

Towards Zero Waste: A Study in Reducing Non-Hazardous Lab Waste

Gideon Choi, MSc. Sustainable Energy Development, BSc. (Biochemistry), BEd.

Research Question: What Zero Waste design strategies will furthest reduce non-hazardous waste production at university labs?



Project Rationale and Background

- University of Calgary research labs produce high volumes of non-hazardous lab waste, including:
 - Unrecycled glass and plastic
 - Discarded lab equipment
 - Contaminated mixed recycling
- Estimated non-hazardous waste production: 20-25 tonnes



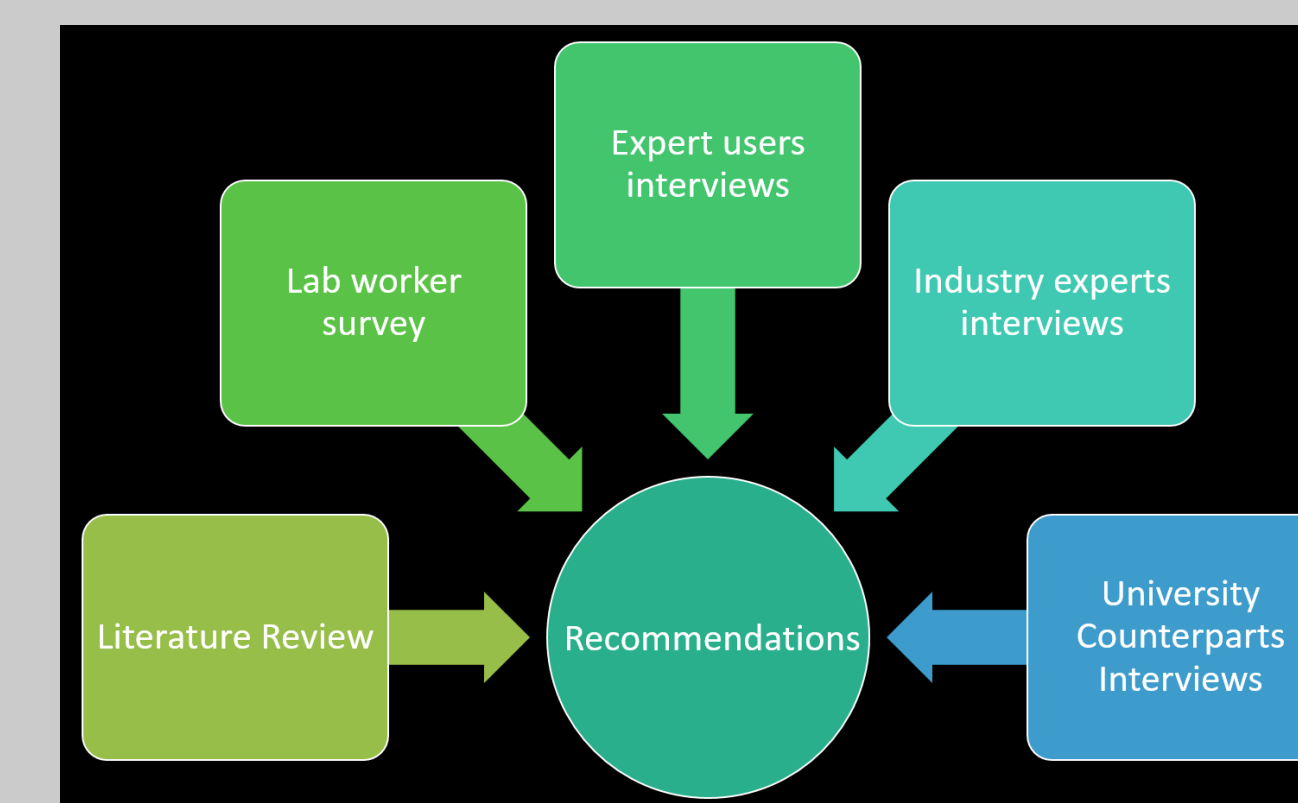
Blue Bucket Program

- Container for pointy end plastics and broken/unbroken glassware.
- Contents directed to city landfill
- Intended consequence – caretaker safety
- Unintended consequence – often confused with mixed recycling program.
- Pain points of Blue Bucket program highlights the importance of evaluating non-hazardous waste production at labs



Methodology

- Project Components and methodology
 - Literature review
 - Lab worker survey and analysis
 - Lab worker and expert interviews
 - Historical waste data analysis
 - Waste diversion GHG reduction calculations
 - Cost/effort matrix analysis



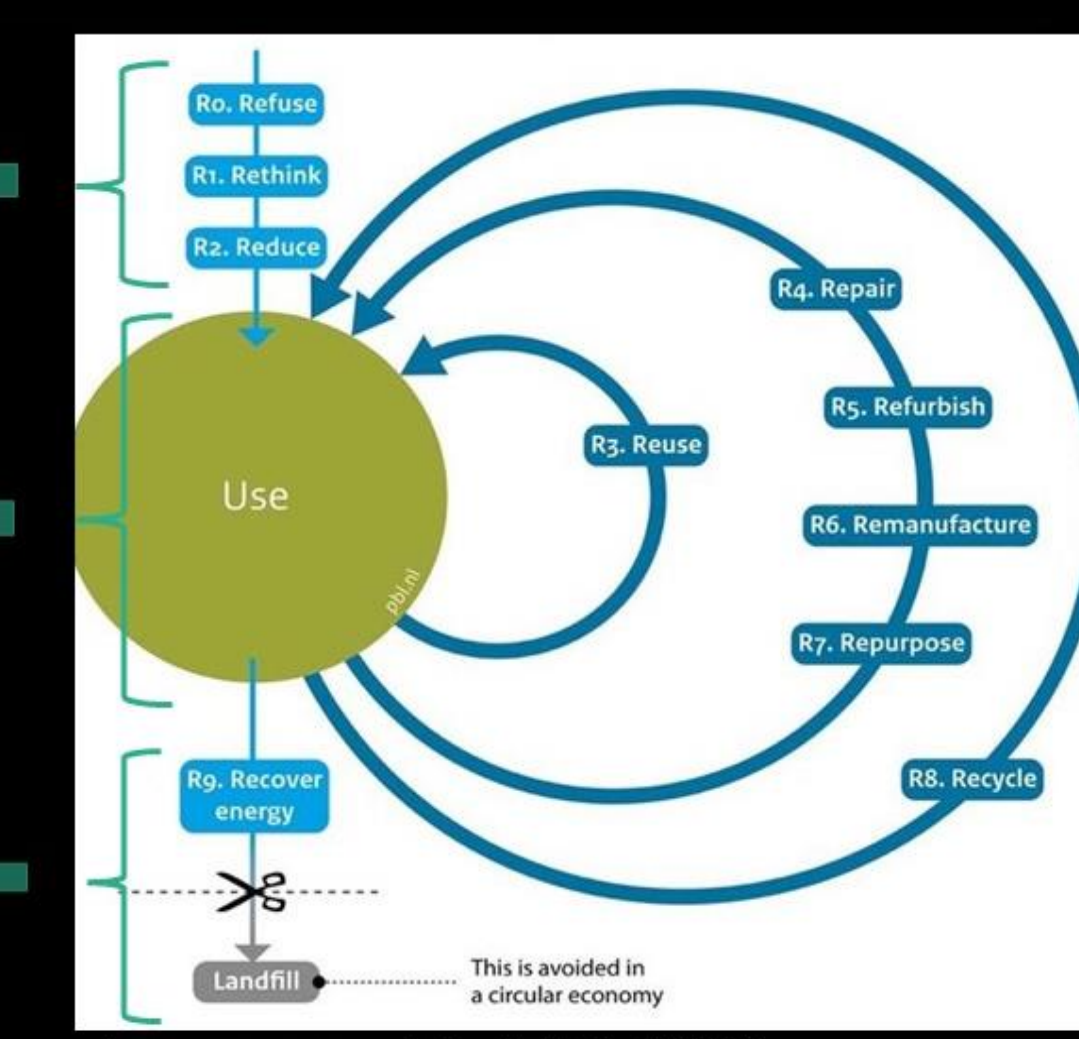
Project Design

- Recommendations based on 3 sections of Circular Economy ladder
- Reimagine:**
 - Creating processes and procedures to minimize waste production
- Repurpose:**
 - Maximize use and re-use of materials
- Residuals:**
 - Maximize waste diversion

Reimagine: Design sustainable systems

Repurpose: Retain value of manufactured products

Residuals: Thoughtful management of what is disposed.

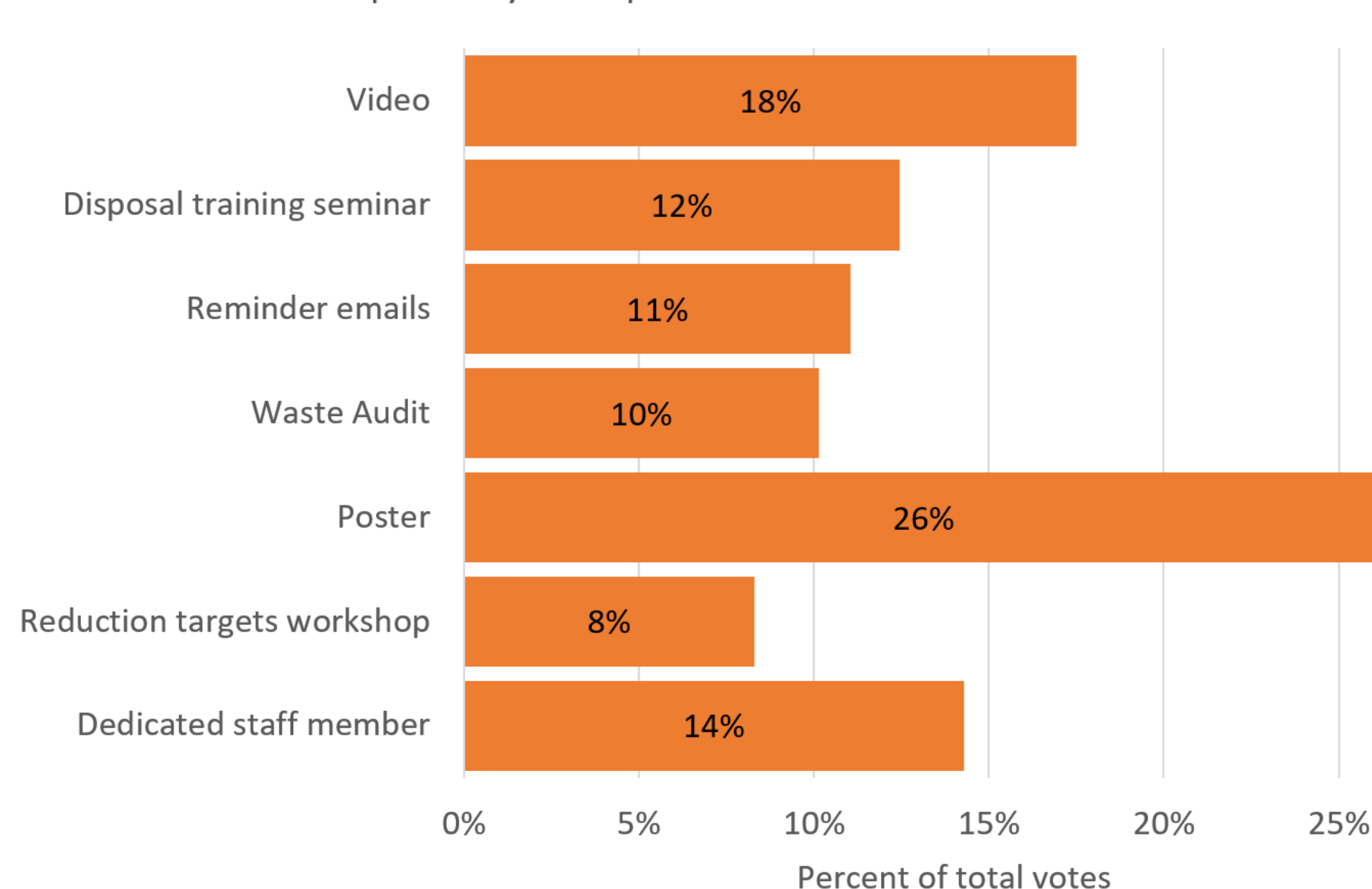


This is provided in a circular economy

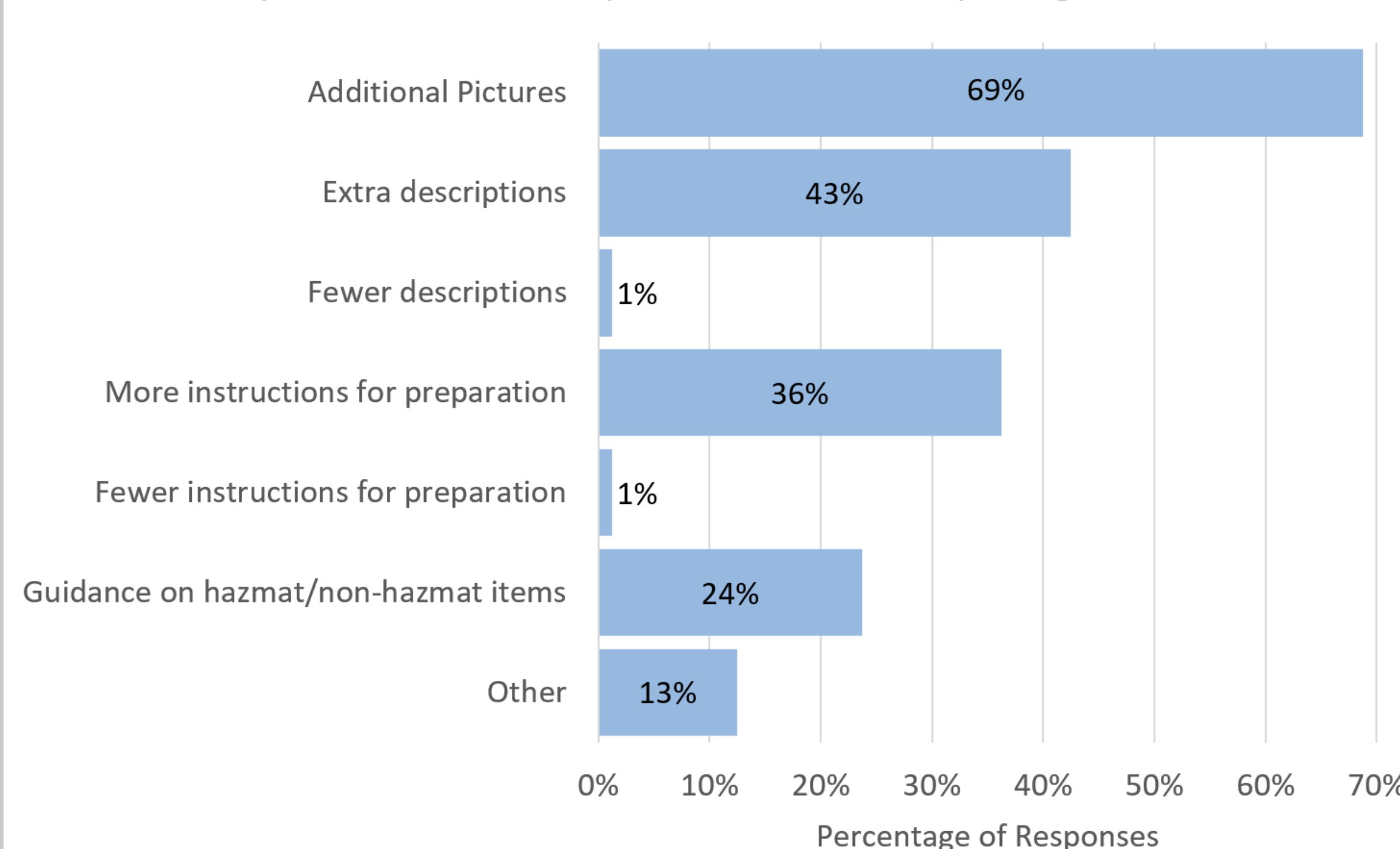
Image source: www.researchgate.net/publication/340563101

Results: Lab Worker Survey Summary

Most Helpful Way to Improve Non-Hazardous Waste Protocols



Top three choices to improve Blue Bucket disposal guidelines



Recommendations: Reimagine (Designing Sustainable Systems)

- Attach infographic to all Blue Buckets



- Create and distribute videos demonstrating proper sorting of non-hazardous lab waste

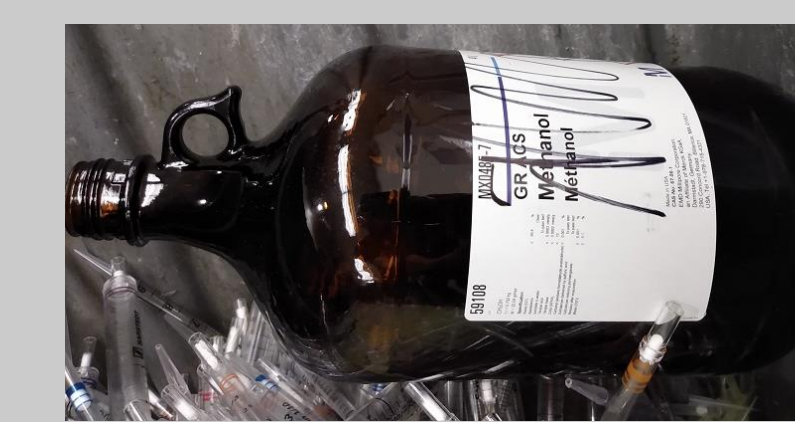


- Facilities sends periodic reminder emails of waste sorting protocols



Recommendations: Repurpose (Maximize Use and Re-use)

- Implement specific waste stream for recycling lab glass and lab plastic. Promote amber glass sanitizing and reuse.



- Organize and implement lab equipment re-use and surplus sale program.



- Education campaign for green purchasing.

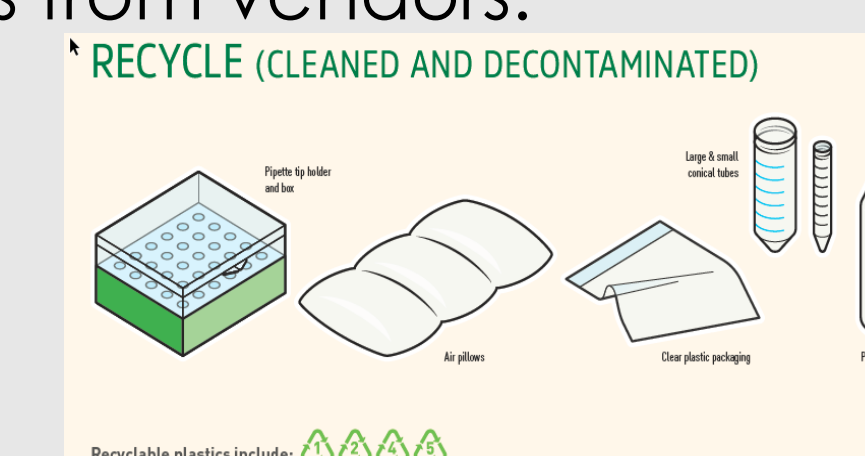


Recommendations: Residuals (Maximize Waste Diversion)

Potential Glass Diversion Benefits			
Diversion	Diversion Rate	Mass discarded (tonnes)	Net GHG Emissions (tonnes CO ₂ e)
None	0%	15.5	-0
Conservative	20%	12.4	-0.96
Aggressive	40%	9.3	-1.91

Potential Plastic Diversion Benefits			
Diversion	Diversion Rate	Mass discarded (tonnes)	Net GHG Emissions (tonnes CO ₂ e)
None	0%	5.0	0
Conservative	2%	4.9	-0.09
Aggressive	10%	4.5	-0.44

- Revise waste sorting protocols to divert clean lab plastics and lab glass. Facilities pursues increased recycling options from vendors.

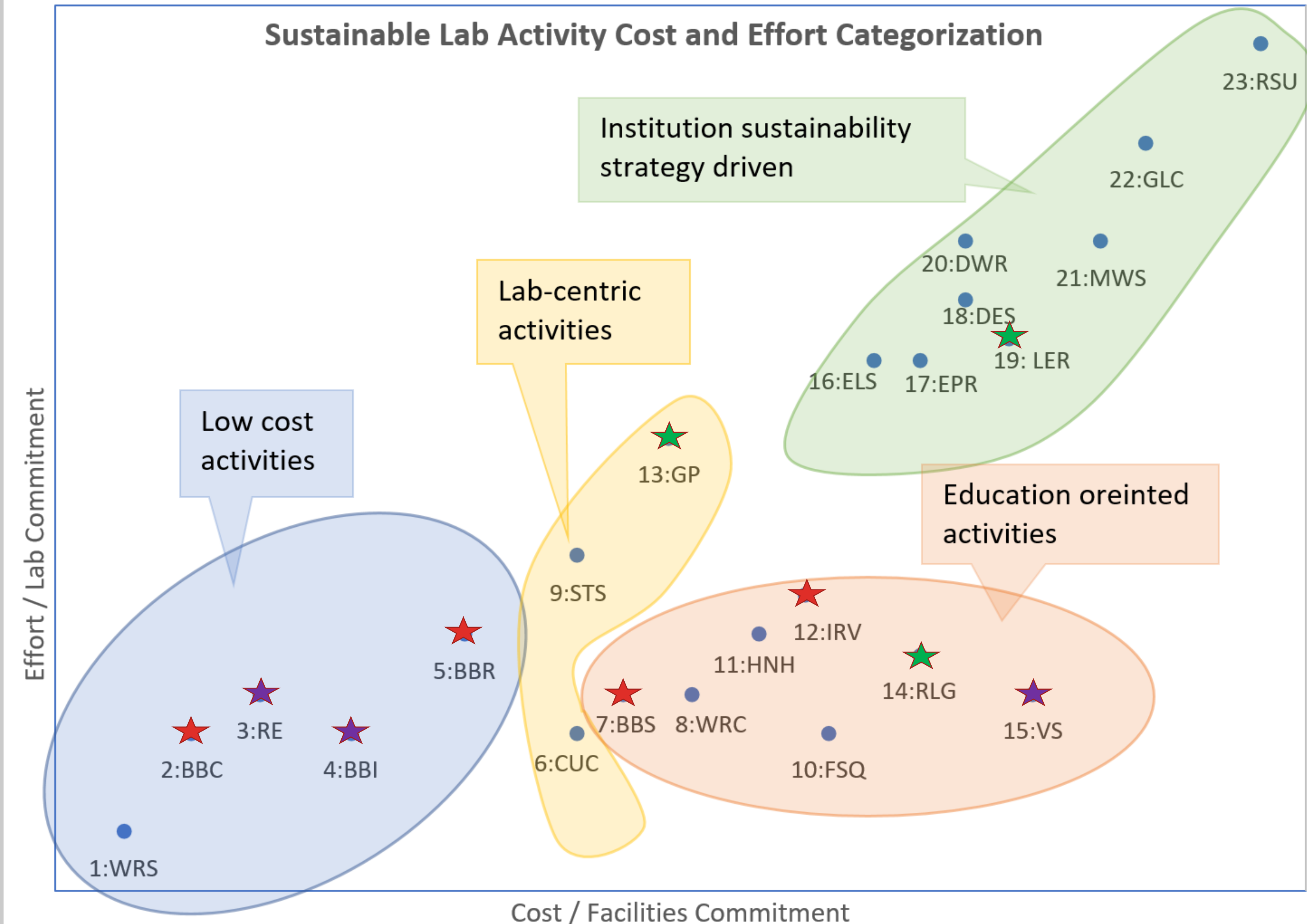


- Implement change in blue bucket collection frequency. Use a 'blue bucket is ready' sign off sheet.



Analysis: Cost & Effort Matrix

Sustainable Lab Activity Cost and Effort Categorization



Description: 23 sustainable lab activities ranked based on relative effort and relative cost and plotted on a matrix. Activities categorized into four types. Key recommendations highlighted (★ = Reimagine, ★ = Repurpose, ★ = Residuals)

- 1:WRS = Waste Reduction Survey;
- ★ 2:BBC = Blue Bucket Collection interval;
- ★ 3:RE = Reminder Emails;
- ★ 4:BBi = Blue Bucket Infographic;
- ★ 5:BBR = Blue Bucket is Ready;
- ★ 6:CUC = Chill Up Challenge;
- ★ 7:BBS = Blue Bucket Sorting;
- 8:WRC = Waste Reduction Competition;
- 9:STS = Shut The Sash;
- 10:FSQ = Facilities Staff to answer Questions;
- 11:HNH = Hazardous and Non-Hazardous education campaign;
- ★ 12:IRV = Increased Recycling from Vendors;
- ★ 13:GP = Green Purchasing;
- ★ 14:RLG = Recycling Lab Glass;
- ★ 15:VS = Videos demonstrating Sorting;
- ★ 16:ELS = Encourage Lab Sustainability;
- ★ 17:EPR = Extended Producer Responsibility;
- ★ 18:DES = Data for Energy Saving;
- ★ 19:LER = Lab Equipment Reuse;
- ★ 20:DWR = Data for Waste Reduction;
- ★ 21:MWS = Multi-Lab Washing and Sanitizing;
- ★ 22:GLC = Green Labs Certification;
- ★ 23:RSU = Replace Single Use items.

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Video Showcase

Check out the 2 minute video Summary

