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Insolvent

How to Reorient Computing for Just Sustainability

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PROBLEMS ARE FRAMINGS

THE DISCORDANT PLURALISM OF JUST SUSTAINABILITY DESIGN

The language we use[] is not neutral and can even become a trap, confusing our discourse on reality with reality itself . . . several authors in the objectivist tradition have not been able to avoid this trap, with the result that they have become prisoners of their own language: they have confused the way they are talking about unsatisfactory situations with reality itself.
—Landry (1995)

It becomes morally objectionable for the planner to treat a wicked problem as though it were a tame one.
—Rittel and Webber (1973)

Can design solve the wicked problems of sustainability and justice? From a problemist standpoint, absolutely. The famous *wicked problems* concept, initially coined in the context of urban planning and policy, has influenced thought in design widely (Buchanan 1992). But the unfortunate name seems to have led many astray. This chapter will address three questions in search of a meaningful position.

1. Can design in principle solve wicked problems involving sustainability or justice concerns?
2. What does it take to intervene ethically in such a situation?
3. How can critical systems thinking (CST) help us to position systems design for meaningful action in this context?

CAN WICKED PROBLEMS BE SOLVED THROUGH DESIGN?

What happens when designers solve a problem? First, the problem needs to be stated, then design activity results in some form of intervention aiming to "chang[e] existing situations into preferred ones" (Simon 1996, 111). Problem framing is so important in design because it directs the work that results in change. Recall that soft systems thinkers showed that any articulation of a problem relevant to a situation is made by someone, implies a worldview, and represents a framing that works like a lens placed in front of the situation. Even if a problem statement does not directly name the objective or satisfaction criterion—or if the criterion later gets restated—how the statement frames the problem profoundly shapes the purpose and direction of the design activity. In a sense, stating a problem cuts a slice out of a problem situation to frame that slice as something worth solving: "problems are not given, nor are they reducible to arbitrary choices which lie beyond inquiry. We set social problems through the stories we tell" (Schön 1979, 150). To frame a problem is to tell a story:

> Each story selects and names different features and relations which become the "things" of the story—what the story is about. . . . Each story constructs its view of social reality through a complementary process of naming and framing. Things are selected for attention and named in such a way as to fit the frame constructed for the situation. Together, the two processes construct a problem out of the vague and indeterminate reality which John Dewey (1938) called the "problematic situation." They carry out the essential problem-setting functions. They select for attention a few salient features and relations from what would otherwise be an overwhelmingly complex reality. They give these elements a coherent organization, and they describe what is wrong with the present situation . . . to set the direction for its future transformation. (Schön 1979, 146)

The telling of any story is socially preformed by metaphors and frames. "Frames structure the way we think, the way we define problems, the values behind the definitions of those problems, and what counts as 'solutions' to those frame-defined problems . . . other frames allow us to see other problems, other causes, and other solutions" (Lakoff and Ferguson 2009). As Schön writes, the "participants in the debate bring different and conflicting frames, generated by different and conflicting metaphors. Such conflicts are often not resolvable by recourse to the facts—by technological fixes, by trade-off analyses, or by reliance on institutionalized forms of social choice" (Schön 1979, 139).

When Rittel and Weber articulated the *wicked problems* concept in the 1970s (Rittel and Webber 1973; Churchman 1967), the limitations of a reductive problem-solving approach had become apparent to those in social policy. An obvious immediate challenge is the complexity of real-world situations. Side effects and ripple effects urge us to expand the considered system boundary (Rittel and Webber 1973, 159). This need to "sweep in" more aspects of the environment to gain a more holistic understanding of the problem situation is potentially never-ending (Churchman 1971, 197; 1979a; Ulrich 1985). Because this difficulty applies to any social problem situation of relevance, "the classical paradigm of science and engineering—the paradigm that has underlain modern professionalism—is not applicable to the problems of open societal systems" (Rittel and Webber 1973, 160).

Wicked problems are often characterized by their original ten properties:

1. There is no definitive formulation of a wicked problem.
2. Wicked problems have no stopping rule.
3. Solutions to wicked problems are not true or false, but good or bad.
4. There is no immediate and no ultimate test of a solution to a wicked problem.
5. Every solution to a wicked problem is a "one-shot operation"; because there is no opportunity to learn by trial and error, every attempt counts significantly.
6. Wicked problems do not have an enumerable (or an exhaustively describable) set of potential solutions, nor is there a well-described set of permissible operations that may be incorporated into the plan.
7. Every wicked problem is essentially unique.
8. Every wicked problem can be considered to be a symptom of another problem.
9. The existence of a discrepancy representing a wicked problem can be explained in numerous ways. The choice of explanation determines the nature of the problem's resolution.
10. The planner has no right to be wrong. (Rittel and Webber 1973)[1]

But skimming this concise list does not do justice to a central difficulty behind the ill-named concept. The complexity of the situation is often considered the primary challenge, but following the ninth criterion leads us to another one that is more profound.

> In dealing with wicked problems, the modes of reasoning used in the argument are much richer than those permissible in the scientific discourse. Because of the essential uniqueness of the problem (see Proposition 7) and lacking opportunity for rigorous experimentation (see Proposition 5), it is not possible to put [a hypothesis for a solution] to a crucial test. That is to say, the choice of explanation is arbitrary in the logical sense. . . . The analyst's "world view" is the strongest determining factor in explaining a discrepancy and, therefore, in resolving a wicked problem. (Rittel and Webber 1973, 166)

The divergent views of stakeholders are based on discrepancies in their worldviews and interests. There is no independent criterion, no "position from nowhere" by which to decide which worldview to prioritize a priori. That is why such situations are "wicked." Many different problem formulations can be given, so a mechanism is needed to evaluate and distinguish these formulations.

The scientific discourse lacks the modes of reasoning—the social rationality—to address this crucial character of wickedness. First, in the positivist tradition, a problem involving many stakeholders is no different from a problem posed by one. There are simply more data, a reason used by experts to marginalize other views (Landry 1995) in the name of scientific expertise. This is where the myths of rational decision-making, value-neutral technology, objective problems, and solvency exert the strongest grip.

Second, some contradictions in conflicting problem statements cannot be resolved via logical means alone because they arise from contradictions in the underlying frames and metaphors used to tell the story about which problems should be solved. These are not simply factual disagreements that could be resolved logically, because they form the conceptual structures and metaphors through which participants see the world and articulate their understanding of it. Problem framing "often depends upon metaphors underlying the stories which generate problem setting and set the directions of problem-solving," and conflicts between the frames used by different stakeholders "are not problems. They do not lend themselves to problem-solving inquiry" (Schön 1979, 150). Instead, many of these contradictions are value conflicts between incommensurable ends. "Ends are incommensurable because they are embedded in conflicting frames that lead us to construct incompatible meanings for the situation" (Schön 1979, 150).

There is no legitimate substitute for democratic reasoning in such situations, and that is why "it becomes morally objectionable for the planner to treat a wicked problem as though it were a tame one, or to tame a wicked problem prematurely, or to refuse to recognize the inherent wickedness of social problems" (Rittel and Webber 1973). Not only does scientific reasoning fail to provide the conceptual framework required to handle this situation, but it hides its own insufficiency by masking the inevitable role of values and politics in the design process. The myths of systems design evacuate the appreciation of the political nature of design and leave behind an impoverished and inadequate model of rationalist problem-solving.

But if there cannot be a singular objective articulation of a wicked problem, then there is nothing that could be *solved*. What exists is a *predicament* offering a space for meaningful action: a messy problem situation that sets a context for a discourse characterized by multiple perspectives that can be mutually contradictory and even irreconcilable. If wicked problems do not have solutions, it is misleading to call them problems. They are quagmires, predicaments, difficult situations. And indeed, when we consider what the ten characteristics are *about*, we notice that they don't describe problems but properties of situations in which problems are formulated by people. The term has misled many scientists, engineers, and researchers into referencing the concept in their exposition of a real-world problem situation, only to advance straight to their proposed "solution," prematurely "taming the wicked problem." In doing so, "they have confused the way they are talking about unsatisfactory situations with reality itself" (Landry 1995, 339). A module for an interaction design course (Wong 2020) is a paradigmatic example of a well-established perspective on design positioned to solve wicked problems. "Have you ever come across a problem so complex that you struggled to know where to start? Then you have stumbled upon a wicked problem." The piece suggests that systems thinking begins with decomposition—"You can utilize systems thinking if you break the information down into nodes (chunks of information such as objects, people or concepts) and links (the connections and relationships between the nodes)" (Wong 2020)—in a paradigmatic uncritical interpretation of the systems idea through an objectivist lens. The module proceeds to advocate for solving wicked problems without recognizing the crucial issue: Divergent worldviews imply conflicting reference systems that require problem negotiation. Instead it assumes that the problem has an existence independent of its formulation. The author interprets the denominating term "problem" in operationalist terms. I have documented the collateral damages straddling the path of this approach in earlier chapters. Even progressive voices seem to fall into the same trap, taking the noun "problem" as the operating concept, merely modified by the attribute "wicked," when they write about "solutions" for wicked problems (e.g., Steel, Lach, and Weber 2017; Wiek, Withycombe, and Redman 2011).

That is why the concept's name is so unfortunate: The name suggests that the concept still fits into the conceptual frame of problem-solving, when its characteristics emphasize the need to transcend it. To see wicked problems as solvable, as many do (Kasser and Zhao 2016; Steel, Lach, and Weber 2017; Wong 2020; Lindberg et al. 2012; von Thienen, Meinel, and Nicolai 2014), is to fall prey to a positivist misunderstanding of the problem concept (Landry 1995). This convenient misunderstanding fits the operationalist mindset perfectly and reinforces the false consciousness of problemism. But wicked problems cannot be solved, neither through design nor through any other means. It is more constructive to focus on *wicked problem situations*—complex, conflict-heavy situations characterized by the ten characteristics, in which different problem frames suggest different interventions.

conflict, n.: Something that does not match up and needs to be fixed. Typically identified between (a) alternative design solutions for a given problem, easily addressed by identifying and modeling the costs, benefits and risks and then trading them off rationally to select the optimum choice (that's what engineers do); or (b) between development branches. (May the wrath of the Gods be upon you in eternity while you slowly roast in hell.) Other forms of conflict are invalid and irrational.

problem, n.: something that can be fixed or solved.

problem-solving, n.: the process of fixing things that aren't broken (because they don't exist) and thereby creating new problems.

EPISTEMOLOGICAL RESTRUCTURING: WICKED PROBLEMS IN CRITICAL SYSTEMS THINKING

When we design in wicked problem situations, we intervene to cause improvement. Dorst (2006) regards "design as the resolution of paradoxes between discourses in a design situation" (17). This primary attention to the discourse has to be a central feature of just sustainability design. But who or what is to be the arbiter of what counts as improvement? Whether something is genuine improvement is a question of legitimacy as much as scientific and other knowledges. What does it take then to design ethically? Critical systems thinking offers a few lessons.

Problems are like framed lenses through which we view a situation. When a *wicked* problem situation invokes issues of sustainability or justice, asymmetric vulnerability shapes the discourse, introduces distortion into the lenses, and thus affects problem framing. Because the conflict-rich nature of the situation brings the political nature of discourse to the forefront, we cannot legitimately assume consensus, but need to appreciate the politics of problem framing. We prepare to do this by examining the epistemic restructuring that resulted in CST.

Proponents of CST recognized the inadequacy of rationalist problem-solving and the illegitimacy of applying physical science methods to social and sociotechnical situations. On the other hand, they also knew first-hand of the technical effectiveness of "hard" problem-solving methods in appropriate contexts. After all, they themselves had developed some of those methods.

To someone subscribed to the ideology of problemism, the shift from problem to situation, from hard to soft systems thinking, and from verification of correspondence to a reliance on consensus, may appear paralyzing. "If we need consensus on everything, we'll never achieve anything. Is that what you want?" But the choice we face is not one between problemism and paralysis. Instead, CST developed an epistemology and methodology to underpin ethical interventions in complex problem situations that makes appropriate use of rationalist methods. In doing so, its proponents had to navigate between the Scylla of positivism and the Charybdis of relativism. They adopted Checkland's shift away from a naive focus on "problems" to an appreciation of the "problem situation." Contrary to Checkland, however, they emphasized how material differences and ideologies shape social reality, so that interpretive perspectives such as soft systems methodology (SSM) are not considered adequate on their own. After all, "one of the most far-reaching exercises of power is in the structuring of the world-views of others, which in turn will be reflected in the definition of a problem" (Thomas and Lockett 1991, 93).

Importantly, Flood and Jackson positioned existing methods and approaches along two axes: the complexity of situations and the complexity of social relations in those situations (Flood and Jackson 1991a; M. Jackson 2003). This allowed them to map out for which kinds of situations existing systems thinking approaches were suitable and to develop multi-methodology frameworks for combining suitable approaches, including *Critical Systems Practice* (M. Jackson 2019). They recognized that the social complexity of problem situations must have primacy in guiding what is an appropriate methodology for intervening in situations. Table 8.1 groups some approaches we encounter in this book in terms of this framework.

Perhaps the hardest lesson from CST is that the critical turn is unwelcome. In facing the difficult task of writing back to the rationalists, soft and critical systems thinkers ultimately failed to convince the mainstream to change direction (Ulrich 2004; M. Jackson 2019; Kirby 2003). But they created organizational and institutional change and significant new streams of research, practice, and education that can help us restructure and reorient systems design in computing.

Structurally and historically, there is a striking parallel and a direct lineage between the rationalist mainstream in operations research (OR) that CST challenged and the rationalist design mainstream that still dominates computing. The myths of computing originate in the sphere of OR with which it shares its roots. The ambition to intervene in the world, which emerged so boastfully in OR, has only grown in computing. What is different today? The effects of computing have scaled up and now have significant aggregate structural impact (recall the classification from chapter 1). Rationalist theories and methods have absorbed and assimilated some of the critical terminology (without adopting its intent). Tech companies are much more powerful than before. And just sustainability raises the additional challenges of asymmetric vulnerability and moral corruption.

Table 8.1 Classifying systems approaches (adapted from Jackson 2003)[a]

		Stakeholders (*social complexity*)		
		Unitary	**Pluralist**	**Coercive**
Situation (*domain complexity*)	**Simple**	General systems theory	Soft systems methodology	Critical systems heuristics
	Complex	System dynamics, cybernetics, climate models, systemic effects of ICT for sustainability: SusAF[b]		Systemic intervention, critical systems practice, autonomous design,[c] just sustainability design

[a] Jackson (2003) adapts this from the original system of systems methodology (Flood and Jackson 1991a). In my version, the axes are renamed for consistency—"Participants" have become "stakeholders" to include those affected but not involved, and "systems" (which originally was called "problem context") has become "situation." Note that "coercive" situations include situations in which coercion is "mild," while "pluralist" refers to approaches that do not come equipped to recognize power and coercion.

[b] SusAF, introduced in chapter 1, remains silent about social complexity, and its language suggests that it models (corresponds to) real effects in the same way as system dynamics and other hard systems approaches do.

[c] I place autonomous design here, rather than in the center, although the suggested design process or approach itself does not appear to incorporate ways to handle the nature of situations characterized by the "coercive" label. There are two reasons. First, Escobar's critical intent lies in the ontological reorientation and in creating a space in which autonomous design can flourish, protected from the coercive nature of the patriarchal, rationalist design paradigm. Second, the principles of autonomous design are decidedly pluralist and reminiscent of soft systems thinking (Escobar 2018, 184–85), but it is worth noting that Escobar speaks of "building *a* model of *the* system that generates *the* problem" (Escobar 2018, 185; emphasis added), which runs counter to soft systems epistemology.

To *do* just sustainability design, we need a design methodology that is robust, critical, multi-methodological, able to handle both domain complexity and social complexity, *and* is able to incorporate and justify rational methods for their appropriate use. Rationalist methods must become components of reflective methodologies with a critical orientation. CST provides the theory and methodologies for doing just that:

for embedding computational problem-solving into a critically systemic design approach. In the next section, we explore how it can help us organize the social life of systems design to be critically appreciative and technically effective.

TOOLS FOR THE POLITICS OF FRAMING A PROBLEM

CST resulted in important conceptual frameworks, methodologies, and methods. Critical systems heuristics, introduced in chapter 5, may be the most robust and well-defined framework. Jackson positions it on the "simple" range of domain complexity, and it is true that it does not in itself provide concepts to address domain complexity, but it has been applied in highly complex situations, including the evaluation of sustainable development (Reynolds 2007). We will see more of it soon.

Recall that CST aims for (1) critical reflection on normative claims, (2) emancipation, and (3) methodological pluralism. In Ulrich's words,

> It is only by giving an equal status to the rationalities of the involved and the affected that we can prevent the former from making themselves the judges who define the measure of improvement. In short, the affected must be helped to emancipate themselves from the rationality of the involved, from the premises and promises of the "experts." [so we need] a *dialectic of expertise and emancipation*, of professional competence and democratic participation of citizens. (Ulrich 1983, 290)[2]

Midgley built on CSH to advocate a shift to process philosophy to overcome some of the inherent dualist challenges central to twentieth-century philosophy. His process philosophy centers on the activity of making boundary judgments, which simultaneously gives rise to the object and to the subject making the boundary judgment. In his methodology, systemic intervention, first-order boundary critique reflects outwards on the boundaries of the object, while second-order boundary critique reflects back on the boundaries of the "knowledge generating system" making the first boundary judgment (Midgley 2000), say a team of operations research practitioners in a social housing project (Midgley, Munlo, and Brown 1998). Here, boundary critique enables a structured reflection, using CSH, on positionality, situated knowledges, privilege, marginalization, and emancipation. Through such reflection, Midgley (1992) recognizes and addresses ethical dilemmas, and he shows how power asymmetry in systems design leads to the marginalization and devaluation of some stakeholders and their views to a profane status while others are elevated to a sacred status beyond debate.

We can observe this tendency in much of the discourse about smart cities. Shannon Mattern (2017) quotes and criticizes a tech writer's view of the smart city: "The city is a computer, the streetscape is the interface, you are the cursor, and your smartphone is the input device" (Mcfedries 2014, 36). Note how the metaphor relocates city life into the domain of computing, where the speaker is the expert. What role do participants have in this approach to design their urban future after this relocation? What rights do they have? In many smart city approaches, professional knowledges and technological expertise have served to marginalize the interests, perspectives, and values of those who have to live with the outcomes of technology-driven urban planning (McCord and Becker 2019).

This is often done under the guise of participation itself and can be quite insidious. In the Sidewalk Labs Toronto project, for example, which was ultimately abandoned after significant pushback from organized civic rights advocacy groups (Wylie 2020), public townhalls called for broad participation. Those who attended were assigned to small groups. Each group was to respond to a predefined question. No opportunity was included to speak up, voice concerns, and create a conversational space among the attendants other than that predesigned by the organizers (McCord and Becker 2019). Effectively, those affected are configured *by design* into the role of a data source or data collector rather than a designer or decision-maker (Palacin et al. 2020). Like a cursor, indeed, they are moved around by someone else.

CST provides the concepts to make this visible and the methodologies to do better. In urban life, and today in the smart city debate, what is sacred is often the professional expertise of the technologists and the market logic of neoliberal capitalism, while those who must live the consequences of smart city developments are considered mere service consumers. As Ulrich (1983) asserts: On the topic of their lived experience, only the residents are the true experts, and ultimately, only those who are in some form affected by a development can lend legitimacy to it. The proposals of professional experts are of course often informed by a profound understanding of the pertinent challenges and opportunities of domain complexity. But their legitimacy ultimately rests on democratic grounds: involvement of, and power to, those affected. CSH supports us in making visible how expert knowledge and lived experience are situated. By using it to question the stated purposes and their justifications, we can map the reference system of assumptions and values on which a project rests. In the less-than-ideal case where those in "sacred" positions refuse to open up their claims for scrutiny, CSH at a minimum allows us to make visible that the situated knowledges of the experts cannot legitimately be justified (McCord and Becker 2019). In an ideal case, CSH allows either for the emergence of a richer shared understanding or a *discordant pluralism* in which multiple worldviews coexist without being forced to reconcile all disagreements. The latter is a CST concept well suited to what Escobar (2018) later calls a pluriverse—it is "local, contingent and historically situated" (Gregory 1996b, 52), it brings radically contradicting perspectives into dialogue without assuming reconciliation and closure, and it nevertheless maintains the need for a normative stance to anchor ethical decision-making.

Through these and other arguments, proponents of CST made important methodological contributions to social science, most importantly on action research, multi-methodology, reflexivity, participation, and socio-technical systems. The restructuring performed in the critical turn in systems thinking engaged deeply with social theory; widened the epistemic horizon beyond the hard and soft systems paradigms; and developed a critical systems theory that can underpin multi-methodological practice.[3]

The differentiation in domain complexity and social complexity helps us see what went wrong with the *wicked problem* concept. From an orthodox rationalist viewpoint, the salient characteristics of wicked problems appear as features of *domain complexity*. They characterize hard, complex problems. There is nothing more appetite-inducing for those of us trained in science and engineering! The interaction design course mentioned previously is one of countless examples dominated by questions focused on that one dimension. The well-meaning sustainability engineer I mentioned in the Introduction who wanted an approach to solve the wicked problem of sustainability is one of many educated in such thinking. Meanwhile, this viewpoint easily overlooks that what truly makes those situations wicked is the *social complexity* they entail: conflicting worldviews, incommensurability, and the effects of power, marginalization, false consensus, asymmetric vulnerability, and moral corruption. And to make it worse, this viewpoint lacks the reflective awareness to recognize its own false consciousness.

To summarize: any articulation of a problem relevant to a situation is made by someone, implies a worldview, and represents a framing that works like a lens placed in front of the situation. Problem frames can be traced to their assumptions and worldviews. Schön and Lakoff suggest that we examine deep frames, frame conflicts, and value conflicts among stakeholders. CST provides the conceptual tools to do so. We can use CSH to make visible the reference system that underpins each problem frame. Ulrich also points us to the interlinking between claims about system boundary, facts, and values. Following Midgley, we can engage in first- and second-order boundary critique to reflect on the boundaries of the frames and the knowledge generating system producing those frames simultaneously. Boundary critique and CSH will also help us detect whether the politics of a situation provide conditions for genuine participation.

As Gardiner writes, "[t]he dominant discourses about the nature of the climate threat are scientific and economic. But the deepest challenge is ethical" (2014, xii). Just sustainability design must face this challenge, step by step. Chapter 10 demonstrates how CSH can be introduced into an engineering process to explicitly guide the participants' attention toward a reflexive understanding, facilitate first- and second-order boundary critique, support the development of critical appreciation, and meaningfully orient the focus of design toward the emancipation of those most affected. But before that, I will illustrate what the epistemological shifts in systems thinking mean for the evaluation of sustainability and sustainable development.

EPISTEMIC RESTRUCTURING IN SUSTAINABILITY

The soft and the critical turns in systems thinking have manifested in generations of systemic frameworks for evaluating sustainability. Initial frameworks such as the World Model underpinning the Club of Rome report were based on a hard systems worldview taking the correspondence of models to the real world as a starting point. Variables such as the world population, the degree of industrialization, the average temperature, and the amount of CO_2 emitted yearly are assumed, and their dynamic causal relationships are modeled. These models produce high-level sustainability indicators (biomass, warming, etc.). These are crucial to understand aggregate impact on a planetary scale and assess to what degree humanity is exceeding planetary boundaries. The underlying epistemology is reflected in small-scale frameworks such as the SusAF model introduced in chapter 1 as well, even if the models are declared speculative.

Later generations of sustainability evaluation frameworks took a more situated, localized standpoint, often aiming to evaluate regional efforts. This is not in conflict: they address different problem situations. But when bringing the evaluation of sustainability into local contexts, Bell and Morse (2008) learned that hard systems approaches were simply not up to the task. They are perfectly capable of addressing domain complexity but struggle on other fronts. A crucial issue for a localized application of a sustainability evaluation framework is the definition of boundaries in time, space, and social sphere. These issues can be sidestepped and avoided in large-scale global models because the planetary boundary makes for easy consensus. But where exactly is the boundary to set when evaluating the effects of a new airport runway? A highway expansion? A train line? Geographic categories soon turn out to be problematic for many reasons. With each shifting of a boundary, different facts become relevant, different stakeholders are identified, and different value judgments are brought to the forefront. Different evaluation frames are sometimes commensurable and reconcilable, sometimes not.

Bell and Morse recognized that the hard systems view is inadequate for this social complexity and turned to soft systems thinking in the form of SSM. Their systemic sustainability analysis (SSA) is "the participatory deconstruction and negotiation of what sustainability means to a group of people, along with the identification and method of assessment of indicators to assess that vision of sustainability" (Bell and Morse 2008, 147). Based on the pluralist belief that divergent opinions can be negotiated, SSA specifies sustainability as a subjective evaluation of a system. The Imagine approach to perform SSA is decidedly a soft systems approach built on reflective action research and subjectivist epistemology. Based on "understanding the context" through a wide range of techniques, including visual tools and system definitions adopted from SSM, Imagine aims to identify a wide range of stakeholders. The approach explicitly embraces their multiple views of sustainability, but it remains silent on how real conflict can be detected and resolved. The inclusion of stakeholders in the process is intended to guarantee that a comprehensive view is represented once agreement is reached (Bell and Morse 2008, 170), but it should be clear by now that this is far from guaranteed. The authors acknowledge the problematic imbalance of expertise and power inherent in the colonial nature of "sustainable development," in which supposed experts from developed countries define sustainability for developing countries (Chambers 1997; Escobar 2011; Gómez-Baggethun 2019), but they do not perform the critical turn. Instead, "participation and inclusion" is labeled an "outstanding issue" (Bell and Morse 2008, 196). This definitely seems a missed opportunity. In contrast, Martin Reynolds's (2007) work on evaluating sustainable development projects applies CSH. This produces a nuanced view of the *social complexity* dimension but remains comparably silent about domain complexity: that is, the content of sustainability evaluation itself.

These three approaches illustrate how each systems paradigm orients evaluation. Table 8.2 summarizes the viewpoints. Clearly, a critically systemic approach for evaluation will need to reintegrate hard systems approaches for handling domain complexity on appropriate and legitimate social foundations. This is a core challenge that just sustainability design needs to work toward. Recent CST work can provide the methodological basis for that, because this is precisely what it grappled with (Midgley 2000; Jackson 2019).

ENCOUNTERING SUSTAINABLE DEVELOPMENT

With all this in mind, let us briefly revisit the nature of "sustainable development" and its predecessor, development. In *Encountering Development*, Arturo Escobar retraces the invention of "underdevelopment" in the late 1940s and writes: "Development fostered a way of conceiving of social life as a technical problem, as a matter of rational decision and management to be entrusted to that group of people—the development professionals—whose specialized knowledge allegedly qualified them for the task" (Escobar 2011, 52). World Bank economists rejoiced in the "marvellous

Table 8.2 Sustainability evaluation on hard, soft, and critical systems terms

Sustainability	. . . on hard systems terms	. . . on soft systems terms	. . . on critical systems terms
Examples	World Model, IPCC reports	SSA/Imagine	Evaluation based on CSH
Strengths	The integration of scientific evidence across a wide range of sciences using the full force of modeling techniques produces the most reliable assessment we know of aggregate human impact on life on this planet.	The participatory, interpretive approach introduces pluralist perspectives, addresses difficulties of incommensurability, and assures broad participation from stakeholders.	The approach addresses social complexity and power by making visible the sources of motivation, control, expertise and legitimation. By addressing the social complexity dimension, the approach has the best claim to legitimacy. This is also the only framework that directly speaks to the ethical dimension of asymmetric vulnerability.[a]
Gaps	Because of the absence of a conceptual framework to address social complexity, silent exercises of power determine the terms and boundaries of debate. Divergent viewpoints are marginalized to "profane" status. The evaluation is profoundly political, but its political nature is not subject to an open and equitable debate.	Because of the absence of social theory to recognize and handle the exercise of power, dominant viewpoints will still determine the terms and boundaries of evaluation and marginalize divergent views.	CSH does not provide *content* for dealing with domain complexity. Instead, it relies on existing hard and soft approaches as appropriate. This means it requires its practitioners to understand all three and navigate their epistemic differences.

Note: a. CST also supplies ample conceptual arguments to extend the consideration of stakeholders beyond the human (Ulrich 1983; Midgley 2000; Stephens, Taket, and Gagliano 2019).

number of practically insoluble problems" they found in countries like Colombia (Escobar 2011, 55) after the World Bank itself "defined as poor those countries with an annual per capita income below $100 . . . if the problem was one of insufficient income, the solution was clearly economic growth" (Escobar 2011, 24). Here too on this grand historic scale, the specification of the problem had left only room for one solution.

When it became clear that there was no way the planet could sustain eight billion people *at the level of material activity of the Global North*, two responses dominated. Both were colonial. One blamed "overpopulation" (again, the problem implies its solution). The other buried the concept of nature and elevated in its place the "management of natural resources"—"the twin of gluttonous vision. . . . What is at stake for these groups of scientists and businessmen . . . is the continuation of the models of growth and development" (Escobar 2011, 193). While earlier, "redistribution of wealth was the favored option to harmonize environmental protection and social justice" (Gómez-Baggethun 2019, 71), with sustainable development, "growth was no longer presented as the cause of environmental problems but as the remedy" (Gómez-Baggethun 2019, 71). The primacy of development was reified by qualifying it as "sustainable" under certain conditions:

> two old enemies, growth and the environment, are reconciled (Redclift 1987). The [Brundlandt] report, after all, focuses less on the negative consequences of economic growth on the environment than on the effects of environmental degradation on growth and potential for growth. It is growth (read: capitalist market expansion), and not the environment, that has to be sustained. (Escobar 2011, 195)

In other words, the aim of sustainable development was "to save 'the religion' of economic growth and to deny ecological breakdown" (DeMaria and Latouche 2019, 149). In doing so, sustainable development framed the relationship between current and future generations as a conflict and manifests a colonial ideology reinforcing institutions dominated by the Global North.[4] This is not to say that the pursuit of most UN Sustainable Development Goals is unworthy, but that "sustainable development" as a framework cannot provide an ethical foundation for just sustainability design.

CONCLUSIONS

Wicked problems are not problems; they are situations characterized by conflicting goals and irreconcilable worldviews. Wicked problems cannot be solved as such because their existence is neither singular nor objective. To see wicked problems as solvable is to fall prey to an operationalist and positivist misunderstanding of the problem concept. Recognizing this trap allows us to pass it by. "The kinds of . . . activities that seem to meaningfully contribute toward sustainability are not those that solve well-defined problems, but rather those that contribute more subtly to a shift in culture or power. While this leaves us in the uncomfortable position of not necessarily knowing what to design . . . it does at least mean that we are looking in the right place for inspiration to strike" (Knowles, Bates, and Håkansson 2018, 7).

This chapter disentangled how domain complexity in wicked problem situations relates to social complexity. This helps us to better understand why rationalist approaches in design are so ill-equipped to design for sustainability and justice: When they handle social complexity at all, they handle *it as a case of domain complexity*. They treat the divergence of stakeholder views and the incommensurability of underlying worldviews as solvable problems of known complexity rather than as challenges to their own worldview. That usually serves those who design rather well. In problemism, the privilege hazard meets Gardiner's danger of moral corruption.

In situations where sustainability or justice are central concerns, irreconcilable worldviews meet asymmetric vulnerability. This creates a strong distorting force for marginalization and moral corruption. To ethically address real-world complexity in wicked problem situations and develop effective interventions, just sustainability design must first address the *ethical* complexity in the situation. This means to prioritize legitimacy over technology, which requires us to focus on establishing a fair discourse. Because the ideal speech situation can never fully be established, we turned to the dialectical tools of critical systems thinking to complete the proposed restructuring of systems design away from problemism toward just sustainability design.

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