Supplementary Information for:

Impacts of Climate Change Induced Sea Level Rise, Flow Increase and Vegetation Encroachment on Flood Hazard in the Biobío River, Chile

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Table S1: Calculated recurrence intervals and associated peak flows and 95% confidence limits for the lower Biobío River based on annual maximum time series using the method outlined in USGS Bulletin 17.

Chance Exceedance	Recurrence Interval	Flow	Confidence limits	
			0.05	0.95
%	y	$m^3 s^{-1}$	$m^3 s^{-1}$	$m^3 s^{-1}$
0.2	500	18,959	32,610	14,164
0.5	200	17,162	26,697	13,429
1	100	15,715	22,784	12,722
2	50	14,184	19,267	11,838
5	20	12,009	15,074	10,304
10	10	10,222	12,198	8827
20	5	8265	9608	7127
50	2	5207	6092	4425
80	1.25	3037	3619	2331
90	1.11	2219	2723	1462
95	1.05	1684	2159	922
99	1.01	961	1411	328

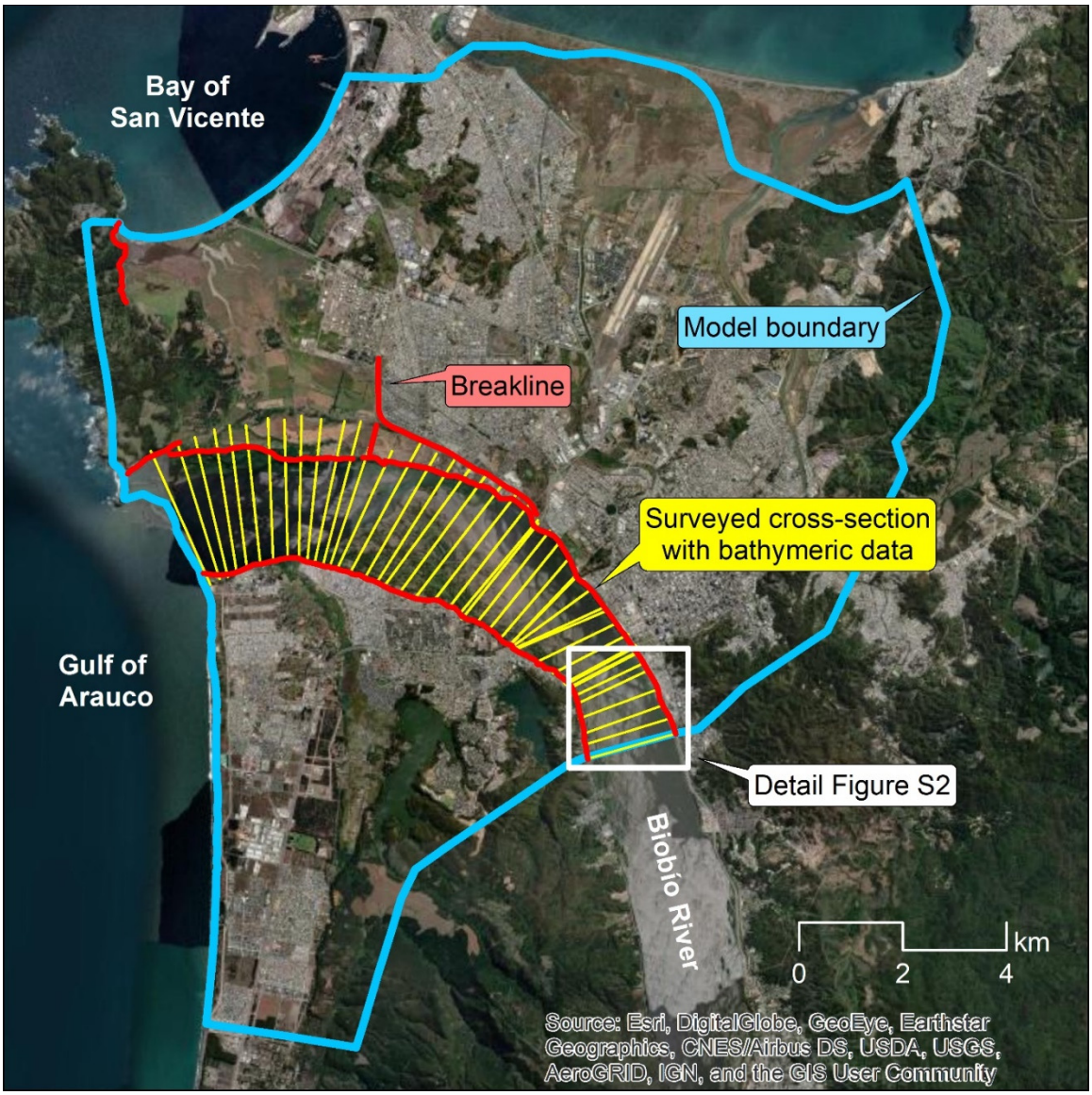

Figure S1: Map of the study area showing the boundary of the hydrodynamic model (blue), breaklines used to refine the computational mesh (red), and locations of surveyed cross-sections (yellow).

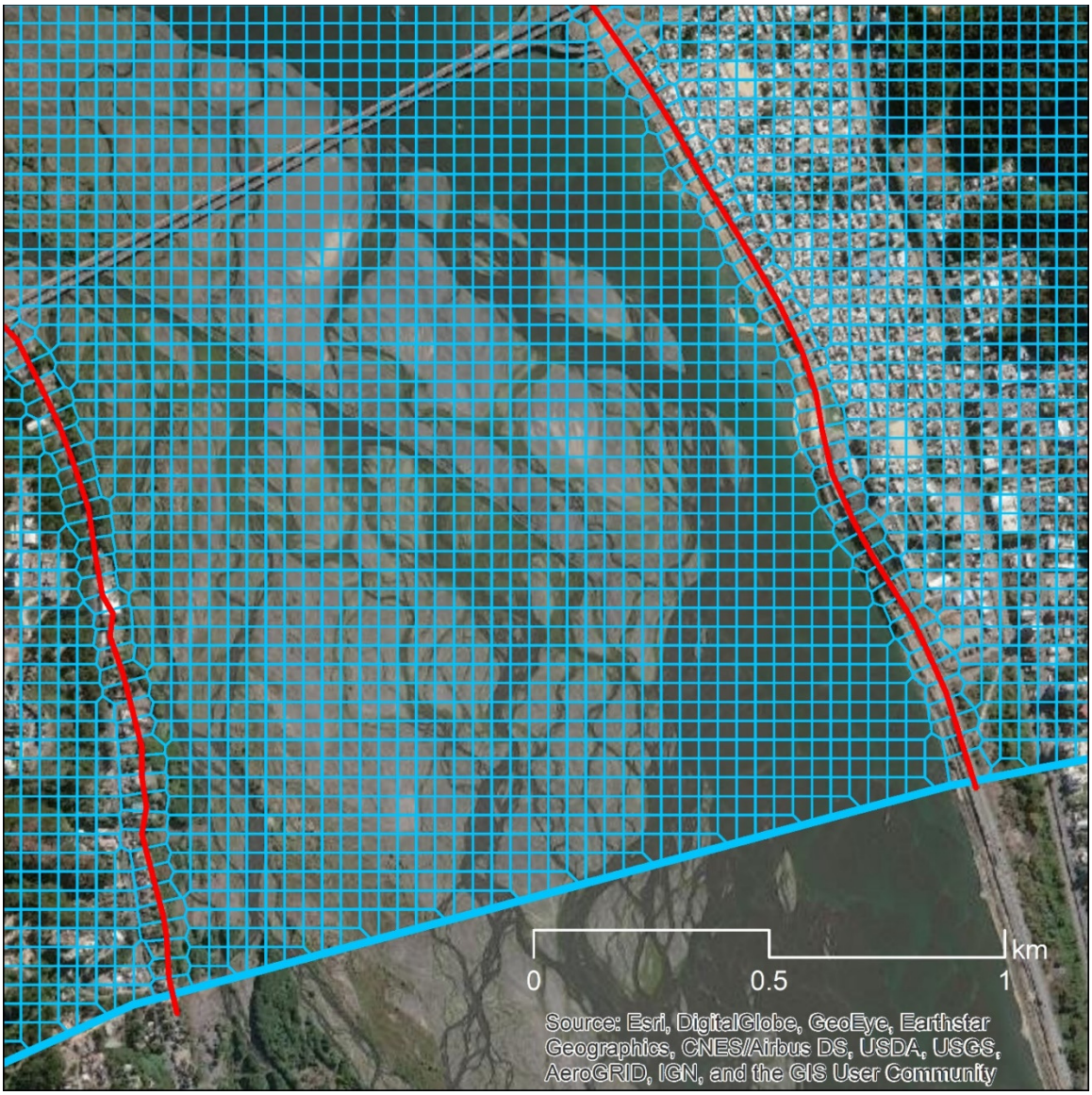

Figure S2: Detailed view of a portion of the computational mesh (blue) and refinement regions along the banks of the Biobío River (red).

Table S2: Manning's *n*-values for different land use types.

Land use	*n*-value	Land use	*n*-value
barren land	0.027	shrubland	0.120
dunes	0.030	forest	0.140
river channel	0.032	dense riparian forest	0.160
pasture/field	0.040	urban area, low density	0.080
wetland	0.050	urban area, medium density	0.120
scrubland	0.070	urban area, high density	0.160

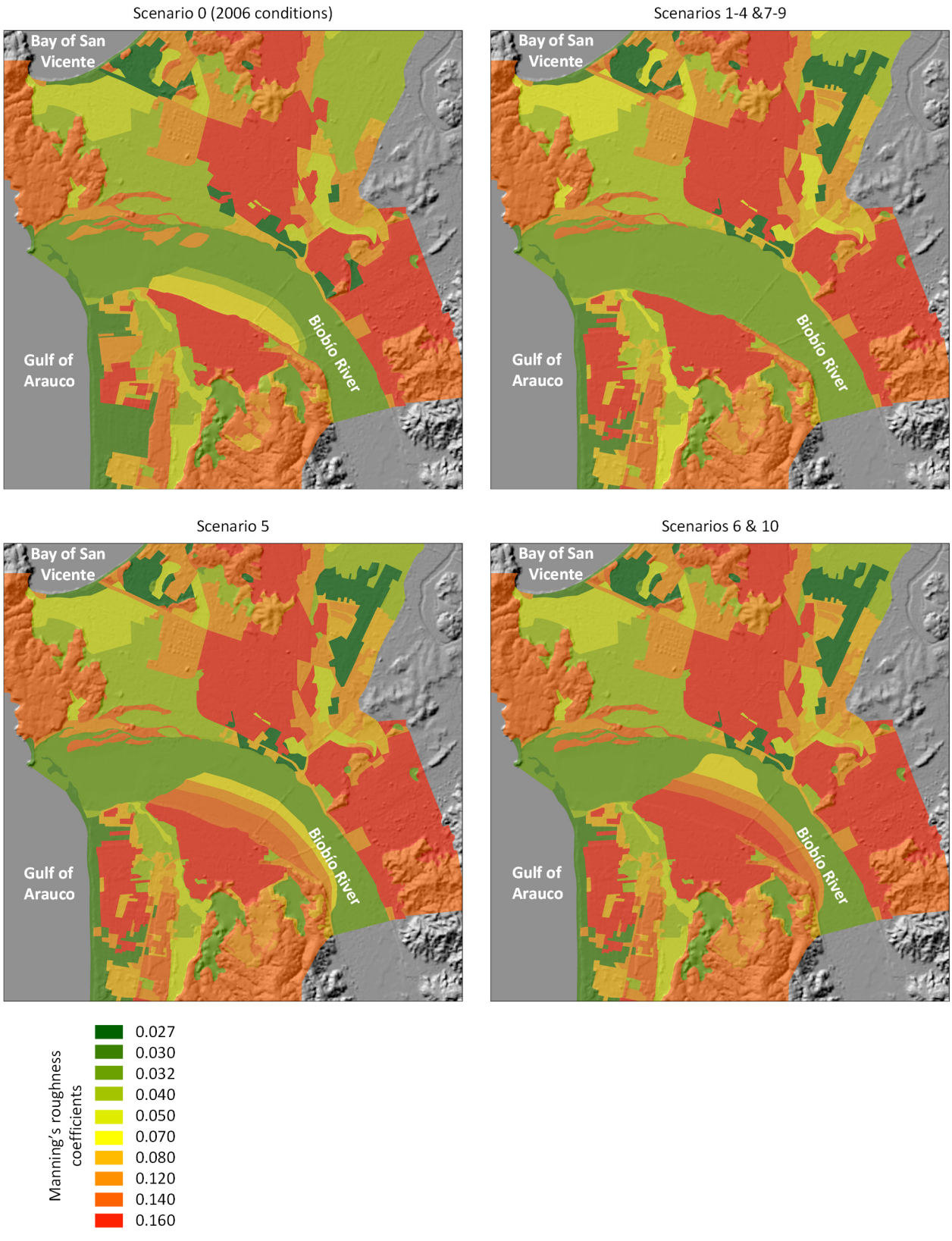

Figure S3: Manning's n-values for different model scenarios.

Figure S4: Overview map (top) showing locations where modeled and observed flood extent for the 2006 flood were compared, and comparison at location 1 (bottom; see red line for comparison; image source: Didier Rousset Buy).

Figure S5: Comparison of modeled (left) and observed flood extents (right) at locations 2, 3 and 4 (see red line for comparison; image source: Didier Rousset Buy).

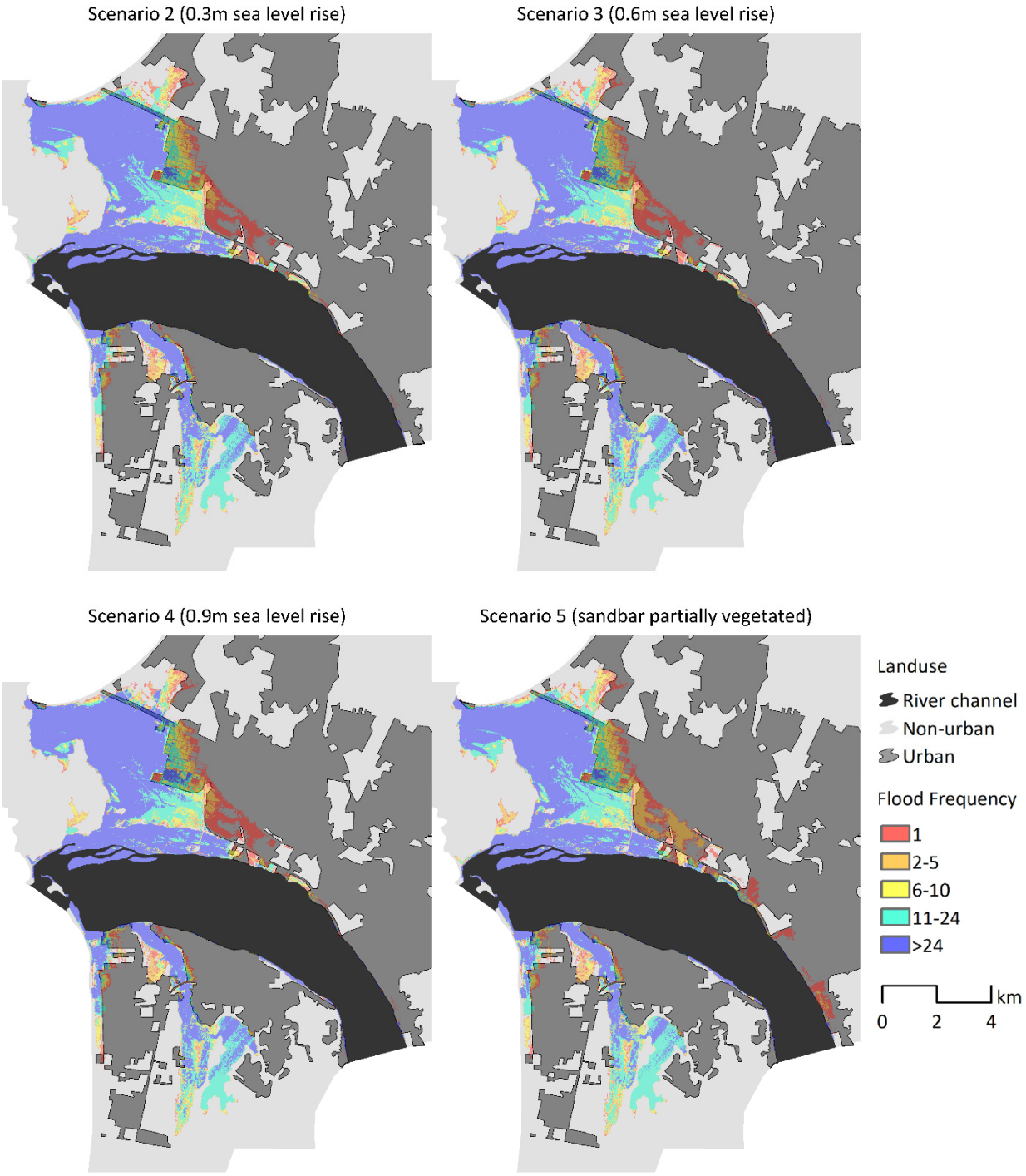

Figure S6: Maps showing frequency of flooding in the study area based on 32 flood events for scenarios 2-5. The river channel is indicated with black shading; areas urbanized in 2022 are indicated with a darker shade of grey.

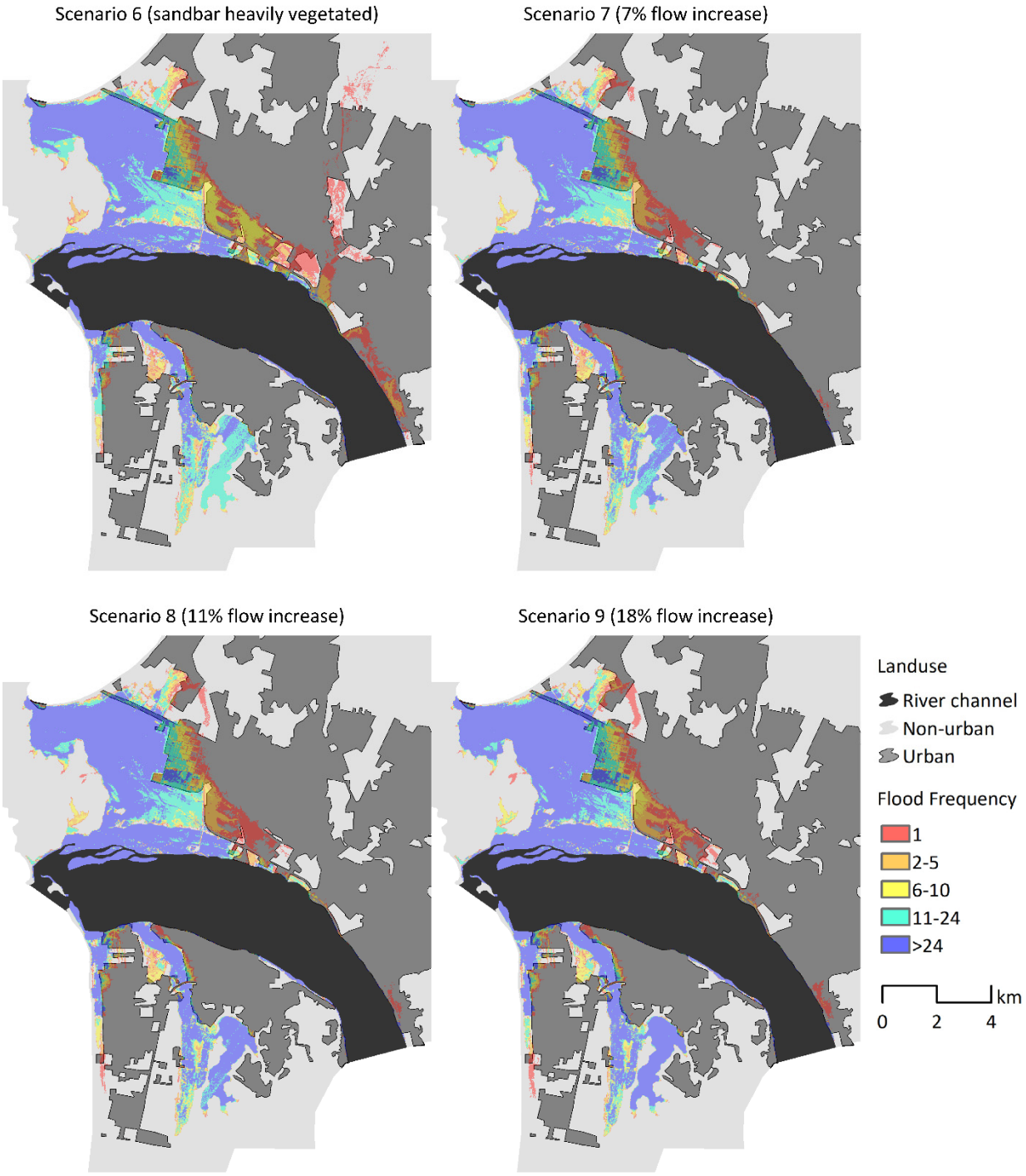

Figure S7: Maps showing frequency of flooding in the study area based on 32 flood events for scenarios 6-9. The river channel is indicated with black shading; areas urbanized in 2022 are indicated with a darker shade of grey.

Figure S8: Photos showing the confluence of the Ñuble and Itata Rivers (Latitude: -36.642239°, Longitude: -72.466197°) in central Chile in 2006, 2009, 2013 and 2022 (image source: José Luis Arumí).