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Irregular Kelo Takings: A Potential Response to Natural Disasters

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A RECORD 62 TORNADOS HIT ALABAMA on April 27, 2011, resulting in 247 fatalities.[1] In Tuscaloosa alone, 5,362 residential structures were damaged or destroyed.[2] Among them were houses along 14th Place East. Seven lots in one section looked like this:
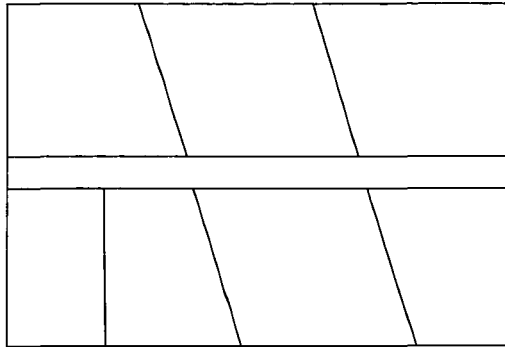
With the exception of the parcel at the bottom left, all of these lots are needlessly "irregular," by which I mean non-rectangular. Several studies (described below) have shown that irregular parcels sell for less than similarly situated rectangular lots. Thus, after the tornado and before rebuilding, the government might have been tempted to

1. Mike Oliver, *April 27's Record Tally: 62 Tornadoes*, BIRMINGHAM NEWS, Aug. 4, 2011, at 1.

2. Chris Pow, *Tuscaloosa's April 27 Tornado by the Numbers*, AL.COM (Oct. 27, 2011, 8:50 AM), http://blog.al.com/tuscaloosa/2011/10/tuscaloosas_april_27_tornado_b.html (reporting numbers from the Tuscaloosa mayor's office).

square the lots to increase property tax revenue.[3] The result would look like this, with no change in square footage:
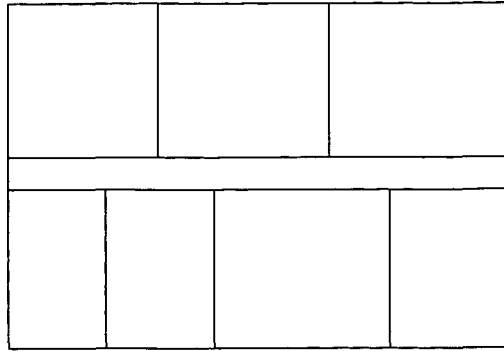
In fact, this did not happen. But should it happen after future disasters? And could it? The answers depend first on the strength of the evidence showing increased value for rectangular lots. In section I of this essay, I will summarize existing research in this field, then report the results of my original data analysis. The conclusion is that rectangular lots are probably somewhat more valuable than irregular shaped lots. But, even if there are modest gains to be had by squaring lots, is it within the government's power to force those gains? Section II examines that question through the lens of the controversial United States Supreme Court case, *Kelo v. City of New London*,[4] and its legislative aftermath.

I. Are Rectangular Lots More Valuable?

A. *Previous Literature*

Five prior studies addressed the question of whether irregular lot shape reduces urban parcel value.[5] The first study examined 123 random real estate sales from 1976 to 1984 in Halifax and Dartmouth, Nova Scotia.[6] According to this study, irregular lot shape reduced value

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3. Other actors—like owners and developers—might feel the same temptation, but transaction costs are likely to be prohibitive. Government could act to reduce those costs rather than redrawing lines itself.

4. 545 U.S. 469 (2005).

5. A sixth study evaluated *agricultural* land and found a significant advantage for rectangular parcels. Gary D. Libecap & Dean Lueck, *The Demarcation of Land and the Role of Coordinating Property Institutions*, 119 J. POL. ECON. 426 (2011).

6. Paul K. Asabere & Barrie Harvey, *Factors Influencing the Value of Urban Land: Evidence From Halifax-Dartmouth, Canada*, 13 AREUEA J. 361 (1985).

by 40% or more, and the effect achieved statistical significance in most specifications.[7] Adjusted R^2 ranged from 0.50 to 0.55.[8] (R^2 is a measure of how well the model fits the data. It is generally between 0 and 1, where 1 is a perfect fit.)[9]

The second study comes from another peninsular city but on the opposite side of the continent: Seattle, Washington.[10] It also found a statistically significant negative effect of irregular shape: a reduction in value of 67%.[11] This study's dataset was much larger: 80,926 King County sales of single-family homes from 1984 to 2002.[12] Control variables included, inter alia, zoning codes and school districts; however, the R^2 was only 0.20.[13]

The third study focused on the island of Manhattan.[14] Using a dataset of 68,208 residential property sales in New York City between 1990 and 2002, the study found a statistically significant *positive* 1.3% irregular shape effect on price per residential unit and no statistically significant effect on total price.[15] Similarly, there was no significant effect for vacant land zoned residential.[16] This suggests little or no lot shape effect. These models included both census tract fixed effects and community district variables.[17]

The final two studies focus on Japanese cities. One reviewed transactions of vacant land from 1975 to 1987 in the central business district of Tokyo.[18] From a regression predicting sale price, the author concludes that "an irregular-shaped lot is about 42% less valuable than a regular-shaped lot" (p<0.01).[19] A more recent Japanese study included both Tokyo and Kitakyushu, a medium-sized city, but limited

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7. *Id.* at 372-73.
8. *Id.*
9. *See* Perry A. Zirkel & Andriy Krahmal, *Creeping Legalism in Grievance Arbitration: Fact or Fiction?*, 16 OHIO ST. J. ON DISP. RESOL. 243, 250 (2001).
10. Christopher R. Cunningham, *House Price Uncertainty, Timing of Development, and Vacant Land Prices: Evidence for Real Options in Seattle*, 59 J. URB. ECON. 1 (2006).
11. *Id.* at 18.
12. *Id.* at 4, 6, 9, 18.
13. *Id.* at 18.
14. Yun-chien Chang, *An Empirical Study of Compensation Paid in Eminent Domain Settlements: New York City, 1990–2002*, 39 J. LEGAL STUD. 201 (2010).
15. *Id.* at 221. R^2 was 0.87 and 0.64, respectively.
16. *Id.* at 222. N was 1,305 and R^2 was 0.79.
17. *Id.* at 221-22.
18. Kazuhiko Fujiki, A Study on CBD Land Value Variations (Aug. 1989) (unpublished M.S. dissertation, University of British Columbia), *available at* https://circle. ubc.ca/handle/2429/27261.
19. *Id.* at 82, 85.

itself to vacant residential lots.[20] Regressions from each city showed statistically significant negative effects for irregular shape. The magnitude of the effect in Tokyo is difficult to discern given complicated model specification.[21] In Kitakyushu, the researchers claim that regular shape increased value by 11.9%,[22] but their model, properly interpreted, actually showed an increase of 5.8%.[23]

B. *The Present Study*

The City of Cleveland, Ohio, was selected for this study due primarily to data availability. As a basically flat midwestern city with few natural obstacles to urban planning and development, it fills a gap in the existing literature. Cleveland is also subject to natural disasters that could present the motivating question for this study: more than 900 tornadoes struck Ohio between 1950 and 2010.[24]

The source of the data is the Cuyahoga County auditor. The most recent major reappraisal was conducted in 2006. In that year, 177,660 parcels were in Cleveland. Observations were excluded for several reasons: missing and non-residential land use codes, air rights, condominiums, duplicates, and so forth. Table 1 summarizes the variables of interest.[25]

The key results appear in Table 2. The irregular shape dummy— equal to one for irregular lot shapes and zero otherwise—is negative and statistically significant in each model. For all residential properties, irregular shape reduces value by 6.4% $(1 - e^{-0.0662})$. Coefficients on the control variables have the predicted signs and are statistically significant. Dividing the residential property by type, there is a 1.4% reduction in land value for irregular lots zoned for single family

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20. Xiaolu Gao & Yasushi Asami, *Effect of Urban Landscapes on Land Prices in Two Japanese Cites*, 81 LANDSCAPE & URB. PLAN. 155 (2007).

21. *Id.* at 161.

22. *Id.* at 162.

23. *Id.* The source of the error was setting SHAPE equal to minus one if the lot was irregular, then interpreting the coefficient as if SHAPE had been set to zero for irregular parcels.

24. Rich Exner, *Details of Ohio's Tornadoes Since 1950*, THE PLAIN DEALER (Aug. 25, 2011), http://www.cleveland.com/datacentral/index.ssf/2009/05/details_of_ohios_868_tornadoes.html.

25. Missing values in the variables listed in Table 1 together required omission of 2% of observations.

In a personal email to the author, John Strok of the Cuyahoga County Office of Fiscal Officer stated that the lot shape variable is "secondary," not used in the county's appraisal, and therefore subject to coding error. E-mail from John Strok, Cuyahoga Office of Fiscal Officer, to Fredrick E. Vars, Associate Professor, Univ. of Ala. School of Law (May 4, 2012, 03:05 PM) (on file with author). Such errors would likely lead the present study to *under*estimate lot shape effects.

Table 1: Summary Statistics

Variable	Mean
Assessed Land Value ($)	16440.14
Irregular Shape	4.56%
Irregular Shape & Small[†]	0.18%
Lot Size (sq. ft.)	5479.2
Frontage (ft.)	41.5
Paved Road	99.91%
Utilities	99.91%
Level	99.37%
N	127312

[†]"Small" is lot size at or below the 10th percentile of vacant residential parcels (2145 square feet).

homes, a 5.2% reduction for multi-family home lots, and an 8.5% decrease for vacant lots.

One question that follows from the relatively large effect for vacant lots is whether small, unbuildable lots are driving the result. The final column of Table 2 assesses this possibility by adding to the model a dummy variable equal to one if the lot had an irregular shape and was in the bottom 10th percentile of vacant residential lot size (and zero otherwise). The coefficient on this variable was positive and did not achieve statistical significance, tending to rebut the unbuildable hypothesis.[26]

Thus, irregular shape appears to have a small but significant negative effect on assessed land value. But perhaps the property owners disagree with the auditor. I tested this possibility two ways: first, by examining the assessed value of buildings on the theory that property owners will put more valuable buildings on rectangular lots, and second, by examining actual market transactions (also from the Cuyahoga County auditor's file).

The first test yields a negative result. Lot shape and assessed building value are not significantly related in any of the three models (Table 3). Nor was there a relationship between irregular shape and sale price for developed residential property (Table 4, columns 1-3). The surprise here is with vacant lots, which showed a statistically significant *positive* effect of irregular shape (+29.0%; Table 4, column 4). This

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26. Setting the cut-off at the 25th percentile (4,200 square feet) yielded the same result.

Table 2: The Impact of Lot Characteristics on 2006 Assessed Land Value

Variable	Land Use Code (LUC)				
	All Residential	1 Family	2 or 3 Family	Vacant	Vacant
Irregular Shape	-0.0662 ***	-0.0137 ***	-0.0530 ***	-0.0885 **	-0.0958 **
	(0.0046)	(0.0020)	(0.0042)	(0.0337)	(0.0361)
Irregular Shape & Small†					0.0544
					(0.0961)
Ln(Lot Size)	1.7313 ***	1.0244 ***	0.6556 ***	1.1306 ***	1.1360 ***
	(0.0334)	(0.0160)	(0.0446)	(0.1529)	(0.1532)
Ln(Lot Size)^2	-0.0751 ***	-0.0369 ***	-0.0152 ***	-0.0408 ***	-0.0410 ***
	(0.0019)	(0.0009)	(0.0026)	(0.0093)	(0.0093)
Ln(Frontage)	0.8353 ***	-0.0822 ***	-0.0727 *	0.6434 ***	0.6420 ***
	(0.0242)	(0.0171)	(0.0319)	(0.0788)	(0.0789)
Ln(Frontage)^2	-0.0955 ***	0.0213 ***	0.0225 ***	-0.0729 ***	-0.0728 ***
	(0.0032)	(0.0022)	(0.0042)	(0.0116)	(0.0116)
Paved Road	0.3274 ***	-0.0333	0.0108	0.4939 ***	0.4945 ***
	(0.0339)	(0.0176)	(0.0530)	(0.1310)	(0.1311)
Utilities	0.7336 ***	0.0130	(omitted)	0.3141 **	0.3147 **
	(0.0331)	(0.0231)		(0.0999)	(0.0999)
Level	0.0402 ***	-0.0277 ***	0.0110	0.0151	0.0149
	(0.0119)	(0.0053)	(0.0120)	(0.0718)	(0.0718)
N	127312	85246	33075	8717	8717
R-squared	0.5448	0.8792	0.7896	0.3234	0.3234

Note: The ordinary least-squares regression on the logirithm of value also included 150 neighborhood dummy variables: one for every neighborhood with 10 or more parcels. Many of these were omitted due to collinearity in the smaller models. Standard errors in parentheses.
†"Small" is lot size at or below the 10th percentile of vacant residential parcels (2145 square feet).
* p<0.05.
** p<0.01.
*** p<0.001.

Table 3: The Impact of Lot Characteristics on 2006 Assessed Building Value

Variable	Land Use Code (LUC)		
	All Residential[†]	1 Family	2 or 3 Family
Irregular Shape	0.0060	0.0100	0.0197
	(0.0072)	(0.0075)	(0.0151)
Ln(Lot Size)	0.5804 ***	0.5879 ***	0.5096 ***
	(0.0594)	(0.0602)	(0.1595)
Ln(Lot Size)^2	-0.0254 ***	-0.0254 ***	-0.0265 **
	(0.0034)	(0.0035)	(0.0094)
Ln(Frontage)	0.5663 ***	0.6129 ***	0.6338 ***
	(0.0594)	(0.0643)	(0.1141)
Ln(Frontage)^2	-0.0485 ***	-0.0520 ***	-0.0722 ***
	(0.0077)	(0.0082)	(0.0150)
Paved Road	-0.1711 *	-0.0603	-0.0688
	(0.0671)	(0.0663)	(0.1894)
Utilities	-0.0646	-0.2373 **	(omitted)
	(0.0915)	(0.0869)	
Level	-0.0159	-0.0251	-0.0367
	(0.0192)	(0.0198)	(0.0430)
N	118342	85099	33010
R-squared	0.4827	0.5118	0.5163

See note to Table 1.
[†]Excluding vacant lots.
* $p<0.05$.
** $p<0.01$.
*** $p<0.001$.

suggests that the market, unlike the auditor, rather strongly *disfavored* rectangular vacant lots.

C. *Integrating the Research*

Irregular lots in medium-sized cities are probably worth somewhat less than comparable rectangular lots. This conclusion gives more credence to the auditor in the present study than to the market, for three reasons. First, the vacant lot market models in Table 4 have by far the fewest observations and lowest R^2s of the models in this study. Omitted variables could explain the observed results. The value of improvements is an obvious confounder. Second, as discussed below, the public purpose of redrawing lot lines would be to increase tax revenue, which is driven by assessed value, not by market transactions. Third, transactions are a non-random sample of lots, likely

Table 4: The Impact of Lot Characteristics on Sale Price, 1990-2005

Variable	Land Use Code (LUC)				
	All Residential	1 Family	2 or 3 Family	Vacant	Vacant
Irregular Shape	0.0185	0.0118	0.0080	0.2547 *	0.3053 **
	(0.0127)	(0.0134)	(0.0319)	(0.1114)	(0.1169)
Irregular Shape & Small†					-0.5409
					(0.3795)
Ln(Lot Size)	0.2292 *	0.7331 ***	0.0080	-0.2078	-0.2535
	(0.1042)	(0.1197)	(0.3006)	(0.4760)	(0.4769)
Ln(Lot Size)^2	-0.0026	-0.0298 ***	0.0082	0.0096	0.0114
	(0.0061)	(0.0069)	(0.0177)	(0.0291)	(0.0291)
Ln(Frontage)	-0.0760	0.1199	0.3525	-0.3044	-0.3986
	(0.0926)	(0.1376)	(0.1922)	(0.3500)	(0.3560)
Ln(Frontage)^2	0.0180	-0.0069	-0.0402	0.0439	0.0569
	(0.0122)	(0.0178)	(0.0253)	(0.0535)	(0.0543)
Paved Road	-0.3704 ***	-0.2900 **	-0.1748	-0.3360	-0.3315
	(0.1009)	(0.1055)	(0.3042)	(0.6983)	(0.6981)
Utilities	0.2892 *	0.1226	(omitted)	0.2940	0.3002
	(0.1149)	(0.1371)		(0.3428)	(0.3427)
Level	-0.0569	-0.0560	-0.0311	-0.4768	-0.4796
	(0.0366)	(0.0399)	(0.0848)	(0.2488)	(0.2487)
N	49383	34458	13477	1389	1389
R-squared	0.2730	0.3216	0.1854	0.2147	0.2160

See note to Table 1.
†"Small" is lot size at or below the 10th percentile of vacant residential parcels (2145 square feet).
* p<0.05.
** p<0.01.
*** p<0.001.

skewed toward lots with uncertain or increasing value. The auditor, on the other hand, uses market and other information to generate a best estimate for every parcel, with no selection bias. So this study shows a reduction in assessed value of between 1.4% and 8.5% for irregular residential lots.

What about the prior studies? The Halifax study was very small (N = 123) and did not control for the value of improvements.[27] The failure to disaggregate land value from the value of structures substantially undermines the study's reliability. The same goes for the Seattle study, which is also suspect because of its very low R^2 (0.20).[28] The New York study corrected both deficiencies and found no statistically significant irregular shape effect for vacant residential lots.[29] That would be a strong argument against the current study's contrary conclusion if the New York study had not relied solely on market transactions. New York is also much larger than Cleveland and unique in other ways. The two Japanese studies also rely on actual sales and come from a very foreign cultural and legal framework. In addition, the first Japanese study lumped together residential and non-residential property in finding its 42% reduction in value for irregular shaped lots in Tokyo.[30] More plausible and applicable to residential property in medium-sized cities is the second Japanese study's negative 5.5% effect in Kitakyushu,[31] which is comparable to the findings of the present study.

II. Can the Government Redraw Boundaries to Create Rectangular Lots?

A. *The Takings Clause*

The Fifth Amendment to the United States Constitution concludes: "[N]or shall private property be taken for public use, without just compensation."[32] This so-called Takings Clause constrains all levels of government.[33] The "public use" limitation has been interpreted broadly to permit more than just actual use by the public or by government of the

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27. Asabere & Harvey, *supra* note 6, at 370.
28. Cunningham, *supra* note 10, at 18.
29. Chang, *supra* note 14, at 222.
30. Fujiki, *supra* note 18, at 82, 85.
31. Gao & Asami, *supra* note 20.
32. U.S. CONST. amend. V.
33. Chicago, B. & Q. R. Co. v. City of Chi., 166 U.S. 226 (1897).

taken private property.[34] Rather, the touchstone requirement is "public purpose."[35]

As the two figures in the introduction illustrate, straightening lot lines generally takes some property from Neighbor A and gives it to Neighbor B in exchange for an equal amount in reverse. However, in *Kelo*, the Supreme Court reiterated the long-standing takings rule that "the sovereign may not take the property of A for the sole purpose of transferring it to another private party B, even though A is paid just compensation."[36] Here, the sole purpose would not be the transfer from one private party to another, but rather to increase property values and hence the local government's property tax revenue.

The majority opinion in *Kelo* expressly left open the question of whether increasing tax revenue, by itself, could constitute a sufficient "public purpose."[37] In predicting how the Court would resolve this open question, the concurring and dissenting opinions are illuminating. Justice O'Connor in dissent argued that the majority

> holds that the sovereign may take private property currently put to ordinary private use, and give it over for new, ordinary private use, so long as the new use is predicted to generate some secondary benefit for the public—such as increased tax revenue, more jobs, maybe even esthetic pleasure.[38]

Justice Kennedy, part of the five-justice majority, responded in his concurrence that the public benefit must not be merely incidental, pretextual, or de minimis.[39]

Increasing tax revenue by squaring lots need not be a secondary, incidental, or pretextual public benefit. The government could legitimately pursue greater tax revenue as a primary and sincere goal. Certainly, in the current economic environment, an increased tax base may be a legitimate municipal goal. But, that leaves us to analyze the goal of an increased tax base under Kennedy's de minimis limitation. There are arguments both ways. This study suggests a 9.3% increase in land value and hence property tax for vacant residential lots that are squared, rather than irregular shaped. That may sound substantial, but it amounts to only about $15 per year on an average vacant lot.[40] The observed rectangular-shape effect for lots with single

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34. *See, e.g., Kelo*, 545 U.S. at 480.
35. *Id.*
36. *Id.* at 477.
37. *Id.* at 486-87.
38. *Id.* at 501 (O'Connor, J., dissenting).
39. *Id.* at 490-91, 493 (Kennedy, J, concurring).
40. Rich Exner, *Northeast Ohio Property Tax Rates, and Where the Money Goes*, THE PLAIN DEALER (Feb. 2, 2009), http://www.cleveland.com/datacentral/index.ssf/

family homes is smaller in percentage terms, about 1.4%, but it works out to $345 per year for an average lot. This means that squaring six average lots in Cleveland like the ones on 14th Place East in Tuscaloosa could be expected, if single-family homes are rebuilt, to increase annual property tax revenues by about $2,068. A single-year increase of this magnitude is probably not de minimis.

Perhaps more important is that, at least in terms of assessed value, there are no net losers in the lot redrawing hypothetical. Sure, neighbor A gives up a slice of her property, but she receives an equally big slice in return, along with an increase in property value. Arguably, this point belongs in the just compensation portion of the analysis,[41] but it is hard to imagine that it would not tilt courts in favor of finding an adequate public purpose. An owner may have a psychological attachment to her irregularly shaped parcel, but takings law generally disregards such non-market interests.[42]

B. *State Law Constraints*

The *Kelo* case precipitated an enormous backlash. Several states enacted laws prohibiting takings if the enhancement of tax revenue is the "primary" or "sole" motivation.[43] These laws would seem to preclude the redrawing of lot lines contemplated here. A complete survey of state law is beyond the scope of this essay, but I will examine the state that framed the study, Alabama, and the state that made it possible, Ohio.

The Alabama Constitution states: "nor shall private property be taken for private use, or for the use of corporations, other than municipal, without the consent of the owner."[44] In case that was not clear, the Alabama Code specifies that "a municipality or county may not condemn property for the purposes of private retail, office, commercial, industrial, or residential development; or *primarily for enhancement of tax revenue;* or for transfer to a person, nongovernmental entity,

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2009/01/northeast_ohio_property_tax_ra.html?appSession=288292351668293 (based on 2008 tax rates).

41. *Cf.* Penn Cent. Transp. Co. v. City of N.Y., 438 U.S. 104, 150-51 (1978) (Rehnquist, J., dissenting).

42. *See, e.g.,* Coniston Corp. v. Vill. of Hoffman Estates, 844 F.2d 461, 464 (7th Cir. 1988) (Posner, J.). *But cf.* Loretto v. Teleprompter Manhattan CATV Corp., 458 U.S. 419, 436 (1982) (finding *per se* taking in part due to "insult" of permanent physical occupation).

43. James W. Ely, Jr., *Post-*Kelo *Reform: Is the Glass Half Full or Half Empty?,* 17 SUP. CT. ECON. REV. 127, 136 (2009).

44. ALA. CONST. art. I, § 23.

public-private partnership, corporation, or other business entity."[45] Therefore, it is obvious why Tuscaloosa did not straighten lot lines after the April 27, 2011 tornado—it could not lawfully pursue this tactic even if it would enhance tax revenue.

The Ohio Constitution strikes a different chord, declaring that private property shall be held "subservient to the public welfare."[46] But Ohio changed its tune after *Kelo:* " '[p]ublic use' does not include any taking that is for conveyance to a private commercial enterprise, economic development, or *solely for the purpose of increasing public revenue,*" subject to inapplicable exceptions.[47] Therefore, the door to redrawing lot lines in order to increase the tax base is likely closed in Ohio as well.

III. Conclusion

This essay fills a gap in the existing literature on the impact of lot shape on urban land values. It generally supports the view that there is a penalty for irregular shape, but of a smaller magnitude than some prior studies have suggested.[48] Still, there may be real gains to squaring lots after natural disasters. This strategy would likely pass federal constitutional muster, but state law restrictions on eminent domain passed in response to *Kelo* may have inadvertently foreclosed the opportunity. Of course, governments could, and perhaps should, encourage through other means (like tax incentives) the creation of rectangular lots through its development and design review process.

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45. ALA. CODE § 11-47-170(b) (2012) (emphasis added).

46. OHIO CONST. art. I, § 19.

47. OHIO REV. CODE ANN. § 163.01(H)(1) (West 2007) (emphasis added); *see also* OHIO REV. CODE ANN. § 163.021(A) ("No agency shall appropriate real property except as necessary and for a public use. In any appropriation, the taking agency shall show by a preponderance of the evidence that the taking is necessary and for a public use.").

48. Although the focus of this paper is disaster recovery, the premium on rectangular lots has other obvious implications, *e.g.*, property tax assessment, city planning, zoning, and private development.