Policy Strategy E – Freeway Greening Retrofits

Freeway corridors represent immense infrastructure investments within the built environment, and they occupy tremendous amounts of real-estate right-of-way that course through some of the most disadvantaged communities in our region. The association of high-trafficked freeway corridors and near roadway air pollution is well established. The freeway infrastructure also offers many opportunities to directly mitigate on-going vehicular emissions and lead the process of transforming and re-stitching the urban fabric to become infrastructures of health equity.

The California Department of Transportation (Caltrans, District 4) has stated their commitment to becoming proactive leaders in rectifying some of the legacy barriers and damages the freeways have wrought in terms of environmental justice and equity. Similarly, the Air District is actively working with local jurisdictions and the state to secure state and federal funds to effect policy solutions concerning the greening retrofit of our regional freeway infrastructure.

This policy section outlines four freeway greening retrofit strategies that can be pursued in any combination:

- E.1 - **Greening of the freeway right-of-way with trees and living walls -** (this is complementary to vegetated tree buffer outside and along freeway right-of way, see policy strategy A) and include installation of the "next generation" of living green walls integrated with sound barriers.
- E.2 - **Design and establish under-freeway public space and parks** - provide positive community linkages and refuge in what is often an unsafe transit hazard. Incorporate green wall features on pillars and under structures.
- E.3 - **Develop strategic intermodal "Goods Movement" improvements** – include as part of comprehensive planning and upgrades to freeway corridors (e.g., dedicated ZEV truck lanes; grade/interchange upgrades, separated electric freight rail infrastructure).
- E.4 - **Develop and design freeway "lids," "caps," and "land bridges"** – target green passageways/linear parks across the freeway zone which also function to absorb/mitigate emissions.

Given the amount of capital outlay required and the long planning-to-implementation timelines often involved, the first steps for these retrofit action goals are to establish policy visions that can begin the multi-step engagement, advocacy, and collaborative planning process.

Policy E.1 – Greening of the Freeway Right-of-Way with Trees and Living Walls

Freeway rights-of-way (ROW) are potential locations to strategically plan for tree/biofilter planting compatible with overarching freeway safety, operation, and maintenance regulations. Where applicable and allowed, planned trees should also be matched with vegetated tree buffers outside of the freeway sound walls where residential or other sensitive uses are directly located (see policy A).

There are many potential opportunities to introduce trees within the large, landscaped areas around freeway interchange and ramps. Already, many freeways in urbanized areas have some form of sound wall barriers that can be further improved and "greened" for air pollution mitigation including placing layers of trees alongside them or weaving next generation green vegetative components in as part of the wall. Freeway rights-of-way, in some cases, may also provide opportunities to install parallel active transit bike paths (bike highways) that are separated from vehicular traffic by various layers of the above-mentioned greening enhancements.[1]

Left: Neighborhood Plan to increase trees as biofilters along and within the freeway ROW (e.g., at interchange areas). View of East Oakland along the I-880 freeway at 98th Ave. (map by Air District staff).

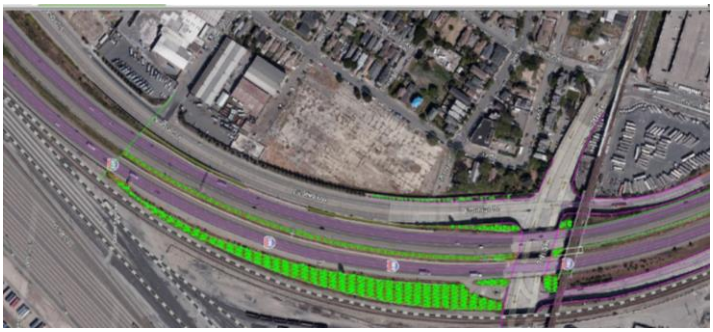
Utilization of Moss Walls

Moss and lichens can also be part of living wall systems and can trap five-times as much CO2e as other trees (see 100k Trees for Humanity explorations in current research developing bio-receptive concrete to foster the growth of lichens and moss) if installed with proper irrigation. These types of bio-reactive installations can also be part of greening of freeway support pillars.

On sections of freeway with on-ramp loops, medians, and sufficient shoulder areas, increased tree canopy can be targeted with adherence to Caltrans maintenance standards. This image shows a targeted section of I-880 freeway (across from Oakland Coliseum) where opportunity areas for planting are highlighted that could be installed as a complement to tree buffers alongside the freeway right-of-way.

[1] Regional and local jurisdictions should work with State of California DOT in their current planning efforts to identify locations and accommodate bike "highways" and bikeways where feasible in the ROW (See 2019 Caltrans Bike Highway Plan and Bike Plan).

CASE STUDY: West Oakland Freeway Biofilter/Greening Design Study



Above: Proposed biofilter greening locations within Caltrans ROW in West Oakland (map by Urban Biofilters/WOEIP as part of an Air District directed study, 2018).

In 2018, the Air District received a State Transformative Climate Community (TCC) planning grant to work with Urban Biofilters and the West Oakland Environmental Indicators Projects (WOEIP) to model, study, and design an appropriate biofilter/urban forestry strategy within the freeway ROW that could mitigate vehicular pollutants and significant diesel PM from port truck along 7th Street (See map above). The project as modeled would have many air pollution health benefits over 40 years including the sequestration of carbon/GHG and the removal of 360lbs of PM 2.5. In addition, the project would help reduce health care costs for adjacent residents and provide stormwater runoff reduction and filtration benefits.

Background

This biofilter study included dispersion modeling inputs of point sources of pollution (black carbon, diesel PM, benzene, etc.). Roadway data was included based on cell phone data and truck counts data from the Port. The model was then compared to with collected data from the recently completed "100-block x 100-block" (BAAQMD, Aclima study 2018).

Some of the biofilter study findings included:

- Determination that there is significant PM going through the 7th St. under-freeway on-ramp/bridge area.
- The proposed project could provide an estimated storage of 1350 metric tons of CO2e.
- iTree[2] estimates show that this project, over 40 years, could remove 360 lbs. of PM2.5, 1658 lbs. of NO2, 8750 lbs. of Ozone, and 227 lbs. of SO2. In total, this would represent an estimated $359,140 of health care cost reductions.
- This project could also create stormwater cost benefits of $41,906 by avoiding 4,689,609 gallons of runoff, and the interception of 11,363,564 gallons of rainwater.

[2] iTree is a software suite from the US Forest Service that provides urban and rural forestry analysis of how tree selection, size, and placement in a specific area can generate multiple benefits including improved air quality.

Policy E.2 - Design and establish under-freeway public space and parks to provide positive community linkages and refuge in what is often an unsafe transit hazard.

Local jurisdictions may seek to proactively work with Caltrans on designating targeted under freeway areas to become active public spaces that can incorporate park-like elements and improve what are typically unsafe or hazardous under-crossings. Not only do these "parks" potentially create some active space and respite from the overhead freeway condition that often bifurcate neighborhoods, but they also create green buffers to wind-swept and settling roadway dust that accumulates around the freeway.

A key consideration that would typically need to be addressed is the attraction or appropriateness of such under-freeway areas, whether improved or unimproved, for use as encampment spaces for unhoused populations. While some jurisdictions may opt to fence in these areas another approach is to create collaborative stakeholder engagement and stewardship agreements to develop spaces that have active uses. Given the current housing affordability and homeless crisis, designated places for safe unhoused camping should be identified if any persons are to be displaced by under-freeway improvements.

CASE STUDY - Chicano Art Park, Barrio Logan San Diego

A precedent-setting example of comprehensive under-freeway public space greening is the Chicano Art Park in Barrio Logan, San Diego. In 1963, the I-5 freeway was constructed through the long-existing Chicanx neighborhood of Barrio Logan, bisecting a community already severely impacted by encroaching industrial/port land-uses. By 1967, resident activists started demanding that the 1.8-acre space under the freeway be granted as a community park.

The City and State initially agreed to these demands. However, in 1969 the community felt deceived when the State Department of Transportation started building a California Highway Patrol station on the promised site. Activists and people from the barrio shut down the construction and occupied the site for 12 days while starting cultivation of gardens and installing art murals. The demonstrations and continued demands for the park intensified until the City and State reached a deal to find another location for the police station. Finally, in 1970, the use as a park was secured. Many of the initial paintings and murals started by *El Congresso de Artistas Chicanos en Aztlan* still adorn this well-loved and utilized park.

Policy E.3 -- Develop strategic "goods movement" improvements as part of upgrades to freeway corridors including dedicated ZEV truck lanes; inter-modal transit options; grade/interchange upgrades.

Freeway "Goods Movement" improvements might include strategies to:

- Coordinate goods movement strategies and plans with County, Regional and State agencies.
- Establish truck-only lanes to separate trucks from other mixed-flow traffic to enhance safety and/or stabilize traffic flow.
- Build parallel inter-modal Port → Train facilities to reduce good movements by trucks and, where feasible (grade-separated electric rail corridors.
- Meanwhile, in addition to addressing goods movement efficiencies localities might consider to de-commission/shut-down certain non-critical freeway segments (such as proposed for the Central Fwy. In San Francisco or the I-980 Oakland)

Given the issue of jurisdiction, many cities in California tend to take a hands-off attitude when it comes to policies affecting the design/planning of freeways that run through their communities. Nevertheless, proactive city or county policies can create an advocacy opening to work with the California DOT (Caltrans) and other agencies to enact transformative changes to the local freeway infrastructure.

One significant joint areas of interest with relevance to local economy and health impacts are considerations of the function, capacity, and long-term prospects of "goods movement" along freeway corridors, especially when key origin or destination points are involved as part of the local planning context. The movement of goods from ports via trucking fleets to peri-urban distribution hubs and the parallel movement of freight trains are a key function of the general freeway-industrial corridor and the most significant source of localized diesel pollution. While transportation planners may be concerned with traffic flow efficiency and minimizing conflicts between commuters and freight trucking, city economic development departments may be concerned with encouraging productive economic upgrades, public health officials will certainly be concerned with mitigation and equitable distribution of the negative externalities of such "goods movement." There are many opportunities then for proactive and collaborative planning and policy engagement as an issue of environmental justice and air pollution.

For example, the Alameda County Transportation Commission (CTC) partnered with the Metropolitan Transportation Commission to jointly develop the 2016 Alameda County Goods Movement Plan and, with the Air District and Caltrans, are collaborating on developing comprehensive regional goods movement strategies and plans. These types of joint long-range planning are being developed to ensure consistency between plan goals and input from a wide range of stakeholders around the region (including city and community stakeholders) and thereby provides a more complete landscape of the goods movement system in the region and especially the relationship to community health.

Certainly, when it comes to developing specific policies of how to improve good movement in ways that reduce congestion, vehicular conflicts, and reduce pollution (e.g., caused by an excess of diesel trucks and/or congestion moving through heavy traffic) various upgrades to the freeway design and infrastructure should be considered as part of the strategies and in many case, such as separated intermodal facilities, may require extensive decades-long planning and hundreds of millions of dollars.

CASE STUDIES – Georgia I-75 Truck Only Lane; Los Angeles Alameda Corridor Rail Expressway; Port of Oakland Joint Intermodal terminal

- In a well-known national case, the Georgia Department of Transportation has been implementing plans to develop a first-in-the-nation 40-mile commercial vehicle/truck-only lane

between the Port of Savannah and Macon along Interstate 75. The estimated cost of this inter-modal project is about $1.8 billion to construct this project (due to be completed by 2028).

- A well-known effort in California to increase the capacity and efficiency of freight trains (and reduce freight trucking congestion on adjacent freeways) is the $2.4 billion 24-mile Alameda Corridor in Los Angeles. This project calls for an intended electrified dedicated "trenched" grade-separated rail expressway that bypasses more than 200 street-level crossings through South Los Angeles and connects the Port to the transcontinental rail system.

- The Joint Intermodal Terminal (JIT) at the Port of Oakland is being developed and implemented to transfer shipping containers directly to the BNSF freight train lines (which have much lower emissions per shipping container especially when double-stacked) and thereby will decrease the necessity to transport shipping containers between the Port and rail terminal in Richmond some 12 miles away by truck via the freeway system. Below is a picture of intermodal ship-to-rail transfer of containerized cargos at the Port of Oakland.

Policy E.4 - Develop and design Freeway "lids," "caps," and "land bridges" as a green passage across the freeway zone that can also function to absorb/mitigate traffic emissions.

Finally, perhaps one of the most innovative planning design policies for mitigating freeway air pollution involve the development of freeway lids, decking, or green land bridges. Most famously and extensively perhaps is the Boston 1991-2006 "Big Dig" (Central Artery Tunnel Project) project which undergrounded and then covered the I-93 with the 1.5-mile Rose Kennedy Greenway but after many hard lessons, more practical retrofit projects are now emerging. Cities from Dallas to Seattle have implemented land bridges to cross existing freeways and many others are developing plans for such urban green crossings in somewhat parallel fashion to the on-going development of habitat corridor bridges. Significantly for this policy, land bridges and decking can be implemented in combination with other lightweight framed trellis structures over freeways for added pollution mitigation benefits. These types of innovative facilities represent cutting-edge responses to the heavy impact freeways have wrought on the urban landscape.

A study from Tufts University (Community Assessment of Freeway Exposure, 2012) shows evidence suggesting potentially moderate reductions of ~40% in near roadway air pollution can be achieved with decking over highways. This tactic is unlikely to be as highly effective in areas with long freeway exposure areas and high volumes of local traffic but nonetheless such strategies can be significant especially in combination with other greening tactics such as vegetated buffers. Moreover, decking, and green lids that serve as linear land bridge park space creates important opportunities for needed green spaces and inviting safe active transit freeway-crossing access.

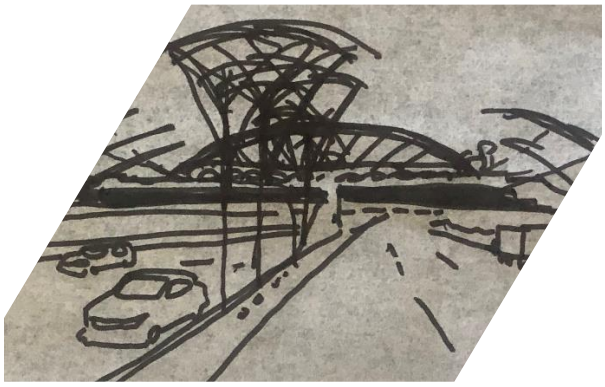
The scale of land bridges as an infrastructure solution of course requires significant municipal and state level coordinated action and present a challenge to fund given the expense (perhaps $15-$50M for a modest facility). The Air District planning staff is presently engaging with the State's Department of Transportation to develop prototype ideas as these for the I-880 freeway that can help the green retrofit

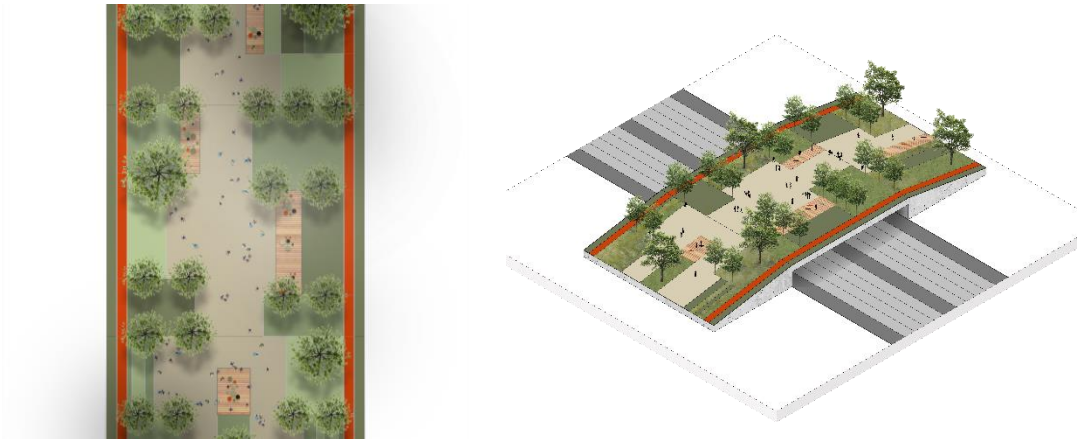
of the freeways while reducing pollution exposure to the surrounding residents and cumulative impacted EJ communities (see below).

CASE STUDY – Proposal for Land Bridges across the I-880 in Oakland, CA.

The Air District is working with Calrans to design and study how, as part innovative green infrastructure retrofit strategies, freeways can be covered with lightweight "trellis" structures that can support pollution absorbing vines creating a pergola/arbor effect in addition capturing carbon and improving noise impacts to surrounding neighborhoods. When combined with land bridge implementation, these greening structures can also provide safe and needed active transit crossing over freeway barriers.

Below: Air District study design ideas for air pollution/active transit land-bridge opportunities along the I-880 freeway at 16th Ave. in Oakland (which has also been a proposed location for an in-fill at-grade BART station and a node for infill housing).





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