

# USER MANUAL

## Section A: Introduction

Sus Pav Design is a data-driven decision-making tool for pavement design. Two versions are developed so far. Based on database, the first concrete version has database for EPD for Louisiana, South, and Nationwide, and economic database which includes material price, initial. Another version for Asphalt only has initial cost database right now.

## Section B: Quick guide

1. In the “Layer Information” tab.

The screenshot displays the 'Sus Pav Des' application window. At the top, there are four tabs: 'Layer Information' (active), 'Weights', 'Transportation', and 'Summary'. Below the tabs, the 'Purpose of Analysis' dropdown is open, showing 'Select An Analysis Purpose' (highlighted), 'Benchmark', and 'Product Comparison'. To the right, the 'Project Location's Zip Code' is entered as '70820'. Below this, there are two dropdown menus: 'Design type' set to 'New pavement' and 'Pavement type' set to 'Rigid pavement'. The 'Layer 1' section shows a 'Thickness' field with '10.0' and a unit dropdown set to 'inch'. A yellow 'Load Material' button is positioned below the thickness field. At the bottom right, there is a blue 'NEXT' button.

Figure 1: Rigid Pavement (Concrete)

- a. Now you are in design 1/layer 1.
- b. You must select a purpose for this analysis first, there are two options which are “Benchmark” or “Product comparison”.
- c. Please type and save the zip code of project.

- d. Select “Design type” where only “New Pavement” is available now.
- e. Select “Pavement type” from combo-box where has “Rigid Pavement” and “Flexible Pavement”. As Figure 1 and 2 shows, the pavement type is used for connecting relative database, please check out for more details in Database section later. If the “Flexible Pavement” is selected, at least two combo-boxes will appear, which are “Course” and “Nominal Aggregate Max Size (mm)”. A “Mix Type” combo-box will show up only if ‘Wearing Course’ is selected.

The screenshot shows the 'Sus Pav Des' application window. At the top, there are tabs for 'Layer Information', 'Weights', 'Transportation', and 'Summary'. Below these, the 'Purpose of Analysis' is set to 'Product Comparison' and the 'Project Location's Zip Code' is 70820. The 'Design 1' section shows 'Design type' as 'New pavement' and 'Pavement type' as 'Flexible pavement'. Under 'Layer 1', the 'Thickness' is 2.0 inch, and the 'Course' is 'Wearing Course'. The 'Mix Type' dropdown menu is open, showing options: 'Asphaltic Mixture', 'OGFC', 'Asphaltic Mixture', and 'Stone Mastic Asphalt'. A yellow 'Load Material' button is visible below the thickness input. A 'NEXT' button is at the bottom right.

Figure 2: Flexible Pavement (Asphalt)

- f. Type into certain thickness value for the current layer.
- g. Click “Load Material” button to open a new window for loading mix materials.
- h. Click “+” button to add multiple designs or multiple layers if it is the case. Multiple layers only allows to be used for Flexible Pavement.
- i. Use the “NEXT” button to go to next page.

2. Now you are in the window of “Select alternatives to be averaged” if the analysis purpose “Benchmark” is selected, otherwise it is “Select Concrete/ Asphalt Mix”

Compressive Strength (psi): 4000.0 psi

Analysis Geographic Region: Louisiana

epds-LA

**Mix design**

	Value	Unit		Value	Unit		Value	Unit
Cement(lb) (65-950)	430	lbs	Air(%) (3-7)		%	SpecialAdditive_A(oz) (0-0)		oz
FlyAsh(lb) (0-800)		lbs	Slag(lb) (0-0)		lbs	SpecialAdditive_B(oz) (0-0)		oz
FineAggregate(lb) (756-2650)		lbs	WaterReducer(oz) (0-733)		oz	SpecialAdditive_C(oz) (0-17)		oz
Water-Cement Ratio (0.24-0.79)		ratio	AirEntrained(oz) (0-34)		oz			
CoarseAggregate1(lb) (0-1987)		lbs	SetAccelerator(oz) (0-95)		oz			
CoarseAggregate2(lb) (0-424)		lbs	SuperPlasticizer(oz) (0-85)		oz			

4 Mixes

Compressive Strength(psi)	District	Cement (lbs)	Water-Cement Ratio	FlyAsh (lbs)	Fine Aggregate (lbs)	Coarse Aggregate1 (lbs)	Coarse Aggregate2 (lbs)	Air(%)	Construction Type	Price (\$ per yd3)
4283.0	Hammond	424.0	0.48	93.0	1431.0	1621.0	0.0	5+/-2	PCC Pavement	106.0
4475.0	Shreveport	436.0	0.48	109.0	1515.0	1515.0	0.0	5+/-2	PCC Pavement	119.0
4173.0	New Orleans	408.0	0.5	102.0	1388.0	1748.0	98.0	5+/-2	PCC Pavement	122.0
4220.0	Shreveport	451.0	0.48	113.0	1500.0	0.0	1534.0	5+/-2	PCC Pavement	123.0

Search Save Finish

Figure 3: Select Concrete Mix

Analysis Geographic Region: Louisiana

**Mix design**

	Value		Value		Value
Type of Mix	WMA	Coarse Aggregate Content %		Antistrip Material	Select
Warm Mix Additive	Foaming ...	Fine Aggregate Content %		Antistrip Content %	
Warm Mix Additive Content		RAP Content %		Additives	Select
Binder Grade	PG 70-22M	Other Aggregate (if any) %		Additives Content %	
Virgin Binder Content	4.5	Air Voids		Dust/Binder Ratio	
Binder Source	Select	VMA			
RAP Binder Content		VFA			

21 Mixes

Binder Grade	Binder Cotent Virgin (%)	Binder Cotent RAP (%)	Coarse Aggregate (%)	Fine Aggregate (%)	RAP Aggregate (%)	Air Voids(%)	District	Price (\$ per ton)	Dust/Binder Ratio
PG 70-22M	4.1	14.3	46.3	39.4	14.3	3.6	New Orleans	75.0	1.5
PG 70-22M	4.1	14.3	46.8	38	14.3	3.5	New Orleans	90.0	1.57
PG 70-22M	4.1	14.3	46.8	38.9	14.3	3.5	New Orleans	100.0	1.57
PG 70-22M	4.1	14.3	46.8	38.9	14.3	3.5	New Orleans	90.0	1.57
PG 70-22M	4.1	14.3	46.8	38.9	14.3	3.5	New Orleans	97.0	1.57
PG 70-22M	4.1	14.3	46.8	38.9	14.3	3.5	New Orleans	100.0	1.45

Search Save Finish

Figure 4: Select an Asphalt Mix

- a. Choose the geographic location for materials first.

- b. Fill mix description information you know, just leave it blank for text-field or default 'Select' for combo-boxes if you don't know other mix parameters.
  - c. Click "Search" after you filling all conditions.
  - d. Choose such mixes you prefer and click "Save" button to save all mixes and do the computation later. (In the 'Product comparison' version, user may need to input transportation distance if the auto distance-calculator doesn't work, which may result from invalid zipcode in the database or invalid internet)
  - e. Close current window by clicking "Finish" button.
  - f. You can add another design or go to the "Weights" tab.
3. Now you are in the "Weights" tab.

The screenshot shows a software window titled "Sus Pav Des" with four tabs: "Layer Information", "Weights", "Transportation", and "Summary". The "Weights" tab is selected. Under "Performance Weights", there are two input fields: "Environmental Performance(%): 50.0" and "Economic Performance(%): 50.0". Below this, a dropdown menu for "Predefined Weights" is set to "EPA Science Advisory Board-based". There are six more input fields for specific impact categories, each with a value of 15.0: "Global Warming Potential(%)", "Ozone Depletion Potential(%)", "Acidification Potential(%)", "Photochemical Ozone Creation Potential(%)", "Eutrophication Potential(%)", and "Non-Renewable Energy Consumption(%)". A "Sum(%): 100.0" field is also present. A yellow "Save" button is located at the bottom right of the window.

Figure 5: Weights tab

- a. Fill value for Environmental Performance(%) and Economical Performance(%)
  - b. Select "Predefined Weights" for impact categories then click "Save" button.
  - c. Click "Transportation" tab.
4. Now you are in the "Transportation" tab.

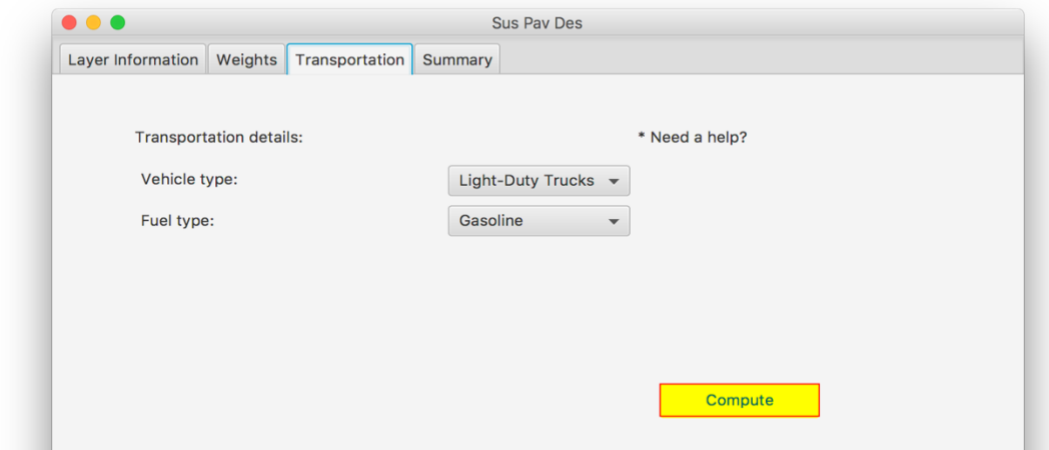


Figure 6: Transportation Tab Under Product Comparison Analysis

- a. Select “Vehicle type” and “Fuel type” for identifying the substance content value.
- b. You need to input the transportation distance if you are in a ‘Benchmark’ analysis. You may input an estimated value directly or use the required zipcode to calculate a real routine distance with a valid internet.

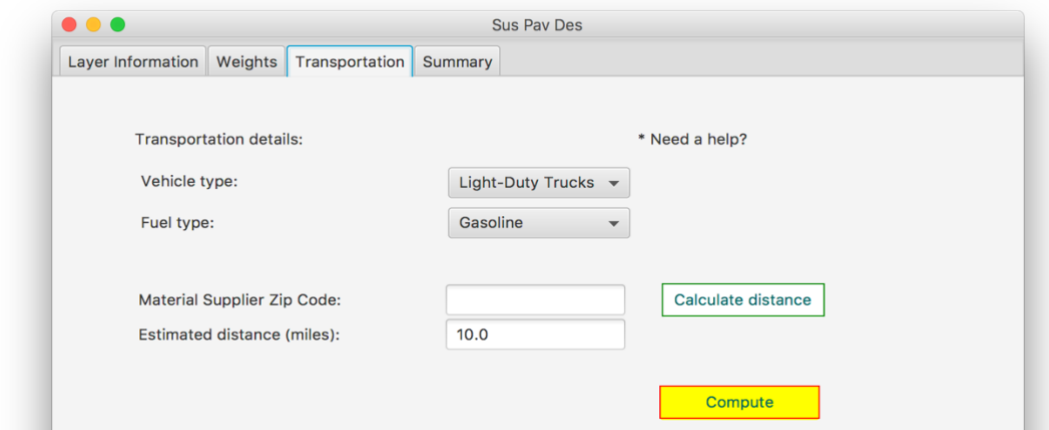
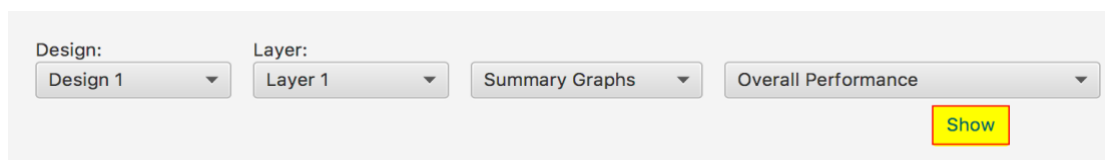
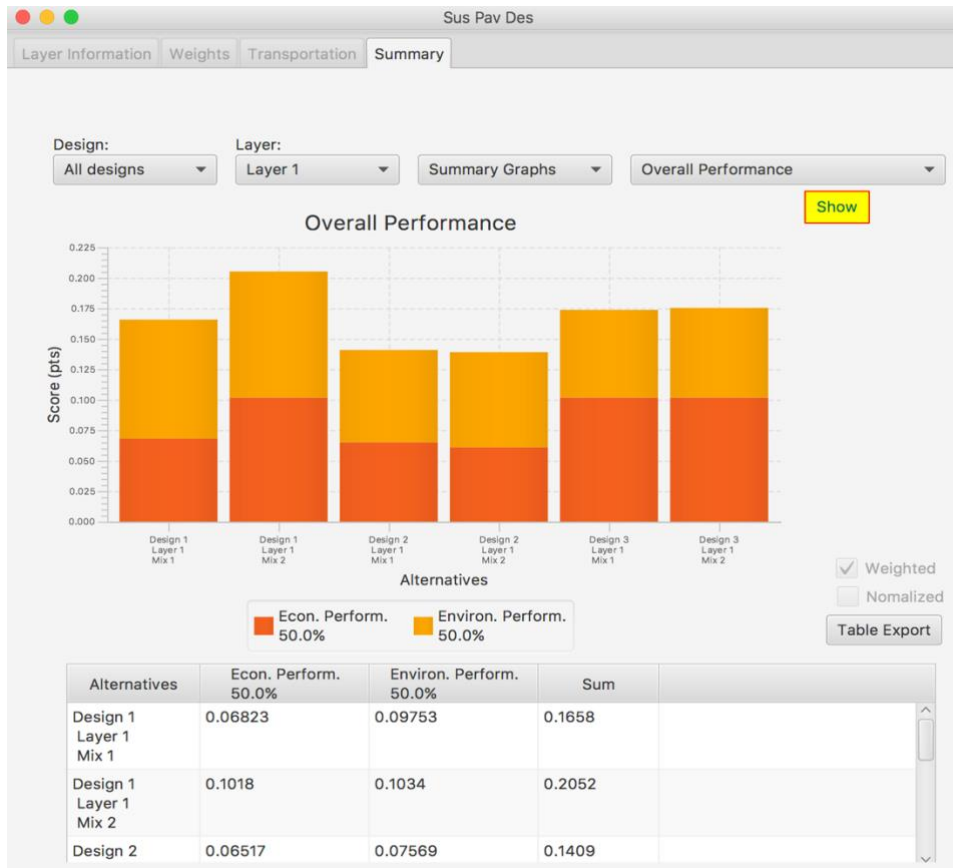


Figure 7: Transportation Tab Under Benchmark Analysis

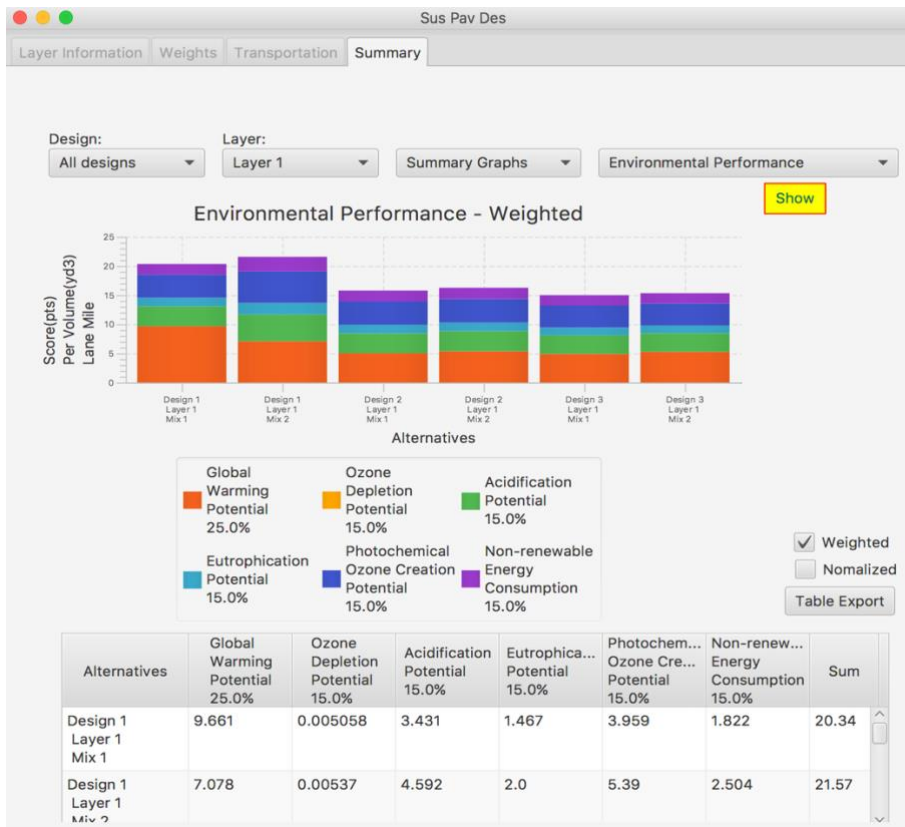
- c. Click “**Compute**” button to calculate environmental analysis.
5. Now you are in the “Summary/Export” window. Choose the design you want to output the analysis results.



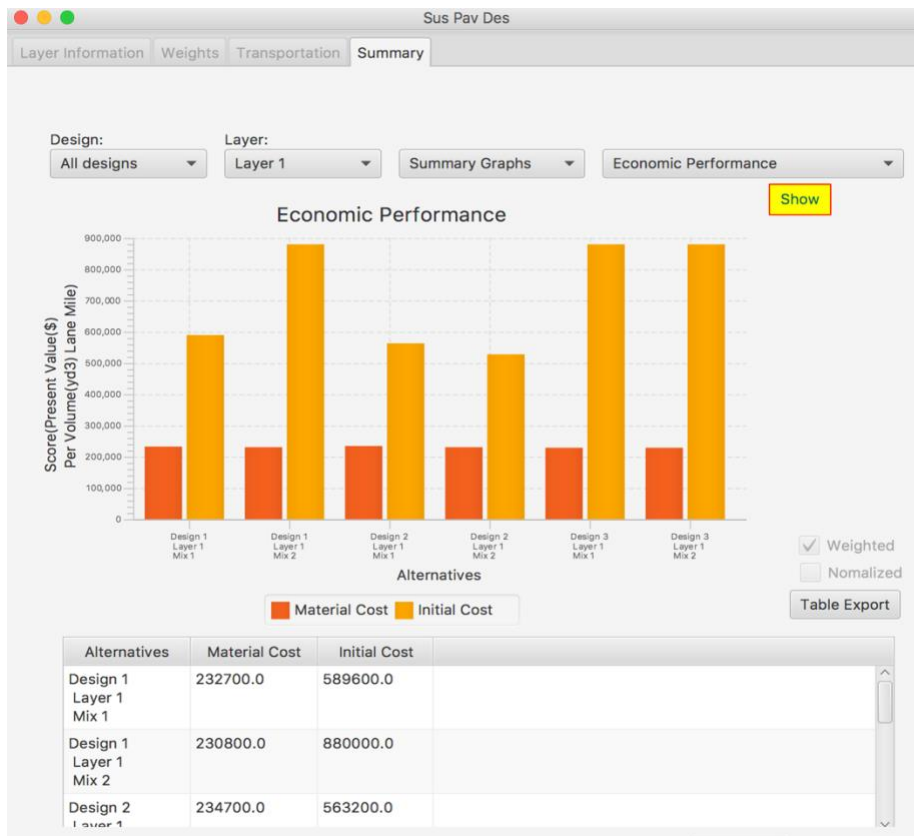
- a. Summary Graph (A lower score means a better design)
  - i. Overall Performance



ii. Environmental Performance

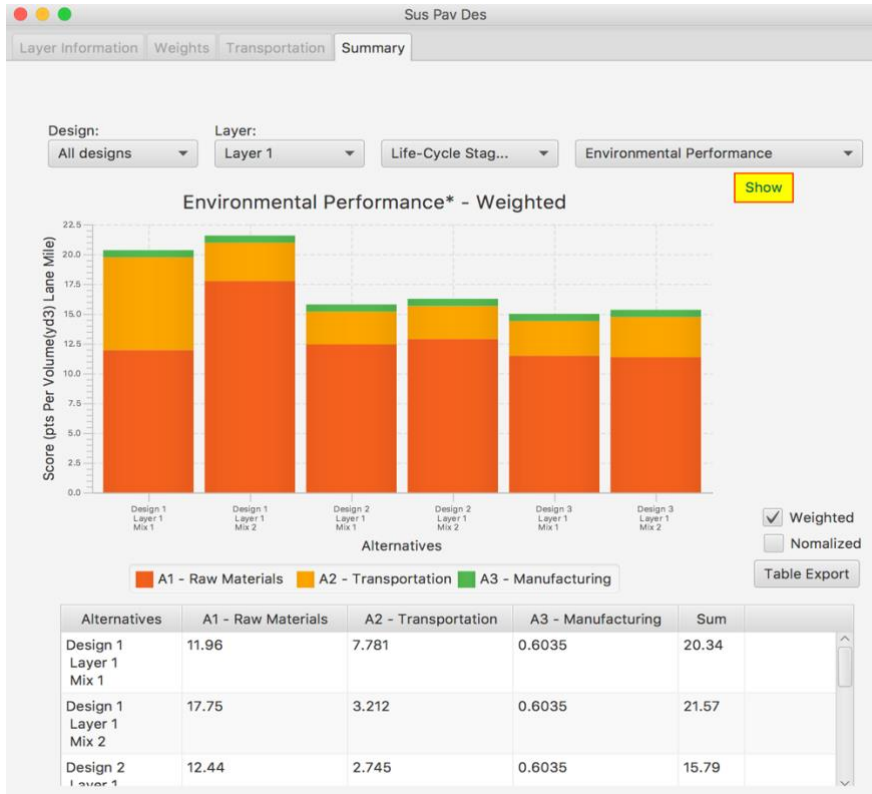


iii. Economic Performance

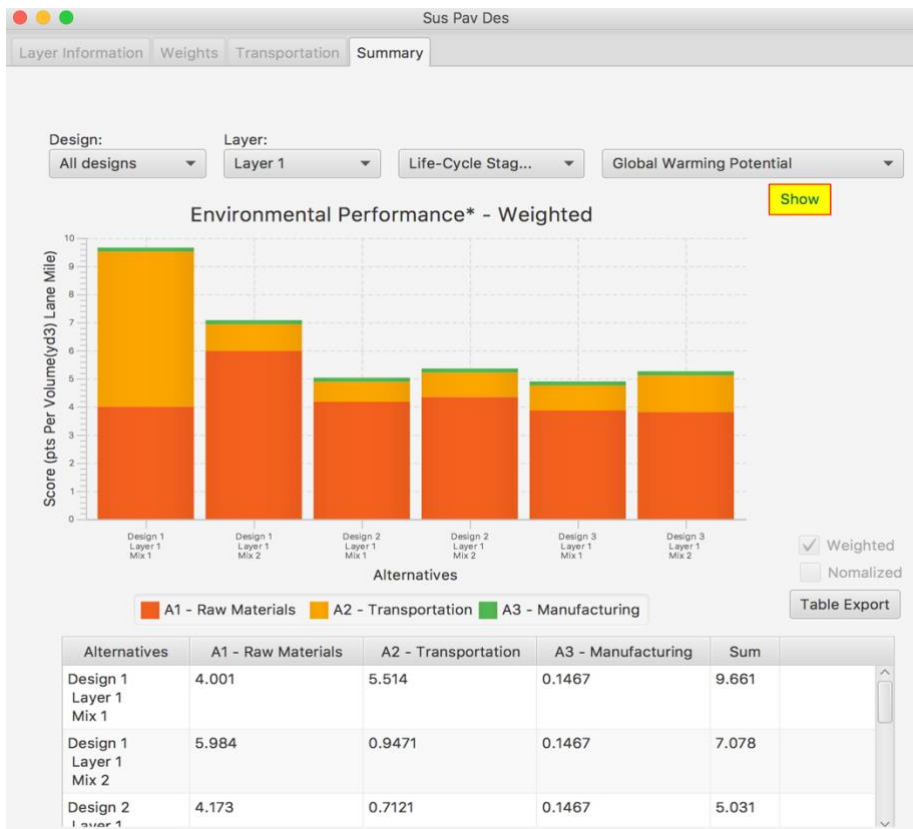


b. Life-Cycle Stage Graphs

i. Environmental Performance



ii. GWP impact





Note: User should operate the tool by following the user guide above, any tab or step skipping may result in no result error in the final Summary table. A “Need a help?” popup icon could guide user for each tab.

