Small scale and quick pulse

Middle scale and slow pulse

Large scale and disastrous pulse

A Prosperous Way Down | Odum & Odum | 2001
Producer

Descent

Consumer

Climax

Sucession

Time
Producer

Climax

Growth

Descent

Consumer

Climax

Succession

Time

A Prosperous Way Down | Odum & Odum | 2001
The building's mass is 71% concrete attributed entirely to its 6" foundational slab. A combination of the timber frame truss system with integrated steel tension members make up the next most significant portion of the building's structure. There is a strong likelihood that all timber was felled onsite, yet transportation of materials was not accounted in the scope of this Life Cycle Analysis.

Biogenic Carbon was accounted for in this report. The carbon sequestered during tree growth of timber used offsets the carbon impact of all materials in the project by 55%.
1930-1950: Mill is at its height of operations
Market Value of Agricultural Products Sold in Tillamook

$123,278,000

2% $2,010,000

98%

Market Value of Crops Sold (2% of Total)

<table>
<thead>
<tr>
<th>Crop Type</th>
<th>Market Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grains, Oilseeds, Beans &amp; Peas</td>
<td>10%</td>
</tr>
<tr>
<td>Vegetables, Potatoes</td>
<td>32%</td>
</tr>
<tr>
<td>Fruits, Nuts, Berries</td>
<td>3%</td>
</tr>
<tr>
<td>Nursery, Greenhouse</td>
<td>29%</td>
</tr>
<tr>
<td>Other</td>
<td>28%</td>
</tr>
</tbody>
</table>

Market Value of Livestock, Poultry and Products Sold (98% of Total)

<table>
<thead>
<tr>
<th>Livestock Type</th>
<th>Market Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cattle &amp; Calves</td>
<td>6%</td>
</tr>
<tr>
<td>Milk From Cows</td>
<td>78%</td>
</tr>
<tr>
<td>Sheep &amp; Goats</td>
<td>.009%</td>
</tr>
<tr>
<td>Aquaculture</td>
<td>15%</td>
</tr>
<tr>
<td>Other</td>
<td>.00016%</td>
</tr>
</tbody>
</table>
TILLAMOOK COUNTY ENERGY DISTRIBUTION

Bonneville Dam Power Transmission

99% of the power for Tillamook travels 120 miles from the Bonneville Hydroelectric Power Plant. Only 0.6% of power is coming from Tillamook's own resources.

BONNEVILLE POWER DISTRIBUTION

- Tillamook: 8.8% - 3 Million kWh
- PNW: 91.2% - 671 Million kWh

TILLAMOOK POWER SOURCE

- Tillamook Digester: 0.6% - 3 Million kWh
- Bonneville Dam: 99.4% - 671 Million kWh
"DEQ wrongly assumes that permits issued to confined animal feeding operations, or CAFOs, by the Oregon Department of Agriculture actually prevent the discharge of bacteria into surface water."
- in lawsuit filed by Hayes Oyster Co. towards Tillamook Dairy Farms,

Seasonal Oyster Harvesting Closure

lower bay
upper bay
flower pot

closed
conditionally closed: flash floods after dry season
conditionally closed: > 2" rain within 72 hr period
conditionally closed: > 1" rain within 24 hr period

TEP Comprehensive Conservation and Management Plan. 2019

Goals by the year 2028
Primary concerns:
- bacteria
- dissolved oxygen
- sediment
- temperature
Secondary concerns:
- toxics
- nutrients
- impacts of ocean acidification

Wastewater effluents from the city are captured in local sewage treatment plants, however the manure from the dairy farms that does not make it to the digesters ends up in the estuary of the bay.

LUMBER INDUSTRY FLOWS

theHeadwaters.co – “Timber Life Cycle”

LUMBER ECONOMICS

in 2019 TILLAMOOK, OR made $21,543,000 from Lumber sales, which accounts for 28.62% of total lumber sales in Oregon.

STIMSON LUMBER COMPANY

Stimson Lumber Company owns and manages approximately 175,000 acres of commercial timberland in northwest Oregon. It is Stimson’s policy to open its lands to those forms of public recreation that are compatible with the management goals and activities on the forests.

Their Mission:

“We are an efficient, PROCESS-DRIVEN COMPANY focused on managing a seamless supply chain — from a Stimson tree to a retail distribution center. Our team efforts result in a STABLE, SUSTAINABLE BUSINESS that benefits our customers, employees, shareholders and communities. Like generations before us, we are committed to growing trees and operating mills in a sustainable manner to CREATE VALUE FOR STIMSON AND COMMUNITIES in which we operate.”
RESIDUAL LOGGING WASTE

60% of tree removed from forest as round log

40% Residual above/belowground (live) carbon remains in forest

Implications:
- Threat to biodiversity
- Bark beetle hazard
- Obstruction to regrowth
- Wildfire risk
NEAR SCAPE CORP: In the late 1990s, the relatively inactive airship was acquired by R&D aviation company Near Space Corp. The company specializes in weather balloons, low atmospheric space flight, and payload recovery.

TILLAMOOK AIRSHAVE: During WWI Tillamook became a port for the US Navy lighter-than-air project, using blimps to guard the ships on the coast. The hangars were a massive effort of timber engineering measuring 307 feet long, 296 feet wide, and 192 feet tall. They served their intended purpose for 6 years before being turned over to the local government as the Fort of Tillamook Bay. The airport became a municipal landing and take-off strip, which still used today. In 1992, Hangar A was destroyed in a fire, Hangar B remains. In 2003, the new Space Corporation began using the site for atmospheric research.

PACIFIC RAILWAY & NAVIGATION: Also known as Park (Tillamook & Nobby), the development of the railway system through Tillamook made log transportation much easier. The rail system also brought to Tillamook its first railroad.

FISHING INDUSTRY: With 5 major rivers meeting at the mouth of the Tillamook Bay, the watershed was recognized in the late 1880s as rich in both salmon and freshwater catfish. The shellfish industry also took root in the early 1900s due to the bay’s low salinity, a favorable condition for producing quality oysters in particular.

MORNING STAR TRADE SHIP: In the few years following the settlement, it was quickly realized that seasonal wood and seine resources that the valley didn’t provide. As the mountains a terrain was challenging for transportation goods, settlers built a trade ship using salvage ship parts and harvested timber for trading in order to avoid travel.

TILLAMOOK DIGESTER: Designed to take the manure from the dairy cattle to extract the methane for natural gas power it currently supplies 9% of Tillamook’s power grid.

TILLAMOOK AIR MUSEUM: Second only to the 1300000 tourists the Tillamook Creamery brings to the Tillamook Air Museum contributes 80000 yearly visitors. In 2014 some of the collection was moved to Macchi, OR in 2016 the classic aircraft followed.

THE TILLAMOOK BURN: A series of fires in 1933, 1934, 1945, 1951 destroyed much of the land. In the years following, there were efforts to use the burned wood. Huge reforestation efforts were made by locals and the US government.

TILLAMOOK CHEESE PRODUCTION: Though it was the main product, the first cheese factory wasn’t established until Merriman Farms in 1944. At this time Peter McTavish brought his expertise to the land. In 1956, the Tillamook County Creamery Association was formed.

TIMBER BOOM: Surrounded by contiguous forests, Tillamook capitalized on the resource starting in the late 1880s. The industry experienced a dramatic downturn following the Tillamook Burn; it is seeing a major resurgence in the last several decades.

SETTLEMENTS AND DAIRY BOOM: Joseph Cheeseman is known to be the first white settler in Tillamook, he is the guy who lived in a sod cabin. The settlers that followed him introduced dairy cows and this became their main source of production.
WILDFIRE HISTORY

Starting in the early 1930's, Tillamook experienced a series of significant burns that deimated as much as hundreds of thousands of acres. These burns were occurring at the tail end of the timber boom and much of the land had been reforested. Since the major burns, there were major reforestation efforts.

From 2001 to 2019 Tillamook Lost near 125k Acres of tree cover, equivalent to a 19% decrease in tree cover since 2000.

60% Tree removed from forest as round log
40% Residual above/belowground (live) carbon remains in forest

TREES COVER LOSS IN TILLAMOOK

Brennen Donnelly (M.Arch '21)
TILLAMOOK LUMBER DISTRIBUTION
- Current mill operations produce upwards of 126 million board feet annually
- Producing solely dimensional lumber
- Product is shipped all over the US, majority sent to home centers across California

PROPOSED SATELLITE DEBRIS PROCESSING ACROSS TERRITORY
- Placed accessible to major logging areas
- Built to house equipment and wood prepared for biochar production
- Drones collect from crop points and return to the Port of Tillamook

TIMBER FLOWS
SYSTEMS INTRODUCED:

EXTENSION OF LUMBER MILL:
- CLT PRODUCTION FACILITY
- BIOCHAR PRODUCTION FACILITY

FURTHER UTILIZING WASTE FROM DIGESTOR:
- ADDRESSING EFFLUENT TREATMENT
- USING EFFLUENT FOR SAPLING FARM

AIRFIELD:
- DRONE OPERATION DEVELOPMENT FOR REFORESTATION AND DEBRIS REMOVAL

OFFSITE:
- LOGGING DEBRIS PROCESSING DEPOTS
ADDRESSING THE LANDSCAPE

ECOLOGICAL CORRIDOR
The Greenbelt will bridge the gap between the Cape Mesa range and the Trask river for wildlife and vegetation.

Additionally, the wetlands will undergo a major revitalization for treating on site runoff.

Brennen Donnelly (M.Arch '21)
RAILS TO TRAILS EXTENSION

As part of the Rails to Trails conservancy and recreation effort, the Port of Tillamook Bay is set to be the terminus for the Salmonberry Rail Trail. The proposed bike network at the POTB will be a pedestrian friendly extension to the rail trail bringing people in to explore.

The trail will meander through the wetlands, forests and lead to higher ground for a viewpoint of the Tillamook Bay.
DESIGNATED AREAS / ZONING

FORESTRY RESEARCH

Inspired by a 1,700 acre conservation forest at Clemson University, this experimental forest will serve as a site where foresters, researchers, and students can explore progressive silviculture theory and practice.

In conjunction with the proposed forestry research center, the area will serve as an invaluable demonstration resource for future generations of scholars and public-policy makers.

Brennen Donnelly (M.Arch '21)
Kahei Lee + Nita Tjahjana (B.Arch '19)
With 32,000 dairy cattle, a limited municipal solid waste source, Tillamook has the opportunity to convert its varied waste streams into energy, increasing its independence and facilitating the transition from fossil fuels.

The Port has a richly layered history of agriculture, manufacturing, tourism, and aviation. After studying the infrastructure, demographics, ecology, and Future Land Use Plan (FLUP), we have identified that a waste to energy facility can help to alleviate many of the issues created by unsustainable waste management practices.

Tillamook People’s Utility District (PUD) is a customer-owned utility providing electric service in Tillamook and neighboring counties. The PUD purchases power from the Bonneville Power Administration (BPA), approximately 122 miles from the Port. Since Tillamook is prone to severe flooding and relies on a distant energy source, power outages in the area are a common issue impacting the lives of its community members.

Our design intervention for the POTB is a waste management facility located on the site of Hangar A. This scheme expands on the existing anaerobic digester, increasing capacity to 9,000 cattle while creating a Waste to Energy facility that processes municipal solid waste to generate electricity for the region. An efficient and productive waste management system is vital to the longevity of our natural ecosystems and a necessary step to a more sustainable future (in Tillamook).
149,241 tons of municipal solid waste per year is collected and hauled to generate enough electricity for 7,949 homes.

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42 dairies within five miles of the POTB have over 7,000 cattle

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1,000 Dairy Cows

33,000 cows:

POTB have over 7,000 cattle

1% other

32% coal

7% wind

18%0%

17% natural gas

40% hydro

34%

52.5%

53%35% 25%25% 25%

181 ton storage tanks

1,810 ton storage tanks

25%25% 25%

837lbs diesel fuel equivalent per year

68%

25%

13%

750 Mw output

200,000 gallons of manure

50%

50%

4% 53%

13%

25.8% 25%

54% 54%


Columbia University, 2004

U.S. Waste to Energy Association, 2006

United Kingdom

South Korea

United States

France

Germany

Norway

Mexico

Brazil

Japan

CHS grain facility

Julia May + Taylor Stevens (M.Arch '19)
Compressed natural gas (CNG) from local sources will provide the fuel for the turbines, allowing the plant to produce electricity for the Tillamook area. The energy production from the turbines will be used to power the building and any surplus will be exported back to the Tillamook Powerline District (TPUD) substation, reducing the area's reliance on imported energy.

The facility is comprised of an anaerobic digester, a waste-to-energy plant, and a renewable energy research center. The anaerobic digester will have a capacity to process methane from 9,000 cattle, with the potential to reduce the area's impact on animal farming production by providing a sustainable, organic, crop center for tours. Visitors will have the opportunity to learn about the history of energy and waste management in the area, and one mixes the sitting together to minimize post-combustion waste.

The facility is located on the port, which is then delivered to local homes and businesses. There are two gantry cranes that exist in this area, one for road construction, in landfill daily cover, aggregate production, and cement blocks. Metals can be reused for new steel and aluminum production. Fly-ash is sold to market as a inert ash and metals. The plant will have the potential to reduce the area's impact on road construction.

Water travels in a closed loop through the turbines as steam and is sent through a boiler. The heat from the furnace is then sent through a boiler. Once the waste is separated it is sent through combustion chambers before entering the Tipping Hall. Waste is unloaded on the港, which is then delivered to local homes and businesses. There are two gantry cranes that exist in this area, one for road construction, in landfill daily cover, aggregate production, and cement blocks. Metals can be reused for new steel and aluminum production. Fly-ash is sold to market as inert ash and metals. The plant will have the potential to reduce the area's impact on road construction.

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