E-COLANT.NET
Ecology - Community - Plant - Net
Biomimicry Launchpad
River Ecological Networks

E-Colant.Net is a startup focused on building an efficient and sustainable system to help rivers adapt to flooding through products that coexist with nature and achieve SDGs.

In the future, residents can easily approach the water’s edge, observe ecology, interact with nature, and gain emotion and consensus to protect streams.
Worldwide Issue: Flooding
The World Resources Institute found that 147 million people will be hit by floods from rivers and coasts annually by the end of the decade, compared with 72 million people just 10 years ago. Flooding also spread infectious diseases, contain chemical hazards, and cause injuries. The sustainability of the city is related to the prevention and control of floods.

Operating Conditions Lens:
Due to the climate change, the 2nd most populous city in Taiwan – Taichung has serious flooding problems. Upstream development and stream cementation have increased the incidence of flooding.

Target 11.5:
By 2030, significantly reduce the number of deaths and the number of people affected by water-related disasters, with a focus on protecting the poor and people in vulnerable situations.

Target 13.1:
Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters in all countries.

Target 15.5:
Take urgent and significant action to reduce the degradation of natural habitats, halt the loss of biodiversity.
Cemented flood control project results:
- Destroy the river ecology
- Less residents enter the river
- The community pays less attention to river conservation.

The overflowing problem of river:
- Insufficient space in the river basin
- Erosion of river embankments
- Insufficient water permeability of the riverbed

Ethos – Social Ecological Networks: The cementation caused the destruction of stream ecology and lost the continuity with the ecology with the mountain area. The vertical dike also reduces the chance for residents to get close to the stream, and loses the attention and awareness of stream conservation.

Life principles:
- Adapt to changing conditions
- Integrate development with growth
- Be resource efficient
Sustainable cities & communities

Flood ➔ River overflow ➔ River bank erosion ➔ Insufficient watershed space

- Impact:
  - Destruction of river ecology
  - Reduce residents’ access to water
  - The community pays less attention to river conservation

- Improve the ability to withstand floods
- Efficient & sustainable stream facilities
- Coexist with the river

**Define Problem Context**

**Function**
- Manage turbulence
- Distribute liquids
- Attach in liquid
- Capture in liquid
- Filter silt
- Store liquids

**Target**
- Efficient & sustainable river facilities
- Balance erosion and accumulation
- Improve the adhesion of plants and soil
- Improve water permeability

**Flow Chart: function-strategy**

- Great hammerhead shark: Reduce turbulence
- Fish scale: Less drag
- Devil’s Claw (Harpagophytum): Attach to animals’ fur
- Marine sponges (Phylum Porifera): Filters food from water
- Tilapia: Filter chemical entities
- Heart valve: Prevent water backflow

We are guided by the Ethos of Biomimicry to reestablish more natural community-community and community-river interactions.
**Research**

**Biological Mechanism**

**Fish scales / Distribute liquid**

The shape of scales causes water flow to streak across fish skin, reducing turbulence and minimizing drag.

**Great hammerhead shark / Manage turbulence**

The shark scales’ ability to bristle in excess of 30-50° angles when the body bends may change the nature of fluid flow.

**Marine sponges (Phylum Porifera) / Filter silt**

There are many small pores on the body wall, and the other end has large pores to filter the seawater out.

**Devil’s claw (Harpagophytum) / Increase attachment**

The sturdy woody seed pods point outwards from the center with smaller hooks that allow the fruit to attach.

**Tilapia / Filter liquid**

Gills also function in monovalention regulation and nitrogenous waste excretion.

**Heart valve / Prevent water backflow**

When the blood is pumped out, the tricuspid and mitral valves at the bottom of the left and right atria will close to prevent the blood from flowing back to the atrium.
Filter water down into the ground

Design Process
Study Model

E-Colant.Net allow sedimentation and encourage the growth of aquatic plants. During heavy rains, E-Colant.Net can concentrate the erosion force in the concave area to balance erosion and siltation. The convex area grabs plants and soil, and introduces part of the water into the groundwater layer, increasing the space for underground flow, making the stream more adaptable to floods, in order to achieve the goal of coexisting with floods.
Module Arrangement Test:

Based on flow simulation test E-Colant.Net reduce erosion and water flow rate, helps to manage water turbulence and mitigate floods.

Grid parts are separately tested to optimize the water filtration and water flow efficiency, so that the water flow can effectively block turbulence in the unit and smoothly lead into the ground. The original design was tested using different shapes and density.
It can form a place for plant growth. The water can pass through the riverbed while keeping the surface from drying up. Residents can easily approach the river's edge.

River cemented wall can provide long life with a minimum of maintenance, but has negative impacts in terms of aesthetics and habitat.

It have low habitat value. Difficult to install, requiring large equipment.

It cannot tolerate a strong amount of water pressure. Relatively ineffective when compared to purpose-designed products.

The cleaned water sustains fish farms and agriculture that support local families. Thus eventually making these services more important over time.

The demand for stone is large, and it is not ecologically sustainable. Watersheds will experience more frequent flooding.

The bank damage needs to be remedied in time to avoid internal stone leakage and affect the stability.

Sandbags are not reliable when it come to durability when exposed to heavy rains and flash floods.

<table>
<thead>
<tr>
<th>SDGs</th>
<th>E-COLANT.NET</th>
<th>Cemented Wall</th>
<th>Rock Gabion Wall</th>
<th>Sandbags</th>
</tr>
</thead>
<tbody>
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<td>SDGs 11, 13, 15</td>
<td>X</td>
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</table>
We surveyed 30 people in the target community and found these deep patterns:

- Most of the existing riverbeds are cement concrete.
- The nearby rivers are mostly used for leisure activities and agricultural purposes.
- Most people think that it's not safe to move around in the river, and the river is not clean.
- They are all interested in planting beside the river and maintaining the river facilities together.

We believe many residents who live near the river experience severe flooding, during rainy season because of cementation.
Market survey and Value Proposition

Customer
- Community Residents
- River Engineer
- Sewer Engineer
- Government

Problem
- Unclean river
- Flooding
- Damage to life & property
- Ecological issues
- Not safe for activities

Solution
E-Colant.Net:
- Support activities in the river
- Lower flood impact
- Improve water permeability
- Increase plant adhesion

Differentiators
- Coexist with the river
- Sustainability awareness
- Innovative product
- Safety
- Eco-friendly

Value statements

Friendly Environment
- Coexist with the nature
- Water recharge to aquifer
- Plants grow in the river

Technological Innovation
- Alternative circular economy
- Sustainable
- Clean up the water turbulence

Green Education

Safety
- Eco-friendly
- Re-connect

Through the new design thinking model (Biomimicry), flooding become abundant groundwater. This is the core value of our new design. Our innovations help re-connect residents and the ecological network. Compared with the existing concrete riverbed, E-Colant.Net is more friendly with the SDGs indicators and life's principles.
**Business Model**

### Supply

**Key partner**
- River Engineer
- Hydraulics Engineer
- Community
- Manufacture Company
- Patent Consultant
- Biomimicry Institute

**Activity**
- Business model design
- Prototype design
- Design for testing
- Market survey

### Need

**Customer relationship**
- Market development
- Sustainable
- Modular

**Customer Segments**
- River engineer
- Business to business
- Household

### Financial

**Cost**
- **Prototype development:** Initial, Structural design, Final design
- **Market survey:** Website management
- **Manpower fee:** Research, Design
- **Equipment cost:** Mold, Structure testing, material
- **Research consultant fee:** Water conservancy engineer, Structural and Environmental Engineer

**Revenue Streams**
- Competition prize
- License: Company pays to use or implement our intellectual property.
- Sponsor
- Government grant

### Next Step:

01 **Apply for patent**
- Obtain intellectual property rights through patent application

02 **Marketing branding**
- Develop diversified applications with technology

03 **Industry Partnerships**

04 **Proof our prototype**
- Software tests of optimized solutions and 3D printing prototypes
R.E.A.D. Lab

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