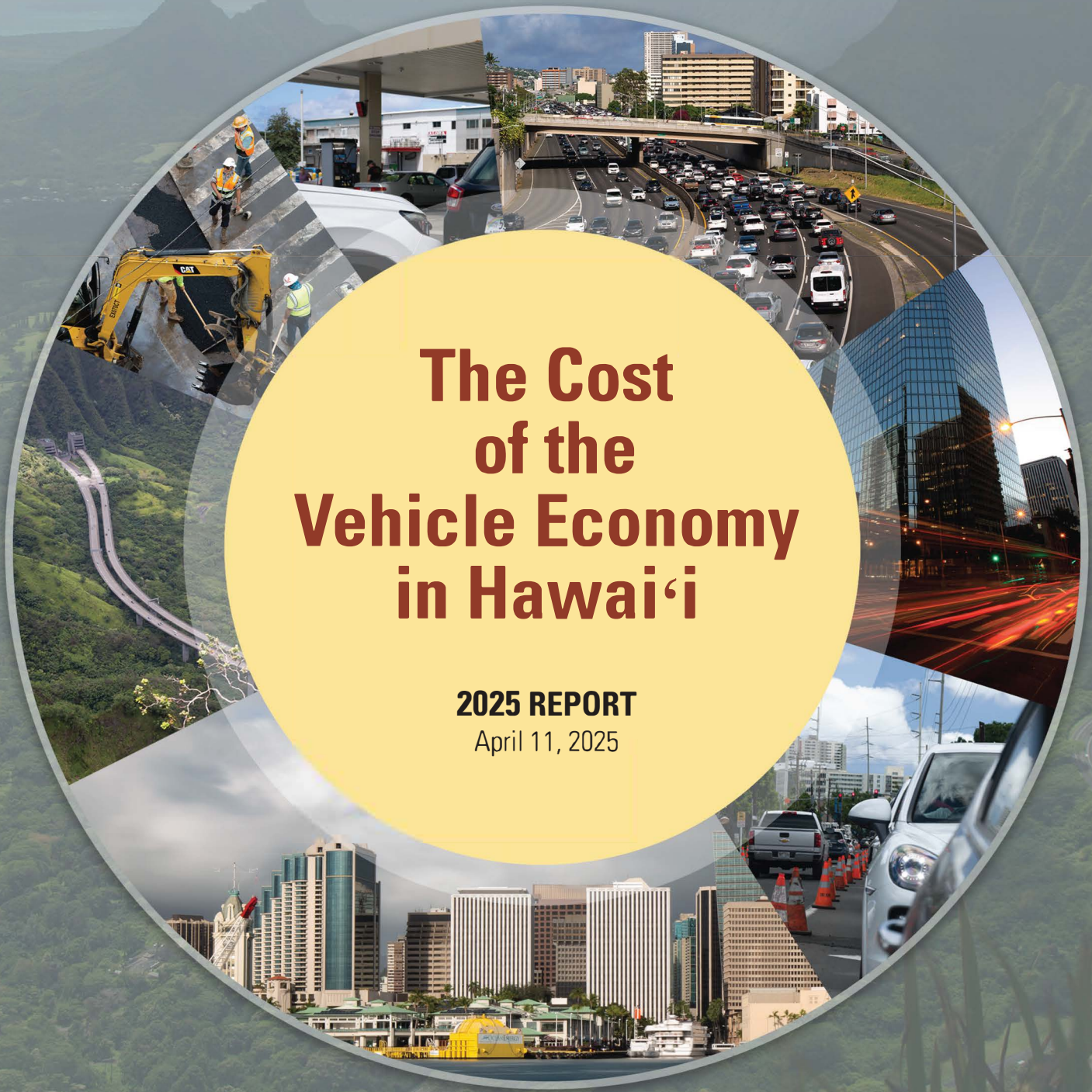

The Cost of the Vehicle Economy in Hawai‘i

2025 REPORT

April 11, 2025

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Introduction

Hawai‘i shoulders a staggering $27.4 billion annual burden from ground transportation costs, highlighting the critical need for strategic transportation policy and planning. Historically, decisions regarding where and how to invest in the transportation system may have been made without full recognition of their impacts on the broader community or the unintended consequences of focusing on objectives like speed, vehicle throughput, or cost of per-mile roadway maintenance. Today, there is a growing recognition among public agencies that transportation plans and projects can be critical to advancing important community goals, including greenhouse gas (GHG) mitigation, the expansion of multimodal choices, social equity, and the improvement of health and safety for all system users and transportation modes. One component is understanding the costs associated with the vehicle economy.

Beyond roadways and vehicles, the “vehicle economy” also includes the direct costs of transportation infrastructure (e.g., bridges, on/off ramps, signs, speed bumps, parking, signals) as well as indirect costs to society, such as pollution and congestion resulting from the use of the ground transportation system. This system is financed by a combination of federal, state, local, and private funding sources, which are becoming increasingly strained due to rising budget demands and shortfalls despite some recent federal funding infusions. Many of these budget demands are imminent (e.g., funding needed for natural disasters and recovery), while others are longer-term (e.g., retrofitting deteriorating roadway systems).

In 2021, Ulupono Initiative developed a report titled, “The Cost of the Vehicle Economy in Hawai‘i,” which summarized the public and private costs in Hawai‘i of car usage and to a certain degree, dependency, at that point in time. The goal of this new report is to provide an update to the 2021 report, using the latest available data sources and methodologies. These findings can help inform Hawai‘i’s decisionmakers as they weigh expenditures and investments to best address short- and long-term community needs.

This is not a cost-benefit analysis. Instead, the purpose of this analysis is to estimate the true annual costs of the vehicle economy statewide to understand the extent of Hawai‘i’s transportation system investment. Our analysis takes a conservative approach, estimating the costs while refraining from inflated assumptions. As such, the costs presented in this report can be viewed as a lower bound of the true costs of the vehicle economy. All dollar figures are expressed in 2023 dollars.

This report finds that the annual cost of the vehicle economy in Hawai‘i has grown, totaling $27.4 billion, with 61 percent ($16.6 billion of the total) borne by the public and the remaining $10.8 billion borne by consumers. The largest contributing factor to the $6.5 billion (31 percent) increase from the 2021 report is inflation, but many other indirect/”hidden” costs have also risen quite fast, such as those associated with GHG emissions, injuries and fatalities. When dividing out the full totality of direct/indirect public costs amongst the population of Hawai‘i, the burden is $33,600 per household annually, regardless of vehicle ownership. The additional private cost of vehicle ownership is substantial—an extra $21,800 per household, per year. Results for this analysis are presented for the City and County of Honolulu and counties of Hawai‘i, Maui, and Kaua‘i. The report discusses the Methodology Updates, Summary Results, Key Findings (regarding inflation, land values, GHG emissions, legal settlements, and socioeconomic impacts), and two Appendices with detailed results and methodology.

Methodology Updates

As part of this analysis, we updated several of the methodologies to reflect the most up-to-date data sources, new research, and updated approaches. Where possible, we updated the data vintage (2022 or newer). In cases where this was not possible, we used the same data vintage as the 2021 report but scaled the dollar-year to account for inflation. Although the 2021 report relied on the underlying methodologies of the Olsen et al. (2019) Harvard Kennedy School study, upon further review we adjusted the methods as shown in the bullets below, including adjustments to use data and processes that are more widely accepted in the economic impact literature. The following bullets describe high-level changes with more detailed methodology updates found in Appendix A:

- **Updated data vintage**
  - *State and County Budgets*: We referenced data from the 5 most recent years (state: 2019-2023, county: 2018-2022).
  - *Capital Improvements*: We referenced the Federal Highway Administration's Disbursements for State-Administered Highways for the 5 most recent years (2018-2022).
  - *Deferred Maintenance*: We referenced the Hawai‘i Department of Transportation (HDOT) deferred maintenance estimates for 2023.
- **Scaled or changed data vintage**
  - *Congestion*: We referenced an updated Texas A&M Transportation Institute study from 2023 for annual hours of delay and referenced revised wage data from the Bureau of Labor Statistics (2023).
- **Changed factoring/multipliers**
  - *Injuries and Fatalities*: We referenced vehicle injury and death numbers for 2017-2022 from the Hawai‘i Department of Business, Economic Development and Tourism (DBEDT) using updated economic values from the U.S. Department of Transportation (DOT).
  - *GHG Emissions*: We used ground-level emissions data from the 2021 State of Hawai‘i Energy Emissions report and updated the social cost of carbon emissions to use a value from the U.S. DOT Benefit-Cost Analysis (BCA) Guidance for Federal Grant Programs (DOT 2023).
- **Changed methodology**
  - *Vehicle Ownership*: We referenced updated vehicle make-and-model repair data from Coltura, in conjunction with registration data from DBEDT (2022). We also referenced updated fuel price data from DBEDT and utilized revised financing interest costs from Edmunds.[1]
- **Changed methodology and factoring**
  - *Pollution*: We updated this methodology to reflect a more accurate accounting of specific vehicle emissions.[2] We utilized emissions-per-mile metrics from the Bureau of Transportation Statistics and annual vehicle miles traveled from the Hawai‘i State Data Book, and monetized based on $-per-metric-ton from the DOT BCA (DOT 2023).
  - *Land Value*: We were unable to find updated land value statistics, so we developed an update method using the delta between 2018 and 2023 property tax assessment data from the City and County of Honolulu and scaling the land value-per-acre from the 2021 report by the change. We updated parking spaces per registered vehicle to 3.3 for the City and County of Honolulu and 4.0 for Hawai‘i, Maui, and Kaua‘i counties based on a new Victoria Transportation Policy Institute (VTPI) report.
- **New cost category**
  - *Settlement Data*: We added this component to this report based on annual data from HDOT. Financial liabilities from transportation-related settlements (various claims, lawsuits, or disputes) represent a drain on budgets not captured elsewhere in this analysis.

[1] While updating the analysis, we encountered an issue with the 2021 report for vehicle depreciation costs. The prior analysis estimated monthly costs but neglected to convert them to annual costs. This issue has been corrected in the current analysis.

[2] Particulate Matter ($PM_{2.5}$) and Nitrogen Oxides (NO_X)

Summary Results

These results represent a summary of the public and private costs in Hawai'i of the vehicle economy, which includes all roadways, vehicles, and transportation infrastructure costs (e.g., bridges, on/off ramps, signs, speed bumps, parking) as well as associated costs, such as pollution and congestion resulting from the use of the ground transportation system. This report concludes that the annual cost of the vehicle economy in Hawai'i is approximately $27.4 billion (see Table 1), with $16.6 billion borne by the public in the form of state and county budget costs, social and economic costs (such as road-related injuries and fatalities, congestion, and pollution), and the real estate value of land set aside for roadways and parking spaces. The remaining $10.8 billion is borne by consumers through the cost of vehicle ownership (including purchasing and financing, depreciation, fuel, insurance, and maintenance and operation) and the real estate value of private land for parking spaces.

Table 1: Annual Cost of the Vehicle Economy in Hawai'i

Category	Cost (Billions of $)	Percent
Public Costs	$16.6	61%
Consumer Costs	$10.8	39%
Total Costs	**$27.4**	**100%**

At a county level, Honolulu has the highest vehicle economy cost at $18.4 billion (67 percent) (see Table 2), followed by Hawai'i County at $3.7 billion (roughly 13 percent), Maui County at $3.6 billion (roughly 13 percent), and Kaua'i County at $1.7 billion (6 percent).[3] As state budgets were assigned to counties by resident vehicle registrations, these costs are generally proportionate to county populations.

Table 2: Annual Cost of the Vehicle Economy in Hawai'i by County

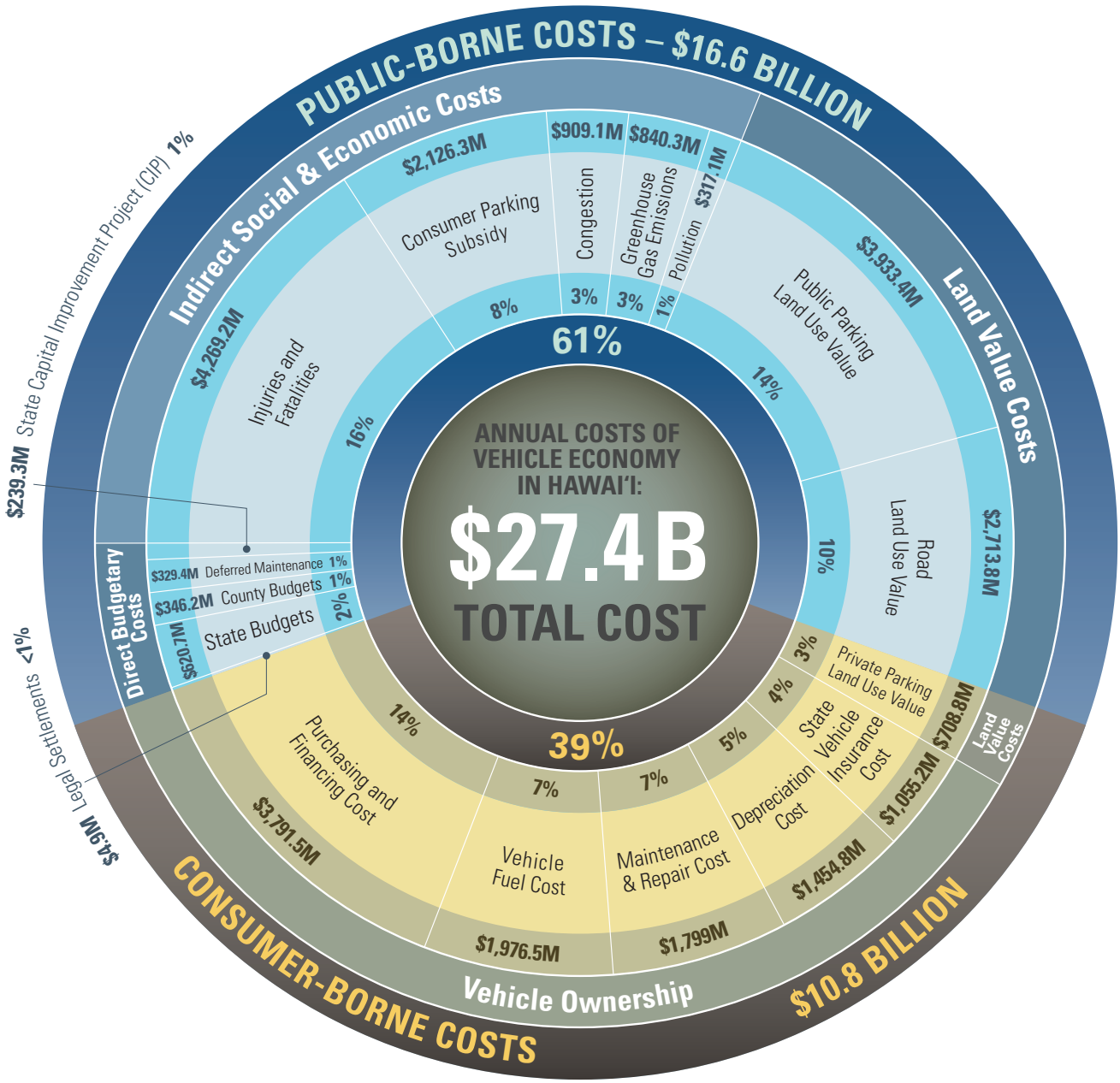
County	Cost (Millions of $)	Percent
Hawai'i	$3,692.0	13%
Honolulu	$18,401.3	67%
Kaua'i	$1,700.7	6%
Maui	$3,641.5	13%
Total	**$27,435.5**	**100%**

Figure 1 graphically presents the costs of the Hawai'i vehicle economy, broken down by category. Publicly borne costs are costs incurred by the public either directly or indirectly, regardless of vehicle ownership. Direct public costs include costs from local, county, state, and federal governments to build, repair, and maintain public roads. Indirect public costs include the costs of vehicle-related injuries and fatalities, congestion, GHG emissions, and pollution. Many of these non-monetary costs represent negative

[3] The county-level costs represent the aggregation of all the cost components presented in the analysis. Some cost categories are naturally disaggregated into counties, such as for the county-specific vehicle-related budgets. Other cost categories are not naturally disaggregated, such as state-level expenditures and capital outlay. Where cost components were not disaggregated, we used the county-level vehicle registration proportions: Honolulu (62 percent), Hawai'i (17 percent), Maui (14 percent), and Kaua'i (7 percent). We recognize that this cost disaggregation is not perfect, but it provides insight into the county dynamics of the Hawai'i vehicle economy.

externalities associated with vehicle travel.[4] The land value of public roads and parking spaces is also a part of public costs, as they reflect the complete opportunity cost of subsidizing vehicle travel–meaning it is possible that some land currently dedicated to roads and parking could be better used as housing or some other use. These publicly borne costs are further described in Table 3. Consumer-borne costs are disaggregated into costs of vehicle ownership and residential parking, and further described in Table 4. Broadly, injuries and fatalities, parking (consumer parking subsidies and public parking land value), and financing make up the largest cost categories across the vehicle economy.

Figure 1. Annual Costs of the Vehicle Economy in Hawai'i



[4] A negative externality occurs when the actions of one party cause a cost to someone else. For example, air pollution is a classic case of a negative externality because there are negative health impacts on people who may not contribute to the pollution.

Table 3 contains estimates for each category of publicly borne transportation costs, which total $16.6 billion. Direct budgetary transportation costs from county and state governments, and outlays from the federal government, total over $1.5 billion, or roughly 9 percent of public costs in this analysis. More than half ($8.5 billion, or 51 percent of publicly borne costs) are indirect social and economic costs. The most expensive indirect costs are those associated with injury and fatalities, followed by subsidies for consumer parking. The final 40 percent of publicly borne costs are the opportunity costs of using land for parking ($3.9 billion) and roads ($2.7 billion).

Table 3: Annual Public Costs of the Vehicle Economy in Hawai'i

Category	Sub-Category	Cost (Millions of $)	Percent
Direct Costs	State Budget	$620.7	4%
	County Budgets	$346.2	2%
	Deferred Maintenance	$329.4	2%
	State Capital Improvement Program (CIP)*	$239.3	1%
	Settlements	$4.9	<1%
	Total	**$1,540.5**	**9%**
Indirect Social & Economic Costs	Injuries and Fatalities	$4,269.2	26%
	Consumer Parking Subsidy	$2,126.3	13%
	Congestion	$909.1	5%
	Greenhouse Gas Emissions	$840.3	5%
	Pollution	$317.1	2%
	Total	**$8,462.1**	**51%**
Land Value Costs	Public Parking Land Use Value	$3,933.4	24%
	Road Land Use Value	$2,713.8	16%
	Total	**$6,647.2**	**40%**
Grand Total		**$16,649.7**	**100%**

*State CIP includes federal funding.

In addition to the public costs, there are substantial costs to consumers who own vehicles. Vehicle owners cannot use their vehicles without paying these costs, and as such, they are necessary to include in any comprehensive analysis of the vehicle economy. Consumer costs include the cost of owning and operating a vehicle and the costs of residential parking areas. We estimate that consumers in Hawai'i pay $10.8 billion (see Table 4) annually on vehicles and vehicle-related costs. Most of these costs ($10.1 billion) are associated with vehicle ownership, while the remaining amount comes from private parking ($708.8 million).

Table 4: Annual Private Costs of the Vehicle Economy in Hawai'i

Category	Sub-Category	Cost (Millions of $)
Vehicle Ownership	Purchasing and Financing Cost	$3,791.5
	Vehicle Fuel Cost[5]	$1,976.5
	Maintenance & Repair Cost	$1,799.0
	Depreciation Cost	$1,454.8
	State Vehicle Insurance Cost	$1,055.2
	Total	$10,077.0
Land Value Costs	Private Parking Land Use Value	$708.8
	Total	$708.8
Grand Total		$10,785.8

These results represent an increase in the Hawai'i vehicle economy by approximately $6.5 billion since the prior 2021 report, which is discussed in more detail in the following section, Comparison to Previous Report.

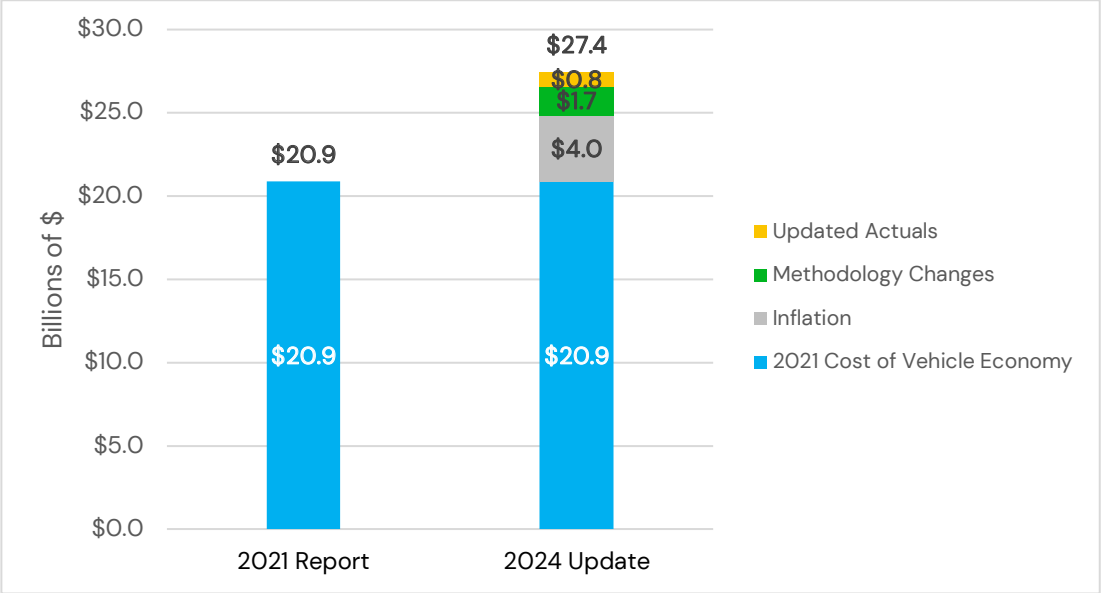
Comparison to Previous Report

Error! Reference source not found. presents a comparison of the summary results from the 2021 and the 2024 reports. The graph presents total costs from the 2021 report of $20.9 billion compared to a total cost estimate from the 2024 analysis of $27.4 billion. This graphic shows that the costs of the vehicle economy in Hawai'i have grown by about $6.5 billion or about 31 percent from the previous report. The largest increase between reports comes from inflation ($4.0 billion, 61 percent of the change)[6], or the year-over-year increases in costs that show up in state and county budgets, vehicle costs, and land value increases. The second largest increase ($1.7 billion, 27 percent) is a result of methodology updates such as a change to the parking space ratio and allowing differences by county, resulting in an increase of $1.02 billion in the assessed land value for parking, an updated dollar amount for the social cost of carbon resulting in an increase in the cost of GHG emissions by $630.5 million, and the disaggregation of the certain emissions for a more accurate accounting of impacts related to pollution resulting in $95.0 million. Lastly, the smallest increase ($0.8 billion, 12 percent) labeled "Updated Actuals", is due to the data vintage of various cost categories being updated.

[5] This report assumes that all registered vehicles are internal combustion engines and rely on gasoline as vehicle fuel. It does not account for electricity costs to fuel electric vehicles (EVs), which account for around 2 percent of registered vehicles (USDOE, 2024).

[6] The $4.0B "Inflation" value is estimated by taking the difference between the converted 2021 report value of $24.9B (in 2023 dollars) versus the actual report value of $20.9B (in 2019 dollars). A CPI conversion factor of 1.19 was used for the conversion ($20.9*1.19 = $24.9).

Figure 2. Breakdown of the Change in Total Cost of Vehicle Economy



Key Findings

The following sections discuss key analysis findings, including inflation and expenditures, land value impacts, GHG and pollution impacts, settlements, and socioeconomic impacts. These findings represent major drivers of results, distinctions or enhancements from the 2021 report, or important findings that impact a large number of Hawai'i's residents.

Inflation and Expenditures

Inflation reflects the largest change between the 2021 report ($4.0 billion, as shown in Figure 2). Increasing costs are not surprising. As a result of inflation, effectively, everything costs more than it used to, and the same amount of tax and revenue dollars finance fewer projects than they did previously. This report factors in inflation across several metrics and variables. Where no new metrics could be sourced, we updated the metrics using the Consumer Price Index (CPI). For example, we use the value of a statistical life to monetize fatalities within the analysis. The DOT source presents a 2022$ value that we scaled using CPI to 2023$ to match other metrics in the report.

Transportation-specific expenditures, however, are outpacing inflation. Since the 2021 report, which analyzed 2019 data, highway construction costs have increased significantly. The National Highway Construction Cost Index (NHCCI) measures fluctuating materials costs of road and highway construction (in a similar way that the CPI from the Bureau of Labor Statistics estimates changes in prices for goods). Between Q1 2019 and Q4 2023, construction costs associated with NHCCI increased by over 64 percent (FHWA 2023a), compared to an average commodity price (represented by CPI) increase of 22 percent over the same period.[7] These highway costs outpace inflation and demonstrate the growing cost of the vehicle economy. Given the significant increase in highway construction costs, these types of transportation investments may be less attractive as the dollars fund fewer projects.

[7] NHCCI higher increases are due to supply chain disruptions, fluctuating oil prices, and material shortages (particularly in asphalt and concrete which are tied to oil prices). https://www.ttnews.com/articles/fhwa-highway-costs-soar

These inflation changes permeate in both the public (as county and state expenditures, metrics used to monetize fatalities and injuries, and costs to build parking spaces) and private (as vehicle purchase prices and gasoline expenditures) cost categories of this report.

Land Value Impacts

Land value reflects the opportunity costs associated with using land for roads and parking, as this land could be utilized for other purposes.[8] These costs reflect the potential value that could be realized, based on comparable land sales, if the land was used for commercial or residential uses. These costs are often overlooked, as land used for roadways and parking are the status quo and we fail to consider how the land could solve other policy issues (e.g., affordable housing). There are three components of these costs: the public value of land dedicated to parking, the public value of land dedicated to roads, and the private value of land dedicated to parking. The total annual cost of land value amounts to a staggering $7.4 billion (see Table 5), with the cost of public parking making up the largest share ($3.9 billion), followed by land value of roads ($2.7 billion) and private parking land value ($709 million).[9] These costs can be found at the county level in Appendix A.

Table 5: Annual Cost of Land Value in Hawai'i

Category	Sub-Category	Cost (Millions of $)
Public-Borne	Public Parking Land Use Value	$3,933.4
	Road Land Use Value	$2,713.8
Consumer-Borne	Private Parking Land Use Value	$708.8
Total		**$7,356.0**

The parking and road value opportunity costs make up over 26 percent of the total cost of Hawai'i's vehicle economy. However, the infrastructure associated with this land is not being adequately maintained, reflected in $329.4 million in annual deferred maintenance (see Table 3). This deferred maintenance is driven by competing budget needs and a gap between necessary roadway expenditures and collected revenues. Hawai'i relies on a combination of vehicle registration and weight fees, various car rental and tour vehicle surcharges, and fuel taxes. The vehicle economy must therefore be subsidized by other funding sources, because not enough revenue is being generated to adequately care for the full investment. This is troubling because the deferred maintenance represents a drain on future budgets and may continue to grow as roadways further degrade.

The 2021 report monetized land value using standardized land values that account for land price disparities and exclude improvements (e.g., structures) from an experimental dataset published by the Federal Housing Finance Agency (FHFA) (Larson et al., 2020). However, this report has not been updated since, and no new analyses isolate land value from property value. To account for increases in land value in the wake of the COVID-19 pandemic, we have adjusted the land values used in the 2021 report using tax assessment data by county, finding that from 2018 to 2023, real property value increased, ranging from 9 to 28 percent, shown in Table 6. As land values increase, the value of the vehicle economy also increases.

[8] Note that this analysis excludes the potential increase in tax revenues that could result from converting current roadway and parking land into other uses.
[9] Land use costs are amortized costs assuming a 40-year life. For more details, see Appendix B.

Table 6: County Increases in Real Property Value

County	Percent Increase (2018-2023)
Kaua'i	28%
Hawai'i	23%
Maui	19%
Honolulu	9%

GHG Emissions and Pollution

As part of this analysis, we updated the values and methodology for monetizing the impacts of GHG emissions and pollution. Combined, this update resulted in an increase in costs of around $725.5 million.

For GHG emissions, we utilized the most recent ground-level emissions data from the 2021 State of Hawai'i Energy Emissions report, and we used updated social cost of carbon emissions to use a value from the DOT BCA guidance (DOT 2023). The consideration of the value of the social cost of carbon is important because it represents a topic that is heatedly debated. This report updates the value to $237.39/CO2e MMT in compared to $51.80/CO2e MMT from the 2021 report. For the purposes of this analysis, we used the value presented by DOT as it represents the best available science and is the value widely accepted by the Federal Highway Administration for their economic and benefit-cost analysis. This change results in a change between the 2021 report and the 2024 report of approximately $630.5 million (part of the $1.7 billion change reflected in Figure 2).

Additionally, we updated the methodology used to monetize the impacts of pollution to reflect a more accurate accounting of vehicle emissions. The prior report used an aggregate pollution-per-vehicle-mile-traveled approach and monetized using a generic value for pollution. However, DOT BCA guidance (DOT 2023) presents a more nuanced approach that allows for monetizing the impacts of $PM_{2.5}$ and NO_x separately, using pollution-specific metrics. We utilized emissions-per-mile metrics from the Bureau of Transportation Statistics and annual vehicle miles traveled from the Hawai'i State Data Book, and monetized using $-per-metric-ton from the DOT BCA guidance (DOT 2023). This change results in a relatively minor change between the 2021 report and the 2024 report of approximately $95.0 million (part of the $1.7 billion change reflected in Figure 2). Ultimately these changes in values reflect both the updated understanding of these impacts, their damages, and their rising costs across the economy, particularly with extreme weather events.

Settlements

Legal settlements are a new addition to the vehicle economy study and represent the financial liabilities from various claims, lawsuits, or disputes. These costs can stem from crashes, contract disputes, and other incidents involving transportation agency operations. Table 7 presents the statewide costs of settlements for the HDOT over five fiscal years, from 2019 to 2023. The five-year average cost of settlements is $4.9 million and shows significant year-to-year variability; for example, the 2023 spike is attributed to a single lawsuit settlement. Note that this same information isn't available for counties and is likely also present.

Table 7: Cost of Transportation-Related Settlements in Hawai'i

Year	Cost (Millions of $)
2019	$4.7
2020	$1.1
2021	$1.2
2022	$0.14
2023	$17.5
5-Year Average	**$4.92**

Although currently not that significant as compared to other costs, high settlement costs can impact the department's budget and its ability to fund other projects and maintenance activities, which is why it is important to understand and analyze settlement data to improve risk mitigation strategies, enhance operational safety, and ensure better financial planning. Additionally, settlements often use taxpayer money, which could otherwise be allocated to infrastructure improvements and other public services. In 2023, $17.5 million could have also funded a new safety project or part of a larger missing sidewalk initiative. The opportunity cost of spending on vehicle-related settlements means less funding is available for enhancing road safety, maintaining roadways, and expanding transportation networks.

Socioeconomic Impacts

We find that the costs to the public are significant on a per-taxpayer and per-household level, and costs are increasing at an alarming rate. When divided out amongst the population of Hawai'i, the public costs amount to roughly $22,200 per taxpayer or $33,600 per household, annually, regardless of vehicle ownership.[10] Public costs do not reflect out-of-pocket expenses, and rather reflect the opportunity cost or externalities of vehicles. Layering in that the cost of vehicle ownership is substantial, an additional $14,400 per taxpayer or $21,800 per household per year, and the costs of the vehicle economy, are shown to be a sizeable portion of annual income. In addition, many of these costs are indirect—so they are not directly attributed to the original roadway investment decision nor usually reflective of users' willingness to pay. These costs are significant compared to the Hawai'i median household income of $94,814 (Hawai'i State Data Center, 2023).[11] Public and private costs amount to just over 35 percent and just under 23 percent of household pre-tax income, respectively, highlighting how much the vehicle economy is subsidized on a per-household basis.

Worker Commutes

Many Hawai'i residents use a private vehicle to commute to work, with 64 percent and 15 percent of commuters driving alone and carpooling, respectively (USCB 2022). When there are limited options, people tend to pay a larger portion of their income to vehicle-related costs, which is especially difficult when they rise quickly.

Vehicle purchasing and financing costs, which represents around 35 percent of private costs, are a large financial burden to many households. These costs may be disproportionately distributed to lower-income

[10] This calculation assumes a taxpayer base of 751,344 (State of Hawai'i Department of Taxation, 2023) and a household level of 496,827 (U.S. Census, 2022). Note that the household values can sometimes be misleading because Hawai'i's household size is larger than the national average with significant range depending on household ethnicity.
[11] Based on 5-year median household income data from the American Community Survey. Average household size is higher in Hawai'i, 2.92, compared to the national average of 2.51 (U.S. Census 2023), which inflates the median household income as it captures all contributors to household income.

households at a higher rate through higher borrowing costs. New vehicle interest rates have hovered around 7 percent over the end of 2023 and the beginning of 2024, while used vehicle interest rates have hovered around 11 percent over the same period (Edmunds, 2024). This means that, proportionately, the financing costs for lower income households, who are more likely to purchase a used car, will be higher in comparison to that of new cars, increasing the overall vehicle cost to lower-income households.

Additionally, public vehicle costs are not internalized within household budgets, but rather paid through taxes, which disaggregates the impact of these costs. Indirect costs, such as GHG emissions and air pollution, impose real costs on communities in the form of poor air quality and respiratory illness, which can lead to lost work productivity, higher lifetime costs of medical care, and lower enjoyment of recreational activities. These costs are not likely to be distributed evenly. Those who live in urban areas, near tourist locations, or along major highways are more likely to be impacted by pollution and congestion impacts. Multiple studies have shown links between low socioeconomic status and pollution, such as particulate pollution, often relating to bias in housing market dynamics and land costs (American Lung Association, n.d.). Studies have also linked socioeconomic status to road safety, where neighborhoods with lower socioeconomic status have higher incidences of crashes and road injuries (Morency et al, 2012; Harper et al, 2015; Pirdavani et al, 2017). Broadly these also hold true in Hawai‘i (County of Hawai‘i, 2020; HDOT, 2023b; City and County of Honolulu, 2024).

Conclusion

This report reveals an alarming 31 percent increase in Hawai‘i’s vehicle economy costs since 2021, now totaling more than $27.4 billion, split between direct consumers and the public. Representing 61 percent of the costs, $16.6 billion is borne by the public in the form of state and county budget costs, social and economic costs (such as road-related injuries and fatalities, congestion, and pollution costs), and the real estate value of land set aside for roadways and parking spaces. The remaining costs, $10.8 billion, are private costs borne by consumers in the form of vehicle ownership and private parking costs.

These costs are significant, and the $6.5 billion or 31 percent increase from the 2021 report shows the increasing burden of the vehicle economy on Hawai‘i. The largest contributing factor is inflation, but many other indirect or “hidden” costs have also risen considerably, such as those associated with GHG emissions, injuries and fatalities, etc. When divided out amongst the population of Hawai‘i, the public costs amount to an average just over $33,600 per household, annually, regardless of vehicle ownership. Layering in that the cost of vehicle ownership is substantial, an additional $21,800 per household per year, and the costs of the vehicle economy are shown to be a sizeable portion of annual income.

The increasing cost of the vehicle economy poses a concern, especially as it plays into the financial constraints of households, including affordability of home ownership and goods and services (e.g., healthcare, childcare). This poses a particular constraint to lower-income households that may feel the disproportionate impact of vehicle-related costs, including increased used car costs, higher used car interest rates, and higher rates of pollution and road-related injuries. As climate change intensifies, Hawai‘i faces a critical inflection point in transportation policy—decisions made now about infrastructure investments will shape household financial burdens, social equity, and environmental resilience for generations.

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Appendix A: County Tables

Table B-1: Annual Cost of the Vehicle Economy in Hawai'i by County (Millions of $)

	Category	Sub-Category	Hawai'i	Honolulu	Kaua'i	Maui	State Total
Publicly Borne Costs	**Direct Budgetary Costs**	County Budgets	$69.1	$197.0	$34.3	$45.8	$346.2
		State Budgets	$102.6	$386.6	$41.7	$89.8	$620.7
		State Capital Improvement Program (CIP)	$39.6	$149.1	$16.1	$34.6	$239.3
		Deferred Maintenance	$54.4	$205.2	$22.1	$47.7	$329.4
		Settlements	$0.8	$3.1	$0.3	$0.7	$4.9
		Total	**$266.5**	**$940.9**	**$114.5**	**$218.6**	**$1,540.5**
	Indirect Social & Economic Costs	Injuries and Fatalities	$705.7	$2,659.1	$286.5	$617.8	$4,269.2
		Congestion	$10.6	$847.2	$8.7	$42.5	$909.1
		Consumer Parking Subsidy	$351.5	$1,324.4	$142.7	$307.7	$2,126.3
		Greenhouse Gas Emissions	$140.1	$524.6	$54.6	$121.1	$840.3
		Pollution	$56.9	$190.4	$24.7	$45.2	$317.1
		Total	**$1,264.7**	**$5,545.8**	**$517.2**	**$1,134.4**	**$8,462.1**
	Land Value Costs	Parking	$205.9	$2,970.9	$243.0	$513.6	$3,933.4
		Roads	$172.1	$2,225.6	$102.1	$214.0	$2,713.8
		Total	**$378.0**	**$5,196.5**	**$345.1**	**$727.6**	**$6,647.2**
Consumer-Borne Costs	**Vehicle Ownership**	Maintenance & Repair Cost	$297.4	$1,120.6	$120.7	$260.4	$1,799.0
		Purchasing and Financing Cost	$626.7	$2,361.6	$254.5	$548.7	$3,791.5
		Depreciation Cost	$240.5	$906.2	$97.6	$210.5	$1,454.8
		Vehicle Fuel Cost	$326.7	$1,231.1	$132.6	$286.0	$1,976.5
		State Vehicle Insurance Cost	$174.4	$657.3	$70.8	$152.7	$1,055.2
		Total	**$1,665.7**	**$6,276.7**	**$676.3**	**$1,458.3**	**$10,077.0**
	Land Value Costs	**Residential Parking**	**$117.2**	**$441.5**	**$47.6**	**$102.6**	**$708.8**
		Total Cost of Vehicle Economy	**$3,692.0**	**$18,401.3**	**$1,700.7**	**$3,641.5**	**$27,435.5**

Appendix B: Methodology

Cost Component	Costs[12]	Quantification/Monetization Steps	Source[13]
Public Borne Costs			
Direct Public Budgetary Costs	• Road maintenance expenditures • Vehicle registration & licensing • Road & highway beautification • Federal Capital Improvement Program funding	• Average costs for each item from each county for the 5 most recent years available • Average state budget costs for Hawai'i, Honolulu, Kaua'i, and Maui highways for the 5 most recent years available • Average annual capital improvement program disbursements from the FHWA for the 5 most recent years available	**County-specific budget files:**[i] • County of Hawai'i, "Operating Budget FY" 2024 • City and County of Honolulu, "The Executive Program and Budget Fiscal Year 2024: Volume 1—Operating Program & Budget" • Kaua'i County, "Annual Operating Budget Ordinance," 2023-2024 • Maui County, "FY 2020 Council Adopted Budget," n.d. **State budget file:**[ii] • State of Hawai'i Department of Transportation, "Operating and Capital Budget, Fiscal Year 2023" **Federal funds:**[iii] • FHWA, "Disbursements for State-Administered Highways-2022"

[12] All dollar values are expressed in or converted from original sources to 2023$.
[13] The most recent documents are cited here. Previous years are necessary to calculate 5-year averages.

Cost Component	Costs[12]	Quantification/Monetization Steps	Source[13]
	• Fire department costs (Emergency Medical Services, or EMS, expenditures) • Police department costs (EMS expenditures)	• Calculate the percentage of motor vehicle-related EMS responses using data (State of Hawai‘i Department of Health) • Multiply percentage of vehicle calls by police and fire department budgets for Kaua‘i and Maui Counties • Add “EMS-S&W”, “EMS-OCE”, and “EMS-Eqpt” line items for Hawai‘i County Fire Department • Multiply percentage of vehicle related responses by entire fire department budget in Honolulu County • Take portion of Honolulu County Police Department budget funded through Highway Fund • Add “Dispatch S&W”, “Admin Serv S&W”, “Traf Svc S&W”, “HCPD Roadblock Program”, “Distracted Driving Project”, and “Speed Enforcement” line items for Hawai‘i County Police Department • Average the 5 most recent years to calculate the estimated annual cost for each county + entire state	**EMS data:**[iv] • State of Hawai‘i Department of Health, 2024 **County budget data**:[v] • County of Hawai‘i, “Operating Budget FY 2023-2024,” 2023 • City and County of Honolulu, “The Executive Program and Budget Fiscal Year 2024: Volume 1—Operating Program & Budget”, 2023 • Kaua‘i County, “Annual Operating Budget Ordinance,” 2023 • Maui County, “FY 2024 Council Adopted Budget,” n.d.

Cost Component	Costs[12]	Quantification/Monetization Steps	Source[13]
	• Deferred maintenance costs	• Add all vehicle-related costs from the State of Hawai'i Department of Transportation's deferred maintenance costs (paving & pavement marking, signs, repaving roads & parking lots, road & parking repairs, spall & deck repair)	• State of Hawai'i, "FY25 Appendix 5: Estimated Deferred Maintenance Costs," 2023 [vi]
	• Settlements	• Convert DOT-related settlement values to 2023$	**Settlements:** • Hawai'i State Legislature, 2019-2023

Cost Component	Costs[12]	Quantification/Monetization Steps	Source[13]
Indirect Social and Economic Costs	• Cost of vehicle injuries & fatalities	• Average the number of injuries and fatalities for the 5 most recent years available • Calculate the 2022 injuries by multiplying 2022 vehicle deaths with the average of the ratios of injuries and deaths from prior years • Multiply the average number of fatalities by the value of a statistical life (VSL) ($13.0 million) • Multiply the average number of injuries by the average cost of injuries at severity A, B, and C • Add the estimated annual costs for vehicle-related injuries and fatalities	**Injuries and deaths:**[vii] • 2017-2021 Injury Data: DBEDT, 2022b • 2022 Injury Data: Calculation • 2022 Vehicle Death Data: HDOT, 2023a **VSL:** • U.S. DOT, 2016 **Comprehensive crash unit cost:**[viii] • U.S. DOT, 2023
	• Costs of congestion	• Multiply the sum of the annual hours of delay per commuter (by urban area) by the median hourly wage • Scale Kahului County metrics to Hawai'i County and Kaua'i County (missing from TTI data) using a scalar of 25%	**Average hours of delay per commuter by urban area**[ix] • TTI, 2024 **Median hourly wage (private):**[x] • BLS, "Hawaii OEWS State Occupational Employment and Wage Estimates", 2023 **Median hourly wage (commercial):** • TTI, 2024

Cost Component	Costs[12]	Quantification/Monetization Steps	Source[13]
	• Consumer parking subsidy	• Average the number of registered vehicles for the 5 most recent years available • Multiply number of registered vehicles by the average number of parking spaces (3.3 for Honolulu County, 4.0 for other counties) to calculate number of parking spaces • Multiply number of parking spaces by 75% to calculate number of asphalt spaces; the remaining number are garage spaces • Multiply number of asphalt parking spaces by building cost (varies by county) • Multiply number of garage parking spaces by garage cost varies by county) • Interest rate is Average of National 20-year "Today" rating for AAA (3.4) and AA-rated (3.6) bonds • Add 3.5% in interest then divide by 40-year useful life to calculate annual cost • Multiply the total cost of parking by 75% (the other 25% are consumer costs)	**Vehicle registration data:**[xi] • State of Hawai'i, "Hawai'i State Data Book 2022" **Average number of parking spaces:**[xii] • VTPI, 2023 **Parking space cost:** • Ulupono Initiative, 2020 converted to 2023$ **Interest assumption:**[xiii] • FMS bonds, 2024 • State of Hawai'i, Department of Transportation, Highways Division, Highway Revenue Bonds Series. 2021. **Parking space useful life:** • Olson et. al., 2019 **Percent commercial spaces:** • Gruen, 1973

Cost Component	Costs[12]	Quantification/Monetization Steps	Source[13]
	• Cost of pollution	• Average the number of VMT for the 5 most recent years available • Multiply the average number of VMT by NOx and PM2.5 per mile • Multiply NOx and PM2.5 pollution by value of NOx and PM2.5 to find the cost of pollution • Add NOx and PM2.5 to find total cost of pollution for each county • Multiply the average number of VMT by NOx per mile	**Vehicle Miles Traveled:**[xiv] • State of Hawai'i, "Hawai'i State Data Book", 2022 **NOx per mile:**[xv] • Bureau of Transportation Statistics, "Estimated National Average Vehicle Emissions Rates" **PM2.5 per mile:**[xvi] • Bureau of Transportation Statistics, Sum of exhaust, tire wear, and brake wear from BTS **Value of NOx:** • DOT BCA guidance **Value of PM2.5:** • DOT BCA Guidance
	• Cost of GHG emissions	• Multiply CO2e MMT by cost of carbon ($237.39)	**Ground transportation emissions by county**[xvii] • County-level emissions data based on the 2021 State of Hawai'i Energy Emissions **Cost of Carbon**[xviii] • DOT BCA Guidance adjusted to 2023$

Cost Component	Costs[12]	Quantification/Monetization Steps	Source[13]
Land Value Costs	• Parking land value per acre	• Multiply number of parking spaces by average size of parking space (330 sq ft) to calculate area of land for parking in each county • Divide area of land for parking by 4,840 to calculate area of parking in acres • Split parking area into garage parking (15%) and asphalt parking (85%) • Multiply garage parking area by 75% to reflect that 25% of parking garages have a second story, and there are space savings • Multiply standardized ¼ acre land value by 4 to calculate land value per acre • Create a land value multiplier based on county property value increases. Apply land value multiplier to older land value per acre to calculate county land value per acre. • Multiply acres used for parking in each county by land value per acre to calculate land value of parking by county • Add 3.5% in interest then divide by 40 years to calculate annual building cost	**Parking space size and garage space savings:** • Ulupono Initiative, PBR Hawai'i, Rider Levett Bucknall, 2020 **Land value per acre:** • Larson et al, 2020 **Property value:**[xix] • City and County of Honolulu, 2018 • City and County of Honolulu, 2023 **Interest assumption:**[xx] • FMS Bonds, 2024

Cost Component	Costs[12]	Quantification/Monetization Steps	Source[13]
	• Road land value per acre	• Multiply lane miles for each county by 5,280 to calculate road length in feet • Multiply road length by average lane width (14 ft.) to calculate area of land used for roads in feet then divide by 43,560 to calculate road land in acres • Add 3.5% in interest rate then divide by 40 years to calculate annual building cost	**Lane miles:**[xxi] • Hawai'i Data Collaborative, 2020 (Lane miles in Hawai'i, Kaua'i, and Maui Counties; road acres in Honolulu County) **Lane width:** • HDOT, 2013 **Interest assumption:**[xxii] • FMS bonds, 2024 • State of Hawai'i, Department of Transportation, Highways Division, Highway Revenue Bonds Series. 2021. **Parking space useful life:** • Olson et. al., 2019

Cost Component	Costs[12]	Quantification/Monetization Steps	Source[13]
Consumer Costs			
Cost of Vehicle Ownership	• Vehicle MSRP	• Find the 3-4 most popular models of the 4 most popular car makes in Hawai'i • Calculate the market share for each car make in Hawai'i then normalize so that the 4 makes comprise 100% of market share • Multiply market-share by vehicle registrations to identify the number of vehicles of each make/model • For each make find the MSRP of a new car in the most recent model year plus used cars that are 8 and 14 years old • Add each of the above costs to calculate the annual cost of owning a car for each model then average the costs for each model year together • Average the cost for each car from each make to calculate the average annual cost of the "typical" make	**Make/Model data:** [xxiii] • Coltura **Vehicle registrations:** [xxiv] • DBEDT, 2022 **MSRP:** • Kelley Blue Book, 2019
	• Insurance	• Summary of Hawai'i insurance premiums for private and commercial auto personal injury protection, auto liability, and auto physical damage • Average the insurance premiums for the 5 most recent years available	• DCCA, 2019 • DCCA, 2021 • DCCA, 2023[xxv]

Cost Component	Costs[12]	Quantification/Monetization Steps	Source[13]
	• Maintenance & Repairs	• For each make and model year divide the 5-year costs of "maintenance and repair" by 5 to calculate annual costs	• Edmunds, 2023[xxvi]
	• Purchasing and Financing Costs	• Calculate annual financing costs using the MSRP for each model year. Assume a 20% down payment and a 7% loan with a 5-year term	**Methodology:** • Olson et. al., 2019 **MSRP:** • Kelley Blue Book, 2019 **Interest Rate**[xxvii] • Edmunds, 2024
	• Fuel Costs	• Calculate the average gas price in Hawai'i for the 5 most recent years available and the average vehicles traveled per vehicle by dividing the total VMT by the number of registered vehicles • Use the above figures in the tool at fueleconomy.gov to calculate the annual fuel cost for each model year	**Vehicle miles and registrations:** [xxviii] • DBEDT, 2022 **Gas prices:** [xxix] • U.S. Department of Energy, n.d.
	• Aggregate costs at county and state levels	• Multiply the average annual cost of the "typical" make by the standardized number of cars in each county (multiply the standardized % by the number of cars in each county)	• Calculation
Cost of Residential Parking	• Costs of Residential Parking	• Multiply the cost of parking from "Indirect Social & Economic Costs" by 25%	• Calculation

Endnotes for Appendix B

This section captures the changes between the 2021 report and this report. A source is "updated" when the same origin source is used, but a newer data-year is consulted. A source is "changed" when data are pulled from a new origin source.

[i] Sources updated to reflect most recent county budgets.
[ii] Sources updated to reflect most recent state budgets.
[iii] Sources updated to reflect most recent federal budgets.
[iv] Source updated to incorporate most recent EMS data.
[v] Sources updated to reflect most recent county budgets.
[vi] Source updated to capture most recent deferred maintenance.
[vii] Injury and fatality sources updated to capture most recent data. Data from original source (DBEDT) unavailable for 2022. For injuries, forecasted the 2022 value based on the ratio of injuries to deaths in 2017-2021. For fatalities, pulled data from HDOT (2023a).
[viii] Source updated to use value from USDOT benefit-cost analysis guidance (USDOT BCA guidance) for federal grant programs published in 2023.
[ix] Source updated to use the most recent TTI report.
[x] Source updated to use the most recent BLS wage data.
[xi] Source updated to pull the most recent registration data from the data book.
[xii] Source changed. The 2021 report used a multiplier (3) from Shoup (2005). This report explored additional multipliers from a summary source (VTPI 2023), using a multiplier of 3.3 for Honolulu County, 4.0 for other counties.
[xiii] Source changed to pull most recent interest rate values.
[xiv] Source updated to reflect most recent vehicle miles traveled.
[xv] Methodology updated. The 2021 report monetized pollution using a generic value of 'pollution cost per vehicle mile traveled.' This report expands the methodology to separate pollution into NO_x and $PM_{2.5}$. For NO_x, the analysis uses a value of NO_x generated per mile traveled based on Bureau of Transportation Statistics (ultimately based on EPA MOVES model) and monetizes using a value per metric ton based on USDOT benefit-cost analysis guidance for federal grant programs published in 2023.
[xvi] Methodology updated. The 2021 report monetized pollution using a generic value of 'pollution cost per vehicle mile traveled.' This report expands the methodology to separate pollution into NO_x and $PM_{2.5}$. For $M_{2.5}$, the analysis uses a value of $PM_{2.5}$ generated per mile traveled based on Bureau of Transportation Statistics (ultimately based on EPA MOVES model) and monetizes using a value per metric ton based on USDOT benefit-cost analysis guidance for federal grant programs published in 2023.
[xvii] Source updated to reflect most recent emissions data.
[xviii] Source changed. USDOT BCA guidance represents the most up-to-date value for carbon emissions used in transportation analyses.
[xix] Methodology updated. Updated land value data were not available; however, the property value (a combination of land value and structure value) data were available for both 2018 and 2023 from the tax assessment from the City and County of Honolulu. To capture the change in land values, this report estimated the change between 2018 and 2023 property value, and then scaled the original land value data by this multiplier.
[xx] Source changed to pull most recent interest rate values.
[xxi] Source unchanged. This report evaluated change in lane miles from FHWA's highway statistics series, but did not see a significant change in lane miles to encourage revising the analysis.
[xxii] Sources changed to pull most recent interest rate values.
[xxiii] Source changed. This report uses vehicle repair data supplied by Coltura to estimate the four most common vehicle makes and models.
[xxiv] Source updated to pull the most recent vehicle registration data.

[xxv] Sources updated to pull the most recent insurance data.
[xxvi] Source updated to pull the most recent maintenance and repair costs.
[xxvii] Source changed to pull most recent interest rate values.
[xxviii] Source updated to pull the most recent registration data.
[xxix] Source updated to pull the most recent fuel price data.