CITIZEN COMPLAINTS AS ENVIRONMENTAL INDICATORS: EVIDENCE FROM CHINA

by

Susmita Dasgupta*
David Wheeler

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* Respectively Economist and Principal Economist in the Environment, Infrastructure and Agriculture Division, Policy Research Department, World Bank. This paper has been produced in a collaborative program supported by China's National Environmental Protection Agency (NEPA), the Tianjin Environmental Protection Bureau (TEPB) and the World Bank's Country Department EA2. Funding has been provided by the World Bank's Research Support Budget and the Social and Environmental Consequences of Economic Growth Fund. We are grateful to our colleagues Hua Wang and C.H. Zhang

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1. Introduction

Much of the pollution control literature assumes that government regulators act as sole agents for the public's environmental interest. [1] Taking the opposite tack, Coase and his followers have highlighted the conditions under which private agents can solve pollution problems without regulators.[2] In this paper, we adopt an institutional perspective which pragmatically blends the two approaches. In practice, regulators often realize that they are ill-informed about pollution problems because monitoring is costly. To fill the gap, they may solicit complaints from citizens or communities damaged by pollution. If these parties are also engaged in direct negotiations with polluters, they may enhance their bargaining position by threatening to complain to the regulators. Local conditions will determine the relative importance of direct regulation, responses to complaints, and community pressure in inducing pollution abatement.[3]

This mixed approach may be particularly important in developing countries, where monitoring resources are scarce or nonexistent. To compensate, pollution control agencies often focus their resources on responding to citizen complaints. For example, FEEMA, the pollution control agency of Rio de Janeiro State (Brazil), currently devotes nearly 100% of its inspection resources to complaints. After setting aside 50% of its resources for targeting priority polluters, Sao Paulo's pollution control agency (CETESB) allocates the remainder to complaints. In Indonesia, the national pollution control agency (BAPEDAL) has very few inspectors but allocates much of their time to

[1] For a comprehensive treatment, see Tietenberg (1995).
[2] See Coase (1960, 1988).

its JAGATIRTA program for complaint response. And, as we will show, China's provincial and local regulators respond annually to more than 100,000 citizen complaints.[4]

Are complaints a good substitute for direct monitoring? To date, this question has not been systematically addressed. Complaints are undoubtedly a source of low-cost information, since polluting facilities are often apparent to their neighbors even if they are invisible to government agencies. There are also compelling social and political arguments for agency responsiveness to citizen complaints about polluters. However, there are good reasons for skepticism about complaint-driven resource allocation. Plaintiffs may lack sufficient information to distinguish between 'nuisance' emissions and those which are truly hazardous. Colorless, odorless toxics and heavy metals may escape notice altogether. Furthermore, some individuals or communities may have higher propensities to complain than others, regardless of the objective situation. If regulators respond passively to complaints, aggressive plaintiffs may capture most of the available resources.

In this paper, we use a new panel data set to assess the role of citizen environmental complaints in China's pollution control system.[5] Section 2 describes the pattern of complaints and agency responses. Section 3 develops a testable model of complaint generation based on individual utility maximization. Data sources and

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[3] For a more detailed discussion of community-plant interactions, see Afsah, Laplante and Wheeler (1996); Pargal and Wheeler (1996); and Hettige, Huq, Pargal and Wheeler (1996).

[4] Complaint response systems in Brazil, China and Indonesia are familiar to the authors from collaborative work with FEEMA, CETESB, BAPEDAL and China's National Environmental Protection Agency (NEPA).

[5] In this paper, the term "province" refers to provinces, autonomous regions and municipalities which are directly affiliated with the central government

estimating equations are treated in Section 4; econometric results are reported in Section 5, along with simulations which explore the implications. The final section provides a summary and conclusions.

2. Environmental Complaints in China

China's citizens are far from passive about the environmental performance of neighboring factories. During 1991-93 the environmental authorities received over 130,000 complaints per year, mostly related to air, water and noise pollution (Table 1). Plaintiffs visited provincial and local regulators over 79,000 times per year and sent more than 53,000 letters. Air pollution received the most attention, with over 20,000 letters and 15,000 visits per year. Noise pollution accounted for over 27,000 complaints, while water pollution dropped from 35,000 to around 23,000.[6]

Table 2 shows that the propensity to complain varies widely across China's provinces. In 1993, there were around 30 complaints per 100,000 individuals in Shanghai and Tianjin, but less than 5 per 100,000 in Gansu, Xinjiang and Inner Mongolia. A provincial map of the propensity to complain (Figure 1) shows that its geographic distribution is far from random. The incidence of complaints is generally highest in the urban/industrial centers of east China; lower in the middle provinces; and lowest in China's least-developed regions -- the western hinterlands. Across provinces, the correlation coefficient of income per capita and environmental complaints per capita is .81.

[6] We have no explanation for the fall in water pollution complaints, which seems to have affected personal visits but not letters. This could represent a lagged reaction to a large increase in water pollution charges

Complaints do not necessarily elicit agency action, but the data in Table 3 suggest that regulators are generally responsive. With the exception of Yunnan (1992) and Qinghai (1993), agency response rates were all between 70% and 100% during the sample period. The cross-provincial correlation with income per capita is relatively weak (.33), and the map in Figure 2 reveals no particular regional pattern. A variety of local institutional and historical factors may play important roles. Whatever the determining factors, the data in Table 3 make one thing very clear: China's environmental authorities respond to a very large number of complaints each year, absorbing much of their inspectors' available time.

3. Why Complain?

Why do people complain to the authorities about pollution? We follow standard economic theory in suggesting that they do so when the expected benefits from agency action warrant their own investment of time and effort. However, we do not assume that expected benefits reflect accurate perceptions -- people may be very ill-informed about the pollution problems they face. Using a constant-elasticity utility specification, equation (3.1) represents the decision problem for a representative individual in province r. His expected utility from complaining depends on the expected pollution reduction from agency action; the value of this reduction (a function of income, existing pollution levels and perception of risk); and the individual's understanding of the problem (which

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which began in 1990. However, it seems very doubtful that the impact could have been this large. For an extensive discussion of Chinese water pollution charges and their impact, see Wang and Wheeler (1996).

we hypothesize to be a function of education). The unit cost of a complaint is the opportunity cost of the individual's time (proxied by income).

(3.1) $U_r = -\rho(c)_r^{\beta_1} E_r^{\beta_2} Y_r^{\beta_3} - \beta_4 c_r Y_r$

U_r	= Net utility of complaining
c_r	= Complaints
ρ $(c)_r$	= Pollution damage suffered by the individual
E_r	= Education
Y_r	= Income

Equations (3.2) relate pollution in a given province to health damage. Expected damage per individual increases at the margin (θ_1 >1) with ambient pollutant concentration (η). Concentration is in turn a function of total emissions (P), normalized by provincial area (T). Apart from transient disturbances, exposure should increase with elasticity ϕ_1 as more pollutant is discharged into a fixed volume of air or water. Thus, expected individual health damage can be modeled as a function of pollution per unit area (P/T), or *pollution density*.

$$\rho_r = \theta_0 \eta_r^{\theta_1}$$

$$\text{(3.2)} \quad \eta_r = \phi_0 \left(\frac{P_r}{T_r} \right)^{\phi_1}$$

$$\rho_r = \omega_0 \left(\frac{P_r}{T_r} \right)^{\omega_1}$$

where:

$$\omega_0 = \theta_0 \phi_0, \omega_1 = \theta_1 \phi_1$$

For the representative individual, we model the expected impact of complaints as:

(3.3) $\frac{P_r^e}{T} = \frac{P_r}{T} C_r^{-\gamma}$

where C_r = complaints per capita. Substituting (3.3) into (3.2), and the latter into (3.1), we obtain an expression for net utility as a function of C_r:

$$(3.4)\quad U_r = -\omega_0^{\beta_1}\left(\frac{P_r}{T_r}\right)^{\omega_1\beta_1} C_r^{-\gamma\omega_1\beta_1} E_r^{\beta_2} Y_r^{\beta_3} - \beta_4 C_r Y_r$$

The representative individual's utility-maximizing complaint level is given by (3.5), which is the solution to:

$$\frac{\partial U_r}{\partial C_r} = 0$$

$$(3.5)\; C_r^* = \left(\frac{\beta_4}{\delta - 1}\right)^{-\frac{1}{\delta}} \left(\frac{P_r}{T_r}\right)^{\frac{\omega_1\beta_1}{\delta}} E_r^{\frac{\beta_2}{\delta}} Y_r^{\frac{\beta_3 - 1}{\delta}}$$

where $\delta = \gamma\omega_1\beta_1 + 1$. For interpretation of the econometric results, it is useful to note that $\left[\gamma\omega_1\beta_1 > 0 \Rightarrow \delta > 1\right]$.

It is also important to note an unstated theoretical implication of equation (3.5), which reflects private benefit-cost calculations. Plaintiffs invest their own time and effort in complaining, but are generally not compensated for the abatement benefits which successful complaints will generate for their neighbors. This will create some divergence between the actual level of complaints (and agency actions) and the socially-optimal level, even if citizens are fully-informed about their pollution problems.

Nevertheless, econometric estimation of equation (3.5) can provide useful insights into the reliability of citizen complaints as guides to agency resource allocation. For greatest reliability, the estimated parameters should meet several conditions. First, the incidence of complaints should be positively affected by intensity of exposure to each harmful pollutant. If only visible pollutants are significant, then complaints provide an incomplete damage index. Secondly, higher-income areas should have more complaints per capita because willingness-to-pay for environmental improvement increases with income. If the opposite finding holds, then complaints are a biased index of potential benefits from pollution abatement. Third, education should have no independent effect once controls are introduced for local income and pollution exposure.   A positive effect would imply significant problems of information or, perhaps, 'intimidation' in poorly-educated populations. In either case, complaints would provide a biased guide to agency resource allocation.

4. Data Sources and Estimating Equation

4.1 Data Sources

For the empirical analysis in this paper, we have constructed a province-level panel database from official yearbooks available in China: **The China Environment Yearbook** (1987-1993) and **China Statistical Yearbook** (1987-1993). Specific sources of data are reported in Table 4.

4.2 Estimating Equation

With composite parameters (λ), (3.5) yields an estimating equation for the incidence of complaints. Since our provincial data on complaints are not divided into air- and water-related categories, we introduce both air and water emissions densities:

$$(3.6)\quad \log C_r^* = \lambda_0 + \lambda_1 \log\left(\frac{A_{Dr}}{T_r}\right) + \lambda_2 \log\left(\frac{A_{Sr}}{T_r}\right) + \lambda_3 \log\left(\frac{W_{Cr}}{T_r}\right) + \lambda_4 \log E_r + \lambda_5 \log Y_r + \varepsilon_r$$

where

C_r^* = Environmental complaints per 10,000 population
A_{Dr}= Total airborne dust (particulate) emissions
A_{Sr} = Total airborne SO_2 (sulphur dioxide) emissions
W_{Cr} = Total waterborne COD (chemical oxygen demand) emissions
T_r = Provincial area
E_r = Provincial literacy rate
Y_r = Provincial real consumption per capita (the best available proxy for income)
ε_r = A random error term

To be a reliable environmental monitoring index, the incidence of complaints should meet the following conditions on signs and magnitudes of estimated parameters (the β's are from (3.5)):

$\lambda_1, \lambda_2, \lambda_3 > 0$; $\beta_2 = 0$; $\beta_3 > 1 + \lambda_5 > 1$

5. Results

5.1 Regression Results

We have estimated equation (3.6) using a random effects model which captures both intertemporal and interprovincial effects (Table 5). We have run two sets of regressions, since our data on SO_2 emissions are available for a shorter period (1991-1993) than the other emissions data. For the shorter period, we have included all three pollutants. Our results on variables other than SO_2 density are very similar in both sets of regressions.

Dust (suspended particulate) density has a consistently significant, large impact on the incidence of complaints. Our random effects estimates for the entire period 1987-93 suggest an elasticity of approximately .20 for particulate density: An increase of 1% in air emissions induces an increase of approximately .2 % in citizen complaints to the environmental authorities. *However, neither SO_2 density nor COD density has any measured impact.*

Estimated income and education effects are both positive and highly significant. After the opportunity cost of time is accounted for, the income results suggest an elasticity of demand for environmental quality somewhat greater than 1.4 ($\beta_3 > 1 + \lambda_4 > 1$). This is in line with previous work on China (Wang and Wheeler, 1996) and willingness-to-pay surveys in the OECD countries.[7] The education results are particularly striking. Controlling for income and pollution density, they suggest a literacy-elasticity (β_2) somewhat above the range 1.7-1.8 ($\beta_2 > \lambda_3 > 0$). Remarkably, a 1% increase in the literacy rate seems to induce a 2% increase in environmental complaints.

5.2 Simulation Results

We explore the implications of our econometric results with simulations over the existing range of provincial income, pollution density and education. Dividing the twenty-nine Chinese provinces into two income groups, we use group medians (750 and 1330 yuan/year) to define low- and high-income prototypes. Within each income group, we use minimum and maximum levels of particulate pollution density and literacy to establish low and high classifications for these variables. The low-income group has literacy rates ranging from 60-84% and particulate densities from 0.1 - 2.0 tons/sq. km. Corresponding ranges for the high-income group are 77-90% and 0.4 - 4.0 tons/sq. km., respectively.

Using low and high measures for income, literacy and pollution, we generate simulation results for eight prototype provinces. We predict the incidence of complaints using the parameter estimates in Table 5.4 which exclude the two insignificant pollution density measures (COD, SO_2).

Our results (Table 6) suggest similar orders of magnitude for the impacts of the three variables.[8] With air pollution density and literacy held constant, the estimated incidence of complaints in our high-income provinces is about 110% higher than in the low-income provinces. Pollution density also has strong effects, with a median increase in complaint incidence of 75% from lightly-polluted provinces to ones with high emissions densities.

The most striking simulation result is the predicted impact of education. At constant pollution density, the predicted complaint incidence is *90% higher* in poor, high-literacy provinces than in poor low-literacy provinces. The corresponding increase for rich provinces is 30%. Thus, for poor communities, an increase of literacy over the existing range (60-84%) has an impact on complaints which is roughly equivalent to a doubling of income or a tenfold increase in air pollution density.

5.3 Implications

[7] We are indebted to our colleague Maureen Cropper for the latter point.

[8] Table 6 presents our results in three steps. First (Table 6a), we tabulate median values by category for income, particulate density, literacy and complaints per 100,000 inhabitants. In the second step (Table 6b), we recode these values as Low or High. Finally, we successively compute High/Low ratios for predicted complaints by determinant, holding the other two determinants constant.

Table 6b is organized to illustrate the computation for income. The first row has a Low value for income and Low values for both pollution and literacy; predicted complaints are 4.0 per 100,000. The fifth row has a High value for income, but Low values for the other variables; predicted complaints are 10.7 per 100,000. Division of 10.7 by 4.0 yields 2.7, the first High/Low ratio in the Income column in Table 6c. After division across four pairs of rows, the High/Low ratios are 2.7, 2.3, 1.9 and 1.7. The median High/Low ratio is 2.10, reflecting a median increase rate of 110%.

Should citizen complaints guide regulatory resource allocation? On the positive side of the ledger, our results suggest that the incidence of complaints is positively related to willingness-to-pay for environmental improvement. The income parameter estimates in Table 5 incorporate three factors: The income-elasticity of demand for environmental quality (β_2); the unit opportunity cost of time, which rises proportionately with income; and the individual's expected return from complaining (reflected in $\gamma\omega_1\beta_1$). Since the latter is positive (or no one would complain), the parameter δ in (3.6) is greater than one. The implied income-elasticity of demand in our econometric result (Table 5, column 1.4) is greater than 1.44: *As income rises, people complain more even though the opportunity cost of time rises proportionately with income.* Controlling for other factors, the effect of income on complaints provides China's regulators with appropriate information about pollution control benefits.

Our evidence also suggests that complaints are strongly affected by exposure to some forms of harmful pollution. Dust (particulate) intensity, a highly-significant determinant of complaints, has been identified by numerous international studies as a major source of human health damage. However, a strongly cautionary note must be added: It may well be the *visibility* of particulate pollution which induces complaints, rather than its damaging impact. Sulphur dioxide emissions and organic water pollution (COD), which are less visible than airborne dust, are *not* significant determinants of complaints, even though there is good reason to believe that they cause significant damage in China.[9] These results suggest that complaints are a significantly biased index of environmental damage.

Another cautionary note is introduced by our results for education. Provinces with relatively low literacy rates have significantly lower propensities to complain about pollution (ceteris paribus). Undoubtedly, part of this effect has to do with lack of information: Citizens will little or no formal education may not understand the harmful effects of pollutants. However, illiteracy may also have an important 'silencing' effect because people with little formal education have no confidence in their ability to influence the authorities. In either case, the education effect significantly reduces the value of complaints as a resource allocation signal to regulators.

Summary and Conclusions

China's environmental regulators respond to over 100,000 citizen complaints per year. The complaints process undoubtedly provides some useful monitoring information, and an important avenue for community participation in environmental policy. However, it also directs a major share of China's inspection resources toward areas where individuals or communities have a high propensity to complain.

Unfortunately, our results suggest that the resulting allocation is subject to significant bias from a social welfare perspective. We do find that the incidence of

[9] While high levels of COD do not directly affect human health, they have undoubtedly depleted fish stocks in many Chinese rivers. Recent research on air pollution and health in China suggests that SO_2 may have a greater impact than suspended particulates. For Beijing results, see Xu, Gao, Dockery and Chen, (1994); for Shenyang results, see Xu, Xu, Chen, Kjellstrom, et. al., (1995). The Beijing and Shenyang studies both use measures of suspended particulates, rather than fine particulates. Since fine particulates are now believed to cause most of the health damage, there is at least the possibility that the SO_2 results are strong because of a correlation with fine particulate concentration. It may be the composition of fine particles,

complaints reflects abatement benefits and the intensity of exposure to highly visible pollutants. However, citizen complaints do not seem to be effected by harmful pollutants which are less visible. Furthermore, our results suggest that basic education has a strong, independent effect on propensity to complain. Reliance on complaints alone would result in inappropriately low allocation of inspection resources to less-educated, relatively 'silent' regions.

We conclude with some potential policy implications of our results. First, incomplete information seems to be a major culprit in this affair. Regulators who rely on complaints should therefore consider large-scale environmental education programs, paying particular attention to communities with lower levels of schooling. Since poorly-educated people may also be more timid about complaining, targeted outreach programs in their communities could be explored. Secondly, our results imply that technical risk assessments should have priority status in determining agency resource allocation. Over time, citizen complaints should fall if regulators establish strategic priorities and pursue them systematically while maintaining close contact with affected communities.

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rather than their mere presence, which is the major determinant of health damage. This is still an open research question.

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Table 1: Environmental Complaints in China

	1991	1992	1993
Total Letters Received	55,775	55,340	53,752
Problem Area:			
Water Pollution	12,560	11,207	11,423
Air Pollution	20,481	20,625	19,586
Solid Waste	1,461	1,648	1,489
Noise	16,845	17,732	17,320
Others	4,428	4,128	3,934
Total Visits	79,313	79,112	84,743
Total Letters + Visits	135,088	134,452	138,495
Total Number of Issues from Visits*	55,584	39,969	44,455
Problem Area:			
Water Pollution	22,771	10,399	11,576
Air Pollution	15,859	14,402	15,999
Solid Waste	2,474	1,431	1,421
Noise	10,969	10,785	12,542
Others	3,511	2,952	2,917

* One complaint issue may involve more than one visit.

Table 2: Environmental Complaints per 100,000 Inhabitants

Province	1987	1988	1989	1990	1991	1992	1993
Shanghai	55.0	43.4	31.3	43.6	34.9	32.1	31.2
Tianjin	26.2	24.9	24.6	26.2	19.8	16.9	28.4
Beijing	28.7	29.3	24.9	28.4	30.2	23.9	26.9
Guangdong	19.8	17.3	17.9	22.5	20.9	21.9	22.6
Zhejiang	29.7	22.8	21.5	22.0	22.0	19.3	21.5
Liaoning	15.7	16.4	20.2	18.5	20.9	20.3	21.4
Hainan	--	14.1	12.8	11.7	10.4	13.2	17.4
Heilongjiang	13.7	10.6	8.2	11.2	15.2	16.4	16.2
Jilin	17.5	18.7	21.4	17.2	14.7	13.7	15.4
Jiangsu	16.3	15.8	13.7	15.5	15.8	14.6	14.6
Jiangxi	6.0	9.0	9.7	7.3	9.2	10.6	12.1
Shandong	10.3	13.8	11.9	10.0	9.6	10.5	12.0
Shanxi	7.5	12.8	13.2	10.3	12.8	15.9	11.9
Hebei	13.0	13.1	14.0	10.7	13.3	11.3	11.3
Guangxi	12.0	9.4	9.4	11.4	11.8	12.1	11.2
Fujian	10.5	6.3	9.1	13.8	12.0	11.3	11.1
Hunan	22.3	16.7	14.4	15.7	15.0	14.2	10.8
Guizhou	6.5	5.8	6.2	9.2	13.4	7.4	10.0
Sichuan	11.3	8.8	7.9	9.0	7.7	7.3	8.0
Henan	14.9	12.1	13.1	11.0	8.1	7.3	7.2
Hubei	10.2	9.5	9.8	7.4	7.6	8.2	7.0
Ningxia	5.1	6.1	1.6	17.9	7.9	8.4	6.4
Qinghai	--	18.2	31.4	47.7	1.4	3.8	6.4
Shaanxi	7.3	10.3	7.7	10.9	9.6	7.2	6.3
Yunnan	4.8	3.0	3.3	4.4	4.0	4.7	6.0
Anhui	4.0	5.4	4.3	4.9	4.0	4.9	5.1
Inner Mongolia	6.2	5.7	6.3	5.3	7.0	5.8	4.8
Gansu	1.7	2.8	3.2	3.3	3.5	3.2	4.7
Xinjiang	3.9	3.5	3.4	3.6	3.6	2.6	3.8

Table 3: Percentage of Environmental Complaints That Generated an Agency Response

Province	1991	1992	1993	Consumption Per Capita (yuan/yr)
Beijing	77.0	99.3	99.8	1549
Shanghai	93.9	96.6	98.5	3262
Ningxia	89.3	100.0	98.0	810
Hubei	97.0	91.3	97.0	988
Tianjin	94.6	95.6	96.7	1654
Sichuan	86.1	95.2	95.9	747
Heilongjiang	92.0	85.6	95.7	1370
Liaoning	93.9	92.4	95.2	1505
Shandong	90.6	97.6	94.9	824
Inner Mongolia	81.9	83.4	94.6	863
Gansu	84.9	88.3	94.0	656
Guangdong	92.4	93.8	91.9	1546
Fujian	82.8	88.5	91.6	1323
Anhui	90.9	85.4	91.1	763
Hunan	94.7	93.0	90.2	889
Jiangsu	90.4	93.1	89.9	1109
Zhejiang	78.5	89.5	89.0	1295
Yunnan	83.6	55.9	87.4	838
Shaanxi	92.7	88.8	84.6	741
Hebei	85.6	90.5	84.4	853
Jilin	83.4	93.5	82.5	1143
Jiangxi	92.0	81.0	82.0	695
Shanxi	75.8	79.0	81.4	871
Henan	84.3	71.7	81.4	592
Guizhou	77.4	70.2	79.0	576
Guangxi	94.1	93.8	78.3	752
Xinjiang	83.9	88.8	74.8	1070
Hainan	82.8	75.8	73.7	1136
Qinghai	78.3	86.4	46.8	908

Table 4: Sources of Data for Twenty-Nine Chinese Provinces

China Environment Yearbooks, 1987-1993

(1) COD (chemical oxygen demand) emissions
(2) Dust (suspended particulate) emissions
(3) SO_2 emissions
(4) Complaints registered with environmental authorities
(5) Responses to complaints by environmental authorities

China Statistical Yearbooks, 1987-1993

(6) Population
(7) Provincial area
(8) Consumption per capita
(9) Literacy rate

Table 5: Regression Results

Regression Variables

C^* = Environmental complaints per 10,000 inhabitants
A_D = Total airborne dust (particulate) emissions
A_S = Total airborne SO_2 (sulphur dioxide) emissions
W_C = Total waterborne COD (chemical oxygen demand) emissions
T = Provincial area
E = Provincial literacy rate
Y = Provincial real consumption per capita

Equation	1.1		1.2		1.3		1.4	
Period	1991-1993		1991-1993		1987-1993		1987-1993	
Dependent Variable	Log C Random Effects		Log C Random Effects		Log C Random Effects		Log C Random Effects	
	Coef	*t*	Coef	*t*	Coef	*t*	Coef	*t*
Intercept	-10.80**	-4.54	-11.20**	-5.16	-9.98**	-3.70	-10.84**	-4.54
Log (A_D/T)	0.30**	2.85	0.33**	3.49	0.19**	3.34	0.21**	5.16
Log (A_S/T)	-0.08	-0.98	-0.07	-0.93				
Log (W_C/T)	0.03	0.42			0.04	0.72		
Log E	2.05**	3.44	2.16**	3.98	1.67**	2.53	1.83**	2.99
Log Y	0.30**	2.18	0.29**	2.16	0.42**	2.11	0.44**	3.11
No. of Obs.	87		87		203		203	
Adjusted R^2	0.84		0.85		0.73		0.73	

** significant at 5%

Table 6: Simulation Results

Table 6a: Group Medians

Income Class	Per Capita Consumption (yuan/year)	Air Pollution Density (tons/sq. km.)	Literacy Rate (%)	Complaints per 100,000 Inhabitants
Low	750	0.1	60	4.0
Low	750	2.0	60	7.5
Low	750	0.1	84	7.4
Low	750	2.0	84	13.9
High	1300	0.4	77	10.7
High	1300	4.0	77	17.4
High	1300	0.4	90	14.3
High	1300	4.0	90	23.2

Table 6b: Group Categories

Income Class	Air Pollution Density	Literacy Rate	Complaints per 100,000 Inhabitants
Low	Low	Low	4.0
Low	High	Low	7.5
Low	Low	High	7.4
Low	High	High	13.9
High	Low	Low	10.7
High	High	Low	17.4
High	Low	High	14.3
High	High	High	23.2

Table 6c: Group High/Low Ratios for Complaints per 100,000 Inhabitants

Income Class	Air Pollution Density	Literacy Rate
2.7	1.9	1.9
2.3	1.9	1.9
1.9	1.6	1.3
1.7	1.6	1.3

Figure 1

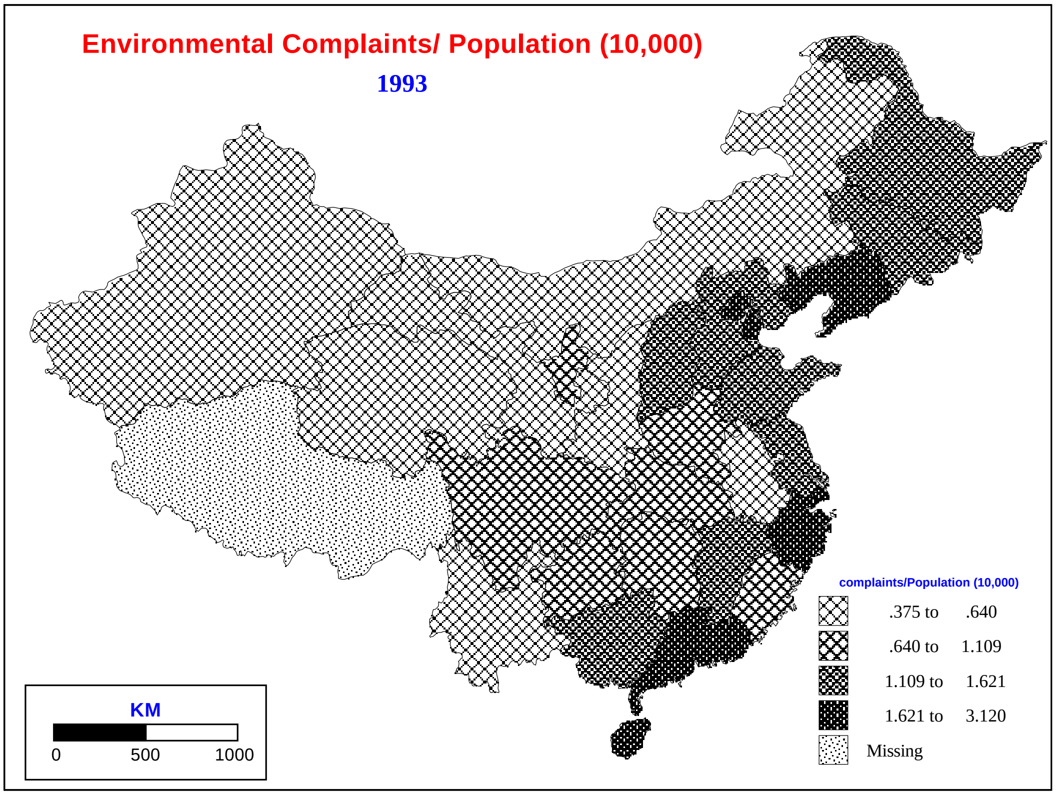
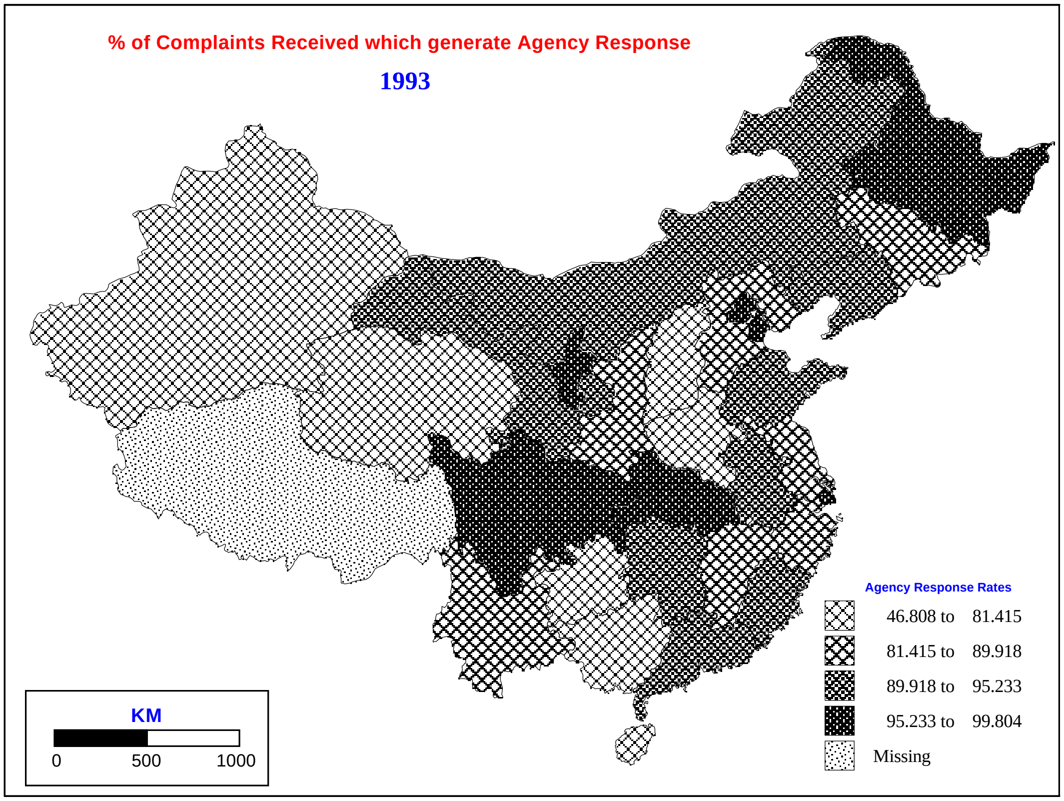

Environmental Complaints/ Population (10,000)
1993
complaints/Population (10,000)
.375 to .640
.640 to 1.109
1.109 to 1.621
1.621 to 3.120
Missing
KM
0
500
1000

Figure 2



% of Complaints Received which generate Agency Response
1993
Agency Response Rates
46.808 to 81.415
81.415 to 89.918
89.918 to 95.233
95.233 to 99.804
Missing
KM
0
500
1000