

Biofuel Transportation and CO₂ Emission Adventure Race

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Introduction

Making biofuel from biomass is an emerging process that has the potential to become widely used. To determine if biomass can be successfully turned into biofuel on a large scale, a CO₂ lifecycle assessment is conducted. This lesson uses CO₂ emission data and mechanical scenarios from the transportation lifecycle assessment conducted by Indroneil Ganguly, Cindy X. Chen, Rene Zamora and other researchers¹.

- Target Group: 6th-8th grade students.



Students prepare their "slash piles" before the race.

Methods of Comparison in Race

- Time=economic viability
- Increase in heart rate=CO₂ emission
- Crumpled paper=biomass
- Flattened paper=ground biomass
- Shredded paper=chipped biomass
- Compressed paper=bundled biomass
- Hopping on one foot=off-road travel (1st half of race)
- Walking=on-road travel (2nd half)

Race Instructions

Group 1 (Scenario: Grinder at halfway point)

- Put biomass in bin until bin is $\frac{3}{4}$ full. Flatten biomass (grinding) at halfway point. Carry to end, do 10 jumping jacks, and record heart rate and time.

Group 2 (Scenario: Biomass bundled at slash site then ground at end)

- Put biomass in bin and compress. Carry bin through halfway point to end of race. Flatten biomass (grinding), do 5 jumping jacks, and record heart rate and time.

Group 3 (Scenario: Biomass chipped with a chipper before transportation)

- Shred biomass at start line (chipping). Carry bin through halfway point to end of race. Record heart rate and time.



Students carry their "biomass" during the race.

Conclusion

By learning about biofuel and biomass transportation through a race, students have a physical representation of the different factors that go into effective and sustainable transportation.

Recommendations

This lesson, designed for MOSS, fits into the overall NARA curriculum because after the lesson students are able to analyze the economic and environmental aspects of biomass transportation. The skills gained allow students to learn about the research NARA conducts as well as prepare them to analyze complicated systems in the future.



Students fill out a worksheet with their time and heart rate after the race.

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References

¹Ganguly, Indroneil, et al. "Modeling Transportation Logistics of Forest Residue Removal: A Life-Cycle Assessment." Infographic. Digital file.