



# APPLES TO APPLES

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# Apples to Apples

## Flood Equity in Harris County

Like water supply systems and fire and rescue services, flood protection is an essential service for the whole population. But in Harris County, TX, the policy approach to flood management has caused harm to a great percentage of the population. These harms include excess deaths, injuries, property damage, reduced property value, ineligibility for mitigation funding, and reduced well-being.

As climate change continues to impact the Gulf Coast region and exacerbate these harms, Texas and Harris County must respond with new tools and methodology to achieve equitable outcomes. There is also a need to adopt a universally accepted and data-driven analysis of baseline conditions. Simply put: we must first frame the problem appropriately before we understand the best and necessary solutions. The purpose of this policy brief is to develop a method for understanding the inequity in simple terms using readily available data. Our method circumvents past approaches that have been used to support the institutionalized inequity that now exists. Specifically, the practice of comparing dollars spent is corrected.

Dollars spent on flood protection do not reflect the benefits received because different areas of the county are at different starting points. Underserved areas have experienced systemic disinvestment, which for decades inhibited economic development, suppressed property values, and resulted in excess deaths, injuries, property damage, and loss of property. At the same time, privileged areas have experienced an abundance of spending on flood protection, which promoted safety, high property values, economic development, and fewer deaths, injuries, property damage, and property loss. These inequities are carefully hidden from view by never comparing flood protection benefits in a fair manner. "Dollars spent" is the first factor, but it cannot be the only factor in an apples-to-apples comparison.

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Dollars spent on flood protection ignores differences in population density between wealthier and poorer neighborhoods. On average, wealthier areas have more land per inhabitant compared to low-income areas which have relatively less land per inhabitant. Structural differences in population density result in further disinvestment per person for flood protection in low-income areas. "Population density" is the second factor.

Dollars spent on flood protection also ignores differences in flood risk, which furthers inequity even as dollars are spent. Required flood protection levels have continued to rise over time, prompting updates to flood maps and flood infrastructure. Dollars spent on each update are routinely targeted to protect wealthier areas, so that underserved areas never catch up and dollars are not distributed by degree of risk. "Flood risk" is the third factor.

The routine ways that flood protection needs and flood protection spending are presented to elected officials and the public has concealed the depth of inequity that actually exists and has contributed to institutionalizing that inequity. To end the practice of concealing inequities in flood protection outcomes, we propose a Flood Benefits Index that integrates the above three factors and enables an accurate understanding of baseline inequity and future spending equity. The index is determined by Census Tract from the following equation:

$$\text{Flood Benefits Index} = (\text{total cost to date}) / (\text{population density} * \text{flood risk})$$

Most people would be able to understand this index intuitively. If data were made available to everyone, many people would be able to calculate this index themselves. Table 1 presents three hypothetical examples of using the index.

The first example in Table 1 shows the current norm, in which extreme differences in spending exist between low-income and high-income areas of Harris County (see Columns 1 and 2). In this hypothetical example, \$1000 has been spent to date in the high-income area, and \$50 has been spent to date in the low-income area. This is a 20-times difference. As expected, the low-income area has a higher population density and a higher flood risk. Table 2 provides a conversion table for flood risk (e.g., 2-year protection

is the same as a 50% recurrence interval). After applying the Flood Benefits Index equation, the indexes for the two areas are \$0.001 and \$2.00, respectively. This is a 2,000-times difference. The low-income area has received, to date, pennies on the dollar compared to the high-income area. The actual inequity is far bigger than the difference in dollars spent to date. This is why cost alone is an inaccurate measure of inequity.

**Table 1. Example of the Flood Benefits Index**

	1	2	3	4	5
	low income	high income	low income	high income	low income
<b>Cost</b>	<b>\$50</b>	<b>\$1000</b>	<b>\$1000</b>	<b>\$1000</b>	<b>\$2000</b>
<b>Population</b>	<b>1000</b>	<b>500</b>	<b>1000</b>	<b>500</b>	<b>1000</b>
<b>Flood Risk</b>	<b>50%</b>	<b>1%</b>	<b>50%</b>	<b>1%</b>	<b>1%</b>
<b>Benefits Index</b>	<b>\$0.001</b>	<b>\$2.00</b>	<b>\$0.02</b>	<b>\$2.00</b>	<b>\$2.00</b>
	Current Norm		Equal Cost	Apples to Apples	

The second example in Table 1 is a conventional attempt to solve the inequity problem by using equal costs, although this has never actually happened (see Columns 2 and 3). In this example, the costs are set equal. Population density and flood risk do not change.

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The resulting Flood Benefits Index values are \$0.02 and \$2.00, a difference of 100-times, which is a big improvement over the current norm but still does not represent equity.

**Table 2. Flood Risk Conversion Chart.**

Flood Risk	
500	0.2%
100	1%
25	4%
15	7%
10	10%
5	20%
2	50%

Achieving fairness requires that the Flood Benefits Index values are set equal in order to achieve an apples-to-apples comparison. It also requires setting flood risk levels equal. The apples-to-apples examples is presented in Columns 4 and 5 of Table 1. The result is that twice as much flood spending is required in the low-income area compared to the high-income area in order to achieve the same flood protection.

These examples are intended to present the concept of equity as applied to flood protection in Harris County. A simple index that accounts for structural factors in which inequity is embedded can be a useful tool for achieving equitable policy objectives.

Another aspect of the Flood Benefits Index is the intentional use of the term "benefits." In cost-benefit analysis, benefits are typically defined as the structure damages avoided in future storms. Under this definition, higher priced homes always beat out lower priced

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homes because the higher dollar value of mitigating them translates into relatively more benefits. But in our conceptualization of the Flood Benefits Index, the benefits of investing in low-income areas are highlighted and counted. Because their need is so great, the benefit of investing is higher compared to investing in areas that already have a high Flood Benefits Index.

### **Community vetting and additional applications for the Flood Benefits Index**

It is important to create tools that can be readily understood and truly accessible to community members who have historically been excluded from data access and data-driven decision making or policy setting. The Flood Benefits Index has been vetted by a small group of impacted residents who are on the frontlines of inequities in Harris County.

The tool is being vetted through the Harris County Flood Resilience Community Task Force, a 17-member multidisciplinary, community-driven body that Commissioners Court established to ensure Harris County develops and implements equitable flood resilience planning and projects that take into account community needs and priorities. The Flood Benefits Index is being applied to create an equity analysis of Harris County Flood Control District's body of work since its genesis. Members of the Task Force have discussed how the Flood Benefits Index can be layered with additional data sets such as EJ Screen, the CDC's Social Vulnerability Index and other tools to understand the compounding effects of inequitable flood risk.

Amongst the Task Force, there is consensus to create and apply a similar "benefits index" formula for each of the Harris County departments engaged in a 2050 Flood Resilience Planning process. This will result in a holistic understanding of baseline conditions and an apples to apples comparison of inequities.

### **Conclusion**

The Flood Benefits Index promotes unlearning conventional ways of counting that have institutionalized inequity as a routine practice in flood management.

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***“The Flood Benefits Index is a useful tool for conducting the apples-to-apples comparisons necessary to achieve flood equity policy objectives.”***