

USING BIOMIMICRY PRINCIPLES TO DEVELOP AN URBAN DESIGN FRAMEWORK ON CANVEY ISLAND: THE GAS WORKS^{CANVEY}

The implications for the project is that it identifies how nature can be used as a guide for shaping and influencing the built environment.



Using nature as inspiration involves ‘mimicking the functional basis of biological forms, processes and systems to produce sustainable solutions’ (Pawlyn, 2011). As Janine Benyus (2012) states, “Biomimicry isn’t an answer; it’s a way to find answers.”

This project explores the reasoning behind using biomimicry as a design-tool in terms of urban design for a potential brownfield development on the southern edge of Canvey Island, Essex.

Aims

Sustainability is at the forefront of design and as such this project will attempt to integrate a sustainability strategy using biomimicry principles to produce an urban design framework for the ‘South West Canvey Long Term Regeneration Area.’ - Project name The Gas Works^{canvey}.

Design Principles

To understand how the project is to evolve, it was necessary to develop a number of principles based on integrating biomimicry with sustainable design:

- Connecting to the rest of island
- Providing Seafront Access
- Establishing Diverse Public Spaces
- Creating Appropriate Building Height, Scale and Form
- Mix of Uses and Activities
- Sustainable Transport and Urbanism

Design Process

By challenging biology to find innovative design solutions, the goal was to minimise waste and maximise output. SEVEN steps allow for the integration of nature’s form, function, or processes into the urban fabric.

1. Identify

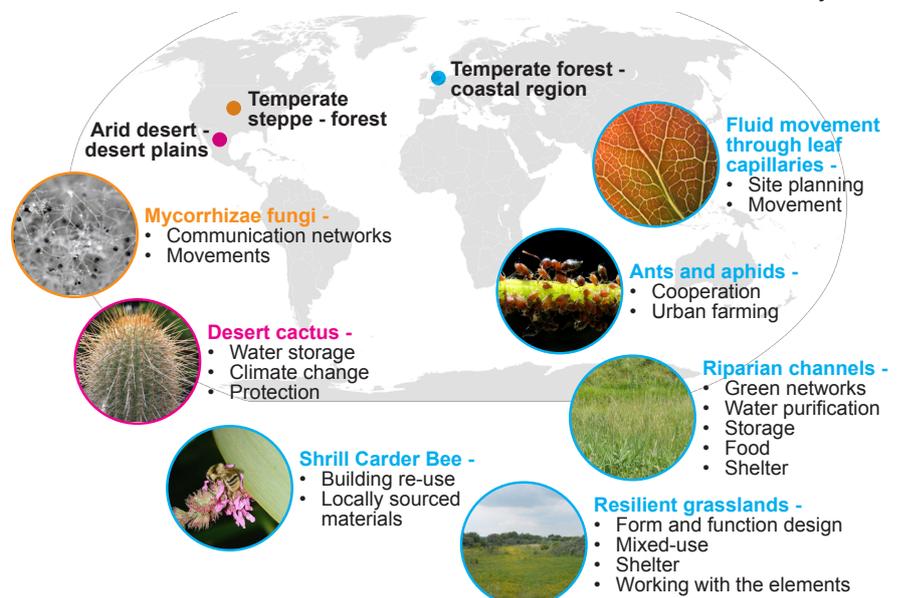
Using the procedures within the Essex Design Guide, a Context Analysis and Site Appraisal were carried out to enable nature’s genius to tap into in the discovery stages. These appraisals identified a number design challenges.

2. Define

The next stage of the process calls for defining the context of the design challenges. This allows for challenges to be grouped together into common elements (e.g. Traffic Management and Permeability relate to movement) and identifies those that can be solved using nature for inspiration.

3. Answer in Biology

This stage finds solutions from nature to discover natural strategies. These are: movement, flooding, climate change, working with the elements, green infrastructure and resource efficiency.



✓ Urban Design Framework.
 ✓ Abstracting processes, functions and designs mimicked from nature to solve the design challenges
 → Sustainable Closed-loop system.
 ↳ Street view of Floating Homes. Community allotments. Variety of housing types. Home Zone. Access to Green Space. Flood-resistant.
 ↳ Bird's eye view of the Town Square. Buildings provide shelter. Shared space slows traffic. Variety of seating options. Flexible space for a range of uses. Attractive edges to the square. Appropriate choice of materials.

4. Discover

With the solutions to the design challenges identified, this stage discovers the biological strategies within nature that solve the challenges, both directly and indirectly. These are:

- Organism movement
- Adaptability to changing conditions
- Expansion
- Evolution.

One example is using the functions and processes of the Shril Carder Bee. It lives in reclaimed burrows and recycles locally-sourced materials to construct nests fit for purpose. In addition, this bee lives in a small manageable community that work together to provide for the hive.

5. Abstract

With examples of nature found for the design challenges we can now abstract design principles from a number of genius organisms/ecosystems on Canvey Island and others located within different ecosystems. These are:

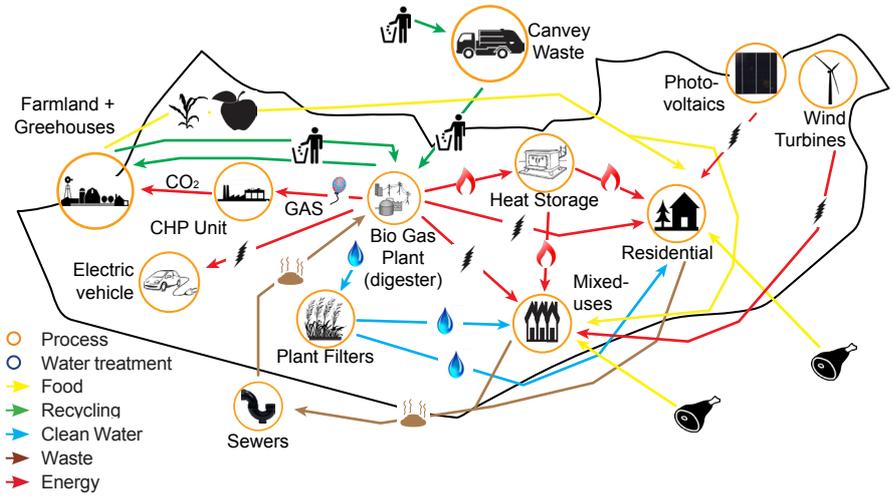
- Leaf capillaries
- Ants and aphids
- Riparian channels
- Resilient grasslands
- Shril Carder Bee
- Desert Cactus
- Mycorrhizae fungi

6. Emulate

With design inspiration abstracted from nature, these were then used to solve the design challenges. By using the capillary movement through leaves it was possible to design a road and cycle network throughout the site. Mimicking the co-operation of ants and aphids ensured that partnerships were created along with urban farming throughout the site.

The resilient grassland informed the design of the buildings blocks and the riparian channels enabled a sustainable method of building water into the development with the addition of water purification. These ecosystems provided solutions to create a closed-loop system.

Throughout the design stage, it was necessary to continually evaluate the designs to ensure that the strategies utilised the form, function, or process to provide a more sustainable solution.



7. Evaluate

By evaluating the project against the Life's Principles developed by J. Benyus (1997), the framework can be tested to find what level of sustainability can be achieved. It is clear that the design for the development needs to achieve a number of objectives from the outset of this project. The strategies adopted are interlinked, the same as ecological, environmental, economic and social sustainability are entwined.

Conclusions

The overall goal of using biomimicry is to ensure that awareness of the natural landscape is created by looking to nature for inspiration. In addition, it puts sustainability is at the forefront during the design process.

Nature recycles all materials using what is

readily available, builds from the bottom up and doesn't use synthetic chemicals. The challenge was to attempt to mimic nature as closely as possible. Although there are limitations, it acknowledges that there is the potential to create minimal disruption to the environment by actively learning from it.

Lessons Learned

Following the successful completion of the project, the following lessons were learned:

1. Potential to minimise infrastructure demands of regeneration
2. Promotes team working by working with biologists and ecologists
3. Successful strategies from micro to macro levels
4. Raises awareness of the environment
5. Integrates the need for design for climate change ●