Environmental Impacts of the Brightline West Project
“Connecting Las Vegas to Southern California”

Group 10

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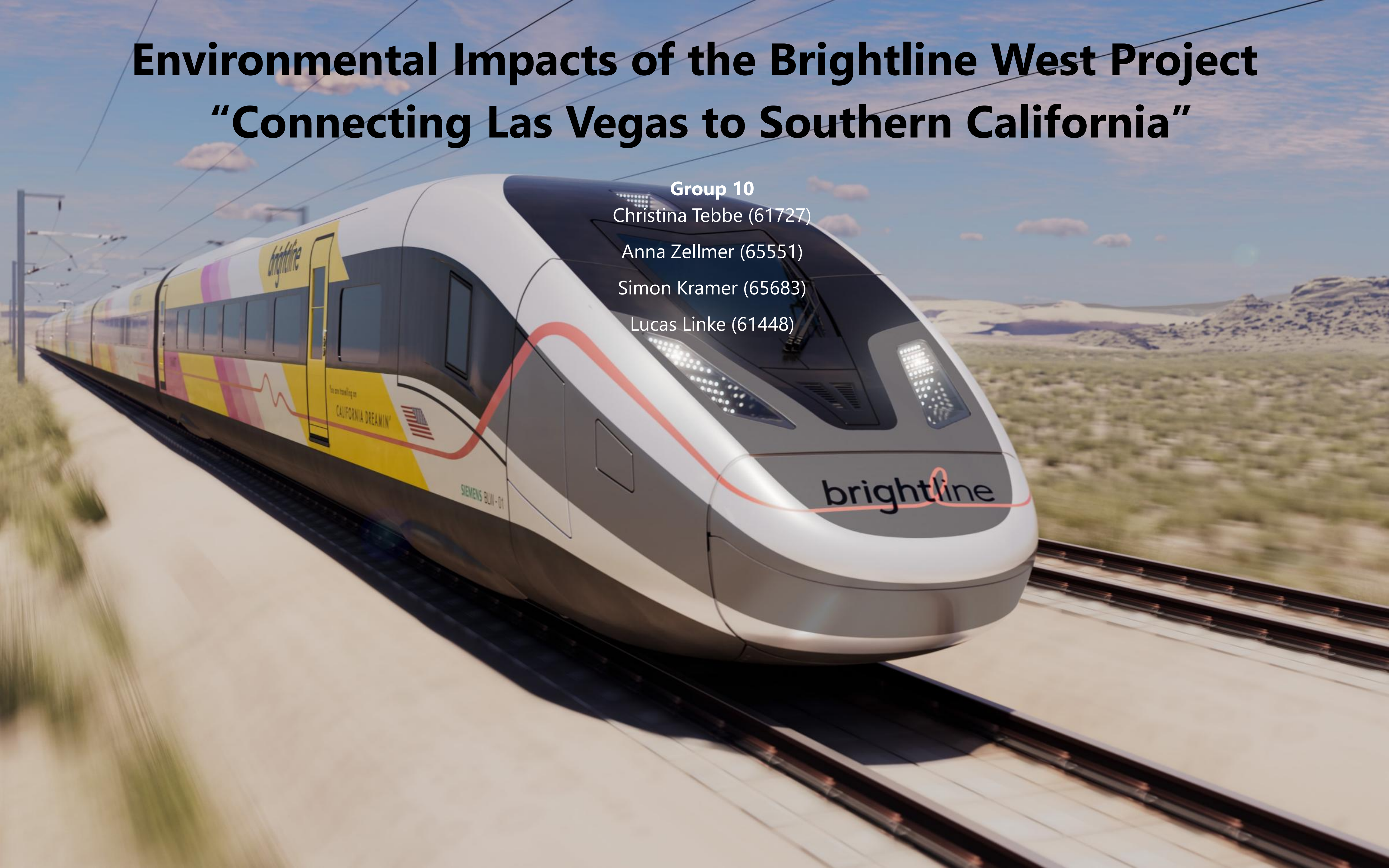

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Brightline West Project Overview

Project

Brightline West is constructing a **high-speed electric rail line** connecting **Las Vegas, Nevada, to Rancho Cucamonga, California**, with additional stations planned for Victor Valley and Hesperia, which connects to Los Angeles via Regional Rail

Developer

Spearheaded by Brightline West, notable as one of the first *privately financed* major high-speed rail systems in the United States, serving as a **potential test case for private investment** in large-scale, sustainable transportation infrastructure

Route

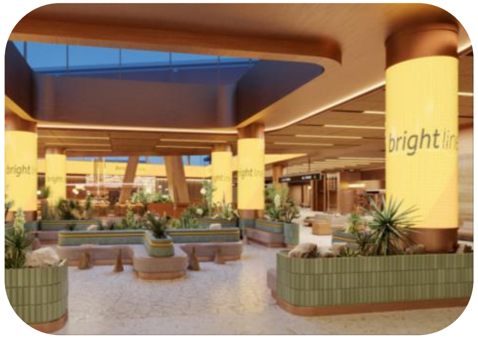
Strategically utilizes the existing Interstate 15 median for much of its alignment, **aiming to minimize new land disruption** through the ecologically sensitive Mojave Desert, but **requires careful management of water resources, soil integrity, and wildlife habitats**

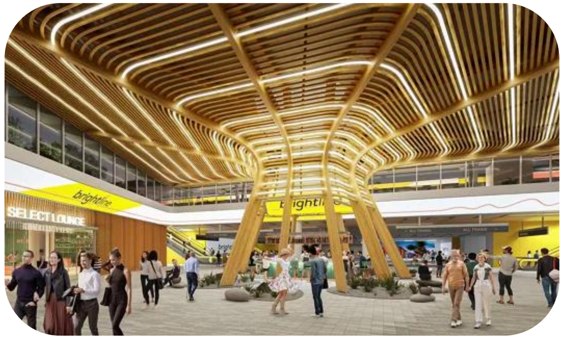
Goal

To provide a **significantly faster** (~2 hours vs. 4+ driving) and **more sustainable travel option** between these major hubs, targeting the heavy traffic flow along the I-15 corridor

Scale

Expected to serve over **9 million annual passengers**, aiming to eliminate over 700 million annual vehicle miles traveled (VMT) and reduce significant CO_2 emissions compared to car and air travel





Impact on Water: Improved Impacts on Water During Operational Stage are Still Limited to Standard Practices

Construction Phase

Highly negative impacts in construction phase

413 M Liters/ Year — High water demand in a desert region, caused by **dust suppression** (~413m litres/year), **concrete production** (~76m litres) & **earthworks** (~12 m litres)

No advanced water-saving technologies, such as mobile treatment units or real-time dust control systems (standard in similar projects in e.g. China)

Insufficient measures for water-stressed region as Mojave Desert, limited to basic best practices like stormwater management & erosion control

Lack of transparency and public reporting on total water use with no comprehensive water footprint report

Operational Phase

Positive impacts in operational stage, limited to standard practices

-57,5 % compared to cars — **Significantly lower direct water use** (3.4 litres per 100 passenger-km) compared to cars (8 litres/100 km) or aviation (>20 litres/100 km)

Indirect benefits through shift in transport mode, as reduced car traffic **lowers road runoff contamination** (oil, tire particles, heavy metals)

Smart **routing in the I-15 median** reduces land take, helping to preserve natural water balance and prevent add. disruption to hydrological systems

Use of **closed-loop water systems and reclaimed water for train washing** and infrastructure maintenance

1. **Establish an IWRM system** to coordinate water use, improve transparency, and ensure climate-resilient adaptation across all project phases
2. **Apply circular water strategies** including mobile treatment units, rainwater harvesting, and fully integrated closed-loop systems
3. **Apply smart monitoring** by combining real-time tracking of water use, dust levels, & environmental conditions to optimize resource efficiency

Impact on Earth: Improved Mitigation During Operation, but Long-term Land Degradation Risks Remain

Construction Phase

Severe and largely irreversible land degradation during construction

Extensive soil sealing from tracks, stations, and roads reduces infiltration and **increases erosion**

Destruction of biological soil crusts causes **dust emissions** (PM10) and **sediment loss**

Habitat loss and ecological disruption for species such as the Mojave Desert Tortoise

Mobilization of contaminants during grading, including arsenic and asbestos-like minerals

Limited application of best-practice erosion control and topsoil preservation

Operational Phase

Persistent fragmentation and soil risks despite partial mitigation

Continued soil sealing from permanent infrastructure leads to long-term land take

Habitat fragmentation remains, with underpasses only partially restoring connectivity

Soil contamination risks from herbicide use, lubricants, and chemical leaks during maintenance

Visual and thermal disruption from paved surfaces alters local desert conditions

Wildlife movement remains restricted due to fencing and linear barrier effects

1. **Minimize soil disturbance through** topsoil reuse, erosion control, and controlled site access
2. **Enhance habitat connectivity** with additional wildlife crossings and adaptive fencing
3. **Monitor soil quality long-term** via Environmental Management Systems and LCA-based tracking

Impact on Air: Moderate but temporary air quality impacts due to dust, equipment emissions, and vibration-related disturbances

Construction Phase

Moderate but temporary air quality impacts

61.400 T
CO_2e

Temporary GHG emissions (approx. 61,400 t CO_2e across regions)

Fugitive **dust and PM emissions** from earthworks and heavy construction machinery

Emissions of NO_x, VOCs, and CO from diesel equipment and transport

Vibration impacts (≥94 VdB) within 8 m during piling works and **noise impacts** up to 88 dBA

Operational Phase

Long-term positive air quality effects from modal shift to electrified rail

-34.000 T
CO_2e/year

Projected net **GHG reduction by 2045**: ~ –34,000 t CO_2e/year

Significant reduction in tailpipe emissions (NO_x, PM, VOCs) through car and flight substitution

Moderate train noise near sensitive zones (61–65 dBA Ldn), dissipating within 200 ft

Ground-borne vibrations within 25 m radius, but below critical thresholds

Wildlife may exhibit **avoidance behavior** due to recurring operational noise

1. Implement **real-time air quality monitoring** near sensitive receptors
2. **Decarbonize the supply chain** (low-emission materials, cleaner logistics)
3. **Evaluate feasibility of DAC** (Direct Air Capture) at terminal locations

Socioeconomic Impact: Negative Construction Impacts Balanced by Significant Economic and Social Development Opportunities

Construction Phase

Significant Job Creation & Economic Stimulus, with Temporary Community Disruptions

35.000 Jobs

Massive job creation (>35,000 jobs, >10,000 union) & focus on well-compensated roles

Boost to US manufacturing (American-made products) & local supply chains

Workforce development through **educational partnerships & apprenticeships**

Temporary **community disruptions** with noise, dust, and traffic diversions

Land acquisition required for project footprint, though minimized

Operational Phase

Major Economic Growth & Improved Quality of Life, but Equity & Adaptation Challenges

1.000 Permanent employers

Sustained direct employment (~1,000 permanent, ~900 union) & indirect job growth (hospitality, retail).

> $10B

Large regional economic impact (>$10B), business productivity enhancement & tourism boost (>9M passengers)

Improved quality of life: reduced travel times (~2 hrs), I-15 congestion relief (~3M car trips avoided).

Potential for **increased property values & new housing** development (>1,200 units) near stations

Ticket affordability and equitable access for lower-income populations unclear

1. **Ensure equitable access** through tiered fares, targeted discounts & social partnerships
2. **Mitigate community disruptions** via proactive engagement & robust impact control measures
3. Maximize local economic benefits with **equitable workforce training & targeted hiring**

Impacts at Glance: Negative impacts in the construction phase are outweighed by positives in operation

Phase	Impact Dimension	Main Impacts	Assessment	Prevention & Mitigation
Construction phase	Earth	Soil sealing	🔴⚪⚪	Erosion control and topsoil reuse
		Dust and erosion	🔴⚪⚪	Wildlife relocation and exclusion fencing
		Habitat loss and fragmentation	🔴⚪⚪	Spill prevention and soil monitoring protocols
	Air	Temporary GHG emissions	🔴⚪⚪	Real-time air quality monitoring
		Dust, PM, NO_x, VOCs, CO emission	⚪🟡⚪	Apply low-noise machinery
		Vibration impacts	⚪🟡⚪	Dust control (water spraying, covers, debris removal)
	Water	High water demand	🔴⚪⚪	Biodegradable dust suppressants to reduce spraying needs
		Depletion of groundwater res.	🔴⚪⚪	Mobile water treatment units to recycle process water on-site
		Contamination f. constr. runoff	🔴⚪⚪	Sedimentation basins & oil separators for runoff treatment
	Socio-Economic	Job creation	⚪⚪🟢	Prioritize union labor & local workforce partnerships
		Temp. community disruptions	🔴⚪⚪	Implement construction mitigation & communication plans
		Relocation impacts	🔴⚪⚪	Minimize project footprint & fair compensation/relocation
Operational phase	Earth	Permanent soil sealing	🔴⚪⚪	Long-term soil quality and habitat monitoring
		Fragmentation of habitats	⚪🟡⚪	Wildlife crossings and adaptive fencing
		Soil contamination	⚪🟡⚪	Integrated vegetation and contamination management
	Air	Net GHG emissions reduction	⚪⚪🟢	Evaluate feasibility of Direct Air Capture (DAC) at terminals
		Reduced NO_x, PM, and VOCs	⚪⚪🟢	Noise-optimized train design and track maintenance
		Moderate train noise	⚪🟡⚪	
	Water	Efficient Train washing	⚪⚪🟢	Expansion of closed-loop water recycling systems
		Road-related water pollution	⚪⚪🟢	Drainage channels w. filtration systems along railway corridor
		Integration of water reuse strat.	⚪🟡⚪	Large-scale rainwater harvesting at stations and depots
	Socio-Economic	Sustained job creation	⚪⚪🟢	Foster long-term local employment
		Improved quality of life	⚪⚪🟢	Explore tiered fares/discounts to ensure equitable access