

1 **Equity and Infrastructure Asset Management: Promoting Community Outcomes in the Water Sector**

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9 **ABSTRACT:**

10 Water utilities across the United States are being tasked with paying increased attention to inequities  
11 experienced in the communities they serve. This paper examines whether a widely used decision  
12 process within the sector, infrastructure asset management, is compatible with this desire to advance  
13 equity. Using three dimensions of equity - distributional, procedural, and recognitional - to interrogate  
14 asset management as currently practiced in the US, we question some of its deeply held principles. The  
15 Environmental Protection Agency has five core asset management questions which focus on asset  
16 systems, sustainability, and long-term costs to the utility; we propose that different core questions are  
17 needed to reconcile the asset management system with equity and realize larger community outcomes.  
18 A case study is presented showing one utility's attempt to do that by basing their asset management  
19 system in the needs of their oppressed communities. In the end, the authors of this paper remain  
20 skeptical about using asset management to drive community equity. Asset management was invented  
21 and evolved in a larger system that produces racial inequities, and we are not confident that it can be  
22 transformed enough to drive equity.

23

24 **PRACTICAL APPLICATIONS:**

25 Asset management’s focus on assets, sustainability, and costs does not promote social justice. To  
26 achieve equity, the water sector needs to reorient their focus to larger community outcomes. Racial  
27 equity requires radical and transformative changes in society, including to infrastructure systems. Water  
28 managers have a responsibility to push for changes to infrastructure planning and decision-making in  
29 their organizations.

30

31 **AUTHOR KEYWORDS:** Community Outcomes, Social Justice, Asset Management, Racial Equity, Water  
32 Management, Infrastructure Planning

33

34 **INTRODUCTION:**

35 Public and other utilities across the US are being tasked with paying increased attention to inequities  
36 experienced in the communities they serve. As amply demonstrated by the Environmental Justice  
37 movement over the last decades, infrastructure is not supporting all communities equitably (Schlosberg  
38 2013). Starting with that background, the purpose of this paper is to question some of the deeply-held  
39 principles used in decision making around infrastructure, specifically how they are implemented through  
40 asset management programs. This exploration is not being done because of the belief that asset  
41 management is bad and needs to be disregarded, instead it is being undertaken because addressing the  
42 inequities in US society requires interrogation of systems, structures, and decision processes to ensure  
43 that the decisions which are made contribute to the wellbeing of all communities. We need to be willing  
44 to have truly transformative change, and that starts with challenging how we do things. We need to look

45 for the harmful and covert, embedded assumptions within our decision processes that don't seem racist  
46 or inequitable on the surface, but uphold systems of oppression.

47 Within the water management community, there has been much recent interest in racial equity and  
48 how to advance racial justice. Much of this work relates to the blatant racial disparities seen in places  
49 like Flint, Michigan (Pulido 2016). In parallel to this, others have been examining asset management and  
50 how to evolve the practice to meet today's challenges in the water sector (Pathirana et al. 2021; Ugarelli  
51 and Sægrov 2022). These two topics have so far, however, been separate conversations. This paper  
52 brings these two areas of water management together and focuses not on the question of if they are  
53 compatible but on how they are, or are not, compatible.

54 This paper asks if it is possible for asset management to drive equitable community outcomes. And in  
55 thinking about this question it is important to further examine some additional questions:

- 56 ● How does our water governance intersect with inequitable community outcomes?
- 57 ● How does asset management exacerbate these outcomes?
- 58 ● How can it serve to improve these outcomes?
- 59 ● What covert racism is built into asset management?

60 More specifically this paper explores the ways in which the underlying premises and assumptions of  
61 asset management dehumanize people. This paper is not a moral judgement of Asset Management as a  
62 body of practice, rather it is an examination of how this approach contributes to and upholds systems of  
63 harm. To change Audre Lorde's famous statement into a question: Can we use the tools of the master to  
64 dismantle the master's house? Can we use the tools of the master to build a new house that is  
65 welcoming to all?

66 **Equity**

67 In order to examine the questions above, we must first define what we mean by equity. Unlike equality,  
68 equity does not require the exact same treatment for everyone. Rather, equity requires us to take the  
69 history and enduring legacy of unfair treatment into account (Keeler et al. 2020). Following Seigerman et  
70 al (2022 p. 3), “Equity means ensuring that people have fair opportunities to participate in society  
71 through interconnected dimensions of recognition, procedure, and distribution”. This framework has  
72 been used in many studies over the years since it was outlined by Schlosberg (2007) as a framework for  
73 environmental justice.

74 One dimension of equity is distributional equity. This is defined as “the fair allocation of resources,  
75 material benefits and burdens, risks, and opportunities” (Seigerman et al. 2022 p. 4). Inequitable  
76 distribution of environmental ‘bads’ was the initial impetus of the environmental justice movement, and  
77 distributional equity is what most people think about when they envision equity in the water sector  
78 (Schlosberg 2013). But, failure to recognize that equal is not fair is a challenge in the sector (Osman and  
79 Faust 2021). Even so, equal treatment is not achieved in some places; for example Levin et al (2024 p.  
80 15) found that “in the poorest of communities race and ethnicity matter most in determining drinking  
81 water quality”.

82 Procedural equity is when decision making processes include fair participation. Fair participation is  
83 different from simply providing opportunities for engagement in that it is an intentional process  
84 designed to reach a representative cross section of impacted communities in a way that is approachable  
85 to a variety of ways of being. For this dimension of equity to exist, the processes cannot be tokenistic or  
86 cosmetic, instead they need to address power imbalances (Arnstein 1969; Lee 2020).

87 Recognitional equity has to do with making sure all of the appropriate differing needs and values of a  
88 community are included. Langemeyer & Connolly (2020 p. 5) emphasize that recognitional equity is  
89 “most closely aligned with perceptions because it involves acknowledging people’s distinct identities

90 and histories.” This means that differences in values, connections to water, historical and current  
91 experiences of discrimination, and ways of knowing and understanding the world must be part of water  
92 management. It involves fully recognizing the technical knowledge that comes from community  
93 members, while also valuing and acting on knowledge that is not quantitative or technical.

94 One further concept that is important to understand for the questions we are asking is - community  
95 outcomes. When we use this term in the paper we are not referring only to the direct services provided  
96 as intended by the infrastructure being discussed, such as drinking water provision or sewage  
97 conveyance and treatment. We are also referring to all the outcomes experienced by the community  
98 both directly and indirectly related to the infrastructure. This includes things like air pollution impacts  
99 from the infrastructure (positive or negative), disruptions due to construction and maintenance, how  
100 the infrastructure impacts a sense of history and connection to place, perceptions of trust either  
101 engendered or damaged by the process, to give a few examples.

## 102 **Asset Management**

103 Asset management has been around for several decades. The first references in the academic literature  
104 were in the finance and management contexts, with some evidence that it originated in accounting and  
105 economics (Alegre and Coelho 2013; Manase 2016). In the 1970s it started being applied to  
106 infrastructure systems, starting with the oil and gas industry (Manase 2016). Asset management that is  
107 applied to large infrastructure or public services is generally referred to as “engineering” asset  
108 management or “infrastructure” asset management (IAM).

109 Infrastructure asset management became attractive to water managers in the US after Federal funding  
110 was reduced in the 1980s and agencies had to rely more on local rate funding, causing the financing of  
111 water infrastructure to become more resource constrained (Pathirana et al. 2021). Prior to that water  
112 sector decision making was more reactive and less focused on the sustainability of their systems

113 (Pathirana et al. 2021; Ugarelli et al. 2007). The main shift has been in risk perception among water  
114 managers; prior to this risk was only thought of in financial terms, or in terms of regulatory compliance,  
115 but asset management attempts to use a triple bottom line approach where financial, environmental,  
116 and social aspects are all considered (Grigg 2012; Marlow et al. 2010, 2013). In the infrastructure  
117 context, asset management is implemented in an attempt to “ensure that infrastructure performance  
118 corresponds to service targets over time, that risks are adequately managed, and that the corresponding  
119 costs, in a lifetime cost perspective, are as low as possible” (Alegre and Coelho 2013 p. 49).

120 Definitions of IAM differ in what is emphasized. Most definitions include several key features, including  
121 focusing on asset condition, evaluation of success in meeting service targets known as Levels of Service,  
122 risk management and risk reduction, and examining the cost effectiveness or return on investment of  
123 infrastructure decisions using lifecycle costs and benefits (Alegre and Coelho 2013; Amadi-Echendu et al.  
124 2010; Grigg 2012; Marlow et al. 2010; Pathirana et al. 2021). The previous focus on short-term financial  
125 valuation and likelihood of failure was becoming unsustainable (Ugarelli et al. 2007; Amadi-Echendu et  
126 al. 2010). Prioritization of maintenance and replacement activities became important, and asset  
127 management offered a way to do that by using the risk of failure of an asset to drive investment  
128 decisions (Ugarelli et al. 2007; Grigg 2012).

129 In the water sector, many organizations have structured their programs around a set of five core  
130 questions proposed by the US Environmental Protection Agency in 2008 (Jones et al. 2014):

- 131 1. What is the current state of my system’s assets?
- 132 2. What is my required “sustainable” level of service?
- 133 3. Which assets are critical to sustained performance?
- 134 4. What are my minimum life-cycle costs?

135 5. What is my best long-term funding strategy?

136 The rest of this paper is structured around these questions and the three dimensions of equity in order  
137 to interrogate the foundational principles of asset management in the water industry. The next section  
138 will examine distributional equity and the first question's focus on assets. The section following then  
139 looks at procedural equity and the focus of questions 2 and 3 on sustainability. After that, section 4  
140 discusses recognitional equity in relation to the prioritization of costs and funding that are in the final  
141 two EPA questions. Section 5 is an example of how one organization has tried to integrate equity into  
142 asset management practice. This example is from the authors' own professional experience in  
143 attempting to bring community outcomes into prominence in a water organization's Strategic Asset  
144 Management Plan. The paper concludes with some final thoughts on ways to bring equity into asset  
145 management and recommendations for water managers.

146

#### 147 **DISTRIBUTIONAL EQUITY AND IAM'S FOCUS ON ASSETS**

148 In this section we will be exploring distributional equity and its nexus to the IAM question of "What is  
149 the current state of my system's assets?" This dimension of equity is appropriate to the IAM question  
150 regarding the state of assets because distributional equity looks at fair allocation of not only resources  
151 to maintain infrastructure and quality of infrastructure, but also the burdens, risks, and opportunities  
152 associated with the services infrastructure provides. If distributional equity is adhered to with fidelity, it  
153 then should go beyond just the mere condition and state of assets to intangibles such as systems,  
154 approaches, and ways of thinking about infrastructure.

155 The EPA questions begin with: What is the current state of my system's assets? Which is an appropriate  
156 place to start, given the name 'asset' management. But what does a focus on assets really mean for  
157 water organizations and communities? As explained by Alegre and Coelho (2013 p. 61), Infrastructure

158 asset management “planning starts from an existing infrastructure and aims at optimizing its behavior  
159 over the analysis period, enabling a progressive improvement of the infrastructure condition and  
160 functional response.” Notably, the standard practice of infrastructure AM planning does not take into  
161 account wider community outcomes, outside of the specific services provided by infrastructure, as a  
162 result of optimizing asset performance. For example, IAM planning has not considered the context in  
163 which a system was developed, such as the displacement of communities for the development of large  
164 scale infrastructure projects. This leaves planners blind to the potential historic and present burdens  
165 placed on communities as a result of how infrastructure is distributed in space. And, it ignores that  
166 development comes with its own stated goals and outcomes that are imposed on communities, often  
167 disregarding the needs of the people who are displaced. In many communities, deteriorating assets are  
168 a big concern, and something that water agencies need to address (ASCE 2021), particularly since poorer  
169 quality assets tend to be concentrated in poorer and marginalized communities (Pulido 2016). But it has  
170 to be addressed with an eye to equity, notably distributional equity, and the aspects of distributional  
171 equity that go beyond hard infrastructure to the more intangible.

172 Unfortunately, the question on the current state of a system’s assets prompts water managers to  
173 continue the traditional orientation of water engineers toward technology rather than people or nature  
174 (Brawley-Chesworth 2023). In prioritization of asset condition, water managers look first and foremost  
175 at technology as both the problem and the solution. A shift in the last decade away from a focus on  
176 individual assets and onto systems, for example, examining wastewater collection and treatment as a  
177 whole system, does not alter this focus on technology (Pathirana et al. 2021).

178 Equity instead requires us to focus on people and communities. Just as important as considering the  
179 condition of a system's assets, water managers need to also consider the conditions of the communities  
180 those assets serve. While improved technology may be needed, assets can be in perfect condition and  
181 still not meet the needs of communities. An example of this that has been widely studied by

182 Environmental Justice advocates is the siting of infrastructure. Which communities are burdened by our  
183 industrial-scale model of infrastructure provision (Schlosberg 2013)? Who lives near wastewater  
184 treatment plants and suffers most from their emissions and is impacted by the traffic generated by  
185 them? By focusing on whether the treatment plant is in good condition we never question the  
186 underlying model of concentrating the impact in one community by relying on a large facility model of  
187 wastewater treatment which inevitably will be located near those with the least amount of power. By  
188 starting with the status of the pipes, pumps, and basins, we fail to question whether a whole different  
189 type of system, be it a distributed system, a nature-based system, or something else, would be more  
190 equitable and serve our communities better.

191 In summary, a focus on asset condition is not supporting equity. Prioritizing existing assets and how well  
192 they are performing ignores questions about who is not being supported by those assets, whose needs  
193 were prioritized when the assets were initially put in place, and what communities are benefitting from  
194 the services provided by those assets. Equity considerations would instead prompt us to ask: Who is  
195 currently being well served by my system's assets, and who is being unserved or underserved; what is  
196 the condition of those communities; are the assets in good condition spread equitably throughout our  
197 communities; and, how well are services being provided to my communities, whether those services  
198 involve assets or not?

199

## 200 **PROCEDURAL EQUITY AND IAM'S FOCUS ON SUSTAINABILITY**

201 This section relates procedural equity to the EPA Asset Management questions: "What is my required  
202 sustainable level of service?", and "which assets are critical to sustained performance?" Procedural  
203 equity is when decision making processes include fair participation. Fair participation is different from  
204 simply providing opportunities for engagement in that it is an intentional process designed to reach a

205 representative cross section of impacted communities in a way that is approachable to a variety of ways  
206 of being. Notice that this does not mean that people are provided with the opportunity to participate, or  
207 that participation is sought, but rather that there is fairness in who actually participates. The  
208 participation in decision making by marginalized communities is often seen as a 'nice to have' rather  
209 than a necessity, and is thought to take too much time and effort to be genuinely implemented in the  
210 water sector (Adib et al. 2023; Araos 2023).

211 Returning to the asset management questions, the two we are examining here are centered on  
212 sustainability. Sustainability is an aspiration to, in the words of the Brundtland report, ensure that  
213 development "meets the needs of the present without compromising the ability of future generations to  
214 meet their own needs" (World Commission on Environment and Development 1987). At its heart is  
215 intergenerational equity. So, the focus on sustainability in EPA questions two and three in some ways  
216 ties asset management directly and explicitly to equity, which is making sure this generation does not  
217 deplete resources needed for future generations. Do these asset management questions reflect the  
218 spirit of the Brundtland report's definition of sustainability? And, what about intragenerational equity,  
219 which is disparities between people living now and is generally the focus of the Environmental Justice  
220 movement? Does asset management's aspiration of sustainability drive equity among people living  
221 today?

222 In practice, sustainability in the water sector has focused on maintaining current service levels into the  
223 future (Pathirana et al. 2018). There has been a movement to make decisions using a 'triple bottom line'  
224 approach, where social, economic, and environmental interests are all considered. But, the political and  
225 economic system's focus on growth and competition between cities has meant that economic interests  
226 have been prioritized, with environmental and equity concerns taking a back seat (Long 2016). As  
227 Zwarteveen et al (2017) have found, equity and justice are assumed to just happen when organizations  
228 prioritize efficiency and economic sustainability. The current state of our communities show that this is

229 naive at best and harmful in practice. Sustainability conversations in the water sector have not resulted  
230 in equitable or just water management. Here are a few examples: First, the Flint, Michigan water crisis  
231 was a stark example of this, where an attempt to achieve financial sustainability of service resulted in  
232 low-income, predominantly Black residents suffering from high levels of lead in their water (Pulido  
233 2016). Second, scholars have found inequitable implementation of vegetated stormwater infrastructure  
234 in communities across the country (for examples, see Finewood 2016; Shokry et al., 2020) where  
235 technical considerations were prioritized over community needs. This resulted in ‘green gentrification’,  
236 where environmentally-friendly infrastructure caused displacement of low-income residents and  
237 residents of color when the infrastructure was built in a way that attracts wealthier, white people  
238 instead of supporting the cultural values and desires of the existing residents of color. A final example is  
239 the displacement of historic Black communities on higher ground in and around Miami as sea level rise  
240 makes those areas more sustainable than low-lying beachfront (Grove et al., 2020; Stewart 2024).

241 These criticisms of sustainability have not gone unaddressed. In asset management, like in many other  
242 disciplines, there has been a movement toward focusing on resilience rather than sustainability (Jones  
243 et al., 2014). The concept of resilience has itself evolved over time. It originated in ecology, where  
244 resilience is the ability of a biological system to absorb change while maintaining the fundamental  
245 relationships between populations (Holling 1973). In engineering, resilience is the ability of a built  
246 system to withstand stress without failing (Wilson 2016). And, as with sustainability, resilience for water  
247 engineers has continued to focus on maintaining the status quo, rather than transforming systems,  
248 anticipating future community needs, or driving equitable community outcomes (Dziedzic et al. 2021;  
249 Grabowski et al. 2017).

250 This engineering definition of resilience as robustness of the system so that it can ‘bounce back’  
251 prevents asset managers from realizing the fundamental need to change relationships and structures in  
252 order to ‘bounce forward’ to a better, and equitable, future (Adger 2000; Keck and Sakdapolrak 2013).

253 An example of this is the rebuilding of infrastructure systems after Hurricane Maria, where traditional  
254 decision systems are being challenged by communities who are advocating for a better, more just  
255 system rather than rebuilding what existed before the storm or imposing the dominant standard  
256 technologically-heavy solutions (Arce-Nazario 2018). Additionally, with climate change we already know  
257 that today's infrastructure will not adequately serve communities of tomorrow, as we see with rising sea  
258 level impacting infrastructure in coastal communities (Wakefield 2019). In fact, they are not even  
259 adequately serving some communities today, as amply demonstrated by the Environmental Justice  
260 movement (Banzhaf et al. 2019). The sustainability and resilience conversations in IAM have not been  
261 adequately addressing these questions.

262 Procedural equity theoretically comes into asset management via levels of service, which is the main  
263 way sustainability and community needs are included in asset management. Levels of Service (LOS)  
264 interpret asset management objectives and clarify the services an organization intends to deliver. LOS  
265 statements typically focus on services, and functions, rather than specific outcomes; and they should  
266 relate to service attributes, such as the quality, extent, and reliable performance of services. They  
267 should also be understandable to customers and the community (IAM 2021). LOS are based in three  
268 drivers: regulatory, technical (i.e. asset-based to ensure long-term performance), and community needs  
269 (Kerr Wood Leidal Associates Ltd. 2018). The community element should make LOS amenable to equity  
270 considerations. However, in practice water organizations have focused on regulatory and technical LOS,  
271 with a poor record of engaging with communities on what services they desire or expect, ignoring larger  
272 community outcomes (Han et al. 2015). Public engagement is lacking in the design of levels of service,  
273 let alone engagement with racialized or vulnerable communities. To date, the practice of asset  
274 management in the water sector fails the procedural equity test.

275

276 **RECOGNITIONAL EQUITY AND IAM'S FOCUS ON COSTS**

277 Recognitional equity, in an asset management context, requires decisions to be derived by incorporating  
278 the community's technical and non-technical values, desires, and knowledge, in addition to technical  
279 system data. In this section we will discuss how recognitional equity relates to the last two asset  
280 management questions posed by EPA: "What are my minimum life-cycle costs?", and "what is my best  
281 long-term funding strategy?"

282 These questions prompt water managers to think about affordability and the long term. Affordability in  
283 the present as well as long term life cycle costs are also priorities for communities, with more disparate  
284 impacts for diverse communities, particularly low-income, historically and presently marginalized, and  
285 socially vulnerable communities who are cost-burdened. However, they may be considered by  
286 communities in ways that are different than asset managers. Also, affordability and long term financial  
287 goals of a utility can be overly prioritized at the expense of providing services and benefits to  
288 communities, especially when adopted under the existing economic paradigm.

289 The tools most used to determine the answers to the EPA questions are business cases and cost-benefit  
290 analysis (CBA) (FCM 2018; IAM 2021). Firstly, tools such as these bring everything down to averages and  
291 overall costs and benefits. It's the tyranny of the average, where individual needs, needs of specific  
292 communities, and impacts to those communities get diluted out. This has long been a tool of white  
293 supremacy to hide disparate treatment behind seemingly objective numbers (Benjamin 2019; Fainstein  
294 2018; Porter 1996). Some will say that a business case or CBA is only a decision tool and doesn't dictate  
295 what we do, but when was the last time your organization overturned a business case-based decision?  
296 When was the last time you went with a more expensive alternative because of the intangible benefits it  
297 provided unless there was a regulatory mandate? How big or small was that decision, and did it really  
298 make a difference in your community? What is the language around justification that we hear from our

299 leadership, both elected and not? In reality, business cases and benefit-cost analyses end up dictating  
300 what can and cannot be done. Add to this the fact that, despite theoretically using a triple bottom line  
301 approach, environmental and social considerations are frequently left out of or deprioritized in the  
302 calculations because they are harder to quantify, and purely financial concerns end up driving decisions  
303 (Pathirana et al. 2021).

304 Second, these tools rely on quantification and monetization. This has been the main focus of many of  
305 our organizations and systems for a very long time. Under our current economic system cost efficiency  
306 has been upheld as a top value for the last several decades, and it is contributing to our current  
307 inequities in society (Finewood et al. 2019). Under this system, only what can be counted counts. What  
308 about intangibles? Community experiences? Happiness, spirituality, connections to community and  
309 connections to nature? A lot of recent work has gone into trying to account for equity quantitatively  
310 (Zuluaga et al. 2021), but have we asked ourselves if this is really the right methodology to use? Are we  
311 just trying to fit a square peg into a round hole? Should we get rid of the round hole instead? There's a  
312 lot of evidence that focusing on money and quantification is inherently inequitable and unethical (Pulido  
313 2016). Water managers' fears of our decisions not being "justified" or "objective" is pushing us to  
314 uphold systems of oppression. Numbers become more important than people and everything is so  
315 abstracted that humanity is lost. Yes, we need to think about how the costs of our services impact the  
316 lives of people, but also about how the costs of not providing a service impacts people and communities,  
317 often in intangible and non-monetary ways.

318 Recognitional equity requires infrastructure managers to equitably include forms of knowledge that are  
319 not quantitative as part of their decision processes. The movement toward traditional and indigenous  
320 ecological knowledge has emphasized that there are other valid ways of knowing and valuing the world  
321 which are more tacit and qualitative (Grabowski et al. 2017; Molnár and Babai 2021). There are ongoing  
322 attempts to quantify this knowledge for inclusion in such tools as business cases and CBA (Jezzini et al.

323 2023), but ultimately these uphold the primacy of quantification and deprioritize other ways of knowing  
324 and deciding. These EPA questions centered around costs steer water managers away from recognizing  
325 other forms of knowledge, and therefore are not compatible with recognitional equity.

326

## 327 **CASE STUDY**

328 This case study is from the City of Portland Bureau of Environmental Services (BES). BES is the  
329 wastewater, stormwater, and watershed health utility for the City of Portland, Oregon. In the early  
330 2000s, BES started implementing asset management to help structure decisions in the bureau, but has  
331 struggled to fully mainstream it into decision processes throughout the organization, especially in  
332 relation to green infrastructure, and it was practiced inconsistently in different sections of the  
333 organization (Brawley-Chesworth 2023). In 2020 as part of a wider bureau reorganization, the bureau  
334 decided it needed more strategic, consistent, bureau-wide policies and principles for asset management,  
335 so the strategic asset management (SAM) team was created.

336 One of the first things the new team did was to write an Asset Management Policy and Strategic Asset  
337 Management Plan. Once those were in place, BES received a 'complete' in the city's asset management  
338 maturity assessment. To increase IAM maturity further, the next step should be to focus on other areas  
339 of IAM. But, as the SAM team spoke with employees around the bureau about the IAM work, they  
340 encountered varying degrees of enthusiasm for the work. Some employees were very excited and  
341 supportive of asset management, believing it would help the organization make better decisions. But,  
342 others had serious reservations about asset management. These employees felt that IAM was not right  
343 for their work or that it conflicted with the bureau's values and the values and priorities of the  
344 communities being served. One of the main criticisms was that IAM did not adequately include larger  
345 community outcomes.

346 The SAM team decided to try to bring these two perspectives together and see if BES could design an  
347 asset management program that would lead with an emphasis on the people and community outcomes  
348 aligned with our long-term asset, infrastructure sustainability, and cost goals. This section will outline  
349 how the approach was refined for the 2023 Strategic Asset Management Plan (City of Portland Bureau  
350 of Environmental Services 2023). The authors of this paper were either members of the SAM team or of  
351 the Equity Plan Steering Committee during the time period discussed below. The first step was to form a  
352 partnership between the Strategic Asset Management team and the bureau’s Equity Plan Steering  
353 Committee. The Equity Plan Steering Committee was composed of employees who came together to  
354 create an updated Racial Equity Plan for BES - City of Portland Resolution 37144 mandated Racial Equity  
355 Plans for its bureaus. The Equity Plan Steering Committee members were focused on increasing equity  
356 for community and within the organization. They followed a racial equity-centered results-based  
357 accountability (RBA) framework for this effort. RBA is a decision-making framework to meaningfully  
358 approach bureau work that supports Black, Indigenous and People of Color (BIPOC). Used properly, RBA  
359 invites envisioning an equitable future, encourages centering community wellbeing, supports  
360 participatory practices, integrates building community trust, builds authentic partnerships, shares, and  
361 uses data to inform practice, and appropriately develops strategies to address root causes of systemic  
362 racism (Bernabei 2017).

363 The partnership between the Strategic Asset Management team and the bureau’s Equity Plan Steering  
364 Committee started with agreeing to a high-level goal that acknowledges the past, and is intentional in  
365 addressing past harms in the work moving forward. The goal centers those who have been historically  
366 ignored; that is Black, Indigenous and communities of color. This overall statement is:

367 *All Portlanders, especially those belonging to Black, Indigenous and communities of color,*  
368 *are flourishing in communities of their choosing within healthy environments supported by*  
369 *clean rivers.*

370 This statement was designed by the Equity Plan Steering Committee as a guiding principle for all work in  
371 the Bureau, not just in the Asset Management program. Community is not only about who is alive now,  
372 it is also about our ancestry and our future. The statement encompasses things such as love and dignity,  
373 much is not written but that is included. We believe not everything needs to be written as we are  
374 moving with a non-colonized and embodied approach.

375 The statement can be understood by looking at five elements. The first two are about who is  
376 experiencing this future Portland. The statement includes all Portlanders while also focusing on those  
377 whose voices have been most ignored and who have had the most burdens imposed on them by the  
378 larger society, BIPOC communities. The third element outlines an overall vision for what they are  
379 experiencing; their desired community outcomes. “Flourishing in communities of their choosing” is a  
380 recognition that people want to flourish, but that the city’s efforts can derail flourishing due to its  
381 actions which result in harm to historically and systematically marginalized communities such as is  
382 evident by the impacts of gentrification, and so people are pushed out of the communities where they  
383 want to continue to be living in. “Healthy environments” encompasses all aspects of the environment:  
384 the built environment; air, land, and water quality; access to vegetation; a sense of ownership and  
385 safety; etc. The statement ends with a direct link to BES's mission: clean rivers.

386 To implement this vision in the asset management program, the bureau asked: What are the values of  
387 our diverse BIPOC and immigrant communities? What do they say have been their biggest challenges?  
388 We did not wait for a large consultant-led outreach process. That is likely a necessary next step; but  
389 given the restrictions in 2020 due to COVID-19, and the time involved in such a process, we decided to  
390 not delay the work until after we could have those conversations. Our communities have already told us,  
391 repeatedly, what they wanted, if we would only listen. So, that was our first task – we collectively read  
392 through reports on the state of various communities put together by the Coalition of Communities of  
393 Color (Coalition of Communities of Color n.d.). This was the foundation for the SAMP revisions. To honor

394 that work, the following four quotes give a very small overview of what was meaningful to the BES team,  
395 revealing the feelings and experiences of Portland’s BIPOC residents:

396 *“Racial experiences are a feature of daily life...the first step is to stop pretending race and*  
397 *racism do not exist. The second is to know that race is always linked to experience...We seek*  
398 *for those in the White community to end a prideful perception that Multnomah County is an*  
399 *enclave of progressivity”* (Curry-Stephens et al. 2011 p. 97)

400 *“...institutional, ideological, behavioral and historic racism intersect to create these*  
401 *harrowing results.”* (Curry-Stephens et al. 2010 p. 8)

402 *“Reduce disparities with firm timelines, policy commitments and resources: Disparity*  
403 *reduction across systems must occur and must ultimately ensure that one’s racial and ethnic*  
404 *identity ceases to determine one’s life chances.”* (Curry-Stephens et al. 2012 p. 81)

405 *“Begin today with an action plan that shows concern, compassion and a commitment to*  
406 *justice. To not act is unconscionable.”* (Bates et al. 2014 p. 6)

407 As a result, the bureau decided to change the questions being asked and answered in asset  
408 management, with the goal of adapting our whole AM system every step of the way. The new questions  
409 to replace those posed by EPA are:

- 410 ● What is the history & state of our communities?
- 411 ● What is the state of our services & assets?
- 412 ● What are our objectives?
- 413 ● Why aren’t our objectives being achieved and what are our strategies to achieve those  
414 objectives?

415 • What asset management system will help us get there?

416 And, for each of the above questions we asked: especially those belonging to Black, Indigenous and  
417 other communities of color.

418 These are similar questions in a lot of ways – but we’re focusing on BIPOC communities in the questions.  
419 By asking the questions differently, hopefully we’ll get different, transformative answers. We did not  
420 abandon the principles and values of our organization and the water industry’s regulations and best  
421 practices, but rather supplemented and integrated them with the community’s values and desired  
422 outcomes. These are shown in Figure 1.

423 The next step was to agree on asset management program objectives. These were designed using a  
424 participatory process where asset management practitioners, members of the Equity Plan Steering  
425 Committee, and other bureau stakeholders co-created them. These are shown in Figure 2.

426 Again, it is important to note that we emphasized for each of the above objectives - especially for those  
427 belonging to Black, Indigenous and other communities of color. So, how does the work of BES measure  
428 up against the three equity dimensions examined in this paper?

429 • Distributional equity: The new AM program objectives prompt BES to focus on communities and  
430 disparities, along with asset consideration. Objective 1 aims for equitable services delivery. Thus, the  
431 new AM program aligns bureau asset objectives with community identified goals and outcomes.  
432 Objective 5 references environmental justice and asks who bears a greater burden in society.

433 • Procedural equity: The process taken by the SAM team was not procedurally equitable. The  
434 decision was made, partially due to COVID-19, but also because of time pressures, to not yet co-create  
435 this with communities. Within our constraints, we included community voice through the Coalition of  
436 Communities of Color reports, but highlighted the need to have a larger, more inclusive conversation in

437 the future. Objective 9 prompts the bureau to engage with communities in our future work in culturally-  
438 specific and historically-informed ways.

439 ●       Recognitional equity: The members of the SAM and Equity Plan Steering Committee  
440 intentionally talked about both technical and non-technical aspects of the values and needs of  
441 communities. Objectives 5 and 6 recognize that water connects with health, safety, property,  
442 economics, recreation and spirituality. These are all important to communities, and inclusion in the  
443 objectives prompts the bureau to consider all of these in our work.

444 We know this is not the end, but is one important step on a journey to an equitable community, with  
445 many more needed in the future.

446

447 **CONCLUSIONS:**

448 Asset management is widely used by water managers to guide decisions that impact people within the  
449 communities they serve. This paper examined asset management’s compatibility with three dimensions  
450 of equity - distributional, procedural, and recognitional - and found that asset management, as practiced  
451 today, does not drive equitable community outcomes. This is because asset management has developed  
452 within a larger societal system of racial inequity.

453 Racial equity will not be achieved until we have radical and transformative changes in our society. This  
454 includes rethinking and redesigning our infrastructure systems. And, while asset management was  
455 developed to improve the efficiency and rationality of infrastructure decisions, it does not prompt  
456 decision makers to question what infrastructure is for and whom it serves. By maintaining the status quo  
457 in those areas, asset management is supporting the intangible structures and human relations that are  
458 inequitable and create harm.

459 This is not to say that the water sector must completely discard asset management. But, it does mean  
460 that asset management needs to be transformed away from solely supporting a focus on assets,  
461 sustainability, and costs towards one that aligns these with community outcomes across planning and  
462 management. We presented an example of how one organization is trying to transform asset  
463 management, but there is still a long way to go. And, even if the ideas presented in the case study are  
464 successful in Portland, the same process and techniques should not be implemented by others. Instead  
465 the case study presented can be used to inspire others to interrogate their implementation of asset  
466 management, and serve as an example for doing so along the three dimensions of equity. Every asset  
467 management professional needs to be creative, develop an in-depth understanding of the needs of their  
468 oppressed communities, critically examine their systems and structures, and not rely on anyone else's  
469 formula.

470 Water engineers and managers have a responsibility to push for changes to how decisions are made  
471 within their organizations. We challenge asset management professionals to:

- 472 ● Move away from narrowly defined goals and outcomes for infrastructure. Think about the larger  
473 ecosystem of community outcomes beyond the mission of individual organizations and agencies.
- 474 ● Define the limits of asset management. Some decisions may need to be separated from the  
475 asset management decision system to create equity in the community. Be open to that and look for  
476 ways asset management may be limiting thinking. Be willing to overrule asset management when  
477 necessary.
- 478 ● Defy the limits of asset management. Ask how your work impacts the broader world and  
479 recognize when you do not have all the answers. Think about how your power as an engineer or water  
480 manager can create a better future for all people. Use your expertise and authority to supplement and  
481 uplift community voices.

482 In the end, the authors of this paper remain skeptical about using asset management to drive  
483 community equity. Asset management was invented and evolved in a larger system that produces racial  
484 inequities (Pulido 2000). We are not confident that it can be transformed enough to drive equity. It is up  
485 to us as water professionals to be critical of the tools we were handed by earlier generations and  
486 transform them where possible or discard them where necessary. Bringing it back to our version of  
487 Audre Lorde’s famous statement: we are not confident that the tools of the master can either dismantle  
488 the master’s house or build a new house that is welcoming to all. But, we are willing to try, and are open  
489 to transforming those tools in ways that may make them unrecognizable from the original, if necessary.  
490 The people in our communities are more important than the tools we use to serve them.

491

492 **DATA AVAILABILITY STATEMENT:**

493 All data, models, and code generated or used during the study appear in the  
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503

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651

652 **FIGURES:**

Community values	City & Organizational values	Industry values & standards
<ul style="list-style-type: none"> <li>◆ Equity</li> <li>◆ Bold &amp; holistic solutions</li> <li>◆ Accountability</li> <li>◆ Culturally appropriate solutions</li> <li>◆ Pride</li> <li>◆ Security &amp; sense of safety</li> <li>◆ Community sustainability</li> <li>◆ Community development</li> <li>◆ Community resilience</li> <li>◆ Stop displacement</li> <li>◆ Financial sustainability &amp; affordability</li> <li>◆ Healthy neighborhoods</li> <li>◆ Environmental &amp; economic justice</li> <li>◆ Diverse relationships with water</li> <li>◆ Participatory decision making</li> </ul>	<ul style="list-style-type: none"> <li>◆ Economic prosperity</li> <li>◆ Human health</li> <li>◆ Environmental health</li> <li>◆ Connection to waterways</li> <li>◆ Equity</li> <li>◆ Resilience &amp; Sustainability</li> <li>◆ Anti-racism</li> <li>◆ Transparency</li> <li>◆ Collaboration</li> <li>◆ Fiscal responsibility</li> <li>◆ Communication</li> <li>◆ Customers &amp; partners</li> <li>◆ Stewardship</li> <li>◆ Workforce</li> <li>◆ Leadership</li> <li>◆ Innovation</li> </ul>	<ul style="list-style-type: none"> <li>◆ Support economic prosperity</li> <li>◆ Affordability</li> <li>◆ Protect public health</li> <li>◆ Protect the environment</li> <li>◆ Restore watershed health</li> <li>◆ Resilience &amp; sustainability</li> <li>◆ Employee safety &amp; well-being</li> <li>◆ Reliability</li> <li>◆ Protect safety, property, and infrastructure</li> <li>◆ Compliance with regulatory requirements</li> </ul>

653

654 Fig 1. Values for the SAMP (City of Portland Bureau of Environmental Services 2023 p. 48)

**All Portlanders, especially those belonging to Black, Indigenous and communities of color, are flourishing in communities of their choosing within healthy environments supported by clean rivers.**

1. Provide services **equitably**. Acknowledge racism, including its current and historic influences; end disparities; minimize burdens; and extend benefits.
2. Provide services and manage assets in ways that support **employee safety, security and well-being**.
3. Provide **reliable** services to our communities.
4. Provide services that help support **economic prosperity** and facilitate community development without contributing to gentrification.
5. Provide services that support **environmental quality** (air, water, and land), which protects public health, public safety, and property. Do this utilizing an **environmental justice** framework, recognizing that some communities bear a greater burden of social and environmental harm than others.
6. Provide services and manage assets in ways that help **support watershed health** and our diverse communities' economic, recreational, and spiritual **connections with water**.
7. Provide services that increase **community resilience and sustainability**.
8. Provide services in compliance with **regulatory requirements** that govern our bureau.
9. **Engage our diverse community** using culturally specific and historically-informed approaches.
10. Provide services that are **affordable** for our most financially vulnerable community members.
11. Be **accountable** to our communities' needs as they evolve.
12. Contribute to **economic justice** in our communities, in our employee development, hiring and promotion, and in our contracting.
13. Implement **bold, integrated, and holistic solutions** that prioritize services that solve our communities' most urgent needs.

655

656 Fig 2. Asset Management Objectives (City of Portland Bureau of Environmental Services 2023 p. 49)

657