
THE FUTURE OF BROWNFIELDS

critical paths for redeveloping the Calumet region

This brief was created by graduate students from the IIT–Institute of Design in collaboration with the Calumet Collaborative.



ID

IIT Institute of Design (ID) is a graduate design school with a history of innovation. ID pioneered the development and dissemination of modern design from its founding in 1937 as the New Bauhaus in Chicago. Experimentation, rigorous methods, systems design, and strategy support ID's current focus of preparing individuals and organizations to take on the world's complex, fast-changing, and unpredictable problems such as competitiveness, digital media and learning, health and wellbeing, social innovation and more.



The Calumet Collaborative is a bi-state nonprofit organization dedicated to achieving inclusive regional prosperity and improving quality of life in the Calumet region through sustainable development. The NGO catalyzes innovative partnerships between Illinois and Indiana stakeholders to advance a thriving Calumet region with a focus on (1) Livable Communities, (2) Economic Opportunity, (3) Environment, (4) Culture and heritage.

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I. INTRODUCTION

This brief was developed by graduate students from the Sustainable Solution Workshop 2018 course offered at IIT Institute of Design (ID). The work is the result of a 14-week collaboration between ID and the Calumet Collaborative. It briefly introduces the context of brownfields in the Calumet region, and presents sustainable solutions considering brownfields redevelopment as a critical path for restoring local economies in the Calumet region.

This brief is intended to provide new ways of thinking about brownfield redevelopment in the Calumet region. The proposals outlined are based on design methods, systemic approaches and asset evaluation. It is representative of the student and faculty work as it highlights several potential solutions from a broad array of possibilities. It is intended to be shared by the Calumet Collaborative as it pursues its vision and strategy. This work is an ongoing effort as is required for intervening in complex adaptive systems, such as those involved in redeveloping brownfields. As a point in time, this brief is intended to spark new conversations to gain further knowledge, and serve as a launching point for continued exploration in design.

This brief is divided into three main sections: Introduction, System of Solutions, and Next Steps. The Introduction section provides information about the context of exploration as well as the approach taken. The System of Solutions section relies on speculative scenarios to demonstrate how new interactions in the lives of the residents and visitors in the Calumet region could be shaped by the proposal. This section also presents how these multiple scenarios are interconnected at three different levels in the system: micro (ecosystem of products and services, meso (platforms and infrastructures), meso and macro (system dynamics). Finally, the plans for the continuation of the project during the coming months are outlined.

Brownfields in the Calumet Region

The Calumet region encompasses the Southeast side of Chicago, South Cook County and Northwestern Indiana in the United States. The region has been the industrial heart of the Midwest but after years of disinvestment, a patchwork of abandoned properties has been left, and solutions for those properties unidentified. While some of these vacant spaces are clean parcels or former agricultural land (e.g. "greenfields") being developed at higher paces within the last decade, many others contain multiple levels of contamination (e.g. "brownfields") and can blight not only their immediate surroundings, but also negatively impact the future of the entire region.

Brownfield remediation is not just a regional concern, it is a national one with an estimate of more than 450,000 contaminated sites across the United States. There are a myriad of governmental agencies, NGOs and for-profit



organizations that are involved in clean up and redevelopment of sites, yet over the years, there has been only a slight change in the number of brownfields overall.

Traditional approaches of brownfield remediation tend to focus on a site-by-site solution without coordinated efforts. Many individuals and organizations working at the regional level are seeking innovative strategies to intervene in brownfields, and promote sustainable futures. A key aspect of the challenge is to look at brownfields from a systemic perspective. This involves understanding the complex dynamics among multiple agents in the region and the environment in which they sit. This allows us to bring new lenses and reconsider the assets in the surrounding geography.

require new approaches

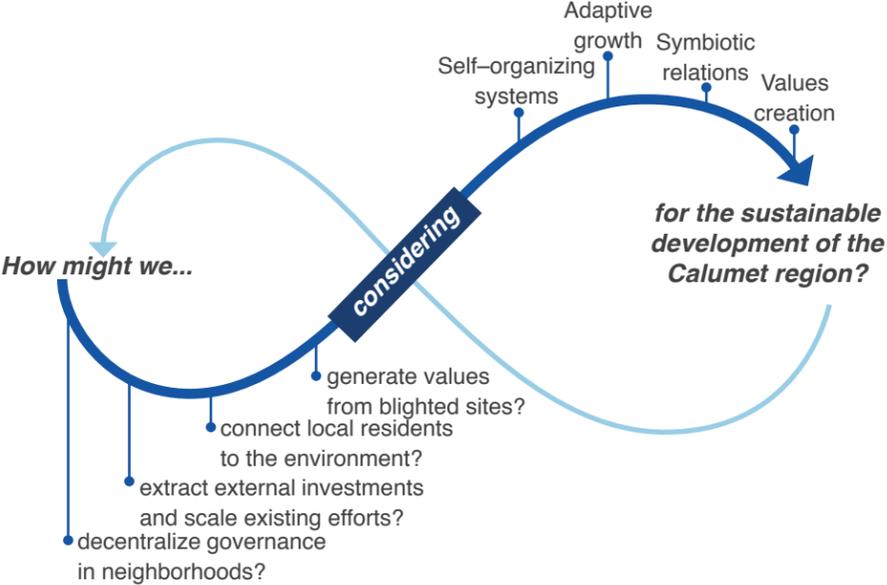
By engaging in the issues of brownfields in the Calumet region through new lenses, we were able to identify new patterns that can inform future strategies for restoring local economies. Here we present four of them as actionable properties for systems intervention and impact: symbiotic relations, adaptive growth, self-organizing systems, and values creation. They are not meant to be exhaustive; rather, they serve as an indication of what's possible given the underutilized assets identified and the common challenges of redeveloping brownfields. If these properties are intended to be part of future interventions, then new approaches should be considered, and new questions must be raised. On the diagram, we present some of the main questions that guided and framed our explorations.

Self-organizing systems
Refers to the spontaneous order that arises from local interactions among parts of an initially disordered or unaffected system.

Symbiotic relations
Refers to three types of relationships between two or more agents in the system: mutualism (+ / +), commensalism (+ / 0), and parasitism (+/-).

Adaptive growth
Refers to a style of growth in which agents gradually become better suited to their environment.

Values creation
Refers to a holistic approach to defining value by considering interdependencies among multiple agents in a socio-ecological system.



II. SYSTEM OF SOLUTIONS

All solutions presented in this brief should be considered as interventions that simultaneously work not only to integrate multiple systems, but also to interconnect multiple levels (macro, meso, micro). Combined they form a system of solutions for long-term, sustainable redevelopment.

Macro

Systems dynamics

It relates to systems dynamics. Rational knowledge is applied to understand the structures and functions based on laws of social, ecological and/or technical systems.

Meso

Platforms and Infrastructures

It relates to institutions, organizations and communities that reveal connections between micro-macro. Integrative knowledge is applied to fit functional and relational complexities.

Micro

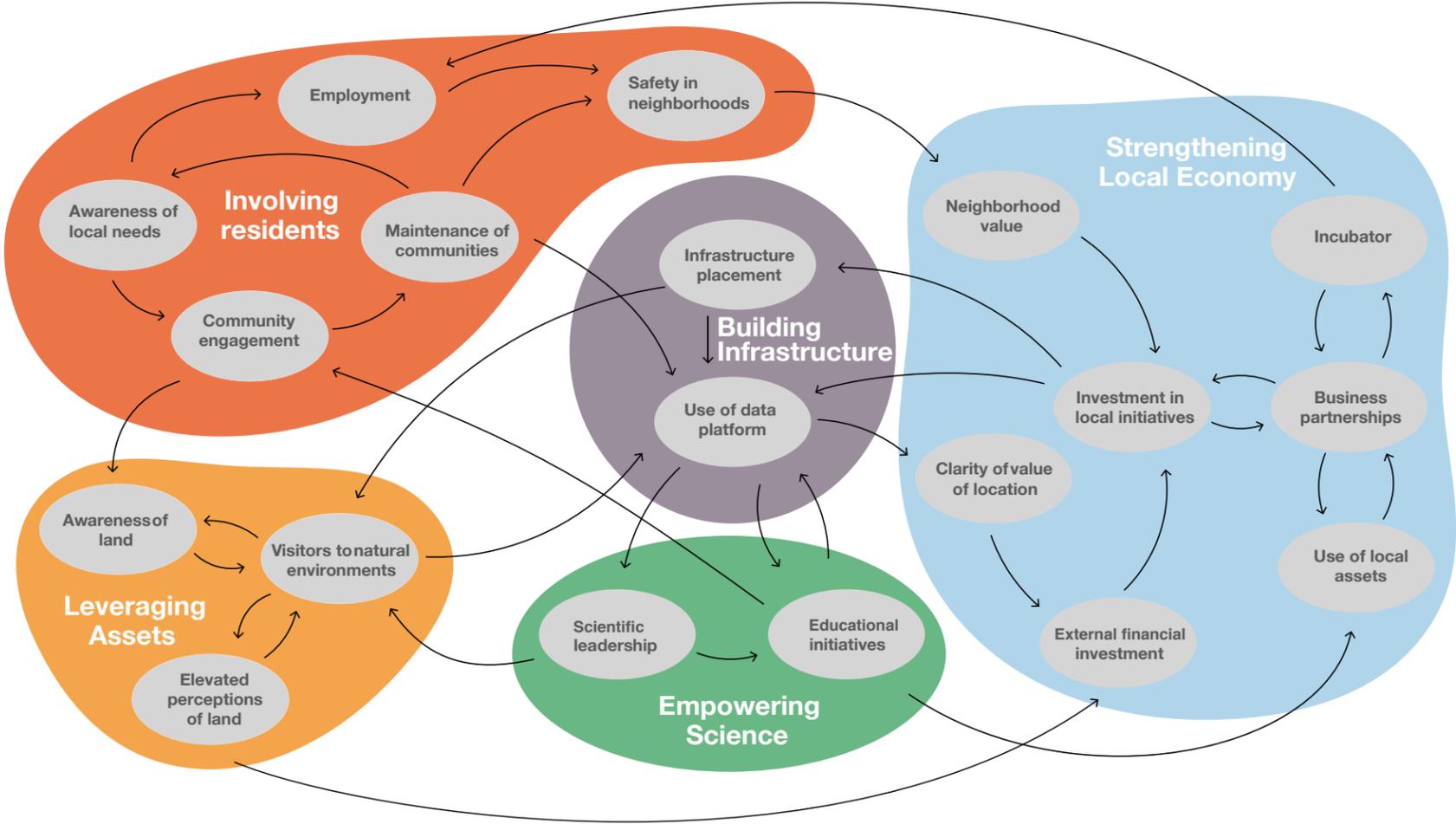
Products and Services

It relates to adaptations of natural phenomena, as well as culture and its diversity at the individual level. Subjective knowledge is applied within specific contexts.

Portfolio of interventions

By incorporating the four actionable properties previously identified (symbiotic relations, adaptive growth, self-organizing systems, and values creation) into our exploration, we were able to propose interventions that speak to some aspects of the complexity embedded in brownfields redevelopment. Together, they present alternative futures that can restore the local economy in the Calumet region. While there are infinite speculative futures that can promote new interactions in the Calumet region, this brief presents several scenarios to introduce new pathways for local economic redevelopment. Four actions can be identified across the interventions: involving residents, leveraging assets, empowering science, and strengthening the local economy.

The scenarios described in this section provide the foundation for a comprehensive data warehouse that will integrate multiple stakeholders in the Calumet region. Because this portfolio of solutions considers interventions across multiple dynamics happening within the region (see diagram on the right), it requires new engagements and new types of values to be exchanged among agents, as well as new infrastructures to overcome fundamental barriers of integrating multiple efforts. Ultimately, this work has the potential to inform new approaches in post-industrial areas around the country.



INVOLVE RESIDENTS

Decentralize governance in neighborhood

Local resident involvement in property maintenance, land ownership and community planning leads to an increase in safety and neighborhood value.



LEVERAGE ASSETS

Generate value from blighted sites

Blighted sites can bring value to the region when considering the potential for the materials available on the site, its location, or its historic significance



EMPOWER SCIENCE

Connect the community to the environment

New technologies provide means for tracking of the environment, building understanding amongst scientists and local residents about the interaction between humans and natural ecosystems.



STRENGTHEN LOCAL ECONOMY

Absorb external investments and scale existing efforts

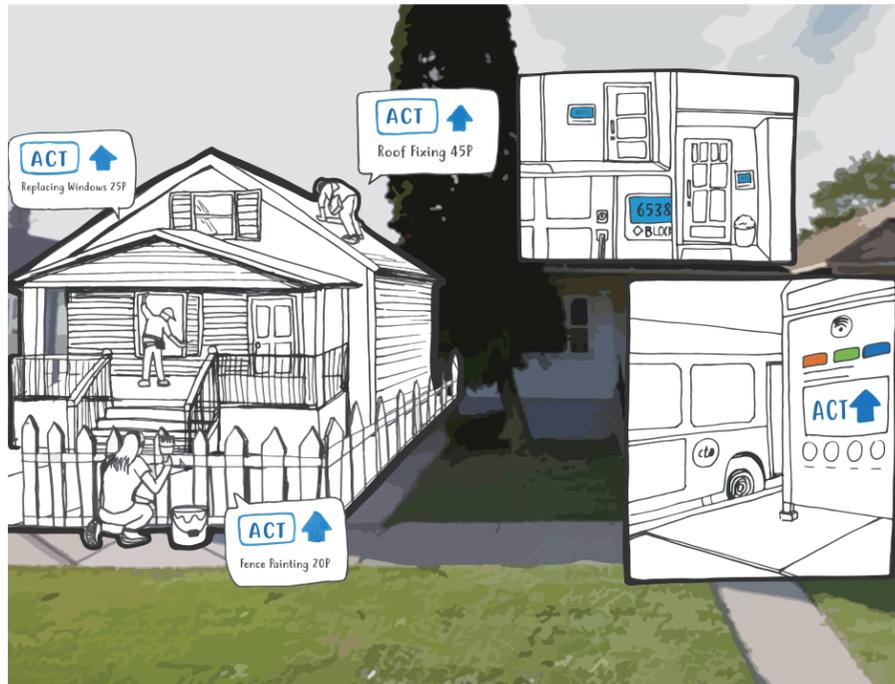
By investing resources in programs that connect local residents to the region, solutions can support, retain and grow intellectual and productive capital in the region.



Act Calumet

Enabling self-organizing systems by decentralizing governance in neighborhoods

Act Calumet provides a system for communities to connect with each other in order to voice concerns, organize projects, and take action. It relies on the integration of digital and physical infrastructures to scale participation and involvement of local residents.



COLOR CODED SIGNALS

Color coding gives common visual language around the purpose or the platform. They relate to the three key ways that users can participate.

Colored LED's on the house sign might turn green if an organizer chooses to promote an active project that they need new members for.

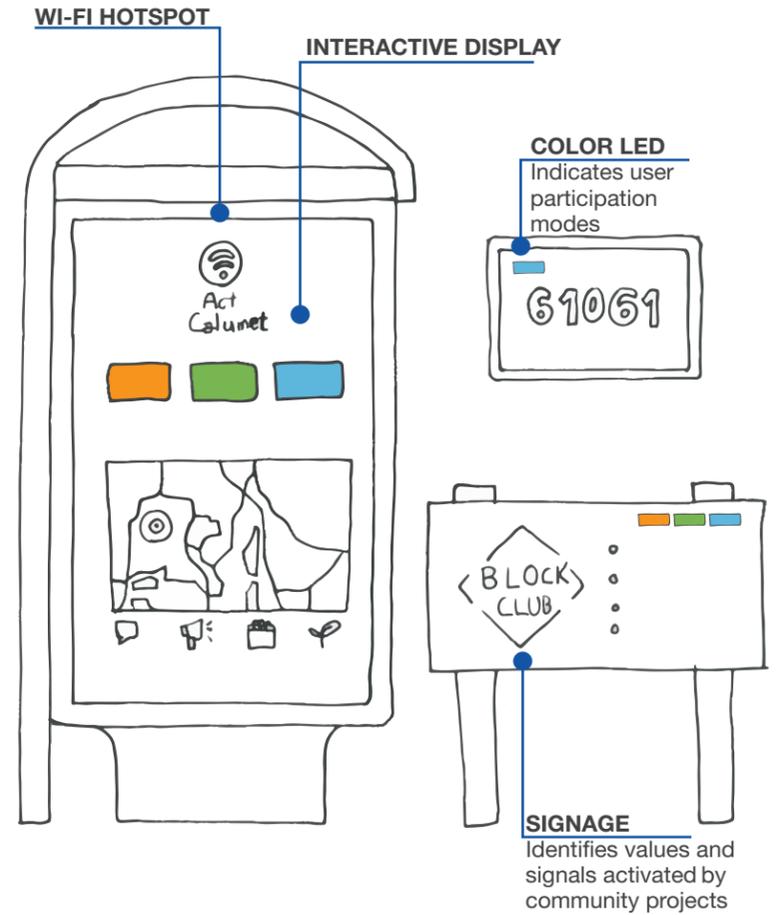
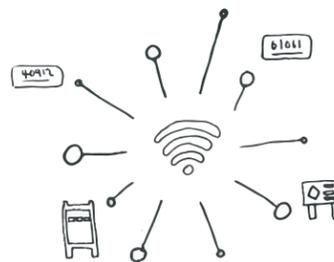
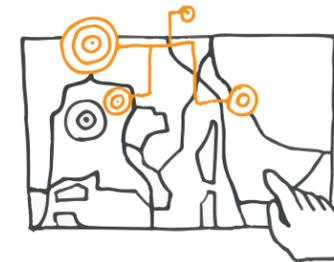
INTERACTIVE DISPLAY

The display invites users to connect with their neighbors. It informs community members about how the platform works and how they can benefit while contributing to a cause in their neighborhood.

WI-FI HOTSPOT

Each bus stop and block club sign provides connection to the platform and with the community. It ensures that all neighbors have easy access to Act Calumet.

The house number sign is connected to the platform as well and can allow organizers to invite community members to connect with them on a project.

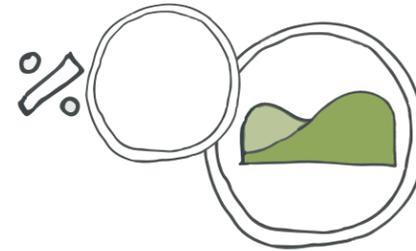




Value Calumet

Building symbiotic relationships in the region by creating new offerings from blighted sites.

Value Calumet empowers collaboration with local economy and local artists based on materials extracted from landfills or other blighted sites. It relies on new offerings to engage different stakeholders, while utilizing sensors and digital infrastructure to inform the environmental performance of the offerings.



NEW PRODUCTS

Products are made from materials mined from landfills, representing values from local resources in that exist in the region.

This product is made by a local shoe company who partners with local artists to create unique designs.

COMMUNICATION

Users can support initiatives with their dollars. Visual graphics and story of the product communicate to users that by supporting the brand they are supporting a local cause.

QR CODE

Connects consumers to resources that allow them to track materials being mined from landfills and provides information on more ways they can benefit from locally sourced resources.

SHOES

Made from mined materials from Calumet former landfills

SIGNAGE

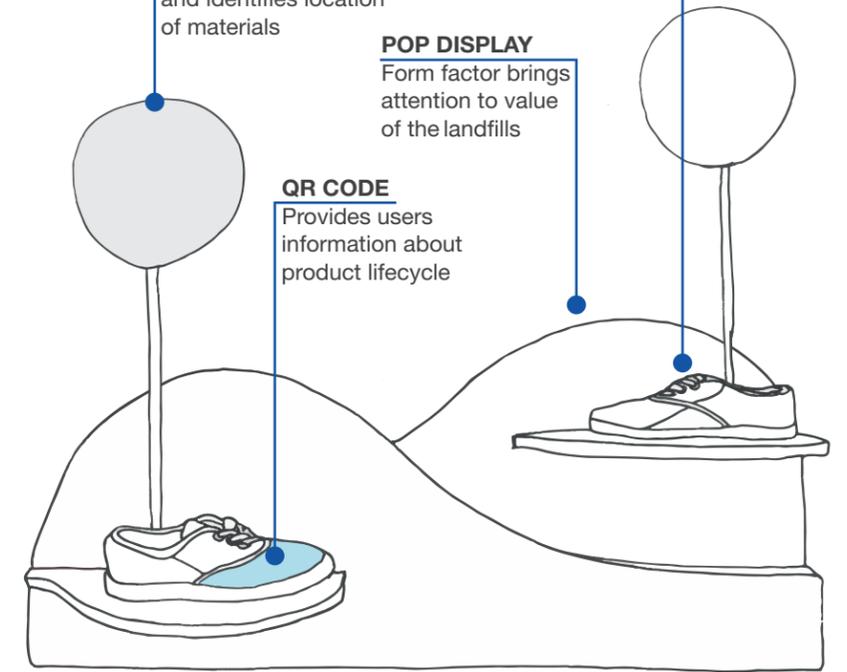
Promotes unique artwork by local artists and identifies location of materials

POP DISPLAY

Form factor brings attention to value of the landfills

QR CODE

Provides users information about product lifecycle

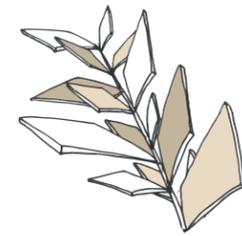
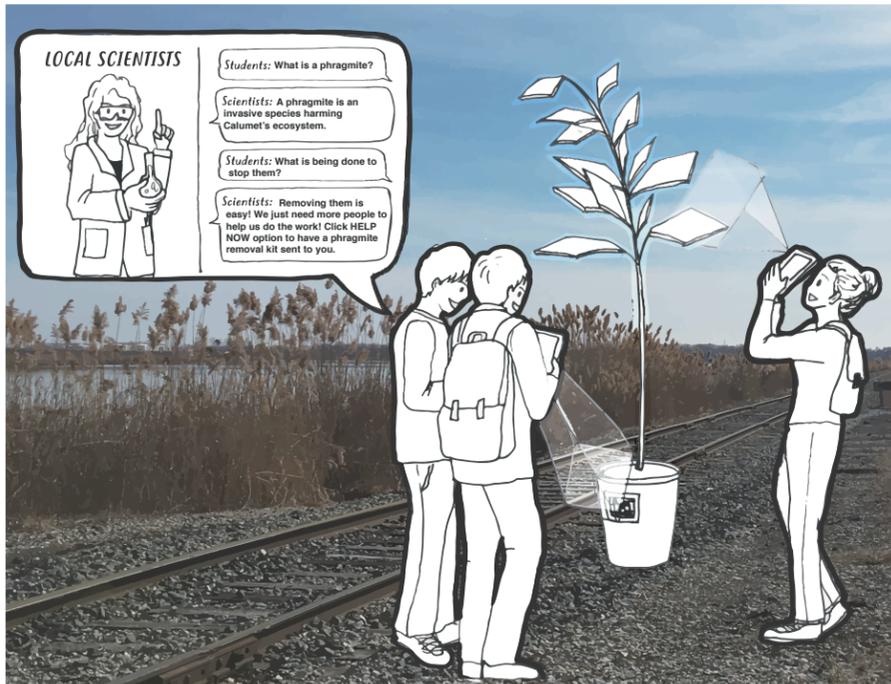




Flag Calumet

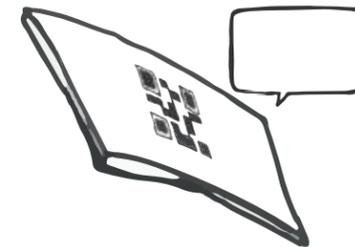
Expanding the perception of values by connecting the local residents with the environment.

Flag Calumet is a constellation of interactive installations that entices residents and visitors to learn about environmental issues and find out how they can be part of the solution. Distributed elements are interconnected through digital technology and infrastructures that can form new relationships, such as explorers with local scientists.



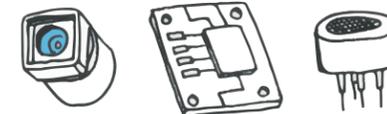
REFLECTIVE INSTALLATION

Reflective components move organically with the wind and contrast with the natural environment to attract visitors and bring attention to environmental causes.



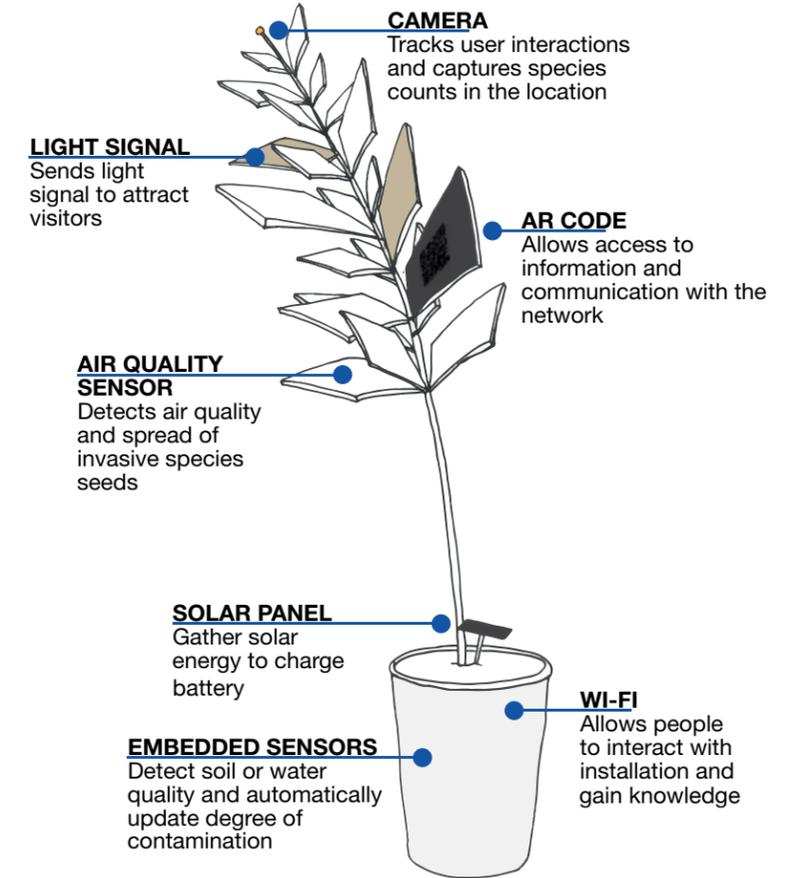
AR STORYTELLING

AR components provide necessary information and enable real time communication with local scientists. Users become aware of actions they can take to be a part of the solution.



MONITORING COMPONENTS

The camera and sensors track human and natural interactions that take place around the installation. Data collected will be communicated with visitors and scientists.

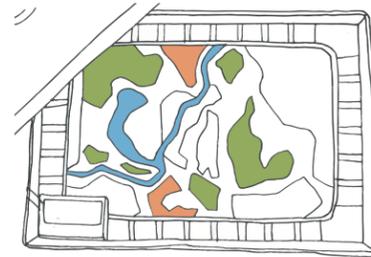




Mini Calumet

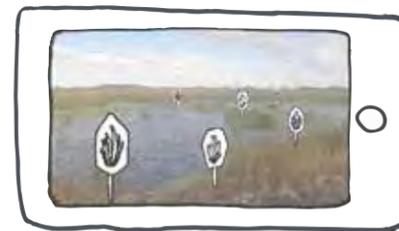
Building models for adaptive growth by expanding existing initiatives

Mini Calumet is a board game that gives kids throughout the region the opportunity to benefit from institutional efforts to connect youth with nature. Empowered by gamification and digital technology, players can connect with the environment and learn about the various actions being taken. While generating data that can lead to new knowledge, participants have the opportunities to engage in existing initiatives, and support efforts to regenerate the region.



CONNECTED BOARD

The board connects to GPS and satellite imagery allowing kids to identify locations on the map and explore the region through their device.



DIGITAL INTERFACE

The game connects to personal devices, such as tablets or a cell phones, so that kids can navigate the region and tag environmental data. Data is shared with scientists, that in return can provide feedback and encouragement to the players.



CARDS

The cards give players actionable missions, empowering kids to form a bond with their environment.

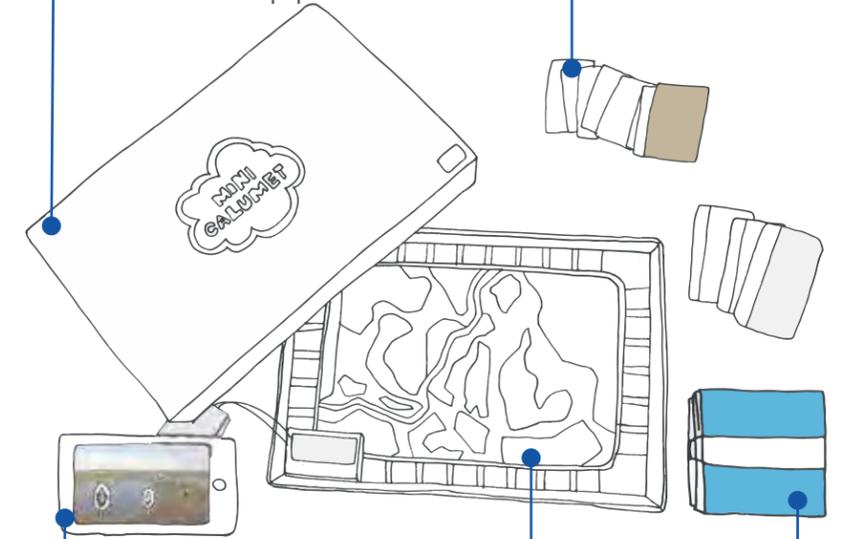
Additional Mini-calumet games will enable them to explore the regions cultural history, and contribute to organizing community projects in their own neighborhood.

MINI CALUMET GAME SET

Sponsored by "Calumet is my Backyard", a youth program at the field museum, all kids in the region now have the opportunity to help track the biodiversity of Calumet for ongoing research and visitor populations.

CARDS

Provides players with actionable missions.



DIGITAL INTERFACE

Enables communication and connection to GPS location and Satellite imagery.

CONNECTED BOARD

Enables connection to GPS location and Satellite imagery.

FIELD GUIDE

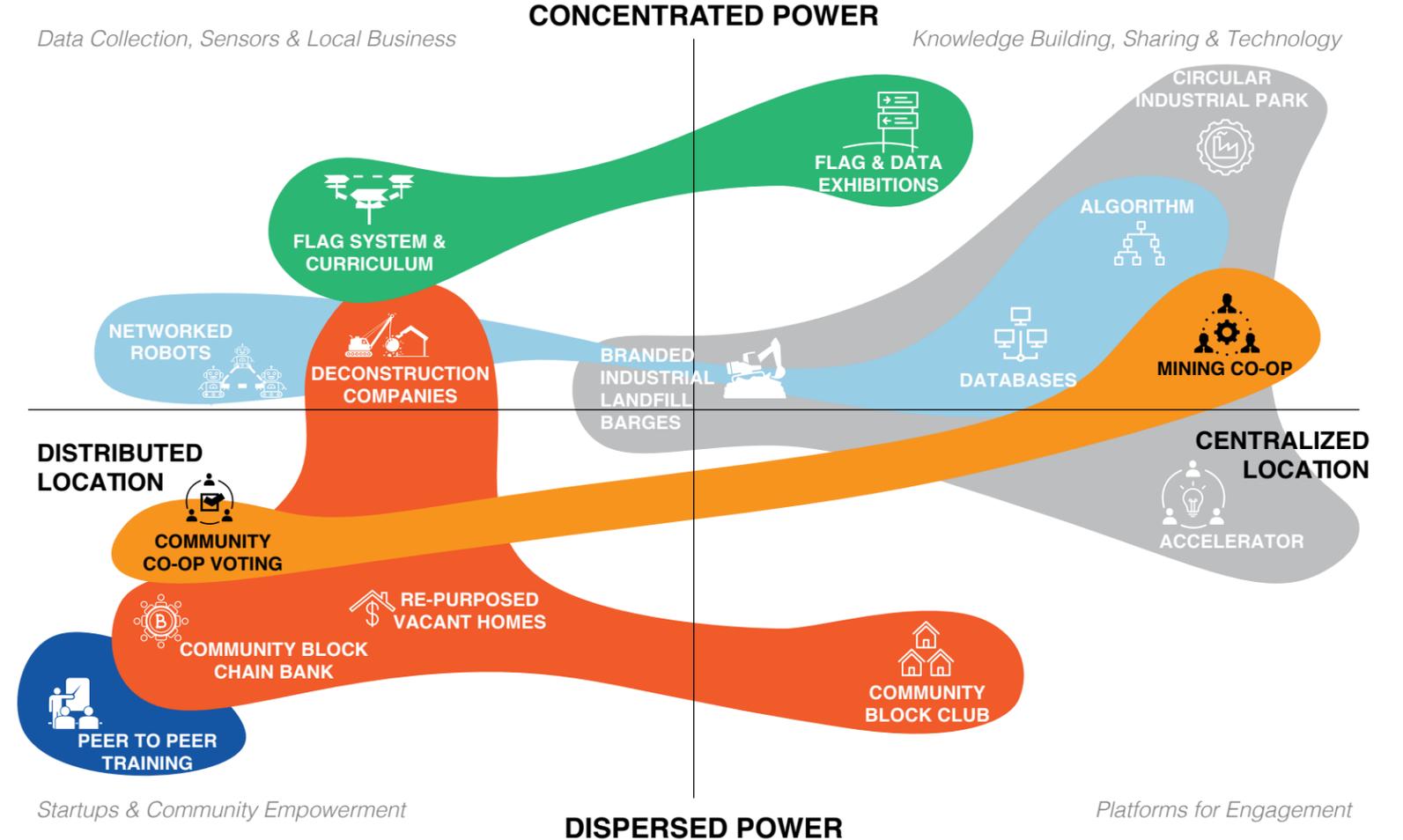
Includes maps of the area and expands opportunities of interactions between teachers, kids and families.

Ecosystems of products and services

By integrating the portfolio of solutions into an ecosystem of products and services, multiple assets can be leveraged for regional redevelopment, including brownfields. The matrix shows how main offerings will distribute power and agency across the multiple agents involved. While there are tradeoffs to each aspect, a central location with a strong digital presence as well as a middle ground of power location is a strong position for organizing activities in the region.

- SPARK CALUMET INCUBATOR**
An innovation hub for stakeholders to tackle the area's biggest challenges in mutually beneficial and break-through ways.
- COMMUNITY BLOCK CLUB**
A higher level organization made up on Block Club members that enable concerns of communities to get organized and act.
- DECONSTRUCTION COMPANIES**
Calumet Collaborative partners with outside construction agencies to create its own deconstruction workforce and expertise, creating new jobs and community opportunities.
- REPURPOSED VACANT HOMES**
Vacant homes that are still viable structures can be repurposed for a new family or a new business.
- COMMUNITY BLOCK CHAIN BANK**
A transparent system of block chain technology, currency and sensors that enable Calumet residents to prosper from helping around their community.
- MINING CO-OP**
Companies and residents partner to mine the landfill and incubate sustainable businesses from its proceeds.

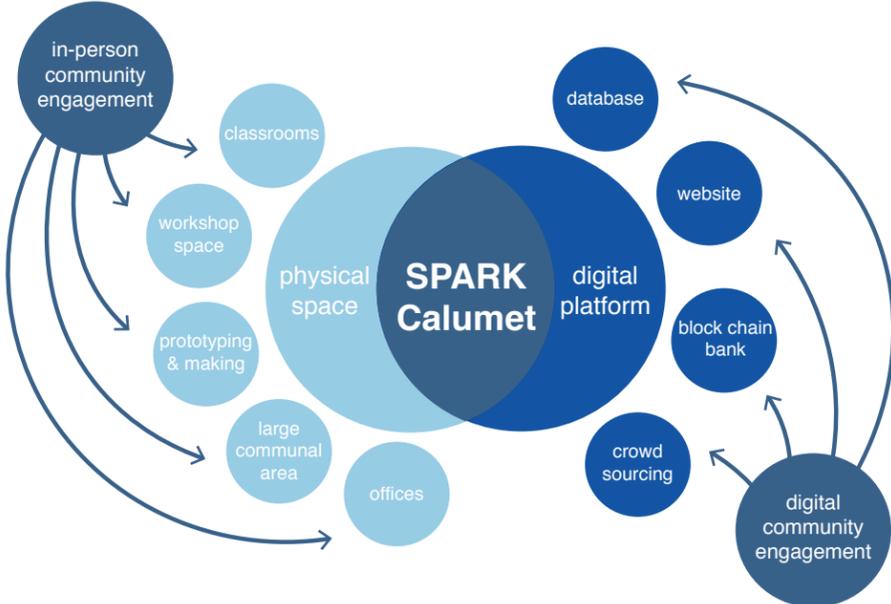
- CIRCULAR INDUSTRIAL PARK**
A collection of interdependent businesses uses each others' waste as raw materials.
- NETWORKED ROBOTS**
Robots engage with the educational system to help children learn about robotics, data collection and sensors. The robots also explore contaminated areas that are not safe for people, and scientists better understand the challenges in specific sites.
- DATABASES**
Data is being collected from touchpoints all over Calumet in this new system. The database allows people within and outside the Calumet to engage in new ways.
- ALGORITHMS**
Algorithms triggered at certain moments due to data could propel the system forward by triggering others to act or respond.
- PEER TO PEER TRAINING**
Experts create new opportunities for skill building through peer mentoring. For instance, an expert in gardening hosts a class on how to grow produce.
- BRANDED INDUSTRIAL LANDFILL BARGES**
Decorated barges increase visibility of more sustainable industrial activities to generate pride in the region's economic growth.
- COMMUNITY CO-OP VOTING**
In partnership with the Mining Co-Op, the community votes on issues they want companies to help invest in exchange for the companies' involvement.
- FLAG DATA & EXHIBITIONS**
Flags collect data and send to a central database to capture improvement over time. Exhibits create awareness so residents know how to interact with the system.
- FLAG SYSTEM & CURRICULUM**
Calumet is home to rich natural areas or areas in rehabilitation with involvement of residents. A widely dispersed flag system interacts with and educates residents.



SPARK Calumet

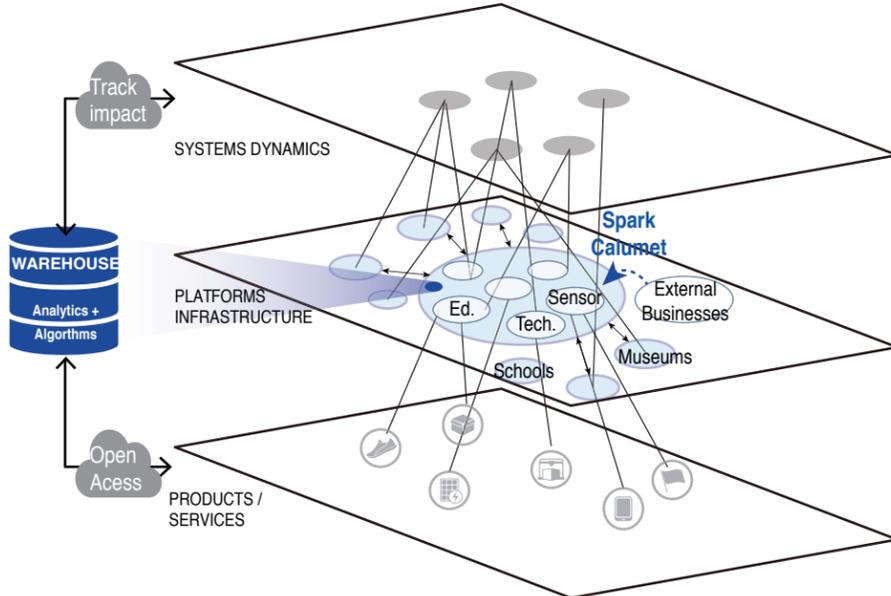
In order to sustain the systems of interactions being proposed, new structures need to be created.

SPARK Calumet is an innovation incubator that will function as a governing structure for restoring the local economy in the Calumet region. SPARK Calumet will leverage local residents, community organizations, scientists and entrepreneurs to bring new ideas and opportunities to life through green technology. The governance will rely on the interconnectivity between physical space and digital platforms to promote dynamic integration of multiple systems, and contextualized interactions between multiple agents.



These structures should be capable of integrating multiple levels and systems.

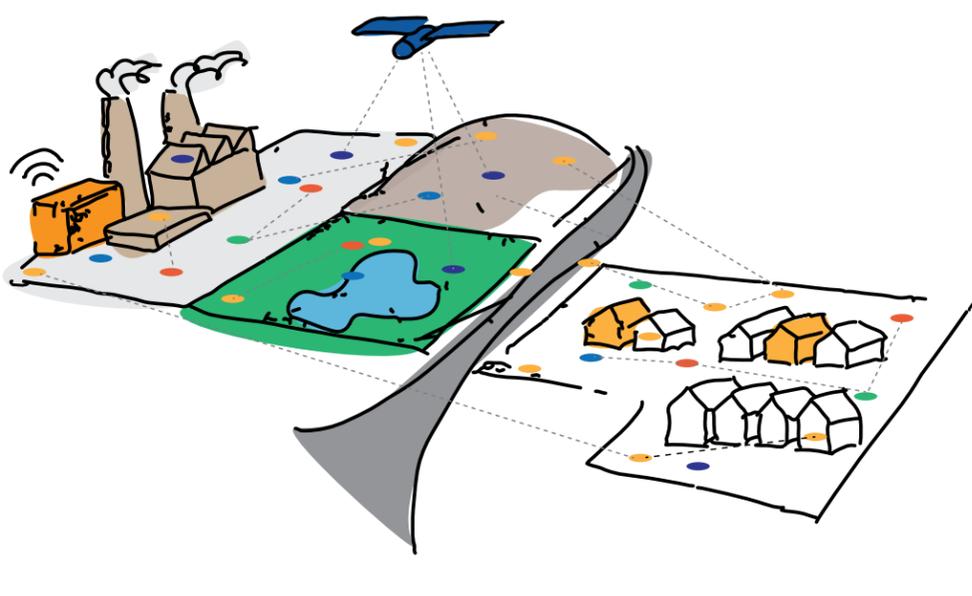
SPARK Calumet was created on the premise that the locus of sustainable solutions is in the design of new infrastructures which allow for interconnectivity, digital technology and co-evolution. By integrating and aligning individual and businesses projects to regional goals, seemingly unrelated products and services can be engaged, and provide better support for broader system impact. The diagram below depicts the dynamic interactions and interconnectivity of solutions across the Calumet region which feed a comprehensive data warehouse.



Infrastructures for sustainable solutions

Because sustainable solutions need to integrate global scale complexity into local scale solutions,

an array of interventions on the ground is required. Together with SPARK Calumet, multiple platforms of interconnected hard and soft infrastructures can emerge, and form new organizational models for intervening in the region. Initiatives should be centered on interdisciplinary projects capable of managing various types of data in the region. While the data should be free and open source, the infrastructure needs to be capable of supporting interpretation and analysis to build knowledge and increase impact towards sustainability in the region.

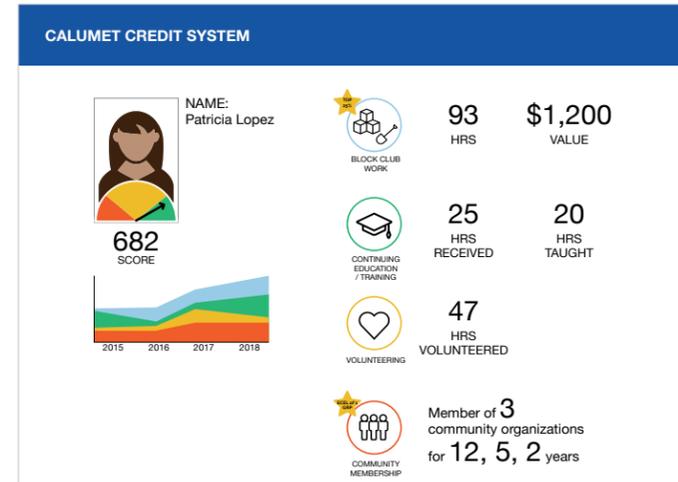


Data flows

In this part, we present dashboards that resulted from speculations about how data from multiple sources can be integrated with the goal of providing information about dynamics of multiple systems, including the flows of multiple values for local residents, organizations and public institutions. The dashboards represent how information is flowing through the multiple levels.

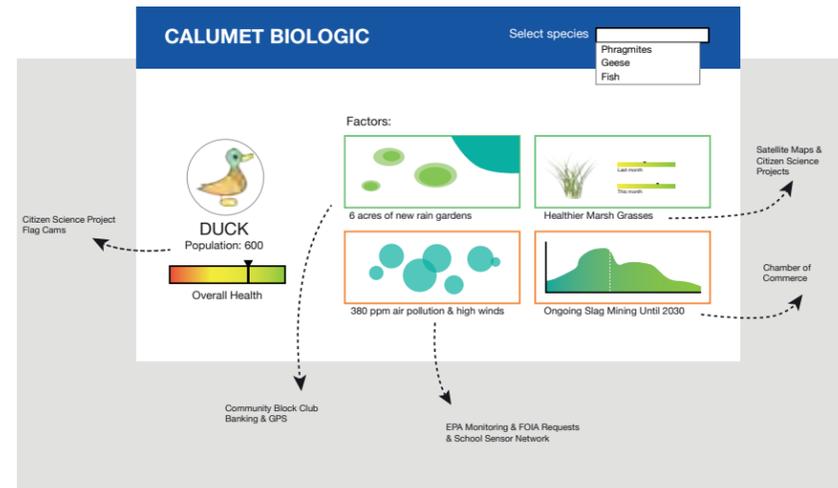
Calumet Credit System

The integration of multiple sources customized to the individual creates opportunities to combine data in new ways, such as the relationship between volunteer activities and the impact on the environment. It is an alternate credit score that encourages volunteerism by assigning value to participation in community improvement projects, creating motivation for residents by unlocking credit access to build equity.



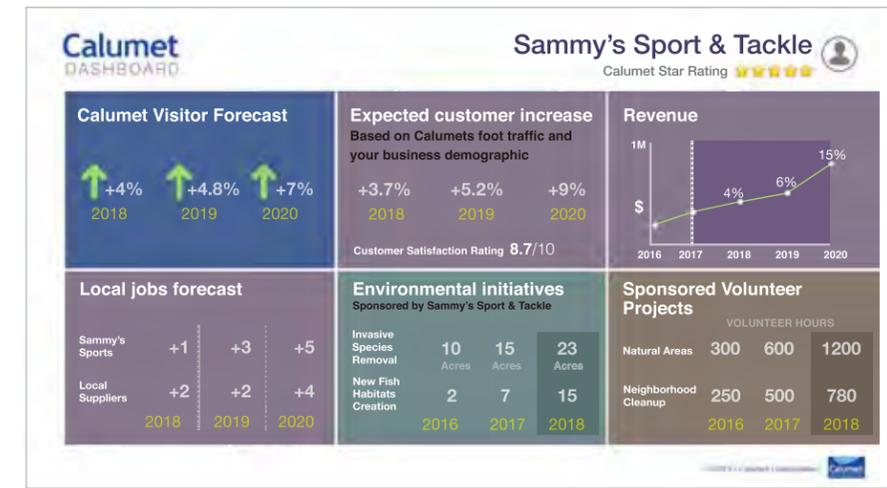
Calumet BioLogic

Biodiversity trackers can incorporate not just natural elements but show how human and industrial activities are affecting wildlife positively and negatively.



Products and Services data

As sensors and community resources contribute to the Calumet data warehouse, local business will benefit from predictive data analytics which provide business and staffing forecasts.



Platforms and Infrastructures data

Sensor technology will allow continuous collection of information about the environment. The integrated database creates opportunities to combined data in new ways, such as the relationship between volunteer activities and the impact on the environment.



Calumet Collaborative

The current purpose-driven strategy of the Calumet Collaborative focuses on connecting partners, engaging the community, and advocating for the region. By adding the capabilities of knowledge and data brokerage, the NGO will be able to provide innovative approaches considering the flexibility in the type and timing of activities the organization takes on. The diagram is based on “Start with Why” by Simon Sinek in combination with the eight lenses for innovation.

Why we exist
Begin with Calumet Collaborative’s purpose for existing.

How we enact our purpose
Multiyear organizational missions that bring the purpose to life.

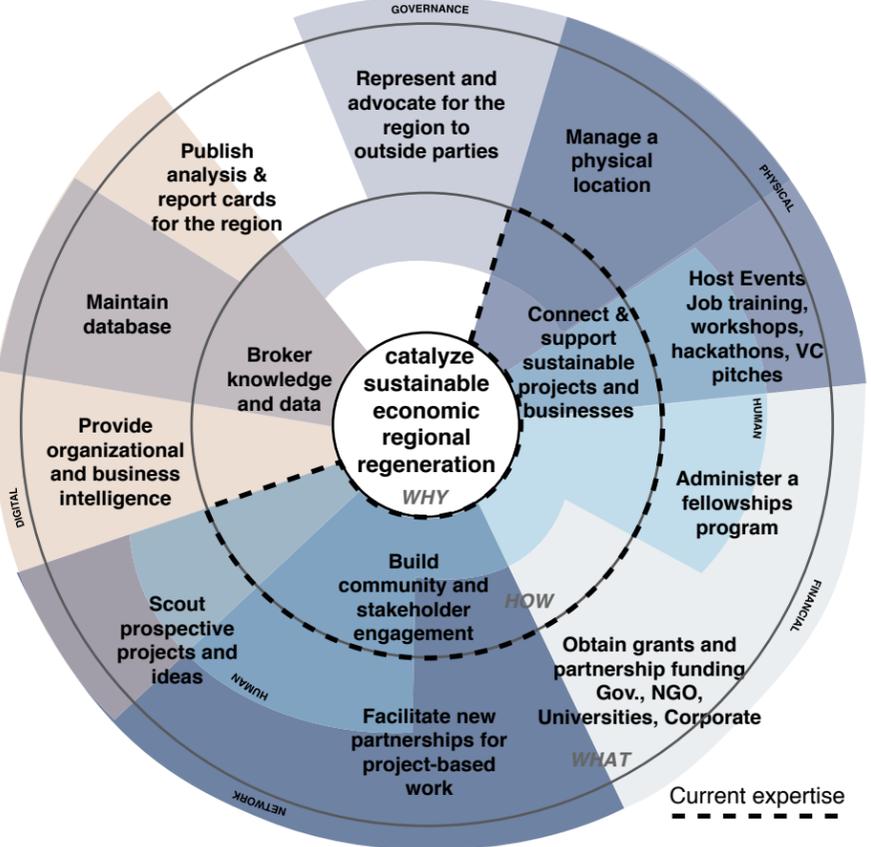
What we do
Strategic activities to deliver on the missions. Activities can stop, start, and continue on a fast or slow cycle.

- Activity planning**
- Continue**
 - Catalyzing regional partnerships
 - Advocating for the region
 - Start**
 - Directly facilitating businesses and projects
 - Building data infrastructures and cultivating data sources
 - Then build**
 - Data analytics & insights capabilities
 - Spun off businesses

Systems dynamics data
Key economic redevelopment indicators provide transparency and information to guide decision making. It is a central source for residents, visitors, developers, investors and scientists. This is the top-level dashboard and there are additional graphs, statistics, and forecasts for each of the eight categories represented.



Linkage study: integration of multi-level data
The systems dynamics will lead to investigations of causal relationships through correlations of data elements in the Calumet data warehouse. A linkage study will help isolate factors and provide insights on cause and effect relationships which will inform priorities and business decisions.



III. NEXT STEPS

The Future of Brownfields Research Project will continue during the summer of 2018. The project will be led by Dr. Carlos Teixeira, Dr. Weslyne Ashton, and Ph.D. Candidate Andre Nogueira in collaboration with the leadership of Calumet Collaborative. The project will benefit from the contributions of two graduate students from the IIT - Institute of Design, Archana Belani and Ye Jin Han, and an independent design consultant, Chris Rudd. The goals for this next phase are to (1) advance the findings from the Sustainable Solution Workshop Spring 2018 through rigorous prototyping, and (2) apply for funding to support a sustainable, long-term research project.

We thank all the participants involved in this research project. Their commitment and contributions were critical to the development of this brief. We welcome feedback and suggestions that can contribute to move this initiative forward.

Appendix

Pictures taken from the last iteration of prototypes designed by the students of the Sustainable Solutions Workshop.

 **Act Calumet**



 **Value Calumet**



 **Flag Calumet**



 **Mini Calumet**



THE FUTURE OF BROWNFIELDS

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A collaboration between:



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