Planning and applied geography: positivism, ethics, and geographic information systems

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Robert W. Lake

Center for Urban Policy Research, Rutgers University, New Brunswick, NJ 08903, USA

In a previous review, I described the challenge mounted by postmodernism to the assumptions of the rational planning model (Lake, 1992). But a critique of the positivist assumptions of rational planning did not await the arrival of postmodernism. These assumptions – of analytical and technical objectivity, political neutrality, subject-object dualism, and of a world discernible in terms of lawful regularities – have been under fire for decades from both within and outside the discipline (for a recent summary, see Harper and Stein, 1992). Healey (1992: 9), for instance, repeats the observation of numerous commentators who have noted 'the retreat from the positivist tradition with its emphasis on the sole validity of objectified, systematized knowledge coupled with a clear separation of facts from values'. Evidently referring to what she considers to be common knowledge, Healey concludes that 'we now appreciate that technical knowledge is inevitably infused with biases reflecting particular interpretive predilections and normative values'. Recognition of the impossibility of separating facts and values seems to have attained the status of conventional wisdom (Brown, 1987; Christensen, 1986; Enbar, 1983; Hoch, 1992; Innes, 1990; Wachs, 1982).

And yet, precisely as the critique of positivism and rational planning has gained widespread currency, at least within the realm of theoretically inclined geographers and planners, the fields of planning and applied geography have infused rational planning's positivist assumptions with renewed vigour. The institutional and structural reasons for the persistence of rational planning noted by Dalton (1986) some years ago undoubtedly continue virtually unabated (see also Alexander, 1984; 1986). But the unrelenting embrace of the rational model by planning and applied geography is not adequately described merely in terms of the tenacity and inertia of convenient and familiar practices. The rational model has been actively resurrected and rehabilitated by the ascendance of Geographic Information Systems to a position near or at the core of both planning and geography. Heywood (1990: 850), for instance, notes, evidently with approval, that 'GIS technology has reaffirmed the importance of the positivist approach to problem solving within the social sciences'. That this has occurred despite, or perhaps even because of, the fact that the positivist assumptions embraced by GIS have long since been jettisoned by academic theorists is cause for some confusion, if not alarm.

This fissure raises troubling questions. A review of the literature unearths little, if any, interest on the part of GIS proponents and developers to consider seriously the epistemological, political, and ethical critiques of the positivist model, or to be concerned about the fundamental disjuncture growing at the core of the disciplines. Perhaps more troubling is the likelihood that consideration of these issues will be even further obscured by the popular momentum, technological complexity, and sheer scale of financial investment represented by the ascendancy of GIS. Once that investment is made, the focus is more likely to turn to expanding applications than to reconsidering philosophical foundations (Clark, 1992). Where the debate has emerged, it has been marked more by posturing and sabre-rattling than by closely reasoned discourse (Openshaw, 1991; 1992). We are just beginning to see a serious and constructive engagement of the dilemmas that positivism poses to the development of Geographic Information Systems, although to date this has largely been pursued by commentators outside the GIS establishment (Curry, 1993; Pickles, 1991; 1993).

Given the claims to disciplinary centrality made by GIS proponents (Chrisman *et al.*, 1989; Openshaw, 1991; Goodchild, 1991a; 1991b), I wish to focus this review on the disjuncture between the ascendancy of GIS within planning and geography, on the one hand, and the critique of positivism broadly advanced by planning theorists and proponents of social theory within geography, on the other. Towards this end, it may be helpful to consider first how the intersecting dilemmas of method, politics, and ethics have been confronted by the broader field of computerized information processing. I then review progress within the GIS field to engage these issues, and point to some gaps – yawning chasms – that remain to be addressed. Breaching the divide at the core of planning and geography will be possible only to the extent that developers of Geographic Information Systems are willing to relinquish their positivist assumptions.

I Computer ethics

Positivist assumptions of objectivity, value-neutrality, and the ontological separation of subject and object (or of the analyst and the object of analysis) constitute epistemological conditions with political and ethical consequences. The rationalists' claim of technical neutrality legitimated their claim to political neutrality. On the other hand, if technical knowledge is indeed 'inevitably infused with biases reflecting particular interpretive predilections and normative values' (Healey, 1992: 9), then to fail to recognize implicit values and to persist in claims of neutrality and objectivity are not only methodologically indefensible but also politically suspect and ethically insupportable (Wachs, 1982; 1985; Martin and Martin, 1990).

Ethical considerations have received considerable attention in the world of computerized information technology (IT) (Dunlop and Kling, 1991; Fimbel and Burstein, 1990; Forester and Morrison, 1990). The general principle at stake has been defined by Ladd (1991: 665) as one of taking 'moral responsibility for evil outcomes'. In Ladd's view, 'we may take the basic question to be about the ethics of what people unintentionally do to harm other people through the use of computers'. This goal has focused substantive attention on such concerns as preventing computer fraud, safeguarding privacy, and limiting surveillance (Rule *et al.*, 1991), and on issues of access to, and control of, information (Batty, 1988; 1992; Beaumont, 1992).

More broadly, the principle of preventing evil outcomes implies an affirmative require-

ment to strive for beneficial outcomes. A code of ethics proposed by the International Federation of Information Processing (IFIP) directs that

> IT professionals strive to use their technical expertise to advance international human welfare and the quality of life for citizens of all nations. They accept the ethical obligation to assess social consequences and help ensure safe and beneficial use of IT applications (Sackman, 1991: 699).

While such statements appear beyond reproach, they are of limited practical value in the absence of guidelines for distinguishing between evil and beneficial use (Wigan, 1987), a distinction that in practice could generate considerable disagreement. The much-heralded application of GIS and related information technology in the 1991 Persian Gulf War has been both hailed as contributing to the safety of USA-Allied military personnel (Schulman, 1991) and condemned as a moral travesty (Smith, 1992).

In practice, the need for ethical guidelines has been reduced to statements defining the proper behaviour of practitioners in the conduct of their professional roles (Curry, 1991; 1993; Harper and Stein, 1992). This is a more easily definable standard, involving requirements for ensuring the accuracy of data, using appropriate methods of analysis, eschewing biased interpretations, and so on. The emphasis is not on what one is doing but on how one is doing it. Basic assumptions of the project remain unexamined: the emphasis is on proper implementation. This corresponds to what Curry (1993) refers to as the vernacular conception of ethical responsibility applied not only in the field of GIS or information technology but in all science. It is institutionalized in the form of codes of conduct or ethics adopted by professional associations. In the field of information technology, such codes have been adopted by the Association for Computing Machinery (ACM), the Institute for Electrical and Electronic Engineers (IEEE), the Data Processing Managers Association (DPMA), and the American Society of Civil Engineers (ASCE) (Martin and Martin, 1990; Dunlop and Kling, 1991; Tiedeman, 1990).

In short, practitioners are enjoined to use the technology at their disposal to good ends, to prevent its use for harmful ends, and to conduct themselves according to professional standards of practice. The emphasis on regulating personal conduct, however, fails to address the problem of unanticipated and somewhat more indirect negative outcomes that accrue despite the best of intentions. In a cogent review, Klosterman (1992) details potential problems arising, not from practitioners' evil intent, but from the institutional impacts of adopting techniques of computer-aided planning. Among these 'generally conservative' impacts of computerization in planning are support of the status quo through 'reinforcing existing structures of influence; empowerment of the technically sophisticated while disenfranchising the less technically adept; and the burying of political choices under 'technological mystification' (Klosterman, 1992: 253). In addition, computerization may transform the planning process itself by focusing attention on technical issues at the expense of political or ethical questions, and by narrowing analytical attention to questions answerable via the available technology (Klosterman, 1992; Adler, 1987).

II GIS ethics

GIS practitioners have not ignored these issues, but have responded in a manner that accords with that of the broader IT community. In parallel with the broader field, the concern has been voiced that GIS technology be used to achieve socially beneficial ends and to avoid evil outcomes, whether these result from nefarious applications of the

technology or from the more indirect effects identified by Klosterman. Considerable discussion has been devoted to issues such as protecting privacy rights and facilitating open access to GIS databases (Edney, 1991; Onsrud, 1992; Castle, 1992; Kozub, 1992; Tolles, 1992). Dando (1992) has summarized the 50 state statutes in the USA controlling the terms of access to local municipal GIS databases and products; Lerner (1992) and Westcott (1992) describe specific arrangements in Florida and Vermont. Conflicts among objectives, such as reconciling demands for open access with expectations of privacy and needs for system security are recognized, although still largely unresolved (Thompson, 1992). A call has been raised for a 'code of professional ethics for GIS practitioners' in order to 'force us as a group to determine what is – and what is not – ethical behaviour in the development, implementation, and operation of geographic information systems' (Obermeyer, 1992: 185).

These steps constitute what may be thought of as internal correctives to emerging ethical and institutional problems. They are internal because they reflect the assumption that a corrective is possible within the existing terms of reference of Geographic Information Systems. Concern about beneficial ends has generated debate about GIS applications. Privacy claims can be protected by designing stronger safeguards within GIS databases. Access to GIS products can be facilitated through open record laws. Technical disenfranchisement can be averted through sensitive advocacy by GIS practitioners, whose practice can be controlled with a code of ethics.

All of these internal correctives can be accomplished without forcing a reconsideration of the positivist assumptions underlying Geographic Information Systems. But while screening applications, improving access, and protecting privacy are necessary and commendable correctives, they are insufficient to dispose of the ethical inconsistencies absorbed into GIS because of and through those underlying assumptions. Discussion of ethical applications of GIS is quite different from a discussion of the ethics of GIS. Distinguishing between beneficial and evil outcomes is insufficient on ethical grounds if it focuses exclusively on ends to the exclusion of means. A code of ethics governs individual practice, but it ignores the ethics of the project of which that practice is a part. Equal access is ethically insufficient if it provides access to an ethically flawed project.

In what sense, then, is the project of Geographic Information Systems ethically flawed? It is flawed because it relies on a partial and incomplete approach to ethics; because of the ethical consequences of its uncritical adoption of the positivist assumption of subject-object dualism; and because of its inability to comprehend and respect the subjective differences among the individuals who constitute the irreducible data points at the base of the GIS edifice. These issues are inextricably linked.

III Means and ends

Discussion of GIS applications would be sufficient to resolve the ethical conflicts implicit in Geographic Information Systems if ethics were determined simply on the basis of moral ends. But a moral theory that focuses on ends to the exclusion of means is partial and incomplete.

The moral theory that focuses on ends is known as teleological, or utilitarian, theory (Curry, 1993; Howe, 1992; 1993; Wachs, 1985).

> To a utilitarian, the measure of a good public policy is how much benefit it brings to the public, or the balance of good and bad created . . . If a substantial benefit can be produced for the majority, which, nevertheless, imposes

> costs on a minority, that is an acceptable outcome as long as the aggregate benefits outweigh the aggregate costs (Howe, 1992: 234).

This is, of course, the theory underlying cost-benefit analysis. Because utilitarianism focuses on ends, it is a consequentialist theory. According to this measure, a GIS application could be considered ethical if it produces a net social benefit in its consequences.

The problems with utilitarian moral theory include all of the shortcomings that have been widely ascribed to cost-benefit analysis in planning and related fields: the difficulty in measuring costs and benefits; the problem of disadvantaged or disenfranchised groups whose perceived utilities do not make it into the accounting of aggregate net utility; the problem of those, such as future generations, whose utilities are incapable of measurement; and the ultimately arbitrary character of the process for defining the universe of aggregate utilities. To return to a previous example, the utilitarian approach likely would yield a different ethical assessment of the GIS applications in the Persian Gulf War depending on whether or not one included the posthumous utility of those applications for the 200 000 Iraqi casualties (Smith, 1992; Pickles, 1991).

But in addition to these problems of implementation, utilitarian ethics are also confronted by an alternative, and incompatible, approach to ethics based on fundamental obligations or rights. Such obligations as freedom, justice, equality, and autonomy form the basis of a deontological approach to ethics. From this vantage point, the problem with utilitarian moral theory is that it may justify a policy or practice on consequentialist grounds that nonetheless violates a deeply held notion of individual rights. Howe (1992; 1993) has examined the ethical dilemma facing planners whose adoption of a utilitarian, consequentialist, approach to ethics makes them vulnerable to the problem of '"dirty hands" – the choice about whether to do morally wrong things such as lying, manipulating others, violating rights, or even killing – in order to do good for the public as a whole' (Howe, 1992: 236).

Thus, within this broader, more encompassing approach to ethics, the concern with directing GIS applications to beneficial ends may satisfy a consequentialist concept of ethics while running afoul of deontological principles of rights and obligations. This, too, might be amenable to correction were it not that the violation of individual rights inherent in Geographic Information Systems derives directly from the positivist assumptions underlying the GIS project. Specifically, GIS runs afoul of deontological principles because of its assumption of subject-object dualism and its inability to comprehend subjective differences amongst the objects of its analysis.

IV Subjects and objects

The positivist assumption of subject-object dualism underlying the rational planning model has been wholly absorbed by Geographic Information Systems. This assumption holds that the perspective, viewpoint, and ontology of the researcher are separate – and different – from those of the individuals constituting the data points comprising the GIS database. Curry (1993) refers to this as the problem of the 'other'. For Curry, the ontological separation of subject and object occurs when access to massive databases causes the analyst to transform those to whom the data refer from subjectively differentiated individuals to an objectified 'other'.

> The other is seen as existing in Cartesian space and technical, chronological time, rather than lived space, or place, and human or narrative time, while the person [the analyst] doing the judgement remains centered in the human world, seeing himself or herself as making decisions and acting freely (Curry, 1993).

Pickles (1991) draws from Foucault to describe this process in terms of the 'normalization' of individuals contributing to the exercise of power in society.

Here is where positivist method fails in its encounter with ethics. For the 'other' to be thought of as an object rather than as a person is to deny that person's autonomy: 'In a discourse wherein one speaks of a person as an "other", one quite simply cannot treat that person as an autonomous individual' (Curry, 1993). But to deny the other's autonomy is to treat that person unethically according to deontological principles of ethics. All the while, of course, the analyst reserves such subjective autonomy, and the consequent expectation of ethical treatment, for his or her own ontological position in the world. This fundamental dilemma holds, of course, regardless of how socially beneficial a particular GIS application may be. This is an institute of a consequentialist objective being achieved through unethical means, that is, by violating a deontological principle of individual rights. It is in this sense that Howe (1992: 236) observes, in her discussion of the 'dirty hands' problem, that 'such behavior violates Kant's basic principle that people should not be treated as means alone'.

This dilemma also makes clear why internal solutions such as improving public access to GIS databases are, at best, only partial and incomplete solutions. Facilitating open access to GIS databases is to allow individuals to participate in a project only to the extent that they are willing to objectify themselves and deny their own subjectivity, and thus their autonomy. They can participate within the terms of the GIS project, not in terms of their own subjective ontology. This inability of GIS to recognize the subjective viewpoint – a legacy of the positivist assumption of subject-object dualism – constitutes yet another dimension of the divide between GIS and postpositivist theory.

V Data and differences

The objectification of the human subjects making up the GIS database constitutes those individuals as fungible, indistinguishable, and interchangeable. While their 'objective' characteristics may vary over space and time, the meaning of those characteristics does not.

The objective data of GIS contrast fundamentally with the feminist conception of subjective difference. Bondi and Domosh (1992) draw a sharp distinction between the objectified knowledge of GIS and the subjectivity of feminism and postmodernism (see also Dear, 1986; 1988; 1991). Reprising critiques of positivism, they describe the assumption prevalent in geography (and, it is safe to say, in planning as well) that 'real knowledge is universal, neutral, objective, unproblematically communicable, and singularly true' (Bondi and Domosh, 1992: 202). This truth 'is without context . . . [existing] independently of time and space . . . set apart from the vagaries and specificities of everyday life'. The belief in such objectified truth

> is at its most evident in the current enthusiasm for geographical information systems. [It] implies the existence of an external vantage point from which everything on earth can be uniquely fixed. It is a 'god's eye view', from which all problems are solvable provided we possess and have sufficient computer power to process all the appropriate data (Bondi and Domosh, 1992: 202).

From this 'god's eye view', any given category (gender, race, class, etc.) has the same meaning for the individuals so categorized, regardless of their situatedness, context, or

viewpoint. Of interest to GIS is how a particular category intersects in a space-time grid with other objectively defined categories.

In opposition to this objectified approach, feminist theorists have long argued the importance of the subjective viewpoint: 'the notion of a universal form of geographical knowledge, external to the observer, denies the partiality and positionality of all our visions' (Bondi and Domosh, 1992: 203). As summarized by Pratt (1990: 597), 'all categories are constructions, all are systems of unity and difference that are created by subjects situated in particular social relations'. Moore-Milroy (1991) explores the planning implications of 'gender specificity' constructed within subjectivities differentiated by gender.

Asymmetrical power relations yield highly distinct, unique, subjective experiences (Pratt, 1992b). Bondi and Domosh (1992: 207), however, are careful to clarify that in their call for recognition of 'the subjective experience of gendered identities', the important distinction is between subjective experiences and not between any resulting social categories. Rejecting 'an appeal to some essential core of femininity or masculinity', they instead 'acknowledge that, in a gender-divided society, women and men are differently located in relation to socially constructed meanings'. Rather than women and men being different in some essential way – thus constituting different objective categories – at stake is the recognition of different subjective experiences as a consequence of gender.

Nor is gender, of course, the only basis for differential subjectivity. In a useful review of Iris Young's *Justice and the politics of difference* (1990), Faust *et al.* (1992: 592) consider identity, and therefore subjectivity, as created from 'complex and mutually embedded multiple identities . . . which intersect, cross-cut, and overlap one another in many different ways'. The multiple layering of identity, moreover, is not conducive to 'additive analyses of the various elements of identity . . . race, gender, class, age, and sexuality are all embedded in each other, and cannot be compartmentalized or experienced additively'.

Finally, while subjectivity is situated and contextual, it is not simply imposed on passive beings born into a constellation of contextualizing identities. In an insightful and illuminating essay, Pratt (1992a) argues that if knowledge is subjective, and subjectivity is situated and positional, then the position one takes is critical in creating one's knowledge – both of oneself and of others. This she deems 'the politics of presence – the grounds for finding a speaking position and the possibilities for speaking across differences' (1992a: 241). Pratt thus seeks to make explicit the political implications of positionality, implications relegated to oblivion by the objectifying assumptions of GIS.

VI Tunnel vision?

The complexity introduced by feminist and postmodernist theory has led to Rosalind Deutsche's by now often quoted aphorism that 'the world is not so easily mapped anymore' (quoted in Pratt, 1990: 597). The situation is not without irony: while feminists have introduced new layers of complexity to geographical understanding, GIS is presented as an integrative technology uniquely capable of handling complexity, of analysing 'the union and intersection of diverse layers of information' (Chrisman *et al.*, 1989: 778). Does this presage a grand synthesis of theory and technology, or is that potential to be forever foreclosed by the tunnel vision of positivism?

The prospect is not encouraging. The irony is even more compelling because of the

emphasis within GIS on conceptualizing the nature of geographic data (Fotheringham, 1991; Nyerges, 1991). Describing data modelling as 'perhaps the most significant issue in GIS', Goodchild (1991b: 195) explains that 'data modelling deals with the question of how the infinite complexity of the geographical world can be represented within a discrete, finite machine'. There is little, if any, evidence to date that this notion of 'infinite complexity' is able to transcend its positivist assumptions to comprehend the subjectivity and difference introduced by feminism and postmodernism.

The chasm at the heart of geography and planning seems, if anything, to be widening, propelled by fundamentally incompatible assumptions. A resolution will surely not be achieved simply by adding more data or variables to the GIS space-time grid. As Moore-Milroy (1991: 12) observed: 'A gender-sensitive theory would begin from the position that introducing sex as a variable is simply not what is at stake; but that recognizing sex as the basis upon which a major social practice, engendering, is built is the fundamental issue'. Ultimately at issue is whether the integrative capacity of GIS technology proves robust enough to encompass not simply more data but fundamentally different categories of data that extend considerably beyond the ethical, political, and epistemological limitations of positivism.

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