you could reduce, or what effects did you anticipate?

- **Materials & Methods** – Describe *what you did*. This includes the duration (how many days), the action you implemented, and how you collected data. Mention the Data Collection Journal as your tool for tracking. Essentially, document the procedure: “First, I recorded my baseline beef consumption for three days, then for the next 7 days I avoided beef, substituting other proteins. Each day I logged my meals, feelings, and any slip-ups. At the end, I calculated CO_2 and water savings using the provided multipliers.” Ensure someone else could understand and replicate your process from this description.

- **Results** – Present the data you collected **in an organized way**. This could include a table of your baseline vs. experiment consumption, and the calculated reductions. You might show a short table or bulleted list, for example:
    - Baseline: 4 servings of beef in a week (total ~1.4 kg of beef).
    - During Challenge: 0 servings of beef (replaced with beans and chicken).
    - **Reduction:** 1.4 kg beef avoided over 7 days.
    - **Estimated CO_2 savings:** ~38 kg CO_2 (1.4 kg * 27 kg CO_2/kg).
    - **Estimated water savings:** ~21,000 L water (1.4 * 15,000 L/kg).

- Include any other observed data (e.g., “Avoided 7 plastic bottles; drank tap water instead”). If it makes sense, you can include a simple graph or chart of your data, but this is not required for a short report. Make sure to also note qualitatively what happened: did you succeed all 7 days? (This can also be mentioned in Discussion if you prefer.)

- **Discussion** – This is the heart of your report where you **interpret** the results and reflect on their significance. Discuss the points from Step 5: Were the results as expected? What challenges did you face? What does the outcome mean for you personally and in a broader context? For example, “My results showed a 90% reduction in my diet’s CO_2 for the week, but I found it challenging to maintain. This suggests that while individual actions can add up (I saved 38 kg CO_2, and if scaled, it’s huge), there are social and habit hurdles to address…” etc. Connect to concepts from class: mention SDGs or systems thinking, *why does this experiment matter for sustainability?* Also, address any errors or uncertainties: e.g., “My calculation is an estimate; actual emissions saved could be ±20% depending on the beef source, but the order of magnitude is clear.”

- **Conclusion** – Sum up the key takeaways in a few sentences. Did your hypothesis hold true? (e.g., “Yes, eating plant-based markedly lowered my environmental footprint.”) What did you learn about the feasibility of sustainable eating? End with a thoughtful closing statement, maybe how you might continue or what this implies about our ability to combat climate change through diet.

- **References** (if required by your teacher) – If you cited any data or sources (like the CO_2 values, or facts from class articles), list them in a simple bibliography. For instance, you might cite the “Menus of Change report” or other provided resources. Follow any citation format given (if not, just ensure it’s clear what source you used).

Throughout your lab report, **write in a clear, formal style** (use past tense for what you did, and avoid slang). However, it’s fine to write in first person for the reflection parts (“I noticed…”) since this is partly a personal experience report. Aim for about 2–4 pages typed (not including any graphs or title page), but follow your teacher’s length guidelines.

Tip: Use the **HOA Lab Report Template** (if provided by your teacher) to structure your writing. It likely has sections and prompts similar to the above. You can even copy your journal notes into the relevant sections and then refine the wording.

When you’re done, **proofread** your report for clarity, grammar, and completeness. Make sure you answered the original purpose: showing how dietary changes can promote sustainability, supported by **your evidence** from the experiment. Turn it in by the deadline set by your teacher.

Wrapping Up:

This Hands-On Activity is all about **empowering you** to see the impact of personal choices. By completing the Low-Impact Diet Challenge, you've engaged in real-world science, collecting data, analyzing it, and relating it to global environmental issues. You've also practiced systems thinking, seeing how one change links to many parts of the food system. We hope you not only learned about sustainability, but also discovered something about your own habits and capabilities. Good luck with your lab report, and remember, **small seeds of change can grow into significant results** when nurtured collectively!