Climate, Empowerment, and Collaboration

STiCH in the Present: Diving into the Refinement and Expansion of the STiCH Carbon Calculator

ARCS
PRESENT tense
ST. LOUIS, MO • 2025
Union Station
November 18–21, 2025

Sustainability Tools in Cultural Heritage (STiCH)
Digital Humanities Advancement Grant Tier III
National Endowment for the Humanities 2023-2025

Administered by the Foundation for Advancement in Conservation
Grant Period: 2023 - 2025

Presented by Shiori Oki, Project Assistant Contractor with FAIC

Climate Change and Cultural Heritage

Tourism accounts for ~10% of Global Emissions

1 in 6 Global Heritage Sites is threatened by immanent climate disasters

The largest threat to Cultural Heritage is Climate Change

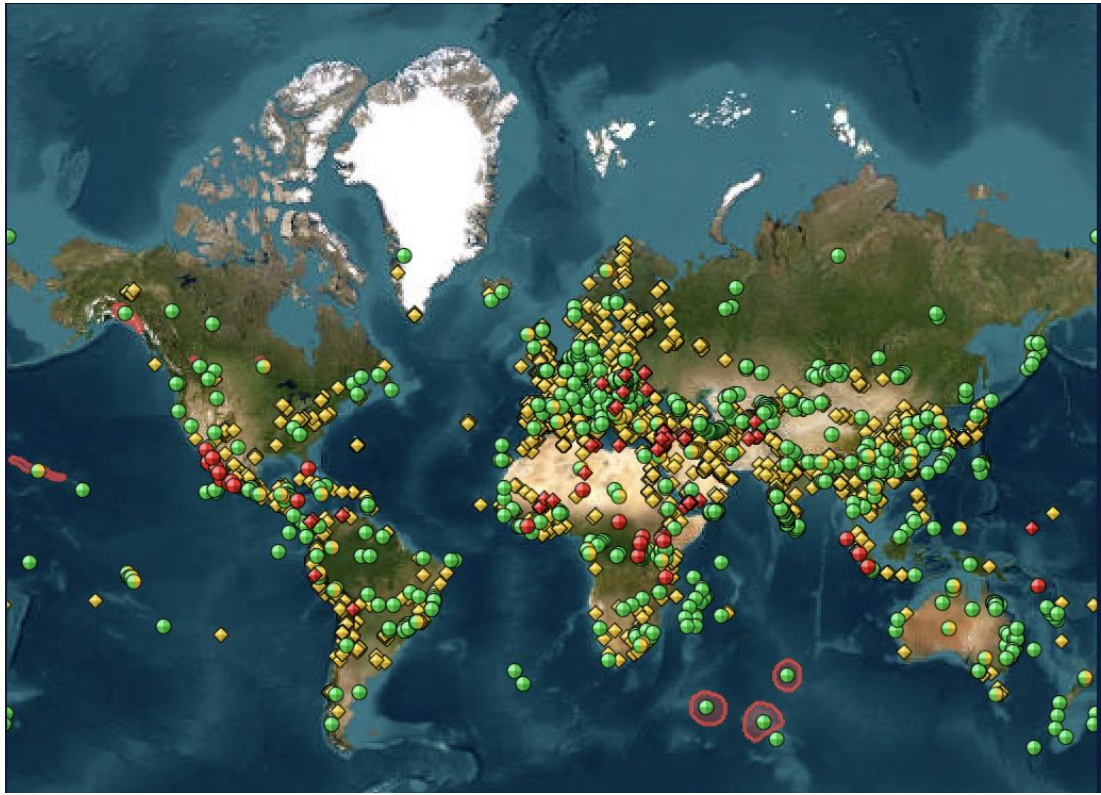


Image Courtesy of https://whc.unesco.org/en/list/

What is STiCH?

STiCH stands for Sustainability Tools in Cultural Heritage

One of the greatest challenges of the 21st Century is climate change. **Sustainability Tools in Cultural Heritage (STiCH)** is a life cycle assessment (LCA) Carbon Calculator and Library of Case Studies and Information Sheets developed to help cultural heritage professionals make educated, sustainable choices to lower the environmental impact of their work.

The Carbon Calculator is a free online tool that quantifies carbon impact of everyday materials and supplies used by field professionals to **empower changing behaviors and practices** when it comes to environmental impact.

STiCH Project History: NEH Tier I and Tier II

foundation for advancement in conservation
Protecting Cultural Heritage

NATIONAL ENDOWMENT FOR THE HUMANITIES

Northeastern University

Pratt

Sustainability Tools in Cultural Heritage

Foundation for Advancement in Conservation - Funding Sponsor

NEH Tier I - Production of a free online Life Cycle Assessment (LCA) library of reports that inform field professionals of the environmental and health impacts of the materials they use to make improved choices around product use in their work. Led by Sarah Nunberg and Sarah Sutton, and a proto-tool developed by Matthew Eckelman.

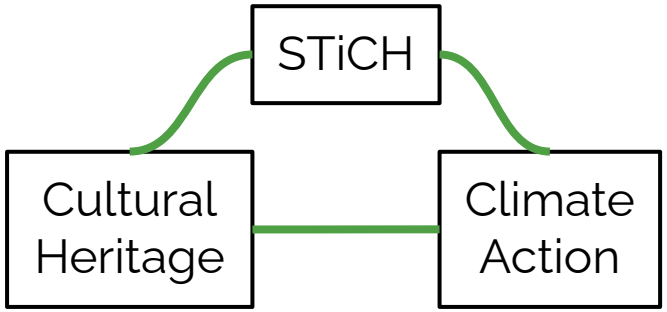
NEH Tier II - Data enhancement of the Carbon Calculating Tool developed out of the NEH Tier I Grant Project and application of the tool in professional case studies and more robust information sheets and essays that explore and explain the impact of more complex action taking using LCA models. .

CARBON CALCULATOR

CASE STUDIES LIBRARY

INFORMATION SHEETS

STiCH, Cultural Heritage, and Climate Action



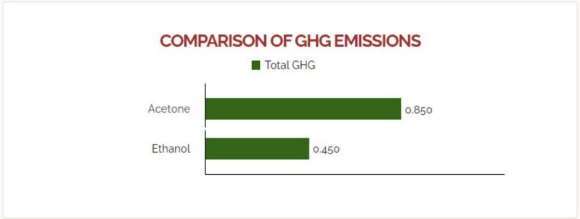
STiCH is at the intersection of science, art, history, and the behavioral impacts of climate consciousness and action. STiCH is a tool through which field practitioners can consider the material and ethical impact of preservation and care. Factors that often impact institutional or individual sustainable and climate awareness practices include lack of **education**, prioritized or bottom line **funding**, and **indifference**.

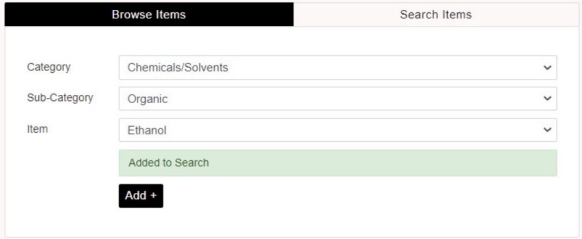
This next phase of the project aimed to understand how the existing tool is used and then adapt and improve the tool to meet the needs of a broader-range of cultural heritage professionals.

STiCH NEH Tier III

STiCH Carbon Calculator Pre 2025 Refinement

CATEGORY	SUB-CATEGORY	ITEM	QUANTITY	GHG/UNIT	TOTAL GHG	SAFETY DATA SHEET	
Chemicals/Solvents	Organic	Acetone	500 ml	0.0017	0.850	Safety Data Sheet	x
Chemicals/Solvents	Organic	Ethanol	500 ml	0.0009	0.450	Safety Data Sheet	x
TOTAL CARBON FOOTPRINT (kg CO_2 eq)					1.300		





Refinement and Expansion of the STiCH Carbon Calculator

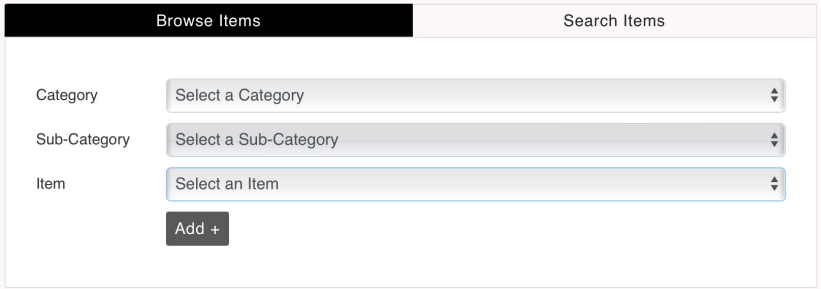
- Update the User Interface
- Update Data Visualization
- Refine Material Navigation
- Add Capabilities to Tool
- Educational Resources

Project Managing an Established Product

Carbon Calculator

A Functioning Tool

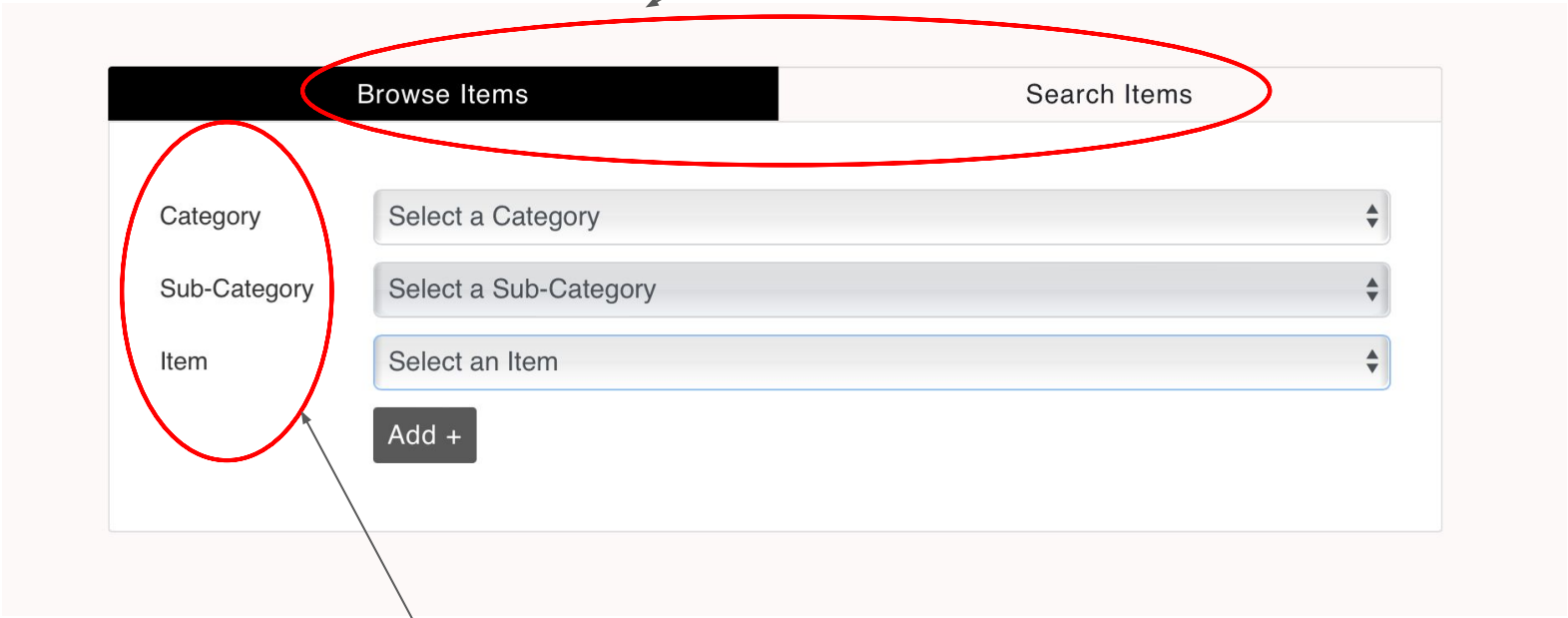
STiCH Carbon Calculator



- Browse and Search Feature
- Carbon Emissions Calculations
- Individual Material GHG Comparison Graphs

Calculator Search Features

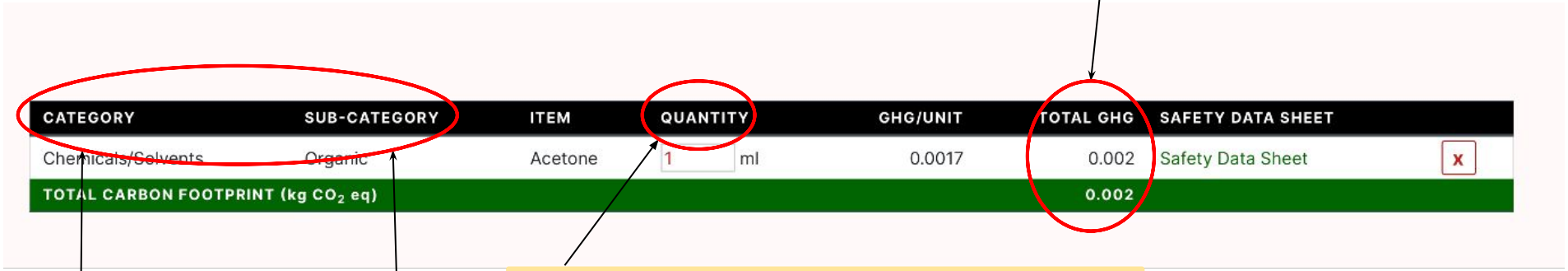
Dual search feature for the tool



Categorization indexing for materials

Challenges Using the Calculator

What does this mean?



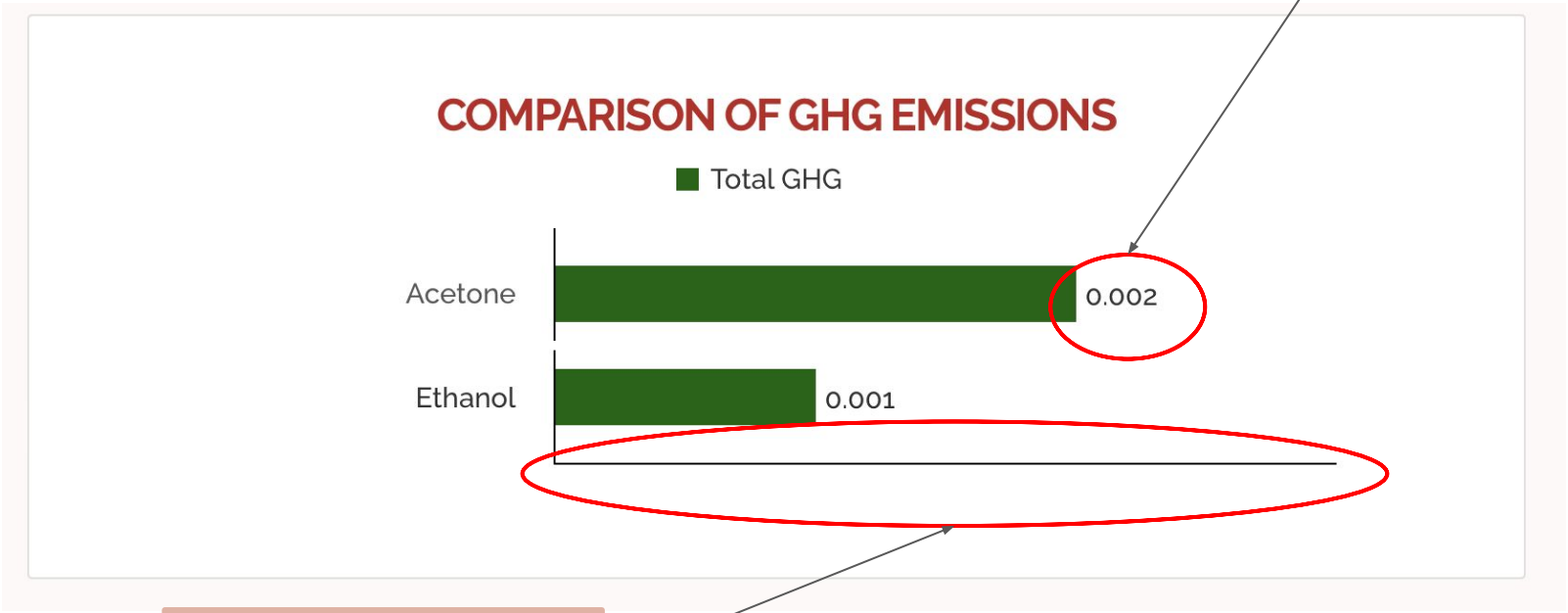
CATEGORY	SUB-CATEGORY	ITEM	QUANTITY		GHG/UNIT	TOTAL GHG	SAFETY DATA SHEET	
Chemicals/Solvents	Organic	Acetone	1	ml	0.0017	0.002	Safety Data Sheet	x
TOTAL CARBON FOOTPRINT (kg CO_2 eq)						0.002		

How do I know my quantities?

What category and sub-category applies to my search?

Limited Visualization of Results

No unit measurements



Lack of axis labels

Case Studies and Information Sheets

Case Studies

In depth Life Cycle Assessment (LCA) reports detailing complex material uses and impacts. These reports include studies too complex for the Carbon Calculator

Information Sheets

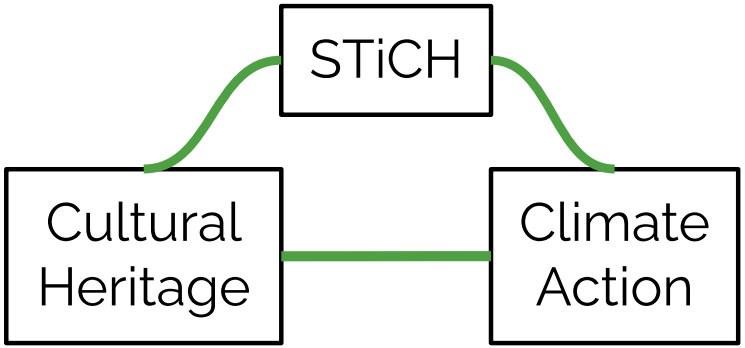
Summary instructions informing site visitors about the various terms, tools, and resources available on the site

MAP: Manage, Adapt, Prioritize

Project Manager Responsibilities

- Understand the tool and the project scope
- Identify the pathways to meeting the project scope
  - Project Requirements
  - Consultants and Workflows
  - Areas of Flexibility
- Collaborate with Teams to meet Team objectives
- Ensure Administrative Tasks are well organized and clear

NEH Tier III Refinement



Navigation of Project Needs vs. Project Objectives

Information Sheets

Defining and Understanding Need vs. Objective

Project Need:

Requirement for survival

STiCH needs to be relevant to users

Project Objective:

Measurable *desired* outcome

STiCH's relevance aims to empower users

Identifying Project Workflows, Needs, and Objectives

ACTIVITIES OF PROJECT TEAM

Project Timeline: September 2023 - August 2025 (24 months)

Phase I:	Establish the project teams, set the foundations; All-Team Meeting.
Phase II:	Revise Calculator Spreadsheets. Calculator modeling and rebuild; concurrent with beta-testing and evaluations.
Phase III:	Create teaching tools, dissemination, and project wrap-up.

Phase I: September 2023 - March 2024 (7 months, activities overlap with Phase II)

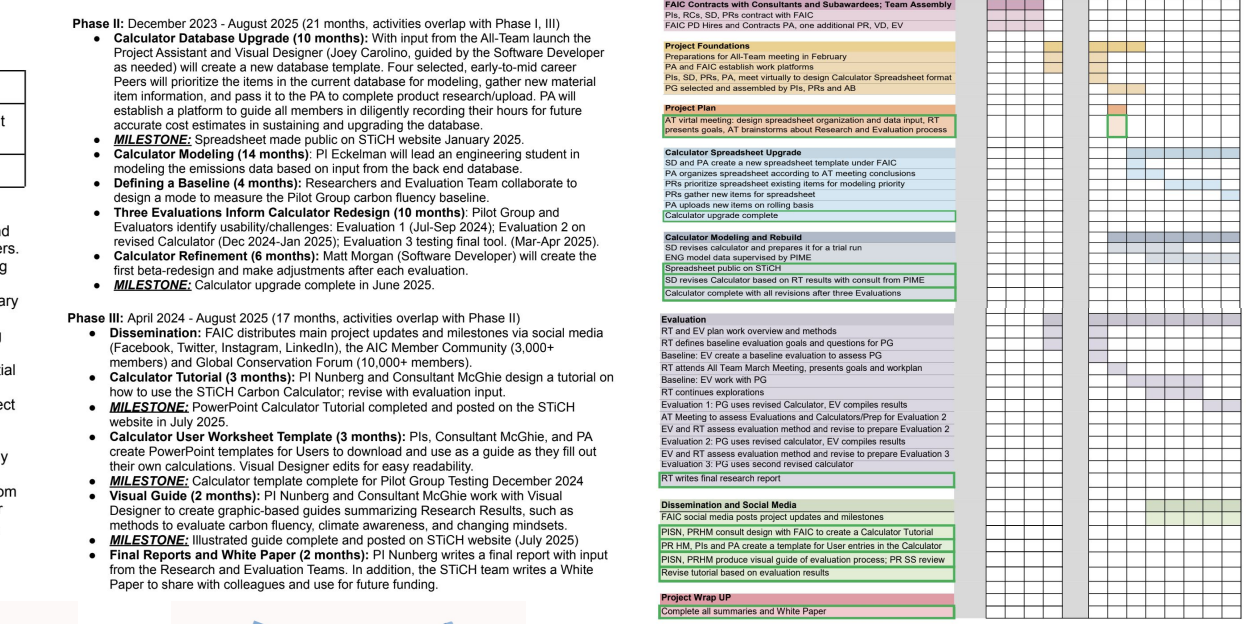
- **Project Team Assembly (3 months):** FAIC will contract with all of the consultants and sub-awardees including the PIs, Software Developer, Research Consultants, and Peers. PI Nunberg and Project Director Tiffani Emig will hire the Project Assistant. Pi Nunberg will consult with Advisors to hire the fourth Peer.
- **Project Foundations (2 months):** PIs will prepare for the All-Team Meeting in February 2024. Considerations for the design of the spreadsheet are important in this step because the subcategories impact the ultimate functionality of the Calculator. Meeting prep will also focus on outlining possible evaluation methods, Calculator page layout, Calculator functions, and methods for information flow. The whole team will be essential for planning each part of the project.
- **Pilot Group Selection (2 months):** The Research Team and Advisory Board will select Pilot Group (beta-testers) comprising 15 cultural heritage professionals from varied materials backgrounds, ideally unfamiliar with STiCH.
- **Establish Working Platforms (1 month):** Data will be owned by FAIC; select an easy collaborative platform.
- **Discuss Research Plan (1 month):** Research Team, led by PI Nunberg with input from Consultants Sarah Sutton and Henry McGhie, will identify key questions and goals for the Pilot Study Group. Considerations: sector needs/impacts, carbon reduction goals, Calculator as an educational asset, modes for measuring the related success, and long-term role of Calculator to fulfill these goals.

Phase II: December 2023 - August 2025 (21 months, activities overlap with Phase I, III)

- **Calculator Database Upgrade (10 months):** With input from the All-Team launch the Project Assistant and Visual Designer (Joey Carolino, guided by the Software Developer as needed) will create a new database template. Four selected, early-to-mid career Peers will prioritize the items in the current database for modeling, gather new material item information, and pass it to the PA to complete product research/upload. PA will establish a platform to guide all members in diligently recording their hours for future accurate cost estimates in sustaining and upgrading the database.
- ***MILESTONE:*** Spreadsheet made public on STiCH website January 2025.
- **Calculator Modeling (14 months)**: PI Eckelman will lead an engineering student in modeling the emissions data based on input from the back end database.
- **Defining a Baseline (4 months):** Researchers and Evaluation Team collaborate to design a mode to measure the Pilot Group carbon fluency baseline.
- **Three Evaluations Inform Calculator Redesign (10 months)**: Pilot Group and Evaluators identify usability/challenges: Evaluation 1 (Jul-Sep 2024); Evaluation 2 on revised Calculator (Dec 2024-Jan 2025); Evaluation 3 testing final tool. (Mar-Apr 2025).
- **Calculator Refinement (6 months):** Matt Morgan (Software Developer) will create the first beta-redesign and make adjustments after each evaluation.
- ***MILESTONE:*** Calculator upgrade complete in June 2025.

Phase III: April 2024 - August 2025 (17 months, activities overlap with Phase II)

- **Dissemination:** FAIC distributes main project updates and milestones via social media (Facebook, Twitter, Instagram, LinkedIn), the AIC Member Community (3,000+ members) and Global Conservation Forum (10,000+ members).
- **Calculator Tutorial (3 months):** PI Nunberg and Consultant McGhie design a tutorial on how to use the STiCH Carbon Calculator; revise with evaluation input.
- ***MILESTONE:*** PowerPoint Calculator Tutorial completed and posted on the STiCH website in July 2025.
- **Calculator User Worksheet Template (3 months):** PIs, Consultant McGhie, and PA create PowerPoint templates for Users to download and use as a guide as they fill out their own calculations. Visual Designer edits for easy readability.
- ***MILESTONE:*** Calculator template complete for Pilot Group Testing December 2024
- **Visual Guide (2 months):** PI Nunberg and Consultant McGhie work with Visual Designer to create graphic-based guides summarizing Research Results, such as methods to evaluate carbon fluency, climate awareness, and changing mindsets.
- ***MILESTONE:*** Illustrated guide complete and posted on STiCH website (July 2025)
- **Final Reports and White Paper (2 months):** PI Nunberg writes a final report with input from the Research and Evaluation Teams. In addition, the STiCH team writes a White Paper to share with colleagues and use for future funding.



At What Cost?

LCA Introduction

Carbon Calculator FAQ

Comparison of Backing Boards on Paintings

Nitrile, Latex & Cotton Gloves

Sustainability Tools in Cultural Heritage

Editable Comprehensive Task Sheet

Project Tasks	Status	Assigned	Priority	Quarter	Due Month	Due Date	Notes	Links and Documents	2023	October	November	December	2024	January	February	Marc
FAIC Contracts with Consultants and Sub Awardees, Team Assembly										1 Oct 23 - 31 Dec 23						
FAIC Hires Project Assistant	Complete	Tiffani E. - PD		23.4	Oct	Oct 21, 2023	Contract signed 21 Oct. 23			21 Oct 2023						
Share Website Login with SD Matt M.	Complete	Shiori O. - PA		23.4	Dec	Dec 5, 2023	Matt E. will share Website Profiles with Shiori to then confirm access profile with Tiffani for Matt M.; Reset password link was sent to Matt M. Dec. 5th, access confirmed by Matt M.					8 Dec 23				
Share Wordpress Profiles with PA for Project Filing	Complete	Matt E. - PI		23.4	Dec	Dec 5, 2023	Matt E. confirmed profiles via WordPress and added Shiori O. to the list of administrators	https://stich.culturalheritage.org/wp-login.php				5 Dec 23				
All Final 2023 Invoices Due to FAIC	Complete	All Contractors		24.1	Jan	Jan 15, 2024	Contract agreements for NEU also needed							15 Jan 24		
Contract with Visual Designer	Complete	Tiffani E. - PD		24.1	Feb	Feb 5, 2024	Contract signed 02 Feb. 24	https://meganpai.com/								
Contract with Additional Peer	Complete	Sarah N. - PI; Tiffani E. - PD		24.1	May	May 1, 2024	Matt E. mentioned possible 4th peer at NEU; new peer discussion to happen after initial review by current peers; Recommended: Kim Krazcon, with focus on Art Materials; initial offer in April conducted by PA and PD	Peer Selection for fourth Peer								
Contract with Visual Designer Fall 2024	Complete	Tiffani E. - PD; Matt E. - PI		24.3	Sep	Sep 30, 2024										
Contract with Visual Designer 2025	Complete	Tiffani E. - PD, Sarah N. - PI, Shiori O. - PA		25.1	Feb	Feb 26, 2025										
Contract with Advisory Board - Letters of Agreement	Complete	Tiffani E. - PD		24.3	Sep	Sep 30, 2024										
Contract with Additional Evaluator	*Removed*			23.4			Removed from Task List - Role assigned to Matt M.									
Project Foundations											1 Nov 23 - 16 Feb 24					
Share Access to STiCH FAIC email with PA	Complete	Tiffani E. - PD		23.4	Nov	Nov 14, 2023	FAIC account created for soki; access to STiCH email granted 14 Nov 23				14 Nov 23					
PA and FAIC Establish Work Platforms	Complete	Shiori O. - PA		23.4	Dec	Dec 1, 2023	PA currently testing various softwares and customization of microsoft and google systems; design and creation of google based excel file for tasking (current document)	Master STiCH Project Task Schedule				1 Dec 2023				
Add Shiori Oki to WordPress Profiles	Complete	Matt E. - PI		23.4	Dec	Dec 5, 2023	Added by Matt E.; Account created 5 Dec					5 Dec 23				
PIs Develop Calculator Site "Wish List" for SD	Complete	Matt E. - PI; Sarah N. - PI		23.4	Dec	Dec 11, 2023	PA created document; shared with PIs 16 Nov 23	"STiCH PI's Calculator "Wish List"				11 Dec 2023				
Call for Pilot Group #1 Evaluators	Complete	Tiffani E. - PD		23.4	Dec	Dec 14, 2023	Baseline Evaluation Participants									
Add Tiffani Emig to WordPress Profiles	Complete	Shiori O. - PA		23.4	Dec	Dec 21, 2023						5 Dec 23				
Website Information Update	Complete	Shiori O. - PA		23.4	Dec	Dec 31, 2023						31 Dec 2023				
Archiving of Previous Project Folder Files	Complete	Shiori O. - PA		25.1												
Advisory Board Annual Meeting	*Removed*	Shiori O. - PA		24.1			Task added to a separate document in shared drive - "Ideas for Future of STiCH" - outside current scope of the project									
Project Plan												1 Dec 23 - 9 Feb 24				
Development of Evaluation 1 for WordPress Platform	Complete	Matt M. - EV; Sarah N. - PI		23.4	Dec	Dec 18, 2023	Matt M. will share draft of Baseline Questions with team via email by 18 Dec 2023 - Team to review by 22 Dec 2023					22 Dec 2023				
EV Create Evaluation 1 DFT to Assess PG	Complete	Matt M. - EV; Sarah N. - PI		23.4	Dec	Dec 22, 2023	Baseline Evaluation script draft provided by Matt M. 18 Dec 2023; review by core team to be completed 22 Dec 2023	STiCH User Testing Script				22 Dec 2023				
Selection Evaluation 1 Participants (Pilot Group #1)	Complete	Tiffani E. - PD		23.4	Dec	Dec 31, 2023	Form to be created via google forms and solicitations put out through various listservs; Form published 14 Dec 2023	Responses to STiCH Baseline Review Application				15 Dec 2023				
EV Drafts Script for Evaluation 1	Complete	Matt M. - EV		24.1	Dec	Dec 31, 2023	SD tasked at 14 Nov 23 meeting; draft of script provided by Matt M. 18 Dec 23					31 Dec 2023				
RT Defines Evaluation 1 Goals	Complete	Henry M. - RC; Matt M. - EV; Sarah N. - PI; Sarah Su. - RC		24.1	Jan	Jan 5, 2024	Meeting scheduled with Sarah Su. and Henry M. to review Baseline Evaluation script							5 Jan 2024		

Refinement Objectives

Main Project Objectives:

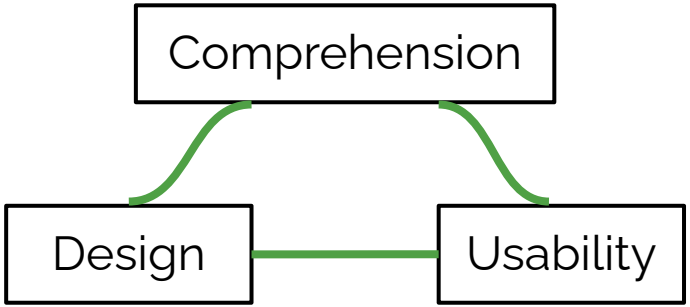
- Update the User Interface
- Refine Material Navigation
- Update Data Visualization
- Add Capabilities to Tool
- Educational Resources

Objective Outcomes:

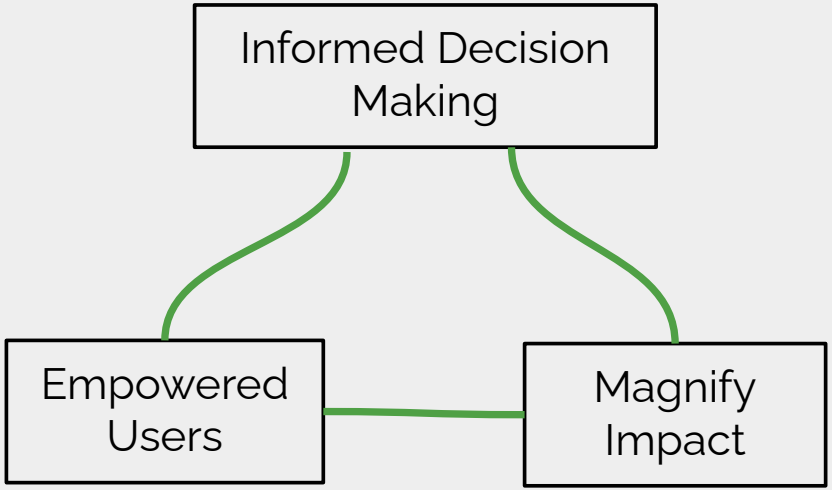
- More accessible and understandable
- Increased accurate data input and output
- Comprehensive retention of data
- More robust impact calculations
- Empowers users and encourages behavior changes

Guiding Tier III Project Workflows

Project Needs

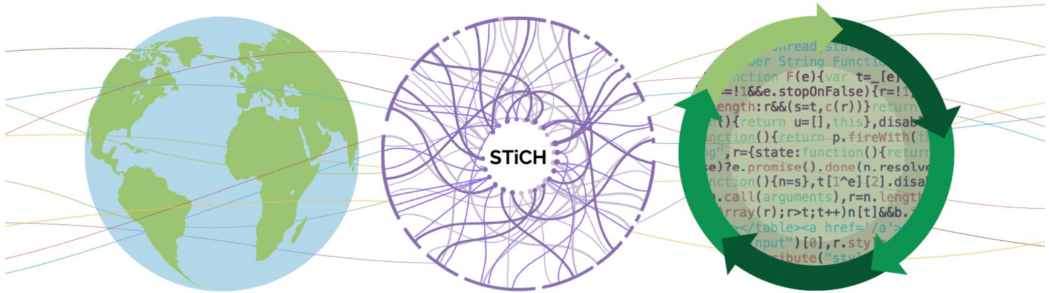


Project Objectives



Workflow Composition

Independent vs. Collective
Styles of Collaboration



About Us

Collective and Collaborative Workflows

Core Team

Project Director (FAIC)	Principal Investigator **Conservator**
Project Manager **Shiori Oki**	Principal Investigator **Engineer**

Design Team

Principal Investigator **Conservator**	Software Developer **Contractor**	Project Manager **Shiori Oki**
Principal Investigator **Engineer**	Visual Designer **Contractor**	

Peer Review Team

Project Manager **Shiori Oki**	Principal Investigator **Conservator**	Principal Investigator **Engineer**
	Peer Reviewer **Artist Materials**	Peer Reviewer **Paintings**
	Peer Reviewer **Paper**	Peer Reviewer **Objects**

Research Team

Principal Investigator **Conservator**	Project Manager **Shiori Oki**
Research Consultant **US Museum Partner**	Visual Designer **Contractor**
Research Consultant **EU Museum Partner**	

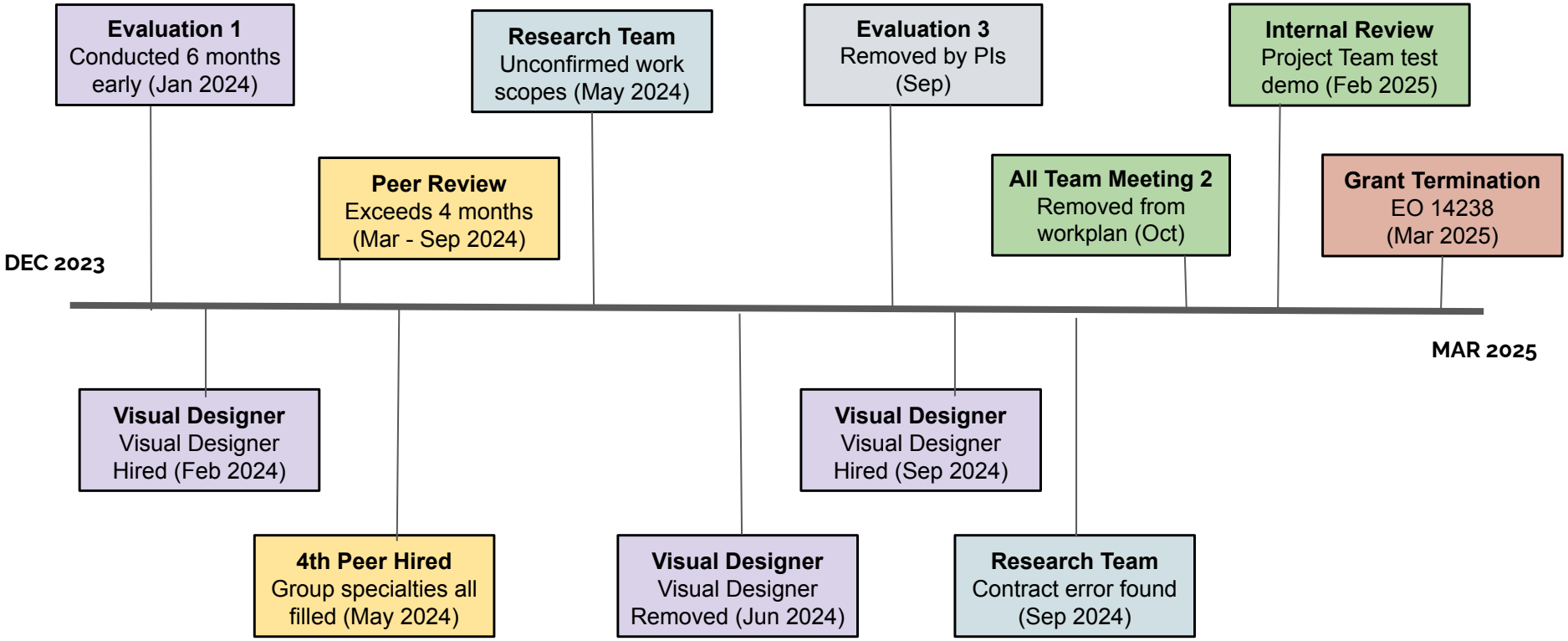
Developing and Tracking Project Workflows

1. **Data review** and **LCA Modeling** for updated materials
2. Calculator **visual and software design** planning
3. **Evaluation** of Tool (Tier II) and working demo (Tier III)
4. **Educational Resources** for STiCH and Climate Action
5. **Administrative** Duties
    a. Budget Tracking
    b. Meeting Notes
    c. Tasking and Task Tracking
    d. Communication/Information Sharing
    e. Quarter Reporting
    f. Document/Design Reviews
    g. Consultant Management

Challenges to Project Workflows

- Distribution of Time
- Distribution of Budget
- Software Limitations
- Contractor Challenges
- Workflow Gaps and Delays

Significant Changes to the Project Timeline



Decision Making and Assumptions

Decision Making

Direct Impact

Indirect Impact

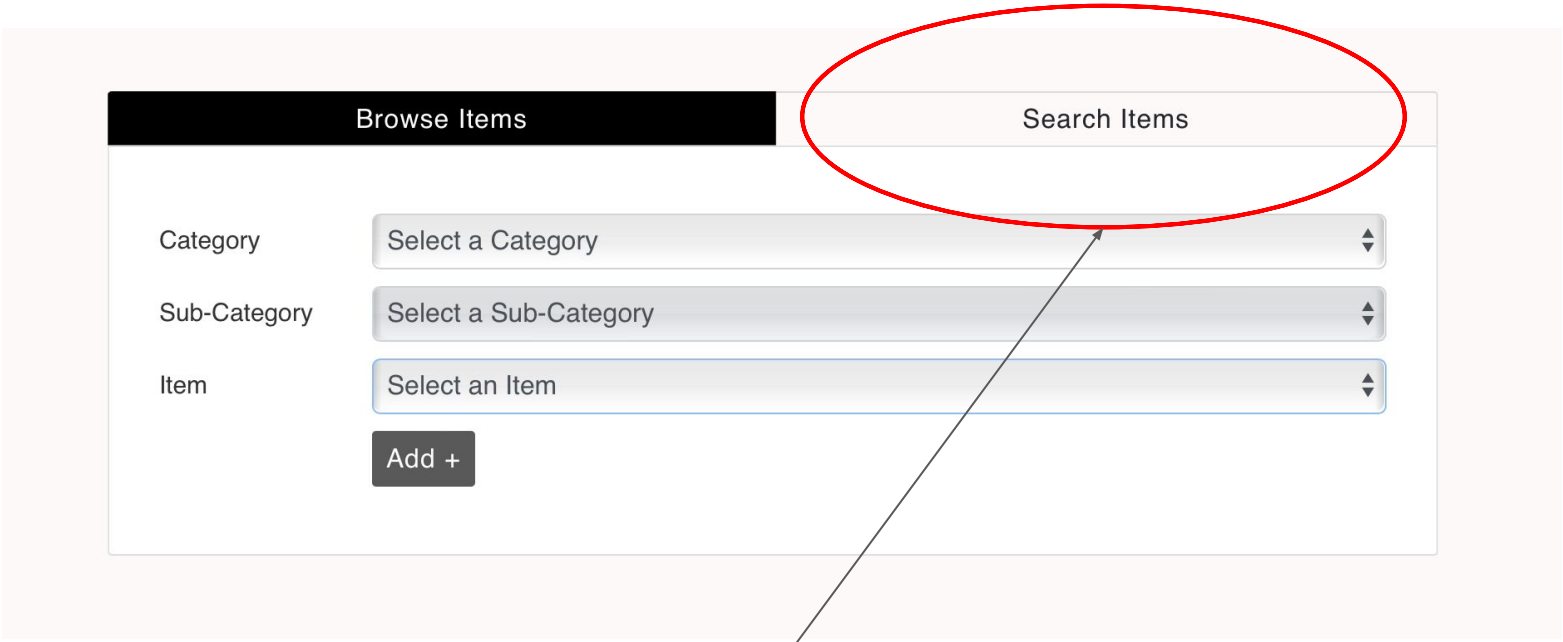
Controls Project Workflows
Dictates Accountability
Provides Direction

Assumptions

Cascading Effect

Complicates Accountability
Creates Tension
Challenges Workflows

The “Search Function” Assumption



“Search Items” options in Tier II Calculator allowed users direct access to the materials list separate from category selection

The “Search Function” Assumption

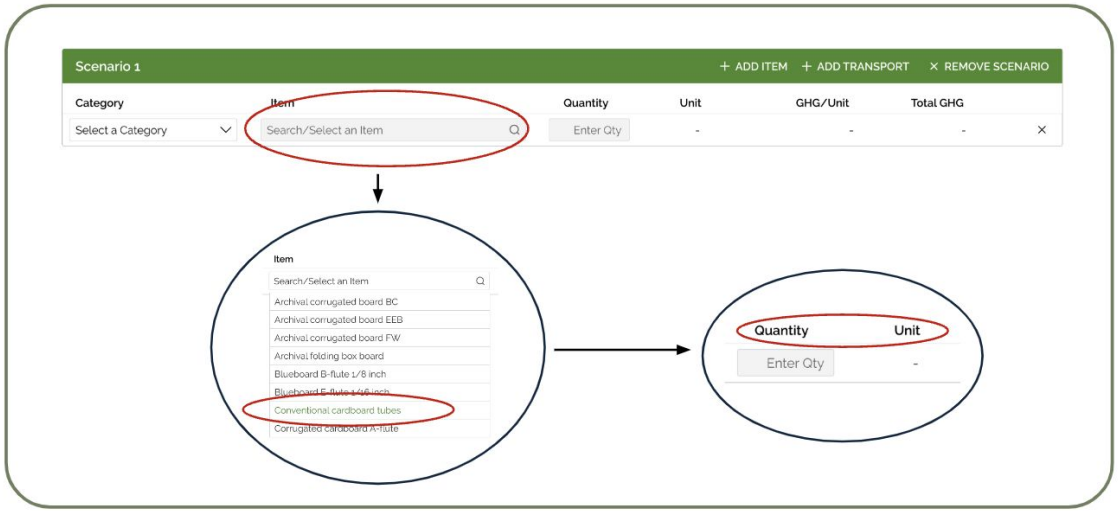
2

(A) Browse or (B) Search

Enter items on your list into the STiCH calculator
You can either browse or search for an item

SEARCH

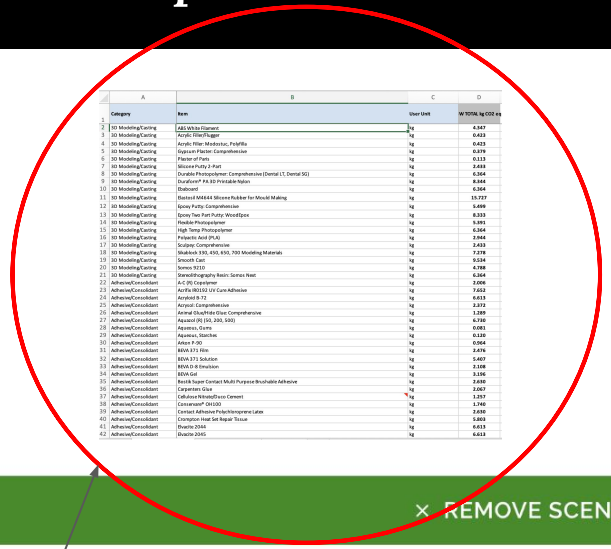
- If you know what specific item you are looking for, you can search for it by typing the name in the **Search/Select an item** box
- Add the **Quantity** using the indicated **Unit**
- Click **Add item**
- Repeat for each additional item



The “User Guide” page has been modified from its original for the purposes of this presentation

The “Search Function” Assumption

The current Carbon Calculator cannot search items without first selecting a category, even though you can type into the box



Carbon Footprint

The itemized list of materials is downloadable from the site

NEH Tier III STiCH Refined Carbon Calculator

Carbon Calculator

Project Wish List

PI #1

- Record Tracking
- Opt-in User Database
- Community Message Board
- Elimination of Sub-Category Filtering
- More Dynamic User Visuals
- Auto Unit Conversions

PI #2

- Easier Uploading of Materials to Database
- Room for Database Growth
- More Accessible Search Options
- Redesign of User Layout
- Item Search Tracking

RT

- Clearer Labeling and Explanation of Terminology on Site
- Removal of Redundancies
- Information on Impact of Calculations
- Congruent Layouts and Connections to Homepage

NEH

- Review and Evaluate Materials List
- Redesign Function and Layout of Tool
- Author Educational Resources for Users

Granted Wish List Items

PI #1

- Record Tracking
- Opt-in User Database
- Community Message Board
- Elimination of Sub-Category Filtering
- More Dynamic User Visuals
- Auto Unit Conversions

PI #2

- Easier Uploading of Materials to Database
- Room for Database Growth
- More Accessible Search Options
- Redesign of User Layout
- Item Search Tracking

RT

- Clearer Labeling and Explanation of Terminology on Site
- Removal of Redundancies
- Information on Impact of Calculations
- Congruent Layouts and Connections to Homepage

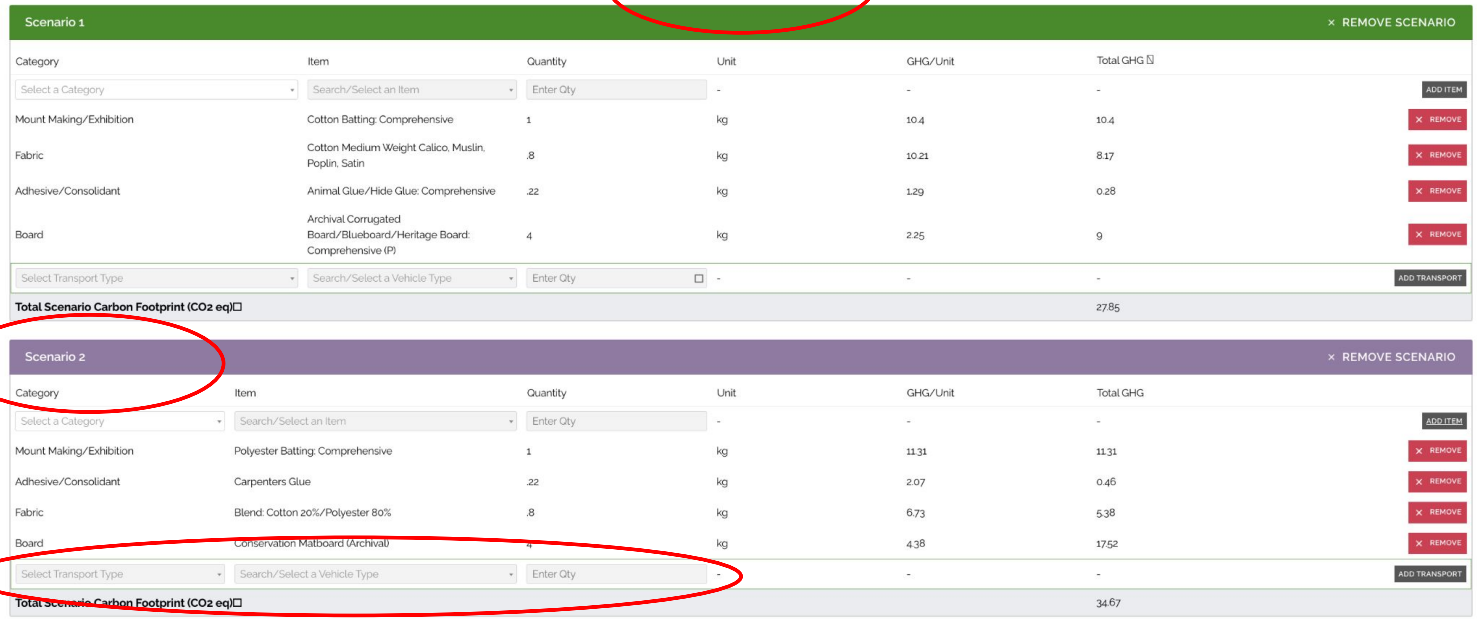
NEH

- Review and Evaluate Materials List
- Redesign Function and Layout of Tool
- Author Educational Resources for Users

NEH Tier III STiCH Carbon Calculator

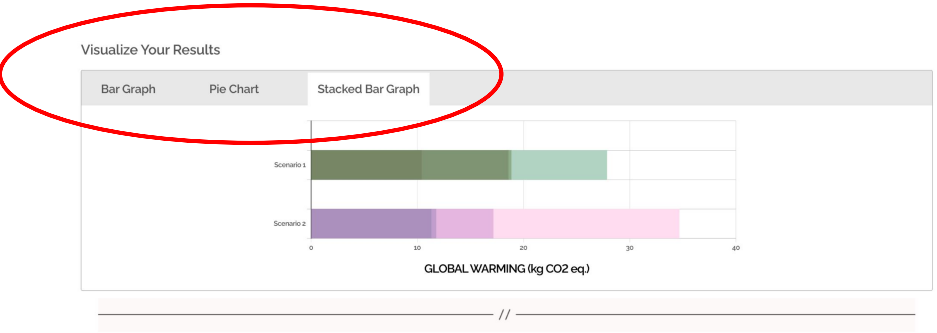
Added functions and features

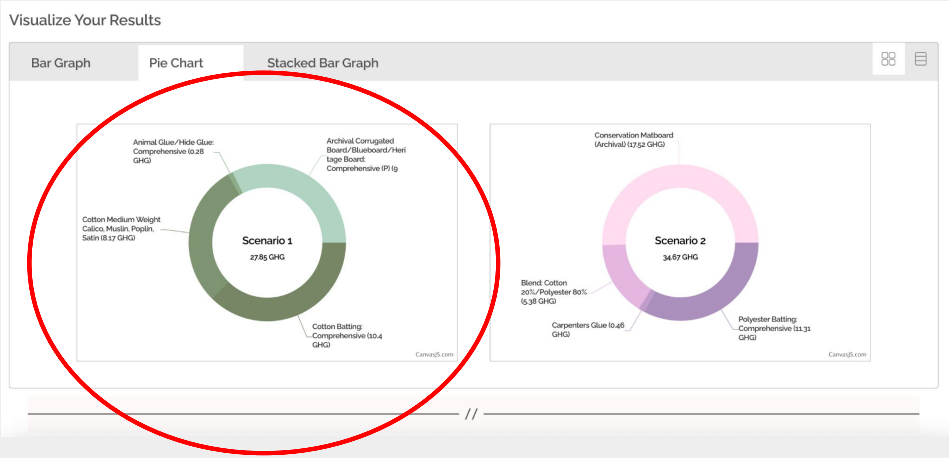
Adjusted language



NEH Tier III STiCH Carbon Calculator

Compare Scenarios' Co2 eq





Various Visualization Options for Individual Scenario Results

NEH Tier III STiCH Carbon Calculator

The “Normalization Factor”

Understand Your Results

Your results can also be expressed relative to common activities:

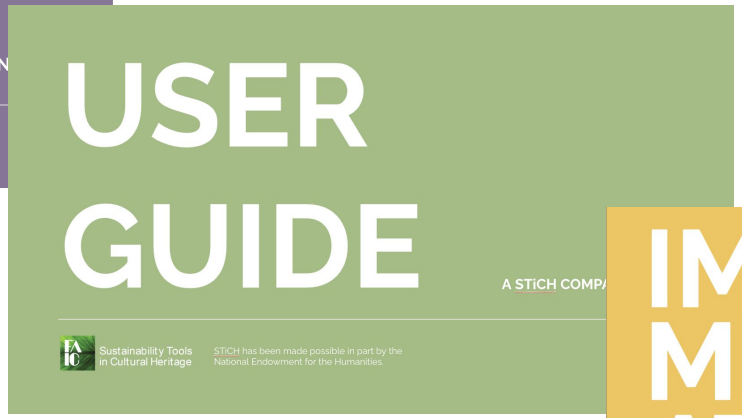
Scenario 1: 52.15 kg CO2eq = 5.9 gallons of gasoline combusted = 133 miles driven in an average gasoline vehicle

Carbon footprint results are expressed in carbon dioxide equivalents (CO2eq). Currently, the average daily emissions per person of CO2eq are 45 kg/day for an American and 30 kg/day for a European but only 0.3 kg/day for people in low-income nations. The common global target of 1 ton per person per year gives a daily budget of approximately 3 kg CO2eq per day.

Quantification of Emissions in Context

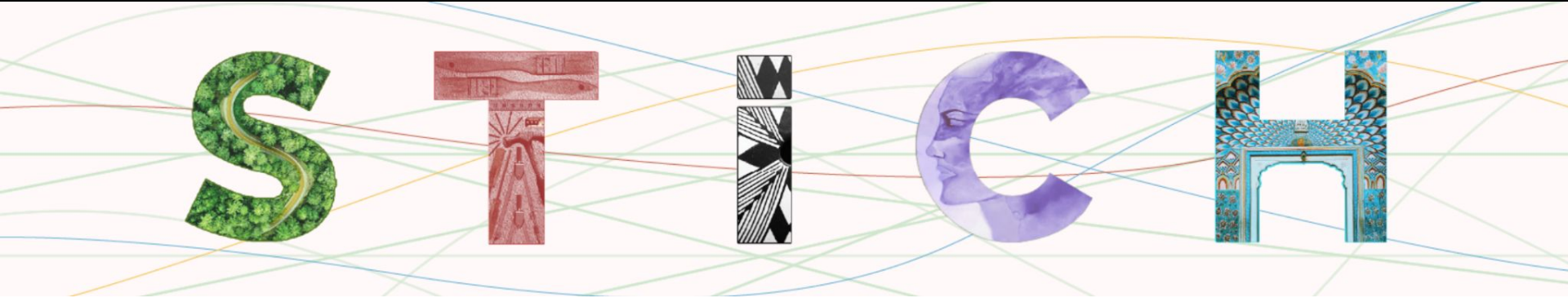
Educational Resources

STiCH Companion Guides



Comprehensive collection of educational guides to instruct and empower users on the impact of STiCH

Learning Outcomes from STiCH Tier III NEH Project Management



ADD IT TO THE LIST

There is always more work to be done --- prioritization of work is your responsibility in collaboration with the project partners

PROJECT CLAIRVOYANCE

There are always going to be tasks/assignments overlooked and unforeseen --- tracking these can help in development of future grants

“FLEXIBILITY IS THE KEY TO AIR POWER”

Project Success is not about hitting every milestone, flawless execution, zero conflict, or even “100%ing”; Project Success relies on the strength of the team to adapt, shift, and overcome by being versatile and resilient rather than rigid and uncompromising.

Project Team Acknowledgement

1. Entirely Remote Work - 13 Project Contractors
2. Adjusting to New Project Management and Oversight
3. Federal Uncertainty and Backlash

Information Cited

Foundation for Advancement in Conservation. 2023. “Held in Trust: Transforming Cultural Heritage Conservation for a More Resilient Future.” https://www.culturalheritage.org/held-in-trust.

“Museums for Better Futures,” Curating Tomorrow, https://curatingtomorrow.co.uk/museums-for-better-futures-report/, 2025.

Sustainable Travel International, https://sustainabletravel.org/issues/carbon-footprint-tourism/, 2025

Sustainability Tools in Cultural Heritage, https://stich.culturalheritage.org/, 2025.

UNESCO World Heritage Convention, https://whc.unesco.org/en/climatechange/#impacts, 2025.