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A Pattern Language for Environmental Justice: Applying Interconnected, Evidence-Based Problem-Solution Sequences to Comprehensive Equity Analysis

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This essay examines *pattern language* design as a method of comprehensive environmental justice analysis. First, the essay describes common limitations of conventional methods of analysis, finding the interconnected problem-solution sequences described as pattern languages address most limitations. Next, the essay examines the potential for pattern language design, when paired with other methods, to equip local communities to more intelligently evaluate the actual equity impacts of environmental choices.

Keywords

INTRODUCTION

I serve on a board tasked with advising the County of Sacramento on all matters of environmental quality. In most cases, this consists of reacting to staff reports or stakeholder proposals, "issue" by "issue," as best we can.

But this approach risks overlooking the communities that are the least equipped to shoehorn their real-world concerns into one of our "issues" each meeting. We are charged with promoting environmental justice but, like thousands of municipal agencies in the United States, we often operate within the piecemeal methodology that has contributed to inequitable outcomes for generations. Policymakers and researchers know this. Compiling research of the causes of inequitable environmental outcomes, Professor Tseming Yang notes underrepresentation in policymaking is but one of multiple factors, exacerbated by the structural characteristics of case-by-case decision-making – a problem to which community empowerment alone fails as a solution (Yang 2002). But attempts to construct a more holistic methodology are plagued by disparities in the available data. In many cases, the built environment has too many variables, with undefined values, for policies to reliably secure the interests of democratically underrepresented communities.

The integrative model of *pattern languages* emerges as an alternative. For forty years, researchers have applied it to cultivating and applying knowledge in science, engineering, technology, and education. Many of those researchers might be surprised to learn their mode of analysis had originally been developed for (and promptly discarded by) the fields of urban planning and architecture. But their success with pattern languages suggests environmental agencies could revisit this methodology, specifically for the purpose of advancing justice.

This essay sets forth my rationale for applying pattern language design to environmental justice, and the prerequisites I discovered through my research. No doubt, operationalizing these aspirations will require significantly more risk, work, and creativity than I have summoned to theorize them. But the same predicament that motivates my rationale also justifies the risk, work, and creativity required to try something new.

Justice requires more than one "issue" on the docket, more than one section of a general plan; justice should be the governing presupposition that "goes without saying" because it's already inherent to every plan, policy, and decision with influence on our environment. But advocating this moral truth is only the first step. The next step is figuring out a way to reliably exert justice through so many products and processes entangled in complex interactions, whose practical fallout we can hardly document, much less predict in many cases.

This is a predicament because the evidence suggests that even the best of intentions, when left with the conventional instruments of analysis, will largely fail to distribute their costs and benefits equitably. This is a predicament telling us it's time to try something new.

THE PROBLEM BEING ADDRESSED HERE

Industries, residents, and public policies all place competing demands on our natural resources. Environmental policy attempts to reconcile those demands and their expected and unexpected externalities upon one another. The complexity of this task evokes the well-known quote by the naturalist John Muir: "When we try to pick out anything by itself, we find it hitched to everything else in the Universe."

The consequences of this "hitched-ness" become especially immediate for human communities when competing demands more directly shape the *built* environment. That's likely true, of course, because the built environment is where people live. But it's also true because the built environment is just as heavily and variously shaped by endogenous activities operating without consistent knowledge of how they affect one another.

For instance, land use choices affect transportation planning, which affects land use choices, which affect transportation. The indefinite causal order of these relationships can be confounding in many cases, especially where land use choices depend on market-driven private-sector investment. Yet, even more confounding than this "chicken-or-the-egg" teaser, the relationships between these choices are also shaped by, and consequential for, an array of other mutually constitutive outcomes in the built environment. At the same time that land use choices are affecting travel demand (and vice versa), such choices are also affecting air quality, water management, public health and hazardous materials control, and costs of living, household wages, economic development, and municipal finance, among other issues.

Most quantitative attempts to account for these causal relationships are limited by a lack of data about how people and institutions make decisions. So, analyses focus on answering narrower sets of questions, modeling only a portion of the determinative effects of an environmental choice, and simply inferring the rest from observation. The effects of a single choice, therefore, present not only a statistical problem of opaque multicollinearity, but also an equity problem of concentrating negative impacts in the communities that are the least equipped to continually respond to new nuisances, risks, or public health threats. Explicit racism and its legacies are certainly major drivers of environmental injustice. But these forces are also abetted by the less-conspicuous dysfunctions of policymaking which merely shift problems from the areas of study, into the areas not being studied.

The lack of data and reliable heuristic processes available to local decision-makers typifies economist Herbert Simon's concept of "bounded rationality," with the added constraint that each decision is as likely to obfuscate, as to clarify, the next one. Thus, policymaking perpetuates a Sisyphean churn of obliquely partial solutions, where decision-makers must settle for addressing old problems with new solutions that they know will likely contribute to new problems down the road — even when they don't yet know what those new problems will be (although I use the phrase "*down the road*" as a metaphor both temporally and spatially, since the newly generated problems do tend to accumulate away from the geographic areas of attention).

In this dynamic of unpredictable aftereffects, the constituencies that are most likely to maintain protection against environmental harms will be those who can continually reassert influence on decision-makers, about new and various topics, time and time again. While these affluent communities nimbly and successfully deflect environmental harms time and time again, the byproducts (both expected and unexpected) pile up in the disadvantaged communities.

For this reason, environmental justice requires us to meet the indivisibility of problems with an integrality of solutions. Fortunately, a practice of developing associative networks of solutions provides a view of that "bigger picture."

This practice, called *pattern languages*, organizes types of solutions by their interoperability, across varying scales, so that a designer can evaluate any new, proposed solution in the context of the "bigger picture" (i.e., the circumstances in which that choice would operate). This "bigger picture" helps the designer to verify whether the proposed solution is appropriately supported and enabled by the right set of policies or characteristics on a broader scale. This function is fundamentally different from most plans, strategies, or programs used by local governments, in ways that are described in this article.

The pattern language applies a different kind of lens to our environmental choices (whether the "choice" is a new policy, a new land use, a construction project, or virtually any other activity with externalities). By comparing each choice's *ideal* circumstances to that choice's *actual* circumstances, the pattern language can guide policymaking toward more holistic outcomes that minimize the Sisyphean churn. In doing so, I propose pattern language design shows enormous potential for helping communities to more fully advance environmental justice.

PATTERN LANGUAGES

A design *pattern* describes two things: 1) a problem that recurs in a given environment, and 2) the core of a solution to the problem. And a pattern *language* integrates multiple patterns that can each be used in the same field. So, patterns describe relationships between problems and solutions, while pattern languages describe relationships between different patterns.

A few important caveats help to explain patterns and pattern languages. First, a pattern is not prescriptive. Rather, a pattern describes the *core* of a solution, generalized so that the solution could be operationalized hundreds of times in different settings. The types of solutions communicated by patterns should be both evidence-based and customizable, a source of research and guidance for the designer.

Second, a pattern encapsulates and delivers something Ward Cunningham has called "concentrated experience." It's not a collection of suggested actions where each action is derived from a success story. Instead, it's a singular description outlining the qualities which thousands of success stories share in common. The pattern conveys the same problem-solution sequence we've seen play out over and over again in different places, distills what it is about that sequence that works, and packages those qualities as a single aggregate type of solution.

But, more important than the solutions themselves, the pattern language *as a framework* articulates these solutions across an entire field by their functional relevance to one another. In this way, a pattern language arranges sets of "best practices" more usefully than most "toolkits" or other guides, because a pattern language does more than describe the best practices. It *also* describes how the best practices are dependent upon, nested within, or otherwise connected to, each other.

The first pattern language was created by architect Christopher Alexander in 1977, including 253 original patterns. Alexander's original patterns range in scale from the spatial arrangement of a master-planned community to the location of a door in a room, all operating in the same field and therefore linked together by their functional relevance to one another. Since Alexander's publication, pattern languages have been created and used in a remarkable variety of fields, from software engineering to molecular biology, manufacturing, pedagogy, and others. Years later, the invention of wikis (themselves a product inspired by pattern languages) has enabled user-editable, crowdsourced pattern languages that benefit from an ever-growing field of "experiences" to "concentrate."

In February 2020, the Centre for the Future of Places at KTH University in Stockholm and the Sustasis Foundation in Portland, Oregon, published a new pattern language for urban planning and development, called *A New Pattern Language for Growing Regions*. It can be viewed online as a federated wiki (at npl.wiki) specifically designed to be copied, shared, edited, and iterated.[1] One of its authors, urbanist Michael Mehaffy, described the platform and its purposes in a recent article in Planetizen: *Is It Time to Revive the Pattern Language*. "These can all be debated," Dr. Mehaffy (2020) writes of his patterns. "The aim is not to end discussion, but to begin it. If another party has an alternative pattern, justified by alternative evidence, let them present it, and let us have a proper debate on the evidence."

The *Growing Regions* product is a milestone. Since its origins, pattern language design had always traded quantitative modeling for an axiomatically inclined aggregation of knowledge. But now, *Growing Regions* amplifies the breadth and depth of knowledge to be aggregated. By opening a new pattern language to the world and inviting feedback, objections, new research, and modifications, with global access and zero barriers to entry, *Growing Regions* significantly expands this design's capacity to harvest and distill the wisdom of practice. For further reading about the applicability of pattern language design to environmental planning, see Mehaffy, M. W. *Urban form and greenhouse gas emissions: Findings, strategies, and design decision support technologies*. Delft NL: Delft University of Technology (2015).

On its own, this approach could be transformative for planning and development in virtually any urbanizing society across the globe. What's more, I propose this approach can be equally transformative for advancing environmental justice, if we intentionally apply it to evaluating how each environmental choice distributes its costs and benefits.

The value of pattern language design is that it shines a light on the full 360-degree setting in which each choice we consider would take effect. This light pours over all 360 degrees through two transparent levels: The actual circumstances in which the choice would take effect,

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[1] http://npl.wiki/view/welcome-visitors/view/growing-regions

and the ideal circumstances for that choice to take effect. The light casts these two realities in stark contrast to one another, prompting consideration of possible adjustments to make the *real* more like the *ideal*.

Such adjustments could include a modification to the proposed choice, for example, or they could include adopting companion policies, in connection with the proposed choice, to mitigate its externalities or augment its benefits. Whatever the outcome, the suitability of that choice would benefit from a more knowledgeable and intentional examination.

While such an examination would likely benefit any number of policy priorities for the built environment, I suggest the examination could benefit equity the most. In the following section, I describe three specific ways in which pattern languages could uniquely and especially benefit equity.

APPLYING PATTERN LANGUAGE DESIGN TO ENVIRONMENTAL JUSTICE

The creation of *Growing Regions* provides an opportunity for regional environmental agencies that are willing to try something new to advance justice. Here, I apply the term "environmental agency" broadly, to mean most government agencies with authority over public works projects, land-use police power, development or certification of state-mandated environmental analysis, or other regulations of or investments in the built environment.

Such an agency could develop and publish a pattern language so that it is available as a resource to policymakers, to staff, to community members, and to other stakeholders. With particular attention to the arenas of community politics, I suggest pattern language design can serve environmental justice in several ways:

1. *Examining Interoperability to Hold One Another Accountable*. By arranging design solutions by their interoperability, a pattern language can orient the public discussion around the "bigger picture." This can help policymakers, when considering a proposed environmental solution, to account for all of the related policies or characteristics of the surrounding area that can impact the proposal's effectiveness. This helps policymakers check their "blind spots" where externalities can otherwise impact constituencies not present in policymaking meetings.

2. *Navigation as a Mode of Analysis*. The navigability of pattern languages places everything in terms of geographic scale, which could provide a check against furthering the sprawling segregation of land uses which dominates U.S. communities and harms low-income and minority households the most.

3. *Public Level-Setting*. By creating a common baseline for decision-makers and stakeholders, pattern languages can help guide the public dialogue toward formulating more deliberative and measured feedback on proposed policies. Generally, this could incline discussions toward consensus-based sustainable policy development.

Let's unpack these benefits:

1. Examining Interoperability to Hold One Another Accountable

As long as the actual interaction of environmental choices remains opaque, justice will always be at risk of neglect (a consequence of the described "Sisyphean churn"). Direct observation, community input, and modeling can each shed *some* light on the causal relationships defining such interaction. But we know those methods are far from sufficient. Genuinely promoting environmental justice requires us to see the "bigger picture" beyond the practical limits of observation, politics, or quantitative methods.

The pattern language helps us see that bigger picture by bundling research into an architecture of the *ideal* interoperations of policies and programs. Policymakers can then compare a proposed *actual* environmental choice with these ideals. The comparison would surface the types of questions that policymakers should want to ask before approving the environmental choice, or adopting policies, or taking any number of other actions with influence on real-world interoperability. If the ideal set of circumstances are not in place for such an action, then the "bigger picture" conversation would force policymakers to account for it. It would hold those policymakers (or staff, or advocates, or whoever it is proposing the action) accountable for the mismatch.

Pattern language design does this naturally, but a more affirmative approach can also be taken to more explicitly center environmental justice. This starts, of course, with the patterns themselves. The innovative agency that embarks on creating these patterns can set a specific intention of ensuring that each pattern promotes an equitable distribution of costs and benefits across *time* (i.e., not chasing short-term solutions), *geography* (i.e., not disproportionately impacting one area to benefit another), and *demographics* (i.e., not disproportionately impacting an ethnic, racial, or other population group). (I suggest an approach and resources for setting this specific intentionality in a later section of this article).

It's important to note a caveat, however, which would apply whether the pattern language is focused on justice or not: A pattern language helps to highlight functions of interconnectedness, yes, but realistically Simon's "bounded rationality" will always limit what we can predict to *some* extent. A pattern language should aggregate, based on empirical research, the methods that *tend to work*. And, as a proximal mechanism of analysis, this framework can *suggest* the externalities that might arise from making a choice that deviates from those methods. But fully understanding those externalities' probabilities and severity will always require empirical research independent of the pattern language.

So, to effectively promote environmental justice, decision-makers must pair the pattern language approach with the other approaches of direct observation, community input, and modeling or other quantitative methods. We've already surveyed the imperfections of such approaches, so we know the Sisyphean churn will be an inevitable part of policymaking to *some* extent. But these approaches are improving. Researchers are constantly developing and deploying new methods of collecting and utilizing data, whether to model or otherwise study specific scenarios, or to broadly apply and incorporate data in established indices, GIS screening tools, or other screening tools. Multivariate regression analysis is often limited to answering narrow sets of questions, but sometimes there can be outsized multiplier benefits hinging on

those answers. So, even though regression modeling can be expensive and piecemeal, it can be extremely valuable in some cases. As the innovative agency considers using pattern languages, it should remain no less interested in applying new data in other forms of studying environmental justice.

2. Navigation as a Mode of Analysis

A novel aspect of pattern language design is its navigability. The user of a pattern language is able to navigate an interconnected set of design solutions, moving from small- to large-scale, or from large- to small-scale (or horizontally within a single geographic scale), however the user wants to navigate it. This navigability corrals the solutions by a kind of fractal order, which has always generally undergirded the ideals of sustainable development. Fractal scaling is the growth model implied by the "20-minute community" where anyone who wants a job within a 20-minute commute can find one, or the locally sourced "farm-to-fork" food access ideal, and any number of other built-environment ideals predicated upon local self-sufficiency.

But today, the coronavirus pandemic places even greater importance on local self-sufficiency. By disrupting vital domestic and international supply chains, and forcing entire national economies to pause, the pandemic demonstrates the importance of *expansion via duplication* as a future growth model. As much as possible, this model drives essential social and economic functions down to the local level, by prioritizing diverse and complementary land uses within the same locality, or at least within the same region. In addition to helping communities survive severe national economic downturns, this model of relocalizing essential functions is also more conductive to scale-sensitive travel restrictions, in the event of future outbreaks of infectious disease. Health authorities could even consider such measures as neighborhood-specific quarantine (as an alternative to statewide "stay-at-home" orders), as a method of containing infectious spread to a small area while still allowing most of the "outside" essential functions to resume.

Policymakers must ask how existing and proposed land uses advance or hinder this model. The pattern language approach supports this type of examination by inherently demonstrating the interdependence of policies and built characteristics across geographic scales. Here, again, the framework is at least as important as the patterns themselves. The framework forbids the user from considering a small hyperlocal land use without navigating its broader ideal circumstances, which necessarily comprise location-efficient growth.

Providing this check against the institutional momentum of inefficient growth benefits all people. But it especially benefits the disadvantaged communities that in many ways endure the most painful burdens of inefficient growth—from transportation costs as a share of household income, to mobile-source air pollution and other health impacts, to say nothing of the brutal economy-wide shutdowns that must be considered in a post-coronavirus era.

3. Public Level-Setting

By presenting the same "bigger picture" to all parties, the pattern language can also provide a common point of reference for local officials, advocates, and other community

members. Whether the forum is a city council meeting, planning commission meeting, townhalls, or online forums, giving everyone the same rubric for judging a given proposal can help to guide public conversations into productive directions. Even if an advocate disagrees with the legitimacy of that rubric, at least all parties are talking about the same thing.

The mutual point of reference ideally leads to more deliberative and measured proposals and reactions to proposals. This benefit is not unlike the public adoption of a land use plan. Laws in every state require localities to each adopt a "comprehensive plan" or "general plan" (among other terms), that legally codifies an agreed-upon basic blueprint for future land uses, into which future capital projects or zoning designations must fit. The larger blueprint anchors subsequent public discussions about smaller, more specific approvals.

But a pattern language affords an even stronger anchor. Unlike most official land use plans, a pattern language provides a seamless continuum from grand master plan at a regional level, all the way down to, say, widening a sidewalk. This interconnectivity eliminates the gray area between lofty blueprint and pouring the concrete.

The pattern language also inherently justifies its patterns, presenting everything as a rational problem-solution sequence. This dyadic quality sets pattern languages apart from most land use plans, whose policies are more often corollaries hanging from the ends of broader objectives or top-down strategic goals which themselves dangle from an overriding "vision statement." While this hierarchical approach often dilutes intentionality by clumping specific solutions under vaguer solutions, patterns instead directly pair solutions with their equally precise reason for existing (*problems*). By consistently articulating the exact reason for each specific policy, across a coherent structure of mutually reinforcing dyads, a pattern language could resolve a lot of the ambiguity where adversaries tend to slug it out over different interpretations of intention.

This fine-grained clarity could, at a minimum, save adversaries a lot of time arguing past one another. More importantly, it could even incline discussions toward policy development that is more reciprocal, more well-rounded, and more sustainable (both politically and environmentally).

Unlike statistical methods, pattern languages can also help decision-makers find answers to non-quantitative questions. This is extremely valuable because, as it's prudent to continually note in the era of "big data," not everything that's important can be quantified. For example, medical statistics can track public health, and opinion surveys can approximate happiness on a snapshot basis. But what about the durability of civic optimism which a given place can or cannot sustain? How can we quantify the effects of a place's environmental conditions on a child's imagination of the future, or self-image, while she is growing up there? We can *generally* know what's positive from what's negative. But, when faced with a specific policy choice, numbers alone can't provide that differentiation.

Instead, providing that differentiation largely falls to local community leaders who must make qualitative judgments in the practice of politics. For example, when communities are weighing the possible effects of an environmental choice on local communal aesthetics and

recreation, cultural expression, educational or other civic resources, or "place-based memory" (i.e., historical preservation and restoration), among other normative values, community leaders are often left unaided by numbers (or, worse, misguided by them). Decision-makers are also bombarded with tailored information from interest groups that are ordered by, and aligned with, the artificial *fractionality* of environmental priorities, which aggressively obfuscates their real-world *intersectionality*.

As a result, local decision-makers are often forced to make judgments, about unquantifiable outcomes, based upon incohesive and sometimes conflicting inputs. This is a scenario where pattern languages can present particular usefulness, since they approximate the causal relationships of non-quantifiable choices, based on qualitative evidence, the state of practice, and communally expressed normative values. At the same time, local decision-makers must also heed observation "in the field" and input from constituents as the truer, more specific signals of local needs and vision.

As discussed, a pattern language would not be a perfect answer or a complete answer. It would be an additional tool in the toolbox. But this raises the question: Once an environmental agency has built its new pattern language, just when and how would the agency actually put that new tool to practical use?

HOW WOULD ENVIRONMENTAL AGENCIES ACTULLY USE A PATTERN LANGUAGE TO PROMOTE JUSTICE?

Once an environmental agency develops and publishes a pattern language, its policymakers would be able to use it to evaluate the next new, proposed solution in its proper context. (The "proposed solution" in question could be anything with externalities: a new policy, a new land use designation, a proposed construction project, etc.).

That context should be the delta between: A) the actual circumstances in which the proposed solution would operate on a broader scale, and B) the latticework of evidence-based axiomatic recommendations about what's necessary to support the proposed solution's effectiveness. That delta is where the conversation would happen about other, complementary policy changes that might be adopted in concert with the proposed solution, to bring the solution's circumstances closer to something ideal.

I'll use my own community of Sacramento County as an example: As it's currently adopted, Sacramento County's General Plan-Environmental Justice Element directs the County to plan for "Wide sidewalks, shorter blocks, well-marked crosswalks, on-street parking, shaded streets and traffic-calming measures to encourage pedestrian activity" (Policy EJ-19-c).[2] Per this policy, let's say someone is proposing adoption of a Specific Plan (including rezonings, transportation improvements, and landscaping) to develop a pedestrian-friendly community

When the County Planning Commission is looking at whether the Specific Plan adequately implements pedestrian-friendliness, Commissioners are apt to ask questions like:

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[2] https://planning.saccounty.net/PlansandProjectsIn-Progress/Pages/Environmental-Justice-Element.aspx

"What's the best way to calm traffic?" and *"Are there more effective methods of shading streets?"*

An expansive state of practice and research provides answers to those questions, which can be curated by a pattern language. All the Commissioner would have to do is search the topic by keyword (say, "pedestrian-friendly"), and the pattern language would generate several *patterns* that offer types of solutions. (For example, the *Growing Regions* pattern language already provides a "Pedestrian Sanctuary" pattern[3] and a "Shared Space Lane" pattern[4], which would appear).

Of course, the County already has its Countywide Design Guidelines and Zoning Code prescribing many of the planning features that increase safety and enjoyment of pedestrians. The pattern language wouldn't try to duplicate these prescriptive specific policies—Instead, it would provide broader, more general design principles that illuminate, rather than duplicate, existing County policies.

But, more important than the design pattern itself would be *the framework* of curating all the related design patterns around it. The pattern language reveals the broader, related designs that would be helpful or required to support the goals of "Wide sidewalks, shorter blocks, well-marked crosswalks, on-street parking, shaded streets and traffic-calming measures to encourage pedestrian activity." In other words, the pattern language would help answer these broader questions: *"In what set of circumstances does this type of Specific Plan work best?"* or *"What are the circumstances required for this type of Specific Plan to work at all?"*

The pattern language would suggest answers to these questions because, once the Commissioner looks up a "pedestrian-friendly" pattern, they would find it automatically links to other patterns that are functionally relevant to pedestrian-friendliness.

For example, to revisit the *Growing Regions* pattern language, when we pull up the "Pedestrian Sanctuary" pattern, we find it also links to an "Urban Greenway" pattern[5] and a "Street as a Center" pattern[6]. These new patterns describe types of planning that support or help implement pedestrian-friendliness. "Pedestrian Sanctuary" also links to a "400M Through Street" pattern[7], which applies an ideal planning approach to a broader geography which, if implemented, would support the "Pedestrian Sanctuary" approach and thereby support pedestrian-friendliness. (The "400M Through Street" pattern, in turn, links to an even broader

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[3] http://npl.wiki/view/welcome-visitors/view/recent-changes/view/pedestrian-sanctuary
[4] http://npl.wiki/view/welcome-visitors/view/growing-regions/view/patterns-of-scale/view/street-patterns/view/shared-space-lane
[5] http://npl.wiki/view/welcome-visitors/view/growing-regions/view/patterns-of-scale/view/street-patterns/view/urban-greenway
[6] http://npl.wiki/view/welcome-visitors/view/recent-changes/view/pedestrian-sanctuary/view/street-as-center
[7] http://npl.wiki/view/welcome-visitors/view/recent-changes/view/pedestrian-sanctuary/view/400m-through-street-network

pattern called "Polycentric Region,"[8] describing the set of *regional* circumstances where this approach would be the most beneficial).

Thus far, this hypothetical has referred to the County Planning Commission as the pattern language's user. But in fact, the pattern language would be a publicly available website. By presenting the same "big picture" to all parties (including advocates, decision-makers, and constituents), the pattern language would provide a common baseline for public conversations (whether it's in Board of Supervisors meetings, Planning Commission meetings, city councils, townhalls, or online forums). This common baseline could prompt community members to formulate more deliberative and consensus-oriented feedback on proposed policies.

It's important to note, however: The pattern language should be used to support aspirational deliberation. This means looking to the pattern language primarily to inspire ideas and prompt questions, and less often to strictly precondition or disqualify proposed policies. That delta between the real and the ideal should spark conversation, but it shouldn't make perfection the enemy of progress.

For example, to return to the hypothetical of the pedestrian-friendly Specific Plan, it's very possible that the proposed Specific Plan is a good plan even if the ideal "400M Through Street" scenario doesn't exist where the Specific Plan would be adopted. Instead of using the "400M Through Street" recommendation as a reason to oppose the Specific Plan, policymakers could look to the pattern language as a premise to guide longer-term discussion toward longer-term improvements. The Planning Commission would reason, "We can't transform this built-out part of the County into a '400M Through Street' scenario overnight, or even in the next 2 or 3 years. But maybe it's a worthy aspiration in a 20-year timescale—a kind of North Star to guide long-range planning, incremental public works improvements, and the ongoing public conversation about our community's shared vision for the area. In the meantime, this Specific Plan is a good piece of the puzzle to start with."

The pattern language offers a set of evidence-based principles and research, not to stop us from moving forward, but to keep us moving on the right track.

A FEW THINGS ABOUT THE PATH FORWARD

In our research to better understand the feasibility of building a new pattern language as an equity tool, I discovered the hurdles and prerequisites that stand in our way. These hurdles and prerequisites will disqualify most municipalities or advisory boards that try to "go it alone." But a well-resourced environmental agency, with regulatory power and a region-wide jurisdiction, could and should do it. To inform this encouragement, I offer my thoughts on the prerequisites and hurdles relating to intentionality, process, and geography:

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[8] http://npl.wiki/view/welcome-visitors/view/recent-changes/view/pedestrian-sanctuary/view/400m-through-street-network/view/polycentric-region

Intentionality

Pattern language design naturally lends itself to an examination of equity in the built environment because its framework demonstrates interoperability, organizes design solutions by a fractal order, and publicly level-sets among disparate constituencies.

But the patterns *themselves* cannot be taken for granted as equity tools. As we've discussed, a pattern is essentially a problem-solution sequence, documenting an observed ritual for successfully dealing with a recurring challenge. But what the pattern is actually advising us to do depends firstly upon how it defines the problem. Different pattern languages over the last forty years have tackled a wide variety of problems. Max Jacobson's *Patterns of Home: The Ten Essentials of Enduring Design*, for example, advises readers on how to maximize comfort and delight in the layout of their homes (Jacobson et al. 2005). The "problem" Jacobson tackles is dissatisfaction with a custom-made house.

Using pattern languages to support environmental justice will require a new way of looking at the problem-solution sequence. This means intentionally telling a story of justice with every sequence by defining the "problem" by its degree of imposing inequitable distributions of costs or benefits, and reciprocating with a "solution" to those exact inequities. The solution should promote a more equitable distribution across *time* (i.e., not chasing short-term solutions), *geography* (i.e., not disproportionately impacting one area to benefit another), and *demographics* (i.e., not disproportionately impacting an ethnic, racial, or other population group).

Sticking to this practice will require patience and perseverance—and imagination. For example, just how does a *pedestrian sanctuary* distribute costs and benefits across time, geography, and demographics? Here's one approach: When characterizing the problem, agencies should ask: "For *whom* is this a problem? Is this a problem for some demographic groups more than for others?" They could also ask: "Is this a problem in some areas more than in others?" If the answer to either question is "yes," then the answer should reorient the entire sequence. Or, when consolidating the solution, agencies could ask, "To whom will the costs accrue?" or "*When* would the costs accrue?"

The question about *equity across time* can be deceptively pivotal. One might apply it to the archetypal approval of a large-scale private development that is conditioned upon a one-time "sweetener" to fund adjoining infrastructure improvements—such as, for example, a community plaza for the enjoyment of residents. After construction and opening, how often this plaza is conveyed and left to the municipal government to maintain, without a serious budgetary commitment or capacity to keep it in good repair. If the *pedestrian sanctuary* we are building in a disadvantaged neighborhood is propped-up on unfunded liabilities, destined for neglect and deterioration within 15 years, then is it really equitable?

But let's not over-rely on our creative faculties—There are people with direct practical experience with these outcomes, and their insights should be consulted when we develop such patterns (a key prerequisite discussed further in the section below on *process*). For now, let's remember that a pattern can only orient itself around a "problem" by presupposing certain

values. We have to establish equity as the chief value, across all patterns, to build a pattern language that effectively promotes environmental justice.

This isn't a completely new idea. Pittsburgh, Pennsylvania recently partnered with Harvard University's School of Design to create patterns that advance justice in four of its disadvantaged communities. Harvard's master's students created patterns addressing not only the physical investment (or lack thereof) in these communities, but also the role of process and enfranchisement as the more immediate determinants of equity. Their book, *Patterned Justice: Design Languages for a Just Pittsburgh*, describes 50 socio-spatial patterns, grouped in the categories of *Public Spaces*, *Neighborhood Change*, and *Mind, Body, and Soul* (Griffin et al. 2020). It sets forth a seminal curriculum for any agency that's interested in building the problem-solution sequence around equity.

Process

Establishing a pattern language for a given region will be (and should be) a rigorous, creative, and controversial public process. In order to establish credibility and ensure local suitability of any new pattern creations, it would be vital to engaging the public authentically and robustly from the outset.

This public process should engage communities of practice, of policy expertise, and of lived experience. The innovative agency that chooses to build a pattern language should utilize practitioners who can contribute local knowledge, in addition to their craft. Communities of policy expertise, on the other hand, shouldn't be bound by geography; universities and other research institutions throughout the world are rich veins of broader knowledge that can be tapped.

Of paramount importance, the agency should authentically embed the lived experiences (perspectives, knowledge, and values) of the people living in the communities which the patterns are supposed to help. While patterns focus on promoting equitable distributions of *costs* and *benefits*, the process of creating them should promoting equitable distributions of *empowerment* and *access* to the decision-making.

A challenge to lived experience-driven design is harmoniously incorporating residents' inputs into a framework, without cherry-picking the convenient ones. The innovative agency must consult lived-experience contributors at the very start of this process, not to react to proposed patterns, but to identify and frame *problems*, then meaningfully contribute to the applicability of the *solutions* that research generates.

In its effort to incorporate lived experience, the innovative agency should also remember a rule of thumb: What you measure is what you value. Therefore, the agency should not track the number of outreach events that the agency conducts. That might sound surprising. But no number of "pop-up" events, townhalls, or surveys will meaningfully advance justice if the agency conducting them is focused on producing a big number of events. Instead, the agency should measure its performance in this area by the quality of the relationships it is cultivating.

The quality of relationships is mostly non-quantifiable, and some readers will have difficulty with that. One way to "ground" the agency's evaluation would be relying on a yes/no questionnaire instead: Do community leaders trust the agency enough to pass its information on to their constituents? Are residents *coming back* to meetings, a second, third, and fourth time? Are communities routinizing these interactions as proactively as the agency? In other words, are the communities asserting the *process* of engagement as much as the agency is? Are communities taking an active role in the *framing* of engagement? For example, are they participating in the design of workshops and neighborhood charettes, or merely giving the inputs? The answers to these questions can all be indicators of the quality of the agency's relationships in the communities it is seeking to help.

And this quality is the truer measure of the performance of lived experience-driven design—not only because relationships drive and reflect how authentically input is being incorporated, but also because these relationships suggest something about the longevity of the agency's ability to incorporate lived experience. The agency should focus not on incorporating lived experience this year, but on building bridges for residents' meaningful involvement that continues into future years.

The agency must also give disadvantaged communities the tools to advocate their perspectives, without biasing how those perspectives are voiced. Pattern languages hand us a convenience in this regard. Unlike a legally prescribed land use plan or a proposed construction project subject to dozens of zoning regulations and budgetary constraints, patterns can be agnostic toward external rules or funding sources. This means the agency can solicit lived experience input without compromising that input with incidental constraints. Fitting projects and policies to those constraints can occur in a different discussion, where the patterns are being *used*, not where they are being *created*; for now, the agency and its constituents can be unimpeded in their co-exploration of ideal scenarios. Communities should be unfettered in establishing that "North Star" to guide the inevitable compromises and adaptations that must take place down the road.

Another convenience is the nature of environmental policy itself: Much of it takes place in a physical setting you can walk through (provided you're wearing the right shoes). A number of nonprofit organizations take advantage of this convenience through guided tours to assess and document their physical surroundings firsthand. WALKSacramento, for example, conducts "walk audits" to assess the environment from multiple viewpoints (whether you're a motorist, a bicyclist, or a pedestrian, all of whom experience the same stretch of road differently). To utilize these viewpoints, WALKSacramento equips its volunteers not only with safety vests, clipboards, and measuring tapes, but also with training, questionnaires, and a forum for subsequently discussing what was observed. This approach not only generates organic feedback—It also teaches kids how to look at their environment around them and turn their observations into recommendations. This potentially activates lifelong activists to pull communities toward long-term change.

While the choice of some patterns over others would entail some debate, these choices are unlikely to attract the same level of controversy as, say, a general plan amendment or a land-use approval. Because patterns are innately abstract and universal, most of the controversy would

likely be limited to academic fields—certainly stretching more broadly in a geographic sense, but significantly narrower in a sectoral sense.

A final note about process, the environmental agency that embarks on building its own pattern language must dedicate significant staff resources to it. As the *Growing Regions* product also ventures, a pattern language should be a living document, a platform open to input and modification from all credible parties internal and external to the agency that owns it. Thinking of the pattern language as a living document might ease the urgency of getting every pattern right "the first time." But it doesn't mean external commenters will take over the workload once the pattern language is published for public review and comment. Staff who are accountable to the agency owning the product would have to be available on a constant basis to evaluate feedback, objections, or proposed modifications that issue from public review. The agency must consistently ensure that community input is being incorporated equitably and effectively. This role would add to the administrative cost of maintaining a pattern language and following through on its purpose to "begin the discussion," as *Growing Regions'* creators might say. Without a doubt, this role would be a serious commitment.

Geography

To genuinely advance environmental justice, the pattern language would have to apply to the full range of environmental characteristics that affect communities. Because many of these characteristics transcend political boundaries, the geographic scope of the pattern language would likely misalign with the jurisdiction of any given municipality. In most cases, the pattern language would apply to a footprint substantially larger than the jurisdiction of a single municipality.

For example, patterns should address the area's ecological and wildlife characteristics that are impacted by, and have to be integrated with, urban growth and the area's primary industries, externalities, and histories thereof. Patterns should also address the area's climatic, topographic, and geologic characteristics that determine natural hazard risk, as well as any other natural characteristics affecting communities (which might also include riparian and hydrological characteristics, as a Sacramento pattern language certainly would).

Most of these characteristics have a high likelihood of transcending municipal lines. They might roughly coincide with other established lines, such as regions or zones recognized by state or federal resource agencies, or local government associations like a council of governments or metropolitan planning organization. These lines can be seen as acknowledging the costs and benefits of resource conservation or management typically accrue to a population far bigger than any city or county. Patterns should also be informed by population data, including demographics and socioeconomic trends, which almost certainly transcend municipal lines.

Sacramento County's approach to environmental justice serves an example of how profoundly limiting municipal lines can be. Sacramento County is the urbanized core of a larger six-county region sharing the major industries, settlement patterns, and environmental features that together characterize the Sacramento Valley. Stretching far beyond municipal boundaries, many of these features defy sufficient regulation by any single county. So the County's recently

adopted General Plan-Environmental Justice Element is limited to addressing equity almost totally through targeting investments in public facilities and services in areas that had been identified as disadvantaged communities, to say nothing of these communities' rights to the actual natural resources we more commonly associate with environmental policy.

A prolific literature offers guidance about defining a region through such natural resources. I'm fond of citing Robert Thayer's imaginative work, *LifePlace: Bioregional Thought and Practice*, not only because it describes in spectacular detail the bioregion of Sacramento and even offers design patterns for it (Thayer 2003). *LifePlace* also sets forth surprisingly intuitive yet perspective-altering instruction of how to differentiate one region from another based upon what actually physically makes them different.

Once the innovative agency (with region-wide jurisdiction) creates a pattern language, the patterns can be used by smaller localities, like city councils or county boards. But the agency driving creation of the pattern language, and responsible for stewarding it, should be an agency with authority and responsibility for all or most of the factors subject to those patterns' recommendations.

The Opportunity Before Us

When Christopher Alexander invented pattern language design in the 1970s, his book made an impact largely because the trades of architecture and urban planning in that period had become so calcified. Alexander's unwieldy index landed resoundingly in a field that had abandoned user intuition in favor of supplier efficiency and standardization. We are in a similar premise now, only we have replaced the morass of efficiency and standardization with a morass of quantitative-only analysis and resource-based analysis—important tools, undoubtedly, but far from the complete answer.

We also have tools today that Alexander lacked in the 1970s. Forming a *pattern* requires more than just documenting incidents of recurring problems and successful responses. It also requires identifying regularities within those stories. Defining those regularities—or common denominators shared by successful responses—is the crux of "concentrating experience" into a useful pattern. These regularities are more likely to emerge as the number of documented incidents grows, and the Internet significantly lowers the barriers to accessing documentation. By exponentially increasing the potential numbers of problems/responses that can be consulted, today's technology makes new insights possible, and thus, new and more ambitious patterns are made possible.

In the year 2021, we find society's mainstream growing more forthright about acknowledging injustice as a prevalent reality, a societally congenital crisis which extends to the very physical settings of our lives. The heightened consciousness and honesty of this moment cracks open a door to national reconciliation through justice. Seizing that opportunity will require a departure from norms, a scary step into unknowns, possibly embodied in experimental policy. But the opening before us is more than just an opportunity—It's also our responsibility. I suggest pattern language design, for the reasons outlined in this article, can play a part in our meeting that responsibility.

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