Housing Market Impairment from Future Sea-Level Rise Inundation
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Supplemental Material

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1 Supplemental Material

1.1 Discount Rates, Value Impairment Estimates, and Assumptions

Important factors in estimating the impaired value of the U.S. coastal housing market are the timing of impairment from SLR and the discount rate used in estimating lost value. Intuitively, a property that is impacted by SLR sooner should see a higher value impairment than a property that is affected by SLR at a later date. The choice of a discount rate is a key assumption for estimating value over time (Arrow et al., 2013). The higher the discount rate, the less value is placed on future values and vis-a-versa. Although choosing a "socially responsible" long-term discount rate is important for making value estimates over multiple decades, we do not explicitly address this issue in our analysis. Our impairment estimates use the current estimated property value, which are held constant over time. This implies a discount rate of 0 percent, which allows us to easily communicate results in an intuitive way. Additionally, a 0 percent discount rate is within the range (albeit at the lower end) of rates used by other researchers and is consistent with current conditions where risk-free interest rates remain near, or even below zero throughout most of the developed world (Drupp et al., 2018).[1] Supplemental material section 1.2 provides a detailed description of discount rates, discounted cash flow methods based on the Gordon (1963) model, a discussion of cash flow impairment, and an interest rate sensitivity analysis.

In addition to the discount rate assumption, our housing market impairment analysis makes a series of simplifying assumptions. First, we assume that once a property is inundated by SLR, the value of the property falls to zero, which is an assumption in line with previous research (Bernstein et al., 2019). In reality, additional flood risks from nuisance flooding or enhanced storm surge would also erode economic value well before terminal impairment from SLR inundation (Amante, 2019; Beltrán et al., 2019). Second, our approach assumes no foresight

[1] Discount rates used in the social science and public policy spheres range from slightly negative to 20 percent, with recent research suggesting a zero or slightly negative discount rate is warranted (Drupp et al., 2018; Bauer & Rudebusch, 2020; Nordhaus, 2013). Other commonly used long-term discount rates for housing markets fall in the low single digits (Giglio et al., 2021; Bernstein et al., 2019)

on the part of homeowners, who would likely begin to discount property values before SLR inundation takes place or might take steps to protect their properties (e.g., by erecting protective flood walls). This either carries forward the value impairment or burdens the homeowner with onerous mitigation costs, both of which would reduce the home's value earlier than our estimates. Thus, our estimates for value at risk are structurally conservative, as we are not accounting for these additional risk factors or costs. Third, we assume that coastal markets have yet to incorporate all the risks associated with SLR into the valuation of coastal housing properties.[2] Finally, our analysis treats the housing market as static: we do not account for future population growth, net migration, housing market growth, or other housing price changes independent of SLR. Although these assumptions are required to enable the technical complexity of the analysis presented, our research offers the following contributions that can help practitioners better account for local SLR risk: 1) We outline and employ a methodology for estimating property (parcel) level inundation elevation using free, publicly available NOAA inundation shapefiles and digital elevation models (DEMs); 2) Identify when properties may be inundated using local SLR projections across a series of climate scenarios; 3) Account for and discuss the importance of climate uncertainty for SLR risk analysis; and 4) We present our results for diverse coastal cities, demonstrating how our approach can be applied to a variety of locations in the U.S. and at different scales of observation.

1.2 Discount Cash Flow Methods and Interest Rate Sensitivity

1.2.1 Discounted Cash Flow and Cash Flow Impairment

Our analytic approach uses a financial impairment methodology to estimate the value at risk from SLR for each property. We base value and impairment estimates on the Gordon (1963)

[2] Although recent evidence is mounting that investors are starting to account for these risks (Beltrán et al., 2019; Mcalpine & Porter, 2018; Keenan & Bradt, 2020; Keys & Mulder, 2020), homeowners may not be accounting for all risks of SLR and coastal inundation (Palm & Bolsen, 2020).

model, which is used by other researchers to estimate SLR timing (Bernstein et al., 2019). The Gordon model assumes that the value of property (V_i) is the sum of all future cash flows (CF_i) discounted by some discount rate (r) and that cash flows for unimpaired properties continue in perpetuity (forever). For our purposes, we make an additional simplifying assumption that cash flows to a property cease when it is exposed to SLR at time (T) and the value of the property immediately becomes worthless. For our impairment analysis, we use the following equations:

$$\begin{aligned}
V_i &= \sum_{t=1}^{\infty} \frac{CF_{i,t}}{(1+r)^t} = \frac{CF_i}{r} \\
V_{impaired} &= \frac{V_i}{(1+r)^T} = \frac{\frac{CF_i}{r}}{(1+r)^T} \\
\%\text{ Total Value Impaired} &= \frac{\frac{V_i}{(1+r)^T}}{V_i} = \frac{1}{(1+r)^T} \approx e^{-(r*T)}
\end{aligned} \tag{1}$$

where:

V_i = present value; property value i

CF_i = cash flow for property i

T = year of impairment; year of SLR impact

r = discount rate

By summing up impairment values for individually impaired properties and the unimpaired values for all properties, we arrive at a total value impairment for an entire housing market (e.g., city, county, state, country) and the share of total value that may be at risk from SLR:

$$\begin{aligned}
\text{Market Value Impaired} &= \sum_{i=1}^{n} V_i(e^{-(r*T)}) \\
\%\text{ Market Value Impaired} &= \frac{\sum_{i=1}^{n} V_i(e^{-(r*T)})}{\sum_{i=1}^{n} V_i}
\end{aligned} \tag{2}$$

1.2.2 Impairment Values and Discount Rate Sensitivity

Our baseline impairment estimates use an easy to communicate and understand 0 percent discount rate, which means that those impairment estimates over time reflect the current estimated property values. However, using some other (positive) discount would result in lower overall impairment value estimates, as future property impairments are discounted compared to properties impaired in the near-term. The higher the discount rate, the lower the impairment value. Below we provide an illustrative example for the city of Galveston using three different discount rates (i.e., 0%, 2.6%, and 4%):

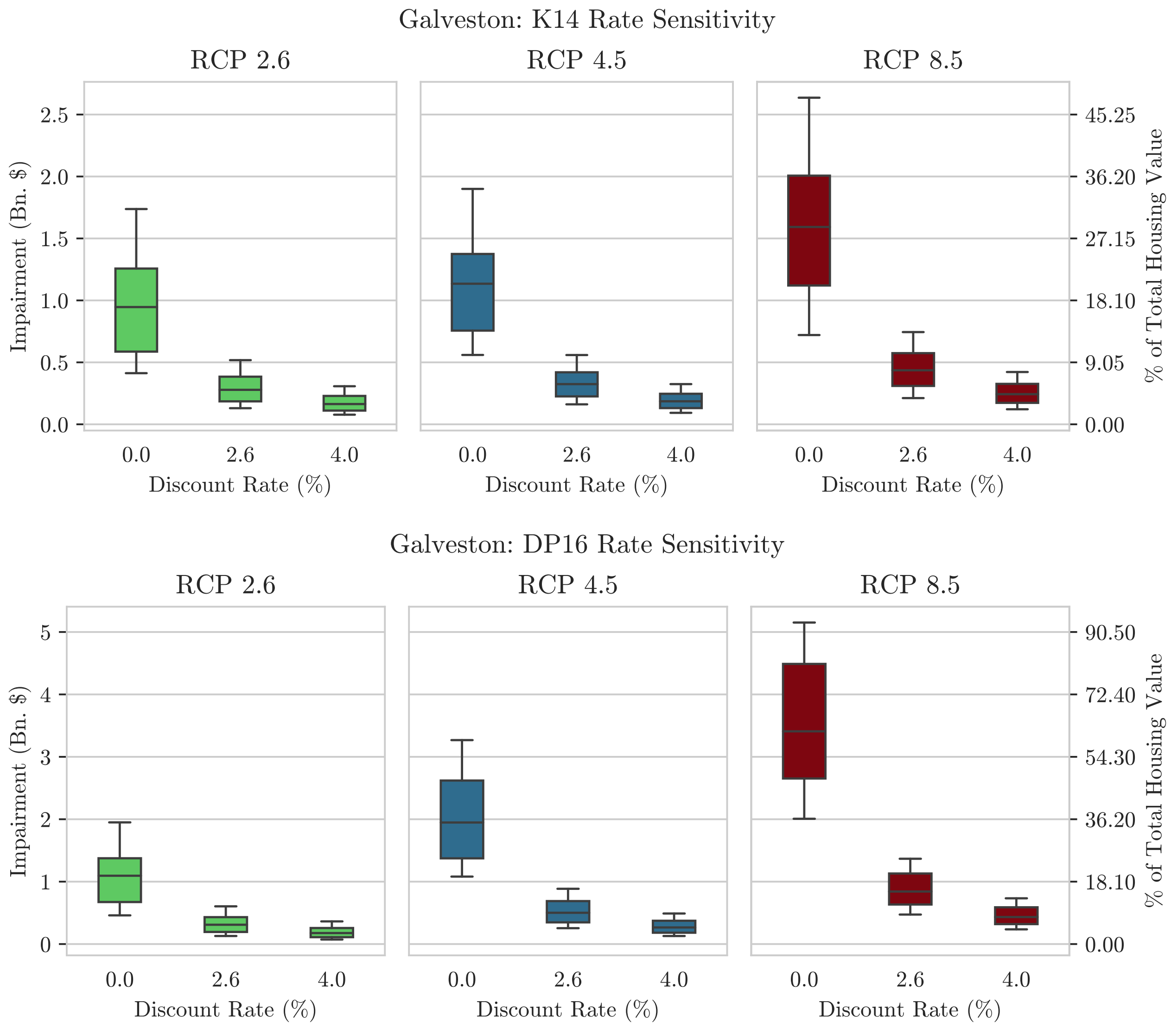


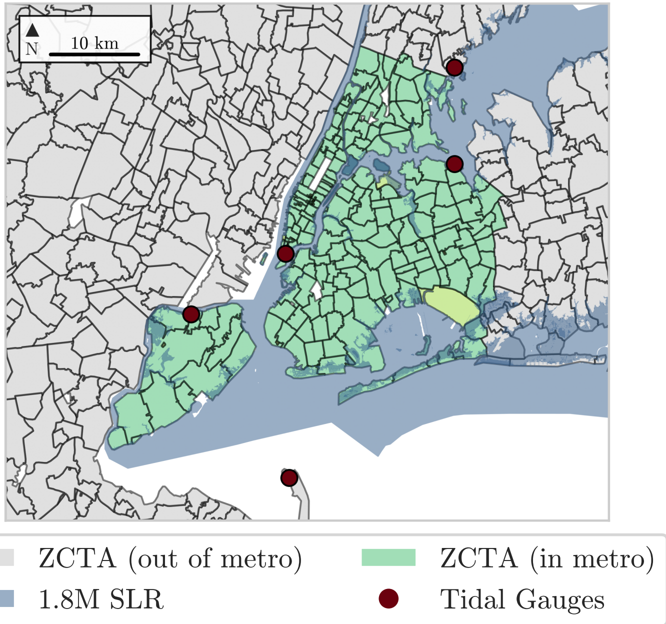
Figure 1: Interest Rate Sensitivity. Box and whisker plots for impaired property values at different discount rates through 2100; following format for tiles (e) and (f) of Figures 5-8 of primary text.

The median results across all GHG concentration paths for (Kopp et al., 2014, 2017; Deconto & Pollard, 2016), using three different discount rates, illustrate the sensitivity of impairment value estimates over time for a chosen interest rate. As an example, the median impairment value estimate with a 0 percent discount rate for K14 through 2100 is \$1.1 billion for RCP4.5. Using the 2.6% and 4% discount rates, this estimate drops to \$0.3 billion, and \$0.2 billion, respectively. This relationship holds across all climate scenarios. As the discount rate rises, the value impairment declines due to the time value of money, indicating the importance of choosing a discount rate for this type of long-term analysis.

2 Metro-Level Results

New York City: Inundation Overview

SLR Inundation Map

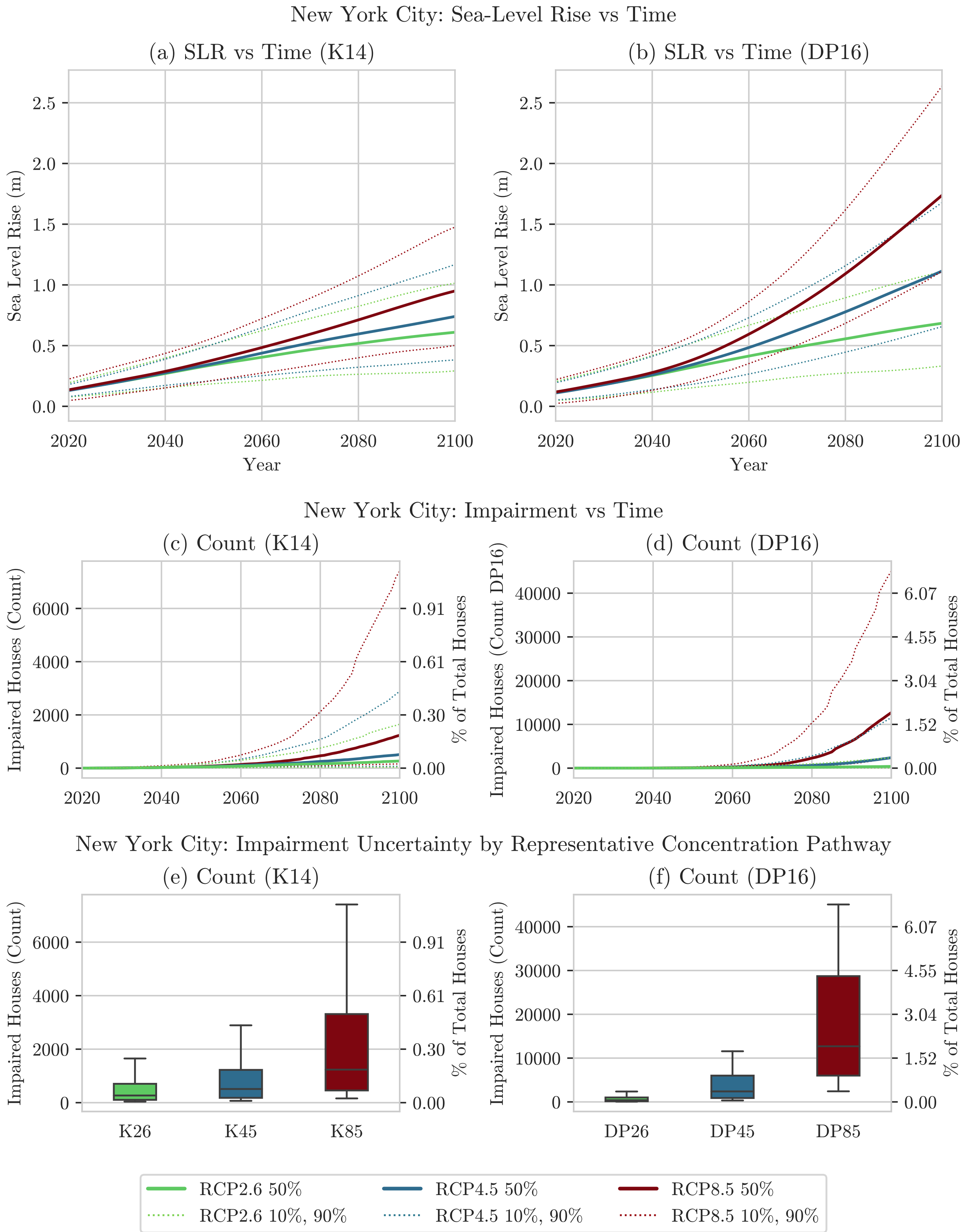


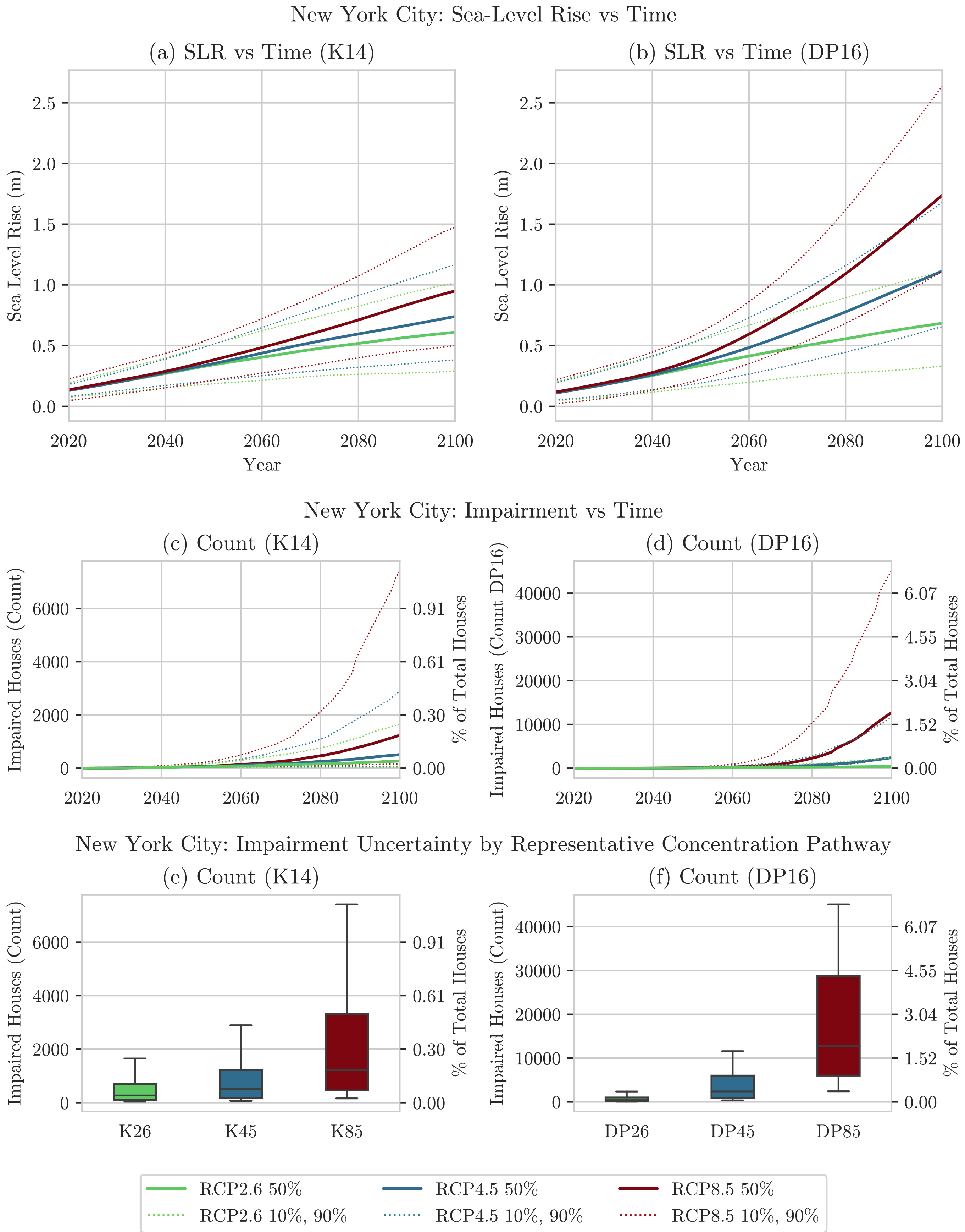
K14

RCP	ptile	Cnt. 2050	Cnt. 2100	% Cnt. 2100	Bn. $ 2050	Bn. $ 2100	% Value 2100
RCP-26	**0.1**	0	16	0.00	0.00	0.01	0.00
	0.5	36	256	0.04	0.01	0.09	0.02
	0.9	150	1645	0.25	0.05	0.63	0.12
RCP-45	**0.1**	0	47	0.01	0.00	0.01	0.00
	0.5	37	496	0.08	0.01	0.18	0.03
	0.9	150	2883	0.44	0.05	1.19	0.22
RCP-85	**0.1**	0	132	0.02	0.00	0.04	0.01
	0.5	53	1223	0.19	0.02	0.46	0.09
	0.9	201	7405	1.12	0.07	3.68	0.69

DP16

RCP	ptile	Cnt. 2050	Cnt. 2100	% Cnt. 2100	Bn. $ 2050	Bn. $ 2100	% Value 2100
RCP-26	**0.1**	0	33	0.01	0.00	0.01	0.00
	0.5	35	373	0.06	0.01	0.14	0.03
	0.9	187	2371	0.36	0.06	0.95	0.18
RCP-45	**0.1**	0	311	0.05	0.00	0.12	0.02
	0.5	40	2377	0.36	0.01	0.95	0.18
	0.9	187	11557	1.75	0.06	6.26	1.17
RCP-85	**0.1**	0	2389	0.36	0.00	0.96	0.18
	0.5	70	12682	1.93	0.02	6.92	1.29
	0.9	269	45069	6.84	0.09	25.85	4.82


New York City: Sea-Level Rise vs Time
(a) SLR vs Time (K14)
(b) SLR vs Time (DP16)
Sea Level Rise (m)
Year
New York City: Impairment vs Time
(c) Count (K14)
(d) Count (DP16)
Impaired Houses (Count)
Impaired Houses (Count DP16)
% of Total Houses
New York City: Impairment Uncertainty by Representative Concentration Pathway
(e) Count (K14)
(f) Count (DP16)
K26
K45
K85
DP26
DP45
DP85
RCP2.6 50%
RCP2.6 10%, 90%
RCP4.5 50%
RCP4.5 10%, 90%
RCP8.5 50%
RCP8.5 10%, 90%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Sea Level Rise (m)
Year
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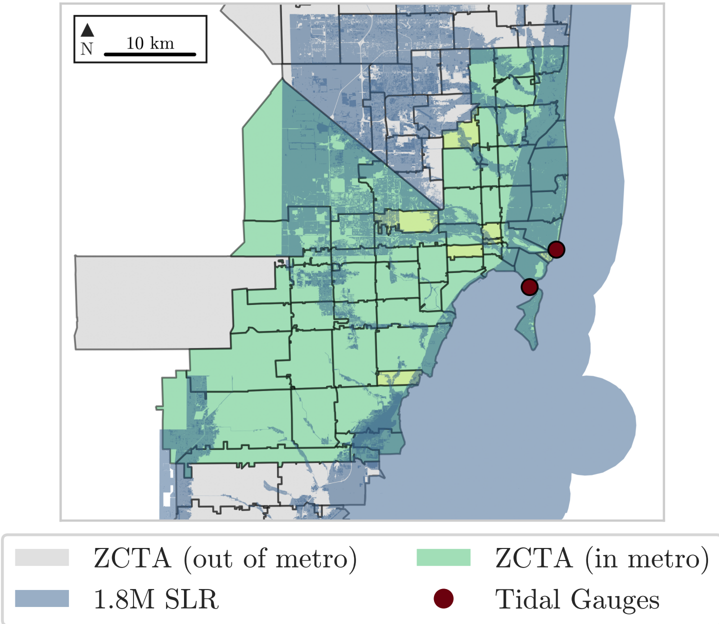
Impaired Houses (Count)
Impaired Houses (Count DP16)
% of Total Houses
New York City: Impairment Uncertainty by Representative Concentration Pathway
(e) Count (K14)
(f) Count (DP16)
K26
K45
K85
DP26
DP45
DP85
RCP2.6 50%
RCP2.6 10%, 90%
RCP4.5 50%
RCP4.5 10%, 90%
RCP8.5 50%
RCP8.5 10%, 90%

Miami: Inundation Overview

SLR Inundation Map

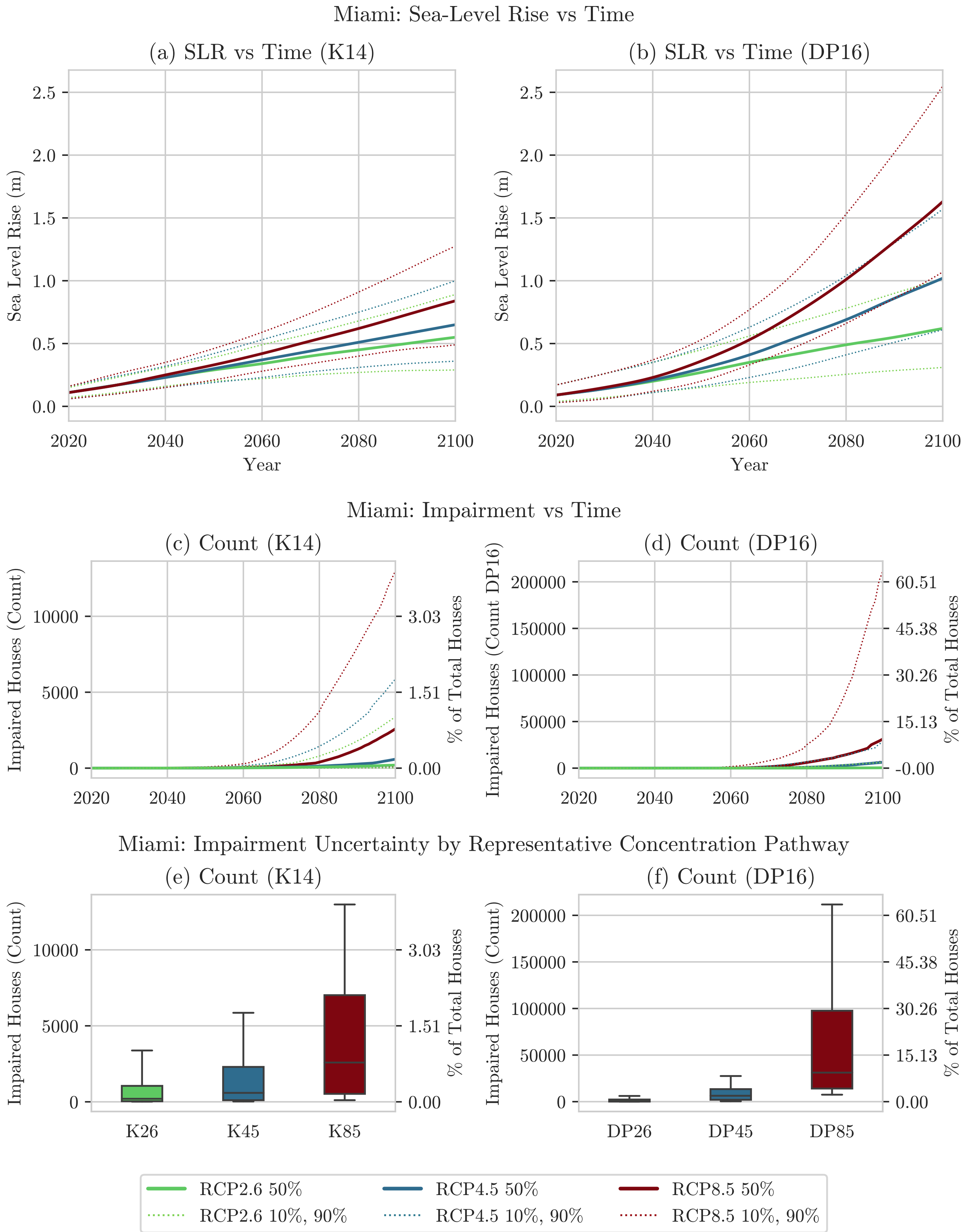


K14

RCP	ptile	Cnt. 2050	Cnt. 2100	% Cnt. 2100	Bn. $ 2050	Bn. $ 2100	% Value 2100
RCP-26	**0.1**	3	11	0.00	0.01	0.02	0.02
	0.5	11	199	0.06	0.02	0.25	0.19
	0.9	30	3377	1.02	0.06	3.52	2.68
RCP-45	**0.1**	1	20	0.01	0.01	0.04	0.03
	0.5	11	588	0.18	0.02	0.68	0.52
	0.9	45	5857	1.77	0.08	5.91	4.50
RCP-85	**0.1**	3	107	0.03	0.01	0.17	0.13
	0.5	12	2584	0.78	0.02	2.69	2.05
	0.9	79	12984	3.93	0.13	13.15	10.01

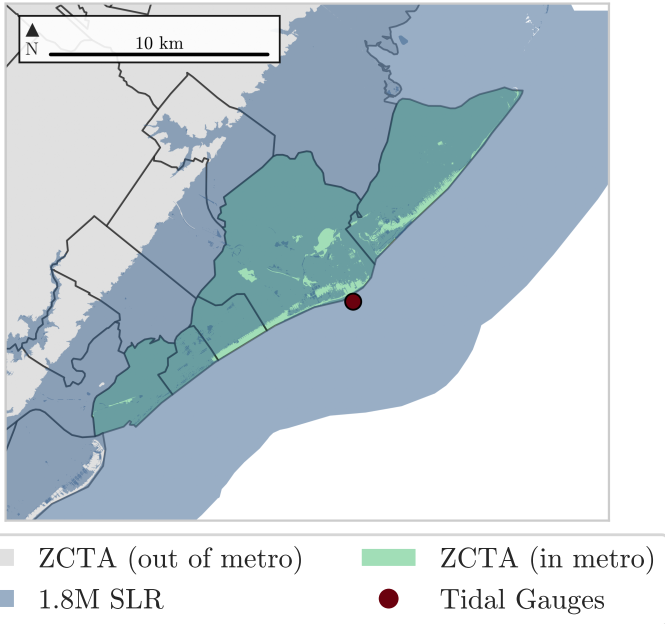
DP16

RCP	ptile	Cnt. 2050	Cnt. 2100	% Cnt. 2100	Bn. $ 2050	Bn. $ 2100	% Value 2100
RCP-26	**0.1**	0	11	0.00	0.00	0.02	0.02
	0.5	8	395	0.12	0.02	0.49	0.37
	0.9	69	6136	1.86	0.13	6.16	4.68
RCP-45	**0.1**	0	347	0.10	0.00	0.45	0.34
	0.5	11	6321	1.91	0.02	6.39	4.86
	0.9	86	27522	8.33	0.14	23.15	17.61
RCP-85	**0.1**	3	7479	2.26	0.01	7.64	5.81
	0.5	20	31164	9.43	0.04	25.30	19.25
	0.9	164	211648	64.04	0.22	86.26	65.63


Miami: Sea-Level Rise vs Time
(a) SLR vs Time (K14)
(b) SLR vs Time (DP16)
Sea Level Rise (m)
0.0
0.5
1.0
1.5
2.0
2.5
2020
2040
2060
2080
2100
Year
Miami: Impairment vs Time
(c) Count (K14)
(d) Count (DP16)
Impaired Houses (Count)
Impaired Houses (Count DP16)
% of Total Houses
0
5000
10000
0.00
1.51
3.03
50000
100000
150000
200000
-0.00
15.13
30.26
45.38
60.51
Miami: Impairment Uncertainty by Representative Concentration Pathway
(e) Count (K14)
(f) Count (DP16)
K26
K45
K85
DP26
DP45
DP85
RCP2.6 50%
RCP2.6 10%, 90%
RCP4.5 50%
RCP4.5 10%, 90%
RCP8.5 50%
RCP8.5 10%, 90%

Atlantic City: Inundation Overview

SLR Inundation Map

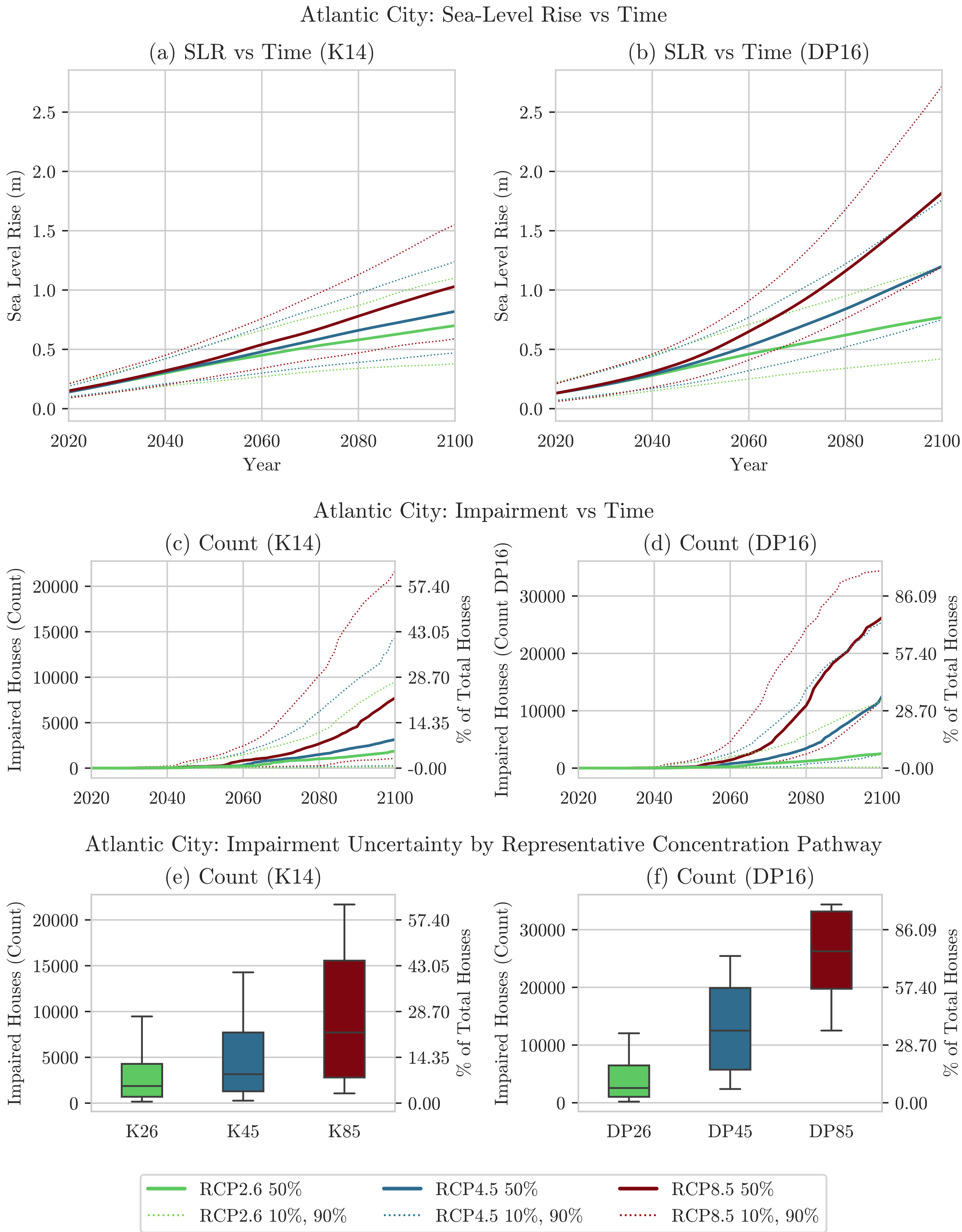


K14

RCP	ptile	Cnt. 2050	Cnt. 2100	% Cnt. 2100	Bn. $ 2050	Bn. $ 2100	% Value 2100
RCP-26	**0.1**	2	145	0.42	0.00	0.06	0.48
	0.5	145	1858	5.33	0.06	0.65	4.89
	0.9	865	9463	27.16	0.29	3.14	23.74
RCP-45	**0.1**	16	252	0.72	0.01	0.11	0.84
	0.5	153	3146	9.03	0.07	1.09	8.21
	0.9	865	14272	40.96	0.29	4.68	35.35
RCP-85	**0.1**	19	1048	3.01	0.01	0.36	2.72
	0.5	175	7703	22.11	0.08	2.53	19.12
	0.9	1078	21683	62.23	0.37	7.53	56.85

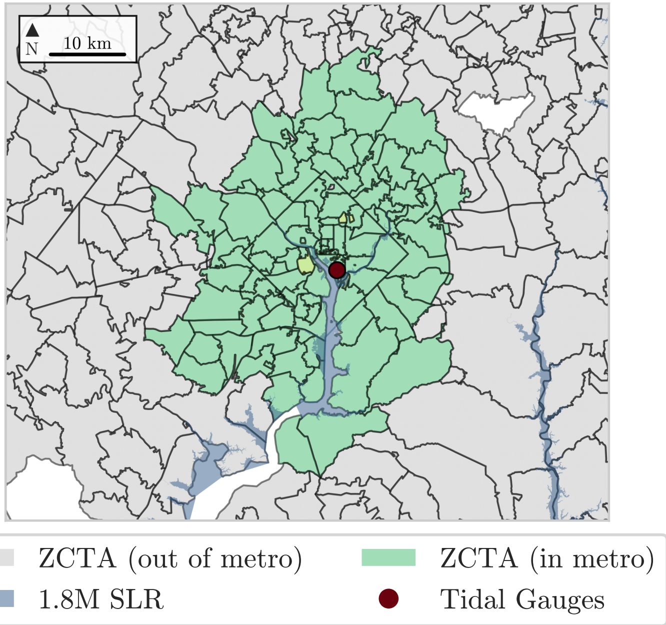
DP16

RCP	ptile	Cnt. 2050	Cnt. 2100	% Cnt. 2100	Bn. $ 2050	Bn. $ 2100	% Value 2100
RCP-26	**0.1**	0	175	0.50	0.00	0.08	0.60
	0.5	119	2543	7.30	0.05	0.88	6.65
	0.9	1012	12042	34.56	0.35	3.97	29.99
RCP-45	**0.1**	2	2365	6.79	0.00	0.82	6.20
	0.5	163	12494	35.85	0.07	4.06	30.65
	0.9	1048	25438	73.00	0.36	9.28	70.12
RCP-85	**0.1**	19	12494	35.85	0.01	4.06	30.65
	0.5	227	26240	75.30	0.10	9.71	73.33
	0.9	1404	34364	98.62	0.49	13.01	98.25


Atlantic City: Sea-Level Rise vs Time
(a) SLR vs Time (K14)
(b) SLR vs Time (DP16)
Sea Level Rise (m)
0.0
0.5
1.0
1.5
2.0
2.5
2020
2040
2060
2080
2100
Year
Atlantic City: Impairment vs Time
(c) Count (K14)
(d) Count (DP16)
Impaired Houses (Count)
Impaired Houses (Count DP16)
% of Total Houses
0
5000
10000
15000
20000
30000
-0.00
14.35
28.70
43.05
57.40
86.09
Atlantic City: Impairment Uncertainty by Representative Concentration Pathway
(e) Count (K14)
(f) Count (DP16)
0.00
K26
K45
K85
DP26
DP45
DP85
RCP2.6 50%
RCP2.6 10%, 90%
RCP4.5 50%
RCP4.5 10%, 90%
RCP8.5 50%
RCP8.5 10%, 90%

DC Metro Area: Inundation Overview

SLR Inundation Map

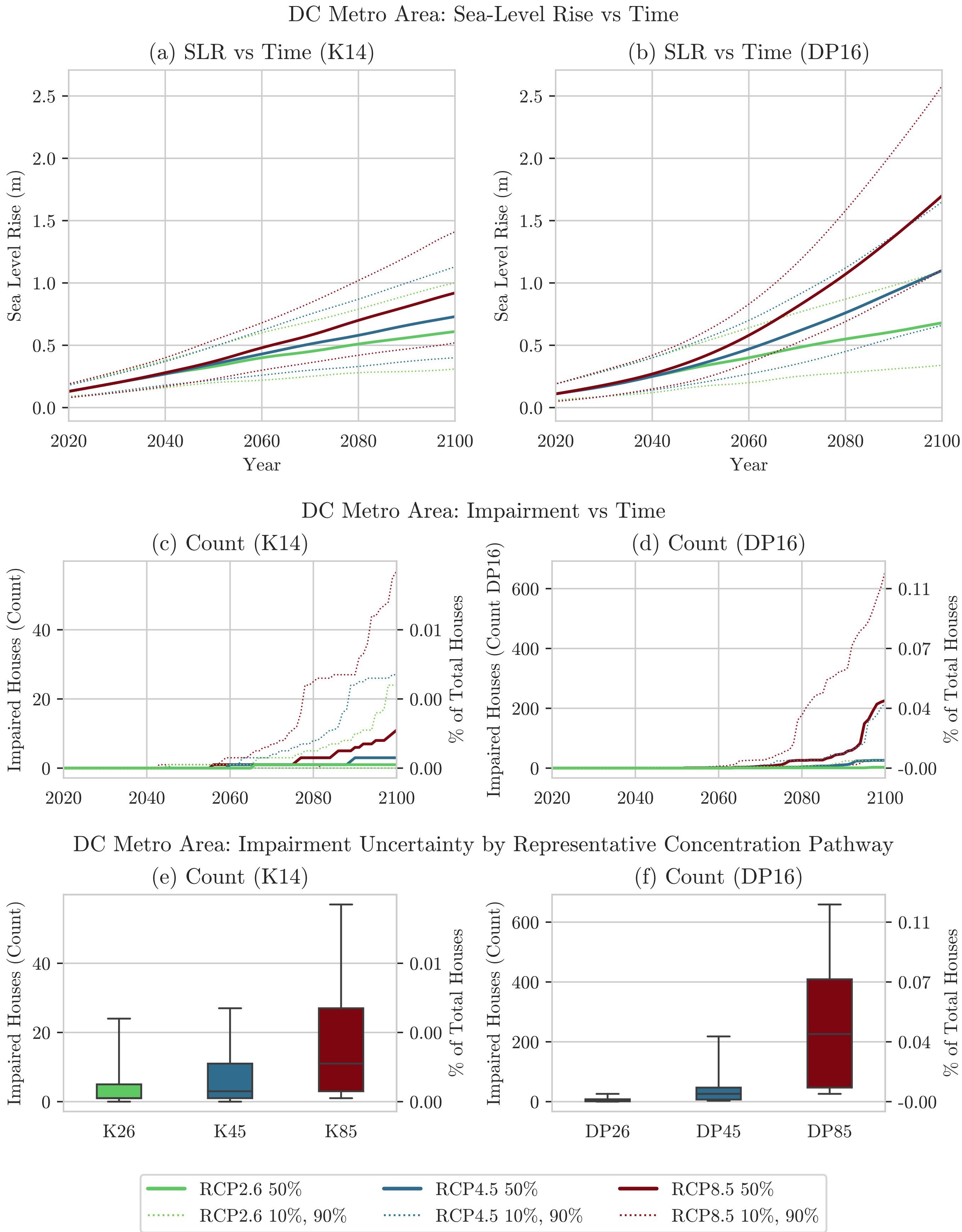


K14

RCP	ptile	Cnt. 2050	Cnt. 2100	% Cnt. 2100	Bn. $ 2050	Bn. $ 2100	% Value 2100
RCP-26	**0.1**	-	0	0.00	-	0.00	0.00
	0.5	-	1	0.00	-	0.00	0.00
	0.9	-	24	0.00	-	0.02	0.01
RCP-45	**0.1**	-	0	0.00	-	0.00	0.00
	0.5	-	3	0.00	-	0.00	0.00
	0.9	-	27	0.00	-	0.02	0.01
RCP-85	**0.1**	-	1	0.00	-	0.00	0.00
	0.5	-	11	0.00	-	0.01	0.00
	0.9	-	57	0.01	-	0.04	0.01

DP16

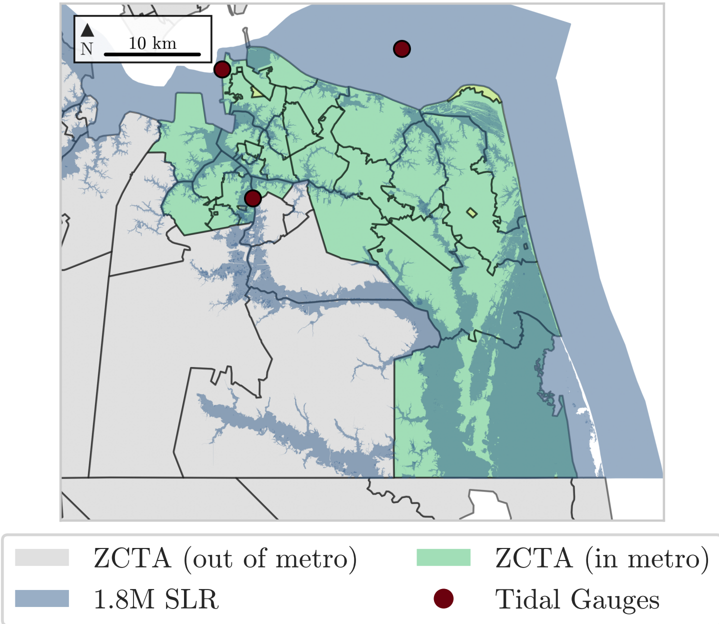
RCP	ptile	Cnt. 2050	Cnt. 2100	% Cnt. 2100	Bn. $ 2050	Bn. $ 2100	% Value 2100
RCP-26	**0.1**	-	0	0.00	-	0.00	0.00
	0.5	-	3	0.00	-	0.00	0.00
	0.9	-	26	0.00	-	0.02	0.01
RCP-45	**0.1**	-	3	0.00	-	0.00	0.00
	0.5	-	26	0.00	-	0.02	0.01
	0.9	-	218	0.04	-	0.13	0.04
RCP-85	**0.1**	-	26	0.00	-	0.02	0.01
	0.5	-	226	0.04	-	0.14	0.04
	0.9	-	659	0.12	-	0.52	0.17



DC Metro Area: Sea-Level Rise vs Time
(a) SLR vs Time (K14)
(b) SLR vs Time (DP16)
Sea Level Rise (m)
Year
DC Metro Area: Impairment vs Time
(c) Count (K14)
(d) Count (DP16)
Impaired Houses (Count)
Impaired Houses (Count DP16)
% of Total Houses
DC Metro Area: Impairment Uncertainty by Representative Concentration Pathway
(e) Count (K14)
(f) Count (DP16)
K26
K45
K85
DP26
DP45
DP85
RCP2.6 50%
RCP2.6 10%, 90%
RCP4.5 50%
RCP4.5 10%, 90%
RCP8.5 50%
RCP8.5 10%, 90%

Norfolk: Inundation Overview

SLR Inundation Map

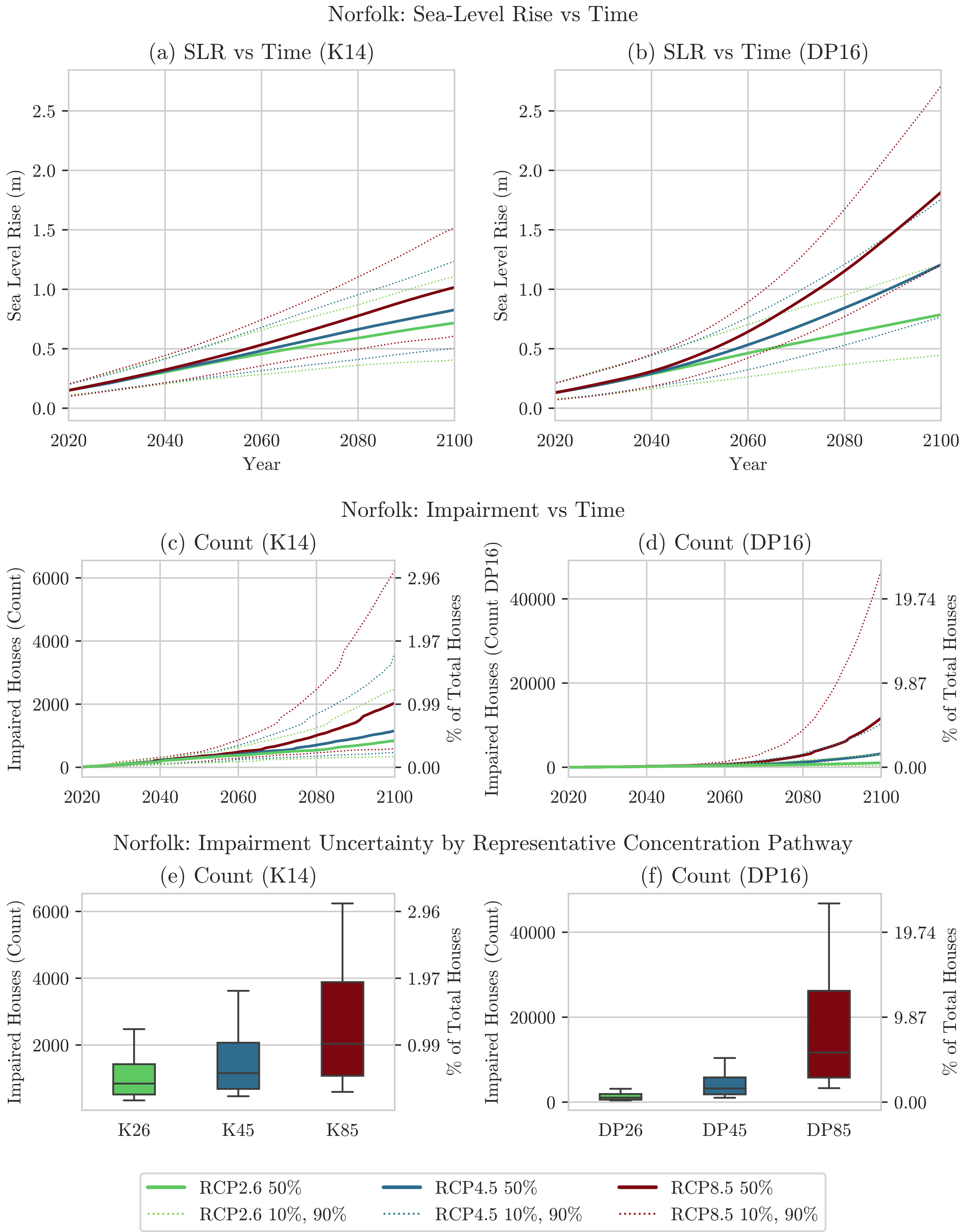


K14

RCP	ptile	Cnt. 2050	Cnt. 2100	% Cnt. 2100	Bn. $ 2050	Bn. $ 2100	% Value 2100
RCP-26	**0.1**	33	241	0.12	0.02	0.11	0.20
	0.5	219	766	0.38	0.10	0.31	0.56
	0.9	404	2446	1.21	0.18	0.95	1.71
RCP-45	**0.1**	51	359	0.18	0.03	0.16	0.30
	0.5	234	1082	0.53	0.11	0.43	0.78
	0.9	424	3595	1.77	0.19	1.35	2.44
RCP-85	**0.1**	77	489	0.24	0.04	0.22	0.40
	0.5	268	1958	0.97	0.13	0.76	1.37
	0.9	460	6212	3.07	0.21	2.37	4.27

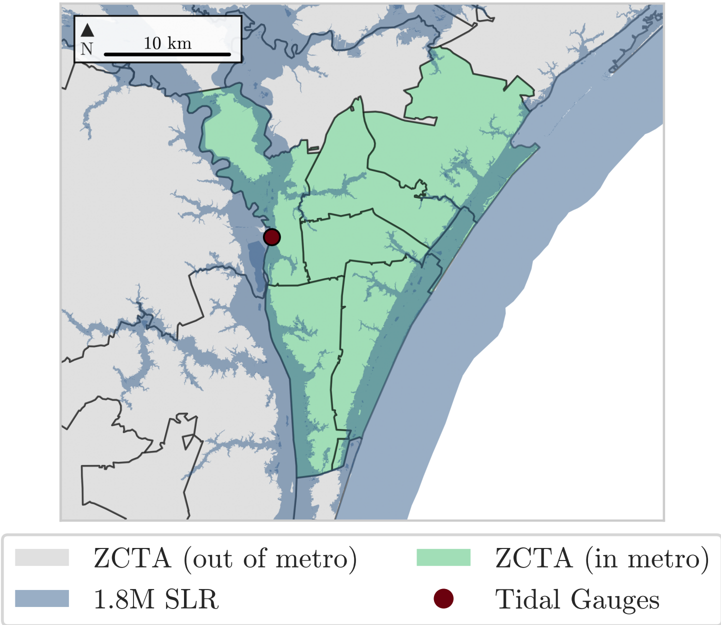
DP16

RCP	ptile	Cnt. 2050	Cnt. 2100	% Cnt. 2100	Bn. $ 2050	Bn. $ 2100	% Value 2100
RCP-26	**0.1**	0	289	0.14	0.00	0.14	0.25
	0.5	210	964	0.48	0.10	0.39	0.69
	0.9	451	3125	1.54	0.20	1.20	2.16
RCP-45	**0.1**	30	902	0.45	0.01	0.36	0.65
	0.5	240	3125	1.54	0.11	1.20	2.16
	0.9	460	10376	5.12	0.21	3.84	6.92
RCP-85	**0.1**	77	3161	1.56	0.04	1.21	2.18
	0.5	296	11589	5.72	0.14	4.25	7.65
	0.9	571	46769	23.09	0.25	14.54	26.18


Norfolk: Sea-Level Rise vs Time
(a) SLR vs Time (K14)
(b) SLR vs Time (DP16)
Sea Level Rise (m)
0.0
0.5
1.0
1.5
2.0
2.5
2020
2040
2060
2080
2100
Year
Norfolk: Impairment vs Time
(c) Count (K14)
(d) Count (DP16)
Impaired Houses (Count)
Impaired Houses (Count DP16)
% of Total Houses
0
2000
4000
6000
0.00
0.99
1.97
2.96
20000
40000
9.87
19.74
Norfolk: Impairment Uncertainty by Representative Concentration Pathway
(e) Count (K14)
(f) Count (DP16)
K26
K45
K85
DP26
DP45
DP85
RCP2.6 50%
RCP2.6 10%, 90%
RCP4.5 50%
RCP4.5 10%, 90%
RCP8.5 50%
RCP8.5 10%, 90%

Wilmington: Inundation Overview

SLR Inundation Map

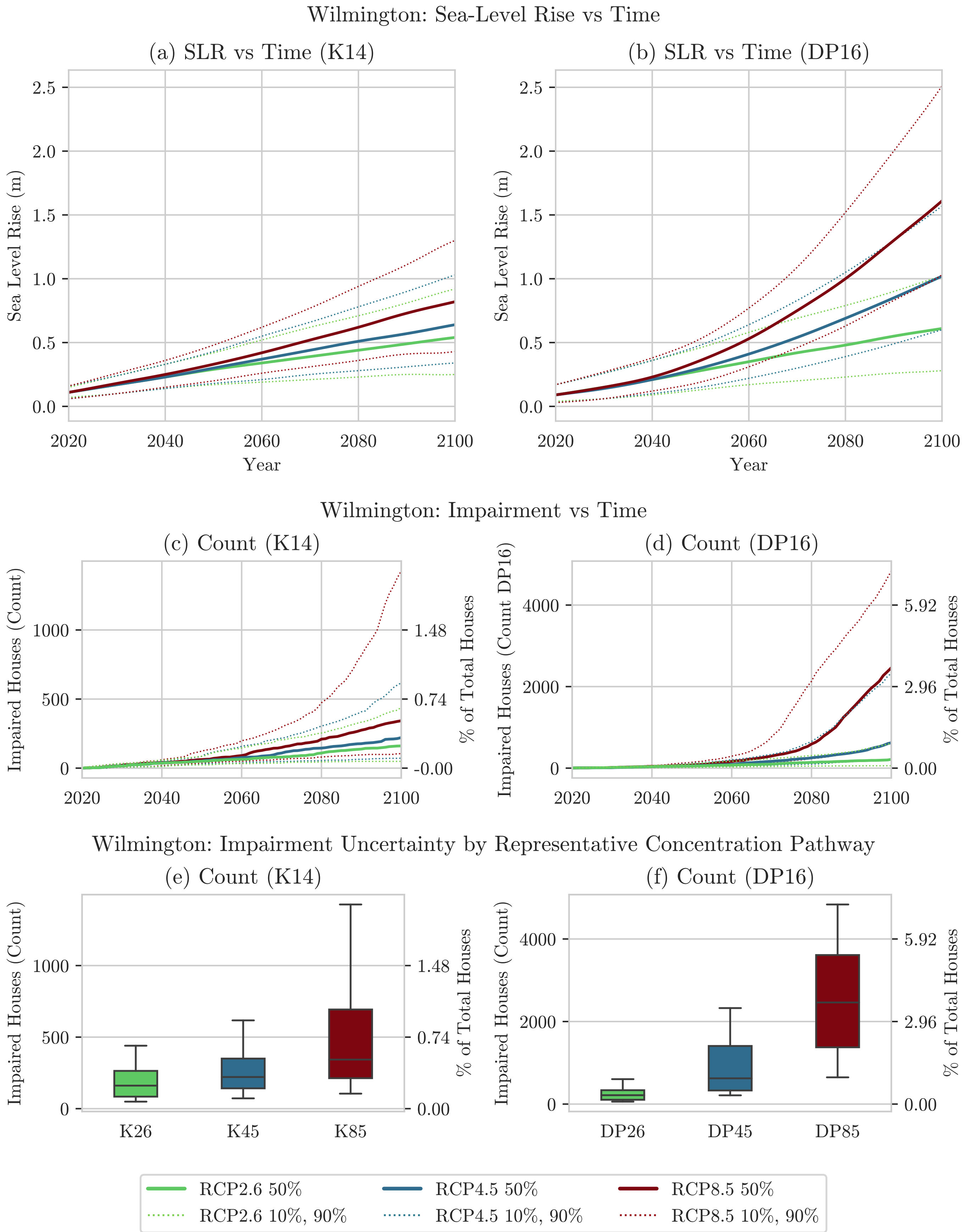


K14

RCP	ptile	Cnt. 2050	Cnt. 2100	% Cnt. 2100	Bn. $ 2050	Bn. $ 2100	% Value 2100
RCP-26	**0.1**	0	25	0.04	0.00	0.02	0.12
	0.5	34	145	0.21	0.03	0.10	0.51
	0.9	75	429	0.64	0.06	0.30	1.47
RCP-45	**0.1**	5	48	0.07	0.01	0.04	0.20
	0.5	35	205	0.30	0.03	0.15	0.73
	0.9	81	612	0.91	0.07	0.44	2.12
RCP-85	**0.1**	11	81	0.12	0.01	0.07	0.32
	0.5	46	327	0.48	0.04	0.24	1.15
	0.9	118	1422	2.10	0.09	1.10	5.33

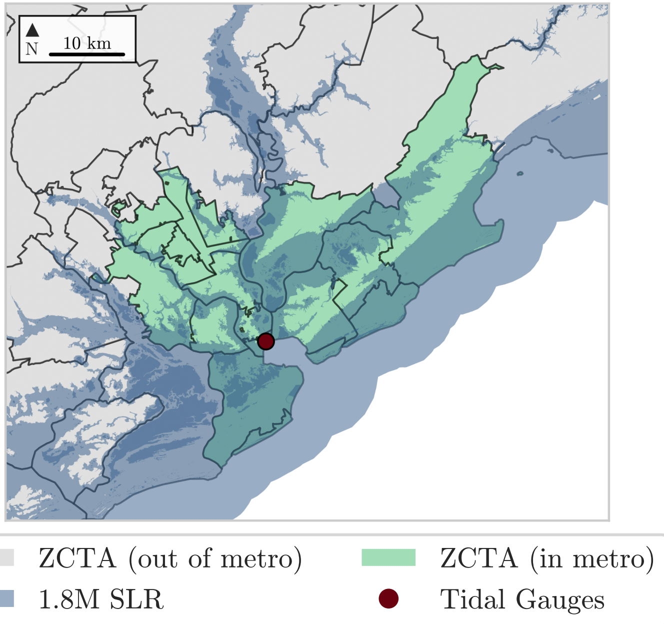
DP16

RCP	ptile	Cnt. 2050	Cnt. 2100	% Cnt. 2100	Bn. $ 2050	Bn. $ 2100	% Value 2100
RCP-26	**0.1**	0	30	0.04	0.00	0.03	0.14
	0.5	30	192	0.28	0.03	0.14	0.70
	0.9	108	602	0.89	0.08	0.43	2.09
RCP-45	**0.1**	0	176	0.26	0.00	0.13	0.62
	0.5	35	602	0.89	0.03	0.43	2.09
	0.9	118	2325	3.44	0.09	1.92	9.36
RCP-85	**0.1**	9	612	0.91	0.01	0.44	2.12
	0.5	56	2439	3.61	0.05	2.03	9.86
	0.9	141	4834	7.16	0.10	3.60	17.51


Wilmington: Sea-Level Rise vs Time
(a) SLR vs Time (K14)
(b) SLR vs Time (DP16)
Sea Level Rise (m)
Year
2020
2040
2060
2080
2100
0.0
0.5
1.0
1.5
2.0
2.5
Wilmington: Impairment vs Time
(c) Count (K14)
(d) Count (DP16)
Impaired Houses (Count)
Impaired Houses (Count DP16)
% of Total Houses
0
500
1000
2000
4000
-0.00
0.00
0.74
1.48
2.96
5.92
Wilmington: Impairment Uncertainty by Representative Concentration Pathway
(e) Count (K14)
(f) Count (DP16)
K26
K45
K85
DP26
DP45
DP85
RCP2.6 50%
RCP2.6 10%, 90%
RCP4.5 50%
RCP4.5 10%, 90%
RCP8.5 50%
RCP8.5 10%, 90%

Charleston: Inundation Overview

SLR Inundation Map

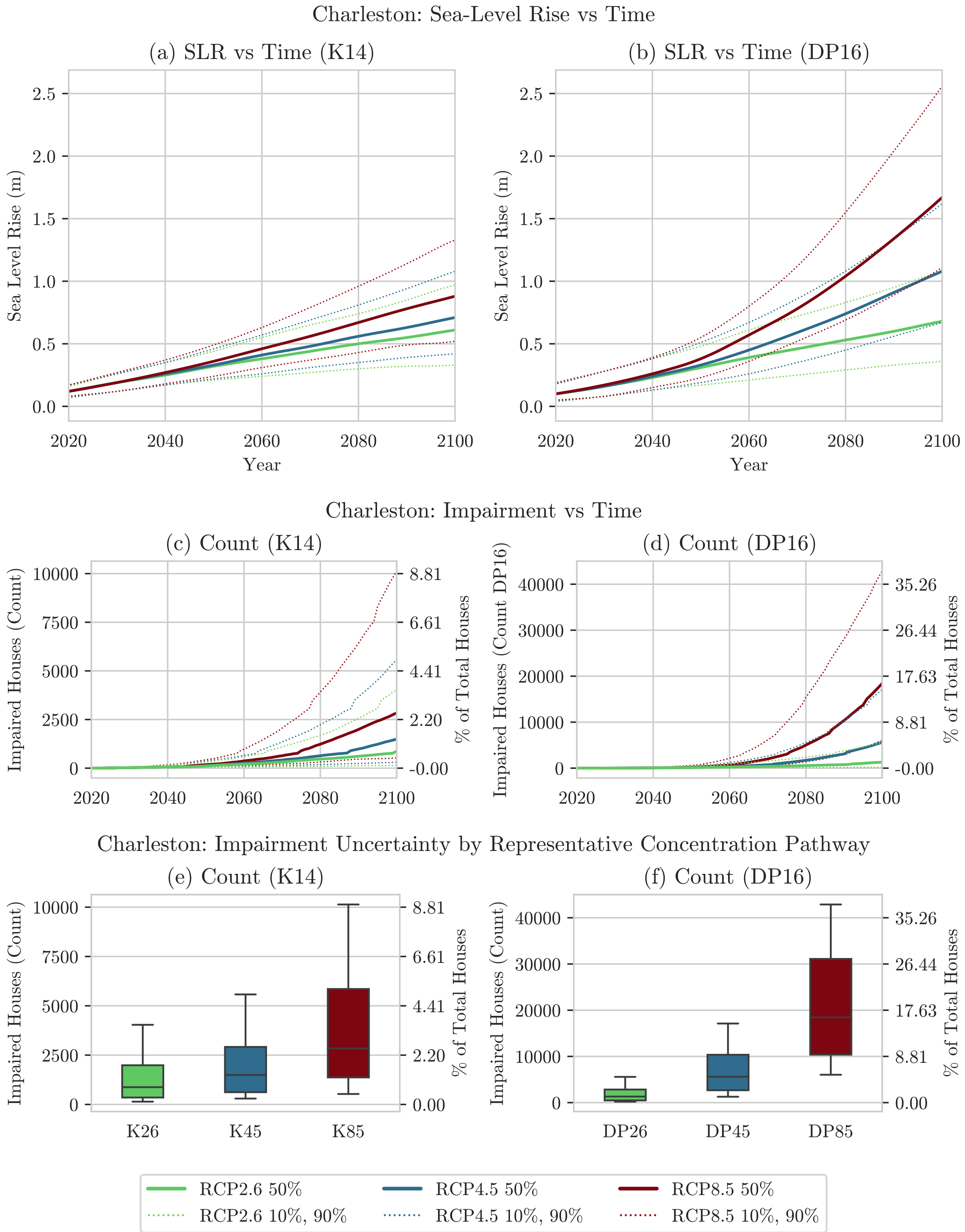


K14

RCP	ptile	Cnt. 2050	Cnt. 2100	% Cnt. 2100	Bn. $ 2050	Bn. $ 2100	% Value 2100
RCP-26	**0.1**	8	99	0.09	0.01	0.09	0.20
	0.5	83	848	0.75	0.07	0.73	1.62
	0.9	289	4021	3.54	0.27	2.99	6.64
RCP-45	**0.1**	14	247	0.22	0.01	0.23	0.52
	0.5	99	1467	1.29	0.09	1.18	2.62
	0.9	343	5563	4.90	0.31	4.01	8.90
RCP-85	**0.1**	24	486	0.43	0.02	0.42	0.93
	0.5	148	2810	2.48	0.14	2.16	4.80
	0.9	418	10121	8.92	0.37	7.10	15.75

DP16

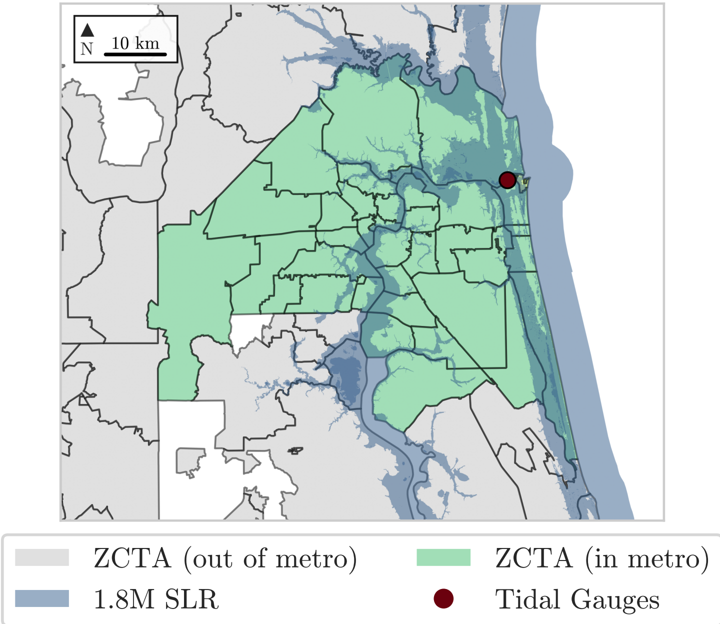
RCP	ptile	Cnt. 2050	Cnt. 2100	% Cnt. 2100	Bn. $ 2050	Bn. $ 2100	% Value 2100
RCP-26	**0.1**	0	148	0.13	0.00	0.14	0.30
	0.5	68	1274	1.12	0.05	1.06	2.34
	0.9	389	5563	4.90	0.35	4.01	8.90
RCP-45	**0.1**	0	1202	1.06	0.00	1.00	2.22
	0.5	99	5563	4.90	0.09	4.01	8.90
	0.9	457	17108	15.08	0.40	11.68	25.91
RCP-85	**0.1**	17	5967	5.26	0.01	4.31	9.55
	0.5	179	18388	16.21	0.16	12.50	27.72
	0.9	583	42867	37.79	0.49	24.72	54.83



Charleston: Sea-Level Rise vs Time
(a) SLR vs Time (K14)
(b) SLR vs Time (DP16)
Sea Level Rise (m)
0.0
0.5
1.0
1.5
2.0
2.5
2020
2040
2060
2080
2100
Year
Charleston: Impairment vs Time
(c) Count (K14)
(d) Count (DP16)
Impaired Houses (Count)
Impaired Houses (Count DP16)
% of Total Houses
0
2500
5000
7500
10000
-0.00
2.20
4.41
6.61
8.81
10000
20000
30000
40000
8.81
17.63
26.44
35.26
Charleston: Impairment Uncertainty by Representative Concentration Pathway
(e) Count (K14)
(f) Count (DP16)
0.00
K26
K45
K85
DP26
DP45
DP85
RCP2.6 50%
RCP4.5 50%
RCP8.5 50%
RCP2.6 10%, 90%
RCP4.5 10%, 90%
RCP8.5 10%, 90%

Jacksonville: Inundation Overview

SLR Inundation Map

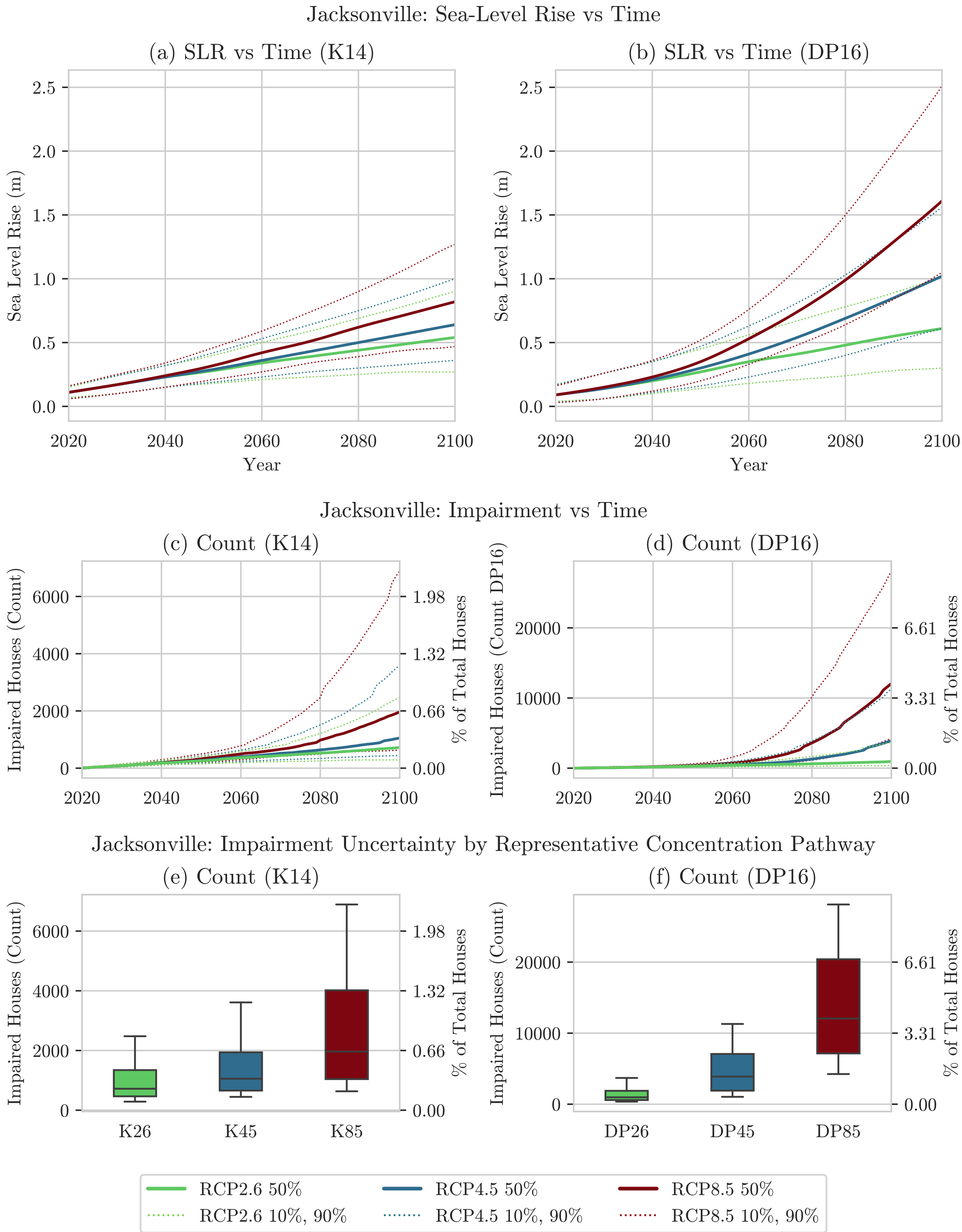


K14

RCP	ptile	Cnt. 2050	Cnt. 2100	% Cnt. 2100	Bn. $ 2050	Bn. $ 2100	% Value 2100
RCP-26	**0.1**	13	152	0.05	0.00	0.06	0.09
	0.5	167	631	0.21	0.06	0.25	0.41
	0.9	373	2441	0.81	0.14	1.04	1.68
RCP-45	**0.1**	30	304	0.10	0.01	0.11	0.18
	0.5	181	966	0.32	0.07	0.39	0.63
	0.9	406	3588	1.19	0.16	1.62	2.60
RCP-85	**0.1**	57	492	0.16	0.02	0.19	0.31
	0.5	238	1875	0.62	0.09	0.81	1.30
	0.9	473	6868	2.27	0.18	3.12	5.01

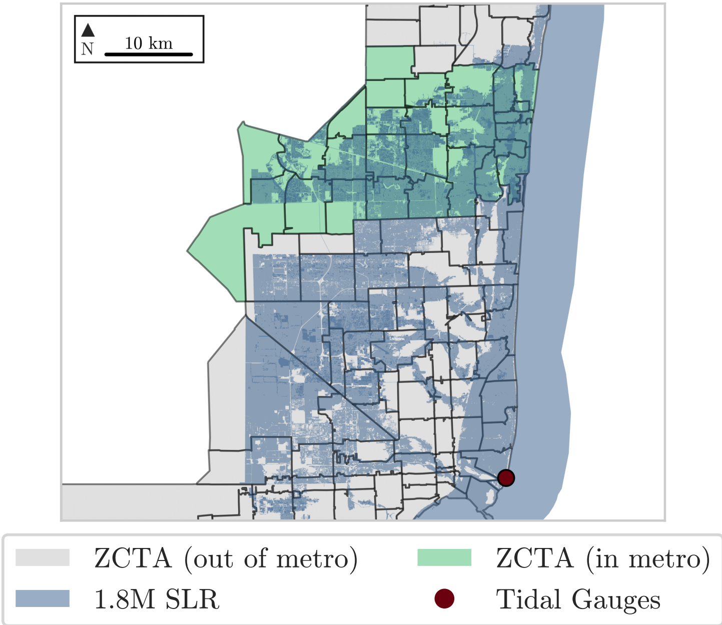
DP16

RCP	ptile	Cnt. 2050	Cnt. 2100	% Cnt. 2100	Bn. $ 2050	Bn. $ 2100	% Value 2100
RCP-26	**0.1**	0	196	0.06	0.00	0.07	0.11
	0.5	151	857	0.28	0.06	0.35	0.55
	0.9	451	3684	1.22	0.17	1.66	2.66
RCP-45	**0.1**	0	857	0.28	0.00	0.35	0.55
	0.5	196	3773	1.25	0.07	1.69	2.72
	0.9	492	11286	3.73	0.19	5.02	8.05
RCP-85	**0.1**	47	4062	1.34	0.01	1.82	2.93
	0.5	285	11945	3.95	0.10	5.31	8.52
	0.9	588	28090	9.29	0.23	11.45	18.39


Jacksonville: Sea-Level Rise vs Time
(a) SLR vs Time (K14)
(b) SLR vs Time (DP16)
Sea Level Rise (m)
0.0
0.5
1.0
1.5
2.0
2.5
2020
2040
2060
2080
2100
Year
Jacksonville: Impairment vs Time
(c) Count (K14)
(d) Count (DP16)
Impaired Houses (Count)
Impaired Houses (Count DP16)
% of Total Houses
0
2000
4000
6000
0.00
0.66
1.32
1.98
10000
20000
3.31
6.61
Jacksonville: Impairment Uncertainty by Representative Concentration Pathway
(e) Count (K14)
(f) Count (DP16)
K26
K45
K85
DP26
DP45
DP85
RCP2.6 50%
RCP2.6 10%, 90%
RCP4.5 50%
RCP4.5 10%, 90%
RCP8.5 50%
RCP8.5 10%, 90%

Fort Lauderdale: Inundation Overview

SLR Inundation Map

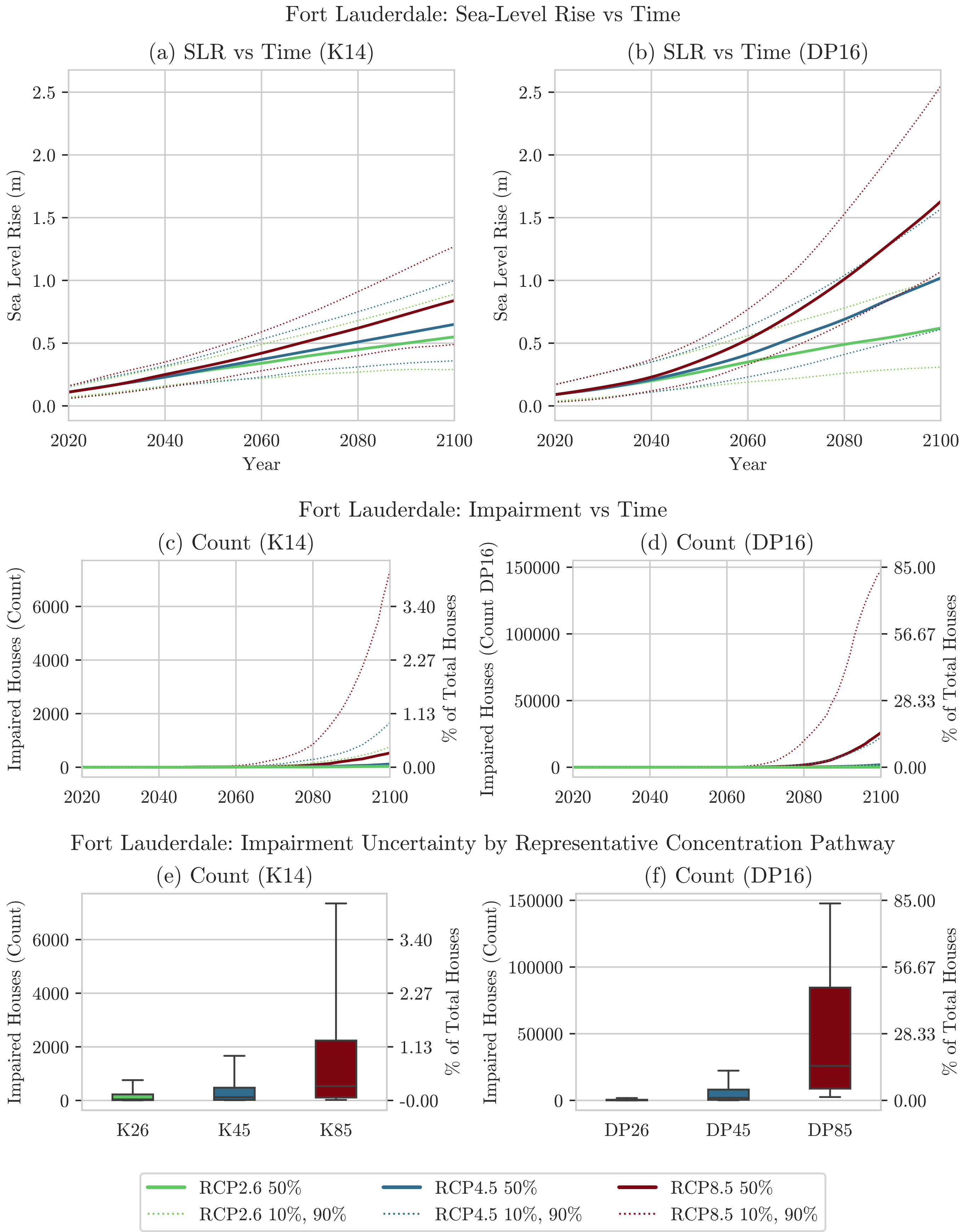


K14

RCP	ptile	Cnt. 2050	Cnt. 2100	% Cnt. 2100	Bn. $ 2050	Bn. $ 2100	% Value 2100
RCP-26	**0.1**	0	2	0.00	0.00	0.00	0.00
	0.5	2	39	0.02	0.00	0.04	0.06
	0.9	10	757	0.43	0.00	0.74	1.13
RCP-45	**0.1**	0	9	0.01	0.00	0.00	0.00
	0.5	5	120	0.07	0.00	0.12	0.19
	0.9	11	1663	0.94	0.00	1.43	2.20
RCP-85	**0.1**	0	20	0.01	0.00	0.01	0.01
	0.5	8	534	0.30	0.00	0.54	0.83
	0.9	14	7347	4.16	0.01	4.80	7.39

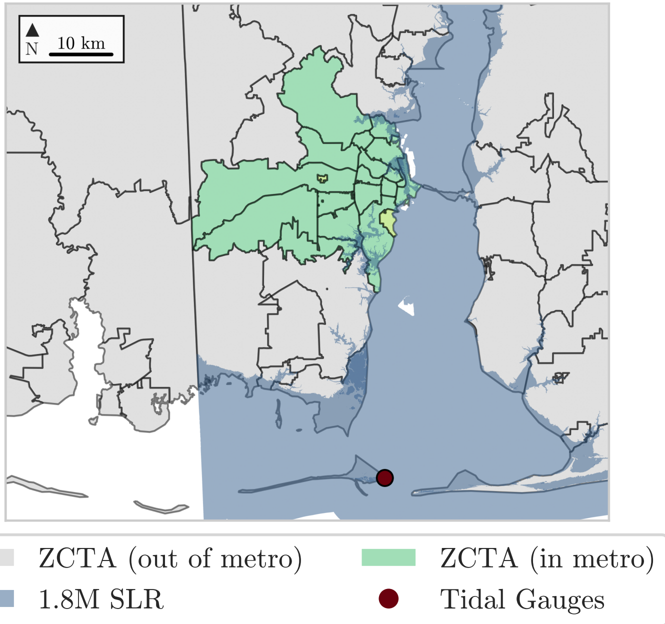
DP16

RCP	ptile	Cnt. 2050	Cnt. 2100	% Cnt. 2100	Bn. $ 2050	Bn. $ 2100	% Value 2100
RCP-26	**0.1**	0	6	0.00	0.00	0.00	0.00
	0.5	1	85	0.05	0.00	0.09	0.14
	0.9	13	1766	1.00	0.00	1.49	2.29
RCP-45	**0.1**	0	73	0.04	0.00	0.07	0.11
	0.5	5	1874	1.06	0.00	1.56	2.39
	0.9	16	22288	12.63	0.01	12.10	18.60
RCP-85	**0.1**	0	2507	1.42	0.00	2.00	3.08
	0.5	9	25952	14.71	0.00	13.63	20.96
	0.9	31	147666	83.68	0.03	56.48	86.85


Fort Lauderdale: Sea-Level Rise vs Time
(a) SLR vs Time (K14)
(b) SLR vs Time (DP16)
Sea Level Rise (m)
Year
Fort Lauderdale: Impairment vs Time
(c) Count (K14)
(d) Count (DP16)
Impaired Houses (Count)
Impaired Houses (Count DP16)
% of Total Houses
Fort Lauderdale: Impairment Uncertainty by Representative Concentration Pathway
(e) Count (K14)
(f) Count (DP16)
K26
K45
K85
DP26
DP45
DP85
RCP2.6 50%
RCP2.6 10%, 90%
RCP4.5 50%
RCP4.5 10%, 90%
RCP8.5 50%
RCP8.5 10%, 90%

Mobile: Inundation Overview

SLR Inundation Map

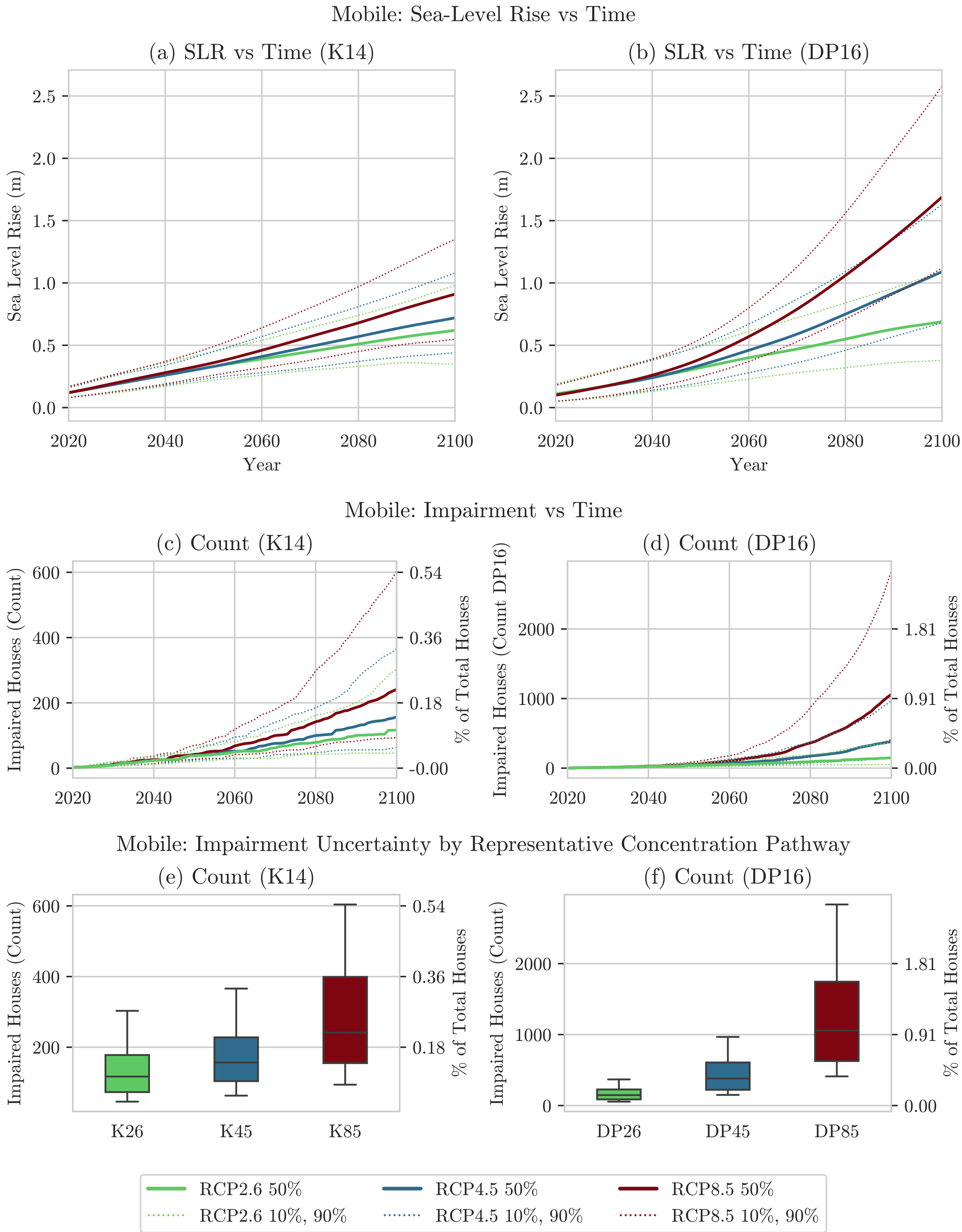


K14

RCP	ptile	Cnt. 2050	Cnt. 2100	% Cnt. 2100	Bn. $ 2050	Bn. $ 2100	% Value 2100
RCP-26	**0.1**	7	33	0.03	0.00	0.01	0.05
	0.5	29	108	0.10	0.00	0.02	0.17
	0.9	53	300	0.27	0.01	0.05	0.38
RCP-45	**0.1**	11	50	0.05	0.00	0.01	0.07
	0.5	29	148	0.13	0.00	0.03	0.22
	0.9	53	362	0.33	0.01	0.06	0.45
RCP-85	**0.1**	15	81	0.07	0.00	0.02	0.13
	0.5	33	232	0.21	0.01	0.04	0.31
	0.9	67	601	0.55	0.01	0.10	0.77

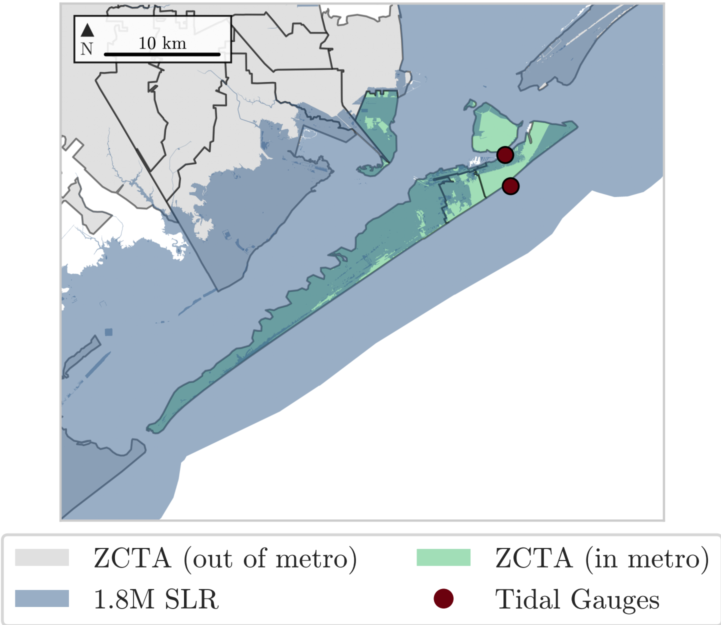
DP16

RCP	ptile	Cnt. 2050	Cnt. 2100	% Cnt. 2100	Bn. $ 2050	Bn. $ 2100	% Value 2100
RCP-26	**0.1**	0	38	0.03	0.00	0.01	0.05
	0.5	29	136	0.12	0.00	0.02	0.20
	0.9	67	368	0.33	0.01	0.06	0.46
RCP-45	**0.1**	3	133	0.12	0.00	0.02	0.19
	0.5	30	368	0.33	0.00	0.06	0.46
	0.9	67	966	0.88	0.01	0.14	1.15
RCP-85	**0.1**	13	394	0.36	0.00	0.06	0.48
	0.5	41	1046	0.95	0.01	0.15	1.23
	0.9	81	2832	2.57	0.02	0.34	2.69


Mobile: Sea-Level Rise vs Time
(a) SLR vs Time (K14)
(b) SLR vs Time (DP16)
Sea Level Rise (m)
0.0
0.5
1.0
1.5
2.0
2.5
2020
2040
2060
2080
2100
Year
Mobile: Impairment vs Time
(c) Count (K14)
(d) Count (DP16)
Impaired Houses (Count)
Impaired Houses (Count DP16)
% of Total Houses
0
200
400
600
-0.00
0.18
0.36
0.54
1000
2000
0.00
0.91
1.81
Mobile: Impairment Uncertainty by Representative Concentration Pathway
(e) Count (K14)
(f) Count (DP16)
K26
K45
K85
DP26
DP45
DP85
RCP2.6 50%
RCP2.6 10%, 90%
RCP4.5 50%
RCP4.5 10%, 90%
RCP8.5 50%
RCP8.5 10%, 90%

Galveston: Inundation Overview

SLR Inundation Map

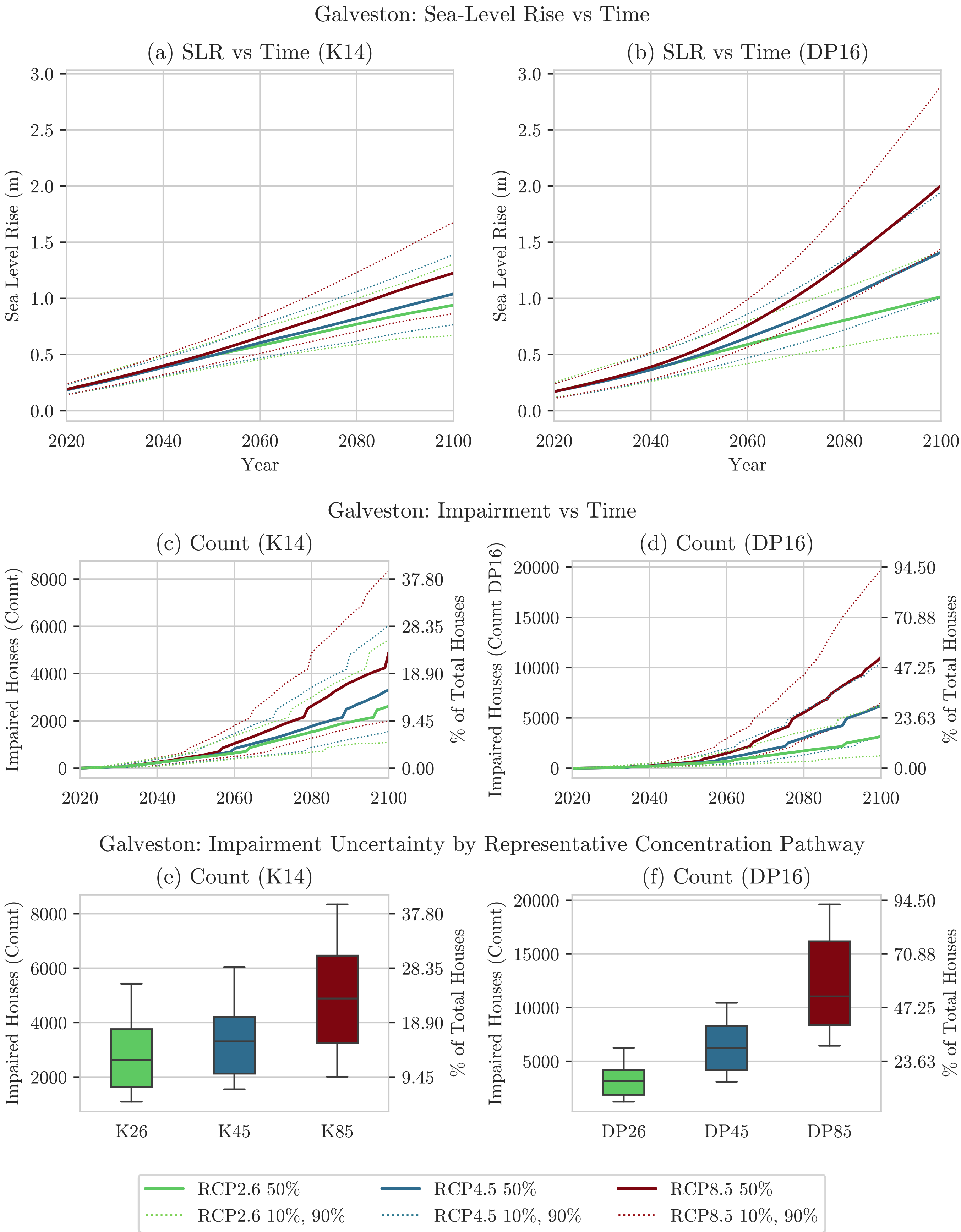


K14

RCP	ptile	Cnt. 2050	Cnt. 2100	% Cnt. 2100	Bn. $ 2050	Bn. $ 2100	% Value 2100
RCP-26	**0.1**	179	1051	4.97	0.07	0.40	7.18
	0.5	408	2587	12.22	0.15	0.93	16.91
	0.9	792	5413	25.58	0.30	1.73	31.34
RCP-45	**0.1**	215	1502	7.10	0.08	0.54	9.84
	0.5	408	3275	15.48	0.15	1.12	20.32
	0.9	655	6027	28.48	0.24	1.89	34.28
RCP-85	**0.1**	253	1964	9.28	0.09	0.70	12.71
	0.5	466	4851	22.92	0.17	1.58	28.61
	0.9	962	8330	39.36	0.36	2.63	47.64

DP16

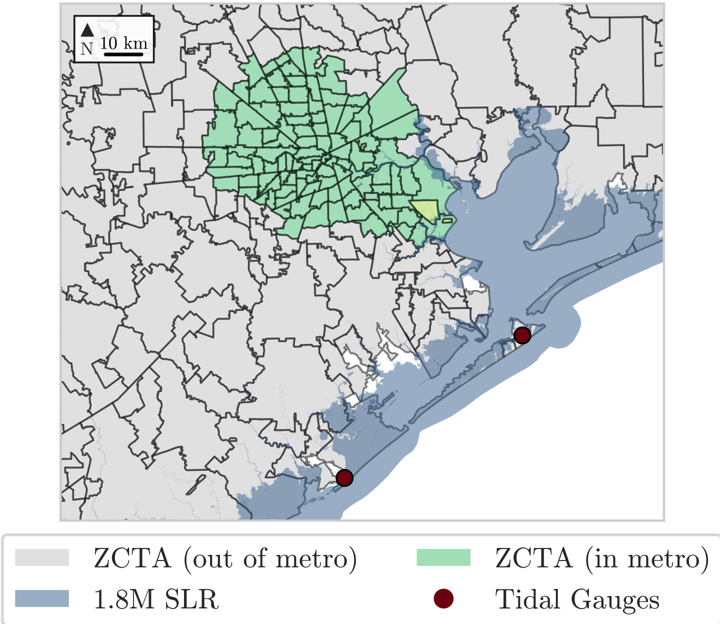
RCP	ptile	Cnt. 2050	Cnt. 2100	% Cnt. 2100	Bn. $ 2050	Bn. $ 2100	% Value 2100
RCP-26	**0.1**	126	1182	5.59	0.05	0.44	7.96
	0.5	389	3115	14.72	0.14	1.08	19.55
	0.9	962	6225	29.41	0.36	1.95	35.24
RCP-45	**0.1**	139	3040	14.36	0.05	1.06	19.20
	0.5	436	6181	29.21	0.16	1.93	34.99
	0.9	1010	10447	49.36	0.38	3.26	59.08
RCP-85	**0.1**	241	6392	30.20	0.09	1.99	35.94
	0.5	535	11003	51.99	0.20	3.39	61.43
	0.9	1263	19603	92.63	0.47	5.15	93.17



Galveston: Sea-Level Rise vs Time
(a) SLR vs Time (K14)
(b) SLR vs Time (DP16)
Sea Level Rise (m)
3.0
2.5
2.0
1.5
1.0
0.5
0.0
2020
2040
2060
2080
2100
Year
Galveston: Impairment vs Time
(c) Count (K14)
(d) Count (DP16)
Impaired Houses (Count)
Impaired Houses (Count DP16)
% of Total Houses
8000
6000
4000
2000
0
37.80
28.35
18.90
9.45
0.00
20000
15000
10000
5000
94.50
70.88
47.25
23.63
Galveston: Impairment Uncertainty by Representative Concentration Pathway
(e) Count (K14)
(f) Count (DP16)
K26
K45
K85
DP26
DP45
DP85
RCP2.6 50%
RCP2.6 10%, 90%
RCP4.5 50%
RCP4.5 10%, 90%
RCP8.5 50%
RCP8.5 10%, 90%

Houston: Inundation Overview

SLR Inundation Map

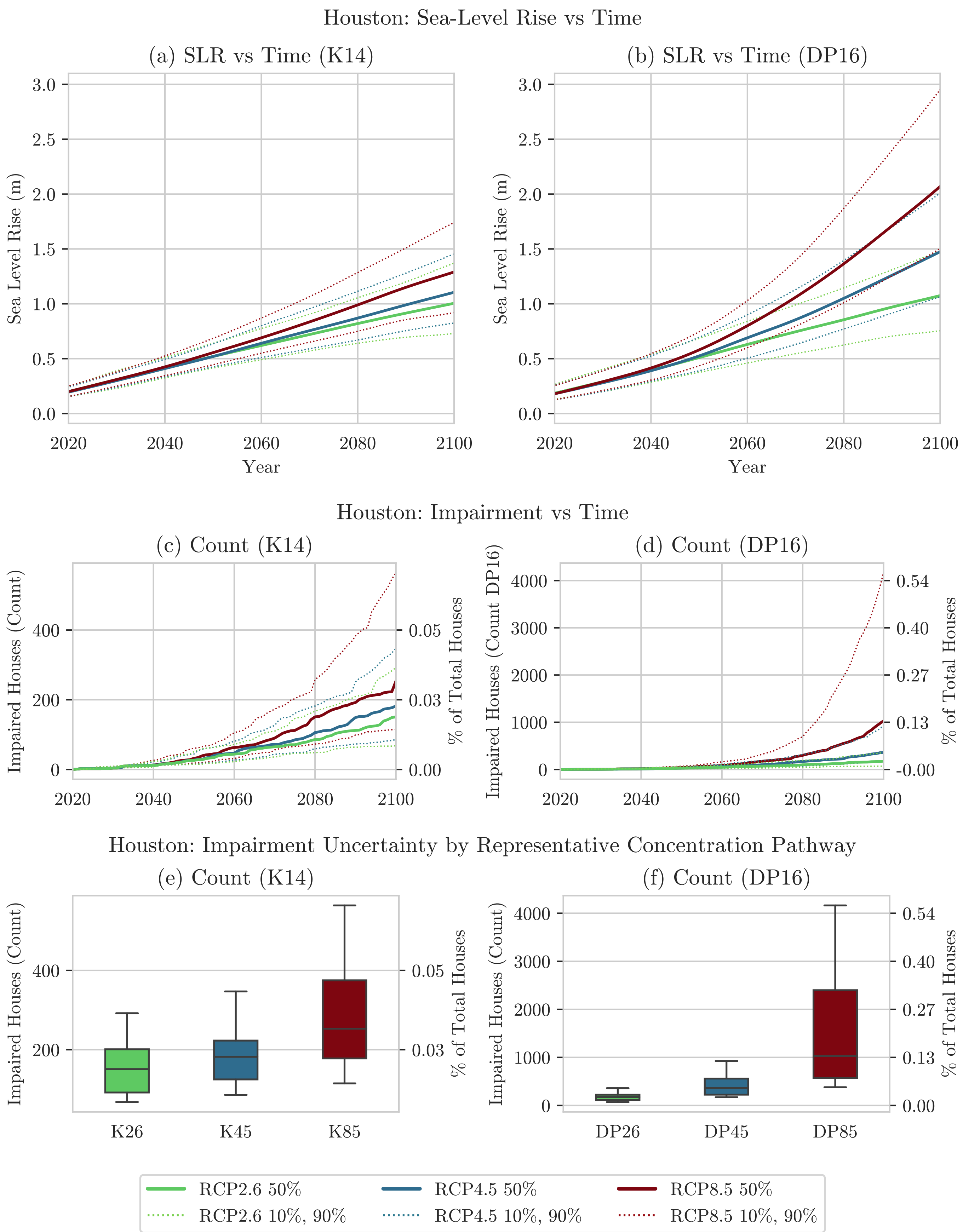


K14

RCP	ptile	Cnt. 2050	Cnt. 2100	% Cnt. 2100	Bn. $ 2050	Bn. $ 2100	% Value 2100
RCP-26	**0.1**	10	63	0.01	0.00	0.02	0.01
	0.5	24	149	0.02	0.01	0.06	0.03
	0.9	51	292	0.04	0.02	0.11	0.06
RCP-45	**0.1**	10	81	0.01	0.00	0.03	0.02
	0.5	24	179	0.02	0.01	0.07	0.04
	0.9	44	347	0.05	0.02	0.13	0.07
RCP-85	**0.1**	13	110	0.01	0.00	0.04	0.02
	0.5	30	251	0.03	0.01	0.10	0.05
	0.9	61	564	0.08	0.02	0.21	0.11

DP16

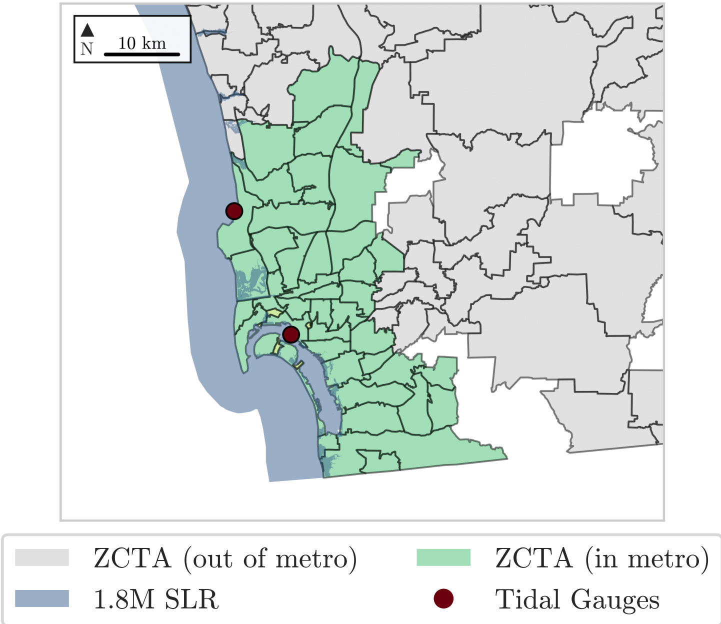
RCP	ptile	Cnt. 2050	Cnt. 2100	% Cnt. 2100	Bn. $ 2050	Bn. $ 2100	% Value 2100
RCP-26	**0.1**	8	66	0.01	0.00	0.02	0.01
	0.5	24	171	0.02	0.01	0.06	0.03
	0.9	61	359	0.05	0.02	0.14	0.07
RCP-45	**0.1**	9	167	0.02	0.00	0.06	0.03
	0.5	24	359	0.05	0.01	0.14	0.07
	0.9	62	925	0.12	0.02	0.33	0.17
RCP-85	**0.1**	10	374	0.05	0.00	0.14	0.07
	0.5	38	1025	0.14	0.02	0.35	0.18
	0.9	69	4163	0.56	0.03	1.18	0.61



Houston: Sea-Level Rise vs Time
(a) SLR vs Time (K14)
(b) SLR vs Time (DP16)
Sea Level Rise (m)
Year
Houston: Impairment vs Time
(c) Count (K14)
(d) Count (DP16)
Impaired Houses (Count)
Impaired Houses (Count DP16)
% of Total Houses
Houston: Impairment Uncertainty by Representative Concentration Pathway
(e) Count (K14)
(f) Count (DP16)
K26
K45
K85
DP26
DP45
DP85
RCP2.6 50%
RCP2.6 10%, 90%
RCP4.5 50%
RCP4.5 10%, 90%
RCP8.5 50%
RCP8.5 10%, 90%

San Diego: Inundation Overview

SLR Inundation Map

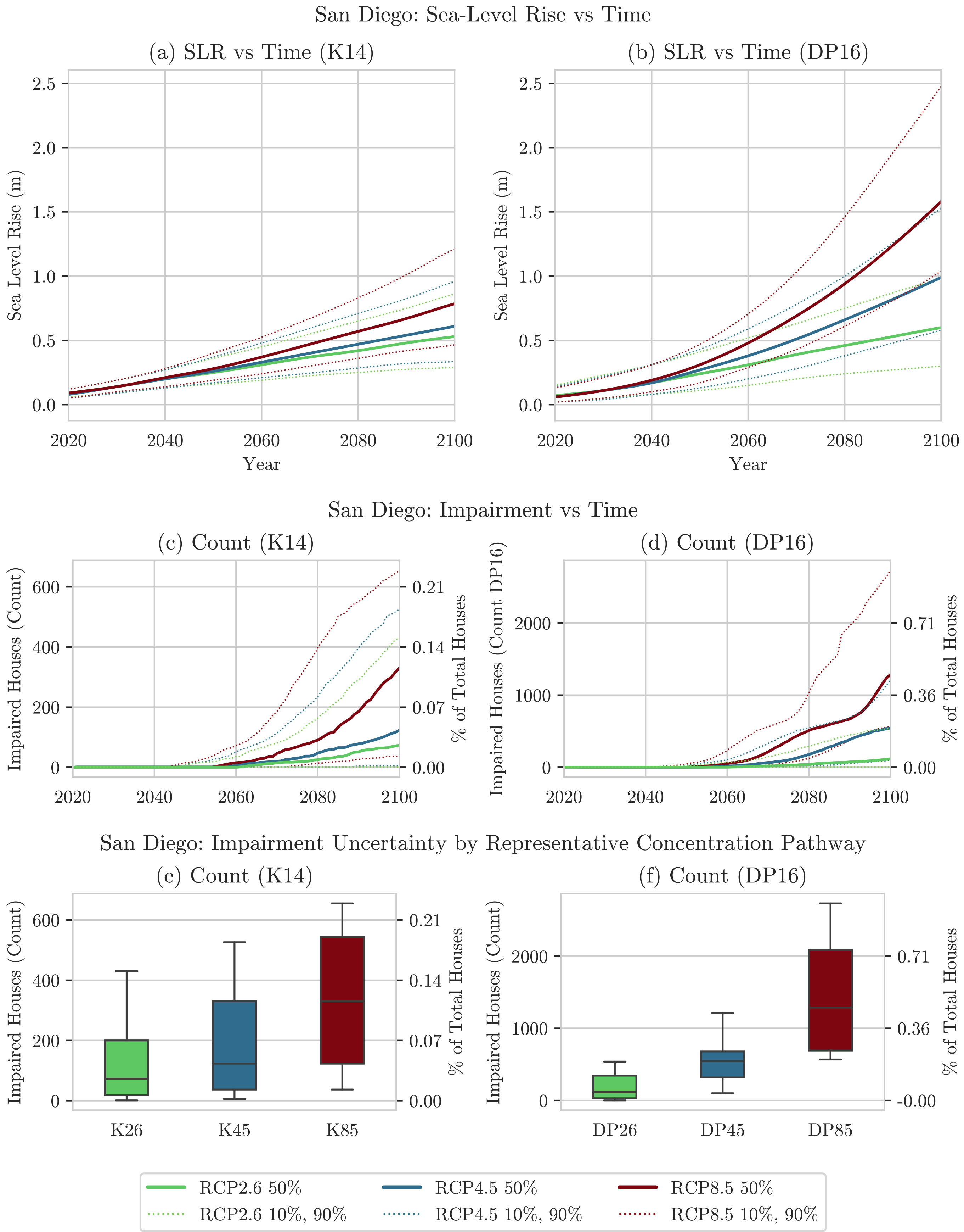


K14

RCP	ptile	Cnt. 2050	Cnt. 2100	% Cnt. 2100	Bn. $ 2050	Bn. $ 2100	% Value 2100
RCP-26	**0.1**	0	0	0.00	0.00	0.00	0.00
	0.5	0	73	0.03	0.00	0.07	0.04
	0.9	13	430	0.15	0.01	0.41	0.22
RCP-45	**0.1**	0	5	0.00	0.00	0.01	0.00
	0.5	0	122	0.04	0.00	0.12	0.07
	0.9	15	526	0.19	0.01	0.50	0.27
RCP-85	**0.1**	0	36	0.01	0.00	0.04	0.02
	0.5	0	330	0.12	0.00	0.31	0.17
	0.9	19	655	0.23	0.02	0.64	0.35

DP16

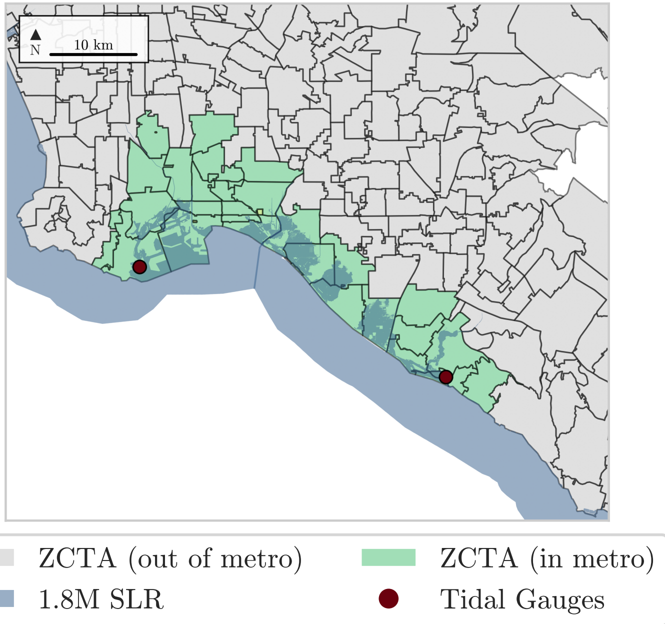
RCP	ptile	Cnt. 2050	Cnt. 2100	% Cnt. 2100	Bn. $ 2050	Bn. $ 2100	% Value 2100
RCP-26	**0.1**	0	0	0.00	0.00	0.00	0.00
	0.5	0	114	0.04	0.00	0.11	0.06
	0.9	21	538	0.19	0.02	0.51	0.28
RCP-45	**0.1**	0	98	0.03	0.00	0.10	0.05
	0.5	0	544	0.19	0.00	0.52	0.28
	0.9	29	1211	0.43	0.03	1.65	0.89
RCP-85	**0.1**	0	566	0.20	0.00	0.53	0.29
	0.5	0	1285	0.46	0.00	1.78	0.96
	0.9	46	2729	0.97	0.05	3.50	1.90



San Diego: Sea-Level Rise vs Time
(a) SLR vs Time (K14)
(b) SLR vs Time (DP16)
Sea Level Rise (m)
0.0
0.5
1.0
1.5
2.0
2.5
2020
2040
2060
2080
2100
Year
San Diego: Impairment vs Time
(c) Count (K14)
(d) Count (DP16)
Impaired Houses (Count)
Impaired Houses (Count DP16)
% of Total Houses
0
200
400
600
0.00
0.07
0.14
0.21
1000
2000
0.36
0.71
San Diego: Impairment Uncertainty by Representative Concentration Pathway
(e) Count (K14)
(f) Count (DP16)
-0.00
K26
K45
K85
DP26
DP45
DP85
RCP2.6 50%
RCP2.6 10%, 90%
RCP4.5 50%
RCP4.5 10%, 90%
RCP8.5 50%
RCP8.5 10%, 90%

CA Coast: Newport to San Pedro: Inundation Overview

SLR Inundation Map

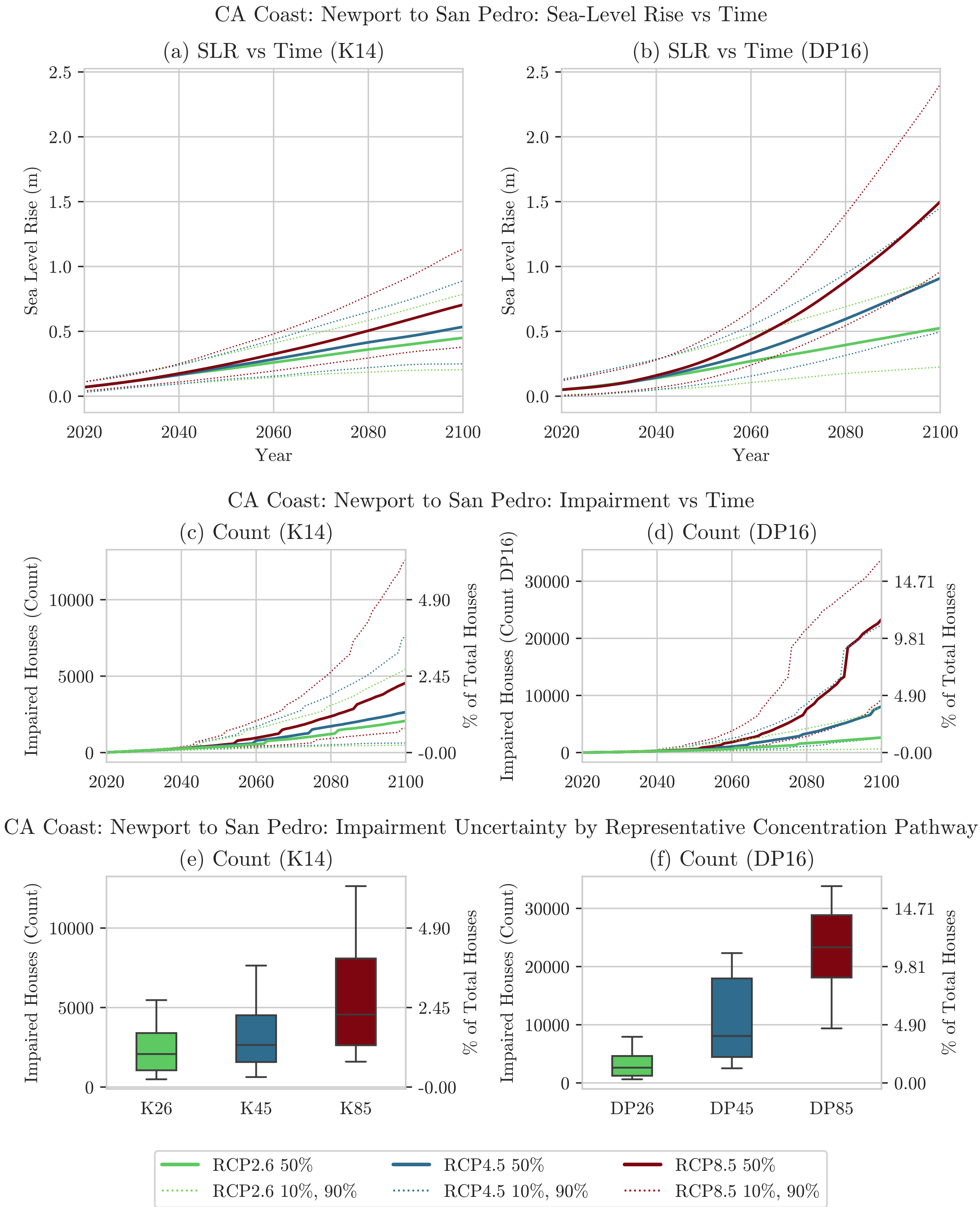


K14

RCP	ptile	Cnt. 2050	Cnt. 2100	% Cnt. 2100	Bn. $ 2050	Bn. $ 2100	% Value 2100
RCP-26	**0.1**	0	276	0.14	0.00	0.30	0.18
	0.5	229	1924	0.94	0.19	2.12	1.29
	0.9	811	5413	2.65	0.91	5.91	3.60
RCP-45	**0.1**	25	395	0.19	0.02	0.43	0.26
	0.5	277	2493	1.22	0.30	2.72	1.65
	0.9	860	7583	3.72	0.97	8.07	4.91
RCP-85	**0.1**	73	1381	0.68	0.04	1.32	0.80
	0.5	334	4409	2.16	0.35	4.89	2.97
	0.9	1022	12581	6.17	1.12	12.77	7.76

DP16

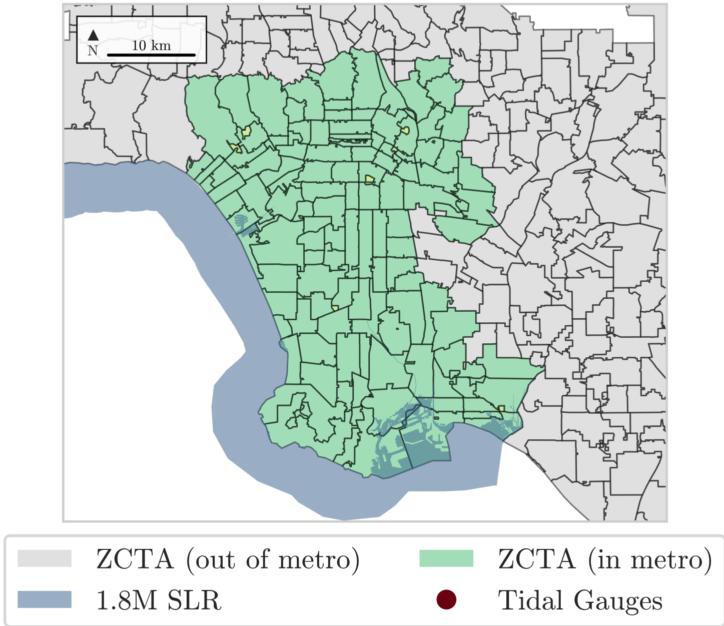
RCP	ptile	Cnt. 2050	Cnt. 2100	% Cnt. 2100	Bn. $ 2050	Bn. $ 2100	% Value 2100
RCP-26	**0.1**	0	333	0.16	0.00	0.35	0.21
	0.5	206	2430	1.19	0.17	2.65	1.61
	0.9	1078	7919	3.88	1.18	8.40	5.11
RCP-45	**0.1**	0	2202	1.08	0.00	2.42	1.47
	0.5	277	7874	3.86	0.30	8.35	5.08
	0.9	1404	22303	10.94	1.35	21.74	13.22
RCP-85	**0.1**	25	9062	4.44	0.02	9.51	5.78
	0.5	395	23124	11.34	0.43	22.66	13.77
	0.9	1648	33794	16.57	1.68	34.85	21.19



CA Coast: Newport to San Pedro: Sea-Level Rise vs Time
(a) SLR vs Time (K14)
(b) SLR vs Time (DP16)
Sea Level Rise (m)
Year
CA Coast: Newport to San Pedro: Impairment vs Time
(c) Count (K14)
(d) Count (DP16)
Impaired Houses (Count)
Impaired Houses (Count DP16)
% of Total Houses
CA Coast: Newport to San Pedro: Impairment Uncertainty by Representative Concentration Pathway
(e) Count (K14)
(f) Count (DP16)
K26
K45
K85
DP26
DP45
DP85
RCP2.6 50%
RCP2.6 10%, 90%
RCP4.5 50%
RCP4.5 10%, 90%
RCP8.5 50%
RCP8.5 10%, 90%

Los Angeles: Inundation Overview

SLR Inundation Map

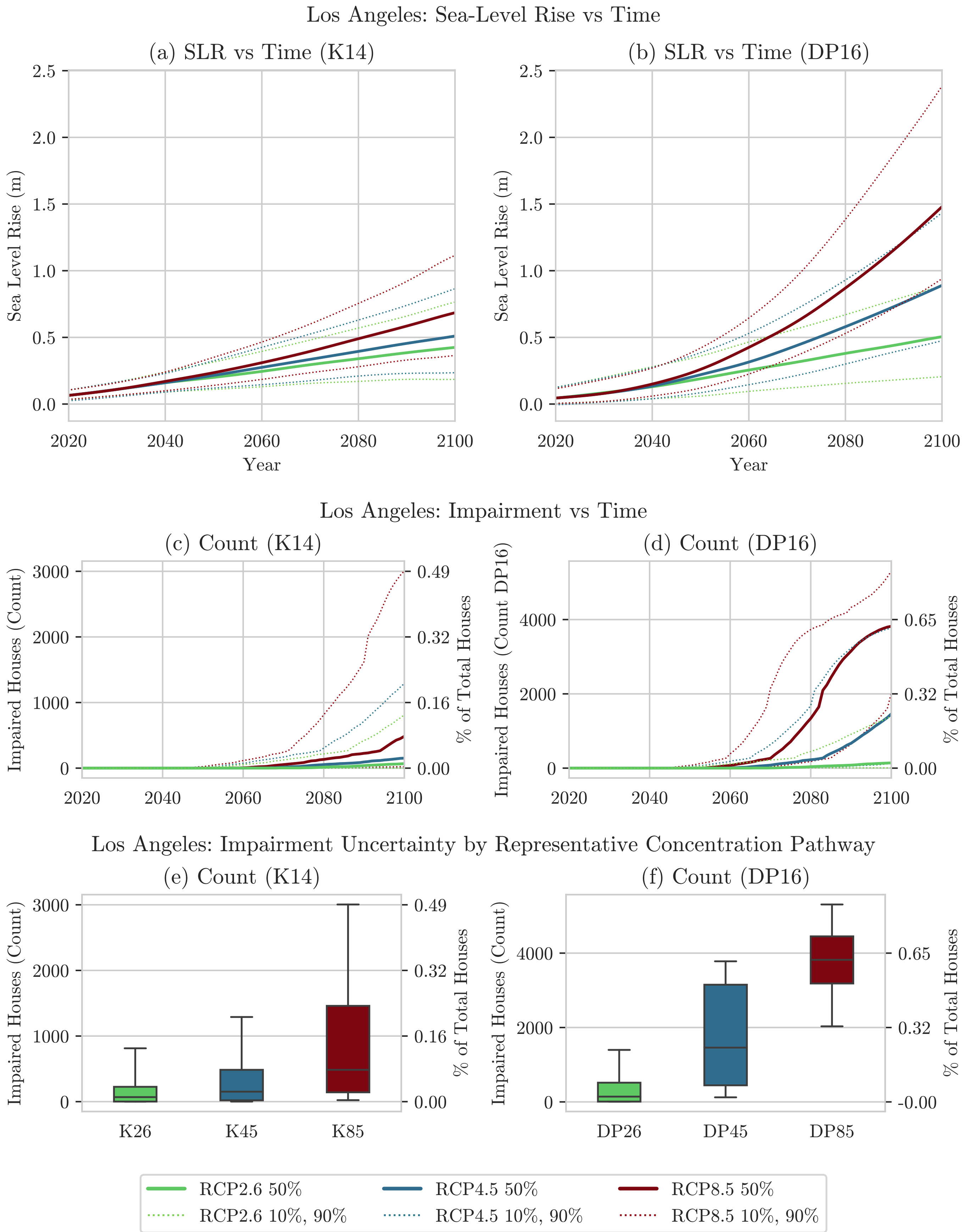


K14

RCP	ptile	Cnt. 2050	Cnt. 2100	% Cnt. 2100	Bn. $ 2050	Bn. $ 2100	% Value 2100
RCP-26	**0.1**	0	0	0.00	0.00	0.00	0.00
	0.5	0	69	0.01	0.00	0.07	0.01
	0.9	5	813	0.13	0.01	0.85	0.17
RCP-45	**0.1**	0	1	0.00	0.00	0.00	0.00
	0.5	1	152	0.02	0.00	0.16	0.03
	0.9	7	1290	0.21	0.01	1.34	0.27
RCP-85	**0.1**	0	23	0.00	0.00	0.02	0.00
	0.5	1	485	0.08	0.00	0.54	0.11
	0.9	23	3005	0.49	0.02	3.03	0.62

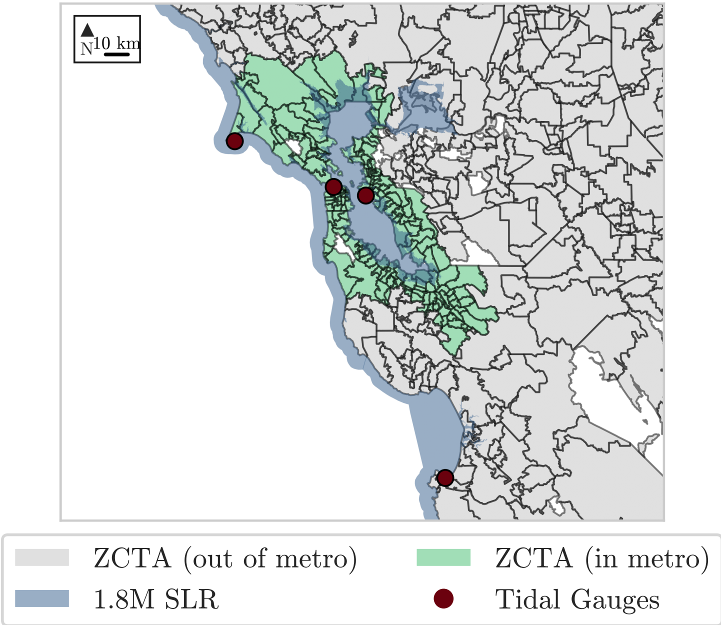
DP16

RCP	ptile	Cnt. 2050	Cnt. 2100	% Cnt. 2100	Bn. $ 2050	Bn. $ 2100	% Value 2100
RCP-26	**0.1**	0	0	0.00	0.00	0.00	0.00
	0.5	0	142	0.02	0.00	0.15	0.03
	0.9	30	1398	0.23	0.03	1.45	0.30
RCP-45	**0.1**	0	115	0.02	0.00	0.13	0.03
	0.5	1	1460	0.24	0.00	1.51	0.31
	0.9	46	3780	0.61	0.05	3.91	0.80
RCP-85	**0.1**	0	2024	0.33	0.00	2.03	0.41
	0.5	1	3820	0.62	0.00	3.96	0.81
	0.9	74	5308	0.86	0.08	5.24	1.07


Los Angeles: Sea-Level Rise vs Time
(a) SLR vs Time (K14)
(b) SLR vs Time (DP16)
Sea Level Rise (m)
Year
Los Angeles: Impairment vs Time
(c) Count (K14)
(d) Count (DP16)
Impaired Houses (Count)
Impaired Houses (Count DP16)
% of Total Houses
Los Angeles: Impairment Uncertainty by Representative Concentration Pathway
(e) Count (K14)
(f) Count (DP16)
K26
K45
K85
DP26
DP45
DP85
RCP2.6 50%
RCP2.6 10%, 90%
RCP4.5 50%
RCP4.5 10%, 90%
RCP8.5 50%
RCP8.5 10%, 90%

San Francisco Bay: Inundation Overview

SLR Inundation Map

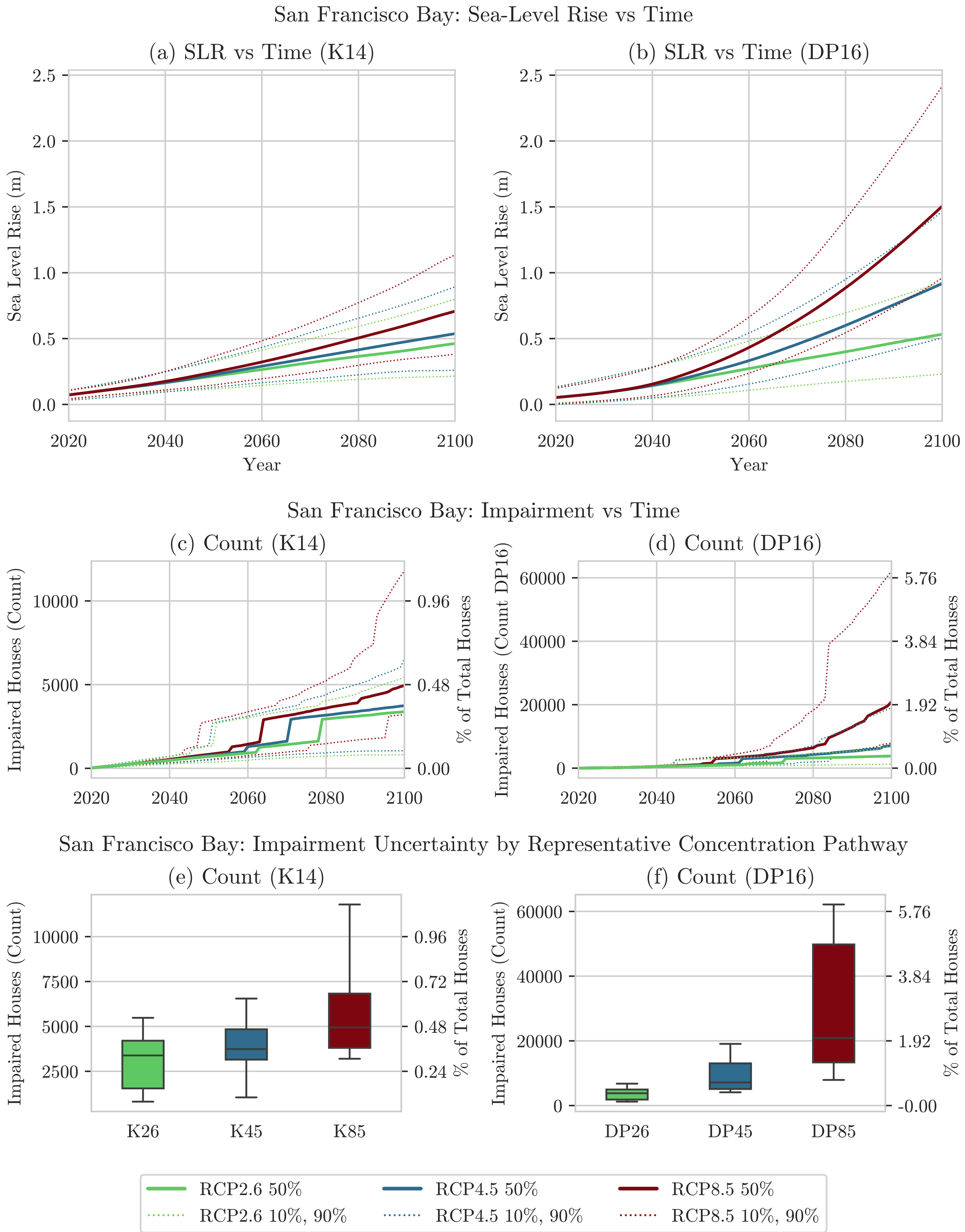


K14

RCP	ptile	Cnt. 2050	Cnt. 2100	% Cnt. 2100	Bn. $ 2050	Bn. $ 2100	% Value 2100
RCP-26	**0.1**	0	322	0.03	0.00	0.17	0.02
	0.5	353	3034	0.29	0.20	2.08	0.24
	0.9	1110	5268	0.51	0.67	3.93	0.45
RCP-45	**0.1**	14	506	0.05	0.01	0.28	0.03
	0.5	401	3387	0.33	0.23	2.33	0.27
	0.9	1160	6339	0.61	0.71	5.02	0.57
RCP-85	**0.1**	62	2707	0.26	0.03	1.87	0.21
	0.5	481	4591	0.44	0.28	3.40	0.39
	0.9	2608	11581	1.11	1.82	8.51	0.97

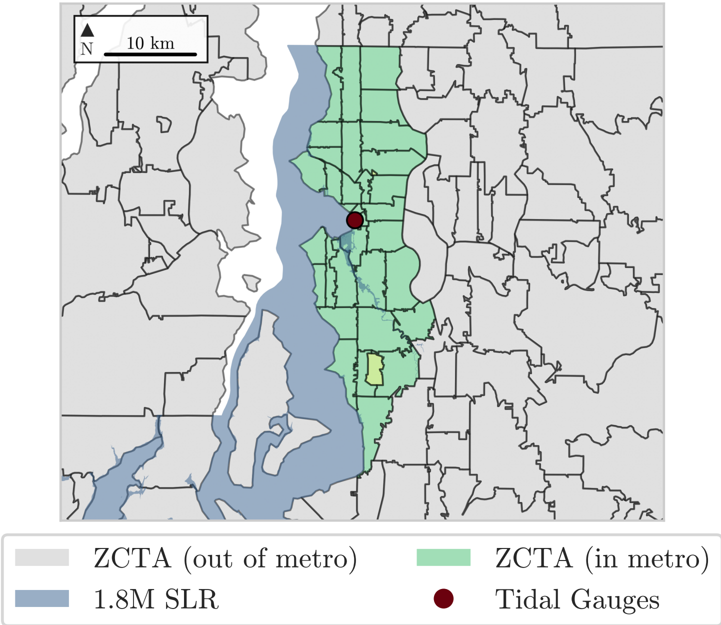
DP16

RCP	ptile	Cnt. 2050	Cnt. 2100	% Cnt. 2100	Bn. $ 2050	Bn. $ 2100	% Value 2100
RCP-26	**0.1**	0	384	0.04	0.00	0.20	0.02
	0.5	312	3362	0.32	0.18	2.30	0.26
	0.9	2650	6726	0.65	1.85	5.28	0.60
RCP-45	**0.1**	0	3255	0.31	0.00	2.23	0.25
	0.5	413	6689	0.64	0.24	5.25	0.60
	0.9	2746	19016	1.83	1.90	13.88	1.59
RCP-85	**0.1**	14	7077	0.68	0.01	5.54	0.63
	0.5	604	20442	1.96	0.35	15.09	1.73
	0.9	2920	62060	5.96	2.01	51.15	5.85


San Francisco Bay: Sea-Level Rise vs Time
(a) SLR vs Time (K14)
(b) SLR vs Time (DP16)
Sea Level Rise (m)
Year
San Francisco Bay: Impairment vs Time
(c) Count (K14)
(d) Count (DP16)
Impaired Houses (Count)
Impaired Houses (Count DP16)
% of Total Houses
San Francisco Bay: Impairment Uncertainty by Representative Concentration Pathway
(e) Count (K14)
(f) Count (DP16)
K26
K45
K85
DP26
DP45
DP85
RCP2.6 50%
RCP2.6 10%, 90%
RCP4.5 50%
RCP4.5 10%, 90%
RCP8.5 50%
RCP8.5 10%, 90%

Seattle: Inundation Overview

SLR Inundation Map

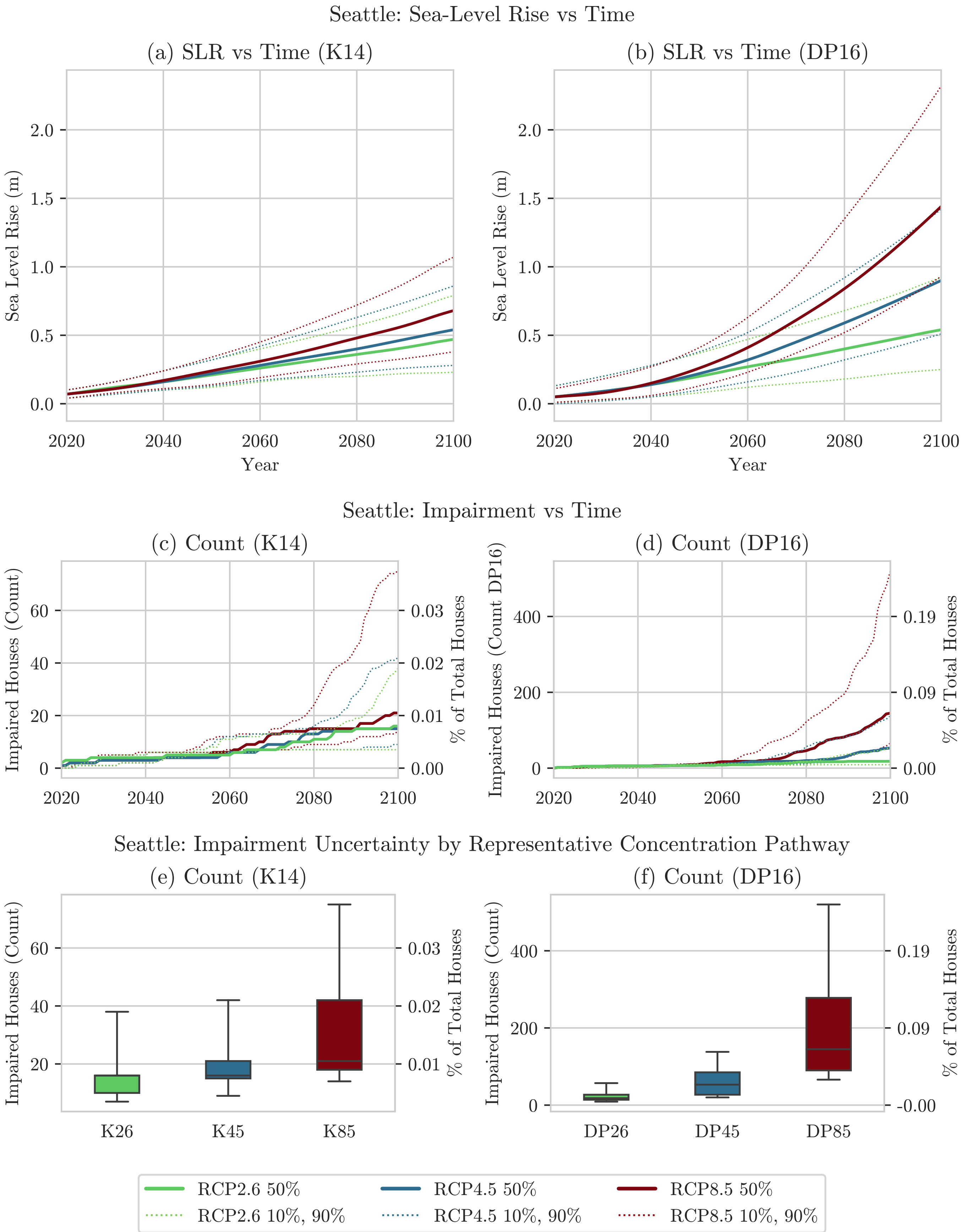


K14

RCP	ptile	Cnt. 2050	Cnt. 2100	% Cnt. 2100	Bn. $ 2050	Bn. $ 2100	% Value 2100
RCP-26	**0.1**	0	1	0.00	0.00	0.00	0.00
	0.5	1	12	0.01	0.00	0.02	0.01
	0.9	4	37	0.02	0.01	0.05	0.03
RCP-45	**0.1**	0	3	0.00	0.00	0.01	0.00
	0.5	1	12	0.01	0.00	0.02	0.01
	0.9	4	41	0.02	0.01	0.05	0.03
RCP-85	**0.1**	0	8	0.00	0.00	0.01	0.01
	0.5	1	18	0.01	0.00	0.03	0.02
	0.9	6	74	0.03	0.01	0.09	0.06

DP16

RCP	ptile	Cnt. 2050	Cnt. 2100	% Cnt. 2100	Bn. $ 2050	Bn. $ 2100	% Value 2100
RCP-26	**0.1**	0	1	0.00	0.00	0.00	0.00
	0.5	1	12	0.01	0.00	0.02	0.01
	0.9	7	57	0.03	0.01	0.06	0.04
RCP-45	**0.1**	0	12	0.01	0.00	0.02	0.01
	0.5	1	47	0.02	0.00	0.06	0.04
	0.9	8	138	0.06	0.01	0.16	0.10
RCP-85	**0.1**	0	58	0.03	0.00	0.06	0.04
	0.5	1	139	0.06	0.00	0.16	0.11
	0.9	11	520	0.24	0.02	0.45	0.29


Seattle: Sea-Level Rise vs Time
(a) SLR vs Time (K14)
(b) SLR vs Time (DP16)
Sea Level Rise (m)
0.0
0.5
1.0
1.5
2.0
2020
2040
2060
2080
2100
Year
Seattle: Impairment vs Time
(c) Count (K14)
(d) Count (DP16)
Impaired Houses (Count)
Impaired Houses (Count DP16)
% of Total Houses
0.00
0.01
0.02
0.03
0.09
0.19
Seattle: Impairment Uncertainty by Representative Concentration Pathway
(e) Count (K14)
(f) Count (DP16)
-0.00
K26
K45
K85
DP26
DP45
DP85
RCP2.6 50%
RCP2.6 10%, 90%
RCP4.5 50%
RCP4.5 10%, 90%
RCP8.5 50%
RCP8.5 10%, 90%

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