Aligning Responsible Computing with the United Nations Sustainable Development Goals

A Responsible Computing White Paper

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Responsible Computing (RC™) was formed in May 2022 by IBM and Dell, under the management of the Object Management Group® (OMG®), to establish a consortium of technology innovators working together to address current and future challenges while ensuring alignment with sustainability and ethics. Since its inception, other members have joined to progress the group's values-based objectives and advance formal positions and actions against the Responsible Computing framework, consisting of six domains of responsible computing: code, data usage, data center, infrastructure, systems and impact.

The domains represent unique and interdependent subjects that all organizations, and their leaders and practitioners, should consider and embrace as demands on technology and computing increase across the globe. These subjects include a focus on everything from the actual technology assets and infrastructure to the data centres and sites in which the technology is being housed, to the data and code used (and produced) as part of the computing process, to applying a systems-thinking approach and then careful planning for and execution of the impact you are trying to achieve. Each of these domains has commonalities and unique considerations to ensure fair, ethical, sustainable, and responsible outcomes.

Importance of Aligning Responsible Computing to the UN Sustainable Development Goals

To ensure the work of Responsible Computing is credible and reliable, there must be an alignment with an existing, globally adopted framework. As stated on the United Nations Sustainable Development Goals website, the Sustainable Development Goals (SDGs), as part of the 2030 Agenda for Sustainable Development, were "adopted by all United Nations Member States in 2015 to provide a shared blueprint for peace and prosperity for people and the planet, now and into the future." Leveraging this blueprint helps to ensure that each Responsible Computing domain is rooted in legitimate and practical concepts to implement and drive beneficial progress.

More is needed, however, to state alignment to SDGs. There must be a way to measure an organization's current state for that SDG and progress against a baseline or point in time as strategies are implemented and domains evolve and mature. There could be a significant reduction in credibility, not to mention potential public and even regulatory and legal backlash if statements reflect overblown promises or inaccurate results. Proof points on progress and achievement are critical to maintain legitimacy.

The Process of SDG Evaluation and Alignment to the Six RC Domains

The Responsible Computing Self-Assessment was created to help organizations leverage guided questions to assess their current state for each of the six domains and identify key indicators of a more mature approach and methods to measure progress.

The Responsible Computing Self-Assessment provides a clear opportunity to cross-reference the various sub-elements addressed per domain with the SDGs list and the various targets and indicators provided underneath. It is important to remember that the SDGs were initially established to guide nation-states; however, thousands of public and private organizations across the globe have decided to align broad programs, as well as discreet projects/initiatives, to specific SDGs. In that spirit, the SDG alignment to the Responsible Computing Domains has been evaluated and aligned. Each SDG was reviewed to determine how it could be affected by advancing and maturing the Responsible Computing domains. Although not every SDG provides technology-specific details, much can be interpreted, extrapolated, and applied from the target language. The results of the analysis are provided in the next section of this paper.

SDG ALIGNMENT CATEGORIES AND KEY EXAMPLES

During the evaluation and analysis process, it was clear that the Responsible Computing Domain alignment to SDGs fell into three different categories:

- SDGs that were *foundational* and ensured the domains were rooted in the law or key standards and were structurally sound.
- SDGs that were *benefitted* by proper scoping, planning or execution of elements of that domain but were inherent to the elements themselves.
- SDGs that reaped the positive *impact* of a purposeful, responsible computing use case based on its intended output/outcome.

We'll review each of those in more detail below.

FOUNDATIONAL SDGS

In the context of responsible computing, a foundational SDG ensures that the framework is built on solid ground. Given the speed of technological innovation and concerns about governance and accountability, a fundamental priority for Responsible Computing and its domains is aligning with SDG 16, which focuses on Peace, Justice and Strong Institutions. This SDG, among other considerations, strives to ensure effective, accountable, and transparent processes and governance while continually upholding the rule of law. Without alignment with this fundamental SDG, other benefits (such as climate action, good health, and quality education) have less credibility and meaning. A few ways in which SDG 16 targets align nicely with each of the Responsible Computing Domains include, but aren't limited to:

- Target 16.3: Promote the rule of law at the national and international levels and ensure equal access to justice for all.
- Target 16.6: Develop effective, accountable, and transparent institutions at all levels.
- Target 16.7: Ensure responsive, inclusive, participatory, and representative decision-making at all levels.
- Target 16.b: Promote and enforce non-discriminatory laws and policies for sustainable development.

Although the UN uses the published Indicators to measure effectiveness, the above targets may not apply to Responsible Computing specific work. Documentation of critical laws, regulations and standards affecting an organization's focus on technology, and its readiness against those, might be a viable first step. Additional criteria to drive progress and maturity across each domain could be extrapolated from the Responsible Computing Self-Assessment or other resources.

BENEFITTING SDGS

The next layer in aligning key SDGs to the Responsible Computing Domains is evaluating how an SDG is positively or negatively affected by how an organization prioritizes, scopes, plans, implements and manages elements within each domain. These would be the inherent benefits of greater efficiencies or waste reduction, more thoughtful coding, sustainable sourcing, and the like. Building in these considerations and sources for measurement up-front will not only ensure any unintended consequences but also identify truly positive impact areas across several SDGs and help progress an organization's own public-facing priorities and commitments.

As each SDG was reviewed against the six Responsible Computing Domains, it was clear that not all SDGs could derive benefit, and a few others could see only minimal benefit. Therefore, the primary SDGs identified for best alignment for this category included the following (listed in numerical order):

SDG 6: CLEAN WATER AND SANITATION

This SDG is focused on ensuring that our world's water resources are managed sustainably and that clean, sanitary water is available for all. Water is leveraged to varying degrees during the manufacture of computing technologies, such as semiconductors, but is also involved in various aspects of asset and data center cooling. As computing power increases, the need to keep chips and broader technology products cool is a critical consideration. Focusing on ways to reduce water use, in this case, would be just one viable way to progress against this SDG.

RC Domain(s): Data Center, Infrastructure.

SDG 7: AFFORDABLE AND CLEAN ENERGY

This SDG is focused on not only helping the world more effectively and rapidly transition to clean energy, but to do it fairly, justly and in a way that more can access it. It also includes the adoption of renewable energy, when it's available locally, to power our organizations and lives. All facilities housing technology must leverage electricity to power up assets and sustain modern compute needs, and the demand on the amount of that electricity is only increasing. Organizations willing to adopt strategies to leverage clean, renewable energy as the source of that power will positively impact this SDG.

RC Domain(s): Data Center, Infrastructure.

SDG 9: Industry, Innovation and Infrastructure

This SDG focuses on building resilient infrastructure, promoting inclusive and sustainable industrialization, and fostering innovation. Given that technology and computing are often the backbone of broader regional and global infrastructure solutions, not to mention the technology infrastructure itself, this SDG is well suited for alignment. Some of the ways in which this comes to life include but aren't limited to (1) modern, efficient manufacturing, supply chains and logistics, (2) scaling more effective and equitable financial services and markets, (3) and global access to the Internet and bridging the digital divide.

RC Domain(s): Infrastructure, Data Usage.

SDG 10: Reduced Inequalities

This SDG aims to address inequality which still exists within and among countries. Often, vulnerable and marginalized populations are repeatedly overlooked or abused. Technology and digital solutions can either help or hurt this situation. When planning for digital initiatives, this SDG can be positively impacted by practices such as eliminating potential discriminatory or biased elements within the code. It's also critical to ensure the data used or generated doesn't accidentally pull in bias or lead to unintended harm. Any decisions taken by digital solutions must be explainable. Additionally, focusing on accessibility technology solutions helps to democratize access to tech to a broader set of individuals, levelling the playing field.

RC Domain(s): Code, Data Usage, Systems.

SDG 12: Responsible Consumption and Production

This SDG focused on a broad spectrum of topics, but two areas may garner the most benefit in technology. First, Target 12.2 within this SDG addresses sustainable management and efficient use of natural resources and Target 12.5 focuses on preventing waste, including reduction, reuse, and recycling. Existing legislation, such as the Restriction of Hazardous Substances in Electrical and Electronic Equipment (RoHS) out of the EU, has helped remove hazardous materials from new computer products. More companies producing technology products are evolving to use less virgin material and are embracing circular economy principles, and leveraging recycled, renewable, or refurbished products can help to progress against this SDG. This same mindset can be applied to how data is managed, both in efficiently using data and eliminating old or redundant data. Finally, the fact that SDG work is being measured means that it should be adequately and accurately reported, which directly ties to Target 12.6.

RC Domain(s): Data Center, Infrastructure, Code

SDG 13: Climate Action

This SDG receives a great deal of attention. It not only encompasses a large area of work, but it also directly ties to what many scientists view as an existential threat. It emphasizes not only the scale of the progress that needs to be made but the sense of urgency that we as a global community and individuals must have. There is a great deal of connection between not only the

Responsible Computing Domains and this SDG but also this SDG to other SDGs. As an example, this SDG benefits when progress is made against SDG 7, resulting in lower carbon emissions when adopting renewable electricity to power data centers. Other opportunities to connect Responsible Computing Domains to progress on climate action include but aren't limited to: (1) ensuring workloads are only running when needed, (2) leveraging infrastructure equipment with reduced energy intensity, (3) reduction of dark data to reduce carbon consumption.

Again, it's important to mention that none of this can be communicated without proper measurement and reporting, but an increasing number of organizations require this level of transparency. Thus, technology is a clear place to drive results.

RC Domain(s): Data Center, Code, Data Usage, Infrastructure.

SDG 15: LIFE ON LAND

This SDG is important when you consider how the building and maintenance of facilities, like data centers, can impact the land and biodiversity surrounding a given location. How is the facility helping or harming that ecosystem? How are you considering what is being taken versus what you should give back? There are several interesting examples in which data centers have been used to fuel sustainable management of local biodiversity ecosystems or grow carbon-grabbing plants, such as redirecting the heat to fuel plant growth in rooftop greenhouses. Minimally ensuring that local habitats experience minimum (or no) disruption, reducing the number of trees which need to be removed or even planting flower gardens which attract pollinators can be ways in which this SDG, especially Target 15.9, is impacted.

RC Domain(s): Data Center.

SDG 17: PARTNERSHIPS FOR THE GOALS

Per the UN SDG website, the purpose of SDG 17 is to "strengthen the means of implementation and revitalize the Global Partnership for Sustainable Development". In other words, partner as much as possible, leveraging public and private collaborations to address commitments and make actual, meaningful progress. Target 17.6, for example, speaks to enhancing regional and international cooperation on and access to science, technology and enable knowledge sharing. This SDG also calls out the need for bigger groups to work together to help smaller or less developed groups. Meaningful impact cannot be achieved, especially at scale, without partnership. Responsible Computing at a systems level requires partnership inside an organization and with stakeholders across the value chain.

RC Domain(s): Systems, Impact.

IMPACT-DRIVEN SDGS

The final but essential category relates to the SDGs, which are most likely to be the recipients of purposeful use of technology solutions to drive impact and positive outcomes. That means a use case has been scoped, planned, implemented, managed, and reported to affect change in one or more significant areas. This type of solution or offering could exist in both non-profit or for-profit settings and has become a critical area of focus for several organizations looking to expand innovation in the sustainability-focused marketplace or have a more significant impact in the communities in which they operate.

The Responsible Computing Domain of Impact captures this most effectively and focuses heavily on driving both environmental and social change. To ensure the solution is genuinely impact-driven, the results cannot be accidental or a byproduct of internally focused work. The key is to ensure, upfront, that the work has: (1) a specific purpose and desired outcome in mind, (2) a plan for how to operate at scale and (3) a model which allows the solution to be long lasting.

Virtually any of the 17 total SDGs could be a focus area for impact using technology-driven solutions. Additionally, virtually any organization could be the brainchild of a new solution to drive purposeful, meaningful, and positive change across the environmental, social and/or governance space. Technology solutions can do everything from optimizing electrical grid substations (SDG 7) to removing plastics from the world's oceans (SDG 14) to delivering previously unavailable healthcare solutions to remote parts of the globe (SDG 3). There are too many examples to list of how technology could enable a just, safe, accessible, and scalable future across each one of the SDGs.

The five SDGs below, however, are just a few which deserve additional attention as we consider how to measure impact, as progress within these has a direct connection to affecting change in others.

In numerical order, they are:

SDG 1: NO POVERTY

This first SDG has a singular focus – to end poverty in all its forms, everywhere. When you can bring individuals out of poverty, there is a huge ripple effect of positive impact. Sadly, due to the outcomes of COVID-19, the UN states that "more than four years of progress against poverty was erased." These are often the individuals in the margins, with whom things like natural disasters, chronic diseases, and pollution affect disproportionately. Focusing on impacting this SDG could benefit greatly across these and other areas.

SDG 3: GOOD HEALTH AND WELL-BEING

The priority for this SDG is to drive healthy lives and to promote well-being for everyone of all ages. A wide variety of concerns are outlined in its targets, including reducing newborn and child mortality, addressing (or preventing) global epidemics, increasing healthcare for non-

communicable diseases, creating more robust programs for mental health and substance abuse and ways to reduce death from pollution. Technology has already proven effective in targeting cancer, helping to provide more access to mental health counsellors and monitoring air and water quality to prevent illness. There is ample opportunity for innovation and impact in this space.

SDG 4: Quality Education

Affecting progress in this SDG could be an enabler for so much, including lifting populations out of poverty. It fuels the future workforce and helps to create and sustain more inclusive and well-functioning communities. Given that so much of education is rooted in technology, a key element here may be to consider how to simultaneously bridge the digital divide for those who don't have access to the Internet or the technology solutions which fuel so much of our work and engagement today, and well into the future.

SDG 8: Decent Work and Economic Growth

This SDG is focused on long-term, inclusive economic growth and giving everyone the opportunity for decent work and productive employment. All people want the opportunity to make a fair wage, work in a safe and accessible environment, ensure the basic needs of their families are met, and feel a sense of pride that they are contributing. The more individuals who can contribute, the more fuel it adds to global economic growth. This is especially true when focusing on developing countries or directing efforts to uplift historically marginalized or vulnerable populations. It is also valuable to drive solutions for youth to ensure they have the skills for future jobs. Any solution or capability which could measure impact in this space would likely have a domino effect on other SDGs, as the contribution to those efforts would be increased.

SDG 11: Sustainable Cities and Communities

This SDG focuses on the ecosystem of human settlements, which can be a community of any size, ensuring they are safe, inclusive, resilient, and sustainable. The various targets called out by this SDG range from concepts like reducing negative effects of natural disasters to proper waste management to safe and accessible road infrastructure. When an increasing number of members can derive the benefits of a more resilient community, they are more likely to affect change across other important SDGs.

SDG 17: Partnerships to Achieve the Goal

This SDG may be one of the most important for organizations to consider, given that no person or organization can drive large-scale impact alone. Public-private, as well as civil society partnerships, will often accelerate progress and result in a much larger footprint of impact. Whether the partnerships are formed to strengthen financing and investment, resource mobilization, policy development, technology implementation or knocking down traditional barriers, all these efforts have strength in numbers.

FINAL CONSIDERATIONS

Whichever SDGs your organization chooses to advance, always root your work in measurement and transparency, and ensure you are cautious with the use of the terms “green”, “sustainable”, or other similar language which may seem advantageous from a marketing or branding perspective but could quickly lead to accusations of greenwashing and reputational damage to your organization. Less is more, in that it is best to concentrate on a small number of SDGs and put the right amount of effort into progressing and reporting on the results.

Adopting the Responsible Computing model, understanding the potential impacts (positive and negative) related to each Domain, identifying, and progressing against a small number of UN Sustainable Development Goals and providing transparent reporting of your outcomes will help drive meaningful and lasting change.

ANNEX A

The following matrix provides a list of suggested UN Sustainable Development Goals against each of the six (6) Responsible Computing Domains. Please note that this list is not intended to be exhaustive, but instead to identify key areas which may align most effectively. Ultimately, organizations should conduct their own analysis and determine the most applicable SDGs to their goals and priorities.

RC Domain	RC Self-Assessment Indicators	Foundational SDG Example	Benefitting SDGs Examples	Impact-Driven SDGs Examples
Code	• Addressing laws, frameworks, standards and policies • Ensuring security and privacy • Addressing energy consumption, energy efficiency and lowering carbon emissions • Efficient coding and maintaining performance levels • Purposeful intent, resource planning and management			*Virtually any of the SDGs could be advanced with a technology-drive use case, but some key SDGs where technology could have significant power (and cited in accompanying paper) are:*      
Data Usage	• Addressing laws, frameworks, standards and policies • Ethical access to and use of data • Ensuring security and privacy • Using quality data • Reducing or eliminating unneeded or "dark" data • Proper records retention and disposition			
Data Center	• Leveraging greater percentages of renewable electricity • Proper heat management • Ensuring no toxic materials or chemicals • Proper utilization & efficiency • Land stewardship for location of facility			
Infrastructure	• Deliberate strategy: cloud, hybrid, on prem • Asset product carbon footprint (total lifecycle) • Products made with circular design and materials • Holistic management • Proper asset decommissioning, refurbishment, recycling • Data sanitization, adhering to privacy laws			
Systems	• Enables collaboration and partnership • Fully integrated to drive and operating in concert • Integrates diversity, equity and inclusion • Process to drive bias/discrimination mitigation • Affordable and accessible • Addresses laws, frameworks, standards and policies			
Impact	*Wide options on SDG alignment, if there is a technology use case, but other considerations may include:* • Stakeholder-informed and output-oriented • Human/society-centric and measurable impact • Collaboration and partnership to achieve scale			

Note: The alignment examples to various SDGs is not meant to be exhaustive and should not serve as a mandate. Organizations should conduct their own analysis and determine the most applicable SDGs to their priorities and goals.

AUTHORS & LEGAL NOTICE

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