

Vertical Farming Towers

Could Feed Entire Bay Area by 2100

Concept by Anne Fougeron, FAIA
for City of the Future Competition

Background: Pre-eminent Bay Area architect Anne Fougeron, FAIA came up with this conceptual presentation for a “San Francisco City of the Future” competition as a way to address environmental and human concerns. As our population continues to grow, we need to find new ways to produce the food we need, locally if possible.

When I saw this futuristic vision, I asked, “So, how do we get there from here?”

Radical inventions require extensive testing and prototyping. So let’s try building one here and use it as a testbed - not just for technology, but also looking to discover the key factors that influence quality of life, property value, maintainability, and ownership.

It would be nice to attract some real backing for a tangible proof-of-concept or pilot project. After all, San Francisco prides itself on its progressive politics, so let’s put that zeal to good use.

- Rebecca Firestone

Rising Food Prices

Food prices have jumped **75%** since 2005, and are likely to increase further over time.

Income growth, climate change, high energy prices, globalization, and urbanization are transforming food production, distribution, and consumption.

Global demand is rising, threatening the livelihoods and nutrition of poor people everywhere.

A **new area of hunger** is emerging in developing countries: even middle-class urban dwellers are being priced out of the food market.

Arable Land

By 2108 global population could be 10 billion.

As of 2008, over 80% of potentially arable land worldwide is already in use. **Where will we find the farmland we need?**

Distribution

By 2040, 80% of the world's population will reside in cities, possibly displacing agricultural land and increasing transport distances.

How will we feed ourselves?

Today's Food Chain

Americans import \$52.5B worth of agricultural products each year.

Food in the U.S. travels an average of **1726 miles** from farm to supermarket.



In the Bay Area Alone:

Bay Area population in 2008: **7.2 million**

Bay Area population in 2108: **17.2 million**

Ecological “foodprint” size: **3 acres**

Acres required to feed 2108 pop: **51.6 million**

Total size of California in acres: **105 million**

First Came the Slow Food Nation...

Slow Food Nation proposed the revolutionary notion that slower can be better when it comes to food production and consumption.

Now it's time to cultivate a second revolution:

urban agriculture.



Urban Agriculture Strategies

Rooftop Gardens
Underground Farms
Agricultural Towers

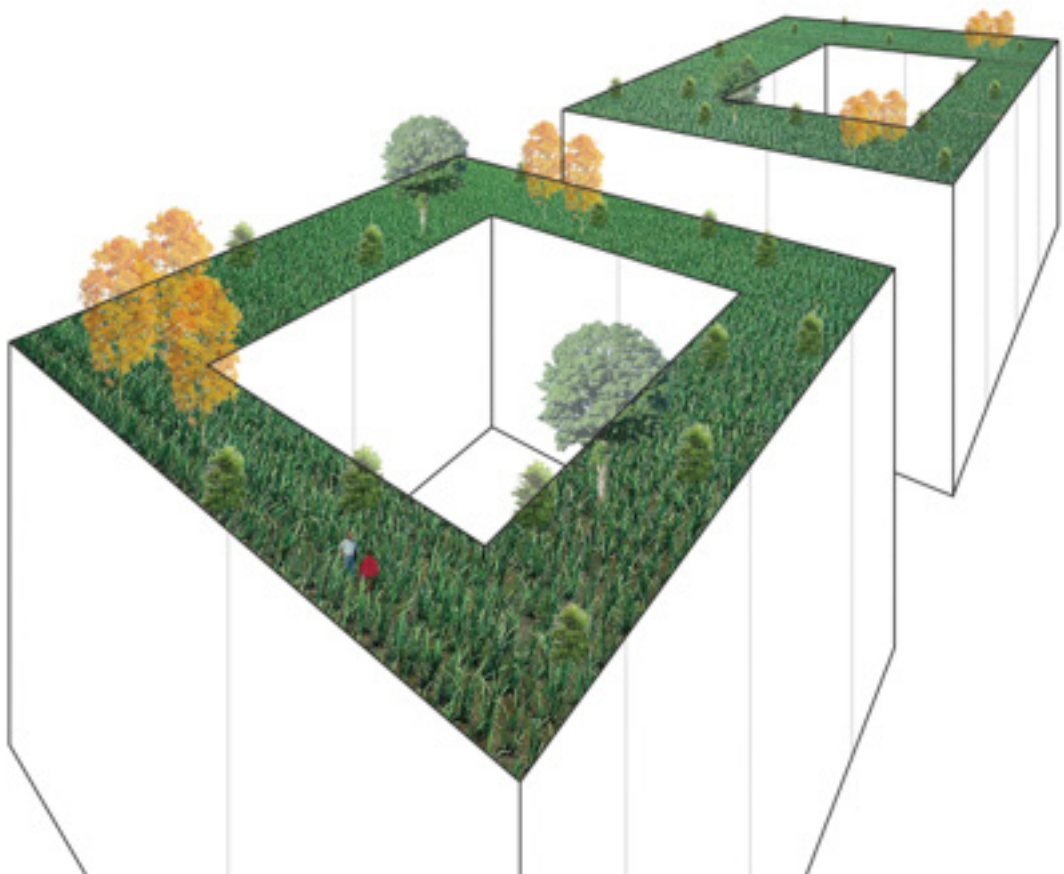
Vertical farming goes up instead of out.



Rooftop gardens could be open-air or greenhouse-style. Hydroponic growing techniques don't use soil, so there's less added weight than with conventional dirt farming. Still, I suppose existing buildings might need structural reinforcement to support a rooftop garden.

Rooftop Gardens

Use existing flat roofs as urban agricultural space, as well as platforms for solar panel arrays.



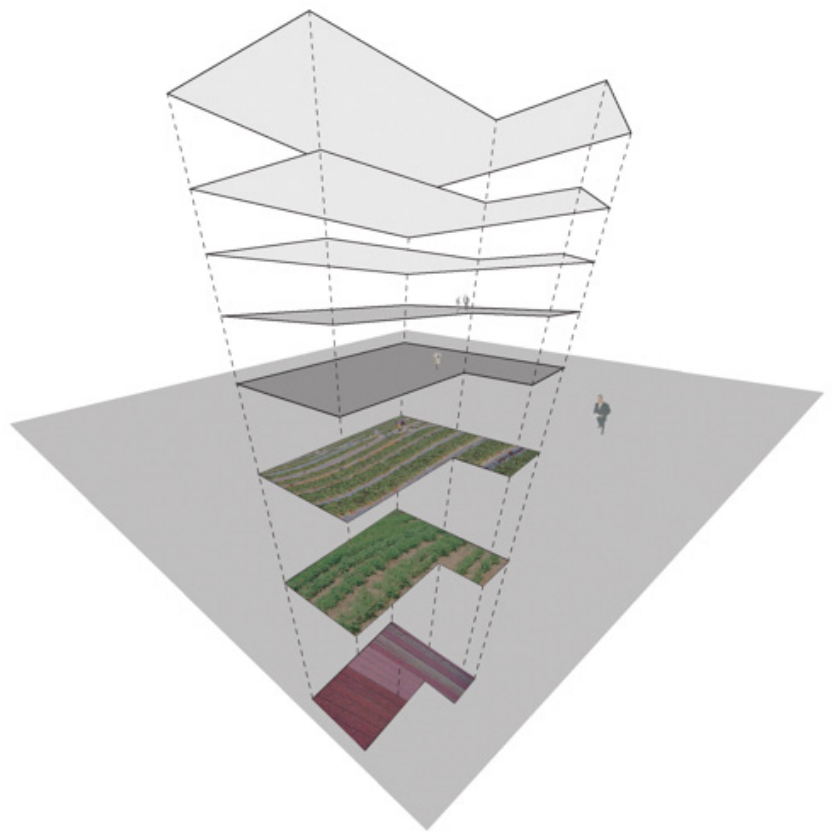
Not all farming is food crops. The most advanced indoor farmers in the Bay Area today are marijuana growers. There are also areas of agricultural land devoted to non-food growing - tulips in Holland. However, strawberries are often grown indoors,

Would we have livestock in these towers? Apparently, chickens and even pigs might work. (Humankind cannot live on carrots alone.)

Underground Farms

In our potential future in the year 2108, cars are banned from the city, leaving millions of SF of unused garage space. This space could be re-purposed as urban farms.

Powered by solar panels and wind turbines, the farms would be irrigated by gray water from the floors above.



If you visit Dickson Despommier's web site at www.verticalfarm.com you'll find a well-developed concept with studies on subjects such as maximally viable crop profiles, socioeconomic implications, various growing systems and growing mediums, and profitability.

Hydroponics isn't the latest word, either. Now it's **aeroponics**.

Here's an interesting quote:

"Britain's MI5 security agency operates on the famous maxim that any society is only four missed meals away from complete anarchy."

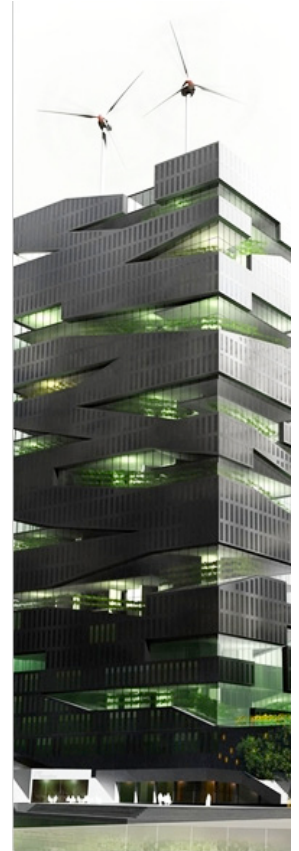
Agricultural Towers

Pioneered by Dr. Dickson Despommier, the vertical farm is an urban tower where food is grown.

This notion could transform food production not only for the Bay Area, but around the world.



The images on this page are visualizations by various architects such as Rolf Mohr and SOA. No price tags on any of them as of yet.



Crops won't fail due to weather or drought, but pests may still be an issue even indoors. There's also no guarantee that indoor farms will be organic, although concentrations of chemicals indoors would need to be carefully thought through.

One Tower Could Feed 50,000

If one floor is 250 x 300 (75,000 SF) and there are 40 floors, you could feed 50,000 people.

In the Bay Area, 200 towers would feed 10 million people.

Advantages

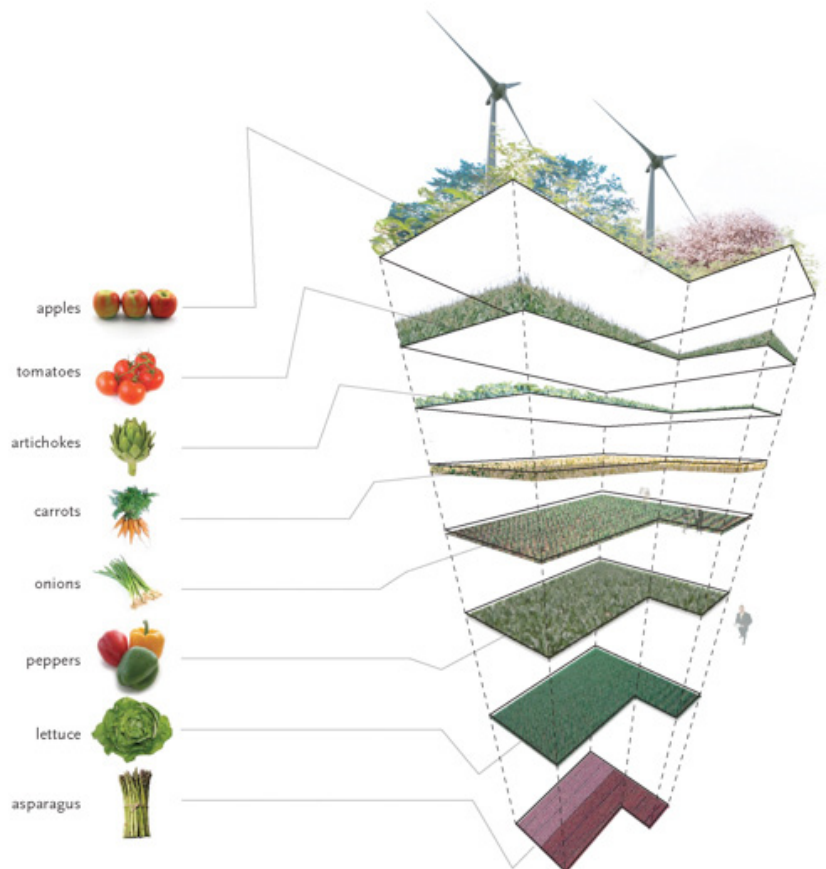
Year-round growing season

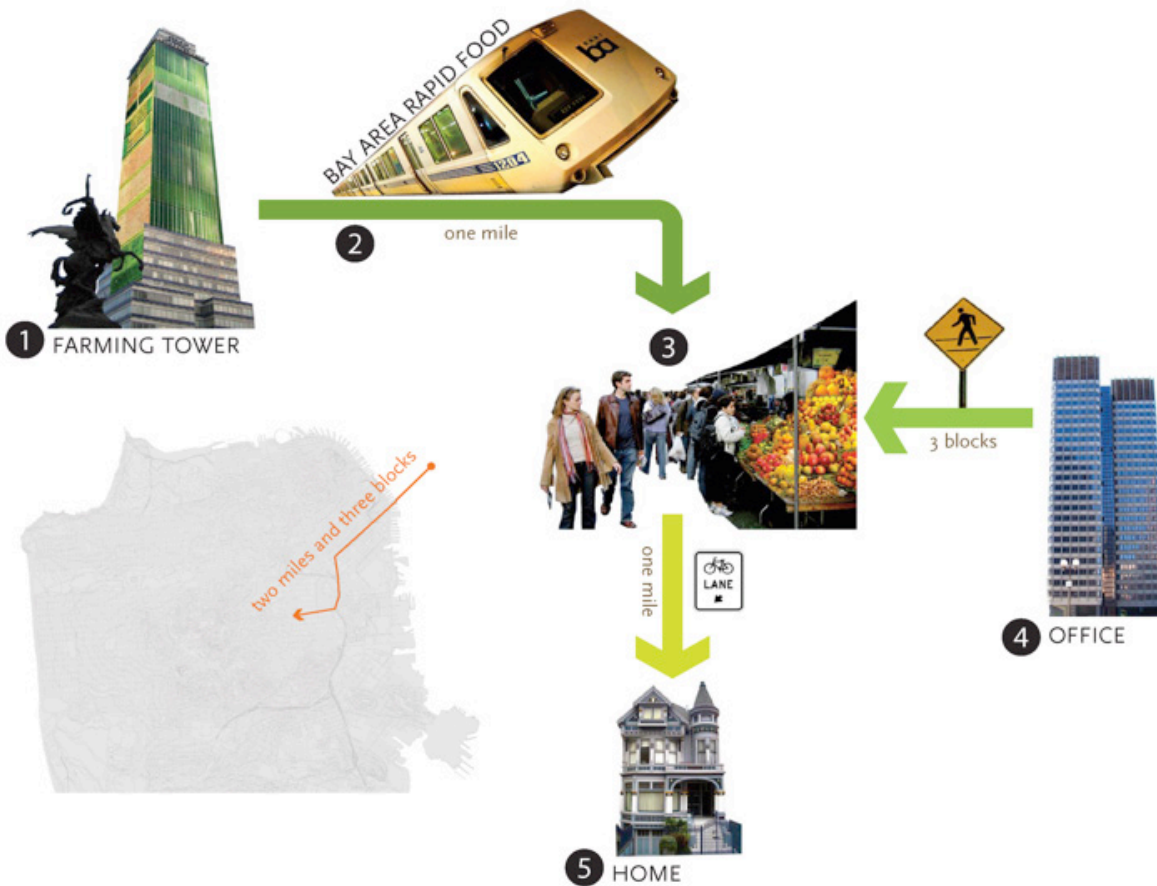
Less risk of crop failure

Locally grown, organic

Gray water reuse from municipality

Reduced fossil fuel





REDUCED 'FOOD-PRINT'

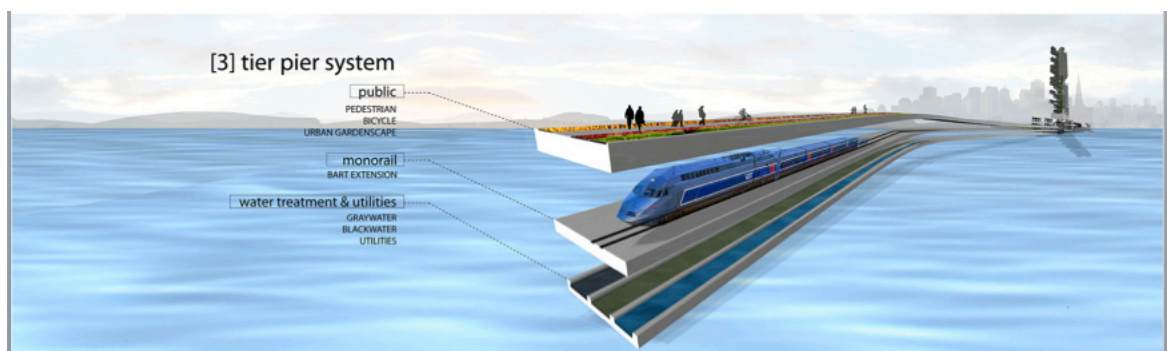
Three-Tier Pier System

Upper - public use

Middle - monorail transportation

Lower - gray water from city, treatment plant

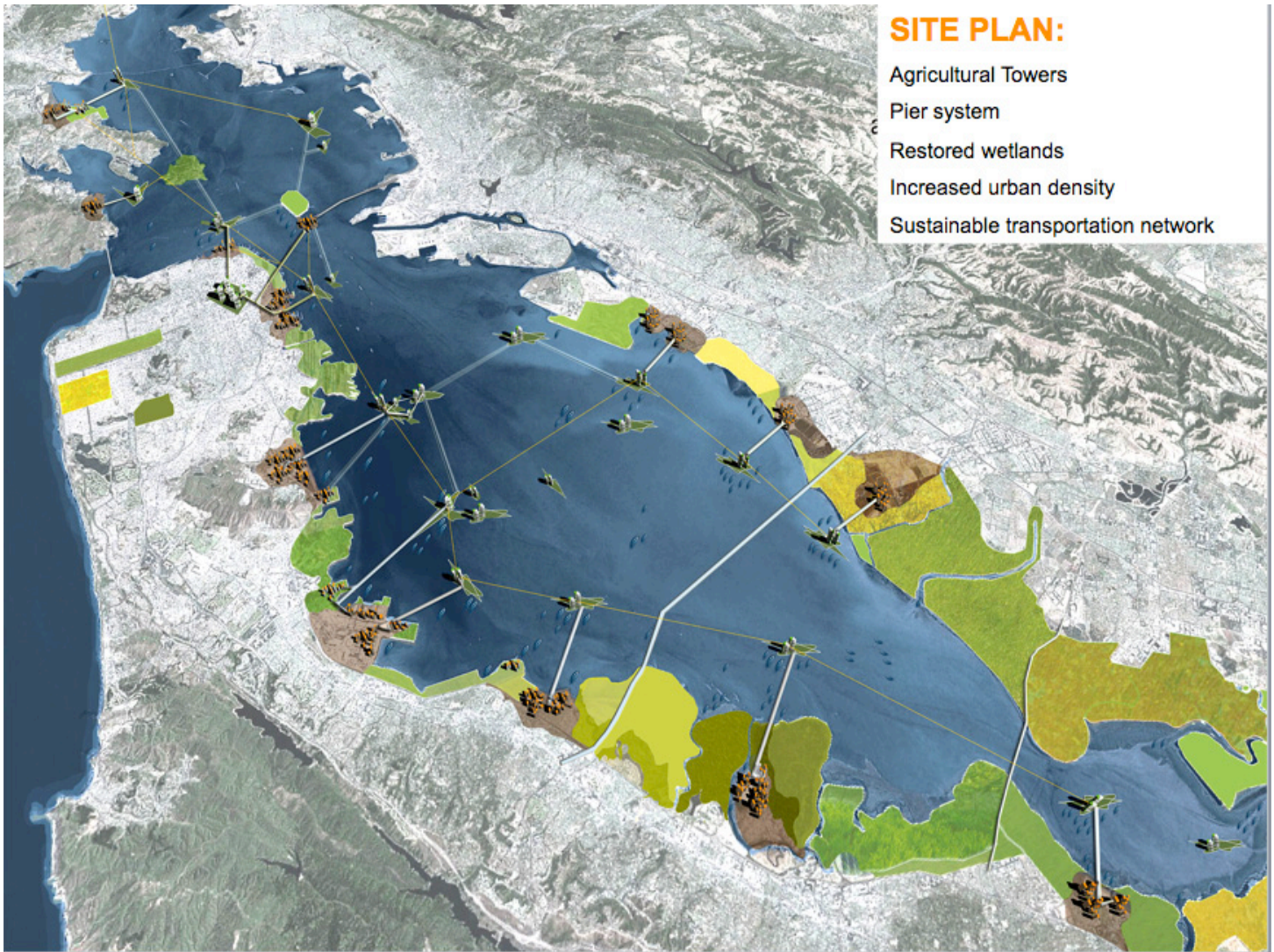
Bottom - fish farm or tidal energy harvesting





Anne Fougeron's Vision

Mixed use agricultural/residential tower with PV skin, wind turbines, irrigation.



SITE PLAN:

- Agricultural Towers
- Pier system
- Restored wetlands
- Increased urban density
- Sustainable transportation network

The “sustainable transportation network” seems an afterthought, almost a given. While this is probably a lesser problem to solve, this concept would need further development.

End Vision: A Network

I’d also like to know who would subsidize all these towers. Community associations? Venture capitalists? Local governments? Possibly a combination of all of these.