



risQ's Partnership with Intercontinental Exchange What it Means for the Municipal Market

risQ, Inc., a Boston headquartered start-up focused on best-in-class climate risk analytics, and Intercontinental Exchange (NYSE:ICE), a market leader in data services to the financial services sector, recently announced a partnership that will enable the municipal bond ecosystem to incorporate climate risk into project and investment decisions.

Combining cutting-edge climate science, catastrophe modeling and geospatial machine learning technology, risQ has developed a comprehensive analytics platform capable of analyzing climate risk for all obligors and issuers of municipal bonds, delivering financially quantitative output across the key climate perils. Critically, the analytics are agile across all maturities, obligors and boundaries, from the largest counties and school districts to the smallest utilities and development districts, and across the most complex hospital systems and transport authorities. For those active in the space, the unique capability risQ brings, combined with ICE's securities data and market reach, delivers high quality, actionable data around climate risk for all municipal bonds functions and parties.

EXEMPLARY MUNICIPAL PRODUCT INSIGHTS

CLIMATE RISK TO SERVICE AREAS: THE CASES OF FLAGLER AND OROVILLE HOSPITALS

Management of Flagler Hospital in St. Johns County, FL, estimated that more than \$5.3 million in operating losses owing to 5 months of business interruption stemming from Hurricane Matthew, which struck Florida in October 2016. Notably, this was not due to physical damage to the hospital itself but instead to interruptions to its service area: some residents postponed elective procedures because their resources had to be redirected to property repairs. There was also an estimated decrease in business from "snowbirds" who refrained from traveling to their winter rented or owned homes because those properties were damaged or otherwise occupied by permanent residents needing shelter.¹ According to risQ data, Flagler represents approximately the ~76th percentile for storm surge risk (out of ~1,250 hospitals with non negligible wind risk) and the ~92th percentile for wind risk (out of ~3,500 hospitals with non negligible wind risk).

By contrast, Oroville Hospital in Butte County, CA -- which is ~98th percentile of hospitals nationally among almost 6,500 hospitals currently captured in risQ's database -- actually saw an *increase* in business as a function of the Camp Fire of 2018 that devastated Paradise, CA. This was because the nearby Feather River Hospital was closed due to fire damage.² It is worth noting that Feather River Hospital had a near equivalent fire risk to that of Oroville's, falling in

¹ <https://emma.msrb.org/ER1086235-ER850143-ER1250819.pdf>

² <https://emma.msrb.org/ER1200048-ES972642-ES1373650.pdf>



the ~99th percentile nationally. The near equivalence in statistical risk suggests this exact outcome could easily have been reversed.

Given these examples, a comprehensive assessment of risk should include not only the vulnerability of a given facility, but to the total revenue base from which that facility generates revenue. risQ leverages a commute time-based approach to characterize any given facility's geospatial service area realistically: the closer a resident lives to a given hospital, the more likely she (and her corresponding property and economic output) is to contribute to its revenue base. To that same end, the residents located progressively far away from a hospital are less likely to contribute to it. risQ's commute time based approach is flexible and user-driven, empowering an analyst to use her expertise in customizing the size of the service area, which can range from 10 to 90 minutes.

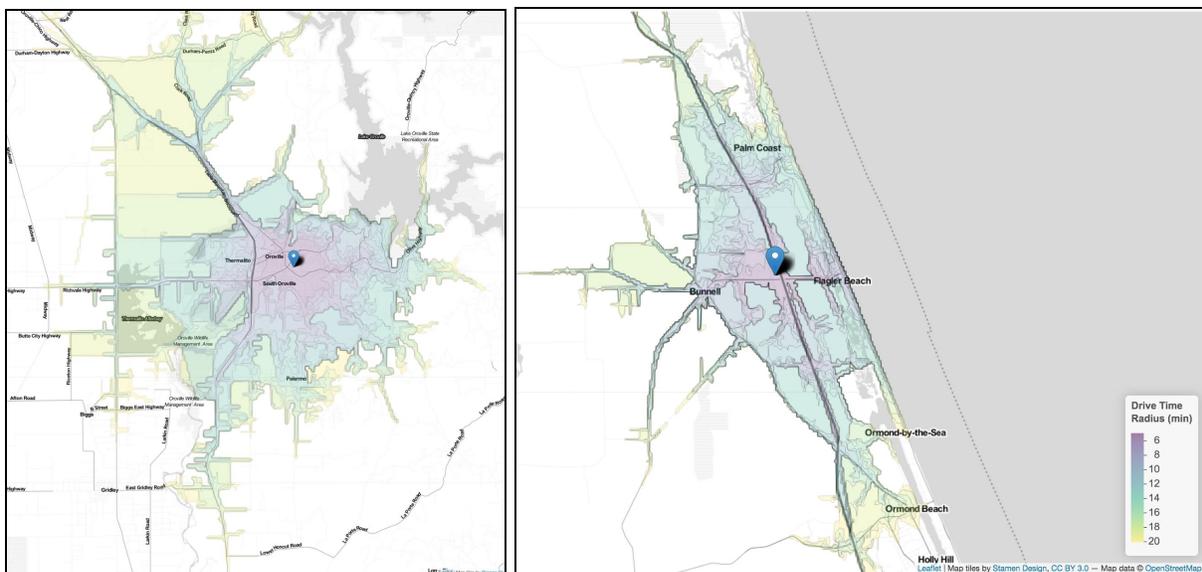


Figure 1: A risQ estimate of the business service area of Oroville Hospital in Butte County, CA (left), and Flagler Hospital in St. Johns County, FL (right). risQ characterizes service areas using incremental transit “isochrones”—commute time radii from a given point location. Flagler Hospital’s service area here is characterized by a 20-minute drive time isochrone. Incremental drive time bands (shaded purple to yellow, representing shorter to longer drive times, respectively) are used to weight the relative contribution of property value, GDP output and climate risks over space to summary metrics.

This same service area analysis can be applied to numerous sectors and obligor types, from charter schools and higher education, to transit authorities and ports.

SECURITY LEVEL COMPARISON: CALIFORNIA WILDFIRE RISK TO SCHOOL DISTRICTS

Last year, a publication in collaboration with risQ’s partner, Municipal Market Analytics (MMA), contextualized the devastating and unprecedented Camp Fire of 2018 for the municipal market. risQ’s partnership with ICE now allows for seamless, comparative analysis of climate risk at the security level. Table 1 shows a simple comparison of 2 CUSIPs, both issued by school districts in California. The comparison serves to illustrate that climate risk can be a point of differentiation when all else is held equal, including ratings, yield and ICE’s evaluation metrics. Middletown Unified School District has about 5 times the magnitude of wildfire risk as does Red Bluff Unified



Elementary School District, but securities maturing at the same time are almost exactly the same otherwise. In fact, the long-term wildfire risk to Middletown Unified School District is actually slightly higher than that of Paradise Unified School District’s was before Camp Fire.

Issuer	CUSIP	Coupon	Maturity	S&P	Price To Date	Yield	Cumulative Wildfire Property Value Risk
Middletown Unif Sch, CA	596877FK1	5	8/1/2048	AA	8/1/2027	2.155	~10%
Red Bluff Unified Elem Sch, CA	756377AE7	5	8/1/2048	AA-	8/1/2027	2.165	~2%

Table 1: Two school districts CUSIPs are compared for wildfire risk in California.

INLAND FLOODING IS INCREASING IN SEVERITY AND FREQUENCY

While much of the popular discourse surrounding climate change is focused on coastal flooding owing to sea level rise, inland flooding is becoming increasingly damaging, particularly in the Midwestern United States. Of many cases that could be examined from 2019’s historic flood season, Figure 2 focuses on Freeport, IL, a city with a population of ~25,000 that sits near the Pecatonica River. The city has flooded 7 times over the span of 2017-2019, with the most severe event occurring in March 2019 and being the worst since 1933.³ The annual average expected GDP impairment to the city—based only on *current* climate—is about 2% per year, which is on par with the risk that Miami Dade County, FL, currently faces (see previous section). Yet, Freeport is not even an outlier—it represents the 71st and 70th percentile among cities and towns in the state of Illinois for GDP impairment and property value risks, respectively. Nationally, it sits in the 64th and 67th percentiles of cities and towns for those two respective risks.

Climate change will continue to amplify inland flood risks in many cases. Warmer air has the capacity to hold more water vapor, on average leading to longer periods between rainfall events, with events being more severe when it does rain. On a regional basis, this is expected to play out differently—in the Midwest, early results from risQ’s climate modeling suggest that extreme precipitation depths may increase in severity from 15% to as much as 40% over the next several decades depending on the magnitude of additional global warming. Later in 2020, risQ will be explicitly embedding these projections within this inland flood model to provide municipal market stakeholders with a view of forward-looking flood risk tied to the call dates or maturities of securities.

³ [Neighborhoods Face Extinction As Floods Increase](#)

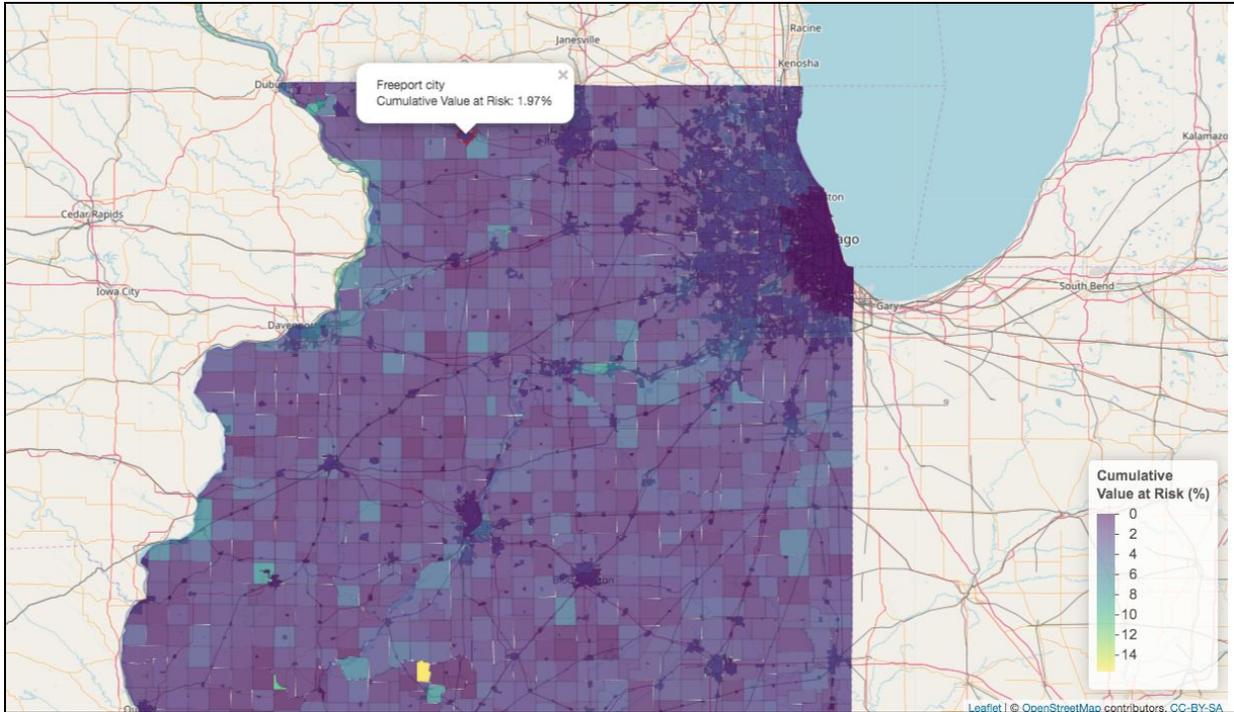


Figure 2: A heatmap shows current GDP impairment risk from inland flooding in Illinois. Its current annual expected GDP impairment is approximately 2%—roughly the same as the relative near term GDP impairment of Miami Dade County, FL.

SMALLER ECONOMIES WILL BE AMONG THE MOST VULNERABLE: GDP IMPAIRMENT

risQ previously commented on a 2019 report authored by BlackRock and Rhodium Group (“BRRG”), both the positive and the areas where further depth and breadth of analysis was possible.⁴ Since then, risQ has expanded its analytics to include GDP impairment risk—in short, the expected economic output unrealized by a local economy owing to the business-interruption impacts of climate events.

A new analysis with risQ’s data shows that over the next 10 years, Miami Dade County, FL, should expect an annualized average expected GDP impairment of ~1-2% from coastal flooding—an estimate in line with that produced by BRRG. However, smaller jurisdictions that, unlike Miami, do not dominate mainstream discourse on climate change are often exposed to much higher relative risks. Port Aransas, TX, is just one of many small cities that serve to illustrate that point. Port Aransas—with a population of only ~4,000 and relatively little affluence and high economic inequality (the city’s Gini index ranks in the 80th percentile in the state)—sustained \$25 million in direct damage from Hurricane Harvey in 2017 and an estimated additional \$15 million in debris removal and cleanup costs. Over the next 10 years, coastal flooding risks alone are expected to impair ~4-5% the GDP of Port Aransas in annual average terms—approximately twice the risk of Miami Dade. Figure 3 shows that, combined with hurricane wind and storm surge risk, the total annual average GDP impairment risk to Port

⁴ [BlackRock: Getting physical. Scenario analysis for assessing climate-related risks](#)



Aransas is ~11% (~110% cumulatively over the next decade). Among cities and towns in Texas, its exposure to hurricane plus tidal flood combined risks ranks in the 99th percentile.

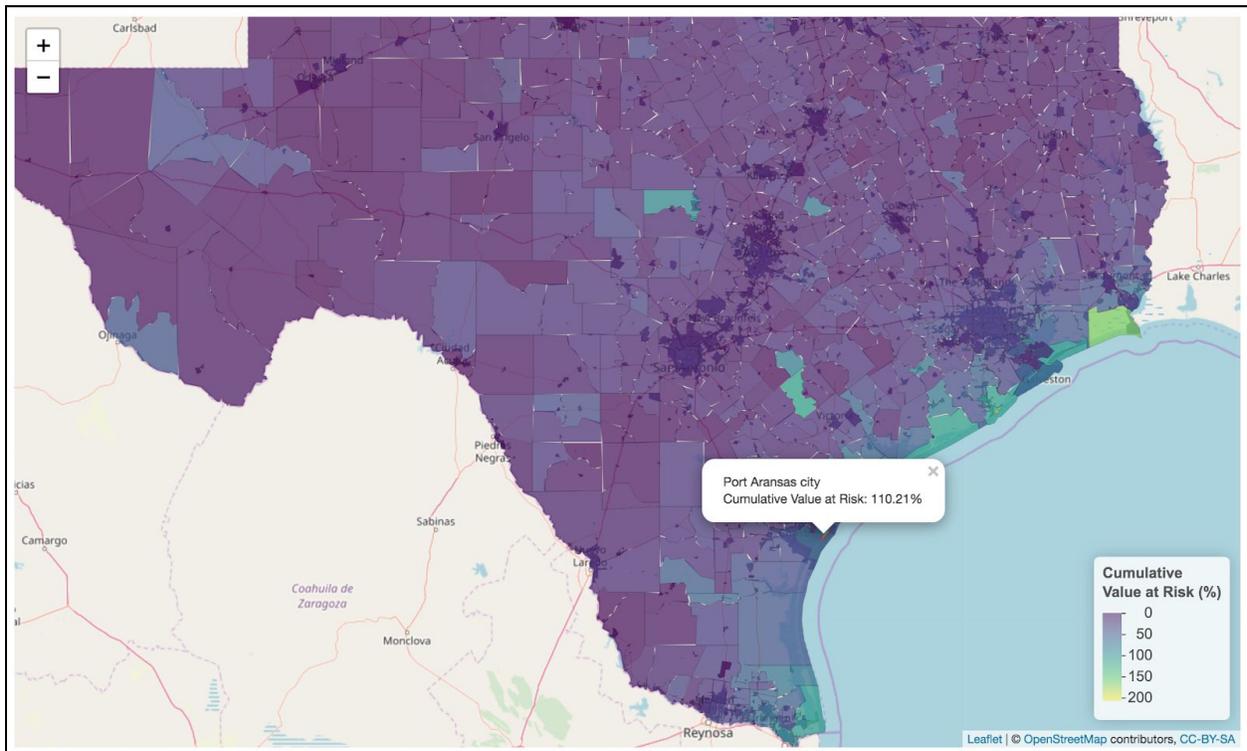


Figure 3 -- Port Aransas, TX has a GDP impairment risk to combined hurricanes wind speeds, storm surge, and sea level rise-exacerbated coastal flooding of ~110% cumulatively over 2020-2029 (i.e., ~11% in annualized average terms).

HOW THE MUNICIPAL BOND ECOSYSTEM CAN ENGAGE

The range of climate hazards, exposures, geographical variance, and obligors and securities to navigate is vast but the data and analytics to rapidly assess a specific case, conduct head to head comparisons, or assess entire portfolios are now available as a result of risQ's partnership with ICE Data Services. Importantly, these tools can be used by any participant in the market, from issuers, advisors and underwriters active at issuance, to the asset managers and credit research desks therein operating in the primary and secondary markets.

For those interested in more information on high level vision and methodology, please see the summary document on the risQ website, or contact chris.hartshorn@risq.io with additional questions or for further information.