

# The Moral Dimensions of Infrastructure

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**Abstract** Moral issues in urban planning involving technology, residents, marginalized groups, ecosystems, and future generations are complex cases, requiring solutions that go beyond the limits of contemporary moral theory. Aside from typical planning problems, there is incongruence between moral theory and some of the subjects that require moral assessment, such as urban infrastructure. Despite this incongruence, there is not a need to develop another moral theory. Instead, a supplemental measure that is compatible with existing moral positions will suffice. My primary goal in this paper is to explain the need for this supplemental measure, describe what one looks like, and show how it works with existing moral systems. The secondary goal is to show that creating a supplemental measure that provides congruency between moral systems that are designed to assess human action and non-human subjects advances the study of moral theory.

**Keywords** Infrastructure · Urban planning · Moral theory · Philosophy of the city

## Introduction

An urban planner relying on moral theory when implementing sustainable infrastructure might not always secure moral outcomes. How do moral theories fail in such instances? Aside from the logistics behind each case, they can fail because the moral significance of infrastructure remains misunderstood and, in several ways, overlooked. Specifically, some failures rest on a lack of congruence between the limits of moral theory and subjects that require coverage under them. For instance, morality is a concept reserved for assessing human action, not the

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objects that humans use. This disconnect exists, but planners' need to assess moral outcomes that often involve infrastructure. Such a condition might lead one to ask, "Is there a need for another theory to comprehend infrastructure's moral significance?" The answer: no. Rather, a supplemental measure that is compatible with existing moral theories and planning goals such as sustainability or resiliency should suffice. This measure should identify infrastructure's moral dimensions and gauge several of its effects.

Here is an analogy. If a moral theory were a smart phone, the supplemental measure would be an app. Users can accomplish many tasks with mobile devices, but highly specific activities require them to download apps. A smart phone can help users navigate the globe while communicating, but you must install an app to translate foreign words and phrases. Simply because the device has limits does not mean that engineers must create a new one to replace perfectly good phones, but it suggests users could benefit from a supplemental app. Such is the case with moral theory. When systematized, theories such as utilitarianism and deontology work extremely well for carrying out jobs such as equitably distributing public services such as waste collection, but a supplemental app might help when comparing existing technologies such as toll roads with new and emerging eco-technologies such as some forms of high-speed rail.

My primary goal in this paper is to explain the need for this supplemental measure, provide a description of what one looks like, and show how it works with existing moral theory. The secondary goal is to exhibit that creating a measure that provides congruency between moral systems designed to assess human action and non-human subjects advances the canon of moral theory. Accordingly, I organize this paper as follows. I discuss the limits of moral theory in planning, explain how to go beyond such limits, and reveal how establishing new limits advances the study of moral theory, proposing future research areas in value theory.

## **The Limits of Traditional Moral Theory in Urban Planning**

The uses of moral frameworks within urban planning range from underpinning design movements to precepts for zoning. Planners employ several approaches, from deontology to care ethics (Upton 2002). Robert Upton (2002), for example, shows that virtue ethics guides the thinking behind New Urbanism. Carol Barrett (2001) champions utilitarianism for solving problems in planning. While these moral theories provide reliability, their inherent shortcomings remain. They manifest in forms that are particular to urban planning, but they follow the same pattern as they did when originally penned.

Here is a brief illustration of the problem. Planners adhering to utilitarianism could make zoning accommodations for a hazardous industry near a less-populated neighborhood. In such a case, an isolated community suffers while remaining residents gain jobs and the city increases its income. Alternatively, if local government officials refused an industry based on deontological maxims, say they decided that no one ought to be regarded as a mere means for economic reasons, then the population would lose needed revenue. This example illustrates the tension

between the outcomes of these positions, both being inherently undesirable. Despite the risks to human health, economic benefits for the city justify a neighborhood absorbing the risks, according to the utilitarian planner. The practitioner with a deontological bent will not budge due to a duty to protect residents' right not to be mere means.

These situations remind us that moral theories have limits, and they make us face pressing questions: If they fail at some point, which failures are acceptable? Specifically, what are the criteria for establishing protocols for acceptable failures in planning, if one must choose? Answering the first question typically means finding the best-of-the-worst-case scenario, undesired by definition. Still, this question does not escape the possibility of a deontology-versus-utilitarianism impasse. The second question usually leads back to the first, establishing protocols that maximize happiness or promote an absolute duty. Such circumstances force one to choose sides: does one plan for the greater good or for respecting community autonomy? In turn, the morality-in-planning conversation does not completely divert from a circular course.

Critics could object to the way that I categorize the limits of urban planning dilemmas above, arguing that I present a false dichotomy. They could argue that positions such as virtue ethics circumvent a moral binary. Upton (2002), for example, maintains that deontological and utilitarian approaches in planning promote viewing the planning process as a series of isolated incidents, while other moral approaches such as virtue ethics looks at the bigger picture. That is a fair criticism, but I would argue that virtue ethics comes with shortcomings also.<sup>1</sup> In the examples above, I caricature moral theory applied to urban planning only to point out its limits. Moral theory can resolve several issues, but it cannot always avoid failure. If moral theory cannot eliminate all of the problems that it was designed to address, it seems challenging to think that it can resolve issues that are far beyond its grasp.

To understand precisely how the limits of moral theory can lead to planning failures, let us examine the two sets of limits that hinder planning efforts. These limits belong to two kinds of moral theory, traditional and extensive moral theories (Stone 1972). Traditional moral theory's limits are inherent, and there are two kinds of limits pertaining to traditional theory worth pointing out here. The first variety is straightforward. Philosophers indicate individual limits to a moral theory when raising objections about it. For example, Rawls (2009) criticizes utilitarianism because it does not seriously consider the distinction between persons.<sup>2</sup> Rawls' objection indicates a distinct limit for utilitarianism, namely, that it cannot function as a system without seriously considering the distinction between persons. While utilitarianism has several strengths such as maximizing happiness for a great number of people, one could argue that adherents to utilitarianism must accept such limits if they want the predictability that comes with its systematic structure. The other kind of limits concerns the scope of a moral theory, its applicability. That is to say, what the theory can do when systematized to solve 'real-world' issues.

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<sup>1</sup> For an example of some of the issues for virtue ethics, see Loudon (1984).

<sup>2</sup> For a distinction on Rawls' view of persons, see Rawls (1993, 175).

For example, Tom Regan (1983, 245) challenged the generally accepted limits of deontology, calling for non-human animals to count as subjects that should receive moral consideration because they are “subjects-of-a-life.” He saw that the limits of deontology rested on the assumption that only humans deserved moral consideration (Regan 1983). He revealed how moving the limits was a legitimate enterprise that allowed philosophers to have meaningful conversations about moral considerations for non-human animals beyond anthropocentric or instrumental arguments. This maneuver counts as moving the study of moral theory forward because it expands the applicability of a moral theory, rather than simply bolstering a position through replying to objections.

While Regan’s approach expands the scope of deontology, it remains modest compared to other extensive moral theories. For example, on a grade scale, Hans Jonas (1984, 8), points out some of the limits of all traditional moral theories:

All previous ethics—whether in the form of issuing direct enjoiners to do and not to do certain things, or in the form of defining principles for such enjoiners, or in the form of establishing the ground of obligation for obeying such principles—has these interconnected tacit premises in common: that the human condition, determined by the nature of man and the nature of things, was given once for all; that the human good on that basis was readily determinable; and that the range of human action and therefore responsibility was narrowly circumscribed.

In the passage above, he is thinking about responsibility for the non-human world, holding that traditional moral theory cannot deal with the impacts of technology. Jonas (1984, 6) argues: “Modern technology has introduced actions of such novel scale, objects, and consequences that the framework of former ethics can no longer contain them.” He grounds an unprecedented demand for a moral theory that goes beyond the limits of traditional ones. Jonas (1984, 8) argues:

And what if the new kind of human action would mean that more than the interest of man alone is to be considered—that our duty extends farther, and the anthropocentric confinement of former ethics no longer holds? It is at least not senseless anymore to ask whether the condition of extrahuman nature, the biosphere as a whole and in its parts, now subject to our power, has become a human trust and has something of a moral claim on us not only for our ulterior sake but for its own and in its own right. If this were the case it would require quite some rethinking in basic principles of ethics. It would mean to seek not only the human good but also the good of things extrahuman, that is, to extend the recognition of ‘the ends in themselves’ beyond the sphere of man and make the human good include the care for them.

Through arguing that modern technology has changed the nature of human action, he justifies expanding moral consideration in a way that goes beyond traditional moral theory. Jonas simply redefines the conditions for responsible anthropocentrism while revealing a need to amend the canon of moral philosophy with extensive moral theory. Jonas (1984), writing before environmental ethics became an established field, addressed how technology has accumulative effects on

the planet, impacts non-human species, and decreases the quality of life for future generations. Jonas' views anticipate today's calls for sustainability. Arguing that modern technology changed the nature of human action, he reminds us that all actions are subject to moral evaluation, including humankind's use of technology that has effects for global populations, non-human species, ecosystems, and future generations (Jonas 1984).

This notion suggests that infrastructures such as transportation, energy distribution, wastewater treatment facilities, and recycling programs, and landfills remain subject to moral scrutiny. Bringing infrastructures such as these into conversations about morality puts us at the limits of extensive moral systems. We can talk about extending moral consideration beyond anthropocentric concerns to account for humankind's treatment of the non-human world and future generations, but unless one wants to extend consideration to things such as public facilities, we have reached the limits of extensive moral theory. Advancing the conversation beyond this point requires uncovering additional features of topics such as infrastructure, namely their moral dimensions.

## Complex Moral Assessment of Infrastructure

Extending moral consideration beyond anthropocentric boundaries requires a justification due to the demands that it puts on people. Environmental philosophers appeal to the intrinsic value of non-human life to defend such positions (Callicott 1989; Hargrove 1992). Applying this line of reasoning to moral arguments that deal with artifacts does not make sense. Objects lack the kind of objective non-anthropocentric intrinsic value that living beings possess, excluding them from coverage under several extensive moral theories (Hargrove 1992). They are not free moral agents, barring much support from traditional approaches.

Several philosophers of technology, however, agree that artifacts have a kind of agency (Brey 2014). Attributing agency to artifacts is supposed to clarify humankind's relationship with technology, going beyond surface-level description to reveal unknown aspects. While this maneuver is attractive, I am unconvinced that it is necessary to hold this view to provide the information that would generate better moral outcomes. Examining some of the major voices within the literature shows why this approach fails at times, where it benefits our understanding, and how it can advance research efforts. For example, initial descriptions of artifacts' agency within the philosophy of technology literature give the impression that philosophers had neglected crucial dimensions of moral theory. Bruno Latour (1994), for instance, argued that technologies are the "missing masses," unacknowledged moral actors in a network with humans.<sup>3</sup>

Following Latour, similar positions emerged, holding that technology has moral agency in some capacity, and most philosophers of technology agree that artifacts

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<sup>3</sup> For instance, Latour (1994, 152) provides an example showing how wearing a seatbelt while driving is an activity wherein he, the car, the police, and engineers make him be moral. In this example, the car counts as one of the "missing masses." For another example, see Winner (1980).

have agency, even though they disagree about its particular attributes (Allenby and Sarewitz 2013; Brey 2014). Peter-Paul Verbeek (2011), for instance, maintains that artifacts mediate human experience, a co-constitutive relationship between people and devices. Humans create technologies that force, persuade, or seduce people to behave in a desired fashion (Verbeek 2011). Other positions hold that artifacts have a stronger sense of agency. Maarten Franssen (2006), for example, assigns moral value to artifacts, claiming that they are normatively good or bad. Elsewhere, I went an additional step beyond Franssen, arguing that technologies have embedded environmental values (Epting 2010).

Contrary to these views, Joseph Pitt (2014) argues for technology's value neutrality, focusing on humans' culpability. Phillip Brey (2014) sees the benefit of thinking about artifacts as having agency, noting that these positions reveal the substantial presence that technologies have in human life, yet his thinking aligns with Pitt, holding that they overshadow humans' accountability. Brey (2014) argues that we should instead think about technologies as playing moral roles, a view that bypasses the need to bring agency into the conversation and, in turn, keeps human responsibility firmly in view.

He proposes to supplement traditional moral theory that focuses on individual ethics with "structural ethics," an approach that addresses the moral aspects of social and material arrangements, taking stock of the morality of technologies within such arrangements, and extrapolate outcome-based behavior guides (Brey 2014). Artifacts are not acting, but they are factors that one must consider in moral assessments. Brey's move away from using the language of agency through talking about moral factors shows how one can discuss the moral dimensions of artifacts without wrestling with notions of intentionality, a research area with several other considerations. Through thinking about artifacts as moral factors in an equation wherein only humans are accountable as agents, human responsibility remains firmly in view. While I support his position, it requires fleshing out to see the wealth of knowledge regarding the moral dimensions of infrastructure that a theory such as structural ethics can address. Brey does not recognize that structural ethics can serve as the foundation for making moral assessments that go beyond immediate anthropocentric outcomes. What is more, addressing such issues without complicating matters with intentionality and agency problems can advance our understanding of infrastructure's moral dimensions.

For instance, we can gauge the rightness or wrongness of infrastructure through their outcomes, how they directly effect human populations, non-human species, ecosystems, and future generations. One could hold that focusing on outcomes voids a theory-neutrality stance, making the arguments in this paper rest on consequentialism. Perhaps the focus on outcomes leads one to such an objection, *but highlighting outcomes does not make any claims about how planners should achieve them*. One of the primary differences between moral theories rests on how one achieves an outcome. All 'real-world' situations relying on the systemization of moral theory have outcomes. Neglecting to predetermine the means for achieving outcomes preserves the conditions for neutrality, providing common ground for all moral theories to consider using a supplemental measure for cases that require one. Deontologists, for instance, could hold that outcomes require planners to act as if

they were making universal laws while not using people as mere means. A deontological planner must plan according to universal maxims that respect individuals' autonomy from a sense of duty. While the 'real-life' consequences that come with planning in accord with deontology's requirements do not matter, the manner that they are brought about does matter. If a planner wants to use the guiding structure of deontology for her decisions, she implements infrastructures that promote or do not violate universal maxims.

Proponents of utilitarianism could hold that outcomes should maximize happiness for the greatest number of people. Having this common ground allows adherents to particular moral theories to establish criteria for determining what counts as a moral or immoral outcome. To accommodate adherents of different foundational theories, holding that a moral outcome directly or indirectly reduces or eliminates harm or benefits human populations provides enough common ground for a shared conversation. Deontologists, utilitarians, and virtue ethicists, for instance, can specify the conditions that define a morally beneficial outcome, along with what counts as an immoral outcome. The point here is not to argue for one theory over another, but to indicate that the pattern of beneficial or harmful outcomes is applicable to any moral theory.

These examples illustrate that planners can act in a manner that is consistent with the theory of their preference, and they can extend the underlying pattern of such theories to determine the moral status of outcomes. In turn, one can avoid unwanted commitments to consequentialism (if that is a concern). One can argue that a specific moral theory fares better for gauging the moral status of an infrastructure. This point is reasonable, but it does not undermine the basic pattern behind extending the principles of a moral theory to an infrastructure's effects.

Claiming that outcomes benefitting urban populations are moral and holding that outcomes that harm residents are immoral remains challenging due to the level of complexity involved. Due to the high number of aspects that one must consider when determining the moral status of an infrastructure, one cannot always immediately judge a decision to implement an infrastructure. In some cases, it could take decades to know if an infrastructure harmed a population. Traditional moral theorists did not gear their theories toward assessing the wrongness or rightness of highly complex moral equations having several agents, people, ecosystems, non-human species, and artifacts. Such cases often have *delayed outcomes*. It is important to emphasize this notion due to its specificity in cases concerning infrastructure.

When assessing an infrastructure, a delayed outcome holds importance because time sensitivity is a feature that is not often present when determining moral status. When introducing an infrastructure to an existing city, its initial presence could be harmless. Over time, however, it could have accumulating harmful effects on public health or local ecosystems. Such conditions are exceptional instances that require examination on a case-by-case basis due to the specialized circumstances surrounding them. This notion suggests that locating highly specific moral absolutes within planning might not be fruitful. Such an idea, however, does not entail moral relativism. It only suggests that finding such absolutes remains challenging because cases can greatly differ. In turn, debating moral absolutes should begin with a

discussion about the effects of an infrastructure, followed with an examination of the elements that create its moral status.

By breaking down the functionality of an infrastructure, the moral factors of each feature stand out as benign or harmful. The variables in each moral situation could greatly differ, but the outcomes for populations should have correlative expressions such as public health impacts. For example, interstate highways in the United States are not inherently bad, considering that they facilitate the distribution of goods and services, but several criticisms note their negative impact on urban life (Hamersmaa 2014). In some select cases, highway removal projects show that eliminating the highway from the city leads to positive outcomes for residents (City of Seattle 2008). The point here worth emphasizing is that the moral status of an infrastructure hinges upon a different set of circumstances from one case to the next, and often traditional or extensive theories cannot cover them. Incorporating subsurface rail in New York City, for instance, is not the same as implementing a subway in Bogotá, Colombia due to topographical concerns (Cobb and Acosta 2014). Factoring in delayed outcomes in moral situations shows how complex cases differ from traditional or customary examples. That is not to say that cases relying on traditional and extensive theories cannot have delayed outcomes, only that they are more common with complex cases.

For example, consider highways in the city. Determining their moral status requires weighing numerous factors against the importance of their function and the available alternatives. Such considerations include traffic fatalities, lengthy commute times, stress, decreased air quality, effects on businesses, walkability and public health, and environmental impacts. In traditional moral theory, one could argue that such processes are not part of how scholars debate moral rightness or wrongness. In turn, we must adjust how we think about these kinds of cases to account for such factors.

Bearing such amendments in mind, assessing infrastructure's moral dimensions requires establishing a vocabulary that correlates with different kinds of planning outcomes. Simple planning issues correlate with traditional moral theory. For example, if a transportation planner engages in some immoral act such as misdirecting funding for light rail allocated for vulnerable populations, obviously he/she is culpable. Blame is clearly relevant in situations wherein the actions of a person or group are directly responsible for such damages. In other instances wherein intentionality is impossible to prove, but it is evident that a minority population endured injurious effects resulting from planning decisions, arguing that such outcomes are wrong suggests that they suffer *disparate impacts*.<sup>4</sup> They must endure harmful conditions, unlike the majority of residents who do not face such injuries.

Debates about the motivations behind Robert Moses' low bridges in New York City exemplify the notion of disparate impacts in planning outcomes (Winner 1980; Joerges 1999). Moses' low overpasses would not allow city buses to reach beaches that whites frequented (Winner 1980). Landon Winner (1980) held that Moses

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<sup>4</sup> For instance, The United States Supreme Court formulated disparate impacts in *Griggs v. Duke Power Co.*, 401 U.S. 424, 91 S.Ct. 849, 28 L.Ed.2d 158 (1971).

intentionally built the bridges to keep black residents away these vacation spots. Bernward Joerges (1999), however, points out several reasons why charges of racism against Moses could be false. These arguments illustrate the power dynamic and intense character of planning decisions, showing how their outcomes significantly carry weight. In instances such as Moses' overpasses, the outcome is immoral, considering that it creates conditions wherein minority residents lack basic access to recreation, equal to whites. We should not dismiss a planner's intentionality, but proving it is not a necessary condition to say that such outcomes are immoral.

While examples such as the case above are alarming, other harmful outcomes require attention because they blend in as part of urban landscape. Normalized through their mundane character, infrastructure can perpetuate undesired outcomes. Some highways serve as good examples. While they are useful for urban mobility and are not inherently bad, factors such as air pollution that exceed established limits suggest that planners should look for safer alternatives such as mass transit (Baldaufa et al. 2013). Unlike disparate outcomes, such issues indiscriminately affect most urbanites. Despite affecting vulnerable communities, they injure residents, ecosystems, and future generations. In such instances, planners act in concert with large networks of individuals, businesses, organizations, municipal, state, and national departments.

In addition to known networks such as those above, planners act and react against a backdrop of issues such as historical events and climate change. Roger Paden (2003), for example, argues that Marxism provides an avenue for planners facing the challenges that history presents. Along with ideas from Lewis Mumford and Ebenezer Howard, he highlights the idea that a Marxist critique of socialist utopia offers a direct route to moral planning (Paden 2003). Paden's argument is significant because it reveals the persistent force of history in current planning practices. He could argue that overcoming historical challenges requires contributions from the canons of philosophy and urban planning. Such notions suggest that planners who make decisions without thinking of historical events lack the necessary scope of thought to contend with forces beyond their immediate grasp. Considering the impact of history on the contemporary planning landscape accounts for only one obstacle; planners have several other dimensions that will affect the moral status of their planning outcomes (Wamslera et al. 2013).

For example, transportation planners and civil engineers must account for the cumulative impacts of the repeated displacement of wildlife when charting new freeways (US EPA 1994). They must think about more environmental aspects of mobility than early planners had to consider (Southern 2006). What is more, it is not a far-fetched idea that one can design a transportation system that benefits human populations, serves vulnerable communities, and considers the non-human world. Yet, planners cannot anticipate additional unforeseen factors that could hinder the efforts of a transportation system, but the system would continue to produce moral outcomes.

Consider recent changes in the operational structure of Bogotá's rapid bus transit (RBT) system, TransMilenio. When Enrique Peñalosa, former mayor of Bogotá, initially implemented TransMilenio, he dramatically reduced traffic-related deaths,

reduced crime and environmental pollution, and improved urban mobility and quality of life (Hidalgo et al. 2013). Mayors following Peñalosa, however, did not share his enthusiasm for transportation, and the system now faces several problems that decrease service quality (Hutchinson 2011).

Due to the complexity that stems from the issues described above, assigning blame in such cases is difficult and mostly unnecessary. Yet, such difficulties do not mean that planners' actions are always benign. Despite lacking ill intentions, injuries happen due to infrastructure. Such injuries require a specialized term to show how such actions do not fit under the categories established for culpable moral agents. Commonly accepted criteria for free moral agency holds that people are responsible if they can reason, judge, tell right from wrong, are expected to act according to moral standards, and are morally responsible for the consequences of their actions (Brey 2014). Considering the degree of complexity surrounding planning decisions as described above, harm resulting from infrastructure could stem from several elements that were not part of the planning behind the decision to implement it. In turn, such effects do not always fit under commonly accepted requirements for free moral agency.

For instance, anticipated outcomes are not always consistent with the effects of a comprehensive plan or decision-making protocols. In such cases, some of the moral conditions of a planning decision are far too complex for the average planner to include in her assessment. Aside from the notion that planners often work in concert with numerous people and agencies, when thinking about displaced wildlife or preserving an ecosystem, for instance, the planner might not see herself in a moral situation. For a planner tasked with a problem-solving measure, long-term effects might not appear on the moral horizon. Concerns about moral responsibility, then, are not subject to the same conditions required under established frames of free moral agency.

Due to elements such as history, culminating impacts, and unforeseen factors, assigning blame is unwarranted, considering the influences that fall outside of the requirements of free moral agency as described above. Planners remain accountable because it is their job, but they do not deserve moral blame. We need a term that allows us to classify this kind of accountability. Luciano Floridi (2003, 728) uses the phrase, "displaced morality" to talk about moral actions that are the effects of morally neutral or insignificant interactions between free moral agents, artificial agents, or a mix of both. This term almost works for cases dealing with infrastructure. Yet, it carries commitments to intentionality (discussed earlier) that I want to avoid, and it neglects to account for elements such as history and environment per the examples above.

Such cases require an account of "fragmented accountability," a view holding that planners are accountable for such outcomes without always being morally responsible. Due to the forces beyond the planner's control, moral responsibility fragments such that the degree of responsibility on the planner's part is minimal. In turn, accountability is divorced from culpability in cases similar to those instances discussed above. Despite lacking a moral obligation on the part of planners in cases that concern fragmented accountability, a different kind of moral obligation remains that is evident when thinking about the overarching view of planning decisions.

Such cases are complex, requiring us to go beyond the taxonomy of traditional and extensive moral theories. This degree of complexity does not fit under the categories of traditional or extensive moral theory, which is why we should call them complex moral cases, the kinds of issues that require a traditional moral theory plus a supplemental measure for morally assessing infrastructure.

Producing assessments for complex cases requires developing criteria for determining the full range of effects, including immediate and delayed outcomes. What is more, the aim of developing an approach to complex moral cases rests on achieving a *desired moral outcome*. Achieving a desired moral outcome that is specific to a moral system (deontology, utilitarianism) and subsystem (such as sustainability or resilience) requires assessing infrastructures' outcomes for humans and non-humans. For example, establishing criteria for evaluating the sustainable outcomes in infrastructure requires examining its effects on social, economic, and ecological systems. During the introduction, I said that we do not need another moral theory. Rather, including a supplemental measure would suffice. To include a supplemental measure, one could employ specific conceptions of sustainability or resilience thinking. The goal is not to champion for a particular moral system or supplemental subsystem, only to show how supplemental measures help secure desired moral outcomes in some complex planning decisions. The reason behind adhering to this theory-neutrality is that remaining free of bias lessens the burdens that come with defending a moral system, focusing instead on the overarching applicability of the needed supplemental measure.

For example, a deontologist planner could make decisions regarding infrastructure based on a deontological configuration of resilience thinking. A utilitarian planner could make decisions using a sustainability framework for the best way to implement a new infrastructure. In either case, however, attaining a moral outcome through pairings of moral systems with subsystems would be challenging but possible. Achieving moral outcomes is highly complex when considering the number of variables that must go into complex moral equations. In the next section, I outline some of the necessary considerations that should go into a supplemental measure for securing desired moral outcomes in complex moral cases.

## **Toward a Supplemental Measure for Assessing the Moral Dimensions of Infrastructure**

In the introduction to this paper, I argued that urban planners relying on moral theory when implementing sustainable infrastructure do not always secure moral outcomes; that traditional moral theory could benefit from a supplemental measure to reduce planning failures that result in immoral outcomes. One can argue that sustainability remains an inchoate interdisciplinary area of study, and that settling on a precise description might not happen. One can also argue that sustainability might succumb to a competing model of environmental efficiency such as resilience thinking or flourishing. Considering these two points, broadly focusing on the themes that cut across arguments within the sustainability literature and rival approaches such as resilience thinking benefit how we understand the importance of

social and environmental concerns for infrastructure. For instance, topics such as future generations, natural resources, non-human species, and ecosystems require study, but consideration for today's populations must remain firmly in sight to avoid unfair treatment.

Planners can use these lessons to approach a myriad of infrastructure issues, gauging their moral status through outcomes and, in turn, make moral progress alongside technological advancements. Planners adhering to a specific subsystem of sustainability can also consider the effectiveness of their particular approach through moral outcomes, making adjustments on a case-by-case basis. Earlier, I mentioned that searching for moral absolutes in urban planning is mostly a fruitless venture, due to the lack of exact conditions that govern planning decisions and the functionality of infrastructure. A masterplan for Suzhou will not work for Denver, and implementing a subway in Bogotá will not work following Boston's protocols. This point brings up an important consideration: one can argue that aiming for moral outcomes in urban planning is a trans-disciplinary philosophical experiment that relies on interdisciplinary accounts to approach urban issues and super wicked problems.

Here is a brief example. Consider the health impacts of populations living near congested roadways. Studies show that children who live or attend schools within close proximity to busy roads can suffer from chronic respiratory symptoms (Gehring et al. 2002). In such cases, instead of focusing on moral responsibility, one could argue the outcome is immoral. Blacktops and Minivans are factors in the morality of an urban mobility equation. While doing nothing leaves residents with a bad moral outcome, municipal governments in certain instances can make moral progress through actions such as reducing auto emissions through implementing alternative means of transit or pushing for state/national policies for fuel-efficient or flex-fuel vehicles.

Here is a slightly more complex case. Considering mass transit as an approach to sustainability and a humble contribution to combating the super wicked problem of global climate change, public transit in Portland, Oregon created immoral outcomes for minority populations. Latinos living on the edges of the city, for instance, witnessed bus services decrease, fare increases, and they report that some operators treat them poorly (OPAL 2012). Due to these conditions, vulnerable populations suffer, often spending several hours per day in transit. While these community members do not typically suffer physical harm, lengthy commutes take away needed family time, social responsibilities, and quality-of-life experiences (OPAL 2012). One can argue that long transit times take away from opportunities for personal growth and flourishing, unfavorable actions for moral outcomes. Through actions such as increasing bus service, municipalities can alleviate some of the harmful conditions, improving moral outcomes for the people, non-human ecosystems that benefit from reduced carbon emissions, and future generations who will benefit from conserved resources.

Transforming this line of thinking into a new way to approach moral theory in planning begins when one shifts to thinking about infrastructure in terms of playing a role in moral outcomes. This shift is not significant due to merely focusing on how to extend moral consideration, such as ethicists have argued with the non-

human world of life and future generations. It is the particular procedure of assessing that one must scrutinize to reveal how planners can know more about the moral dimensions of design, public facilities, and services.

Instead of only expanding the scope to include “to whom” should planners give moral consideration, the neglected dimension is *how* they should give it. Specifically, the problem lies with how planners fail to account for several dimensions of infrastructure when making moral assessments. When dealing with an infrastructure, gaining a clear view of its complete moral impact requires examining the infrastructure as discussed above, but it also means thoroughly investigating the basic materials used in terms of moral outcomes. For example, one should investigate the social elements such as labor and justice issues that are tied to the collecting of the materials, ecological impacts made when harvesting materials, along with the energy outputs required to transport, store, and dispose of materials, and how such materials will likely impact future generations.

While this list is not exhaustive, it indicates the required mindfulness for producing better moral outcomes. Accounting for the exact nature of the overlooked aspects in urban planning or sustainable urbanization will differ from one case to the next, but they should include topics such as material composition, labor, human rights, energy consumption, durability, and efficiency. This kind of mindfulness goes beyond what Carl Mitcham (1997, 272) calls “duty plus *respicere*,” considering more factors than functionality concerns. It also involves examining the interconnected relationships of materials, capital, labor, environmental impacts, and future generations that relate to such concerns. Through evaluating these aspects of infrastructure as moral factors, the scope of moral assessment expands due to a change in how we morally assess infrastructure.

In terms of how a basic material affects moral outcomes, consider concrete. Concrete is a complete principled arrangement precipitating innumerable moral conundrums. Arguably, researchers have yet to determine its full range of social and ecological impacts. The cement industry remains one of the top producers of greenhouse gas emissions, contributing to anthropogenic climate change (Worrell et al. 2001). As the base material of a transit system, it creates pollution that harms public health and exacerbates climate change (Worrell et al. 2001). Having highways as the primary mode of transit, most residents must purchase cars, insurance, licenses, fuel, and repairs. In turn, portions of their income must go toward securing the means to travel within the city, for cities lacking public transit, safe bicycle lanes, and walkability. Cities preferring highways to mass transit encourage social isolationism, depression, and deprives residents the opportunity for social exchanges (Miles et al. 2012). Highways put residents at risk, resulting in numerous injuries and deaths per year.<sup>5</sup> As the key component in highways, concrete plays a moral role, producing moral outcomes.

However, one can argue that concrete has positive ecological and social values. Consider, for example, that concrete’s durability ensures that structures made from it will last over 1000 years (Meyer n.d.). Using it in construction makes buildings

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<sup>5</sup> For more information regarding highway related deaths, see <http://www-fars.nhtsa.dot.gov/Main/index.aspx>. Accessed 4 January 2015.

less susceptible to fire damage, and specialists are researching ways to improve the production process, aiming to improve its environmental footprint (Meyer n.d.). It also facilitates urban mobility. The point here is not to rally for or against concrete, only to demonstrate that the basic building materials used to make infrastructures have moral outcomes that differ from one case to the next. Considering that each case has different factors that cause different effects, researchers can only determine the moral status of infrastructure on a case-by-case basis. For example, some highways might have socially and ecologically positive moral impacts in some instances and the opposite for other cases. One could argue that a highway in the city that is away from people is moral, and freeways that cause harmful pollution and traffic in the city are immoral.

## Future Areas of Research

If one can argue that highways have various social and ecological dimensions that effect moral outcomes, one must ask: what are the limits behind this kind of thinking? Do all artifacts have such dimensions? Assuming all artifacts have these or similar dimensions, should they count as considerations in the larger moral questions to which they belong? The point in asking such questions is to show that seriously considering the argument that we can advance moral theory through questioning the moral dimensions of public artifacts smuggles in several notions that will open new avenues for research, suggesting that there might be numerous untapped veins of research in value theory.

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