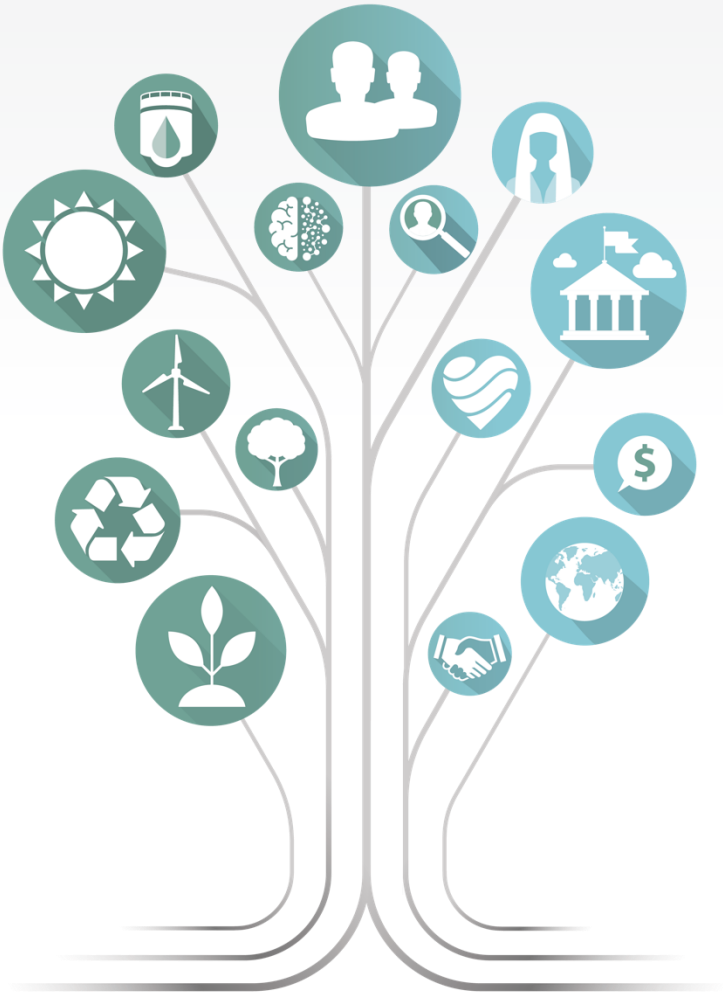
Manpower®

Future Workforce Horizons Series • Volume 3

Accelerating the Sustainability Workforce



The Job Roles Needed to Build Sustainable Solutions

CONSOLIDATED REPORT

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Welcome

About This Report

This report, **Accelerating the Sustainability Workforce**, the third volume in our ***Manpower Future Workforce Horizons Series***, was prepared for Manpower USA clients, employees, and broader external stakeholders in our shared ecosystem working towards a more sustainable future. The aim of this asset is to provide a cohesive, descriptive, and holistic reference and toolset to advance the Sustainability Workforce.

The aim of this asset is to provide a cohesive, descriptive, and actionable reference and toolset to advance the Sustainability Workforce.

Manpower's research and development effort used a qualitative and descriptive approach to review existing literature and relevant cases on the sustainability workforce related organizational concepts. The research also built new and innovative reference models and perspectives for how to identify the work performances and employment roles that build, deliver, and use sustainability solutions. Our research and development approach relied on several additional efforts: review and analysis of available resources and literature (commercial, academic, governmental or independent/private); conducting semi-structured interviews with industry experts; participation in past and current convenings and project work; formal academic studies in related program areas and derivative professional knowledge; delivery of Manpower advisory service approaches and tools; and creation of original thought leadership and construction of these assets. This resulting Sustainability Workforce consolidated toolset includes components which may be useful in whole or in part by many different stakeholders. The research and development cycle and sequence is highlighted here:

- Our effort started by describing how we see the challenges and opportunities and the events that are shaping the scope and form of the Sustainability Workforce – and how that shape is expanding to two cores of modernized, native, and emergent roles: first, the eco- and science-focused "Green+" roles, and then the adjacent spectrum of "turquoise" roles, which are the enabling social, business and governance roles that empower and position sustainable work and workers.
- We continued on to describe the need for leaders and workers in all functions and sectors to apply a 5P mindset (people, planet, process/product, purpose, and prosperity) extending the well-known 3Ps (people, plant, profit). To this end, we evolved over 30 core sustainability workforce solution drivers and insights as the basis for a cohesive view of the key themes and trends in sustainable solutions work and workers.
- A positioning of the connections between sustainability and Environmental, Social and Governance (ESG) programs and reporting frameworks emerged early as a key driver.
- As a core priority for effective workforce planning and development, we developed original key frameworks and assets focusing on sustainability solutioning overall from a circular process perspective. We defined a 10-stage circular solution life cycle also used as a workforce domain framework to structure the needed work, workers, and capabilities.
- We then set up six subcommunities in Manpower's initial view of the Sustainability Workforce roles, including a subcommunity of over 225 cross-industry (all organizations) roles for consideration, as

well as over 550 other roles in aligned subgroupings of these commercially necessary and purpose-driven divisions.

- We answered questions about how roles come together to work on key processes. To address these asks, we illustrated via 10 Action Chains several magnificent opportunities and needs for collaboration and interdisciplinary work introducing over 100 roles that support key sustainability solution activities.
- We envisioned, indexed, and now share multiple list views of over 775 roles that populate this much larger and inclusive tent of opportunity and obligation, responsibilities, and rewards.
- And, to energize next steps, we provide a series of recommendations that round out the research and development effort.

Yet, with all of these assets now created, we know that more workforce planning and development effort by ManpowerGroup and other employment intermediaries and partners is necessary and is to come. More roles can be identified and added. More profiles, snapshots and action networks can be developed. More skills and development plans can be identified and implemented.

Our shared immediacy for sustainable progress on ecological health, climate impacts, resource management and opportunities for growth is shown here in various views including climate related work domains and roles in various eco strategies, renewable energy and materials, biodiversity, and newly commercialized science arenas. We expand the space of sustainable process and product designs and production that are the sources of materials consumption and environmental impact; we include and welcome roles that enable new business models, social innovation, product and process innovation opportunity sponsorship, ideation, and design.

We acknowledge the connected dimension of sustainability that is people-focused in terms of health, employment, community, and education and some of the disparities that are magnified by eco-enviro factors and so require inclusion of social innovation roles. And our ‘bigger tent’ description of the workforce includes better governance and prosperity innovation roles to enable transparency, policy, leadership, and shared benefit.

All of the workforce roles are accompanied with calls to action for the broader system to encourage, develop and employ these roles. These roles – skilled or upskilled to use and/or create sustainability solutions - increase the respectful interaction with and use of nature’s wisdom and resources combined with more equitable social strategies and economic structures. This workforce enables an era of creating a new “nature of business” mindset (also known as bio-business, climate- positive, nature-positive and life-friendly) for accomplishing the (re)generation of communities into resilient, future-focused work and life systems.

This research - acknowledged as a first-generation contribution to a larger, ongoing effort - adds to the body of knowledge of the Sustainability Workforce by providing a means to identify, plan and ultimately improve a Sustainability Workforce mix - the New Mix as we will explore - for most any employer. Whether needing two roles or two hundred, employers and workforce professionals can benefit from the suggestions how to guide a diverse sustainability workforce.

This research asset – acknowledged as a first-generation contribution to a larger, ongoing effort - adds to the body of knowledge of the Sustainability Workforce by providing a means to identify, plan and

ultimately improve a Sustainability Workforce mix - the New Mix - for most any employer.

Manpower believes this information is needed across industries and communities to jumpstart and continuously benefit from the capabilities that bring to life, literally, a workforce transformation in accelerated sustainability solutions. As with past Manpower role taxonomies, access to the toolset in whole or part is expected to be a springboard to look at the range of roles and understand where and when to employ them. This resource should help solve major issues about defining and employing the New Mix of the sustainability workforce while offering complimentary connections to the business opportunities for innovation, effectiveness and growth that create sustainable communities and economic prosperity.

We remain hopeful that with the right knowledge, tools, and aims, a well-trained workforce, including ethical and innovative leaders and government, can mitigate today's challenges and risks and reset the paths to sustainable life, resilience, and adaptation.

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First, we give gratitude to our clients, business leaders, co-workers, community contacts – including those we don't know personally and who don't know us – who are recognized for sensing, adapting, and evolving the commercial, public, social, and environmental sectors with us and other change advocates. We are grateful for those who acknowledge the past, seek to change the present, and demand a better future. They are the business and community leaders, innovators, workforce professionals, teachers, and mentors who, while not directly involved in this project, provide workforce and talent development problem scenarios, case examples and practices. Their experiences and shared teachings inform core aspects of this work and motivate our practices in this arena and where we see the opportunities of the future.

Next is our sincere appreciation to those in the Contributors List who generously contributed their time and expertise directly to this research through interviews and targeted reviews. These colleagues, clients, and experts added to the publicly available work of dozens of fellow practitioners and researchers in related fields. We are sincerely thankful for these named individuals as well as an additional core group of other key contributors.

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Figure 1: List of Contributors

We also wish to thank our colleagues in Manpower Engineering for their input, and also offer very special thanks to Manpower North America Marketing for their support.

We are honored to be part of an organization that takes its own ESG planning and commitments as intentionally and energetically as does ManpowerGroup globally under the direction of Ruth Harper, Chief Sustainability Officer.

Very sincerely, we acknowledge and are most thankful for our direct teachings and project experience through:

- Stanford University's commitment to multidisciplinary work, study, programs, and learner experiences and the direct early teachings and continued decades of access to the program resources and global efforts of the Human Biology program. Thanks for a well-leveraged grounding in hybrid systems thinking and practice applied to human, social, and environmental challenges and workforce and employment systems as well. We are also thankful for the continued shared resources and training of the Stanford D-School and their Design Thinking approach.
- The two tireless and innovative icons, business partners to each other, and co-founders of the modern Biomimicry practitioner field and leading biomimicry organizations (The Biomimicry Institute, Biomimicry 3.8). First, to Dr. Dayna Baumeister, thought-leader, executive consultant and industry teacher, mentor, Professor of Practice at Arizona State University, and founder of the global Biomimicry Professional Certification program (go B-Pro class of 2018!), a most sincere thank you for the example of bridging biology and business, as well as exemplifying purpose and perseverance. And a humble thank you to author, global movement and client advisor, global Biomimicry ambassador, iconic guardian and master teacher of the discipline, Dr. Janine Benyus. Their collaborative leadership, research, instruction, and application are world-

changing, not just for those who know them and have studied and worked with them, but also for those who are our future change makers. These pioneer and keystone extraordinaires lead the emerging cadres of natural, social, and business hybrids – business biologists and biomimicry practitioners of all types who bring “life to life” through the innovative organizations and solution designs they advise and inspire.

All of these specific and general coaches, contributors, and colleagues join us in preparing the workforce for sustainable employment in sustainable solution development and use. We share a mission to educate, employ, and provision sustainability workers. And we choose to add the role of being an organizational biologist to our day jobs of helping others towards sustainable, life-oriented jobs, leading to a more sustainable and just future.

This work effort is for all the sustainability and interdisciplinary leaders and practitioners globally - past, present, and future, green and turquoise - who work on sustainability in all forms often despite challenges and pushback. It is dedicated to the planet’s wellness, the health and prosperity of communities near and far, and the sustainable employment of many. We hope this workforce effort expands the cavalry, or in biomimetic language, we hope this resource accelerates the succession of the workforce via the Pioneer, Keystone, and Producer roles we identify here.

About Manpower and Manpower Manufacturing Solutions

For over 70 years, ManpowerGroup has developed unique insights on the issues impacting organizations and individuals in today’s ever-changing world of work. Providing staffing and workforce solutions, along with advisory support and services, Manpower connects employers and candidates and optimizes the performance of people and workforce processes globally. Our US and North American focus extends into multiple sectors of Manufacturing, Energy, Logistics and Distribution, Finance and Insurance, Government, Hospitality, Life Sciences, Telecommunications, Technology and Aerospace.

Manpower Manufacturing Solutions is an advisory and innovation hub within Manpower US. With a focus on thought leadership for future jobs and major workforce transformations, we deliver advisory services, thought leadership research and publications, field and client enablement, and innovative employability programs. While tackling manufacturing often first and foremost, our focus opens to all other areas of our business, as Manpower Manufacturing Solutions partners with all ManpowerGroup brands and industries across sectors globally.

Opinions, Comments and Citations

The opinions or comments expressed in this report are not necessarily endorsed by organizations or individuals mentioned, sourced, or interviewed. Specific content of the presented report has been informed by these peer and practitioner inputs and reviews from various combinations of the named and unnamed contributors as well as largely through our original work. Specific attribution beyond conventional referencing to published content or full content reviews was not necessary for the contributors in agreement with their objective and honest perspectives guarded by our commitment to generic attributions. The views expressed in the narrative and outputs of the taxonomy work, including unintended mistakes or omissions, are those of the authors.

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We welcome comments, suggestions, and further conversation!

Section 1: Executive Overview

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Section 1: Executive Overview

Welcome

What do you see when you look outside your window and consider the current state of your “world”, your livelihood, and your personal lifestyle? How do they stand up to being sustainable?

As you consider a truthful answer, how many of these realities are part of what you see?

For some, they see a changing experience...

- Diverse and less conventional stakeholders demanding change across environmental, social, and economic systems.
- Business and consumer influence jockeying to take the lead.
- Major disruptions and painful living and working conditions.
- A broken natural and economic environment relationship with misplaced priorities between performance and outcomes and disruptive causes and effects.
- Reluctance when it comes to making a choice to be problem solvers even if one is not a major problem causer.

They also see a sustainability arena where some resent being asked to change in certain areas, while demanding change of others. Some see the ‘kick the can’ game for sustainability playing out in overtime, a game decades old and centuries in the making. Some see overwhelmed leaders, oblivious leaders and angry bases. Some see stakeholders with a lack of clarity, including entire organizations and sectors with the failure of imagination, comfort, or paralysis of the moment, and of course, some see pushback in many places.

For some like Manpower, we/they see …

- Swinging pendulums with some settling along the way that begets enough significant change to energize the team.
- Opportunity *and* obligation abounding.
- Risks and rewards literally flooding for some and burning for others.
- Business and biology converging, making more people wish they’d paid attention in 9th grade science class.
- Movement and progress, and in spite of some not reacting to in-the-face disruptions and obvious solutions, some do see a range of change and amazing new ways to live, work, build and replenish.
- Work effort and organizational and community performance ranging from proactiveness and global collaboration, lessening the concern for the Rip Van Winkle sleepy response modes of some as well as hibernating by others.
- Ranges of champions from innovators to early adopters that achieve first educator advantage to winners and sponsors from many countries, walks of life, and combinations of change makers.

- Finally, government joining and enabling when they can while juggling crises, with politics occasionally resolving enough for more progress in new legislation, new standards, new funding, new financing models, and new investment strategies supporting new ideas.
- Acceptance and new opportunities, knowledge seekers, teams and groups jumping in without knowing all the answers. And as a result of their efforts, we see real answers and tests of potential.

These patterns are the story of sustainability: two steps forward and one step back. Every.Step.Of.The.Way.

Not everything is rosy at all. As a global business and workforce realist, we also see…

- Other simultaneous challenges and current priorities for the broader workforce and stakeholders' attention.
- Current business missions and objectives, earnings per share targets pressured and pushed, economic uncertainty, wars, national political upheaval, and geo-politics challenging most everyone.
- Social unrest, pay inequity, disadvantaged communities and segments of citizens.
- A changing planet with heat waves, dried reservoirs, supply chain hiccups, toxic air and soil, washed-away national park buildings, waste across industries, and outcomes of a pandemic that has crafted economic and social changes to where most still don't know they will land.

All the more reason that as we clearly see the directional shift to better and more sustainable solutions and a spectrum of the workforce making it real, we need to be part of the broader transformation. And, in so many ways we see that this workforce and those to join it from here on out help address all the challenges that one may see.

Manpower sees this movement as hopeful and inevitable. It is the chance, as ManpowerGroup's former CEO and Founder, Elmer Winter, undoubtedly inspired by originator Benjamin Franklin, would say "to do well by doing good". We believe sustainability solutioning eventually will be at once decisive and the new default.

This is because of real progress being made and more being proposed. Plus, there just must be a point at which enough of us get smarter and act smarter at the same time. We see future generations expecting and preparing for a world with different business, political, social, and environmental systems. We see the high likelihood to rewrite the story: take three steps forward and then make one or occasionally two sidesteps (aka "teachable moments") before hopping back on the path.

Onward we go. It won't ever be easy, automatic, or universal. But the destination is clearly visible, and the majority of effort will aim towards times where sustainability will be risk's best strategy, the road to resiliency, the reward for courageous change and innovation, and the default operating mode for users and providers of sustainability solutions.

When we squint and look hard, what details of this change do we really see when we look outside and add in the focus and lenses of our crystal ball? At Manpower, we have an advantage by being well informed via our expertise in the world of work, our client needs, views of future jobs, high-value employment, and sustainability solutioning.

A preview of this entire body of work can be summarized in what we see: a horizon both near and far of possibilities, probabilities, and actualities for the Sustainability Workforce and the employers, geographies, and societies that put them to work and support their efforts.

Because we also see that behind – or may actually in front of – the rhetoric, the distractions, and the legitimate world challenges, there is real sustainability change underway.

You likely see it too, although one can legitimately question if or when it is enough to alter the challenges we have. We may not know the precise numbers or the size of the workforce shift, but the numbers are developing. We may not know the cost, but we do know there is lost opportunity and unrecoverable expenses from society's current ways. We, as well as others, acknowledge the employment, diversity, expertise and supporting policies for a more qualified and sustainability-active workforce are not enough now nor on a fast enough talent acquisition and development path.

ManpowerGroup continuously researches the world of work, addressing and directing solutions in these current times to an timely view of the Great Realization for employers (See Figure 1). The 20 trends in our Great Realization research show employers need to solve for accelerating trends and renewed urgencies faced in 2022 and going forward.

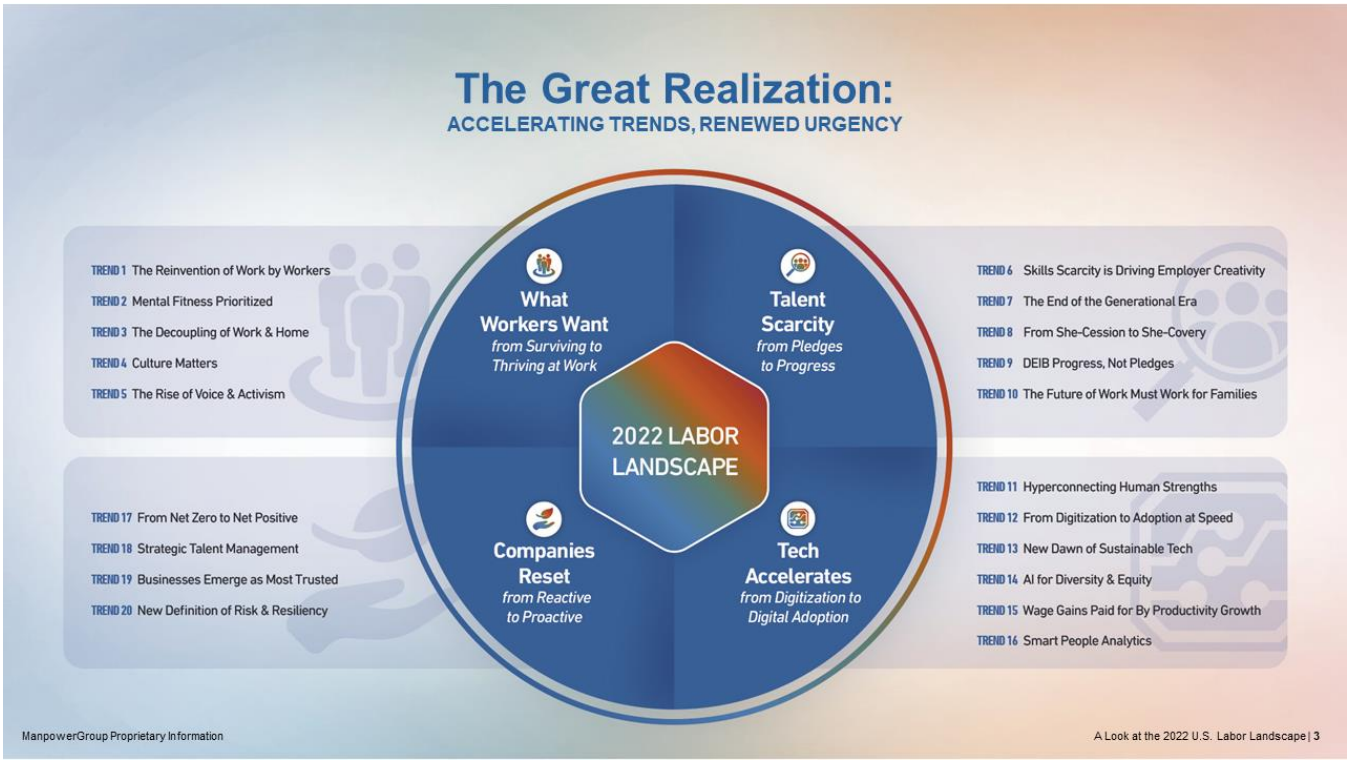

Figure 1: The Great Realization Trends

This view of the labor landscape provides the setting in which we explored the issues, growth and increasing expectations of Sustainability in our society, organizations, and economies. From here is where the research and development grew into the specific work reported in this consolidated toolkit.

Introduction

Over the last year, Manpower set out to answer eight essential questions (see Figure 2) about the critical Sustainability Workforce of the future:

Figure 2: Research Questions

Our research and thought leadership investment focused on how we need to transform the workforce into modernized, native, and emergent capabilities and roles across a Sustainability Solution Life Cycle (SSLC).

The compilation of outcomes and assets are a toolkit collection of multiple components and references as shown below in Figure 3 and are available in the full edition of this consolidated toolset. Not all of these outcomes in their full form are required to improve sustainable workforce planning and improvement or will be used all at once; yet each asset will be useful in whole or in part and at different stages by many different stakeholders.

Figure 3: Research Outcomes

Manpower acknowledges this toolset as a first-generation version and as a contributor to the larger effort across the many intersecting arenas of sustainability. Our research and development approach to this asset relied on several major efforts: a review of available resources and literature whether commercial, academic, governmental or independent/private; semi-structured interviews with industry experts; participation in past and current convenings and project work; formal academic studies in related program areas and derivative professional knowledge; Manpower advisory service approaches and tools; and original thought leadership and construction of these original and proprietary assets.

As with past Manpower role taxonomies, widespread use of the toolset in whole or part is expected to be a springboard to look more collectively at the many roles and understand which, where, and when these roles are essential to solve for our major issues while offering opportunity for innovation, employment and sustainable communities.

Hope floats that with the right knowledge, tools, and aims, a diverse and well-trained workforce, including ethical and innovative business leaders with educators and government as partners, can mitigate risks and reset the paths to innovation, resilience, regeneration and sustainable growth.

Summary Preview

Over 775 roles, 350 skills, hundreds each of challenges and opportunities, 21 essential conclusions, 10 stages of a Sustainability Solution Life Cycle, 6 subcommunities of role adjacencies, three connecting arenas of ESG, two major workforce groups – Green+ and turquoise under the new big tent of sustainable solution workforce - all come together to comprise our one, single, cohesive view of the boundless, unquantifiable opportunities for the future Sustainability Workforce and its impact in our lives and those of the next generations.

Across those outputs, we have futurecasted many trends, themes, and specifics around the sustainability solution space. Futurecasting is a practice used in many industries to strategically plan for an organization's future. It evaluates underlying industry dynamics, descriptive models and predictive analyses, and a variety of strategies to help develop an insightful vision of the future.

Futurecasting is a practice used in many different industries to strategically plan for an organization's future. It evaluates underlying industry dynamics, descriptive models and predictive analysis, and a variety of strategies to help develop an insightful vision of the future.

Our futurecasting and asset development work here has been a combination of descriptive and predictive review and analyses organized as applied research to propose a more complete view of the Sustainability Workforce. Our predictive efforts should aid an organization to see and understand what might happen next with its workforce definition and planning. Our descriptive analysis efforts have drawn from existing data and sources and past histories to give a view that should be a springboard to building the Sustainability Workforce. In that way, we hope to have provided a vision of the future based on past, present, and future insights and elements including new and original perspectives and assets. We believe the future will bear out the majority of these trends with data of what all has not yet happened, but as we predict, is highly probable to be a key driver of the future.

This effort is a toolkit for change. Use it to change (redirected and aligned to the 5Ps) the business, organizational, workforce, environmental and economic targets. Use it to change (adapt) processes, change (innovate) materials, change (optimize) resources, change (transform) purpose, change nature to be a model or inspiration versus a never-ending source of materials. Our shared challenge is to figure out how to make all those essential arenas more sustainable. Sustainability deserves deep and conscious consideration. Here is our contribution to the workforce of today and tomorrow: a source of potential great business strategies, new products and processes, a lifetime of varied and well-paying career opportunity for workers, a multi-generational work shift across all sectors towards good jobs, resulting in a healthier planet, improved built world efficiencies, and higher qualities of life for us and future generations of both humans and all the species we share this space with.

By definition, if we increase our Sustainability Workforce, we're adding life to our livelihood and seeing some incredible Green+ and turquoise views outside the window view.

Actually, it's even better to get out and talk a walk. From spectator to participant, from solution provider to solution user, join us as we venture into new spaces with increased understanding, new opportunities, and new faces.

Overall Conclusions:

1. ***All work and every job role can be more sustainability focused.*** There is a more sustainable version of every solution, process used, or product offered, of all work being done and every job or role. The span are roles and jobs on the way to being more sustainability oriented or awaiting a transformation, including opportunities and just transitions to better versions of conventional roles and new reskilling probabilities for high change sectors and job/role families. Seeing and enabling those sustainable jobs and roles benefits a sustainable version of every organization, business, community, and economic model, as long as we no longer tolerate the failure of imagination and innovation or intervening self-interest.

There is a more sustainable version of every solution,
process used, or product offered,
of all work being done and every job or role.

2. ***A case for change to sustainability commitments and investments exists.***
The case for change for sustainability exists but needs to be built for each solution and must speak to the stakeholders. Sustainability is no longer only seen as a special interest of environmental advocates. It's evolved through pain and potential and now through crisis to a more shared and immediate interest – actually a series of imperatives – and shows in Figure 4 as opportunity across the 5P model, one of our key frameworks.

Figure 4: Case for Change Selected Data Points

3. ***Sustainability is driven by problem solving and value creation.***
Accelerating Sustainability is a set of drivers, including but not limited to several that can lead to or be worsened by the climate crisis. There are other drivers that are broader, opportunistically-oriented factors, making this the perfect time for pursuing more commitment, investment and change regardless of orientations to climate and its impacts. Innovation, growth, changing preferences and relationships to the natural world, first to market and first educator advantage also drive sustainability solutions. What is real news is the available bio-inspiration that can fuel innovation and usher in "nature positive" economies. Figure 5 introduces our view on Drivers that are discussed in detail in Section 3.

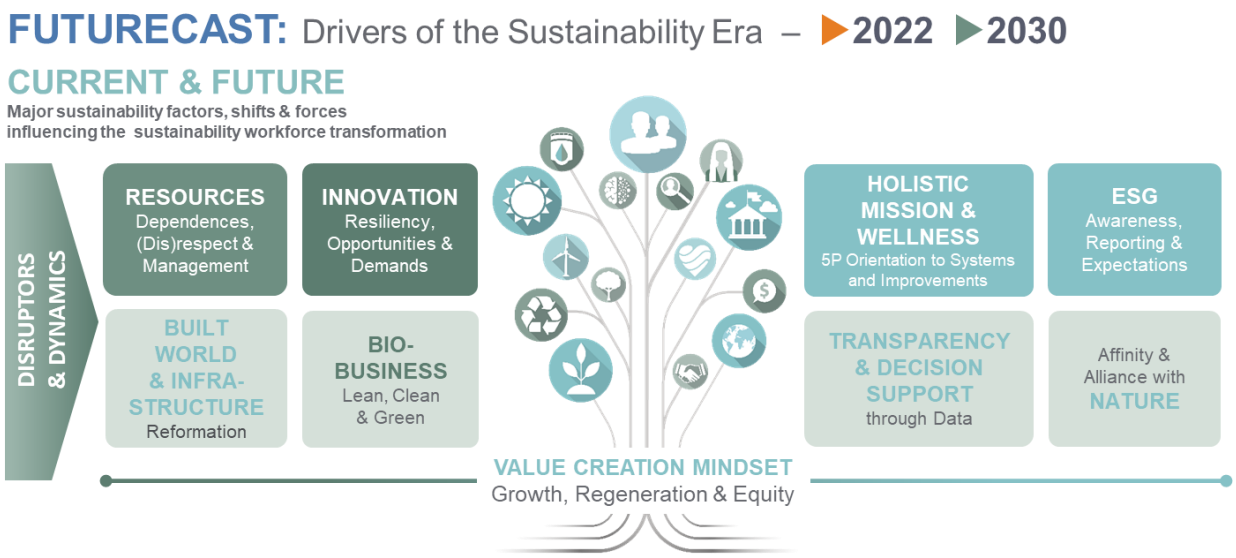

Figure 5: Futurecast Drivers

4. *The Green Workforce is now the Green+ and Turquoise Workforce.*

Everyone needs to get clearer and think more broadly about what WAS the GREEN workforce and now IS the Green+ and turquoise workforce. To deliver on these opportunities, a better and more accurate view of the "green workforce" is needed to show adjacent roles and functions, areas of focus, impacts and contributions. Our model calibrates to the concept of sustainability versus (conventional) green to describe the broader focus of the Sustainability Workforce Spectrum that is both Green+ and trending turquoise. This includes more adjacent and mutually supportive roles (see Figure 6) from broader technical, business and social arenas from bio-business, social innovation, regenerative communities, and innovative economic models offering broader prosperity.

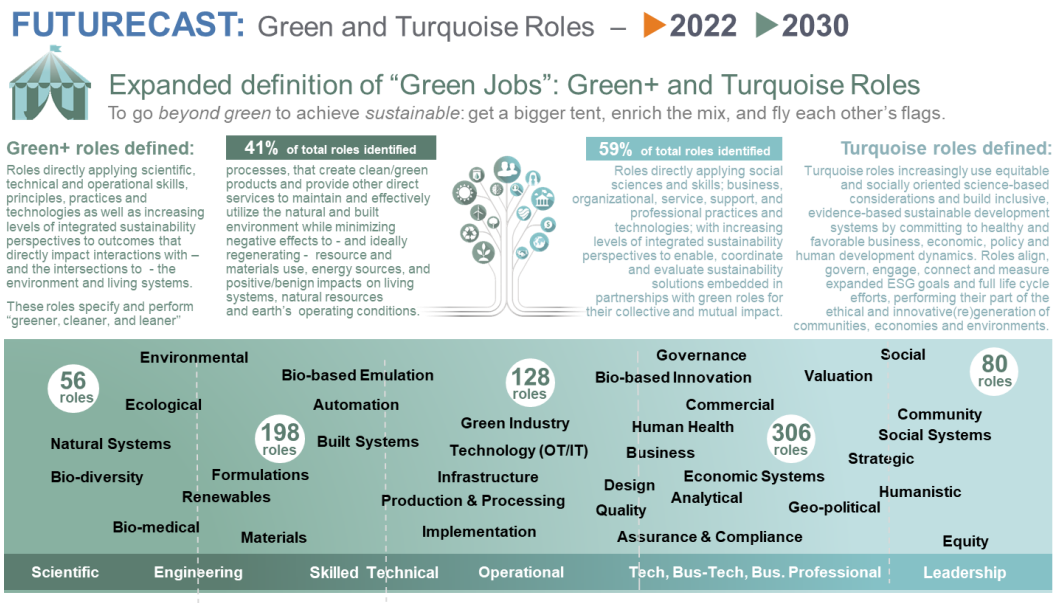

Figure 6: Futurecast Green and Turquoise Roles

Green is now Green+ and it's trending Turquoise.

5. *Sustainability workforce numbers are elusive, but the direction of change is clear.*

Clean and decisive workforce data and labor pool numbers are elusive, but the direction of change is clear. Across the 775+ roles reviewed, there are early winners of uptake and change in high-profile sectors, various job/role families, and skill clusters for key functions, science, business and people and culture. As Figure 7 shows, the areas of early uptake and change cross sectors, functions, and role and job families, opening up many opportunities for sustainable solution success.

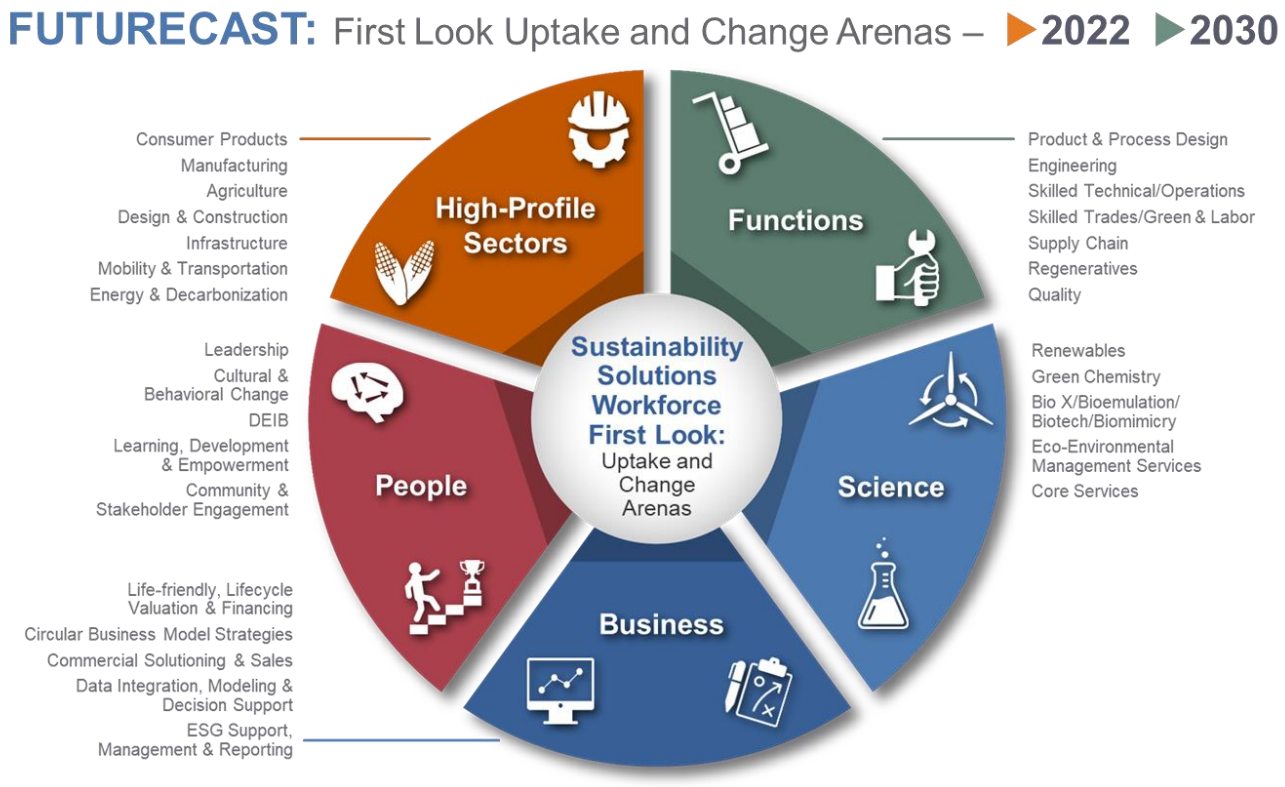

Figure 7: Futurecast First Look Uptake and Change Arenas

The numbers related to the sustainability workforce in terms of supply and demand are - very understandably - not easily available, nor necessarily reliable, or calibrated. Less structured workforce data is a logical outcome at this time for supplies and demand for future work roles based on several reasons: investment and structural employment factors, entire sectors in early stages of sustainability business models and practices adoption, and high numbers of conventional roles and jobs in need of Green+ reskilling that are not seen, titled, or understood as being in scope for the "green" conversation. Workforce categorization and calibration is an ongoing challenge for employers, government, and researchers. The data will improve, especially as we better understand who and what work roles and jobs are involved, making it easier to map supply and current roles as well as to add new ones. Also, demand will be more quantified as intensive solutioning opportunities and related workforce planning occurs, based on the roles we have identified.

6. *Business planners must include more holistic risk and opportunity scenarios.*

Business planners need to update their 'environmental scans' to literally include the natural world, the complex and diverse social landscape, and other sustainability context insights. We suggest trends as in Figure 8: meta trends, social and workforce trends, business trends, and governance insights circa 2022-2030 as they all change the needs and conditions for creating and then using sustainable solutions.

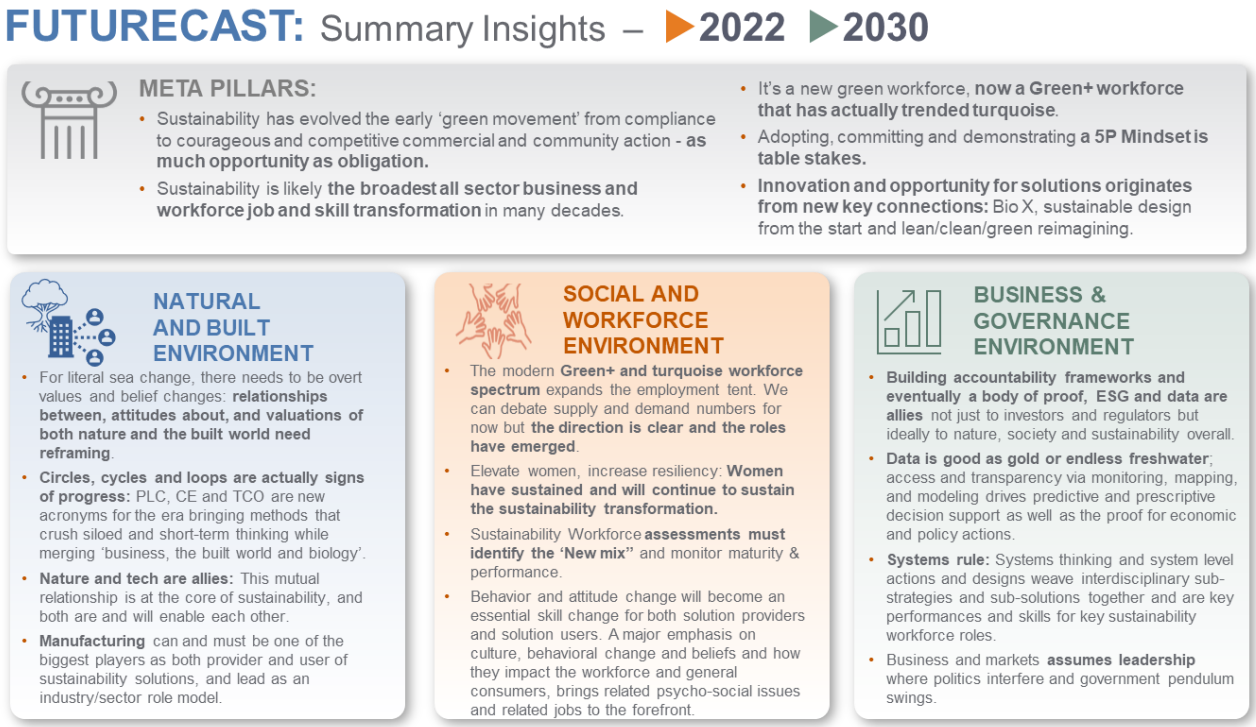

Figure 8: Futurecast Summary Insights

These summary insights are discussed in depth in Section 3.

7. *Two waves of the New Mix of high-value employability appear through 2030.*

Workforce trends between now and 2030 can be seen in two waves (Figure 9): those seen now and a second wave that will build from the first wave as exponential change to the New Mix of high-value employability over the next 8-10 years. This summarizes some of the broader changes and specific roles that we already see in markets, more uptake or change as we approach 2030, and global goals targeted for that timing.

Figure 9: Futurecast Workforce Transformation Trends

8. *Twelve sustainability-native role design principles drive the New Mix.*

More specific role and job (re)designs and job transformations are based on 12 primary principles (Figure 10) and can guide the creation of updated role and job descriptions, success profiles, candidate personas, hiring practices, development programs, and compensation plans.

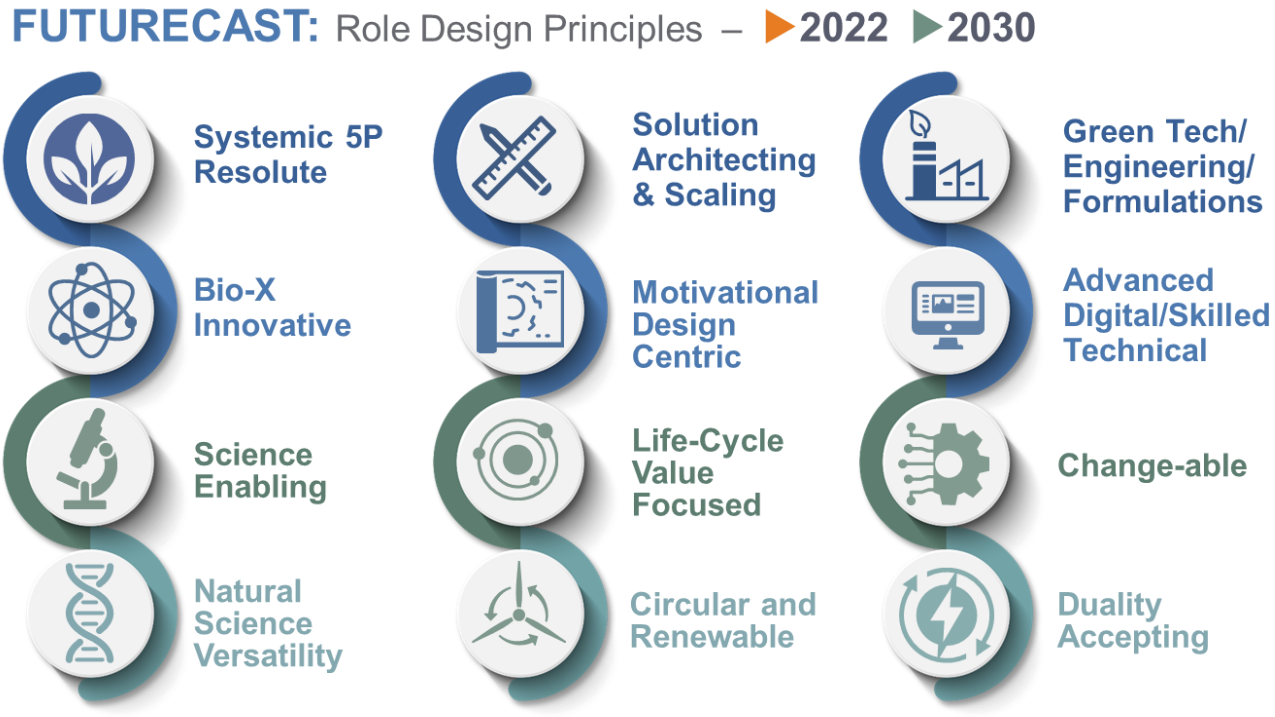

Figure 10: Sustainability Role Design Principles

For EVERY job, there is a SUSTAINABLE TWIN.

9. ***Challenges in sustainability offer at least 125+ areas of career focus.***

Role and job redesigns and related talent development needs - in fact, entire new and revised business models and offerings – have the opportunity to address the 125+ representative challenges we collectively identified. (See Figure 11).

FUTURECAST: Sustainability Challenges – ▶2022 ▶2030

CURRENT & FUTURE Representative challenges driving needed workforce capabilities to address

Abandoned/underutilized or outdated facilities
Abandoned/underutilized or outdated mines, wells
Age discrimination
Air pollution/air quality
Atmospheric degradation
Biome/biodiversity disruption and loss
Biosafety
Bioterrorism
Broken or insufficient infrastructure
Built in obsolescence
Carbon emissions; local, regional, global
Chemicals & pollution action
Cities and lifestyles – adverse impacts/footprints
Climate action compromises, distractions, inexperience
Climate change denial/cause attribution
Climate impact by human/industrial denial
Climate migration
Climate related water availability/usage and waste/water pollution
Combustion engine dependency
Community impact
Compliance penalties
Considerate construction
Contradicting company culture
Customer use bias to older products
Cyber threats to health and wellness
Cyber threats to infrastructure
Disasters & conflicts
Disparate impacts of climate disasters, land abuses, destruction of native lands
Disposable culture
Dominion arrogance; nature as man's disposable resource
Drought affected water supplies
Education & environment
Employee Value Propositions
Energy consumption & waste
Environmental degradation (forest, land, water)
Environmental rights and governance
Excessive, unnecessary travel patterns/habits
Excessive water use for discretionary habits
Exploitation
Exclusive climate action focus
External liability
Extractives
FAST vs SLOW fashion, food
Food insecurity
Fossil fuel overdependency
Fossil fuel transition impacts
Gender inequity
Greenhouse gas emissions
Green and circular economy inexperience
Greenwashing in many forms and deeds
Hazardous materials
Health & safety infractions and dangerous conditions
High costs of loans and lower equity values for disadvantaged or underserved clients and locations
Higher cost of some organic materials, products, processes
Human trafficking
Improper waste removal
Inclusive and accessible design
Industrial incidents and accidents
Inequality
Insufficient representation of stakeholder groups
Internal liability
Intolerable greenhouse gas emissions
Invasive species transport
Irresponsible sourcing
Lack of awareness of available sustainability frameworks and standards
Lack of high speed and/or mass transit
Lack of land and facility retro fitting and regeneration
Lack of social innovation
Lack of supply chain visibility for sustainability practices
Lack of trained sustainability workers at all levels
Material waste
Microfiber pollution
Microplastics pollution
Net zero greenwashing
Noncompetitive employment value propositions
Oceans & seas
Over consumption
Over population
Passive design
Poaching
Politicization of many sustainability issues and factors
Pollution
Poor energy efficiency of older heating, cooling, ventilation systems
Poor HR practices
Process inefficiencies
Product quality and lack of longevity
Resource efficiency
"Risks" of broader impact reporting to profiteers
Rising energy and material costs
Short-term thinking, fast 'x' (fashion, food, etc.)
Single-use products
Social injustice
Social unrest
Soil degradation
Stalled sustainable development goal adoption/progress
Technology
Toxic materials and chemical processing
Toxic materials
Toxic water infrastructure
Unscrupulous business ethics and practices
Undo political influence
Use of toxic or unsustainable materials
Valuing consumption, dominion over more life and eco-friendly values
Varying stakeholder needs for reporting and measures
Violation of business regulations
Wage inflation
Wasted raw materials
Wasted excess inventory
Wasted water
Water loss
Water toxicity and pollution
Weakened supply chains

Figure 11: Futurecast Sustainability Challenges

10. *Sustainability is as much about opportunity as obligation.*

The New Mix of sustainability workers have the opportunity to add or expand their work and impact in over 45 strategic and tactical opportunity trends in 3 categories as shown in Figure 12.

Figure 12: Futurecast Opportunity Trends

11. *ESG and sustainability are different yet mutually dependent with some but not all shared DNA.*

The emergence of ESG can put both carrot and stick in place and advance sustainability efforts in the publicly traded or financially regulated commercial areas, or in other reporting and compliance situations. Sustainability above and beyond ESG program management and reporting can and should exist and evolve in more specific, holistic, and custom decisions, innovation roadmaps, and performance plans that can be independent from yet connect to ESG standards and plans.

Figure 13: Connected DNA

12. *Six primary communities house all 775+ roles in top-level workforce categories.*

The Sustainability Workforce can be envisioned as mapping to 6 primary communities, where roles find a home base of adjacency and progression and make workforce planning, hiring and management a more consistent effort. The six communities are described in Figure 14 below:

Figure 14: Futurecast Subcommunities Definition

13. *The work of sustainability aligns to a Sustainability Solution Life Cycle (SSLC).*

The SSLC (introduced in Figure 15) consists of 10 circular and iterating stages with over 40 substages. Focusing on providing or using sustainable solutions, the SSLC creates a footprint that always starts with a commitment, a promise, a decision towards an effort that will be sustainable from an environmental, social, and economic perspective. It engages early key stakeholders and a workforce that can design and create the sustainability solution as the left (orange) side entails. The SSLC efforts continue on the right (blue side) to operate, distribute and experience the outputs, including regenerative considerations. These are the primary work domains and subdomains where roles and impact can align.

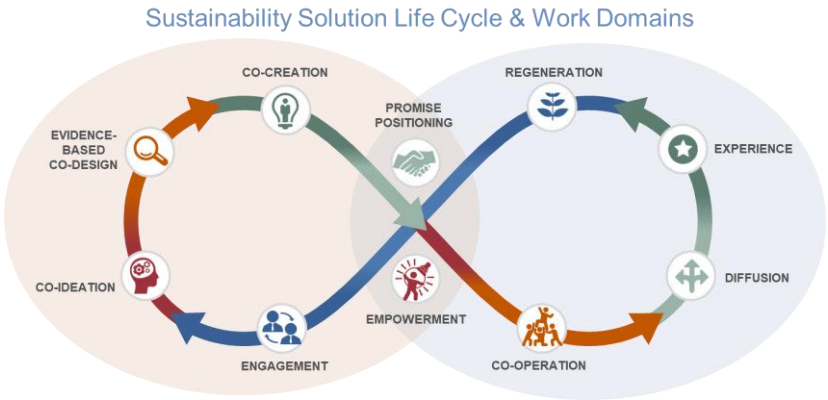

Figure 15: Sustainability Solution Life Cycle

When asking "*what is the work in sustainability?",* one can answer more definitively, strategically, and functionally by using the SSLC.

14. *The 2-level SSLC also aligns workforce roles.*

The SSLC organizes roles in a way that supports functional, process, and knowledge domain considerations. This allows for the Sustainability Workforce to be more fully described and aligned based on mapping existing or new job roles to the second level of the SSLC. We identified and envisioned over 775 roles and then meta tagged for essential descriptors and completed multiple vectors of mapping to provide a clearer picture of the workforce and their values. Figure 16 illustrates how individual roles align to SSLC stage based on when the role could first be expected to join the SSLC effort.

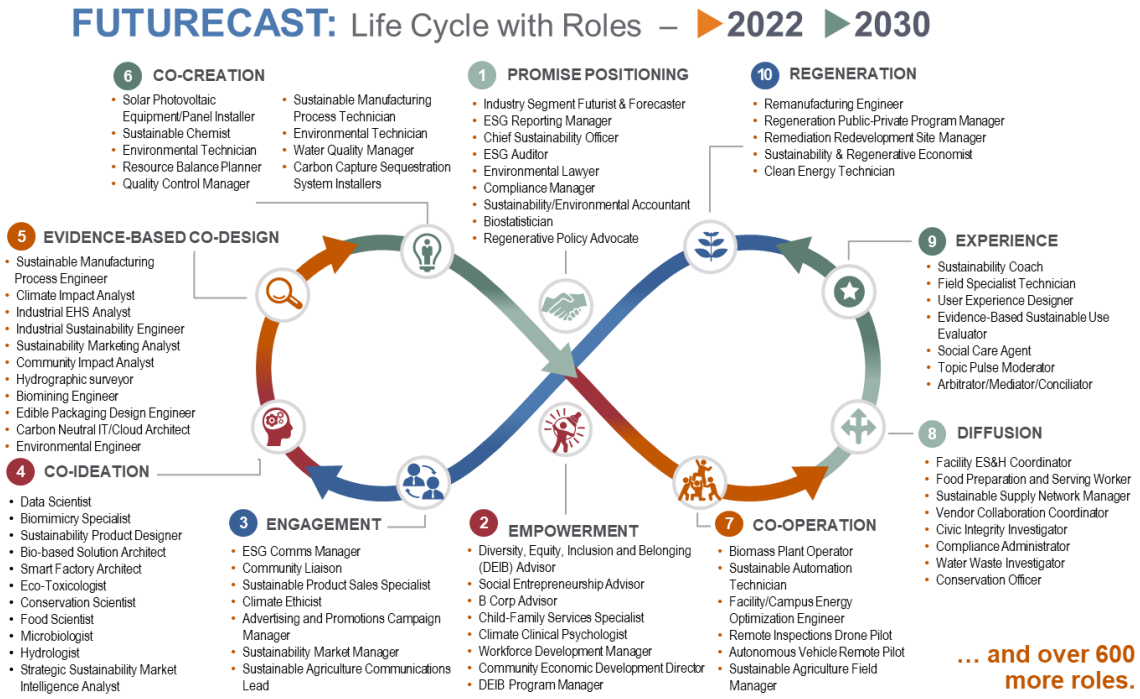

Figure 16: Futurecast SSLC with sample roles

15. *Co-operative design wins most popular SSLC stage award.*

Overall, the distribution of the roles across the domains (Figure 17) reveals that evidence-based co-design brings the most roles into the SSLC for the first time, positioning over 180 roles that can potentially co-design the sustainability solution, representing the many diverse areas that can contribute and innovate to a solution.

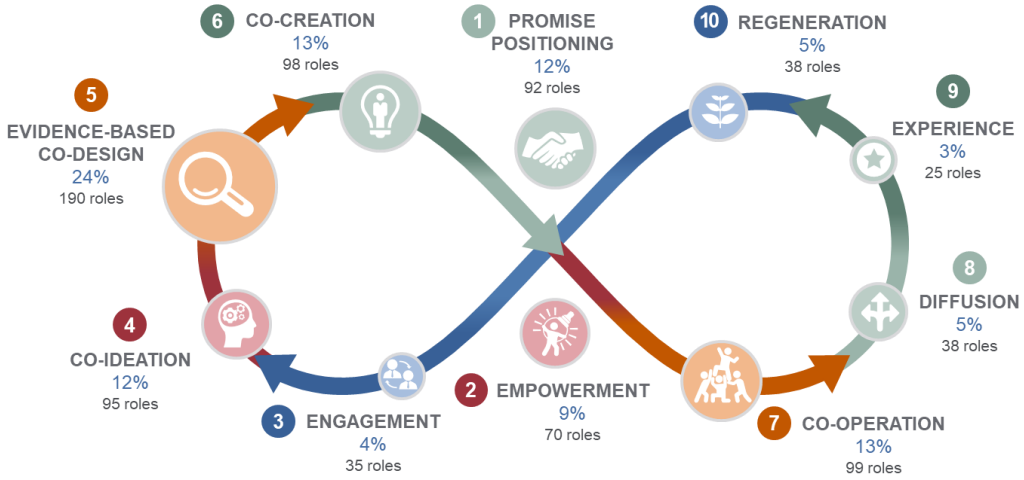

Figure 17: SSLC Stages with Role Allocations

A proprietary database to enable our identification, calibration and management of this workforce description framework and containing over 9000 data elements on these roles has been built to support our ongoing oversight and continuous improvement of the workforce model.

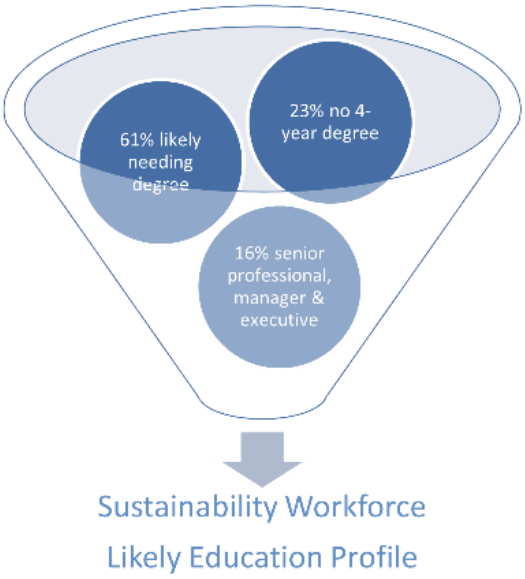

Figure 18: Likely Education Profile

16. *Four-year degrees win most popular likely education profile.*

There is an obvious attribute of sustainability roles needing more business and science/technical skills, knowledge, and capabilities that are most often associated with a 4-year university degree program (Figure 18) however:

- **23%** of roles (~180 in our review scope) are likely available to candidates not needing a 4-year degree (total of laborer, et.al., technical/representative; skilled technical and paraprofessional);
- **61%** of roles (~470 in our review scope) likely require at least a bachelor's degree, although we project that over time some of these will be achievable by 2-year certifications programs or equivalent for experienced skilled technical and paraprofessional workers;
- **16%** (~130 roles in our review scope) are senior professional, management and executive roles with likely the same or more academic readiness as the broad professional category.

We expect that as these roles mature and with more scaffolds built into organizations, processes, and technologies, some of the professional roles will appropriately be performed by workers not needing a 4-year degree but often benefitting from certifications and structured on-the-job experiences.

17. *Cross-Industry wins top community for most critical roles.*

Out of the 775+ roles reviewed, almost 125 were selected as critical roles for either their positioning as a Pioneer, Keystone, or high value Producer (see Figure 19 below).

FUTURECAST: All Subcommunities, All Critical – ▶2022 ▶2030

Ecological and Environmental

Biomimetic Process Designer
Biomimetic Product/Component Designer
Biomimicry Specialist
Chief Sustainability, Environmental & Safety Officer
Ecological Value Assessor
Energy, Water and Material Balance Planner
Environmental Engineering Project Manager
Environmental Science & Protection Technician
Environmental Technician
ESG Program Management Integrated Initiatives Lead
Geoinformatics Technician
Geoinformation Analyst
Global Decarbonization Project Manager
Pollution Solution Advisor
Renewable Energy Advisor
Restoration Ecologist
Sustainable Chemist
Water Quality Field Technician
Water Quality Manager
Water Waste Investigator

Infrastructure

Drinking Water Treatment Plant Operator
E-Mobility Grid Installer
Energy Source Integration Engineer
Facility/Campus Energy Optimization Engineer
Lead Solar Installer
Long-Duration Energy Storage Engineer
Power to X Optimization Architect
Recycling Coordinator
Solar Energy Installation Manager
Solar Operations & Maintenance Supervisor
Solar Photovoltaic Equipment/Panel Installer
Solar Turbine Assembler
Streaming Service Energy Optimizer
Sustainable Builder
Sustainable Construction Materials Technologist
Waste Management Specialist
Wastewater Treatment Plant Operator
Water Recovery Specialist
Water Resource Management Specialist
Wind Energy Operations Manager
Wind Turbine Installer

Manufacturing

Biomimicry Manufacturing Specialist
Industrial Ecologist
Industrial Sustainability Engineer
Materials Engineer
Materials Scientist
Photonics Technician
Product Designer
Remanufacturing Engineer
Sustainability as a Product Strategist
Sustainability Product Designer
Sustainable Additive Materials Engineer
Sustainable Automation Technician
Sustainable Factory Engineer
Sustainable Manufacturing Process Engineer
Sustainable Manufacturing Process Technician
Sustainable Packaging Engineer
Sustainable Product Designer
Sustainable Product Innovation Strategist
Sustainable Product Sales Specialist

Community

Climate and Social Equity Specialist
Climate Change Policy Analyst
Climate Justice Policy Analyst
Climate Migration Specialist
Community Economic Development Director
Economic Development Specialist
ESG Program Managing Chair
ESG Reporting Manager
Sustainability Behavioral Change Specialist
Sustainability Policy Development Specialist
Sustainability Talent Recruiter
Sustainability Workforce Planner
Workforce Equity Recruiting Strategist

Cross-Industry

Bio-Based Business Solution Architect
Carbon Neutral IT/Cloud Architect
Chief Diversity, Equity, Inclusion & Belonging Officer
Chief Mission Officer
Chief People Officer
Chief Risk Officer
Chief Sustainability Officer
Climate Ethicist
Community Network Coordinator
Digital Nudge Technologist
Digital Transformation Advisor (Green IT Transformation)
Diversity, Equity, Inclusion and Belonging (DEIB) Program Manager
Efficiency & Optimization Specialist
Enterprise Sustainability Culture Change Management Specialist
ESG Auditor
Evidence-Based Sustainable Use Evaluator
New Loop Economy Architect
Organizational Biologist
Procurement Manager
Product End of Life Specialist
Product Life Cycle Manager
Product Manager
Product Recovery Specialist
Quality Assurance Specialist
Quality Control Manager
Quality Manager
Remote/Hybrid Work Designer
Renewable Energy Operations and Maintenance Specialist
Resource Balance Planner
Responsible Sourcing Specialist
Risk/Opportunity Modeler
Social Innovation Advocate
Supplier Diversity & Sustainability Manager
Supply Network Sustainability Compliance Manager
Supply Network Sustainability Global Compliance Manager
Sustainability & Regenerative Economist
Sustainability Analyst
Sustainability Financial Risk Specialist
Sustainability Financing Strategist
Sustainability Metrics Manager
Sustainability Partner Integration Planner
Sustainability Sales Account Manager
Sustainability Solutions Architect
Sustainability Solutions Sales Engineer
Sustainability Transformation Leader
Sustainable Cloud Engineer
Sustainable Engineer
Sustainable Supply Network Manager
Vendor Collaboration Coordinator
Quality Assurance Technician

Critical Roles for Adjacent Sub-Community Not Identified

Figure 19: Futurecast All Subcommunities, All Critical Roles

Across the communities, we see the distribution of critical roles as shown in Figure 20.

Figure 20: Allocation of Critical Roles by Subcommunity

This is not a recipe for a specific hiring slate but rather an initial assessment of the larger group that may be helpful as a first filter of what often are the most valuable and important roles within the 775+ overall placed into more accessible lists of roles by subcommunity and domain. Figure 21 shows the critical roles for the Cross-Industry subcommunity. Of course, importance and value are dependent on additional factors: place in the supply chain, existing staff, use of third parties, and other primary workforce planning considerations.

Figure 21: Futurecast Critical Roles Cross X

18. *Necessary and valued capabilities include 350+ business, technical, and professional skills.*

The sustainability skill transformation, career skilling, reskilling and new educational and practice requirements will be the most major workforce competency transformation since automation and digital technologies. There are over 350 skills, knowledge, and capabilities in our review across professional, business, and technical/science that bring valued contributions to sustainability solutions and work.

Figure 22: Technical Skills Partial View

Figure 22 represents the first half view of our identified technical skills; the remaining technical skills as well as business and professional skills are included in Section 8.

19. *Action Chains build rich business cases for the Sustainability Workforce.*

The New Mix of work roles and jobs need to be assembled as collaborations towards critical sustainability actions and outcomes. Ten representative Action Chains (Figure 23) describe roles that collaborate to achieve progress and reduce risks across environmental, social, and economic challenges. Figure 24 is one of the 10 action chains.

Figure 23: Action Chain List

5 An Action Chain for
Sustaining supply chains

How sustainable is our supply chain? What are the **environmental and human impacts of our products'** journey or our service delivery through the supply chain? Are you asking these questions? According to ESG stakeholders, supply chain and logistics are major areas for sustainability attention, touching the full life cycle of an organization. We saw from the Covid 19 pandemic impacts, the Ukraine war, and global weather and geo-political forces how vulnerable the supply chain is. From raw materials or supply sourcing to production and use and literally every move or part in between, these roles and others are looking for efficiencies, innovations, more resilient approaches and shared opportunities.

Supply Network Sustainability Compliance Manager ■
We have both mandatory regulatory and voluntary compliance programs for our supply chain, including those to meet government supply chain. I assess and plan efforts for our network and individual suppliers to meet those standards and keep our business using best practices.

Chief Logistics Officer ■
I lead, along with our Design, Operations, Supply Network Facilities and other core executives, the efforts to make sure their teams have everything they need to get our work done and move our resources and products from place to place. My team and I also take on major project oversight for new facilities, startups and shutdowns. We're constantly increasing our analysis of the total cost life cycle and impacts to the environment, our communities, and our supply chain while reengineering to better and sustainable practices.

Supplier Diversity & Sustainability Manager ■
My role is to discover and incubate new vendor relationships and find vendors in unexplored categories to support our DEIB and environmental goals. I find and help ready new partners, such as small businesses, minority-owned businesses, experts with specific sustainability expertise or businesses in a new region.

Social Entrepreneurship Advisor ☐■
Mission-oriented entrepreneurs and startups in the social service sector or companies simply wanting to be more adept and mindful of their social practices ask me to assess their business models, operations, organization and plans. Along the supply chain, there are brand and operational risks to underestimating the critical aspects of leveraging social entrepreneurs to improve, balance or grow existing suppliers.

Sustainable Supply Network Manager ■
My day-to-day procurement and management of various supply chain partners has been modernized to include coaching them on our sustainability programs and ensuring our contracts, reporting, orders, and related tasks meet those aims. Every new sustainable practice also has the chain to cascade in their other supply chains.

Smart Contract Advisor ☐■
Bringing digital technology, cybersecurity and process efficiency to purchasing and contract management is my role. I'm an expert in smart, automated contract systems and processes. I advise on piloting new tools and emerging practices, including blockchain, with a goal of ensuring lower cost, lower resources and higher credibility of transactions, all without extensive third-party involvement.

Sustainable Innovation Partner Liaison ■
I'm an insider-outsider-prime-and-partner type of role, constantly looking for innovation with our partners. I seek new supply network members, design pilot programs, onboard suppliers, and advance our supply chain capabilities through change.

Vendor Collaboration Coordinator ■
My role is measured on successful implementation and execution excellence of our vendors and suppliers. Part vendor manager, part procurement partner, part mediator and troubleshooter, I help build agility and improved sustainability into our supply chain.

Demand Planner ■
Sustainably optimizing inventory availability with forecasted vs. actual demand in our supply chains is where I contribute. There are costs due to overproduction, excess inventory management, unnecessary storage and transport costs. These are just some of the factors I can mitigate with the right data and partners.

Smart Contract Reviewer ■
Since we build our compliance requirements into our automated smart contracts, I concentrate on measuring effectiveness and efficiency of the process and tools, focusing on transparency, ESG reporting and security/non-tampering, as well as further improvements.

Remember Adjacent Roles!

There are many conventional supply chain roles that are also part of this extended capability network, such as:

- Inventory Managers
- Logistics Engineer
- Logistics Compliance Analyst
- Vulnerability Assessor
- Wholesale & Retail Buyer
- And many more!

Also, a reminder….Some companies will also be managing fleets and there are roles in sustainable fleet management to consider as well. Substantial resource use, costs, safety and optimization make even a relatively small fleet a prime target for more sustainable impact and with that more key "supply chain" roles will be involved there as well as fleet optimization continues to be an improvement target for sustainability.

Figure 24: Sample Action Chain

20. *Count on culture as much as science to create opportunities and solutions.*

An actionable culture is as important as the right New Mix of the workforce. Aligning the seen culture (actions, behaviors, customs) as shown in Figure 25 with the unseen aspects of culture (values, beliefs) will deflect the idea that 'culture eats change for breakfast' and instead serve as the primary accelerator for the new workforce mix.

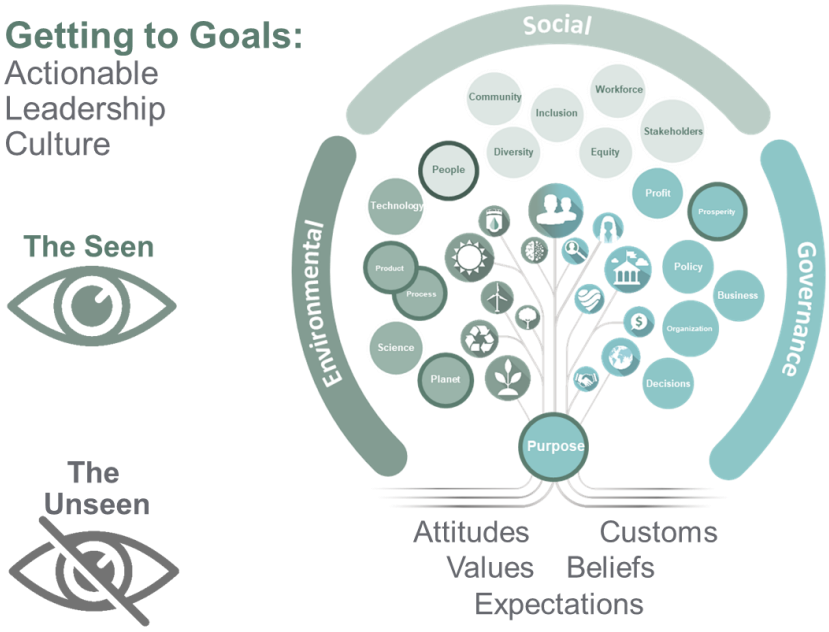

Figure 25: Seen and Unseen Culture

Across the organization, whether a solution provider or a solution user, these practices (Figure 26) preview some actions that can help leaders create a supportive culture. Additional discussion on leadership and a culture of sustainability can be found in Section 8.

Figure 26: Actionable Culture Practices

21. *Essential calls to action make the destination worth the journey.*

Every organizational journey is different, as are the individual employment opportunities in our view of the Sustainability Workplace. Recommended calls to action in Figure 27 bring together what key stakeholders need to do to see the impacts and opportunities for sustainable business, workforce, environmental and community goals.

What is next on YOUR list?

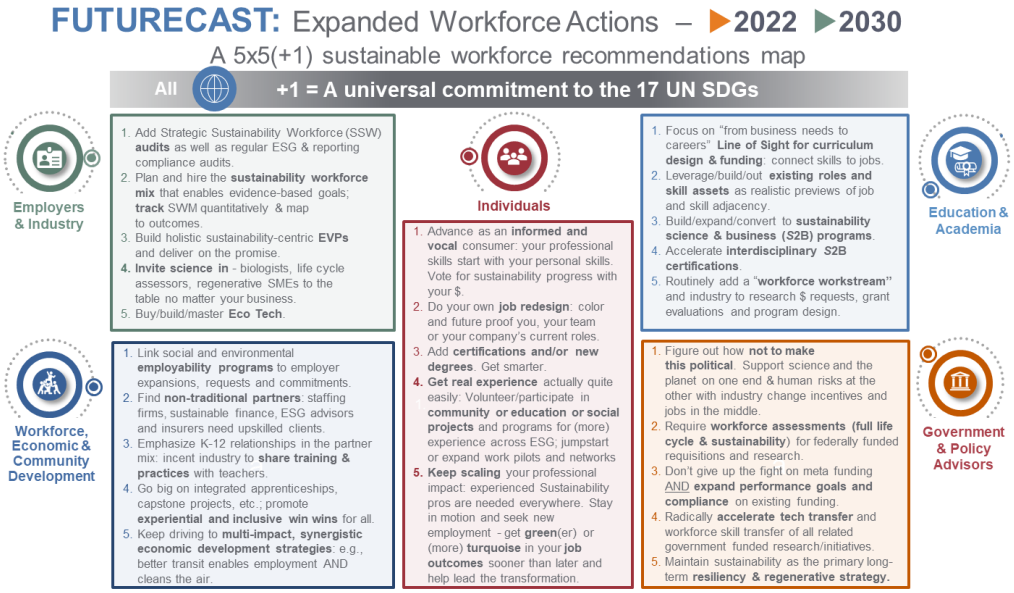

Figure 27: Futurecast Expanded Workforce Actions

As these key conclusions show, Manpower now sees the spectrum of the sustainability workforce; we know how to describe it; we can map conventional and new or emerging job roles to a view of it; we can connect job roles to meaningful performance and impacts; and we can give guidance on how to determine the "New Mix" that can result in those achievable aims of better resource management, better and more equitable social engagement, better earth stewardship, improved living conditions, broader economic prosperity and overall less disruptions and conflict.

The workforce overall - today's and tomorrow's - is the zone Manpower studies and where we offer solutions of many types.

The workforce is where we see guiding indicators of acceptance of the challenges and the obligation and opportunities that our current state of the environment, society, and our governing and economic sectors demand.

At Manpower, we operate from a perspective as workforce planners and solutioners that jobs and work roles are a proxy for what society values. With the benefit of more insights and finer tuned lenses and support to turn the tides, employers of all types (from industry to health care to entertainment to NGOs) will change their business and workforce mix and reap the benefit of more informed ways to see what sustainability work is and what it can offer as purpose, effectiveness, and prosperity.

Jobs and work roles are a proxy for what society values.

What we share here about the changing Sustainability Workforce may not be proof enough for some and may not give the instant answer or provide the numbers to drive the magic bus or change the direction of the ship for others. Yet, we believe that regardless of sector, industry, geography, or maturity, organizations must not lose their opportunity to seek, identify and build their new workforce mix to accelerate sustainability. Starting there, we believe organizations can progressively embrace new ways of actionable *leaner, cleaner and greener* methods including the time-tested intelligence of nature and bio-emulated innovation. They can find and invest in transforming themselves, their industries, and their customers' practices to deliver on resilient economies and regenerative communities.

We hope to use our understanding of the Great Realization and additional sustainability specifics to spur the critical mass and make changes. It seems like the most logical and sane nature of governing bodies, businesses and communities would be to do a few obvious things:

- build an adaptive and resilient world through a trajectory of sustainable practices for our natural world in partnership with the people who make life happen.
- make commercial and industrial efforts to sustainably improve human health, livelihoods, abilities, and availability for dynamic and prosperous work.
- and encourage conscious consumption, keeping it all open to innovation and continuous exchanges of value.

The path to those goals beckons to all but is varied: longer for some, an off-road itinerary for others, and already down the line for early winners.

Is there really any other option than to navigate the path to being a sustainability solution provider and consumer and run ferociously with clearer vision to the future? Pay now or pay later may actually be pay now or have no value-backed currency to exchange in the future.

Manpower's work here brings a toolkit of assets ultimately intended to help employers, educators, policy makers, thinkers and doers in most any organization to gain a clearer view of the new workforce mix with guidance on how to identify and assemble inspired action chains in the workforce that create opportunistic and impactful sustainable solutions.

We hope you keep looking out your window and are inspired, calmed, and coached by the inherent resilience and strength of the natural world, the social innovations that bring health, wellness and opportunity, and economic systems that support both.

Here's to brighter sights, a vision for the near term and towards a long and prosperous future for you and yours.

Section 2:

Our Purpose.
Everyone's Problem. *Your* Challenge.

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Section 2:
Our Purpose. *Everyone's* Problem. *Your* Challenge.

Introduction

It's not news that we have a very busy intersection of environmental, social, economic, and political factors impacting the health of our people, economies, organizations, communities, and the environment where we both live and work. Our social, natural, and built worlds are under great challenges. Major government investments and policies swing like a pendulum. Consumers and citizens fluctuate in their demands and willingness to change, especially where there are shifting demographics, including impacted groups or modern mindsets who expect profound change around them. In business, the ESG measurement and reporting evolution and the increasing expectations by broader stakeholders for addressing, sharing, and reporting progress on all fronts is shining a light in the eyes of many executives, commanding action and information. Across sectors, we need change, innovation, and efficiencies in all areas: people, planet, process/product, prosperity, and purpose. Fortunately, while facing those pressures, we also have access to unprecedented capabilities: shared information and heightened awareness, technologies and innovations, science and early successes, progressing government agendas and changing social tides, and an increasing sophistication, including in the expanded arena of more holistic sustainability.

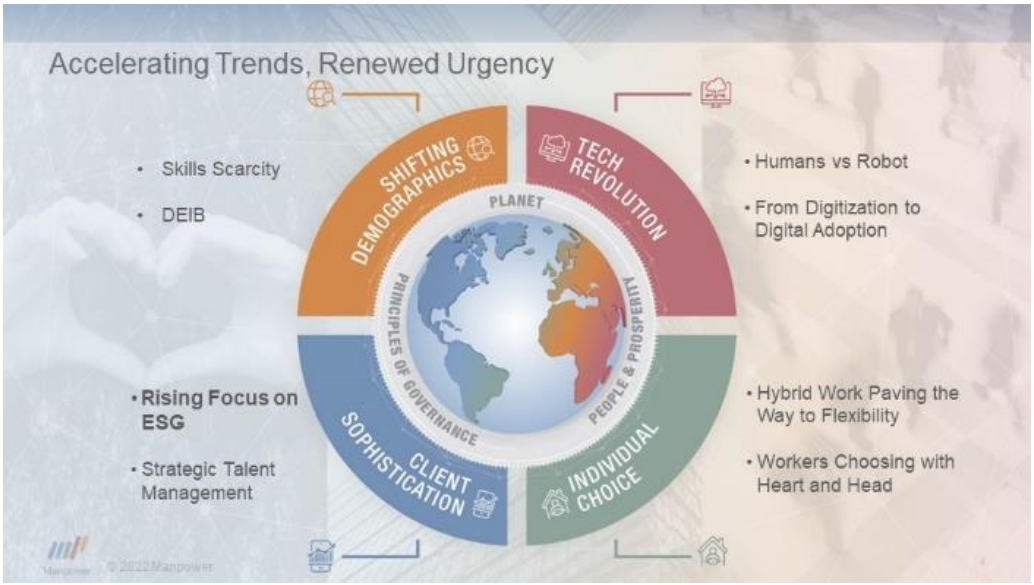

Figure 1: Accelerating Trends

Over the next decade, sustainability needs, expectations, investments, and successes for more rapid and real change will continue to accelerate in the face of greater risk and reward, obligation, and opportunity (see Figure 1 for accelerating trends). Manpower believes society and the world of work will come to understand that sustainability skills and outcomes have become the most significant workplace transformation arena since digital technologies and automation. Sustainability will become the single largest meta-domain of skills and knowledge since technology for all sectors to transition, upskill, and redesign work and the jobs that do it.

Hang on to your hat, or should we say, the closest tree.

Part A: The Effort - Our Purpose

Why our research, and why now?

Manpower believes the time has come to collectively improve the way we look at sustainability jobs and work. This research is meant to be a way to organize workforce roles, capabilities, planning needs and talent strategies to make it through the modern minefield that is sustainability's target. This 'green jobs landscape' is at the epicenter of solutions to many of the disruptions being faced locally, regionally, and globally.

It is also time to keep evolving how 'green jobs' are described. Our intent is to modernize the green jobs spectrum. In addition to direct/science or ecological and environmental as the primary green jobs, we are very committed to creating a bigger tent and expanding conventional thinking about green jobs. Broader and diverse collaborative business and social roles, together with modernized green and conventional roles, represent a more holistic span of high-impact, highly needed roles.

As a starting point, we want to introduce five subtopics that help to define the effort, purpose, and structure of our applied research into the Sustainability Workforce arena. These subtopics share the intentions for the effort and the list of outcomes that we share more deeply in Sections 3-9.

- **Problem Statement:** What do we think is the issue and why do we care about researching it?
- **Premise:** What do we believe to be true overall about solving the problem and addressing its major issues as we see them?
- **Research Goals:** What are the specific questions we planned to answer to support our premise and that directed the assets we built?
- **Guiding Values:** What are the critical success factors for the principles and core content of the assets we produced?
- **Outcomes and Assets:** What are the components that make up the collection of assets provided here?

Research Origins: The Problem Statement

Overall, our strong interest in this research is to be able to apply it broadly and specifically on behalf of our clients, both the thousands of employers we serve and hundreds of thousands of employment candidates we have millions of conversations with annually.

Problem Statement

Many employers across most sectors have ongoing challenges with proactively adapting to the accelerating sustainability trends and conditions that impact their continued success. From skills scarcity to the rising focus on ESG to diversity there is a renewed urgency and hence the Great Realization that was introduced earlier.

Employers need help to evolve and innovate the sustainability processes, products, and structures that they struggle to address amidst the constantly renewing urgencies of systemic disruptions across our social, economic, environmental, and governance arenas.

This led us to a specific problem statement to address via this research (Figure 2).

PROBLEM STATEMENT

We believe employers are challenged to more sufficiently and skillfully be able to:

- Understand their sustainability opportunities and obligations to solve for some of our most pressing major problems.
- Adopt a mindset, culture, and deep practice around successful sustainability.
- Blend scientific, social, and business capabilities into organizational, team and individual work designs.
- Define associated jobs/roles and work.
- Plan and develop optimal workforce changes.
- Create value for their shareholders and their broader stakeholders.

Figure 2: Problem Statement

As one of the leading workforce solution providers, we care greatly about employment, the world of work generally, and specifically the success and resilience of our clients and candidates. Manpower believes that in fulfillment of our purpose of “doing well by doing good”, we need to lead in developing, attracting, and placing workers in meaningful employment to provide high-value capabilities. This is especially important in the solution arenas to our most pressing challenges of today and in the high-value employment positions that enable continued operations and resilience of our employer clients.

Research Origins: The Premise

When it comes to solving the problem for our employer clients and individual candidates, we work from several key baseline values and beliefs (see Figure 3) which is our premise for the research overall:

- Sustainability emerges as the third major horizon of change for employers of the last several decades. Following automation and digitization, sustainability has more potential for positive impact because of the preceding major changes. Automated controls and processes as well as general technology, digital data, and communications enable many sustainability practices and innovations and increase awareness of the impacts and needed action.
- We believe the practice of sustainability does represent the next and most significant transformation for the global workforce. The capabilities and contributions of a sustainable mindset and practice will solve for many social, environmental, economic and governance issues.
- We believe the obligations and opportunities to leverage sustainability, to design and operate bio-inspired business and organizations generally, and to deeply engage in regenerating the communities where we live and work, can and will create the ultimate and collective stakeholder value.
- We also believe there is tremendous opportunity for Manpower and ManpowerGroup to lead in the workforce solutions shift to The New Workforce Mix.

The Premise

- Sustainability as most significant transformation
- Leverage sustainability mindset and practices
- Lead and operate bio-inspired business and organizations
- Regenerate communities
- Create ultimate stakeholder value

Figure 3: The Premise

- This **New Mix** as we call it, is *the combination of upskilled, reskilled and newly career skilled sustainability roles across the spectrum of expanded Green+ and Turquoise roles: leadership, business, business technical, operational, and scientific roles and capabilities.*

Applied Research Goals

What are the specific questions we planned to answer to support our premise and direct the assets we built?

Eight questions (see Figure 4) kept our focus and enable us to:

- Provide views of the work in sustainability and the resulting job and role views that can help direct workforce decisions and investments by government, industry and company leaders, workforce developers and educators, and current and future sustainability workers.
- Deploy usable, key references to enable capabilities of small- and mid-size manufacturers as well as larger industrialists:
  - Centralize a current and future state view
  - Identify a work domain view and a role taxonomy
  - Refresh Sustainability Workforce challenges
  - Create a shared view of the sustainability talent ecosystem

While accepting this is a viable but initial effort, we are aware that derivative work to determine how we and others can more directly apply these findings and assets will be necessary. Work and interpretation from these assets will create more targeted opportunities as will supply/demand and other data to quantify certain aspects of the emerging need and transformation as shown in Figure 4.

Figure 4: Research Goals - 8 Questions

Our intent is that Manpower's Sustainability Workforce efforts overall will help clarify the work to be done and the roles needed to do it. These assets and insights can be used to better inform decision makers, organize sustainability talent, and provide targets to policy makers, funders, educators, and job seekers.

Guiding Values

Our intent was *not* to convert hardened hearts (but hopefully bring along minds), nor to re-establish the business or scientific cases, or to repeat the incredible array of data and narratives available to prove or dispute the specific impacts of not being sustainable. Our purpose was to *passionately originate* newer perspectives and assets and to provide frameworks for the future planning, development, hiring and employment of a workforce that will make an impact on sustainability progress and opportunities.

So, our choice with this work was to be complete in answering the research questions and to avoid overanalyzing or only restating the general conversation of sustainability problems. This

Figure 5: Guiding Values

choice supports increased employability and capability. Our preference is to focus on opportunities, and that drives our overall guiding values which position the employment arena of sustainability as opportunistic, solution-cycle oriented, solid enough to meet needs for today and tomorrow, and through assets that have us in our lane with a workforce and capability bias.

These guiding values in Figure 5 hopefully increase the relevance of this body of work across industries and sectors and for employers or other stakeholders at most any stage of the journey. While sharing current and future sustainability skill needs with other industries, most every employer will eventually compete with other market segments for a sustainability-capable workforce across various business and technical work areas. In this way they can see where they are in common territory with others, yet also see segmentations that apply to them more specifically. Other previous and ongoing sustainability workforce development initiatives in the public and private sector have provided foundational resources to guide workforce planning and development, but more sustainability-specific guidance was needed - guidance that is more holistic and yet applied.

Outcomes and Assets

As a result of this sustainability effort, there is now a set of meaningful tools and thought leadership to organize the work, workers, and work environment of the sustainability ecosystem. Figure 6 is a summary of the primary pieces available.

Figure 6: Research Outcomes

Within this portfolio of outcomes, Manpower has maintained the same approach in other Future Jobs research by keeping the taxonomy assets as shown in Figure 6 and then adding others to complete the scope. Other new taxonomy assets have been added to this Sustainability Workforce research.

Hopefully, that is what is accomplished here.

Our framework establishes an initial yet minimally viable, representative, role-level focused taxonomy of workers and a "now and next" view of the critical work required of the Sustainability Workforce. We have been both generic (or cross industry) and at times specific to sectors in order to offer coverage. Views of today's challenges and tomorrow's horizons are considered as several key workforce tools have been created. Figure 7 is the baseline set we have used in past workforce taxonomy efforts, and new components have been added as well.

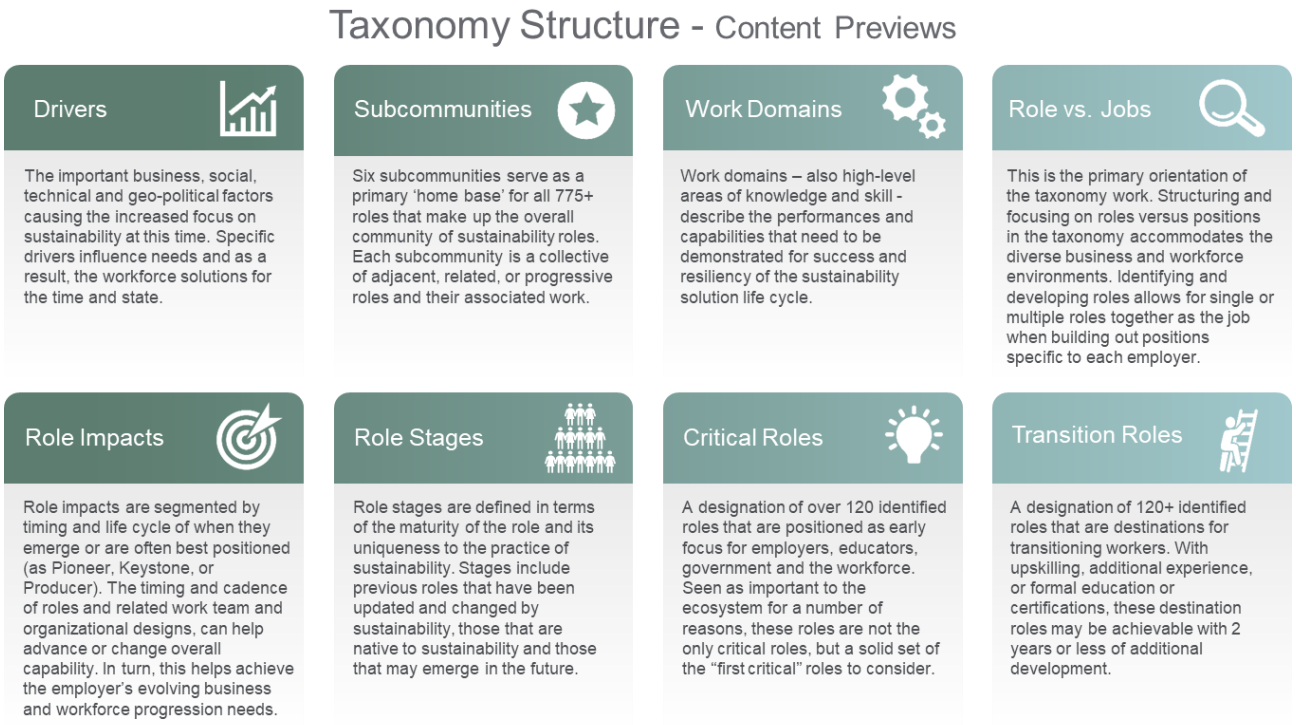

Figure 7: Taxonomy Assets

These tools on evolving the Sustainability Workforce can serve as a sustainability-specific primer for industry, individuals, academia, government, and workforce development as they meet the related workforce challenges. Whether one wants to be a better workforce planner, recruiter, career coach, educator, business leader, policy maker, sustainability strategist or other, there should be answers to some of your questions here as well.

Part B: Everyone's Problem. Your Challenge.

Sustainability and the workforce that it requires and inspires is an evolving chronicle that even in short format can best be told through past, present, and future narratives. Provided in this second part of Section 2 are five outlooks, each providing a slice of the past, present, and future view of the sustainability arena as it relates to workforce transformation. These outlooks set the landscape for the shape, form, and direction of change in today's Sustainability Workforce. We'll introduce the background issues and even some history as we set the stage for the insights and further outcomes that we share more fully in future sections.

Together, the subtopics in this section begin the account of the change and innovation for the sustainability opportunities that employers continue to have or need to accelerate. Manpower believes every industry seems likely to experience some version of a tipping point in the near future towards a much broader sustainability solution-oriented workforce, and these problems and challenges should have wide application and meaning.

Covered in this section on Everyone's Sustainability Problem and Everyone's Workforce Challenge are these subtopics:

:

- **Sustainability Defined**: Calibrating on a foundational definition sets the stage for understanding the insights, models and assets created to accelerate sustainability and the workforce that creates it.
- **Drivers and Challenges**: Drivers are our view of the high-level important business, social, technical, and geo-political factors causing the increased focus on sustainability at this time. We also identify a representative set of the shared specific challenges underneath the major drivers that direct the work, skills, capabilities, and outcomes that the New Mix needs to accomplish.
- **Opportunities**: These are representative prospects for organizations and individuals to pursue and the reason why tackling sustainability in most any form can be a meaningful and prosperous career or business focus.
- **Timeline**: What has brought us here across the many previous eras? Here we offer a shorthand view of our take on some relevant or diverse history that may broaden perspectives of why we are where we are and why it is time to move on.
- **Horizons**: Here we will share some of the emerging changes on the landscape that may not have achieved modernized or native sustainability states but are those most likely to next define priorities that we are seeing for many sectors and for manufacturers in particular.

Sustainability Defined

From newsfeeds to politics to boardrooms to Super Bowl commercials and the shelves of our stores and our online carts, we feel the reality of our interactions between the natural and the built world and see that sustainability is pervasive today. It's a key part of the constant stream of change and calls to action for business, society, industry, and most all of us as both citizens and workers. The sustainability conversation is an essential one for all industries, especially manufacturing, which has changed to more immediate, more expansive, more critical, and more opportunistic.

So, let's first make sure we are calibrated on *What is Sustainability*? before we attempt to gain insight on it.

We are grounded in a commonly held reference for the definition of sustainable development which is the one from the UN World Commission on Environment and Development: "… sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs."

Building from that we also use the commonly held scope of sustainability that it is the process and efforts towards sustainability overall - a more holistic view of sustainable development that goes beyond economic and human development into a holistic systems view. Sustainability is inclusive of the planet AND people, purpose, process and product and prosperity.

The UCLA definition of sustainability is a favorite as it pulls forward the concept of integration and the future generation obligation while acknowledging the interconnected nature via the realistic preview that this is a complex arena.

A Favored Definition:

Sustainability:

"The integration of environmental health, social equity, and economic vitality in order to create thriving, healthy, diverse and resilient communities for this generation and generations to come.

The practice of sustainability recognizes how these issues are interconnected and requires a systems approach and an acknowledgement of complexity."

Definition Source:
UCLA Sustainability Committee

Figure 8: Definition of Sustainability

A related concept for the holistic view of sustainability is that we see the work and the workforce through the lenses of a "5P mindset" in Figure 9. Derived from the original work of John Elkington and used throughout the sustainability field of practice is what was originally the triple bottom line of people, planet, and profit. He was an originator of having broader views of the importance and value of sustainability and corporate social responsibility.

The 5P View

From
- **People**
- **Planet**
- **Profit**

to
- **People**
- **Planet**
- **Product/Process**
- **Prosperity**
- **Purpose**

Derived from the works of John Elkington

Figure 9: Our 5P View

A related concept for the holistic view of sustainability is that we see the work and the workforce through the lenses of a "5P mindset".

ManpowerGroup, as a global corporation, uses our Working to Change the World report to share a strong, service oriented 3P focus of Planet, People and Prosperity, and Principles of Government to guide our ESG planning and reporting.

Manpower extended the conventional 3P view of sustainability with additional lenses to a view in the Accelerating the Sustainability Workforce research that adds products and processes to our planet lens. This is also in consideration of what our many clients and their supply chains face as producers and users of physical and materials products and resource intensive processes since those actions and outputs are where they intersect directly with the planet. We change profit to prosperity as a wider lens into successful outcomes, and we add purpose as another P that grounds all the others to a truer scope of what sustainability needs to achieve.

This 5P view is a cornerstone to our point of view and drives the scope and direction of how we see the work and the workforce. "Sustainability" and "sustainable development" are evolving to be both the goal and the more specific strategies, efforts, and methods for achieving that goal. The United Nations' Sustainable Development Goals are recognized as the international standard for sustainability and sustainable development in a strategic and tangible framework. Across their 17 goals and 163 targets, many areas of impact across the 5Ps are specified. These represent the where or how of the efforts to improve economic well-being and the quality of life while balancing the ability of future generations to do the same.

In addition to the UN framework – and others from international guidance bodies – employers can learn from the current and evolving frameworks and standards associated with ESG programs and reporting. It's not essential to pick only one framework, nor to map our view of the workforce to a definition of sustainability or sustainable development. It is essential to see that they tie together under the broad framework of the 5Ps and that the interconnectedness of the 5Ps is table stakes to any level or scope of sustainability work.

Drivers and Challenges

First, the drivers….

What is driving sustainability? There are numerous factors contributing to the sustainability business and workforce challenge. A more clear and shared understanding of a set of drivers is needed by all stakeholders - owners, leaders, technologists and workforce planners and developers.

Drivers are the high-level important business, social, technical, and geo-political factors causing the increased focus on sustainability currently. Specific drivers influence needs, and as a result, the solutions. The scope of sustainability issues is widening, and the frequency is causing increasing crisis to human, government and business realms, including industries like manufacturing that are specifically accelerating change. The current state shows many data points for improving sustainability performance.

Drivers are the important business, social, technical, and geo-political factors causing the increased focus on sustainability at this time.

Specific drivers influence what organizations will need to anticipate, respond to, and translate from disruptor or risk to opportunity. As a result, drivers set the direction for expanded and accelerated change – and the expanded roles, mindsets and skillset needed in the Sustainability Workforce today and tomorrow.

Modern (hu)man's messages to earth have been mixed and myopic for centuries. Human dominion over natural resources and life forms would be cited by some as necessary for human advancement and outweighing the damage caused in the name of progress. Humanity's fight for security, shelter, progress, and prosperity has often resulted in fights and destruction against each other. People could only support themselves in certain ways for centuries before the advent of the more modernized workforce models we know of today. When it comes to government and industry, most people's experience has been that power, information and decision making was too often overly centralized and as a result counterproductive to the mutual interests of most societies and organizations.

We didn't know what we didn't know. Then, later, we did know, and we did it anyway.

But now we are seeing other impacts and opportunities and have learned a great deal. We are beginning to prioritize other relationships and exchanges with the world around us. These past, present and future factors are all part of the backstory to the summary drivers we see for the Sustainability Workforce Transformation:

Here is a view (Figure 10) of the summary drivers shown in our first Futurecast (Futurecasts share some of our most important insights, findings and new reference material):

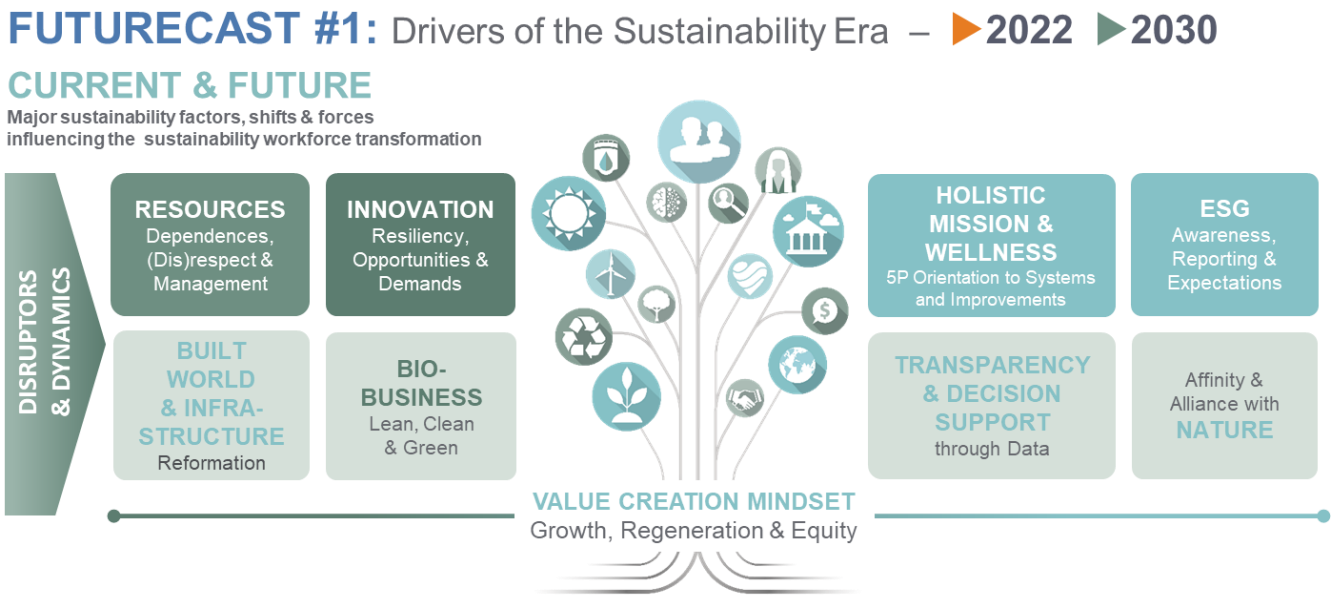

Figure 10: Futurecast #1 Drivers

The drivers are a set of risks and rewards all oriented around the continued **goal of value creation**, and in the case of sustainability, value creation with sustainable growth, regeneration, and equity. Pressures abound from issues around **resource dependencies, resource respect, and resource management** – especially natural resources and concerns over availability, cost, and replenishment, including loss of biodiversity globally. Another key driver is the back-and-forth conversation among many stakeholders about ESG reporting and transparency and the expectations and accountability to do it without greenwashing, and when doing it to have positive performance to report. Another driver with high pressure on employers is managing and creating the built world and infrastructure – one that is aging and often inefficient, yet a prime candidate for more green and sustainable management and maintenance.

On the reward and opportunity channel are the drivers of innovation and resiliency and the chance to go lean, clean, and green with the available gains - from cost saving to environmental stewardship. The era of bio-business is here and will drive very important career skilling and hiring shared with other industries also going for those 4-year+ science and bio degrees. There is increasing understanding and consumer/citizen demand for conscious and mission-oriented goals of employers and sellers. Another influential driver is the changing relationships we are having with mother nature, understanding her fragility and as a result aligning more often than before with nature and those who are attempting to be good stewards. And last, one of the key drivers is the one coming through access to data – and often lots of it – but most any amount of data is giving decision makers and customers or workers better information. We can measure and monitor the global environmental impact more, and we can understand the footprint of the smallest electronic. Overall, there is an emerging important synergistic relationship between sustainability and technology that will create certain dynamics, such as strain on minerals, metals, and the earth mining needed, yet will also advance sustainability in such ways as predicting disruptions, regulating energy consumption, and improving efficiencies.

And now, the challenges…

Causing or illustrating the disruption and negative impact of some of the drivers are the more specific challenges (Figure 11). Do not think of these as a hopeless collection of worry and damage. Rather, go into this list with the view that these are the many places that sustainability skills, knowledge and capabilities can make a difference and solve for situations impacting the quality of life and outcomes across the 5Ps. This is why all the drivers represent a value-based mindset to solution for the many challenges of the day.

FUTURECAST #2: Sustainability Challenges – ▶2022 ▶2030

CURRENT & FUTURE Representative challenges driving needed workforce capabilities to address

Abandoned/underutilized or outdated facilities
Abandoned/underutilized or outdated mines, wells
Age discrimination
Air pollution/air quality
Atmospheric degradation
Biome/biodiversity disruption and loss
Biosafety
Bioterrorism
Broken or insufficient infrastructure
Built in obsolescence
Carbon emissions; local, regional, global
Chemicals & pollution action
Cities and lifestyles – adverse impacts/footprints
Climate action compromises, distractions, inexperience
Climate change denial/cause attribution
Climate impact by human/industrial denial
Climate migration
Climate related water availability/usage and waste/water pollution
Combustion engine dependency
Community impact
Compliance penalties
Considerate construction
Contradicting company culture
Customer use bias to older products
Cyber threats to health and wellness
Cyber threats to infrastructure
Disasters & conflicts
Disparate impacts of climate disasters, land abuses, destruction of native lands
Disposable culture
Dominion arrogance; nature as man's disposable resource
Drought affected water supplies
Education & environment
Employee Value Propositions
Energy consumption & waste
Environmental degradation (forest, land, water)
Environmental rights and governance
Excessive, unnecessary travel patterns/habits
Excessive water use for discretionary habits
Exploitation
Exclusive climate action focus
External liability
Extractives
FAST vs SLOW fashion, food
Food insecurity
Fossil fuel overdependency
Fossil fuel transition impacts
Gender inequity
Greenhouse gas emissions
Green and circular economy inexperience
Greenwashing in many forms and deeds
Hazardous materials
Health & safety infractions and dangerous conditions
High costs of loans and lower equity values for disadvantaged or underserved clients and locations
Higher cost of some organic materials, products, processes
Human trafficking
Improper waste removal
Inclusive and accessible design
Industrial incidents and accidents
Inequality
Insufficient representation of stakeholder groups
Internal liability
Intolerable greenhouse gas emissions
Invasive species transport
Irresponsible sourcing
Lack of awareness of available sustainability frameworks and standards
Lack of high speed and/or mass transit
Lack of land and facility retro fitting and regeneration
Lack of social innovation
Lack of supply chain visibility for sustainability practices
Lack of trained sustainability workers at all levels
Material waste
Microfiber pollution
Microplastics pollution
Net zero greenwashing
Noncompetitive employment value propositions
Oceans & seas
Over consumption
Over population
Passive design
Poaching
Politicization of many sustainability issues and factors
Pollution
Poor energy efficiency of older heating, cooling, ventilation systems
Poor HR practices
Process inefficiencies
Product quality and lack of longevity
Resource efficiency
"Risks" of broader impact reporting to profiteers
Rising energy and material costs
Short-term thinking, fast 'x' (fashion, food, etc.)
Single-use products
Social injustice
Social unrest
Soil degradation
Stalled sustainable development goal adoption/progress
Technology
Toxic materials and chemical processing
Toxic materials
Toxic water infrastructure
Unscrupulous business ethics and practices
Undo political influence
Use of toxic or unsustainable materials
Valuing consumption, dominion over more life and eco-friendly values
Varying stakeholder needs for reporting and measures
Violation of business regulations
Wage inflation
Wasted raw materials
Wasted excess inventory
Wasted water
Water loss
Water toxicity and pollution
Weakened supply chains

Figure 11: Futurecast #2 Sustainability Challenges

What these challenges require and what the drivers all share and make possible is the need and opportunity for having a conscious, creative, and logical mindset around creating value for today and tomorrow: fixing problems, protecting the future, and bringing new and improved and more valuable ways of doing what society and industry couldn't or wouldn't do before as default behavior. Not all challenges impact each of us, but they impact someone. Not every challenge can be seen today, but they are within visible sight for the long run. Not every driver will resonate or be of equal impact to every employer, worker, or other stakeholder, yet it would not be productive to ignore that all these drivers are real. Not every employer, worker or stakeholder will need to know how to address each and every driver. But on the whole, these drivers are the backstory to establish the spectrum of broadened green roles where the breadth and varied skillsets of the workforce represent opportunity all around – the opportunity to keep inspiring, seeing, shaping, and defining the opportunities in sustainability.

Even with less time than we need to solve for some of our economic, social, and environmental issues, we should have the space for the big fix by addressing these drivers, seeing the disruptions and the opportunities that are within them. Then, with changing our ways, our workforce, their outputs, and their missions, we can transform the collective capabilities needed to achieve a sustainable future.

From October of 2022, the publishing date of this research, we're only 85 months away from 2030 and the targets to achieve initial UN Sustainable Development Goals.

Opportunities

What is here in addition to all of this risk and all of these challenges? Opportunity. Let's focus on the positive. While some may deny, and some may defer, and others may devastate, ***others will do***. For many, it has long been too late to just kick the can and pass along risk and responsibility. For early adopters and legacy sustainability sponsors and practitioners, there has never been a more crucial time to get in on or accelerate the many reasons to innovate, change, solve, and compete for sustainable solution rewards.

So many challenges invite so many solutions

A view of what Manpower sees as opportunity trends are shown in Figure 12.

Figure 12: Futurecast #3 Opportunity Trends

Adopting versions of any or all these opportunities translates into the need to identify and employ the "New Mix" – those modernized, sustainability-native and emergent work roles and capable people in combinations that accelerate the journey to be both a sustainably-operating organization as well as a creator and regenerator of sustainable products and processes. An opportunity attitude allows us to see the current and future jobs and employability. We aim for the opportunities that allow us to do well by doing good.

Rethink resources. Forge new partnerships. Embrace bio-business and bio-inspired design and emulation of nature's genius. Collaborate and create community. Ask "what would nature do"? Father time accelerates our pace as scientists and officials and our friends down the street may ask, "do we pay now or pay later?" Think of investment, versus cost and expense. Even if you aren't the biggest cause of the problem, you can be part of the solution. Hire the New Mix. Unleash the entrepreneurial green.

We aim for the opportunities that allow us to do well by doing good.

Timeline and Transformation Trends

A Certain Timeline on Sustainability

Some of these drivers are not new at all, and yes, some are absolutely propelled by more recent events, whether it's the last few years or the last few decades or centuries, because recent is relative. For life on earth, we are talking millions of years of dated carbon samples, right? But from a more modern perspective, we recognize thousands of events and billions of actions have brought us to the challenges and opportunities we face today.

Figure 13, *A Certain Timeline,* is an enlightening jaunt to run through the last 4 billion years, true. But there are a few major arcs in history involving our relationship with the environment that bring us to today. Our understanding of this history is crucial to our success at sustainability because we need to get context, impact, and the rate of change right. We need to realize what's been building in terms of both problems and solutions with the intersection of environmental, social, and governance issues.

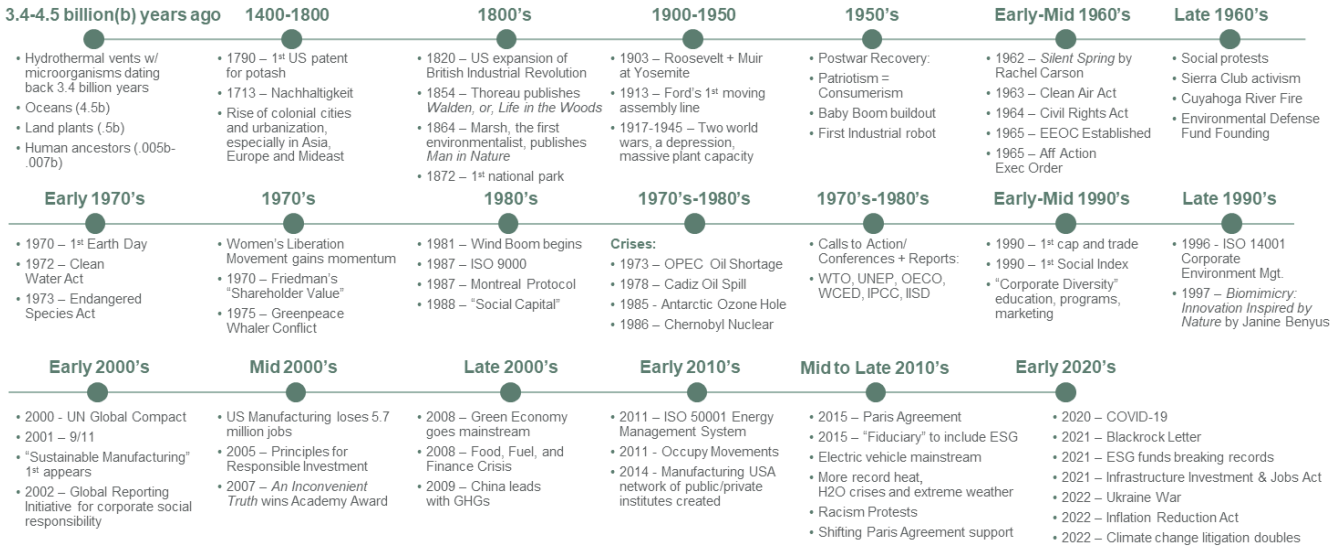

Figure 13: A Certain Timeline

There are themes to this timeline as described in these summaries of four periods.

Period 1 – A Philosophical Failing: A big misstep in (relatively speaking) earlier times may have occurred on the part of humanity, but it needs to be understood based on where humans were on their journey. While several hundreds of years ago may not be so early compared to when life first showed up and led to the multi species, multi ecosystem earth we've known to be documented, we do need to recognize there was a gap between philosophies. The gap set up an attitude – conscious and unconscious - that earth was here to be reigned over, mastered, and used up by humans. It differed from prevailing philosophies of life-respecting perspectives, an overriding shared relationship of man and nature, social and economic. Remember, we didn't know what we didn't know. We had other human catastrophes to address with our limited awareness of human history. So, thank both historical and more modern writers, thinkers, and scientists. Thank Thoreau, for example, for exploring and sharing alternative ways to view our relationship to earth and nature. Many more continue to expand and demand a change and that's been evolving while we saw widening and more conscious gaps.

Period 2 - Uses and Abuses: It's a fair way to describe the pain and pleasures of Industrialization over the last 150+ years. The notion of use and abuse acknowledges the positive and negative 'progress' that industrialization and scientific, commercial, and social advances had on planet, people, and sustainable prosperity. Some would argue that the abuse is what industrialization has enabled, and there is truth there – again, some deliberate and much unintentional. Yet, we also see that as industrialization began to change our world, the awareness of and solutions for early impacts were interrupted or arrested by a few more pressing issues of the time. There were world wars, pandemics, early labor and social reforms, and rebuilding of economies where consumerism and rampant production meant patriotism. It took society's eye off the ball as to some of the impacts. It's also essential to mention that certain advancements we have now to help enable sustainability weren't available just decades ago (think automation, information, shared knowledge and scientific advancements). It's chicken-egg.

Period 3 - Mirror and Windows: Humans and communities started to get a comeuppance, especially during the last three decades of the 20th century. Humanity's perceived dominion over the natural world and rampant perception of positive industrialization and not seeing impacts on health and communities, even with all the strides and important advances and development that society had seen, caught up to the reality of what was outside our

windows. Attitudes and practices started to change, not without tragedy and unconscionable behaviors by some, once we experienced disasters from oil spills to nuclear accidents to rivers catching on fire and local child cancer rates skyrocketing in toxic areas. Social partnerships were made once we took to the streets for causes and awareness of the social, environmental, gender, and public policy issues in the 60's, 70's and 80's. At the same time, to bring awareness and initial action, public-private efforts were shaping at the national and global levels. Movements, research, and policies, especially responding to the 80's and 90's, gave voice and calls to action for many of the efforts that brought us to the last 20 years.

Period 4 - The Holism Era of Sustainability. Over the last 20 to 30 years, the connections were made across many previously mis-connected issues. Many got smarter and issues were more commonly understood. Systems and shared resources, realities, and problems were discussed. Two steps forward and sometimes one step backward. More thought leaders and teachers like Rachel Carson, Janine Benyus and Dayna Baumeister and others providing insights about our troubled relationship between the built and natural world expanded. Early adopters appeared at the same time there were many lost opportunities. Innovative strategies for change were sponsored and some have taken hold, even a couple hundred years from when they could have been the basis for our modern world. Gratitude should be paid to those who listen enough to fight for the environmental and social issues, who research, practice, and teach on the mutually supportive, regenerative, and respectful connection we should have between humans and other life and the earth overall. We increased our "scared straight" recognition. And along the way, we amped up what had been a huge barrier in the past – the connection between economies, commercialization, the environment, and human health and social wellness. We chipped away at the cycle of profit versus planet, profit versus people, and profit versus purpose, and we are making real the connection of obligation and opportunity.

Manufacturers and many business and commercial sectors have much more current history in their sustainability transformations strategies. While they are still and always will be in progress, these sustainability efforts are not starting from nothing. Figure 14 is a view of those that can extend the historic timeline into today's work arena and represent some of the major progress trends we are seeing.

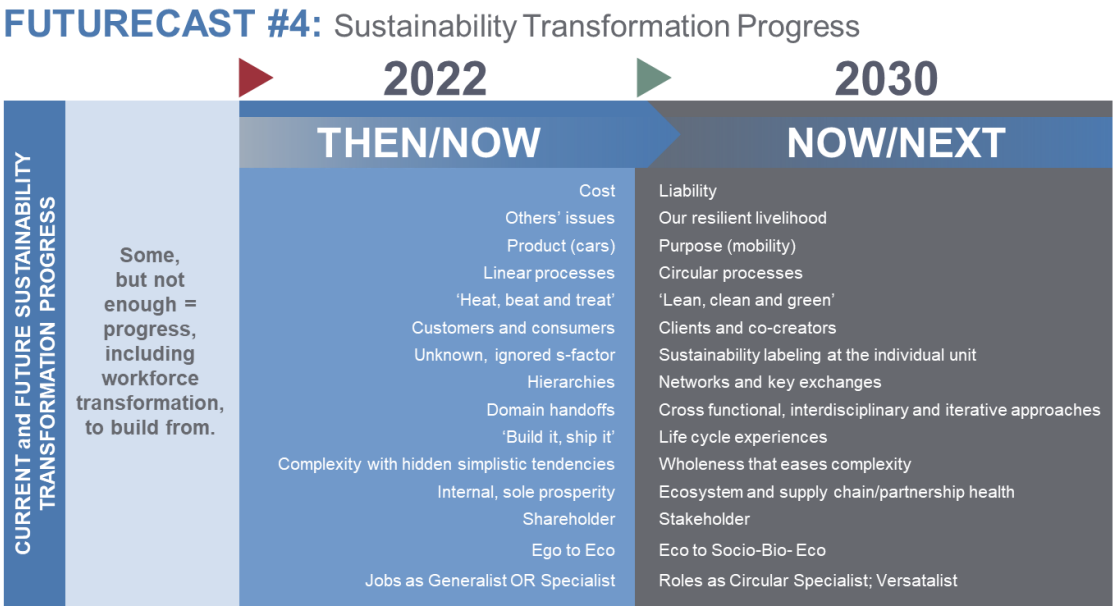

Figure 14: Futurecast #4 Transformation Progress

Horizons

So many aspects of the case for change, the drivers and the enablers have history and are works in progress. There's a real blur between past, present, and future, but here are a few highlights of what we know will continue or emerge as real direction influences for sustainability. We call out just a few in Figure 15 across categories of policy, people, process and technology.

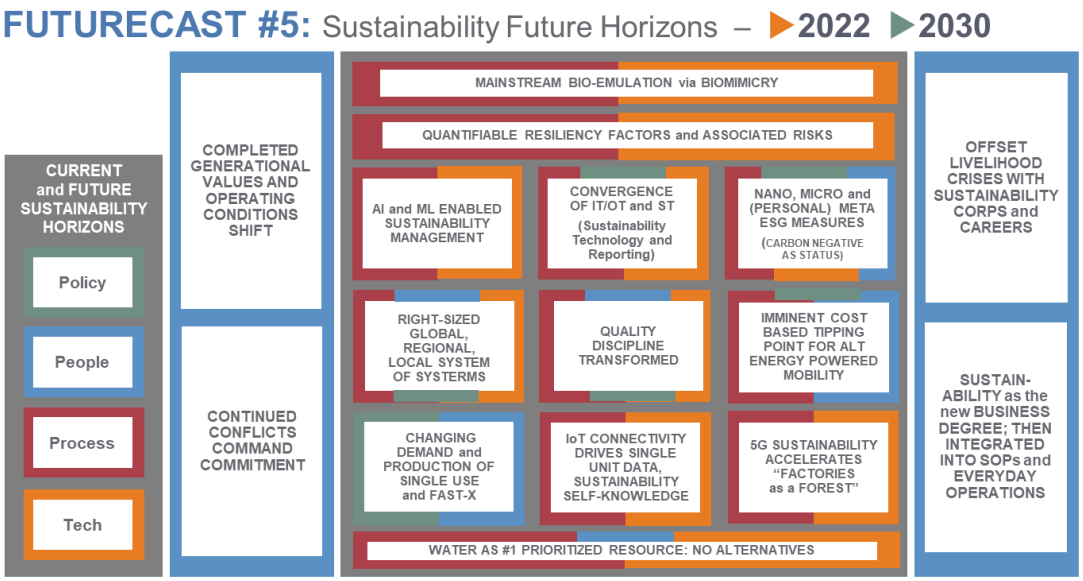

Figure 15: Futurecast #5 Horizons

Summary

These key outlooks cover some aspects of sustainability's past, present and future. They ground the workforce shape and form we identify in future sections. When we think of the timeline, the transformation to date, the horizons, and the timeline overall, possibly the best takeaway is also hundreds of years old:

"Whereof what's past is prologue; what to come, in yours and my discharge."

Shakespeare did not intend his quote from *The Tempest* to be applied to a sustainability-related timeline over 400 years later, but it is a perfect reference to cite after considering these outlooks. History sets context for the present. The past is already done, already written in the books of time. Yet, the future is ours to make, ours to affect whether as individuals or groups or societies. Depending on the choices we make and the attitudes and behaviors we modify, the future is our chance for change and our opportunity to write tomorrow's history today.

Section 3: Primary Insights

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Section 3: Primary Insights

Introduction

Sustainability signals one of the busiest intersections of the modern world: the natural and the built environment, the social and the commercial, the innovators and consumers, the efficiency seekers, the brand strategists and hundreds of other roles and jobs. There are many converging opportunities in those intersections facing our stakeholders as we have shared in previous views of the drivers, challenges, and opportunities. Regardless of problems, opportunities, industry, or area of justice seeking, there are solutions and rewards for pursuing sustainability solutions. Consider these reminders of possibilities and opportunities that were introduced in Section 2:

- Better resource management
- Improved environmental health and resilience
- Lower costs to overall life cycle
- More conscious commercialism and consumerism
- Better and more efficient environmental stewardship and management
- More market share
- More innovation
- More customer or shareholder capital
- More community impact
- More social, economic, and environmental justice
- Increased regenerative and restored environments
- Less risk for consumers and ultimately liability for a provider
- Goals of first-educator advantage

There are opportunities to be gained via sustainable approaches, bio-business, and regenerative community and regional systems. Far from being only a “woke” or altruistic agenda, these are actually frontiers of possibility and prosperity in a modern and changing world when we look for and use more effective and efficient - translate to “life-friendly” - design principles and processes that support multigenerational prosperity and viability.

The Manpower future jobs effort offers a springboard and energizer to better understand the Sustainability Workforce and the capabilities they can bring. As we offer models, directional assistance, and new ways to view the work and the workforce, we believe **some overall insights** and key maxims will be helpful to position first so they can be used as broad navigational guides and previews. These guidelines signal broad trends, targets of current and future change, core design approaches, and closer views at collaborations that can accelerate the opportunities. With these perspectives offered, later sections of the research will explore certain major topics in much more detail and fully populate our initial view of the Sustainability Solution Workforce, life-cycle stage by stage, function by function, impact by impact, and role by role.

- **Summary Insights**: What are some broad trends throughout and across the research that have recurring influence? Not that these are the only conclusionary points, but the list is a good first pass at summary perspectives.
- **First Look Uptake and Change**: What do we see as the first adopters or targets of current and future sustainability practices? Where in which sectors across four job/role families (people, business, science, and key functions) did workforce groups bubble to the top as early uptake and key candidates for changes to more resourceful and sustainable practices?
- **First Look Role Design Principles**: Considering some of the existing, increasing, and changing work trends in sustainability, what are some broader design principles that will affect how jobs and roles are redesigned? Adding to our original ten for the digital era changes of the last ten years, these are 'secret sauce' factors for many workforce change agents looking for the short cuts to designing sustainable roles.
- **First Look Roles via 10 Action Chains**: An era that requires consideration of more factors than ever requires collaboration extraordinaire. What do some of these collaborations look like? Introducing over 100 roles of the 775+ that we included as this first-generation taxonomy, we created Action Chains to illustrate powerful combinations of roles. Some of the combinations of roles shown in the Action Chains are likely to be the base staffing recipes for efficiency, effectiveness, and success in sustainable solutions and practices. Many more action chains can be visualized, yet these offer powerful first sets of sustainability workers.
- **First Look Workforce Transformation Trends**: What does the horizon look like as we start to bring together and theme some of these perspectives? Pulling together some of these viewpoints (insights, first look uptake/changes, and role design principles), here is a fuller summary sketch including specific job roles, functions, and families. These trends and futurecasts indicate how we see the next ten years of the workforce possibly evolving in the sustainability solution space.

Summary Insights

First, what are some broad trends throughout and across the sustainability space that have recurring influence on the workforce? As a first pass at these summary perspectives and by way of introduction, core insights are provided for meta pillars and three connecting categories of factors often used to represent sustainability:

- **Meta insights:** broad trends and anchoring influences.
- **Natural and built world:** the lens of our physical space, materials, earthly operating conditions, and the natural environment.
- **Social and workforce:** the lens of people, human behavior, health, community, and employment.
- **Business and governance:** the lens of economic systems, commercial entities and practices, and private and public governance directional decisions and leadership.

There are 20 key insights we observed as shown in Figure 1:

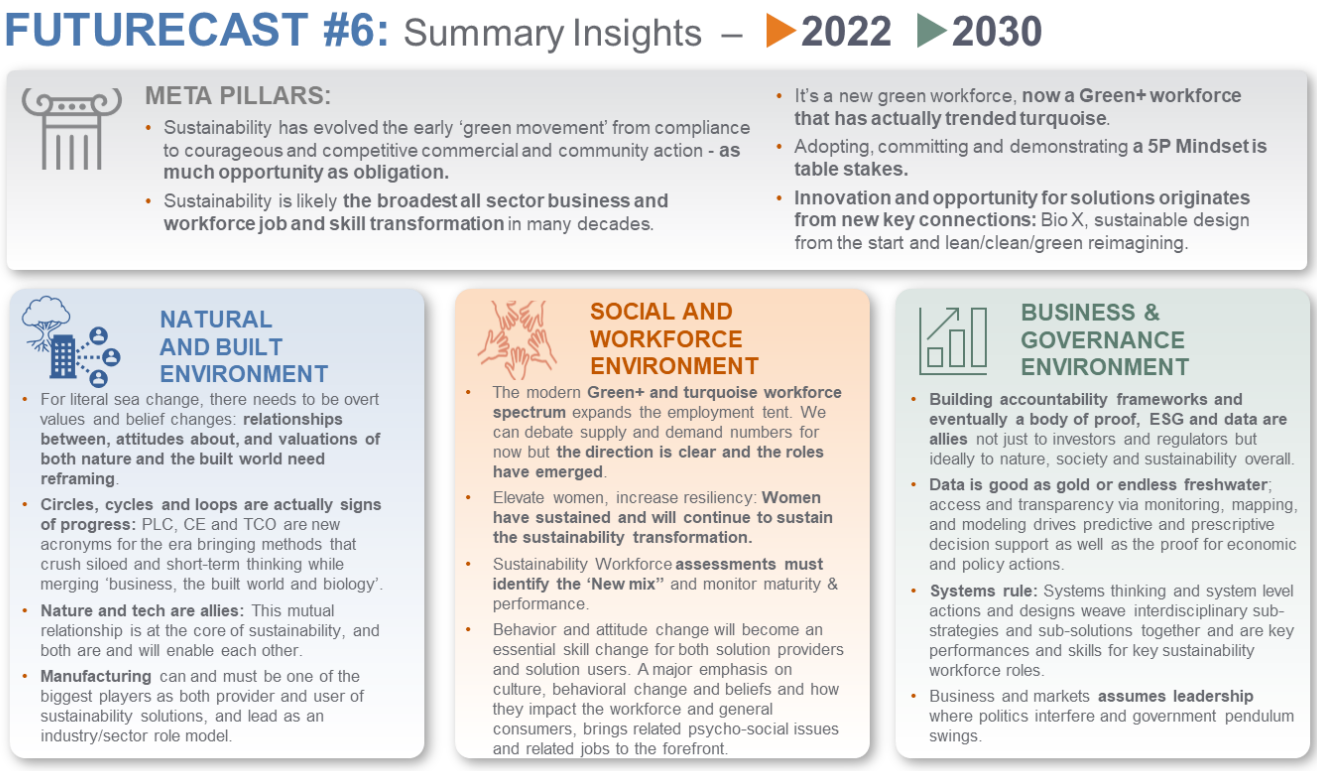

Figure 1: Futurecast #6 Summary Insights

Where do we start describing the landscape for learning about and defining the Sustainability Workforce? Our research summary insights form a foundational map to guide employers through this modern minefield.

Let's begin with callouts to these selected broad insights across the four categories.

1. Meta Pillars

Some of the primary questions and core insights in this category:

- **What does Sustainability from 2022 forward offer as a reason for and driver of change?** We've seen the changes to the industrial world described as Industry 1.0, 2.0, 3.0, 4.0. What generation is green on? At the very least**, sustainability has evolved from the early 'green movement' of grudging compliance to a time of more courageous commercial and community action – creating an era that equally invites opportunity and obligation.** It moves green to its own advanced era, from regulations or an image issue to being a societal and environmental imperative and a rewarding business and consumer model, a resource and cost management tool, a process/product reality, and ground zero for the next era of innovation and inspiration.

- **How big of a change will this really be to act and work differently? Sustainability is likely the broadest business and workforce job role and skill transformation in many decades**. It's time for action for all sides resulting in what looks to be the broadest business and workforce transformation seen impacting a wider workforce than previously imagined. Most of our contributors volunteered an early and primary perspective that solving for sustainability overall as well as solving for the workforce gap requires a holistic view (human, economic, business, political, cultural, and technical) and that as a 'big' issue, it would take a 'big and connected' solution. To address the Sustainability Workforce challenge and

sustainability overall, we need to build and employ workers in roles across all work cycle stages, functions, sectors, and job families who can achieve results that address 'soft' (policy, strategic business, social, and cultural) issues and outcomes as well as those who can achieve and produce in "hard" issue areas (technical, financial, scientific, natural, physical, etc. arenas). **Sustainability is likely the biggest workforce and business transformation since automation and modern technologies came to the forefront** in progressively advanced ways over the last 30-70 years.

- **What color is the sustainability transformation? It's a new Green+ that has actually trended turquoise.** The transformation is more colorful than we have described it as in the past. Evolving from centuries and especially the more recent decades since heavier industrialization and global growth, the very nature of today's sustainability scope has evolved. It's no longer (just) green but different shades of green, ever brighter and varied. The 'green workforce' of today and tomorrow includes and goes beyond the 'green' workers of yesterday. In prior decades, the 'green workforce' was isolated no matter how critical and weighty on the impacts to the environment because many stakeholders under messaged how impactful green issues were to human, social and economic systems. Sustainability goes beyond green and brings us to these connected concerns in addition to the environmental arena. At the one end of the spectrum of green roles where some may see familiar work, will now be modernized and innovative Green+ roles and jobs. These varied roles bring core sciences and updated technologies to direct interaction with the use, management, stewardship, and impacts of and to the environment and natural resources. At the other end is the expanding turquoise end of the spectrum, where broader professional, social, business, and leadership roles and jobs enable accelerated environmental, social, and economic health. See Section 4 for a full discussion on **the sustainability workforce being embodied in 'green and turquoise' roles as a spectrum of Green+ that is actually trending turquoise.**

- **How do we wrap our heads around and start to organize the huge arena of sustainability? Adopting, committing, and demonstrating a 5P Mindset is table stakes.** The need for the broad changes to the expanded Green+ and turquoise workforce is due to sustainability's more valid definition and centeredness around an honest 5P mindset (People, Planet, Product/Process, Prosperity and Purpose) in Figure 2 that offers the more realistic baseline for considerations, action, needed capabilities, and ultimately opportunity.

  - It's not just environmental; it's economic.
  - It's not just cost; it's investment.
  - It's not just commercial; it's social, political, and humanitarian.
  - It's not just planetary; it's the products and processes we build in and from the planet.
  - It's not just commercially driven; it can't get anywhere without humans moving it through social, education, and governmental systems and communities.

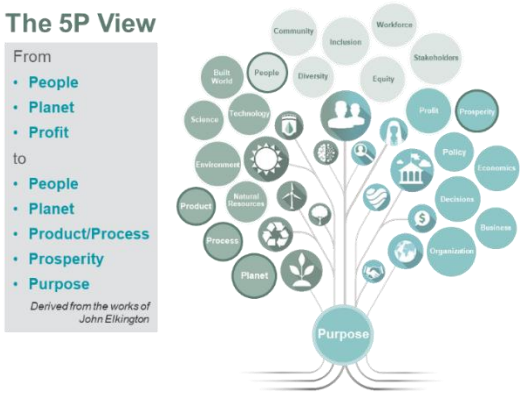

Figure 2: The 5P View

Green today and tomorrow captures and goes beyond green of yesterday. Sustainability is beyond green and brings us to other connected concerns in addition to the environmental arena.

2. Natural and Built World Environment

Some of the primary questions and core insights in this category:

- **What business or non-science strategies bridge the solution space between the natural and built world? Circles, cycles, and loops are actually signs of progress: PLC, CE and TCO are new acronyms for the era.** To make actionable the 5P mindset, even more holistic consideration is needed about broader, longer-term stakeholders - both natural and of the 'built' or 'human' world - and their legitimate needs as sustainable solution participants. In some ways this is jumpstarted and grounded by thinking of cycles, loops, and circular systems. Product life cycles (PLC), circular economic (CE) thinking, and more honestly and objectively assessing total cost of ownership (TCO) of products, initiatives, etc. build these bridges between the natural and built world. They enable better short- and long-term strategies and decision making by establishing a framework of interdependent and blended factors to consider.

- **What tensions between the natural and built world need to be addressed as part of the sustainability work change? For literal sea change, there needs to be overt values and belief changes: relationships between, attitudes about, and valuations of both nature and the built world need reframing.** Relationships to the natural world, to commercialism, and to consumerism need to change as much as the science, technology, workforce, and policies that will drive change. Creating products and a built world and their economies that aren't throwaway will empower thousands of new business models and strategies and open new workforce arenas. We have gone from a view that says, "we have to use our natural resources for national economic gain now" to "how do we innovate so our natural resources serve our economic, social, human health, and natural health for generations to come"? Sustainability is the epicenter of the "and" conversations, no longer the "but" conversations, and they all need be more significant, mutually appreciative, and respectful.

- **What is the relationship between nature and technology and how will that impact the workforce? Nature and tech are allies: *This mutual relationship is at the core of sustainability, and both are and will enable each other.*** An interesting insight is the relationship between two seemingly opposite elements: nature and technology (informational, communication, material, etc.). As it turns out, they are great friends and mutual supporters in the world of sustainability. Not that tech professionals working in core technology can't reduce tech's power and end-of-life material waste issues (it needs to, pronto) and not that tech pros don't need to design how to demand less essential natural resources (think lithium batteries and silicon for semiconductors as feedstocks being mined from the earth), but tech also offers key solutions to understand, monitor, and manage natural resources and environmental impact. Material innovation and tech, engineering tech, process tech, and other technologies can all enable sustainable solutions, as long as they themselves achieve more sustainable goals.

- **How much science will a business professional in sustainability need to know? *Bio-X practices combine the genius of sustainable design, materials, forms, functions, and systems, reimagining the built world.*** Abundant wisdom from the sciences is available, so, yes, many will wish they had paid more attention in 9th grade biology, but a cavalry of trained business-science hybrids is on the way. Innovation and opportunity for solutions originates from new key connections: bio-inspiration, bio-emulation, biomimicry, and living systems design are new arenas serving as coach, mentor, and evaluator of our built world policies, products, and processes. As contributing both subject matter and practices, the workforce in these areas create opportunities and solutions. This biologization of business represents one of the most significant areas of innovation and improvement available for our futures.

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3. Social and Workforce World Environment

Some of the primary questions and core insights in this category:

- **What is the supply and demand in the market for sustainability workers and employment? The modern Green+ and turquoise workforce spectrum expands the employment tent and sets a higher bar for training and career skilling.** Our conventional sizing of the Sustainability Workforce has been too limited, and we now have the basis for a more accurate scope. Also, demand is dependent on innovation and utilization of existing solutions and practices. A wider base of roles and efforts are needed across the workforce spectrum to achieve even more sustainable outcomes and rewards, a workforce that can look at the bigger picture - the short-, mid-, and long-term - and craft better outcomes. **We can debate and work to calibrate supply and demand numbers for now, but the direction is clear, and the roles have emerged**. With changing pressures, new investments, and additional solutions, the numbers for providers and trained users will accelerate.

- **How can sustainability be an opportunity for women in both developing and developed economies? Elevate women, increase resiliency: Women have sustained and will continue to sustain the sustainability transformation.** The work efforts of women, the relationship between women's education access and their ability to engage in sustainability roles and careers, the support and the rise of 'Fempreneurs', and the relationship of social justice, including health care and advocacy, are all seen as major positive sustainability strategies. As a result, the increased engagement, prosperity, and productivity from women being in the workforce will add to early data showing positive relation of climate actions to increased involvement and investment in women. For additional discussion on the role of women in sustainability solutions, see our highlighted key insight sidebar later in this section.

- **Who will handle the behavioral and cultural aspects? Behavior and attitude change will become an essential skill change: as both change makers and change doers,** everyone will best enable their own sustainability by accepting needed and positive changes. Changing human behavior, consumption expectations, and sources, as well as investment changes and policy changes, will impact social, community, and workforces. By using embedded technology or product and process nudges and scaffolds, change is possible, building on more self, work, and lifestyle awareness. By accepting eco-anxiety is real for some and there is also a cost to psychological impact, we can drive improvement. Interestingly enough, these changes are at all levels: the individual level, the team level, the organizational level, and the societal level. Hence, ***there is a major emphasis on culture, behavioral change, and beliefs and how they impact the workforce and general consumers, bringing related psycho-social issues and related jobs to the forefront.***

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4. Business and Governance Environment

- **What is the relationship between nature and data, and will that impact business and governance?** ***Data access and transparency via monitoring, mapping, and modeling drives predictive, prescriptive diagnostics, decision making, and proof which drives changes to economic and governmental actions***. The overall tech-nature alliance has opened up the world of data for overall awareness, decision making, reporting, and transparency to best understand the real costs and the real influencers along the way. Sensors and automation drive efficiencies and effectiveness innovation all around: from optimizing and remote management of megafarm water via irrigation systems or facility energy use; to where computer-aided design can create incredibly efficient and almost no waste pattern making and cutting ranging from apparel to sheet metal parts and beyond; to where it's mainstream to create digital twins of geo-eco-infrastructure maps of water systems and other civil engineering views of our natural and built worlds. Digital tracking can identify source materials and other key attributes to provide the continuous footprints of products, services, and other elements that need more accurate data access and management for sustainability decisions.

- **Where does ESG fit? Building accountability frameworks and eventually a body of proof, *ESG and data are also allies, not just to investors and regulators but ideally to nature, society, and sustainability overall.***
  Consider actual transparency, future models, evidence, data, and codified experience. Actual and projected data has and will enable better earth-friendly, socially-equitable business, environmental, and social/human solutions. Data can help solve for the challenges, yet data systems have to be set up to capture the holistic sets of information – i.e., beyond inventories and financials – and with ethical data management and utilization. How can we merge with operational systems that are increasingly automated and tracking source information? Technology from modeling catastrophes to putting humidity sensors in farm crop storage to auto optimized resource balancing systems will contribute greatly to sustainability solutioning. At the same time, we have to watch for and manage the downsides of technology and data, the potential to greenwash, and the ever-present practice of applying shiny new automation to old toxic (literally) practices.

- **Do the governing and economic systems need to be dismantled to achieve sustainability?** It's a big question but our observation is actually that **Systems rule: Systems thinking and system-level actions and designs weave interdisciplinary sub-strategies and sub-solutions together and are key performances and skills for key sustainability workforce roles**. Sustainability's deserved attention wouldn't be such news to some or current event topics if communities, business, and government sectors had built in life-cycle and systemic planning and assessments. Today's views and our acceptance of the complexity of sustainability will need to address multiple factors and their connectedness. Systems thinking and systems (of all types) design are massively important to understanding the challenges and creating the solutions.

Data can help solve for the challenges, yet data systems have to be set up to capture the holistic sets of information – i.e., beyond inventories and financials – and with ethical data management and utilization.

A Highlighted Key Insight: Women in Sustainability

Women have sustained and will continue to sustain the sustainability transformation.

Not only does the future sustainable workforce offer an opportunity for women to grow their careers and act as agents of change in social equality across sectors and supply chains, but we won't be able to fill the roles to power sustainability transformation without them. Historically, women have been leading the charge on sustainability efforts, from social movements to consumer habits to workforce and policy changes, but they've also been more negatively affected by climate impact, social inequities, disproportionate exposure to toxins through various working conditions, and managing health and wellness concerns for family. The time is now to bring more women into the fold; not only because it's the right thing to do but because there's no other option. As former Irish president Mary Robinson aptly summed it up, "climate change is a man-made problem with a feminist solution."

Traditionally, women have shouldered more of the responsibility to be eco-conscious and build a more sustainable future. Green products are marketed to women so much so that it's created an "eco gender gap" – women being both great consumers of eco-friendly products and responsible for doing the lion's share of domestic household activities. Studies have shown that this is in part women's tendency to be more socially conscious and possess a higher levels of socialism to care about others. At the same time, women are underrepresented in the Sustainability Workforce, still face a gender pay gap, and are responsible for two to ten times as much unpaid work as men (estimated at $10 trillion globally!). We simply cannot achieve an inclusive and sustainable economy without gender equality and sustainability.

With projections that climate action could spur the creation of as many as 65 million new jobs by 2030 globally, not only must we ensure a just transition to make sure that men and women both benefit from these new, often lucrative, jobs, but women will also be integral to filling these millions of new roles. As we build a more inclusive economy that is more resilient to climate impacts, we're presented with the opportunity to do things differently and move towards gender equality. But we must take action – Even though women are currently better represented in clean energy jobs than in the traditional energy sector, they still only make up approximately 30% of the clean energy workforce, despite making up almost half of the workforce.

How do we ensure a gender-just transition for sustainability jobs? We're at a unique crossroads where companies are facing more and more pressure from investors to address ESG concerns, and green job sustainability is dependent on social equity along with environmental concerns. To ensure this just transition, it cannot be business as usual. The workforce ecosystem must understand how to bring women into traditional green jobs, as well as across the supply chain and beyond, looking also at turquoise jobs that traditionally have higher female representation such as healthcare, educators, caregivers, etc. Educational inequalities must be addressed, as a recent study revealed that women in the U.S. earned just 36% of the bachelor's degrees in STEM fields, while women of color earned 14% of bachelors degrees overall. Also, with an anticipated $100-$150 trillion invested globally to achieve net zero by 2050, public and private players need to consciously support female entrepreneurs in the green economy.

All of the first look segments may have some bias towards genders historically, in one way or another. Many (e.g., infrastructure or skilled trades) have been historically more populated by men; some (e.g., learning and development or culture and behavioral change) see higher proportions of women, and many of the rest are seeing increasing inclusion across genders even if absolute parity isn't achieved.

No matter history nor current progress to date, the sustainability solutioning era will need the strengths, perspectives, and high volume of women to join existing forces as the future problem solvers, innovators and delivery forces.

With those macro perspectives in place, we can take a next look at which sectors, functions and role/job families are seeing uptake and change with sustainability practices, capabilities, and contributions.

First Look Uptake and Change

Looking out the window, yes, here comes the Sustainability Solution Workforce, en masse. What can we envision as their key characteristics, valued contributions, and industry opportunity influences?

- Solution versus blame-oriented
- Systems thinkers challenging the short-term focus
- Near-term action accelerated for long-term good
- Opponents of siloed thinking, or at least asking it to jump in the backseat once and for all
- Bolder, brighter, bio- and life-friendly inspired
- Vulnerability and risk aware
- Efficient, resourceful, adaptive, and innovative
- Long-term sustainable value directed and focused on continuous prosperity even with needed investments
- Smart systems and tech enabled
- Adaptive, analytical, and resourceful
- Sufficiently cross-trained and versatile
- Dedicated to pledged commitments
- Engaging of holistic stakeholders
- Performing as connected innovation teams
- United as diverse designers
- Optimized operations capabilities
- Oriented to higher positive versus negative impact and results versus offsets
- Earlier considerations and risk management strategies that better benefit more stakeholders
- Wider consideration of values to more stakeholders, based on truer cost picture across longer, fuller life cycles

This wide and wonderful list paints Manpower's first picture of what the Sustainability Workforce looks like. More pictures are here in this gallery of how to view the transforming world of work and its workers. All of these visions of attributes, applications, and contributions exist today in various workspaces and have various levels of current demand and supply. They also unfortunately but understandably have unknown and extremely difficult-to-measure future supply and demand. Today's understanding of their use, calibration to job/role titles, and workforce or business plan maturity makes the estimations difficult. At least for now. We see any of their presence as evidence of increasing probability. It is also to us evidence of the direction and in many ways the likely inevitability of seeing these changes and others to our transforming workforce.

Going forward with increased sustainability solution awareness, process improvement, overall practices, evidence-based connections to outcomes, and changing mindsets, we believe these workers and their work will become the new standard, the New Mix of the workforce. As a new standard and a new workforce mix, this emerging view of the workforce will someday not be called out because of their sustainability orientation, but rather be highlighted because of their valued innovation and productivity. That same workforce will be rewarded as key contributors to the improved, (new) life-friendly default of the natural and built world tandem workforce.

A new standard and a new workforce mix, this emerging view of the workforce will someday not be called out because of their

sustainability orientation but highlighted because of their valued innovation and productivity and rewarded as part of the improved and new life-friendly default of the natural and built world tandem.

Next, how can we begin to report out where we see overall trends and likely the continued uptake and changes to roles and jobs? Five workforce segmentations organize our first looks for uptake and change arenas where these roles stand out and unite.

Sustainability Solutions Workforce First Look: Uptake and Change Arenas

There will be winners in the sustainability role sweepstakes. Early winning tickets have already and will likely continue to be drawn for certain sectors and certain role families, meaning we are seeing and expect to see higher value and volume initially in these arenas (See Figure 3). Other uptake and change arenas of course have emerged but these offer more overarching progress, volume, and early consideration.

FUTURECAST #7 : First Look Uptake and Change Arenas – ▶2022 ▶2030

Figure 3: Futurecast #7 First Look Uptake and Change Arenas

High-Profile Sectors

First, which sectors did our work reveal as high-profile, whether early adopters or highlighted targets to this point for improvement? Here are those we offer as first look uptake and change arenas, whether solution providers and/or solution users:

- **Energy and Decarbonization:** Almost everyone's focus - for change and for legacy industries and practices - is on energy production and use, including fuel contributions to climate and environmental disruptions. We need energy, we have only scratched the surface of renewables, we need to decarbonize, and rightly so, this sector has been and will be an essential target.

- **Mobility and Transportation** As both a producer (e.g., vehicles) and user (e.g., fossil fuels, lithium batteries from mined earth sources) of sustainability solutions, the way we and our materials, products, and lifestyles get around our towns, nations, and the globe is a deserved essential target sector.

- **Infrastructure:** For both the above sectors and for the built world in general that supports human life, our infrastructure is in need of dynamic change, redesign, energy and material optimization, and never done before regeneration strategies. Whether for new component products and materials from steel to concrete to bamboo, whether e-vehicles and light rail systems or trains designed to emulate the king fisher, including SCADA managed connected-water chain facilities or other major civic solutions that interact with our various infrastructures, there is major opportunity to adapt our built world structures for more sustainable creation and use.

- **Design and Construction:** Related to aspects of Infrastructure, the build out of the private and public structures and spaces of our lives and ensuring sustainable versions are built demands efficiencies and innovation leveraging some of the essential progress seen to date. Across the designs that architects provide, the materials specified and used, and the engineered processes and practices that can not only build but efficiently operate and maintain the life cycles of these structures, all are increasingly dependent on good design from the start. More attention and change is to come leveraging the innovation in Architecture, Civil and Design Engineering, and the many domains of Construction. Lean, Clean and Green has been the shared rallying cry to date for this early sustainability-adopting sector. From carbon capturing cement to self-cooling buildings designed like ant hills, there is much riding on this sector's continued innovation.

- **Agriculture:** A large contributor to greenhouse gases and a large polluter to land and water, agriculture is a prime sector target for more sustainable practices, less waste, better related formulations, and fewer toxic byproducts. Increased productivity with more sustainable practices and more logical policies and government program interventions make this an essential uptake and change arena.

- **Consumer Packaged Goods:** Hello shoppers! Across the supply and value chain of the products we consume every day – those non-durable items from food to soap to paper products and even the increasing array of non-durable electronics - this sector sees huge use of materials and energy and has a larger-than-life impact on waste as well. It's a perfect target for everyday attention and life-cycle changes.

- **Manufacturing** (In many ways a vertical as well as a cross-sector uptake and change arena) offers a rich target for continuing sustainability efforts. Whether cars or washing machines, silicon chips or latex gloves, we build and produce every item in our built world. Manufacturing also is a producer and user/consumer of sustainable solutions. Manufacturing inclusion here can also cover other sectors of processing and production, such as food or fashion, which bring both common and unique sustainability challenges where some are sector-specific and some are adjacent service providers for the manufactured goods.

Universally across these sectors and in other sectors not specifically called out will be key functions and broad role/job families that earned our first look for uptake and change. These key functions and role/job families are highlighted below.

Functional Families

In the zone of key functions – as broad job/role families – where do we see significant early uptake and change?

- **Product and Process Design**: Most every effort and product in our modern lives can continue to be reimagined and redesigned to be more sustainable. And by the time we're done with re-envisioning and recrafting this world, another wave (maybe a tsunami?) of new practices and materials will enable us to move farther faster in coming generations once the traction catches, becomes the default design, and the political stigma of Green+ fandom fades. Product and process strategists, architects, and designers will continue the ongoing re-creation in most every space, all in smarter, more sustainable ways, keeping these roles in contention for a leading overall workforce uptake and change arena.

- **Skilled Technical/Operations:** Increasing automation and technology-enabled operations make possible a more insightful, efficient, and effective physical and informational world. Thank you, sensors, AI, mechatronics, digital twins, advanced automation, adjusted operating practices for new materials, and engineered tolerances and the like. There's a naturally digital transformation continuing with tech being a key sustainability enabler. It's also a key greening target, so operational and technical support roles are essential. Both provider and user of sustainable practices positions these skilled technical and operations roles at the epicenter of users, enablers, and producers growing the digital nature of integrated sustainability performances.

- **Engineering:** Sustainability loves and desperately needs engineers and benefits from the rapid modernization of engineering practices and conversion from the 'heat, beat and treat' default into 'clean, lean and green'. There are more demands, more factors, more complexities and connections that face these engineers across dozens of engineering disciplines, but the time has never been better for interdisciplinary engineering, varied systems engineering, emergent engineering sub-domains, and the engineering life cycle and problem-solving DNA endemic to professional engineers and their practice.

- **Quality**: The quality arena is one where we are excited to see incredible innovation and change as quality roles emerge to carry the sustainability torch across their organizations and industries. This expanded and evolved role for the centennial approaching discipline is 1) as the coaches on sustainable practices and performances and 2) as the new stewards of data. This is partly as creators of continuous improvement proof and as evidence of quality taking on more shared responsibility for innovation and organizational effectiveness that meets sustainability goals, performance standards, and conventional quality measures as the modernized scope of 'quality'.

Also, ***Supply Chain***, ***Regeneratives*** and ***Skilled Green Labor*** are three other early uptake and change arenas, each offering significant needs and opportunities for workforce change, increased readiness, and reskilling and incorporation into any New Mix of workers for most any company.

Science Role Families

In a way, the science arena is a version of going back to the future when it comes to the sustainability solutions workforce. Most of the classic science arenas are involved again in new ways while new science arenas join in front and center to increase the innovation building on core sciences. Our initial view of science uptake and change areas:

- **Renewables**: All categories (Energy, Materials, etc.) are of course the logical heavy focus as stocks, inventories, and reserves diminish or are available at costs (financial, human, or environmental) that are not sustainable. The continued damage and impacts by non-renewables accompany key disruptions such as climate change and bio-diversity loss.
- **Green Chemistry:** Our accelerating understanding of materials and interactions at the molecular level is enabling our progress at the metalevel of the built and processed world. This results in source reduction because it prevents the generation of pollution.
- **Bio-X:** Bioemulation/Biotech/Biobusiness/Biomimicry: The natural world has been figuring out circular economies, materials innovation, resourcing and upcycling, mutually beneficial relationships, incredibly strong and efficient forms and processes, beautiful designs, and simplifying complex systems for billions of years. There is much there to combine with our human strengths. Besides being deserving of more care and stewardship since we only have one natural world to share, how can anyone argue nature and earth aren't a huge source of innovation for our human problems and built world designs and fixes? Industries and communities don't need to only respect and repair their relationship with nature and natural life, but they also need to use her as mentor, model, and evaluator and invite science, business, government, and social pros to learn more about Biomimicry and Bio Business horizons and the possibilities of cross connecting to all things bio.
- **Rise of 'X':** Interdisciplinary and cross functional and life cycles are new table stakes for many industries to both understand core sciences and to be a leader in innovation based on nature's wisdom. Whether internally bringing together business, technical, science, and social disciplines earlier or externally engaging with supply chains in the same way, the label of the day is 'X', meaning cross discipline, cross functional, and/or both internal and external.

Also, a focus on ***Core Sciences*** and their role/job families (e.g., Biologist, Geologist, Environmental Scientist, etc.), a focus on ***Eco-Environmental Management Services*** as a role/job family, and a role/job family for ***Water: Coming and Going***, are three other essential science and natural world-oriented clusters with early uptake and change that Manpower sees.

Business Role Families

In the business space, we see a New Mix including these highlighted innovative and different sustainability role clusters that will not only be more on the uptake and change themselves, but they will actually help drive uptake and change across their organization by putting the strategies, models, and solutions into the agendas and investment plans of public and private sector entities. Some of the first look nominees are roles focused on:

- **Life-friendly, Life-cycle Valuation and Financing:** The pros that can understand and then cost and value fuller life-cycle solutions provide an essential service that has been missing: looking at the solution space over the mid- and long-term and seeing the opportunity for efficiencies and new markets,

especially when they combine it with changing financing options, tax and investment options, and more sustainable pricing and revenue capture strategies.

- **Circular Business Models and Strategies:** Close partners to the above role/job family, here's where reuse, remanufacture, and recycle come to life as viable and sustainable models. These roles are leading the way in many sectors as they leverage the embedded resource capture possibilities. Look for examples from fashion to construction to medical device equipment to see early examples of why circular business model and strategy roles will be in demand in the now and next economy.

- **Commercial Solutioning and Sales:** To transition the best ideas from the lab, the test beds, or the early adopters, sustainable future needs those who can envision the broader use of these solutions and help buyers and sponsors see the benefits. From creating solution offerings to determining specific solution architectures to building business cases and appropriate contracting and investment designs, commercial solutioning and sales are both honorable and essential role/job families for early uptake and change.

Also, ***Data Integration, Modeling and Decision Support*** as a role/job family, and a role/job family for ***ESG Management and Reporting*** roles and jobs are two other essential business-oriented clusters with early uptake and change that Manpower sees strongly as a part of the sustainability transformation.

People & Culture Role Families

In the people realm where social, workforce, and community combine, there are critical uptake areas because these also are the multiplier roles. They not only do some of the work in sustainability, but they also create the workforce and spaces to do it. Social challenges have bred the need for integrated social innovation to increase the resiliency and life-friendly human conditions and systems. From human rights, fair labor practices, living conditions, health, safety, wellness, diversity, equity, work-life balance, empowerment, community engagement, philanthropy, volunteerism, and human development in many forms, this is the category to accelerate for overall sustainability success.

- **Leadership:** Leaders lead the way. Whether community, business, or technical leaders – as well as their hybrid versions - they bring new mindsets, innovative strategies, and the skills to drive culture and business change. Boldness, courage, collaboration, and a holistic view will differentiate the leaders and the laggers.

- **Cultural and Behavioral Change:** With no shortage of societal, group, and individual change as part of the transformation needed, we humans need culture professionals, coaches, even climate ethicists. Behaviors and values need to incorporate reality and increased awareness of cause and effect and options. We need to address the increasing toll on people of not taking action. For example, climate anxiety is a real thing, so we can't underestimate that psychological and emotional support workers specific to sustainability will be increasingly a part of change efforts along with those who understand human behavior and culture well enough to enable its transition as well.

- **Community and Stakeholder Engagement:** Consistent understanding of the broader needs, rights, uses, and contributions of a wider set of stakeholders is another cornerstone of effective sustainable solutions.

Also, ***Learning, Development and Empowerment*** as a role/job family, and a role/job family for ***Diversity, Equity, Inclusion and Belonging*** roles and jobs are two other essential people-oriented clusters with early uptake and change that Manpower sees strongly as a part of the sustainability transformation.

There are many more roles across other role families, sustainability workforce communities, and other segmentations that we use to describe our field of 775+ roles that we studied. Every role/job has a sustainable version. Every business and community has a sustainable version. All of them are winners in the Green+ and

turquoise jobs sweepstakes, but those shown here represent our first look at highlighting top contenders in uptake and change.

First Look Role Design Principles

Both as a way to give proactive guidance to the roles and work views throughout these assets and as a way to backcast and see more clearly what unifies these roles as meta themes, we developed a manageable set of role design principles. These role design principles meet three major purposes:

- Serve as high-level descriptive orientations of role functions/tasks
- Introduce newer aspects of role accomplishments that modernize conventional roles
- Offer critical themes for roles needed to succeed in this era

This set of twelve role design principles (Figure 4) are those that we observed and identified as forming the broad bases for role design and inclusion as we continued to iterate and added or envisioned roles. They also are useful as we continue to calibrate or connect shared sustainability era role transformation themes across many roles and jobs. Presented here, they can be used as major route markers, first to anticipate roles and jobs, and then to facilitate the understanding or customizing at more detailed levels.

Figure 4: Futurecast #8 Role Design Principles

As familiarity with the domains of work, the communities, the roles, and the knowledge/skills/capabilities increases, these 12 principles will become self-evident and self-definable. For now, consider them as major zone markers for what is needed cross industry and across job families to modernize existing roles, welcome sustainability native roles, and break ground for emerging roles.

First Look Roles: 10 Action Chains

Action Chains (also known as Capability Network Maps), establish groupings of sustainability roles intended to provide a realistic preview of how roles can work together. Action Chains are 'roles in action'. These mini-visual showcases are a high-level guide to various roles involved in delivering on a process/work initiative or major task. While these won't likely be the only activity or process the named role would perform, it is at least one of their 'on the job' areas of responsibility. They serve to directionally guide business leaders, hiring managers, workforce planners, curriculum strategists, and others to see at least one area where the roles bring value.

Our Action Chains begin to tell rich stories that feature how roles work together. How can over 100 roles connect as a capability network for 10 essential, high-value, sustainability-related processes and/or initiatives? See the 10 Action Chains listed and displayed (Figures 5-15). Action Chains enable stakeholders to tell stories for many talent management and development purposes. For many, this is a valuable extended workforce development asset, giving educators on this program and elsewhere directional guidance for connections between roles, showing prospective candidates a range of possible roles for shared education and development, providing career coaches with a broader view, giving recruiters a holistic picture of who works together, and giving business types and workforce planners a view into their group level casting and talent investment decisions.

1 An Action Chain for **Pitching a circular economy business**

2 An Action Chain for **Evolving an impactful ESG program**

3 An Action Chain for **Assessing life cycle costs and values of sustainability solutions**

4 An Action Chain for **Justly transforming the green-turquoise workforce**

5 An Action Chain for **Sustaining supply chains**

6 An Action Chain for **Leveraging community in building a new production site**

7 An Action Chain for **Greening product designs**

8 An Action Chain for **Greening facilities**

9 An Action Chain for **Greening manufacturing processes**

10 An Action Chain for **Regenerating abandoned sites and cities**

Key to role placements (see actual action chains):

■ Often an internally held and managed employee position based on the size and need of the targeted organization

□ Often an external vendor, contracted, third-party or community funded position based on their specialty

Figure 5: Action Chain List

1 An Action Chain for
Pitching a circular economy business

Sustainability entrepreneurship is an established capability, whether as a new business start-up or the reframing of an existing business. New businesses based on circular economies (CE) bring promise. CE focuses on business systems that combine to **eliminate waste and pollution, keep products and materials in use and regenerate natural systems.** With such a dynamic horizon, it's an era for exploring and settling the new green business frontier. We are seeing more jobs for modernized conventional business development roles and native sustainability finance and strategy roles. Together, they can make a powerful pitch team, 'productizing' the CE opportunities, building the business case, and motivating investments.

Sustainability as a Service Strategist ■
I'm an expert in designing business service models and delivery channels that match sustainability needs to sustainable solutions, including emerging capabilities. As a result, I help create new business service opportunities, shaping entirely new companies, new markets and new brands.

Sustainability Solutions Product Strategist ■
My role is to work across product development teams to match sustainability needs and opportunities to the portfolio of our new or updated product designs. I then partner across the life cycle on how to best position these products in the market.

Sustainability Brand Strategist ■
My marketing experience and responsibilities combine with ESG awareness to enable me to position our increasing sustainability performance as part of our market and employment brand.

BCorp Advisor ☐
Mission-oriented companies ask me to assess their business models, operations, organization and plans, both to seek BCorp status and to help them advance their overall sustainability performance.

Close Loop Economist ☐
I'm a business economist with a deep focus on CE and showing its viability. I help venture teams and market sectors apply strategies, principles and proof of both standard economics and closed loop specifics to build business practices, acquire needed capital, operate efficiently, and generate profit.

Sustainability Financing Strategist ■
I'm a capital resource planner who creates funding strategies for CE businesses, products and services. Understanding some of the short-term and long-term life cycle issues and knowing how to value and price them across the life cycle improves our chances of funding.

New Loop Economy Architect ☐■
Integrating across multiple businesses and often to (re)generate local or regional communities or modernize sectors, I connect suppliers with producers, sellers and consumers. I then design financial and business systems that connect the dots in a circular economy.

Strategic Sustainability Market Intelligence Analyst ■
Market watching, competitive intelligence, valuations and impacts of regulations or investor expectations are all factors I study daily and provide to both business strategists and our innovation, sales, and marketing organizations.

Financial Risk Specialist ☐■
My role is to quantify the many business challenges from multiple risk categories that sustainability-oriented businesses may face. Speaking of superpowers, mine is that I know to look for and quantify the risks of NOT going green, including lost opportunities.

Sustainability Evangelist ☐■
With a broad view and relationships into many business and community sectors, I partner with industry, academia and government to enthusiastically promote, sponsor and connect stakeholders across environmental, economic and community systems.

Remember Adjacent Roles!

Conventional product and service strategists, entrepreneurial business leaders and actual pitch teams can benefit from these increasingly experienced sustainability financial and planning experts. Others who help tell the story of possibilities include:

- Communications Manager
- Sustainable Solutions Sales Architect
- Cost Estimator
- Financial & Investment Analyst
- And others

Also remember…many roles much closer to the designing and making of the sustainable solution - whether product, process, facility and operational workforce roles can expand key details for a successful proposal or pitch.

Figure 6: Action Chain 1- Pitching a Circular Economy Business

2 An Action Chain for
Evolving an impactful ESG program

Increasingly evident or formalized sustainability efforts including ESG programs are expected by stakeholders, including investors, insurers, customers, employees and communities at large. Requirements that companies organize and commit to environmental, social and economic strategies may or may not be regulated and can be engaged in voluntarily. Yet, teams and programs that lead these efforts work together to align, monitor and report on results that improve environmental stewardship, social equity, transparent decision making and ensure healthy economies. Evolving a sustainability or ESG program brings together leaders and program approaches to direct these efforts. Together they plan, stay compliant, remain innovative and commit to greener goals. Program leadership will include both key functional C-level leaders and dedicated staff roles. Here are some best practice sustainability and ESG program and support team roles:

ESG Program Lead (Process/Product/Ops)/ Chief Operation Officer ■
I'm driving the sustainability of our total operations capability, including how we do, make and deliver what essentially defines our industry position and customer value.

ESG Program Chair/ Chief Sustainability Officer ■
Leading and organizing the integrated ESG strategies, reporting and accountabilities is my core focus. I'm responsible for engaging and integrating practices and decisions across our people, processes, products, and planetary impact and setting us all up for prosperity.

ESG Program Lead (Org. & Workforce Transformation)/ Chief People Officer ■
My role is to guide the human and workplace arc of change for our organization, our employees and our culture towards a skillset and mindset of holistic short- and long-term sustainability.

ESG Program Lead (Brand & Communications)/ Chief Communications Officer ■
It's both mandate and opportunity to (re)define our brand as a sponsor and steward of sustainable business and employment. I keep the internal and external conversation focused on our purpose, values, principles and progress.

ESG Program Lead (Audit & Compliance Chair)/ Chief Risk or Chief Audit Officer ■
Managing the external compliance and wildly-varied risks of today's world, potentially both opportunistic and damaging, are where I focus and monitor our efforts. Translating these into actual or potential impacts and modeling with my peer leaders lets us make better decisions.

ESG Program Lead (Ethics and Corporate Responsibility)/ Chief Ethics Officer ■
Our stakeholders have new and legacy challenges to balancing many legitimate interests. I am here to give insights and guidance on why and how to maintain our ethical, legal and social integrity.

ESG Auditor ☐ ■
I support the ESG program through continuous assessment and gap analysis of our plan and program commitments, our actual operational performances and our regulatory or stakeholder expectations.

Bio-based Business Solutions Architect ■
I am a hybrid scientist and business professional who advises the program chair, leads and networks on where our alliances, products and services can be a benefit to as well as benefit from the natural world.

ESG Program Lead (Reporting)/ Sustainable Metrics Manager ■
I translate our program and business needs into measurable methods and metrics. Then, I design and manage our periodic and real-time data and reporting systems and contribute our performance data to ESG Reports.

Environmental Interpreter ■
I'm one of several sustainability area analysts and communicators called in at times to aid the ESG program in better understanding and framing how the science meets the business and vice versa.

Remember Adjacent Roles!

Organizations will scale or focus and broaden their ESG program roles based on requirements from stakeholders including regulators, as well as their business, size, industry, and actual ESG maturity. Not every organization will have a formal ESG program but still can have a strong sustainability business mindset, strategy, and set of initiatives with similar leader and team roles. You might see other adjacent program roles like:

- ESG Communications Manager
- Sustainability Transformation Leader
- Chief Strategy & Brand Officer
- Industry Segment Futurist & Forecaster
- And others

Also remember… beyond the sustainability or ESG program leader and reporting there are **many other life cycle roles and often hundreds or thousands in the workforce of any company** involved in doing the work that results in positive environmental, social and economic outcomes.

Figure 7: Action Chain 2 - Evolving an Impactful ESG Program

3 An Action Chain for

Assessing life cycle costs and values of sustainability solutions

How do you know the total cost and value of a new business idea, product innovation, facility or policy implementation? Especially when it comes to calculating the true cost of a 'sustainable' solution, chances are one doesn't know the full life cycle implications and their extended financial impacts or costs. Costs are often limited to purchase prices based on materials and manufacturing process for production and not to the impacts on nature as a seemingly endless bounty of natural resources nor to human life involved in producing or managing the total experience with that product or process. Who can help broaden these considerations and contribute to a more realistic picture of the costs for a wider group of stakeholders? There are entire work domains that come together to show the economic and financial factors and business cases for going or not going green. Here are some of the roles involved in taking both the short- and long-term financial view for a wider group of impacted parties.

Remember Adjacent Roles!

Financial analyses will potentially need various sustainability or sector specific information and insights. Many other finance roles could be involved including:

- Finance and Investment Specialist
- Environmental Accountant
- Sustainability Financing Strategist
- Sustainability Funding Mechanism Connector

Also remember… there could be other experts on specific solutions or strategies, or operations and other functions, to be brought in for the full life cycle picture. From scientists and engineers, to operators and community coordinators, viewpoints and expertise on impacts can be broadened for a better picture of total costs. These evaluators and contributors can and should be from solution providers, users, regulators and the broader public.

Figure 8: Action Chain 3 - Assessing Life-Cycle Costs and Values of Sustainability Solutions

4 An Action Chain for

Justly transforming the green-turquoise workforce

Everyone is a bit of a workforce commentator these days. It's mainstream news and coffee talk that employment and workforce issues are impacting everything from economic recovery and growth to resolving social equity. Forecasting, staffing and managing the needed sustainability workforce combines with displacements (whether or not from transforming from fossil fuel dependency) or lower accessibility and employability for identified populations, alongside those who have been disproportionately impacted by environmental and social damage from past practices. An entire ecosystem of workforce experts, including these roles, are working to make the training and transformation to sustainable jobs especially open and just for these affected people.

Chief People Officer ■

As a company leader and as the head of our workforce and organizational effectiveness teams, I'm responsible for our people-centric adaptability and resilience. This includes aligning our workforce, workplace and culture to join with the communities where we live and operate to be part of fair and equitable major transformations. Addressing job shifts, leveraging the talent of our displaced economy and meeting needs of our emergent opportunities are some of my top targets.

Sustainability Workforce Planner ■

I assess, forecast and strategize how to meet our workforce needs for today and tomorrow. This is key to our company resilience, and I am applying **sustainable workforce management** practices and looking for people in the sustainability domains that we need.

Chief Diversity, Equity, Inclusion & Belonging (DEIB) Officer ■

My leadership role is as the keystone person for diversity and inclusion initiatives at our company. My team and I manage, optimize and partner with managers and other roles across the organization on how to make our workplace a fairer, more equitable place for all employees and key stakeholders.

Workforce Equity Recruiting Specialist ■

I'm focused on designing and implementing sourcing and recruiting strategies that are fair, equitable, and give consideration to candidates who may have been overlooked in the past. I also partner with development and employability programs for emerging skills that target transitioning groups.

Sustainability Content Instructor ☐■

Combining programs and resources to train and develop essential sustainability skills and knowledge is my focus. My peers, partners and I are providing a huge spectrum of business, technical and personal skill development. Our offerings need to include an incredibly broad arena, from circular design to conflict resolution to resource optimization and biology for business.

Remote/Hybrid Work Designer & Coach ☐■

Never have we needed a better handle on how to merge remote and hybrid work into the workplace. I design, test and monitor creative process and technical support for hybrid and WFH work. It not only enables business continuity, but it also helps innovation and lets us look at more sustainable and equitable ways to employ more people and address work-life balance of society at large.

Sustainability Psychologist ☐■

Most people aren't fully conscious of the psychological aspects of moving towards sustainability solutions and equitable society. Exploring the relationship between our personal or familial or cultural values, beliefs and behaviors can accelerate change and progress.

Educational Guidance & Career Counselor ☐

Sharing opportunities and good careers in sustainability as early as possible with students and future workers is one of the first steps of our workforce planning system and my area of professional expertise and personal passion. Some of my peers have a focus on transitioning and displaced (but experienced) workers seeking a second career.

Climate Equity & Community Partnership Program Manager ☐

I oversee a portfolio of climate equity programs and work with employers, schools and community groups to identify employment candidates, onboard trainees, deliver workforce development services, and put a wide range of residents into green jobs. The more I learn about our community needs, assets, and sustainability in general, the more I see opportunities and channels into even more diverse sectors of our community.

Equity Achievement Assessor ☐

My role is as an evaluator and remediation planner for social equity related programs. Currently, I work with schools, up/re-skilling programs and other employability solutions to focus on determining if their DEIB goals and commitments are being achieved and how to close any gaps.

Remember Adjacent Roles!

Some of the other partners in this effort include:

- Community Economic Development Director
- HR Manager
- Training and Development Director and Specialist
- Sustainability Workforce Recruiter
- K-12 Educators
- Community Economic Development Director
- Policy Analyst
- Also, see the Impactful ESG Program & Leveraging Community action chains

Also remember… This isn't an easy solve, and as with other sustainability-related umbrella goals, there are many roles involved in the effort. Along every step of the way, each role can ask what they are doing to ensure a just transformation. Social equity assessors and Community Justice Liaisons and other social justice roles can provide the specific insights and connections to groups that are being most impacted by poor environmental stewardship and changing industry profiles.

Figure 9: Action Chain 4 - Justly Transforming the Green-Turquoise Workforce

5 An Action Chain for
Sustaining supply chains

How sustainable is our supply chain? What are the **environmental and human impacts of our products'** journey or our service delivery through the supply chain? Are you asking these questions? According to ESG stakeholders, supply chain and logistics are major areas for sustainability attention, touching the full life cycle of an organization. We saw from the Covid 19 pandemic impacts, the Ukraine war, and global weather and geo-political forces how vulnerable the supply chain is. From raw materials or supply sourcing to production and use and literally every move or part in between, these roles and others are looking for efficiencies, innovations, more resilient approaches and shared opportunities.

Supply Network Sustainability Compliance Manager ■
We have both mandatory regulatory and voluntary compliance programs for our supply chain, including those to meet government supply chain. I assess and plan efforts for our network and individual suppliers to meet those standards and keep our business using best practices.

Chief Logistics Officer ■
I lead, along with our Design, Operations, Supply Network Facilities and other core executives, the efforts to make sure their teams have everything they need to get our work done and move our resources and products from place to place. My team and I also take on major project oversight for new facilities, startups and shutdowns. We're constantly increasing our analysis of the total cost life cycle and impacts to the environment, our communities, and our supply chain while reengineering to better and sustainable practices.

Supplier Diversity & Sustainability Manager ■
My role is to discover and incubate new vendor relationships and find vendors in unexplored categories to support our DEIB and environmental goals. I find and help ready new partners, such as small businesses, minority-owned businesses, experts with specific sustainability expertise or businesses in a new region.

Social Entrepreneurship Advisor ☐■
Mission-oriented entrepreneurs and startups in the social service sector or companies simply wanting to be more adept and mindful of their social practices ask me to assess their business models, operations, organization and plans. Along the supply chain, there are brand and operational risks to underestimating the critical aspects of leveraging social entrepreneurs to improve, balance or grow existing suppliers.

Sustainable Supply Network Manager ■
My day-to-day procurement and management of various supply chain partners has been modernized to include coaching them on our sustainability programs and ensuring our contracts, reporting, orders, and related tasks meet those aims. Every new sustainable practice also has the chase to cascade in their other supply chains.

Smart Contract Advisor ☐■
Bringing digital technology, cybersecurity and process efficiency to purchasing and contract management is my role. I'm an expert in smart, automated contract systems and processes. I advise on piloting new tools and emerging practices, including blockchain, with a goal of ensuring lower cost, lower resources and higher credibility of transactions, all without extensive third-party involvement.

Sustainable Innovation Partner Liaison ■
I'm an insider-outsider-prime-and-partner type of role, constantly looking for innovation with our partners. I seek new supply network members, design pilot programs, onboard suppliers, and advance our supply chain capabilities through change.

Vendor Collaboration Coordinator ■
My role is measured on successful implementation and execution excellence of our vendors and suppliers. Part vendor manager, part procurement partner, part mediator and troubleshooter, I help build agility and improved sustainability into our supply chain.

Demand Planner ■
Sustainably optimizing inventory availability with forecasted vs. actual demand in our supply chains is where I contribute. There are costs due to overproduction, excess inventory management, unnecessary storage and transport costs. These are just some of the factors I can mitigate with the right data and partners.

Smart Contract Reviewer ■
Since we build our compliance requirements into our automated smart contracts, I concentrate on measuring effectiveness and efficiency of the process and tools, focusing on transparency, ESG reporting and security/non-tampering, as well as further improvements.

Remember Adjacent Roles!

There are many conventional supply chain roles that are also part of this extended capability network, such as:

- Inventory Managers
- Logistics Engineer
- Logistics Compliance Analyst
- Vulnerability Assessor
- Wholesale & Retail Buyer
- And many more!

Also, a reminder….Some companies will also be managing fleets and there are roles in sustainable fleet management to consider as well. Substantial resource use, costs, safety and optimization make even a relatively small fleet a prime target for more sustainable impact and with that more key "supply chain" roles will be involved there as well as fleet optimization continues to be an improvement target for sustainability.

Figure 10: Action Chain 5 - Sustaining Supply Chains

6 An Action Chain for

Leveraging community in building a new production site

Building any site, especially new production or processing sites, has always been a public-private, short- and long-term major project. Increasingly, it's only successful when involving all stakeholders and benefitting from the guidance of varied advisors, planners, engineers, developers and community representatives who understand and apply sustainable practices and designs and who use a holistic view of compatibility and resilience. Many factors matter in securing cooperation and funding and in mitigating any negative impacts to land and life. This includes recognizing the long-term land, air, water, and human impacts of the site facility waste, its related systems, the workers, and the adjacent populations. Here are some of the roles across the community that work at the start of developing and building new facilities:

Economic Development Specialist ☐
Working across the community with industry, government and academia, my role is to create and connect opportunities. From policy to funding to site procurement, I work the full life cycle for new major employment and business initiatives.

Urban Planner ☐
My focus is the bigger picture, the stage setting. I liaise with public officials, developers, and the public to consider economic and environmental studies, census and population data, and market research. I analyze those actors affecting land use and impacts on infrastructure, health, and commerce.

Municipal Ecologist ☐
My environmental systems and ecology training and my municipal role enable me to keep both nature's interests and the public's interests in mind when I work with urban planners, site development teams and intended owner/operators of new facilities.

Sustainability Assessor/Planner ■
As more frameworks or standards for assessing sustainability performance are developed, I add to my toolkit. I can evaluate and coordinate projects and create roadmaps towards sustainable facilities and operations.

Sustainable Funding Mechanism Connector ☐
Concentrating on sustainable initiative or business funding is my focus. My peers and I can represent public or private investment sources, clients looking for capital, or communities bringing more opportunities, especially with targeted green or equity goals.

Arbitrator/Mediator/Conciliator ☐
Resolving conflicts and finding shared benefits is my purpose as a neutral negotiator. My peers and I work with parties to come to agreements and terms - both legally binding or informal - that enable all parties to resolve issues and move forward.

Community Network Coordinator ☐■
My focus is personal contact with program coordinators at the many local and regional organizations who represent different stakeholders, needs, and resources. From churches to non-profit housing coordinators and from job candidate pools to municipal training programs, I connect needs and services.

Social Impact Consultant ☐
As a more generalist social sector advisor, I focus on understanding and improving the human and community side of major initiatives. My goals are minimizing negative impacts to health and wellbeing, societal resilience, work and educational opportunities, and equitable accessibility.

Energy, Water & Material Balance Planner ■☐
Optimizing the care, use, and cost of essential resources is my focus. Part operations engineer, part business analyst, part resource specialist, I assess, plan, and remediate for resource management pre-and post-construction and during operations.

Conservation Action Planner/Coordinator ☐■
I'm a bridge between developers, government agencies, and environmental groups focusing on environmental planning and policy development. From the environmental science side, I co-research what the environmental value and impact is to determine whether we proceed, protect, and/or preserve.

Remember Adjacent Roles!

Depending on the purpose, location, size and related regulations around the facility, there can be many community roles involved representing broader interests. Here are other capabilities and roles that might be needed:

- Climate Resilience Specialist
- Policy Analysis & Development Specialist
- Sustainable Construction Materials Specialist
- See other roles from other action chains: Pitching, Greening Facilities, and Regenerating.

Also remember… what's essential here is to be holistic in the development life cycle – both lifespan and participants. It's everyone's concern: commerce, conservation, and community.

Figure 11: Action Chain 6 - Leveraging Community in Building a New Production Site

7 An Action Chain for
Greening product designs

Where do we see the impact of the built world the most concretely (no pun intended)? It's usually through products that are created, used and eventually discarded from materials we take from the world around us. Whether our highways or homes, they use concrete, steel and wood extracted from the earth. Our smart phones use mined precious minerals. Our cars involve tons of materials that eventually need to be disposed. The fabrics of the clothes we wear take 40 pounds of cotton and gallons of water for one T-shirt. Product design clearly plays an integral role in sustainability. What are some roles looking to make the products more functional with a lower footprint?

Manufacturing Biomimicry Specialist ■
I am the biologist at the table sharing nature's wisdom with product teams. I research models in nature and translate them to new forms, functions, and processes that can be the cornerstone of more sustainable products.

Sustainability Product/Service Strategist ■
My role is to develop and implement various business tactics to improve the performance of sustainability products. I keep up on the competitive market and innovation areas and guide our designers, marketing and others on development of our product/service portfolio while managing the related roadmaps.

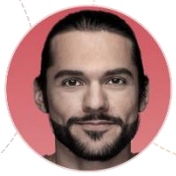
Sustainable Product Designer ■
Translating product solution designs from pain points to new opportunities is where I come in. Part artist, part scientist, part engineer, part client rep, I move stakeholder needs into product design specs, taking ideas to prototypes to production.

Product Life Cycle Manager ■
Who works with and guides all these brilliant people and others from ideation to production to customer experience and end of life management? The full life cycle of the product and its total cost of development, ownership and sustainable impact is my focus.

Materials Engineer ■
My role is to bring molecular level knowledge of materials and model their characteristics and performance for various product uses. Proudly, I feel like one of stainability's new heroes – solving problems in many industries as they seek more benign materials and more energy efficient performance.

Remanufacturing Engineer ■
My practices are the new face of product repair, maintenance, and upcycling. Enabling rebuilds to spec or producing new designs and functions that leverage most of the original material and design is my specialty.

Sustainable Product Sales Specialist ■
My in-depth understanding of our sustainable products and services and my passion and customer knowledge to sell them grows our revenue and brand.



Sustainable Packaging Engineer ■
Bringing new designs, materials and approaches to how we house, share, ship and even sell our products is my responsibility. I leverage an interdisciplinary set of capabilities to impact product quality, safety, user satisfaction, production and distribution efficiencies, all the while minimizing our footprint on the environment and human wellness.

Product Recovery Specialist ■
As part of our responsibility for the full life cycle of our products and materials, I make disposition of defective products or unused materials or inventory. My contribution is to decrease our waste stream by converting unsellable stock and inventory to an asset, if not to us then to others, often by finding sources for it to be remanufactured, recycled or upcycled. We are now designing with product recovery in mind.

Biofuels Technology & Product Development Manager ■
I'm just one example of a product manager for a specific sustainability product category. You'll see others for other alternative energy types, innovative materials, product functions, and solution strategy types

Remember Adjacent Roles!

Product design and development is a huge opportunity and need for sustainability innovation. Every aspect of a product from single use mode to actual material composition to ease of upcycling or longevity and quality of the product can matter greatly to its footprint and impact. What are some other varied roles that can contribute to the greening of product designs?

- Bioengineer
- Materials Scientist
- Precision Biologist
- Brand Sustainability Behavior Coach
- User Coach
- Customer Return Experience Coordinator
- Product Recovery Specialist

And remember, it's sometimes those roles later in a product's lifecycle that can have great insights on what should have been the design aspects much earlier in the lifecycle.

Figure 12: Action Chain 7 - Greening Product Designs

8 An Action Chain for
Greening facilities

Humans and the built environment have a special and intimate relationship. We live, work and play in buildings and facilities that have for millenniums been built from materials extracted from the earth and processed via "heat, beat and treat" methods into building materials. They were then constructed using energy and resources, again from the earth, and operated relying on more extracted materials, the process leaving a trail of mismanaged resources and a damaged environment. 'Greening' of facilities is achievable whether a new build, continuous improvement of existing facilities, or major retrofitting and recommissioning. Great innovations have improved the forms, structures and systems for creating and using our facilities, but much more needs to be done by these roles and others to continue the greening of our facilities

Sustainable/Smart Factory-Smart Grid (Meta System) Engineer ■
My engineering role connects our advanced and smarter-than-ever factories to the broader infrastructures or our connected environments, communities, and transportation systems. As smart cities, advanced grids and distribution channels grow, my system design challenges increase but also create the setting for sustainability strategies.

Sustainability Factory Designer ■
I am a designer and architect who applies sustainability practices ranging from self-cooling buildings to new carbon sequestering materials to reusable or modular construction materials. These and many other innovations enable me to design highly-functional and much more life-friendly structures that can coexist with, versus coopt, the natural world.

Facility/Campus Energy Optimization Engineer ■
With my responsibilities for energy assessing, monitoring and modifying, I focus on optimizing our resources and meeting utilization, cost, and other stakeholder targets. My focus is on identified facilities within a particular geography, region or campus.

Smart Factory Architect ■
I am a factory designer and architect with a focus on automation, AI, digitization and advanced industrial control systems, processes and equipment. The smarter and more efficient we can make our facilities, the more sustainable and safe we can make them as well.

Renewable Energy Operations & Maintenance Specialist ■
My role is an ops and maintenance tech responsible for our facility side systems and equipment connecting and distributing renewable energy from the grid to our plant power systems and equipment. I'm increasing my experience with solar system integration, geo-thermal, wind and hydro power across our several facilities.

Solar Energy Systems Engineer ☐
I am responsible for letting the sunshine in! As a solar energy systems engineer, I design solar energy capture, transfer, and distribution systems for production and general facility operations.

Community Network Coordinator ■☐
As part of a new facility build out team, I liaise with members of the community to engage residents, groups and partners and ensure we get off on the right foot.

Sustainable Infrastructure as a Service Migration Engineer ☐
As more firms like ours take on more sustainability services for clients who can outsource them to our experts, I am in the role of designing the migration plans for facility systems monitoring, operations and overall management.

Green Automation Technician ■
In my role, I install, repair and maintain computer-controlled systems and robotic devices used within our facility and aimed at more sustainable outcomes. I bring electronics, mechanics and computer/digital skills to monitor, diagnose and repair these systems, or I bring in the specialists who can add to my efforts.

Sustainability Insurance Specialist ☐
I specialize in property and liability insurance policies for losses arising from adverse effects of sustainability, climate change or brand related risks. I advise clients on the need for environmental and reputational protections that are more broadly available and more needed than ever.

Remember Adjacent Roles!

The environment and community specifics where a facility will reside will also determine other roles to be involved. Consider these other roles and their potential contributions:

- Watershed Planner
- Water Waste Investigator
- Climate Justice Investigator
- Hazardous Materials Removal Worker
- Solar Installer and other skilled technical roles (see Action Chain Sustaining Sustainability with Skilled Technical Roles)

Also remember… facilities are closely tied to the products they produce and the processes they run. See those action chains for more roles that may be more directly involved in the greening of facilities as well as those other home action chains.

Figure 13: Action Chain 8 - Greening Facilities

9 An Action Chain for
Greening manufacturing processes

The "green" in manufacturing includes both **green outputs**, which are the improved products for conscious consumers, the equipment used in or for renewable or sustainable efforts, and the **greening of the methods or processes.** Manufacturing processes can go green by reducing energy or material waste levels, reducing toxicity to living systems, increasing reuse, and considering eventual regeneration of production sites or materials. Lean and green is not new to manufacturing, but it is becoming more prevalent and is seen as not only as a compliance practice or cost reduction option but also as an innovation and value-add activity. Some of the roles making that happen include:

Sustainable Manufacturing Process Engineer ■
I specialize in identifying, developing, and implementing process improvements based on green engineering and green manufacturing practices. I'm contributing process optimization, troubleshooting and problem solving that makes manufacturing sustainable and benign.

Manufacturing Operations Leader ■
Across multiple plants, I'm responsible for driving key measurable results in safety, quality, waste, productivity and cost. Not only because of regulatory compliance but also because we see innovation and improvements, I need to position sustainable design and process as value add versus extra cost. It's becoming a cornerstone in our strategic planning and operational management, including long term capacity and operations planning.

Sustainable Cloud Architect ■
I am responsible for designing both public and enterprise cloud architectures. With their energy and resource intensity, my success is dependent on how to reduce IT-generated carbon emissions and innovate responsibly overall. My role includes designing for decreased energy costs and increasing utilization rates, making server workloads more efficient and lessening the associated material use of tech hardware.

Autonomous/Remote Plant Manager ■
I am an increasingly modernized manufacturing leader – a plant or facility manager with teams and tools that allow us to operate the plant remotely through various levels of autonomous control systems. We aren't new as remote operations have been around for decades, but issues like the pandemic, AI, cheaper automation, safety and sustainability have created more opportunity for us.

Green Engineer ■
My engineering focus has been modernized to focus on the design, commercialization, and use of processes and products in manufacturing operations. The 'green' requirement means I enable processes and promote sustainability, clean up our footprint from an environmental perspective, protect human health and maintain economic viability.

Laboratory Technician ■□
My role is to test samples of materials, outputs, byproducts and other internal and external environmental samples or process elements. The data from my tests is just part of the increased and improved analytics and science to support investments in sustainability.

Quality Assurance Technician ■
The legacy of quality roles like mine has been in process improvement and efficiency. Now I help champion sustainability as part of the ground level ESG team. My role includes testing, inspection checks, equipment calibration and quality process reporting specific to sustainability focused improvements.

Sustainable Manufacturing Process Technician ■
My role is to support plant engineers and production and processing teams through the safe monitoring and modification of equipment, as necessary. As more materials and methods change as a result of green (re)engineering, I am busy with both new industrial systems and processes.

Machinist-Setter, Operator & Tender ■
Production roles like mine and my teammates' set up machines for operation or operate the machines. Some of us do both. The common changes we've been seeing such as automation, robots, materials, energy source integrations and waste reduction make manufacturing more sustainable AND have made it safer and less toxic for those of us in the plant.

Industrial Process Automation Technician ■
Supporting engineering including automation, AI systems, advanced instrumentation, controls and technology generally is my focus. I am analyzing, testing specs for, and helping implement new production and processing systems. Everyday process improvement helps us reach financial, sustainability and safety related goals.

Remember Adjacent Roles!

With so many processes involved in manufacturing, there are many varied roles in this action chain category. Other generalists and specialist could include:

- Autonomous/Remote Plant Operator
- (Onsite) Plant Operator
- Quality Manager
- Photonics Engineer
- Nanosystems Engineer
- Energy Auditor
- And many others in the Manufacturing subcommunity

Also remember that there are many material providers, energy providers, equipment and systems vendors that influence manufacturing processes. Many of them are bringing better and more green practices. Those roles as well have great influence on process greening activities.

Figure 14: Action Chain 9 - Greening Manufacturing Processes

10 An Action Chain for
Regenerating abandoned sites and cities

One of the most visible examples of the impacts of mismanaged industrialization are the vacant, ravaged and/or toxic lands, waterways and ruined facilities or residences that present challenges for wealthy as well as older and financially distressed communities, both urban and rural. Regeneration, reclamation and recovery involve environmental, social and often commercial programs. Who assesses the recovery value to the community or the environment? Who develops the roadmaps, policies, funding, and community engagement processes to restore the sites to ones of value versus the results of unfortunate human interventions? Here are some of the roles involved in regenerating our sites and cities:

Restoration Ecologist ☐
We are environmental specialists working in many industries beyond our home playing field of conservation. We are employed in consulting firms and federal, state or local government agencies, giving advice and services for protected or neglected land and ecosystems or as part of disaster relief efforts.

Remediation & Redevelopment Site Manager ☐■
My role is to manage efforts to make contaminated or damaged land livable again. With others or individually, I ensure environmental impact studies have identified how and how much it will cost to detoxify the land and ecosystem and restore it to enough health and stability that it can host living organisms, plants, humans, animals and potentially new and more benign human use.

Environmental Program Manager ■
My business and organizational skills are increasingly valued as the environmental sciences sector and bio business continue to grow rapidly. I can be responsible for performing or coordinating varied activities, ranging from general project technical oversight, regulatory agency relationships, permitting, compliance and mitigation, construction, or ecosystem remediation.

Environmental Lawyer ☐■
There's always a lawyer involved, and frankly it's important to have legal experts like me working with the policies, laws and regulations protecting the environment, mandating certain compliance and accountabilities and ensuring consideration and the rights and responsibilities of all the stakeholders.

Remote Inspections Drone Pilot ☐■
We are increasingly primary explorers and recorders of abandoned, unsafe, or difficult-to-reach areas. We operate drone systems and pilot devices to visually inspect land areas and building sites as part of safer and more efficient detection, inspection and recording efforts.

Resource Recovery & Reclamation Specialist ☐■
I'm an onsite/field materials and recycling specialist who can work to identify higher value reusable resources and how best to extract them during reclamation and recovery efforts. I interface with other extraction and removal roles to ensure safety for the workers and no further releases of contaminants into the environment.

Sustainable Environmental Accountant ■
My conventional accounting background has been modernized and transformed by specializing in the evolving standards for ESG reporting, specialized investing and sponsors who want more specialized versus generalized financial pictures of their sustainability related assets and actions.

Maintenance & Repair Specialist ■
My role to install, troubleshoot and repair is also useful when sites are being cleared and equipment or inventories are being assessed for reuse, recycling or remediation.

Forest Restoration Officer ☐
As part of the science and environment team, I am an operating forest patrol and maintenance staffer who performs forestry debris removal and new landscape stock replanting. I also monitor access, use and everyday ecosystem conditions while our teams are rebuilding these ecosystems.

Eco Infrastructure Builder ☐
I am a construction laborer working on building and upgrading our infrastructure. Whether roads, bridges, or grids, my peers in general or skilled labor and skilled technical roles work with me to put the structures in place to support a hopefully more sustainable future.

Remember Adjacent Roles!

Restoring and regenerating ecosystems and land can be a long and complex process. Depending on what the repurpose is and the condition of the land, there are many other roles that could be involved:

- Sustainable Agriculture Field Manager
- Remanufacturing Engineer
- Recycling material collector/sorter
- Landscape Restoration Designer

Also remember… prior to operational reclamation and recovery, there will likely have been many other roles in the community, previous owner/operators and future users involved in the stakeholder discussion.

Figure 15: Action Chain 10 - Regenerating Abandoned Sites and Cities

Workforce Transformation Trends

Across this section on essential perspectives and broad insights that anchor our research, Manpower has introduced different ways to see the Sustainability Solutions Workforce take shape. That workforce comes into view as a collective of capable and innovative workers that will change life, government, society, and industry for generations to come as they become the dominant source of innovation, capacity, and valued contributions. In this research, Manpower has identified macro insights, early uptake and change targets, overall role design principles, and action chains that both introduce some of the 775+ roles we worked with and also plant ideas of the specific practices that are part of sustainability solutioning. This is only the start but a rich one at that, and one that can use a consolidated picture with trends and sample specifics as well.

Pulling from various themes introduced here, as well as a few more peeks at later topics and role specifics, Manpower sees this nest Futurecast (Figure 16) as a consolidation of many of the top workforce trends directly in front of us now and soon to be on the horizon.

Figure 16: Futurecast #9 Workforce Transformation Trends

In the following sections, we will build out the backdrop – such as Manpower's Sustainability Solution Life Cycle and work domains and Green+ and turquoise roles, and – and then move into specifics on the community of roles, the 6 subcommunities, and the 775+ roles themselves, with closing sections on roles in action and calls to action for all key stakeholders.

Summary

Many drivers, challenges, and opportunities as we shared in Section 2 are promoting the growth that has opened up for roles, jobs, and careers on many different levels in sustainability arenas. In this section, we have provided additional detail on the type of growth anticipated and outlined a directional path. The New Mix for the workforce takes shape. It reflects sectors, specific functions, and role and job families that we see as early maturity, innovation, and commitment. If nothing else, this section may have shown that the world of work and workforce perspectives are not a simple equation of known green jobs but rather a rich equation of a New Mix and a better ratio across the sustainability roles for each organization, solution provider, and solution user.

As you see the direction of the New Mix unfold, it should be no surprise that we don't now have enough Green+ and turquoise skilled workers. Part of this is the slow opportunistic business movement over the last 50 years and investment cost of entry, the slow creation of related jobs, and the minimal investments in training that backed into the broader workforce development and education system. Part of it is the woeful assumption that there were only (conventional) green jobs and the slow adoption that there are many other related turquoise jobs to enable the classic green workforce. Part of it is the lack of leadership on related environmental vs. industry issues, responsibilities and funding, and the list could go on. However, as we look forward to the newer horizons and the markets and impacts that have changed, we all find a different environment, whether natural and built, social and workforce, business, or governance.

We can debate the count of jobs or the trillions needed for investment, etc. but not the direction, the need, the opportunity. And lastly, there's always debate on the numbers of job changes and proportions when any major new era is evolving. Some jobs change, some are lost, some are new and some open channels and networks into areas of business not seen before and where great demand grows.

Stakeholders will keep looking at the numbers, especially with the improved understanding from research like this and the structures and role designs that outline the new workforce. With more application and calibration of what roles are coming and in place, workforce volume estimates will improve. With more attention to a just transition where additional focus and planning is needed for those highly impacted, workforce impacts will improve.

For now, even with more to come, we see the broad perspectives, the direction, the themes, and the wide bands of opportunities and hope you all do as well.

We see sustainability as everybody's playing field and invite all to participate: the efficiency seekers, the resource optimizers, the problem solvers, the crisis averters, the innovators, the community conscious, the opportunity seekers.

There are no exclusions and plenty of opportunity to win.

We see sustainability as everybody's playing field and invite all to participate: the efficiency seekers, the resource optimizers, the problem solvers, the crisis averters, the innovators, the community conscious, the opportunity seekers.

Section 4: Two Workforce Cores – Green+ and Turquoise Roles

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Section 4: Two Workforce Cores – Green+ and Turquoise Roles

Introduction

The Sustainability Workforce commands a massive scope of jobs, roles, and skills as we have previewed - creating a sure challenge to identify, structure, and classify related workforce information. Sustainability employment and economic output is more than defining the workers and work in a single sector. It is not an industry in the conventional form. It is not enabled by a simple or precise or definable field of education, training, or employment experience. As our favored UCLA characterization of sustainability described, it's by definition a cross-sector, multi-industry, holistic, meta work field that targets, requires, and benefits hundreds of universal domains of application. And in practice, it is highly interdependent and interdisciplinary.

SUSTAINBILITY

Sustainability: "the integration of environmental health, social equity, and economic vitality in order to create thriving, healthy, diverse and resilient communities for this generation and generations to come.

The practice of sustainability recognizes how these issues are interconnected and requires a systems approach and an acknowledgement of complexity."

DEFINITION SOURCE: UCLA SUSTAINABILITY COMMITTEE

Our view of sustainability applications – and, as a result, the work and the workforce - span solutions and efforts concerning our lands, seas, and air, our natural settings, and our built world. They involve our public and private lifestyles and scenarios, supply our most elemental basic living environment, and exist as the stage for our for-profit commercial settings, ranging from our largest industrial situations to our most local businesses and informal trade systems. These applications include achieving those goals in ways that address and improve human health and the human condition, including people's livelihoods and their social systems. Lastly, these applications engage and are dependent on our government, policy, and commercial decision makers and methods for equitable and shared stake and prosperity. For this large employment space, we seek better definitions, specific descriptors, and identifiable workforce elements to answer:

- All eight of our original research questions (see Section 1 and 2) and more narrowly here:
    - Who in all those applications does the work of sponsoring, funding, creating, and providing sustainable inputs and solutions?
    - Who in all of those applications serves in the role as buyers, consumers, users, managers, operators, and distributors who consume and experience the solutions and are key to recyclers and regenerators of the solutions to restart the cycles and circular systems?

This is the place where a taxonomy – or organized structure for consistent classifying, naming, and scoping - of job roles and work performed becomes a critical asset. The framework of general sustainability has been evolving as we see and learn about sustainability from our history, see and feel it through today's most challenging situations, and demand it be viewed through every aspect of tomorrow's existence.

The sustainability work arena is the most colossal practice area that exists to date, and we hope to contribute to the conversation by addressing these topics in this section:

The Problem with (Not) Redefining 'Green Jobs'

Introducing Green+

Introducing Turquoise

The Problem with (Not Re-) Defining 'Green Jobs'

Sustainability exists and is evolving as an omni workforce arena, and our intent is for this effort to help lead on that charge. We have already identified and can see related roles and job opportunities. Sustainability work is not new, nor is it without a rich social and scientific history as our timeline shared. Yet, for most people and certain parts of the economic, policy, commercial, education, and employment setting, the current and future view of green jobs is limited, and that disguises and distracts from the opportunity and need for both impact and employment.

Conventional views and understanding of sustainability jobs are mainly focused on classic green jobs and, more specifically, focused on green jobs without the benefits of today's wider sustainability perspectives. This limited focus is because 'green jobs' broadly have been most often focused on the work that has the most direct contact

… for most people and certain parts of the economic, policy, commercial, education, and employment setting, the current and future view of green jobs is limited, and that disguises and distracts from the opportunity and need for both impact and employment.

with the environment, whether working in the outdoors (think Conservationist or Forest Ranger), structurally harnessing the resources or waste of/in the environment (think Hydrologist helping design a dam or define a floodplain or a waste recycler), or responsible for understanding impact on the environment (think Environmental, Health and Safety Technician).

As defined by the U.S. Department of Labor, green jobs are jobs that preserve the environment and jobs that make an organization more environmentally friendly. Green jobs, by that definition, are placed in traditional sectors such as agriculture and manufacturing, as well as in green sectors such as renewable energy and waste management. The International Labor Organization shares a similar perspective: green jobs are decent jobs that contribute to preserve or restore the environment, be they in traditional sectors such as manufacturing and construction, or in new, emerging green sectors such as renewable energy and energy efficiency.

Green jobs, i.e., early, conventional yet still essential jobs or roles are a component of (partial) *sustainability* jobs, centered on those directly in the environmental space or working out in the natural settings. In the past, these could have grossly been (mis)characterized by the commercial sector as non-revenue generating jobs. In fact, these jobs were viewed by businesspeople, who were less holistically sustainability focused, as jobs that translated into non-value add or costs or investments without a return, or as mandated regulatory and compliance or human safety roles. Before and while green jobs began to broaden in the last 15 years, many viewed them from a limited, while important, range of application categories like renewable energy, energy efficiency, and environmental management services. This included masking some innovative and opportunistic climate change jobs and roles, including innovative business and social roles which were often just not highlighted and, even if they were, would often be positioned as too much of the maligned and devalued (almost ostracized by the business world) 'green workforce'. Unfortunate history put expansion and progression of these green and more-than-green roles constantly either on the back burner or in the hot seat and as an overly political or regulation

associated workforce segment. It may be changing, but for some, it doesn't change fast enough to capture the need and value and opportunity of those past, current, and future greener roles.

Unfortunate history put expansion and progression of these green and more-than-green roles constantly either on the back burner or in the hot seat and as an overly political or regulation associated workforce segment. It may be changing, but for some, it doesn't change fast enough to capture the need and value and opportunity of those past, current, and future greener roles.

Without a better framework for a broader view of *green* jobs, especially what we see as more modernized and advanced green roles and skills which we refer to as Green+, any conversation about meeting the need for a *sustainability* workforce framework cannot be met. Nor can the benefits of new capabilities, additional value, and innovations be added to outdated job and role titles. Lastly, the dreaded conversations about displacements by green jobs of legacy sectors (e.g., fossil fuel conversion and net job loss) can be made more accurate with an expanded way to look at legacy modernized, native, and emerging green jobs. Proponents for green work did not have much of solid balanced "business" case without a more integrated framework of the work being done and the workers doing it. There was a large separation between planet and profit goals and shared futures and the slow emergence of valuing and taking responsibility for the people aspect and the fact that sustainability solutions are also opportunities for better cost efficiencies, growth, and other benefits we have listed.

How has this partial and outdated view of green jobs hurt us?

- Underestimated the impacts of non-sustainable practices by shielding certain roles from true costs or life-cycle implications
- Underrepresented the breadth of roles involved in the work settings where *green* or *sustainable* solutions are envisioned, designed, and operated
- Suboptimized solutions by not having the right people "at the table" or "in the field"
- Reinforced silos, wasted efforts, and increased costs by not having efficient processes and practices
- Hid innovation opportunities brought by other fields and jobs
- Lowered education and reskilling development funding due to a lack of commercial value-added employment affiliation
- Limited career growth and career reskilling opportunities that can cross the science-eco-people-business lines
- Concealed areas of career pursuit for those not wanting to get caught in the 'green wars' or the 'greenwashing flush', denying both the future workforce in the natural and the built world from seeing smart and capable hybrid participants and resources

Even in recent times, let alone several decades ago, working on the people side or the sales side or in policy areas of that green equation would not have been counted as a green job, which contributed to the isolation of green work, the diminished size of the actual workforce and the amount of change occurring more broadly. The notion of actual green businesses from a "means AND ends" perspective was suppressed, and consideration of other organizational or business roles were separated or referred to generically – so much so that tracking indirect environmental related work, or work in broader sustainability, was not counted, associated, or enabled.

This is what we hope to help by broadening the tent to incorporate, refresh, and expand the honorable yet legacy green workforce to the sustainability workforce that we refer to as Green+ and turquoise. The big miss of the past has been the interdependence, the collaboration, the fuller costs, and the life cycles of how environmental, social, technical, and governmental have to work together for any of them to be resilient, efficient, effective, fair or to survive.

So why evolve how we frame the work now? Where did it start and how does our spectrum of beyond green show a new space for sustainable work that is solution oriented?

Important Legacy Job Sources Evolve

Until the early 2000's, workforce and labor professionals lacked structured or standardized ways to view or track green jobs in the economy. The Century Foundation covered some of the milestones in efforts of green jobs economic research over the past fifteen years in their *Redefining Green Jobs for a Sustainable Economy* report. As they note, reports on green jobs began appearing in peer reviewed journals around 2004, when economist Mathew Forstater proposed a green public service employment program. In 2008, the Political Economy Research Institute published a report proposing a two-year, $100 billion recovery program to create 2 million energy efficiency jobs. The Bureau of Labor Statistics (BLS) launched its green jobs study efforts and online reporting in 2010, thanks to Van Jones' advisership during the 2009 American Recovery and Reinvestment Act (ARRA) appropriations**.** $8 million was given for the BLS to measure green jobs in order to gather information on green job volumes and trends; industrial, occupational, and geographic distribution of the jobs; and wages. As of 2022, the program, unfortunately defunded in 2013, leaves researchers, educators, and workforce planners/developers to study the varied and evolving sector without a consistent source of funding and data support.

Over the last 20 years, stakeholders, Manpower included, referenced the categories (grown now to 200+) on the O*NET Green Jobs list and related BLS data. Also, as online sourcing and talent acquisition has progressed, we have seen green jobs information and position descriptions via publicly accessible general research, networking, and job search sites (e.g., LinkedIn) and specialty (e.g., International Society of Sustainability Professionals) online job postings.

These and similar sources have been reviewed and considered in this taxonomy work. These lists and postings have seen expansion in the breadth of conventional green roles, especially as they related to the intersection of working *in* the natural environment and working *with or impacting* the natural environment. More entries in the list involve and engage industrial settings and work and begin to include business or non-technical roles. This is indicative of the shift we want to accelerate - there are complimentary turquoise roles to enable classic green work, and green work is necessary for sustainable social and commercial enterprises.

Yet, since much of the data is self-reported or individually submitted (such as BLS and LinkedIn data) and then mapped, and since the majority of online job posting data lacks classification except at high categories or through search algorithms likely trained through more conventional lenses, we saw a need for a working version of a broader but still cohesive structure. As organizations are free to label job titles as they choose, it is a tough challenge to assemble and structure any workforce, including the *green* workforce let alone the *sustainability* workforce. These factors are common labor force and workforce and job design data analysis and reporting problems.

So, we have taken up the gauntlet on behalf of sustainability futures and employment and business opportunities.

More structured and defined and broader frameworks of sustainability work and workers is essential and has been missing as the sustainability workforce arena expands and represents increasing segments of the economy and an organization's capabilities. There couldn't be a better time to work on this through our effort here and by others dedicated to understanding, enabling, and expanding more sustainability solutions.

Our New Spectrum: Green and Turquoise Jobs

An Introduction to Bigger Spaces and Found Opportunities

Fast forward to today's more inter-dependent and connected world of work and life. As our background has explored, our recognition has increased of how connected and system dependent our everyday lives are and how we are facing highly connected challenges and opportunities. In our focus on 5P sustainability and the integration of planet, process/product, people, prosperity, and purpose drivers, we have more factors to connect and consider. Realities of changing demographics, customer preferences, and all of the Great Realization trends sets the stage for a broader set of work to be done and people to do it. Add the notions of resource renewal, combined with scientific and technical advances, innovation, and adaptation, and we have the need for a much expanded and more cohesive view of the Green+ and Sustainability Workforce to evaluate, design, and operate a more sustainable world – to make it a reality. As we adopt the mindset of sustainability and move into 5P thinking as default, and as we encompass environmental, social, and governance reporting on transparency and real impact, it becomes clearer that we must create a bigger tent, invite more roles in, and collaborate to create and work differently.

Our entire work effort makes the case for and describes this broader view of conventional green - the movement to Green+ and then further to encompass our sustainability scope. We need to honor, preserve, and modernize the conventional green roles while expanding them and drawing the bigger family tree to include other branches of complimentary roles in related interdisciplinary workspaces. They have been carrying a heavy load for decades and it's time for our many other skills, practices, and capabilities to join and accelerate the 5P outcomes that can benefit more stakeholders much more equitably than staying in our unnecessary and unrealistic separate camps.

So, our direction setting for the definition of sustainability is:

- Green+ jobs and role structures must evolve from a legacy view of conventional green to a more enriched and modern view of Green+ with modernized and innovative environmental, scientific, and biological and other science knowledge and elevate even higher the priority systems of the natural and ecological world.
- Green+ moving to broader sustainability must by default also expand to include the built systems, products, and processes in our environment and make their interplay the new green space.
- Green+ moving towards broader sustainability must also add a new range of 'color' and space on the workforce spectrum to share the workforce horizon with social innovation and integration into workforce, community, and humanistic factors from human development and wellness to diversity and inclusion to community development and education.
- Green+ moving to broader sustainability must lastly, as the foundational framework of how modern societies and economic systems work, embrace, collaborate, partner, and, within many specific roles, jobs and positions, combine with leadership, strategy, policy, performance management, business operations, and economic and financial factors.

The broader and more effective work role spectrum we need, the bigger workforce tent we pitch. This tent establishes major space for these added job, role, and skill arenas. It's a tent that requires the two-way flow of information, inputs, and outputs. So not only does the expanded green/science/environmental workspace need to collaborate with the business and social workspace, the social, business, and governance space must also cooperate with the Green+ arena. Business and social efforts need to advocate, enable, complement, design, and

directly work on behalf of or make possible the conventional AND modernized green work if all 5Ps are considered.

That means that business and social roles are looking greener, but they are also ‘something’ else.

We color this ‘something else’ turquoise, a diverse color with a wide range of shades and variations, and a color also seen in nature and the built world as well, a color that radiates the tranquility of blue, the growth of green, and the energy of yellow.

One has to look more closely at the color of turquoise and its many hues, to see that it isn’t actually green and isn’t actually blue based on the higher wavelength on the color spectrum.

The business and social roles working in the Green+ space aren’t traditionally green, but they are a combination of green and other disciplines.

To some who study color, turquoise is a color that evokes integration and more holistic thinking. And interestingly to the color experts, turquoise is a color that emerges visually as we mix the many shades of green, grey, brown, and blue colors of earth. By design, the business and social roles are meant to integrate and bring broader perspectives to the conventional science and environmental world of legacy green. This seems to make turquoise a perfect complementary color to Green+ and its new partners under the tent.

So, with the space marked, let us officially introduce several key Manpower frameworks - the New Mix, the Sustainability Roles Spectrum, the Green+ and Turquoise Workforce.

Defining Green and Turquoise Jobs: An Expanded Spectrum

First, to frame the spectrum of work we see as the new Green+ and Turquoise Workforce, we saw that around 41% of the roles we have covered in this work align generally to our view of modernized, native, and emergent green roles on the sustainability solution spectrum. Almost 460 roles, or 59% of those we covered, are classified as what we have termed “turquoise” roles and actually represent the majority of the identified and reviewed roles. This confirms that the Green+ arena has expanded well beyond those roles that deal directly with the sciences and the environment and includes the broader social and economic spaces needed for integrative and collaborative solutions that also meet human, community, political, and business needs.

How are we defining this range? Figure 1, another essential Futurecast, shares a deep definition and a first view of the Sustainability Workforce Spectrum.

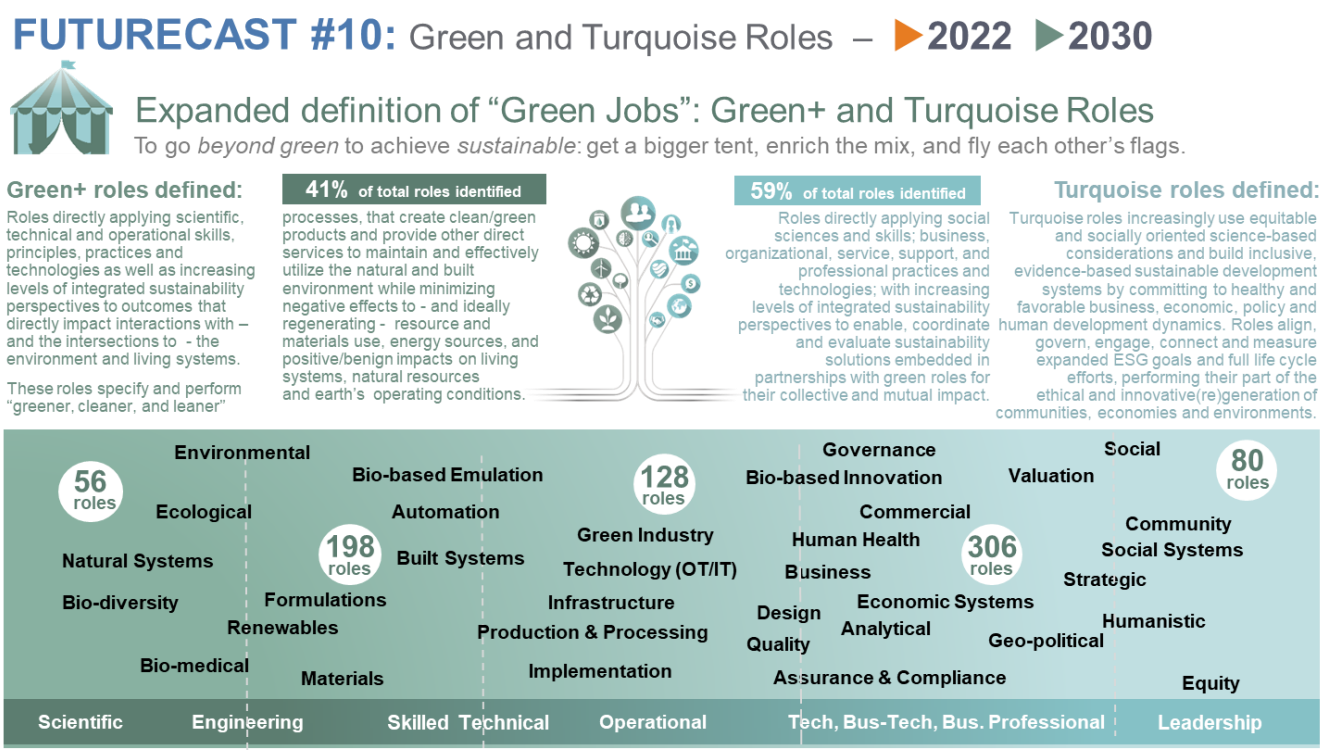

Figure 1: Futurecast #10 Green and Turquoise Roles Definition & Spectrum

What does the spectrum offer to workforce planners, educators, business leaders, and other stakeholders? We believe it is a way to see the improved picture as it merges conventional green with:

- Considerations of roles that address concerns and disruptions in the environment but also the broad view of sustainability in terms of the social and governance factors and roles
- Wider views of more sciences involved in sustainability solutions
- Adding in the views of bio-inspired innovation on all aspects of business strategies, models, and offerings
- More space for roles responsible for the built world and it's infrastructure and operations
- Wider views of the engineering capabilities involved in sustainability solutions
- Broader inclusion of the technology associated roles that are part of the industrial setting and are key enablers of better sustainability actions
- Enhanced views of operational roles that bridge science, industry, and business
- A mirrored view for key roles in the social settings that bring "people" into the mix as a key resource and key stakeholder
- Expansive consideration of related business professional roles
- Placeholder for key leadership, governance, and policy roles

Introducing Green+ Roles

Green+ roles generally are those roles directly applying scientific, technical, and operational skills, principles, practices and technologies, as well as increasing levels of integrated sustainability perspectives to outcomes that directly impact interactions with – and the more direct physical and biological intersections to - the environment and living systems.

These roles specify and perform increasingly "greener, cleaner, and leaner" processes, which create clean/green products and provide other direct services to maintain and effectively utilize the natural and built environment while minimizing negative effects to - and as importantly- regenerating – resources, materials use, and energy sources with positive/benign impacts and acceptance of living systems, natural resources, and earth's operating conditions.

When viewing across an expanded Sustainability Workforce Spectrum of both Green+ and Turquoise roles, Green+ roles (Figure 2) cover the sections of the expanded Sustainability Roles Spectrum that work in areas including: Environmental Science and Management, Ecological Sciences and Systems, Scientific Research and Transfer, Engineering, Engineering Technology, Bio-based Emulation, Natural Systems, Formulations, Bio-diversity, Renewables, Bio-medical, Life Sciences, Materials Science, and blending into Technical and Operational arenas such as Built Systems, Green Industry, Technology, Infrastructure, Implementation, and Production and Processing.

Introducing Select Green+ Roles

On our spectrum of Green+ and turquoise roles in sustainability, what are some of the over 325 shades of green roles/jobs we reviewed? Here is a sampling:

- Bio-based Solution Architect
- Facility ES&H Coordinator
- Clean Energy Technician
- Materials Scientist
- Solar Panel Installer
- Biomining Field Lab Tech
- Biomimicry Specialist
- Plant Pathologist
- Smart Factory Architect
- Smart Cities Engineer
- Eco-toxicologist
- Environmental Technician
- Environmental Science & Protection Tech
- Conservation Associate
- Sustainable Process Engineer
- Energy Analyst
- Climate Impact Analyst
- Industrial EHS Analyst
- Water Waste Investigator
- Wind Power Engineer
- Bio-mining Engineer
- Edible Packaging Design
- Hydrologist
- Resource Balance Planner
- Food Scientist
- Green Chemist
- Microbiologist
- Conservation Officer
- Water Quality Manager
- Field Specialist Technician
- Environmental Engineer
- Biomass Plant Operator
- Carbon Capture Sequestration System Installer
- Green Automation Tech
- Facility Energy Optimization Engineer
- Remote Inspections Drone Pilot
- Autonomous Vehicle Remote Pilot
- Ecologist

Figure 2: Introducing Select Green+ Roles

Complete views of the fuller lists are available in Sections 6-8.

Introducing Turquoise Roles

Turquoise roles generally are those directly applying social sciences and skills, business, organizational and service, support, and professional practices and technologies. With increasing levels of integrated sustainability perspectives, these roles enable, coordinate, and evaluate sustainability solutions embedded in partnerships with green roles for their collective and mutual impact.

Turquoise roles increasingly use equitable, socially oriented, and science-based considerations and build inclusive, evidence-based sustainable development systems by committing to healthy and favorable business, economic, policy, and human development dynamics. These roles align, govern, engage, connect, and measure expanded ESG goals and full life-cycle efforts, performing their part of the ethical and innovative (re)generation of communities, economies, and environments.

When viewing these across an expanded Sustainability Workforce spectrum of both green and turquoise roles, turquoise roles (Figure 3) cover the sections that work in areas including Strategy, Governance, Social Services, Community Development, Social Systems, Leadership and Innovation, Bio-based Business and Organizational Innovation, Sales and Commercialization, Economics, Finance, Design, Quality, Data and Analytics, Business Valuation, Human Resources, Workforce Planning and Development, Technology Strategy, Business and Operational Planning, Politics, Policy, Geo-politics, and Assurance and Compliance. They will all be acquiring, applying, and impacting factors and practices of sustainability whether on new financial or accounting models that track environmental costs or are designing better communications strategies for communities needing more voice in their future. Real changes to the means and the ends occur as turquoise workforce advances their awareness and aptitude and positive impact around more sustainable versions and methods of their previous work focus, including sustainable prosperity to fund the future.

What are some of the over 450 turquoise roles we reviewed? Here is a small sampling:

- Diversity Equity, Inclusion and Belonging (DEIB) Advisor
- Social Entrepreneurship Advisor
- B-Corp Advisor
- Child-Family Services Specialist
- Climate Psychologist
- Workforce Development Manager
- Sales Economic Development Director
- DEIB Program Manager
- ESG Communications Manager
- Sustainability Marketing Analyst
- Community Liaison
- Transportation Planner
- Quality Control Manager
- Sustainable Supply Network Manager
- ESG Reporting Manager
- Chief Sustainability Officer
- ESG Auditor
- Sustainability & Regenerative Economist
- Environmental Lawyer
- Compliance Manager
- Environmental Accountant
- Data Scientist
- Demand Planner
- Sustainable Product Sales Specialist
- Climate Ethicist
- Community Impact Analyst
- Fundraising Manager
- Sustainability Market Manager
- Policy Analyst/ Development Specialist
- Sustainability Coach
- Bio Statistician
- Brand Manager
- User Experience Designer
- Evidence Based Evaluator
- Social Care Agent
- Topic Pulse Moderator
- Strategy Market Intelligence Analyst
- Industry Segment Futurist & Forecaster

Figure 3: Introducing Select Turquoise Roles

Complete views of the fuller lists of all identified turquoise roles are available in Sections 6-8.

Almost 460 roles, or 59% of those we covered, are classified as turquoise roles and actually represented the majority of the identified and reviewed roles, confirming that the "Green+" arena has expanded well beyond those roles that deal directly with the sciences and the environment.

Roles Vs Jobs

Our approach for this type of workforce research is to structure role-oriented frameworks. These may or may not always correspond to job-specific frameworks. Roles are clusters of related duties, skills, and contributions of key outcomes and any one position or job may include multiple roles. It is akin to the fact that we almost always "wear more than one hat" and that we may have clearly identifiable sets of accountabilities and tasks (roles) that could also be another intact job if the volume and scope required or if the availability of people supported a more 1:1 lineup. We believe a focus on roles allows for more granular views, increased understanding of the work being done, and offers more flexibility in adoption, hiring and structuring the work and the worker job design that may be needed at any one time at any one employer without losing the opportunity to calibrate and consolidate workforce data.

Threshold

Many roles and jobs will be impacted by one or more sustainability drivers, and some propose that *all* roles and jobs can be more sustainability focused; the Sustainability Workforce spectrum could include every job or role possible at some place across the green and turquoise spaces. At some level, that could be true and as part of a Sustainability Workforce audit it would be an important exercise, especially sector by sector or organization by organization. However, it is not practical nor necessary to start with universal inclusion of all of the workforce. Focusing the need for major skill development or hiring attention may bring a better return by first making a conscious determination of those roles that are more directly involved in creating or providing or using sustainable related solutions to the point where it requires job changes, new skills, new knowledge, new performance levels and new expectations of outcomes.

To that end, we generally apply a threshold for inclusion of at least an estimated quarter of the role responsibilities and decisions to be aimed at dedicated sustainability related tasks, outputs, and decisions and/or requiring the application of sustainability-related knowledge or practice of specific sustainability skills across at least **25%** of the work tasks.

Another threshold is that the role can be seen as an essential potential participant in the associated phase of the Sustainability Solution Life Cycle (SSLC) where we aligned the role. Roles are aligned to an SSLC stage we use to plot and scope the continuous loop or work involved in creating and operating Sustainability Solutions (See Section 7).

These thresholds are meaningful but do widely open the doors to the tent overall. For each organization, the mix of sustainability roles will be different. The color palette will be unique like tie dye fabric. *The opportunity and need are to understand the beneficial mix of all the roles on the spectrum and how their work efforts contribute to – or conflict with – sustainability solutions, progress, and opportunities.*

Our research purpose, especially in establishing the lexicon of green and turquoise roles and building the spectrum of specific role/job spaces is to provide an organizer for the dictionary of possible sustainability roles. Each organization, each employer can write its own sustainability workforce and jobs story and needs to determine their own pattern of the New Mix using the dictionary here. And, like all dictionaries, there will be updates as novel words and use conventions evolve, in this case as a progression of green to turquoise so as to make sustainability a positive reality in our employment sphere, economies, and societies.

Summary

The spectrum of Green+ and turquoise sets up a core structure of our work and resulting assets. It's breadth and depth – while, frankly, no simple task and acknowledged as evolving and open to more inclusion – is the most critical background concept of defining and structuring the world of modern and future sustainability-oriented work.

It sets scope.

It invites necessary economic and commercial connections.

It connects capabilities for success.

It reframes whose job it really is. (Basically, it's most of ours, no matter what we thought in the past).

We recognize and endorse that Green+ advances, honors, and builds upon legacy green jobs and work adding expanded science, technology, and engineering capabilities. There are innovations and advances in these arenas that need increasingly to engage with the business, social, and commercial inclusion and extension including investor, owner, and consumer acceptance. Green+ capabilities are just waiting to scale and evolve and fit into the now and next patterns of our economies and lifestyles.

We recognize and elevate that the holistic focus of sustainability means to broaden the tent and means defining the bigger tent and including the business strategy, business and government policies, financial, leadership, social, and other turquoise capability areas and roles that are equally important for successful, sustainable solutions and performances.

Our Green+ and Turquoise spectrum offers this broader and more accurate view. It helps answer some of our most important research questions and opens the opportunities to employers of how to see, plan, and leverage the skills and efforts of the workforce. It shows the increasing broad arena of career skilling and progression available.

This new wider reach and inclusion of more roles and jobs, all aimed at better and more accelerated solutions that address and support all 5Ps, is the renewable power source for defining the increased value of our workforce.

Section 5: Ten Sustainability Solution Life-Cycle Work Domains

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Section 5: Ten Sustainability Solution Life-Cycle Work Domains

Introduction

So, what actually is the work of sustainability?

In realistic practice, the work and employment arena of sustainability could have as many definitions as there are companies or organizations who see themselves in the space as providers, practitioners, users, and advocates. Manpower set out to answer an overarching question of "what is the current and future landscape for the work of sustainability – and what functional value does the Sustainability Workforce deliver?" As a result of our efforts, Manpower established a work landscape by creating a framework of domains and subdomains that describe the basic work.

This section will cover Manpower's view of the work to be done, which is our Sustainability Solutions Life Cycle (the SSLC), by exploring these subsections:

- **Development of the SSLC:**
    - What is our life-cycle model?
    - Where did we draw inspiration and contributing content to establish the stages and connections?
    - How will the life-cycle model map to other key elements like roles?
- **Work Domains**:
    - How do the stages of the SSLC serve as the macro-organizer for the roles doing the work?
    - What is the description of each domain?
    - What are the subdomains of each domain?
    - What roles would I expect to first see join in the SSLC in each domain?

Developing the Sustainability Solutions Life Cycle (SSLC) Model

What and Why the SSLC Model Was Created

This 'framework of work' provides a logical organizing structure that relates the collections of sustainability roles and jobs, serving as a way to define and classify (at a high level) the work that is being done. This framework provides the backbone to another part of this set of assets that is essentially a dictionary of possible roles employed to do the work (Section 7). If the work domains and roles are the entries in a dictionary, then each organization writes its own Sustainability Workforce and jobs story using this dictionary. Each organization

Domains Dominate and Roles Rock

As a reminder, the employment "axis" for our Manpower taxonomies is always on **roles** - a cluster of related duties, skills, or knowledge that contributes to key outcomes of a work effort as identified by the domains.

Roles represent the "assemblies" of skills, knowledge, and outputs that are found to contribute specific value and outputs. This focus on identifying roles rather than jobs is an important distinction when we are doing workforce definition work.

Jobs are one or more roles tied together to meet a need or focus of an organization and managed as a position for one or more people to do. Organizations can assemble roles into jobs as needed.

A role can be an entire job and often is an entire job, especially in larger organizations. Other organizations will combine roles into one job or position, especially in early stages or where the volume of sustainability work does not require dedicated positions. Roles can and often still are mapped to many of our public and private workforce resources that are labeled as "jobs".

The range of needed sustainability solutions is diverse, for various environments, industries, and issues. Each organization will need different sets or combinations of roles as their "New Mix."

Manpower's focus on domains sets up the dominant space of activity, contribution, and value. Our work on roles specifies what roles do that work and enable sustainability overall.

creates their own state of the New Mix by considering and implementing sustainability work domains and the related possible roles.

What did Manpower use to direct the actual scope and set of work domains for the sustainability arena? Our view of a circular sustainability solutions model of continuous and inclusive problem solving emerged from key priorities, themes, process, and inputs for the goals and nature of this work model.

Sustainability-centric: Our domain model goes beyond conventional 'green' work and industries into to Green+ and into the holistic aspects of sustainable development, broader human wellness, prosperity, social innovation, climate resilience, and environmental health.

More work under the bigger tent: Our domain model embraces and houses the 'bigger tent' for the updated green and environmental roles; it is the workplace that opens to the turquoise roles that enable green roles from business and non-scientific perspectives. It includes work in the social innovation and community settings, along with the work in sustainability leadership, business management, policy and other non-technical work that is essential to sustainability performance across holistic measures and outputs.

Internal and external: Our domain model reaches across an enterprise into most every functional area and then out into community, academic, public sector, and NGO employment arenas - anywhere that people do critical work that enables or delivers sustainability results.

Scalable work print: Our domain model provides enough specificity yet offers enough generic flexibility as a macro reference of work activity to allow for the buildout of more specific, derivative workforce planning and talent management tools and practices for areas of subspecialty or targeted sector activity.

Scalable workforce print: Our domain model covers enough workspace to allow for scaling the roles up and down, allowing for flexibility needed in various industries, sectors, and/or sizes, for example small, medium, and large manufacturers. Our work domain model provides the space for over 775 roles, offering enough breadth and diversity to bring modularity, flexibility, and yet some calibrated work and role views that enable the buildout of collections that meet the maturity and scale of the company, creating the(ir) New Mix.

Solution-oriented: Lastly and most importantly was the unchangeable requirement to describe the work of sustainability in a positive manner, while accepting the climate crises that deserves great attention, but not focusing on conflict or cause or blame, or only on roles that would come from mandates, compliance, or regulatorily required roles. **Rather, our domain model includes work that delivers on opportunity as well as obligation and addresses risks as well as achieving rewards, immediate as well as in the future.**

Our view of a sustainability workforce domain incorporates these themes and view sets high-level areas of solution-oriented, life-cycle centric value contribution. With that comes the roles and their knowledge, skill, participation, work output, and change impact across environmental/natural science, social and governance arenas.

Our sustainability workforce domains view sets high-level areas of solution-oriented, life-cycle centric value contribution. With that comes the roles and their knowledge, skill, participation, work output, and change impact across environmental/natural science, social and governance arenas.

Inspirations for the SSLC Work Model

Manpower's primary inspirations for addressing needs were pulled from areas of practice and their fundamental principles, application, and tools that contribute to solving for challenges and producing outcomes of most any type that are sustainable, resilient, and adaptive. Encouragingly, some of these inspirational practice areas are often actually based on or directly emulate natural and living systems and materials. With nature and it's 3.8 billion+ years of "on the job experience," these inspirational areas provide an endless source of innovation and resilience to any area of application - products, processes, leadership, management techniques - as well as practices that restore, protect, and preserve the natural world itself.

Human Biology Principles and Practices: an interdisciplinary approach to understanding the health, development, and resilience of human beings from biological (natural/environmental and human health), behavioral, social, and cultural perspectives. Knowledge of Human Biology in conjunction with other disciplines (economics, Product Design, etc.) can be applied to formulate and evaluate health, environmental, and other social and economic policies and practices that influence human and living systems welfare. Our consideration of Human Biology was its deeply rooted inclusion of systemic and holistic views of these interdependent factors, needs, perspectives, and stakeholders viewed together in systemic ways to form the basis of sustainability solutions more broadly.

Circles of Sustainability: Circles of Sustainability provides practical tools for creating sustainable cities and communities and looks at Profiles, Processes, Engagement, and Knowledge as its primary lenses. It is part of a related approach, Circles of Social Life, which guides collaborative practice in making our cities, locales, and organizations more sustainable, resilient, adaptable, and livable. Our consideration of this was who would facilitate these types of work? Who would be the subject matter experts? Who would be the solution designers, and then, lastly, who would operate these more sustainable cities and communities?

Biomimicry: Biomimicry is a practice that learns from and mimics the strategies found in nature to solve human design challenges - and find hope. Treating nature as mentor, model, and measure, Biomimicry practitioners apply multiple approaches, tools, and guidelines based on three key lenses: use of Life-friendly Design Principles, Abstraction of Biology to Design, and extensive libraries of natural models of form, process, and systems-level solutions. Our consideration of Biomimicry is driven because it provides universal design strategies, approachable methods, and vast examples of biomimicry in action towards more sustainable solutions.

Design Thinking: Design thinking is a non-linear, iterative methodology which provides a solution-based approach to solving problems. It's extremely useful when used to tackle complex problems that are ill-defined or unknown - because it serves to understand the human needs involved, reframe the problem in human-centric ways, create numerous ideas in brainstorming sessions, and adopt a hands-on approach to prototyping and testing. It also serves to solve complex problems that occur in our companies, our countries, and across the world. Our consideration of this was the engaging and iterative methods at the heart of design thinking and its open approach to assembling broad sets of stakeholders and their core needs with broad sets of designers who each bring a potential piece of a workable solution.

Other practice areas and considerations for the work domains and subdomains included:

- Innovation cultures and activities (general)
- Business functions and best practices (general)
- Manufacturing functions and best practices (general)
- Contributing disciplines and their functions (e.g., engineering, ecosystem services, diversity and social equity, ESG programs and reporting, innovative and conventional science and design functions, etc.)
- Generic problem-solving approaches/models
- Natural life cycles and structures (general)
- Business life cycles and structures (general)
- Science disciplines and related innovative arenas
- Social innovation and community functions (general and specific)
- Sustainability solution areas (general and specific)
- Systems management (general)
- Systems thinking (general)
- Systems development and product management and development life cycles (various generations from Waterfall to Agile - software related and other derivatives)

Many of these practice areas and functions contribute to understanding the work involved in sustainability because first and foremost they are the way we live, build, do business, live in community, and operate overall. Every area of work is eligible for sustainability efforts and represents a part of the solution life cycle.

Others are reflective of broader areas of work and knowledge. Together, they have influenced our initial view of the SSLC and Work Domains. While the purpose of this work was not to provide quantified supply and demand data for 'sustainability' jobs, this view of the sector and industry agnostic work domains built on life-cycle functions, solutioning, and collaborative efforts sets an almost unlimited scope for modernizing and innovating all areas of work.

Work Domains Descriptions

Drawing from these and other basic work analysis considerations, Manpower crafted its' 10-stage view of the work being done (Figure 1). In the ten stages, there are some allusions to certain sequences, often with iterations as this is the case in life cycle and systems development experience. Our **Sustainable Solutions Workforce Life Cycle** *is not presented as an absolute process, and certainly is not presented as a linear process, nor a stage by stage or single pass approach for developing sustainable solutions*. Rather, we offer it as a **flexible organizer** for the work and roles that are involved in iterative stage efforts that likely occur across a SSLC, from initial commitment all the way through regeneration with partial or whole stage iterations occurring along the way.

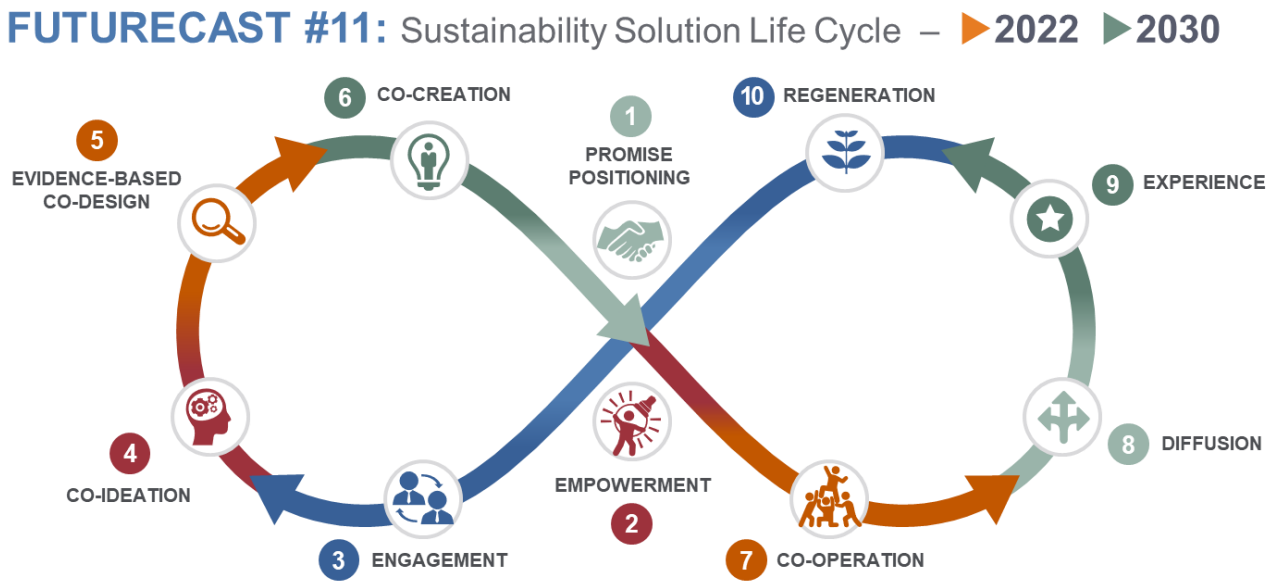

Figure 1: Futurecast #11 Sustainability Solution Life Cycle (SSLC)

The next level of definition from the 10 domains in the sustainability solutions view are over 35 subdomains. These subdomains reflect the sub-stages, sub-activities, and generally segmented areas of work that contribute to the overall stage or domain.

As a 25,000-foot to 50,000-foot view, the subdomains and domains shape a landscape that defines the workspace of sustainability solutioning and its life cycle. It can facilitate initial conversations about the work of sustainability solutions and the place for organizing the roles, and it allows for initial mapping of current and future workforce needs across the work arenas being researched.

As this framework is established, we iteratively place identified roles within the domains and subdomains, which helps expand or calibrate or refine the work domains. Once, as we describe in this section, there is a stable domain structure with roles placed, we move into deeper views of the roles themselves and identify role impacts, stages, criticality, and more traits of the roles as you will see in the following sections.

Domain Descriptions

This section provides a tour through the ten domains with brief definitions of the work we see being initiated in that stage, including the subdomains and an overview of the types of roles. Full lists of roles aligned to each domain/subdomain are provided in Section 7.

The placement of work activities and related roles are based on when one might first see that work, the related roles, and their contributions routinely involved in the SSLC. The work as described in earlier domains/stages may evolve to related work in later domains/stages, and the roles themselves introduced in one stage will likely also participate and contribute in multiple, later domains/stages.

Stage 1: Promise Positioning

The SSLC kicks off with this initial stage of directing targets for sustainability improvement and making commitments to provide "solutions" (products, services, programs, etc.) that bring meaningful value, solve for issues, provide opportunities, and are sustainable from the perspectives of the 5Ps. It is an essential early foundation work effort because it sets directions and intentions for sustainability. This includes ESG programs (if appropriate), setting of sustainability goals, building the business case around risks and rewards, generating directional roadmaps, and setting cultural and operational expectations. Also, whether part of an ESG reporting system or more generally, Promise Positioning work establishes more specific sustainability performance goals and measures. Overall, it is where we see the first work to drive the intent, valuation, resourcing, total risks/costs of ownership and impacts, and commitment to make sustainability solutions a reality. It establishes, declares, and sanctions the further efforts to turn that commitment into policies, initiatives, operations, follow-on efforts, and human and organizational changes in behaviors.

A brief introduction to the subdomains of Promise Positioning:

- **Purpose:** the work and inclusion of roles that direct, lead, and interpret strategic intent, missions, and values around sustainability and related emerging issues. It determines organizational directions and business models or opportunities, champions organizational change and sustainability impact, and leads continuing sustainability work, including managing key functions, programs, and projects.
- **Policy**: the work and inclusion of roles that set, interpret, or analyze policies for significant requirements, standards, compliance, and expectations of performance.
- **Proof**: the work and inclusion of roles that provide and/or enable data and evidence that establishes the risks, value, priority, and consideration of the solution or change. Early auditing, compliance, and forecasts of opportunity and need are initiated to support other promise positioning activities.
- **Prosperity/Economics**: the work and inclusion of roles that apply sustainable financial and economic principles to support equitable opportunities with valid initial assessments of the holistic, life cycle costs and value of the problem and solution potential. This also contains work to assess broader economic implications, identify funding sources and opportunities, and lead early aspects of related economic development.

What kinds of roles would you first expect to be involved here as part of a Sustainability Solution Life Cycle?

From company executives and managers to senior sustainability experts; from ESG program leads and risk management roles to sustainability policy, intelligence advisors, sustainability economists, and financing roles; from sustainability, diversity, environmental and governance advocates and ethicists, as well as transformation leaders and supporting data and performance metrics reporting managers, **a total of 90+ representative Promise Positioning roles** could be expected to participate in these work functions depending on size, maturity, and sustainability goals.

Promise positioning may not always be the "literal" first stage, but it is one that requires firm attention to best position or reposition any sustainability solution and bring it into existence via a more holistic purpose orientation based on data and science, sound economics for all stakeholders, initial stakeholder commitment, and diverse sponsorship.

Stage 2: Engage

The next key stage of the SSLC focuses on efforts to Engage stakeholders. Results of this domain stage produce informed and aligned key contributors or stakeholders, more highly participative community members, and prospective buyers and users of the sustainability solutions.

A brief introduction to the subdomains of Engage:

- **Communicate:** the work and inclusion of roles that create and deliver essential messages around the sustainability goals, initiatives, progress, and results. Work on creating and sharing meaningful stories, historical archives, and knowledge bases can also initiate here.
- **Communitize:** the work and inclusion of roles that take the sustainability issues and resources out to the community to increase interest and involvement in addressing the issue or opportunity. Considerations of diverse and equitable community involvement have focus here.
- **Commercialize:** the work and inclusion of roles that create commercial opportunities for the solution products or services, market those, and provide appropriate incentives for participation and use of the sustainability solution.

What kinds of roles would you first expect to be involved here as part of a Sustainability Solution Life Cycle?

From sustainability service and product incentive strategists to marketing managers to renewable energy sales consultants; from climate justice coordinators to ESG communications managers and community liaisons and community network coordinators; to cause marketing strategists and business development specialists, along with **a total of 35 representative Engage roles**.

The Engage stage is the work domain of early, often and always engaging stakeholders – including community members, current and future employees, influencers, buyers, users, and others. While many roles across the solution life cycle also have engagement responsibilities, this stage and its early participating roles represent how to consider, message, and attract stakeholders as early as possible in the overall process.

Stage 3: Empowerment

The next key domain of the SSLC focuses on the work that empowers key participants and stakeholders to develop the skills and capabilities needed to participate in the sustainability solutioning cycle. It is part readiness and part ongoing improvement and development at several levels. From coaching and counseling to social services delivery, education and training, team building, organizational effectiveness, and broader community development, all are considered potential work in this stage. The work associated with the Empowerment stage provides/produces efforts and experiences that develop other roles and enable their better or fuller participation and improved performance across the cycle where they contribute, work, or use the sustainability solution.

A brief introduction to the subdomains of Empowerment:

- **Individual (Empowerment***)* - the work and initial inclusion of roles that are often associated with developmental empowerment of individuals. This can include diverse approaches such as education of an individual in K-12 or higher education or individual services such as counseling from a Climate Psychologist.
- **Team (Empowerment)** - the work and initial inclusion of roles that are often associated with developmental empowerment of teams.
- **Organization Effectiveness** - the work and initial inclusion of roles that are often associated with developmental empowerment of larger groups or the entire organization.
- **Social (Innovation)** - the work and initial inclusion of roles that are often associated with developmental empowerment of multiple organizations or at the community or multi-community level.

What kinds of roles would you first expect to be involved here as part of a Sustainability Solution Life Cycle?

From education and workforce development designers and facilitators or instructors to recruiters specializing in sustainability careers; from social workers and various mental health and wellness practitioners to human factors engineers; also, DEIB Coordinators and Diversity Equity Advisors, Community Development Advisors and Social Entrepreneurship Advisors; and Enterprise Sustainability Culture and Change Management Specialists, including the emerging role of an Organizational Biologist, can be expected to contribute to Empowerment. **The 70 representative Empowerment roles** in this domain not only contribute across the life cycle but are often a key Social Impact itself by preparing people for more sustainable careers and equitable employment opportunities.

Empowerment is not only a distinctive stage, but also one that it is iterative. Ongoing empowerment is critical to participants and workers in the sustainability cycle not only bringing the best skills and capabilities early in their sustainability work, but also to continuous improvement and progress.

Stage 4: Co-Ideation

A next key domain of the SSLC focuses on the Co-Ideation stage, generating ideas, foundations, and guidelines for sustainable improvements and solutions. This stage expands knowledge, scientific findings, technologies, processes, and other contributing intellectual and organizational capital via new advances, inventions, and expert insights. It brings out the visionary and novel or more holistic early views from multiple specialists on the possibilities and progress for sustainable solutions. As one of three “Co-” domains, this domain uses the “Co-” prefix to emphasize the shared, collaborative, and integrated nature of the work required here – work that brings together a range of broader, deeper, and novel modernizers and ideators that depending on the solution, could be involved in ideation work.

A brief introduction to the subdomains of Co-Ideation:

- **Ideate and Innovate** - the work and inclusion of roles that generate possibilities for sustainability in action by brainstorming and sketching innovative approaches to address the problem or opportunity area. Free from some of the constraints of having to jump too early to development or implementation, and instead

imagining and safely proposing new and different thinking, talent in this sub-domain is able to re-envision solution sets.

- **Research** - the work and initial inclusion of roles that conduct formal qualitative or quantitative studies and exploration, including primary and applied research into related areas of sustainability solutions and practices. Examples include more conventional research such as developing new materials that enable water soluble packaging and imagining new carbon capture formulations for concrete, to less obvious yet critical research such as updating business decision guidelines.
- **Subject Matter Expertise** - the work and initial inclusion of roles that brings experienced advisors, practitioners, scientists, and other professionals with subject matter expertise into collaboration to provide reative insights and early guidance.

What kinds of roles would you first expect to be involved here as part of a Sustainability Solution Life Cycle?

Strategists, advisors and technologists such as Sustainability Solutions Product Strategists, New Loop Economy Strategists, Renewable Energy Advisors, Climate Adaptation Strategists, or Technologists such as Mechanical or Environmental Engineering Technologists; Sustainability Product Designers, Bio-based Business Solution Architects; Catastrophe Modelers, Research and Management Analysts, Sustainability Data Scientists; and almost 50 various technical experts and scientists (Material Scientists, Eco-Toxicologists, Synthetic Biologists, etc.). These along with other **representative roles comprise 90+ roles that one could expect to involve in the Co-Ideation stage**. And while we align most engineers in the next phase of Co-Design, they could also be important participants in Co-Ideation.

Bringing together diverse perspectives and professional areas of expertise early in the solution process can inspire efficiency, creativity, innovation, and consideration of emergent solutions as well as enable experts with extensive knowledge of proven practices to leverage established sustainability winners. Supporting formal research and less formal explorations and market intelligence efforts also opens thinking and solutioning. Co-ideation on the whole often negates conventional bias, inertia, and defeatist attitudes and replaces them with new thinking, new partners, and ground-breaking solution concepts.

Stage 5: (Evidence-based) Co-Design

Building from the best of the Co-Ideation work, a next key stage of the SSLC focuses on furthering the solution shaping through evidence-based Co-Design work. This stage continues the outlining and specifications of the solution and produces analysis results, plans, scaling strategies and roadmaps, design specifications, prototypes and testing, and validation plans and results. Where increasingly necessary or to simply benefit from standards and best practices, work here on auditing and assuring can also be completed before further development and operations continue. Design here is not (only) the same as ‘aesthetic’ design but intended as broader, multi-discipline and cross-stakeholder design. Another “Co-” phase, Co-Design engages a broad variety of stakeholders and solution contributors as they further evolve the solution design and begin to iterate on early versions of it.

A brief introduction to the subdomains of Evidence-based Co-Design:

- **Assess & Analyze:** the work and initial inclusion of roles that examine and explore the situation and background for the needed solution or opportunity. Whether using structured assessments or more informal evaluation approaches, further review of the situation and need helps refine design details.
- **Plan & Scale:** the work and initial inclusion of roles that arrange the work plans, schedules, and resources to continue the solution cycle or to scale it for wider use, all considering efficient, equitable, and sustainable practices in those efforts.
- **Audit & Assure:** the work and initial inclusion of roles that complete structured and formal audits and assurance work, often with regulatory or compliance standards of performance. ESG reporting to external stakeholders will increase this subdomain's importance.
- **Design & Prototype:** the work and initial inclusion of roles that formulate and specify the detailed design of the solution whether a process, product, program, etc. Early and iterative prototypes and design spec iterations are encouraged here.
- **Test & Validate:** the work and initial inclusion of roles that create testing and evaluation plans and complete efforts that document and ensure the sustainability solutions are produced, delivered, perform, or operate within expected quality attributes, performance conditions, release specifications, and other design requirements.

What kinds of roles would you first expect to be involved here as part of a Sustainability Solution Life Cycle?

The Co-Design domain sees assessors, analysts, designers, auditors, planners, managers, and a huge contingent of possible engineers – **over 100 different engineer roles** - that are critical to good sustainability solution design and are, in part, dependent on the type or nature of problem or opportunity being solutioned.

The Co-Design domain is not only absolutely essential to embedding detailed sustainability outcomes in the solution specs before it is launched or used, but it is the most populated domain of the SSLC in terms of roles. When thinking of the many solution needs and spaces, the many possible contributors, and the fact that design of anything is pivotal to the remaining stages, one can appreciate the breadth and scope of Co-Design work and roles. While there is no substitute for how solutions work in reality, in practice, and over time, sustainability success is dramatically increased with diverse, collaborative, and holistic design contributions. **190 roles across the 5 subdomains of Co-Design work** are provided for consideration for any organization's New Mix.

Stage 6: Co-Creation

As designs and plans are completed and verified, the next stage of the SSLC focuses on Co-Creation work. The work associated with the Co-Creation stage is the work which actually produces and fully develops the sustainability solution whether it's a service, process, product, program, etc. Co-Creation work includes procuring and supplying needed materials and resources, setting up and applying the processes and production efforts to create the solution, and securing and protecting the solution from a physical- and cyber-risk perspective as well as any further risks possible during the remaining work stages. Co-creation evolves the solution to the point where it can be continuously operated, distributed, and experienced (the next three phases).

A brief introduction to the subdomain of Co-Creation:

- **Provision:** the work and initial inclusion of roles that sustainably provision or supply the necessary resources of any type so that the solution can be fully created. Procurement functions are included here; however, they need to be modernized to reflect sustainable supply chain risks, sustainable materials, ethical sourcing, and other sustainable approaches and strategies when providing inputs to the next subdomain of processing and production.
- **Process and Produce:** the work and initial inclusion of roles that construct or build the solution. Whether discrete or batch processing and production, custom development, or other creation work, this is the effort of implementing the designed methods, resources, other inputs, and specifications that tangibly makes the solution and/or solution creation setting.
- **Protect:** the work and initial inclusion of roles that secure and protect the solution from physical and cyber vulnerabilities as well as mitigate any further risks possible during the remaining work stages.

What kinds of roles would you first expect to be involved here as part of a Sustainability Solution Life Cycle?

Procurement roles such as buyers, supply chain compliance specialists, technicians, developers, assemblers and operators, production specialists of many types depending on the solution, installers, retrofitters, and inspectors, all supported by implementation engineers and production managers. Also, facility and system development roles, IT roles, and vulnerability analysts contribute their expertise along with the remaining roles, **totaling 95+ representative roles in this domain.**

Converting designs into inventories and/or operational settings for products, services, programs, policies, or other sustainability solutions will vary in actual creation work performed depending on the nature of the solution. It has its own requirements to create as sustainably as possible as well as to produce the solutions per the solution design sustainability specs.

Stage 7: Co-Operate

Once the sustainability solution has been created and is available for access and/or continued use, a next key stage of the SSLC focuses on ongoing operations. This is the domain where operational work efforts maintain the functionality of the produced sustainability solutions. As the fourth of the “Co-” domains, this Co-Operate work stage also depends on collaborative and cross-functional roles to do their part to maintain uptime and performance levels or bridge the products, services, programs etc. into distribution and use modes by end customers (in the next two domains of Diffusion and Experience).

For example, a new saltwater treatment facility moves from launch phase (where it was co-created and established) to the Co-Operate mode of sustained availability (to serve its local customers). Out of the planning and building stages comes the operations management stage. Production management, service delivery management, program administration, quality management, and resource management all have a spotlight turned on them in this domain. Now, with the lens of sustainability and the 5Ps in their sights, the workforce in this stage hopefully has good designs and built processes and systems to work with and can fine tune and maintain them through ongoing operations delivery.

A brief introduction to the subdomains of Co-Operate:

- **Obtain:** the work and initial inclusion of roles that receive, supply, or make the sustainable solution available. With some similarities to the Provision subdomain in the previous stage, there will be actions

here to ensure access, supply, scheduling, etc. of the sustainability solution. Additional confirmation of the ability to operate – think audits, examinations, inspections, certifications, etc. – could be considered part of accessing the operational version of the sustainability solution.

- **Operate:** the work and initial inclusion of roles that maintain the functional mode of the solution. From ensuring that operations teams work well together and follow established processes to administration to collecting necessary data about the operations.
- **Optimize:** the work and initial inclusion of roles that ensure during on-going operations that the best level of effectiveness and efficiency is the level of functionality. This includes maximizing productivity, reliability, longevity, and utilization, while balancing resource and material consumption, waste, materials, labor, money, and information.
- **Conserve:** the work and initial inclusion of roles that focus on conservation work especially in and with our natural settings and resources. While many roles that would work in this sub-domain may also have been working earlier in the solution cycle on various activities, additional roles join here and may do direct conservation tasks on an operational basis including species and biological diversity protection, habitat restoration and maintenance (connecting also to the Regeneration phase), and improving ecosystems management services.

What kinds of roles would you first expect to be involved here as part of a Sustainability Solution Life Cycle?

As with other stages of the SSLC, we may also see the continued presence of earlier stage roles who 'entered' the life cycle at a previous point and are also involved in Co-Operate work. Maybe they were involved in Co-Design or Co-Create work and continue here in the Co-Operate mode. Who joins them? Additional operators, technicians, engineers, coordinators, administrators, program managers, vendor integration operators, and leaders focused on continuous operations are some of the roles here. Renewable energy operations and maintenance specialists, efficiency and optimization specialists, and energy, water, and material balance planners and operators of the specific solutions from many contributing technology or life-friendly principles are also some roles you would expect to join the life cycle here.

Depending on the nature of the sustainability solution, the operations work and roles will vary. **Almost 100 representative operations roles for various and generic solutions have been included in this view**. Their essential role is to make sure the sustainability features designed and built are operational and that changes to the operating conditions can be accommodated in operation updates to maintain the optimal balance between resource use and product/service functional operations.

Stage 8: Diffusion

A next key stage of the SSLC focuses on the Diffusion or distribution and delivery of the sustainability solution. Diffusion is another stage that is often parallel or in a continuous loop with the Co-Operate domain. Diffusion work efforts aim to get a sustainability product or service into the hands of its intended customers, clients, and users. While all the stages preceding this have the same goal, Diffusion focuses on the physical sharing and real-time exchange with the targeted 'consumer', all along ensuring trust and satisfaction for the product/service to arrive and perform to the standards and expectations as promised.

For example, if it's a tangible product, people want to know how it works and how it will improve their lives. If it's a service, then you need to be able to convince people that your service is better than everyone else's.

A brief introduction to the subdomains of Diffusion:

- **Store:** the work and initial inclusion of roles that sustainably package and warehouse products and, comparatively, services. Incredible advances in packaging material utilization and techniques make major differences here. Facility efficiency, location and ease of arranging distribution models and modes will greatly impact the effectiveness and resource use across Diffusion, starting here with storage, warehousing, and supporting the transfer of product and services connections across activities of this domain.
- **Network:** the work and initial inclusion of roles that focus on client/customer/user support, vendor relationships, supply chain coordination, service delivery and feedback. Network here is about sustainably setting up and maintaining the connections across the providers and consumers/customers. With global supply chains more of a norm, the sustainability issues in operating across regions, with the inherent disruptions possible and various regulations relating to sustainable practices, have led this network area of work to be a hotbed of sustainability improvements in performance, standards, fair trade, efficiency, traceability, and other Diffusion factors.
- **Distribution:** the work and initial inclusion of roles that process and track other 'order to delivery functions' and physically transport and deliver the product or manage the service delivery in real-time to the intended customer. Electronic delivery applies as much as physical product distribution here, so even if it's a streaming product, distribution still applies. For various services, distribution can look very different, not just from traditional physical package delivery or retail delivery but between varying kinds of services. When we think of an adjacent industry, e.g. an airline distributing service of 'air transport', those sustainable distribution activities and roles will be different than those of an environmental consulting firm distributing and delivering their services. Still, they all are eligible as sustainability solutions and have opportunities to do it more sustainably as well.
- **Regulate/Balance:** the work and initial inclusion of roles that optimize the performance across Diffusion, achieving sustainability standards, meeting regulations and safety targets, and continuing optimization practices. Doing this while decreasing resource use, waste, or making negative impacts from storage, delivery, networking, and distribution all are in focus here.

What kinds of roles would you first expect to be involved here as part of a Sustainability Solution Life Cycle?

From Field Service roles to Transportation/Storage/Distribution Managers, and Inventory Management work and roles; from Sustainable Supply Network Managers, Supplier Diversity and Sustainability Managers, Logistics Engineers to Responsible Sourcing Specialists. Adding other roles that balance use or maintain use or consumption can add some interesting roles here that may not have been considering holistic sustainable practices in the past but will need to in the future when thinking about Diffusion more broadly. From Civic Integrity Investigators to Facility ES&H Coordinators and even Transit Law Enforcement, there will be modernized considerations and tasks for those roles and their work in these stages of sustainability solution use and distribution.

Nearly 40 additional roles join the previous stages as more representative workers doing what could be involved in the Diffusion stage of the SSLC. While depending on the actual sustainable solution as a product or service or program, etc., the Diffusion work and roles can be wide and varied. Most all solutions will have a stage and work needed to take constructed solutions from their operational mode and deliver into our hands, homes, workplaces, and living spaces.

Stage 9: Experience

A next key stage of the SSLC focuses broadly on the aspect of Experience with the sustainability solution, giving space for the work and role areas where the sustainable solution is consumed over time, where stakeholders participate in the solution and become the more critical players at this point. Experience - different from Co-Operate or even Diffusion - takes on a definite “user” perspective and positions work and roles that focus on that user experience and their interactions with the solution. Very importantly, here we want to establish the part of the life cycle dependent on the contribution of user/consumer behavior, feedback, and acceptance of the solution towards achieving its intended life cycle of sustainable performance and impact. So, what work and roles enable this domain?

A brief introduction to the subdomains of Experience:

- **Use:** the work and initial inclusion of roles that provide and support the end users or additional stakeholder’s interactions with the solution in the intended ways so as to achieve the sustainable performance and results as intended.
- **Re-use:** the work and initial inclusion of roles that provide and support the multiple usages of the product or service to optimize the resource investment in that product of service.
- **Review:** the work and initial inclusion of roles that provide and support the feedback cycle about the sustainability solution.
- **Return:** the work and initial inclusion of roles that enable and support the return of the product to the manufacturer so that it can be appropriately entered into the regeneration stage (often through recycling).

What kinds of roles would you first expect to be involved here as part of a Sustainability Solution Life Cycle?

From a Field Specialist Technician with a customer focus to a Brand Sustainability Behavior Coach or a Social Care Agent; from the specific role of a Sustainable Fashion Stylist or a Responsible Eco-tourism Guide; from Customer Return Experience Coordinators to Product Recovery Specialists; and including Arbitrators/Moderators/Conciliators involved in disputes or feedback exchanges, as well as Evidence-based Sustainability Use Evaluators and online Topic Pulse Moderators. There is work to be done and roles to be filled in the Experience arena.

Much work and many roles in earlier stages directly contribute to initially putting a sustainable solution into the life of the intended end user or consumer/customer. **This stage identifies the workspace for a set of approximately 25 representative roles** who more directly support and enable the actual and ongoing experience with the sustainability solution product or service. Other previously identified roles may also work directly during the Experience phase, especially those who have installed, delivered, networked, maintained, and regulated the product or service operations and diffusion tasks. They too can impact and work in the domain area of Experience. All this work and the workforce there have significant impact on the performance and viability of the sustainability solution when in the hands and heads of the humans.

Stage 10: Regeneration

For the initial loop of the SSLC, the closing work domain focuses on efforts to Regenerate resources, materials, and settings as they approach the end of their utilization or life cycle. Preventative maintenance and repairs extend longevity and use. **End of life design considerations are increasingly a part of the life cycle, driving recovery and recycling and even rebuilding**. And, as for natural or built environments and communities, issues of restoration and/or regeneration are finally more of a factor or expectation than before. All work activities in this stage require a large variety of changed human and consumer behaviors for them to be successful. That means work is done here to coach, incentivize, and motivate actions by the users/consumers involved, going beyond not just the direct workers in this domain but also more indirect roles that interface and influence other stakeholders.

A brief introduction to the subdomains of Regeneration:

- **Repair**: the work and initial inclusion of roles that maintain, fix, and extend the usable life cycle of the included products, settings, materials, etc. Proactive maintenance and all the work that enables or delivers it are also included here.
- **Recover**: the work and initial inclusion of roles that obtain the used products, materials, waste, etc. and deliver it to be readied as stock, putting it into the circular economy where it can then be recycled.
- **Recycle**: the work and initial inclusion of roles that convert the recovered materials, items, etc. into reusable forms. This would connect to (re)creation or remanufacturing in most cases as the next loop continues.
- **Restore**: the work and initial inclusion of roles that return settings (environments, natural settings) back to previous healthier, less toxic, and more originally functional states. This would include replanting and resetting a natural land parcel after excavation of a prior factory site.
- **Rebuild**: the work and initial inclusion of roles that reconstruct facilities and other built world structures into more sustainable or less toxic or inefficient versions.
- **Reimagine**: the work and initial inclusion of roles that accelerate and energize the Regeneration stage and increase circular economy product strategies and designs.

What kinds of roles would you first expect to be involved here as part of a Sustainability Solution Life Cycle?

These roles may reconnect with previous Co-Ideation and Co-Design stages. **35+ Regeneration roles** were identified to perform work here, though a reminder is shared that other roles already involved in the Sustainability Life Cycle would also be able to contribute effort to Regeneration activities. Some of the roles aligned to Regeneration include Remediation and Redevelopment Site Managers, Decarbonization Technicians, Recycling Material Collectors and Sorters, Metallurgy Recycling Specialists, Remanufacturing Engineers, Sustainability and Regenerative Economists, Mechanic/Repairers, and Landscape Restoration Designers.

Regeneration is a very positive work domain that extends the practice of sustainability into resilience and renewal. It brings materials back into the circular economy. It restores plant and animal diversity and maintains diverse biomes. It clears community sites for healthy human and natural living, and it reuses materials and facilities and optimizes these assets of the built world. Regeneration attempts to rebalance the many withdrawals we have made on this earth and decreases the impacts of less sustainable solutions.

Now that we've introduced the stages and kinds of roles you can expect to see, Figure 2 illustrates visually how various roles can be shown to first come into the SSLC. Some additional and more specific roles for each stage are included.

Section 7 will cover all 775+ roles and the stages they map to.

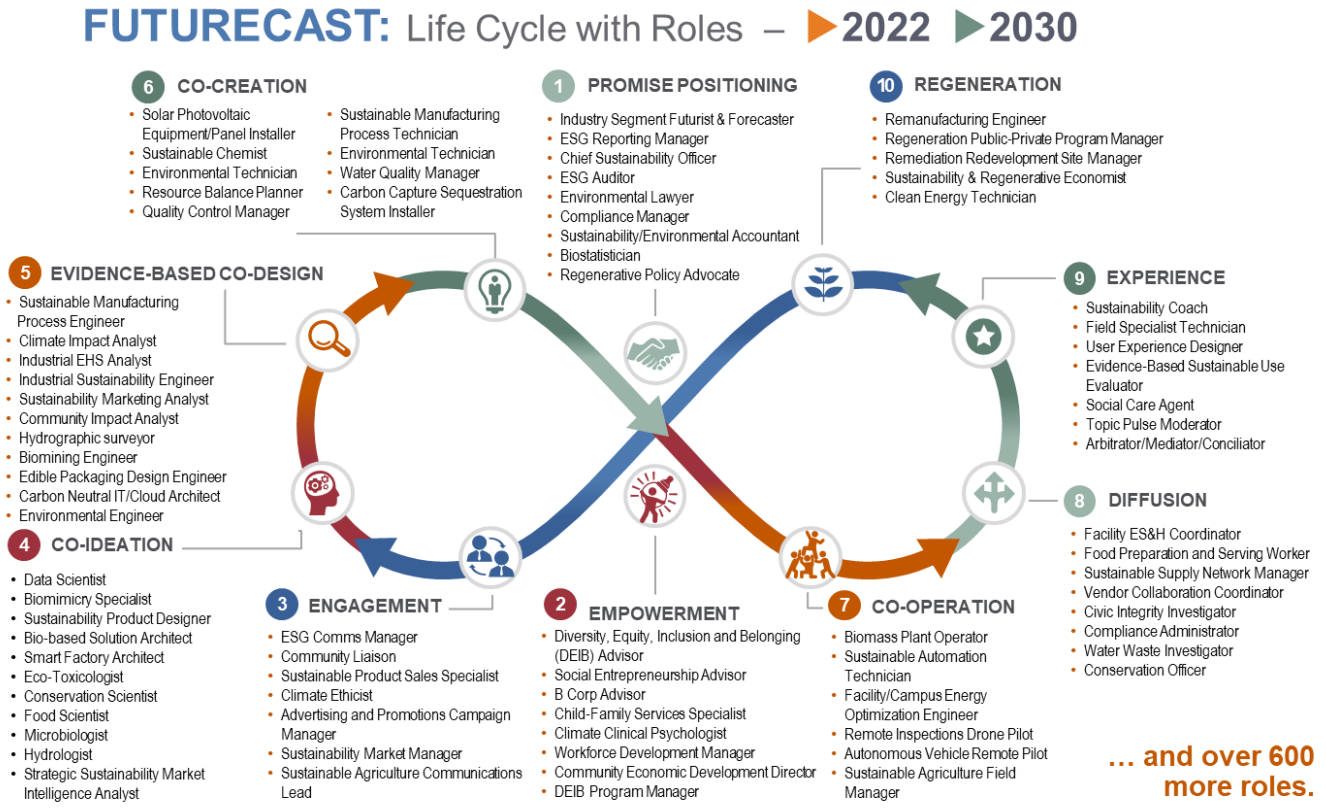

Figure 2: Life Cycle with Roles

Summary

The SSLC provides a generic yet meaningful framework for sustainability work activities. When someone asks *what the Sustainability Workforce does*, one can answer with the SSLC in mind. The Sustainability Workforce creates and uses sustainability solutions and follows the iterative and circular loops with efficiency, good science, innovation, life cycle thinking, multiple disciplines, and circular economy principles driving the specific activities across the SSLC. The Manpower SSLC view answers:

- What are the generic work areas as well as specific representative work areas that deliver sustainability performances and outputs and are needed for successful sustainability impact?
- Which domains and what work areas are common to most sustainability solutions, offering a general work print for the widest range of sustainability solutioning employment?
- What are initial groups of roles we expect to see?

This 10-domain work blueprint enables stakeholders to see the connections between the work and the workers in sustainability. The addition of more comprehensive domains brings to light the opportunity for leaders and workforce planners to design a more integrated and realistic space and zone of work effort. With that, the opportunity to build and customize the organization's New Mix emerges representing the work and the workforce to solve for today's and tomorrow's issues.

Section 6: Six Subcommunities

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Section 6: Six Subcommunities

Introduction to Subcommunities

Our main goals for this R&D effort center around supplying meaningful and practical structures to align the broader Sustainability Workforce. Alongside this is the intention to improve workforce planning, education, hiring, and use of these essential roles and their capabilities. To help the initial use and view of the overall community of sustainability roles, and because of the substantial number of roles we identified, we needed high-level categorizations as well as various ways to map and navigate the set of roles.

As Figure 1, the Community of Roles Mapping & Rating Framework shows, our first method for selecting and organizing the broad set of roles we studied was to align all 775+ roles from the overall community of sustainability roles to one of six subcommunities.

- Subcommunities are the next lower-level defined collections of roles within the overall Sustainability Solution Workforce 'community.'
- Subcommunities serve as a primary 'home base' for the roles.
- Each subcommunity is a collective of adjacent, related, or progressive roles and their associated work.

The six subcommunities are basically a 'nested' set of roles within the overall community of sustainability roles and are helpful for seeing both vertical and horizontal views of the work and workers in the sustainability solutions universe.

Sustainability Workforce Community, Subcommunities and Categorizations

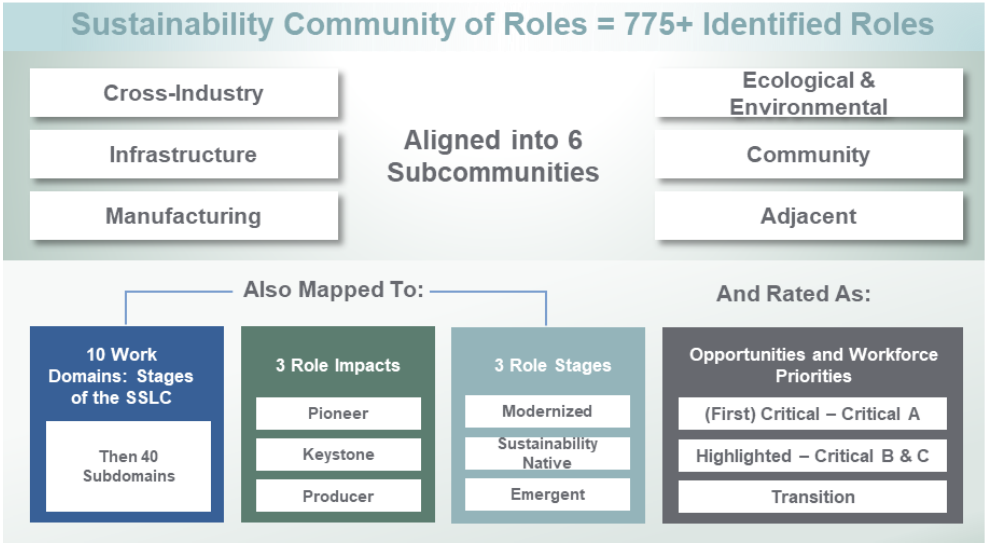

Figure 1: Community of Roles Mapping & Rating Framework

Whether a business leader, a sustainability transformation strategist, a workforce planner, the head of an engineering center, or a recruiter for any of these areas, a sustainability stakeholder must at times see more than just a few roles or jobs. The unifying aspects of the subcommunities within the overall community should help stakeholders with the initial understanding of the sustainability solution work and the workforce.

These views of the entire community of Sustainability Workforce roles through the lens of subcommunities are explored in these two subsections:

Subcommunities Described

Running Lists – All Roles by Subcommunities

Subcommunities Described

Six Home Bases

Subcommunities have a common, shared primary economic or service focus or targeted outcome. Our subcommunities include:

- All organizations, regardless of particular focus, also labeled as Cross-Industry roles
- Ecological and Environmental roles
- Social system and human development roles, also labeled as Community roles
- Infrastructure roles
- Manufacturing roles
- Representative industry roles that are extensions of or service industries using large industrial goods, also labeled as Adjacent roles

The subcommunities are populated with a wide variety of roles at all levels of employment and can be assessed for their merit and need by any organization or sub-sector that identifies with a subcommunity focus or needs to connect and relate to that subcommunity.

The identified six subcommunities are further described in Figure 2 below.

Figure 2: Futurecast #12 Sustainability Subcommunities

The placement of a role in a subcommunity is not 100% standardized, nor 1:1 for any given role. Almost all roles could also be part of another subcommunity. Yet, a primary place of association is important, and viewing the roles from this level of grouping will be helpful, especially when big questions like these come up:

- Which roles are potentially useful for any organization? **Cross-sector**.
  - What/where are sustainability roles useful and likely needed or involved with sustainability efforts overall? Which roles are considered at or found at most any organization, employer, or business (depending on sustainability maturity)? What/where are roles needed, whether an employer is product or service oriented, high-tech or lower-tech, specialized or fuller life cycle?

- Which roles construct the built world and serve societies and industries alike? **Infrastructure**.
  - What/where are roles associated with building out a more resilient or green infrastructure so that better solutions at many levels are possible? Which roles are involved in both public or shared infrastructures or in a particular business, coordinating or connecting between public and private infrastructures?

- Which roles work most closely with the ecological/environmental and scientific aspects of the relationship between humans and the earth? **Ecological/Environmental**.
  - What/where are the roles that more directly deal with science-based areas of knowledge, like the structures, processes, and systems of the natural world?
  - What/where are roles and work, whether those roles are focused on understanding, assessing, managing, extracting, or fixing these natural systems and resources?
  - What/where are many of the varied scientists? What/where are many of the conventional ‘green’ roles that have been in place for decades?

- Which roles most directly deal with communities and the “people side”? **Community**.
  - What/where are the roles and work with the most direct social and communal aspects with the civic, public, and human development arenas that require cooperation across society, populations, and locations? Even if within the private sector, what/where are some roles that connect most directly to the public and communities at large?

- Which roles are most directly involved in manufacturing? **Manufacturing**.
  - What roles are involved with primary producers and processors of natural and formulated materials?
  - What roles are a central focus of sustainability obligations and opportunities, both for their direct operations and because they design and produce the materials, components, and products that other sectors need as inputs to use in their adjacent operations?
  - What roles design and produce goods at the major industrial and consumer level, including the materials, components, and products human consumers and users routinely experience first-hand in normal, everyday lives.

- What/where are the roles in industries or sectors adjacent to manufacturing? **Adjacent**.
  - What roles are top consumers or distributors of the produced materials, components, and products and make decisions about their purchase and ultimate use?

— What roles can influence manufacturing?

— What other industries or sectors essential to sustainability overall may supply specific products and adjacent services beyond manufacturing related work?

Note: Adjacent targets and subcommunity roles are wide open for future examination. We position a small set to start and hold their key place alongside the other major subcommunities in the taxonomy. We invite adjacent sectors to continue to build out these workforce roles with us in future editions.

Introduction to other Mapping and Ratings

Additional ways to view the Sustainability Solutions Workforce structure go beyond subcommunities to provide other identifying characteristics. This includes:

- Role domains
- Stages
- Impacts
- Criticality identification
- Transition role designations

All of these mappings allow for deeper segmentation and identification of the 775+ roles and better cross-referencing overall. These supplemental mapped views are explained in other sections, often with varying formats of the lists of roles.

Two Adjacent Organization Examples

AERONAUTICS AND AVIATION:

The aeronautical and aviation industry requests, uses, manages, and operates the manufactured airplanes received from the airplane manufacturers. The manufacturers primarily need to address the original equipment manufacturing related production waste and factory emissions, etc., including their supply chain, where the varied means of air and atmospheric transportation are built.

Other sectors exist to deploy, service, and manage the life cycle of those produced goods - planes, rockets, and satellites - once they are distributed from the manufacturer. So, aviation and airlines in this example, as well as the users and fleet managers, are adjacent to airline manufacturers.

An example of fleets would be Airbus 360's delivery to the adjacent industry of airlines. How they are optimized, maintained, and routed are just some examples of how a Fleet Manager in the airline industry can contribute to more sustainable practices and, so, is on our radar as a subcommunity role adjacent to manufacturing.

SPORTS and ENTERTAINMENT:

Sports and entertainment are another adjacent sector/industry to manufacturing. A good example of an adjacent role would be a Sports & Entertainment Venue Manager. Why are they an important sustainability solution role in the Adjacent subcommunity?

If you consider the stats of an average stadium that hosts 300 events annually, it uses 5.4 million single-use cups and so creates a whopping 63.75 tons of plastic waste at each venue, each year. With that impact, you should easily appreciate the connection between the manufacturer and the adjacent industry of sports and entertainment.

While the Venue Manager may not be involved directly in the green production (waste, emissions, toxicity, shipping, etc.) of creating those cups, Venue Managers are responsible for and involved with the more sustainable purchase, specification, use/reuse, and end of product life disposition for those cups.

They and other adjacent subcommunity roles will increasingly be in the Sustainability Workforce.

Running Lists – All Roles by Subcommunities

In this section, running lists by subcommunity are provided as a "first look" at all the 775+ roles.

The 775+ roles map across the six subcommunities with the varied distribution as shown in Figure 3. The 'Cross-Industry' subcommunity is the largest subcommunity with almost a third of the roles, emphasizing the shared work and roles in sustainability that most any organization could have. Those roles are truly cross-sector and yet the few or the many that any one organization would need depends further on functions, maturity, industry, size, and other factors that influence their sustainability work profile.

Figure 3: Subcommunity %s of Total Roles

You will see these roles again through other segmentations and with other attributes attached to each role. In this Subcommunity view, you see them sub-categorized to their primary domain (one of the 10 stages of our SSLC covered in Section 5). A primary domain assignment is based on where one might expect to first see that role involved. It is not the only stage that role would be involved with.

A Note on 'Slates'

In some role titles, we use the term "slate". That term identifies where we are positioning an array of related roles without identifying specific role titles across a relatively structured range.

A 'slate' is used to hold a place and represent a set of roles generally. The roles in a 'slate' often form a progressively responsible and higher skilled list or branching of a list or related roles.

For example, a slate that we often actually specify when we are listing roles or jobs in an area would be a (manufacturing) laborer, (manufacturing) operator, (manufacturing) technician, (manufacturing) specialist, (manufacturing) technologist, (manufacturing) engineer, (manufacturing) engineering architect, and (manufacturing) engineering strategist. Another slate, a health care delivery example, could be: (health care) companion, (health care) orderly, (health care) aide, licensed practical nurse, medical assistant, registered nurse, nurse practitioner, physician assistant, and physician.

There are a few slates included in the lists of the Sustainability Solutions Workforce. Adding a few slates illustrates that even more roles could be aligned to a domain or subdomain, yet for this first version of a taxonomy, the 'slate' term serves a placeholder of more groups of roles. These slates – and others not listed in this version – broaden the range of sustainability roles and hopefully can be more fully defined and discussed in other derivative work.

Cross-Industry Subcommunity

Primary Domain	Green/Turquoise Role
Promise Positioning	All Leaders
	Business Ethicist
	Chief Executive Officer
	Chief Diversity, Equity, Inclusion & Belonging Officer
	Chief Information Officer
	Chief Information Security Officer
	Chief Innovation Officer
	Chief Mission Officer
	Chief Operations Officer
	Chief People Officer
	Chief Research and Innovation Officer
	Chief Risk Officer
	Chief Security Officer
	Chief Strategy & Brand Officer
	Chief Sustainability Officer
	Chief Sustainability Resources Officer
	Climate Investments Manager
	Closed Loop Economist
	Compliance Manager
	Data Custodian
	Data Engineer
	Data Lab Director
	Data Owner
	Data Services Manager
	ESG Auditor
	ESG Program Chair - Processing & Production
	External Auditor
	Fund Control & Reporting Director
	Funding Disbursement Director
	General Manager
	Intellectual Property Manager
	Lead Internal Auditor
	Merger & Acquisition Director - Sustainability
	Non-profit Development Director
	Regulatory Affairs Manager
	Regulatory Affairs Specialist
	Resilience Researcher and Advisor
	Risk Advisor
	Risk Manager
	Social Innovation Advocate
	Sustainability Director
	Sustainability Economist
	Sustainability Ethicist
	Sustainability Financial Risk Specialist
	Sustainability Financing Strategist
	Sustainability Funding Mechanism Connector
	Sustainability Governance Business Analyst

	Sustainability Insurance Specialist
	Sustainability Intelligence Specialist
	Sustainability Metrics Manager
	Sustainability Transformation Leader
	Sustainable Small Business Owner
Empowerment	All Managers
	All Senior/C-Level Managers
	Climate Clinical Psychologist
	Climate Social Psychologist
	Diversity, Equity, Inclusion and Belonging (DEIB) Program Manager
	Enterprise Sustainability Culture Change Management Specialist
	Human Factors Engineer/Ergonomist
	Organizational Biologist
	Remote/Hybrid Work Coach
	Remote/Hybrid Work Designer
	Team Improvement Facilitator
Engagement	Advertising and Promotions Campaign Manager
	Business Development Manager
	Cause Marketing Strategist
	Climate Ethicist
	Climate Team Campaign/Community Organizer
	Community Network Coordinator
	Digital Content Manager
	Ecological Entrepreneur
	Environmental Interpreter
	Marketing Manager
	Merchandiser
	Public Relations Specialist
	Sales Consultant
	Sustainability as a Service Strategist
	Sustainability Campaign Associate
	Sustainability Historian/Archivist
	Sustainability Market Manager
	Sustainability Sales Account Manager
	Sustainability Service/Product Incentive Strategist
	Sustainability Solutions Sales Engineer
	Web Designer/Developer
Co-Ideation	Accountant
	AI Sustainability Engineer
	Bio-Based Business Solution Architect
	Catastrophe Risk Modeler
	Computer Scientist
	Cost Estimator
	Data Scientist
	Digital Nudge Technologist
	Digital Transformation Advisor (Green IT Transformation)
	Digital Transformation Strategist
	Emergent Market Finance Strategist
	Management Analyst

	New Loop Economy Strategist
	Product Life Cycle Manager
	Quality Manager
	Risk/Opportunity Modeler
	Smart Contract Advisor
	Strategic Sustainability Market Intelligence Analyst
	Supply Network Sustainability Global Compliance Manager
	Sustainability Brand Strategist
	Sustainability Solutions Architect
	Sustainable Procurement Advisor
Evidence-Based Co-Design	Business Analyst
	Business Impact Analyst
	Carbon Neutral IT/Cloud Architect
	Carbon Project Pilot Lead
	Data Architect
	Demand Planner
	Design Engineer
	Energy Analyst
	Engineer (All Others)
	Event Planner/Manager
	Facilities Engineer
	Financial and Investment Analyst
	Hazard Assessor
	Logistics Compliance Analyst
	Marketing Analyst
	Mobility Modernization Analyst
	Network Redundancy Engineer
	New Loop Economy Architect
	Operations Management Engineer
	Policy Analyst
	Product Manager
	Product Specialist
	Quality Engineer
	Senior Biosafety Specialist
	Smart Contract Reviewer
	Software Engineer
	Supply Network Sustainability Compliance Auditor
	Sustainability Analyst
	Sustainability Assessor/Planner
	Sustainability Marketing Analyst
	Sustainability Systems Testing and Evaluation Specialist
	Sustainable Application Engineer
	Sustainable Artificial Intelligence Specialist
	Sustainable Engineer
	Sustainable Info Tech Specialist (App)
	Sustainable Info Tech Specialist (Cloud/Network)
	Sustainable IT Transformation Architect
	Sustainable Software Quality Assurance Tester
	System Architect

	System Engineer
	Systems Analyst
	Validation Engineer
	Vulnerability Assessor
Co-Creation	Business Continuity Coordinator
	Business Continuity Manager
	Computer Technician
	DevOps Engineer
	Emergency Preparedness and Response Services Manager
	Emergency Preparedness and Response Specialist
	Health and Safety Specialist
	Inventory Specialist
	IT Specialist
	Network Administrator
	Network and Computer Systems Administrator
	Occupational Health and Safety Technician
	Physical Asset Controller
	Programmer
	Project Manager
	Quality Control Manager
	Recycling Maintenance Mechanic
	Resource Balance Planner
	Software Developer
	Supply Chain Architect
	Sustainable AI Trainer
	Sustainable Application Developer
	Sustainable Cloud Engineer
	Sustainable Innovation Partner Liaison
	Sustainable Software Developer
	Vulnerability Manager
	Wholesale and Retail Buyer
Co-Operation	Business Operations Specialist
	Data Security Analyst
	Efficiency & Optimization Specialist
	Emergency Management Specialist
	Energy Auditor
	Financial Examiner
	General Laborer
	Hand Packer and Packager
	Housekeeper/Janitor
	Integrated Sustainability System Operator
	International Compliance Manager
	Office and Administrative Associate
	Quality Assurance Specialist
	Remote Inspections Drone Pilot
	Renewable Energy Operations and Maintenance Specialist
	Sustainability Partner Integration Planner
	Vendor OEM Collaboration Manager
	Vendor/Alliance Collaboration Coordinator

	Venue Sustainability Coordinator
	Vulnerability Specialist
	Quality Assurance Technician
Diffusion	Compliance Administrator
	Compliance Analyst
	Compliance Auditor
	Compliance Specialist
	Field Service Manager
	Field Service Representative
	Field Service Technician
	Fraud Examiner, Investigator and Analyst
	International Supply Chain Manager
	Logistics Engineer
	Procurement Manager
	Product/Service Tracer
	Responsible Sourcing Specialist
	Supplier Diversity & Sustainability Manager
	Supply Network Sustainability Compliance Manager
	Sustainable Supply Network Manager
	Vendor Collaboration Coordinator
	Weather Derivatives Analyst/Trader
Experience	All Employees
	Brand Manager
	Brand Sustainability Behavior Coach
	Digital Impact Auditor
	End Consumer/Customer (Products/Services)
	End User/Customer (Systems)
	Evidence-Based Sustainable Use Evaluator
	Field Specialist Technician
	Product Recovery Specialist
	Customer Return Experience Coordinator
	Return Lead Technician
	Warehouse Damage/Returns Processor
Regeneration	Clean Energy Technician
	Maintenance and Repair Specialist
	Mechanic/Repairer
	Product End of Life Specialist
	Regeneration Public-Private Program Manager
	Sustainability & Regenerative Economist

Ecological/Environmental/Science Subcommunity

Primary Domain	Green/Turquoise Role
Promise Positioning	Biostatistician
	Biometrician
	Chief Biosafety and Security Officer
	Chief Sustainability, Environmental & Safety Officer

	Climate Change Program Director
	Climate Policy Development Specialist
	Environmental Lawyer
	ESG Associate
	ESG Program Management Integrated Initiatives Lead
	Internal Sustainability Futurist
	Sustainability Advocate
	Sustainability Nowcaster
	Sustainability/Environmental Accountant
Empowerment	B Corp Advisor
Engagement	Renewable Energy Sales Consultant
Co-Ideation	Air Quality Scientist
	Aquarist
	Aquatic Ecologist
	Astrobiofuturist
	Atmospheric Scientist
	Biologist
	Biomimicry Director
	Biomimicry Specialist
	Botany Specialist
	Catastrophe R&D Director
	Climate Adaptation Strategist
	Climate Resilience Specialist
	Coastal Scientist
	Conservation Scientist
	Consulting Forester
	Decarbonization Solution Architect
	Ecologist
	Eco-Toxicologist
	Energy & Climate Research Analyst
	Environmental Biologist
	Environmental Engineering Technologist
	Environmental Geologist
	Environmental Planner
	Environmental Science and Protection Advisor
	Environmental Scientist
	Geoinformatics Technologist
	Geoscientist
	Hydrogeologist
	Hydrologist
	Integrated Sustainability Researcher
	Limnologist
	Marine Biologist
	Meteorologist
	Microbiologist

	Municipal Ecologist
	Natural Resources Biologist
	Plant Pathologist
	Pollution Solution Advisor
	Precision Biologist
	Renewable Energy Advisor
	Restoration Ecologist
	Science Director
	Soil and Plant Scientist
	Sustainability R&D Specialist
	Sustainability Strategic Advisor
	Synthetic Biologist
	Weather Hedger - Climate Disaster Modeler
	Wetland Scientist
	Wildlife Biologist
	Zero Waste Strategist
	Zoologist
Evidence-Based Co-Design	Air Quality Engineer
	Biochemical Engineer
	Bioengineer
	Biomimetic Process Designer
	Biomimetic Product/Component Designer
	Biomining Engineer
	Carbon Offset Advisor and Sourcer
	Climate Impact Analyst
	Coastal Program Analyst
	Conservation Specialist
	Decarbonization Engineer
	Drinking Water Engineer
	Ecological Value Assessor
	Environmental Analyst
	Environmental Engineer
	Environmental Planner, Principal
	ESG Analyst
	Flood Hazards Specialist
	Geoinformation Analyst
	Geophysical Engineer
	Hydrographic Surveyor
	Land Trust Director
	Landscape Architect
	Marine Engineer
	Mobility Modernization Engineer
	Storm Weather Specialist
	Surveyor
	Sustainability Data Analyst

	Sustainability Engineer
	Sustainability Impact Analyst
	Sustainability Program Management Office (SPMO) Leader
	Sustainability Solution Testing & Commissioning Engineer
	Sustainable Architectural and Interior Designer
	Sustainable Creative Artist/Designer
	Sustainable Design Specialist
	Vehicle Electrification Engineer
	Wastewater Engineer
	Water Resources Engineer
	Water Systems Engineer
	Watershed Engineer
	Watershed Manager/Planner
	Zero Waste Analyst
Co-Creation	Biological Monitor Assistant
	Biological Technician
	Conservation Action Coordinator
	Environmental Engineering Project Manager
	Environmental Program Manager
	Environmental Program Specialist
	Environmental Science & Protection Technician
	Environmental Technician
	Global Decarbonization Project Manager
	Hydrologic Technician
	Sustainability Program Manager – Energy & Water
	Sustainability Security Risk Manager
	Sustainable Chemist
	Water Quality Field Technician
	Water Quality Manager
Co-Operation	Bear Conflict Manager
	Beekeeper
	Climate Change Program Associate
	Conservation Laborer
	Conservation Technician
	Ecological Field Crew Laborer
	Ecological Field Crew Technician
	Ecosystem Management Services Lead
	EHS Specialist
	Energy, Water and Material Balance Planner
	Environmental Compliance Officer
	Environmental Management Specialist
	Environmental Records Specialist
	Environmental Services Director
	Forest and Conservation Worker
	Frog Watcher

	Geoinformatics Technician
	Geoscience Program Coordinator
	Global Oceans Program Manager
	Hazardous Materials Removal Technician
	Invasive Species Coordinator
	Land Firefighter and Prevention Specialist
	Landscaper, Lawn Service/Groundskeeper
	Managing Forester
	Mitigation Banking Specialist
	Pesticide and Vegetation Management Technician
	Renewable Energy Program Director
	Storm Water Compliance Inspector
	Sustainability Program Coordinator
	Watershed Forester
Diffusion	Conservation Officer
	Environmental Investigator
	Facility Environmental, Health and Safety (EH&S) Coordinator
	Land Fire Inspector and Investigator
	Sustainability Auditor
	Water Waste Investigator
Experience	Environmental Experience Specialist
	Natural Resources Youth/Comm. Program Coordinator
	Responsible Use Ecosystem Guide
	Return Material/Inventory Stream Facilitator
Regeneration	Brownfield Redevelopment Specialist and Site Manager
	Decarbonization Analyst
	Decarbonization Specialist
	Decarbonization Technician
	Deconstruction and Decontamination Waste Operations Specialist
	E-Waste Recovery and Recycling Specialist
	Forest Restoration Officer
	Household Hazardous Waste Recycling Worker
	Land Conservation Specialist
	Landscape / Restoration Designer
	Native Areas Specialist
	Remediation Redevelopment Site Manager
	Resource Recovery and Reclamation Specialist
	Restoration Field Specialist
	Restoration Land Specialist Post Fire
	Retro Commissioning, Remediation & Reclamation Engineer
	Transfer Station Operator

Community Subcommunity

Primary Domain	Green/Turquoise Role
Promise Positioning	Climate and Social Equity Specialist
	Economic Development Specialist
	Economist
	Environmental Justice Specialist
	ESG Program Chair - DEIB
	ESG Program Chair - Org and Workforce Transformation
	ESG Program Chair- Community Outreach
	ESG Program Chair- Environment and Sustainability
	ESG Program Chair- Ethics and Corporate Responsibility Officer
	ESG Program Chair Facilities and Resources
	ESG Program Chair- Marketing & Communications
	ESG Program Chair- Product Design
	ESG Program Chair- Risk, Internal Audit, Compliance, IT
	ESG Program Chair-Operations
	ESG Program Managing Chair
	ESG Reporting Manager
	Government Agency ESG Slate
	Government Regulator
	Health & Wellness Advocate
	Industry Segment Futurist & Forecaster
	Industry Sustainable Enterprise Researcher and Advisor
	Regenerative Policy Advocate
	Senior Government Affairs Advocate, Conservation
	Sustainability Activist Investor
	Sustainability Evangelist
	Sustainability Policy Development Specialist
Empowerment	Child-Family Services Specialist
	Climate Equity & Community Partnerships Program Manager
	Community Development Liaison
	Community Economic Development Director
	Community Justice Liaison
	Compensation, Benefits, and Job Analysis Specialist
	Correctional Officer
	Counselor
	Curriculum Developer/Planner
	Diversity, Equity, Inclusion and Belonging (DEIB) Advisor
	Diversity, Equity, Inclusion and Belonging (DEIB) Coordinator
	Diversity, Equity, Inclusion, and Belonging (DEIB) Director
	Early Childhood Care Delivery
	Early Childhood Educator
	Educational Instructor
	Educational, Guidance, and Career Counselor
	Eligibility Interviewer, Government Program
	Environmental Educator
	Equal Opportunity Program Representative

	Health & Wellness Program Coordinator
	Health Care Delivery *Slate*
	Health Care Support Services *Slate*
	Healthcare Social Worker
	Human Resources Manager
	Human Resources Specialist
	Human Service Care Assistant
	Industrial-Organizational Psychologist
	Job/Role Architect
	Mental Health Incident Responder
	Neurodiversity Workforce Advisor
	Neurodiversity Workplace Coordinator
	Occupational Coach
	Organizational Designer
	Rehabilitation Counselor
	School Social Worker
	Social Entrepreneurship Advisor
	Social Program Manager
	Social Services Senior Administrator
	Social Worker
	Student Health, Wellness & Safety Coordinator
	Student Success Transition Specialist
	Sustainability Behavioral Psychologist
	Sustainability Environmental Content Instructor
	Sustainability Governance Content Instructor
	Sustainability Instructor/Sustainability Faculty
	Sustainability Interdisciplinary Content Instructor
	Sustainability K-12 Teacher
	Sustainability Knowledge Bank Manager
	Sustainability Social Content Instructor
	Sustainability Talent Recruiter
	Sustainability User Trainer/Coach
	Sustainability Workforce Developer
	Sustainability Workforce Manager
	Sustainability Workforce Planner
	Training and Development Manager
	Training and Development Specialist
	Workforce Development Manager
	Workforce Equity Recruiting Strategist
Engagement	Climate Justice Communicator
	Communications Associate
	Community Liaison
	ESG Comms Manager
	Ethnographer
	Social Cause Entrepreneur
	Sustainability Awareness Communications Specialist
Co-Ideation	Human Biologist

	Social Anthropologist
	Social Scientist
Evidence-Based Co-Design	Climate Change Policy Analyst
	Climate Justice Policy Analyst
	Climate Migration Specialist
	Community Impact Analyst
	Environmental Policy Analyst
	Equity Achievement Assessor
	Health and Wellness Assessor
	Industry Sustainability Standards Developer
	Rural Enterprise & Community Justice Specialist
	Social Impact Advisor
Diffusion	Civic Integrity Investigator
	Law Enforcement Officer
	Probation Officer and Correctional Treatment Specialist
	Transit Law Enforcement

Infrastructure Subcommunity

Primary Domain	Green/Turquoise Role
Engagement	Energy Broker
	Residential Solar Canvasser
	Solar Sales Representative
Co-Ideation	Biomass Optimization Solution Advisor
	Smart Cities Architect
	Smart Cities Engineer
	Sustainable Construction Materials Technologist
	Sustainable Smart Grid (Meta Systems) Engineer
	Urban Planner, Principal
Evidence-Based Co-Design	Architect
	Architectural and Civil Drafter
	Biofuels Engineer
	Biofuels/Biodiesel Technology and Product Development Manager
	Biomass Optimization Engineer
	Civil Engineer
	Desalination Engineer
	Energy Engineer
	Energy Source Integration Engineer
	Energy Systems Engineer
	Grid Architect
	Hydrogen Power Engineer
	Industrial & Community Water Process & Compliance Coordinator
	Infrastructure Engineer
	Long-Duration Energy Storage Engineer
	Metallurgy Engineer
	Mobility System Electrification Engineer

	Nuclear Engineer
	Petroleum Engineer
	Power to X Optimization Architect
	Smart Grid Sustainability Engineer
	Solar Design Engineer
	Solar Electrical Engineer
	Solar Energy Engineer
	Solar Performance Engineer
	Solar Project Engineer
	Streaming Service Energy Optimizer
	Sustainable Infrastructure as a Service Migration Engineer
	Sustainable Interior Designer
	Sustainable Water Infrastructure Engineer
	Sustainable Water Infrastructure Inspector
	Transportation Climate Change Specialist
	Transportation Engineer
	Transportation Planner
	Turbine Aerodynamics Engineer
	Urban Planner
	Waste Management Engineer
	Water Recovery Specialist
	Water Resource Management Specialist
	Wind Energy Development Manager
	Wind Energy Engineer
Co-Creation	Carbon Capture Sequestration System Installer
	Carpenter
	Construction Equipment Operator
	Construction Inspector
	Construction Laborer
	Construction Manager
	Construction Trades Worker
	Crane Technician
	Earth Driller
	Eco-Infrastructure Builder
	Electrician
	Electrification Program Manager
	E-Mobility Grid Installer
	Equipment Installer (other)
	HVAC System Retrofitter
	Hydroelectric Plant Technician
	Hydroelectric Production Manager
	Infrastructure Manager
	Insulator
	Lead Solar Installer
	Operating Engineer
	Passive/Sustainable HVAC System Installer
	Permitting Specialist
	Plumber, Pipefitter, and Steamfitter
	Roofer

	Security and Fire Alarm Systems Installer
	Solar Communication Technician
	Solar Electrician
	Solar Energy Installation Manager
	Solar Photovoltaic Equipment/Panel Installer
	Solar Turbine Assembler
	Structural Welder
	Sustainable Builder
	Sustainable Water Infrastructure Installation & Maintenance Laborer
	Waste Management Specialist
	Weatherization Installer
	Wellhead Pumper
	Wind Turbine Installer
Co-Operation	Autonomous Vehicle Remote Pilot
	Biofuels Production Manager
	Biomass Plant Engineer
	Biomass Plant Operator
	Biomass Technician
	Biomining Field Lab Technician
	Clean Energy Systems Operator
	Desalination Operator
	Drinking Water Treatment Plant Operator
	Drone Engineer
	Electrical Technician
	Energy Monitoring System Operator
	Facility/Campus Energy Optimization Engineer
	Geothermal Production Manager
	Geothermal Technician
	Metal Worker
	Oil & Gas Service Unit Operator
	Power Plant Operator
	Recycling Plant Operations Manager
	Solar Cell Technician
	Solar Operations & Maintenance Supervisor
	Utility Operations & Maintenance Manager
	Wastewater Treatment Plant Operator
	Water Distribution Plant Operator
	Water Management Lab Technician
	Wave Energy Producer - Operator
	Wind Energy Operations Manager
Diffusion	Air Traffic Controller
	Customs and Border Protection Officer
	Shared Transit Driver
	Transit Driver
	Transport Driver
	Transportation Manager
	Transportation, Storage, and Distribution Manager
Experience	Citizen Science Grid Sentinel
Regeneration	Recycling Coordinator

	Recycling Material Collector/Sorter
	Refuse Materials Collector
	Solar Turbine Overhaul Test Technician
	Waste Management Collector-Operator
	Water-Sewer Remediation and Construction Engineer
	Water-Sewer Remediation and Construction Laborer
	Wind Turbine Service Technician

Manufacturing Subcommunity

Primary Domain	Green/Turquoise Role
Promise Positioning	Manufacturing Operations Leader
Engagement	Sustainable Product Sales Specialist
Co-Ideation	Electro-Mechanical and Mechatronics Technologist
	Engineering Technologist
	Industrial Ecologist
	Industrial Engineering Technologist
	Materials Scientist
	Mechanical Engineering Technologist
	Renewable Materials Technologist
	Smart Factory Architect
	Sustainability as a Product Strategist
	Sustainability Product Designer
	Sustainable Product Innovation Strategist
Evidence-Based Co-Design	Aerospace Engineer
	All Source Analyst - Biosafety and Security
	Biomimicry Manufacturing Specialist
	Biosafety & Security Analyst
	Drafter
	Edible Packaging Design Engineer
	Electrical and Electronics Drafter
	Electrical Engineer
	Electrification Engineer
	Electronics Engineer
	Factory Automation Engineer
	Factory Automation Manager
	Fuel Cell Engineer
	Hardware Engineer
	Industrial (Process) Automation Engineer
	Industrial EHS Analyst
	Industrial Engineer
	Industrial Hygienist
	Industrial Sustainability Engineer
	Internal Manufacturing Sustainability Standards Developer

	Manufacturing Engineer
	Materials Engineer
	Mechanical Designer
	Mechanical Engineer
	Mechatronics Engineer
	Nano Systems Engineer
	Photonics Engineer
	Photonics Fabrication Engineer
	Photonics Solution & Design Engineer
	Process Engineer
	Product Designer
	Robotics Engineer
	Sustainability Hardware Engineer
	Sustainability IT/OT Integration Engineer (Internal)
	Sustainable Additive Materials Engineer
	Sustainable Factory Architect
	Sustainable Factory Designer
	Sustainable Factory Engineer
	Sustainable Manufacturing Process Engineer
	Sustainable Operating Tech Specialist (IoT/Edge)
	Sustainable Operating Tech Specialist (Network)
	Sustainable Packaging Engineer
	Sustainable Product Designer
	Test Engineer
Co-Creation	Automotive Engineering Technician
	Edible Packaging Production Engineer
	Electrical and Electronic Technician
	Engineering Technician
	Foundry Mold and Coremaker
	Helper, Laborer, and Material Mover
	Industrial Engineering Technician
	Industrial Machinery Mechanic
	Inspector, Tester, Sorter, Sampler, and Weigher
	Millwright
	Photonics Technician
	Prepress Operator
	Production Assembler
	Robotics Technician
	Sustainable Manufacturing Process Technician
	Team Assembler
	Welder, Cutter, Solderer, and Brazer
Co-Operation	Autonomous/Remote Plant Manager
	Autonomous/Remote Plant Operator
	Biosafety & Security Field Supervisor
	Computer Numerically Controlled Tool Operator

	Electro-Mechanical and Mechatronics Technician
	Machinist - Setter, Operator, and Tender
	Material Processing Operator
	Plant Manager/Site Manager
	Plant Operator
	Plastic Worker
	Predictive Maintenance Specialist
	Sustainable Automation Technician
Diffusion	Production, Planning, and Expediting Clerk
Regeneration	Electrical and Electronics Repairer, Commercial and Industrial Equipment
	Ferrous/Non-ferrous Recycling Specialist
	Remanufacturing Engineer
	Reprocessing Engineer

Adjacent Subcommunity

Primary Domain	Green/Turquoise Role
Engagement	Food and Agriculture Campaigner
	Sustainable Agriculture Communications Lead
Co-Ideation	Agricultural and Food Scientist
	Food Scientist
Evidence-Based Co-Design	Agricultural Engineer
	Automotive Engineer
	Aviation Engineer
	Biomedical Engineer
	Naval Fleet Operations Manager
	Product Engineer (adjacent industry)
	Sustainable eGame Designer
	Sustainable Entertainment Designer
	Sustainable Fashion Designer
	Textile and Leather Processing Engineer
Co-Creation	Urban Farmer / Hydroponic Farmer
Co-Operation	Agro Forestry Manager
	Alternative Agricultural Grower
	Aquaponic Farm Operator
	Farmer, Rancher, and Other Agricultural Manager
	Farming, Fishing, and Forestry Laborer
	Farmworker and Laborer, Crop, Nursery, and Greenhouse
	Laboratory Technician
	Logging Equipment Operator
	Sustainable Agriculture Field Manager
Diffusion	Food Preparation and Serving Worker
	Food Service Manager
Experience	Sustainable Fashion Stylist

Regeneration	Bus and Truck Mechanic and Engine Specialist
	E-Automotive Service Technician and Mechanic
	Farm Maintenance Technician

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Summary

The identification of the primary subcommunities is a way to begin to organize the many functions and primary associations between roles in the Sustainability Workforce. To us, six subcommunities emerged as logical groupings of these roles: **Cross-Industry** roles that seem truly generic across sectors, those of course that cluster around the **Ecological/Environmental** area, **Community** roles that have the most direct focus on human development, community, and social areas, those focused on **Infrastructure,** which is literally a physical point of connection to all sustainability work and living situations, **Manufacturing,** including processing because of its significant role in the use of materials and creation of much of the built world components, and **Adjacent** areas where representative roles remind us of both other sectors to look at more deeply as well as roles who as users or service providers manage the experiences with and later life-cycle stages of products.

Some employers will directly employ diverse mixes of roles and capabilities across subcommunities, and others will have a narrow mix and capability focus yet will need to know and consider the other subcommunities. Occasionally an organization will only employ people in roles from one subcommunity. Yet it may interact with roles from other subcommunities so having the view across communities can be very helpful. Many organizations already, or will, employ and interact with sustainability roles in multiple subcommunities.

Overall, direct, and indirect collaboration across subcommunities, whether through employment, partnerships, supply chains, or system-level connections is the name of the game to sustainability solutions. Multiple subcommunities of roles need to be capable and available to employers and stakeholders in all sectors.

Section 7: 775+ Sustainability Roles

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Section 7: 775+ Sustainability Roles

Introduction to the Roles

As with our other Future Workforce efforts focusing on Digital Manufacturing and Cybersecurity in Manufacturing, a key outcome is the set of roles that shape and scope how Manpower sees the workforce for a targeted area or major transformation arena. Our strategic framing of a broad view of a workforce with detailed role identification has proven helpful in past efforts to a wide range of stakeholders. From HR executives to government officials to academics to recruiters and HR leaders, our taxonomy users have shared that the Future Work assets provide a rich resource to pull from for macro and micro workforce and talent planning, as well as further research and design uses. Our previous efforts attract thousands of downloads. As with those previous efforts, a large part of this body of work was to review and envision a broad range of role titles for inclusion in our Sustainability Workforce taxonomy.

The project's intention as shared in Section 2 is to answer key workforce questions, including demonstrating a representative structure that defines and classifies the wide range of possible work and workers. For sustainability, over 775 roles populate this initial view of the Manpower Sustainability Workforce.

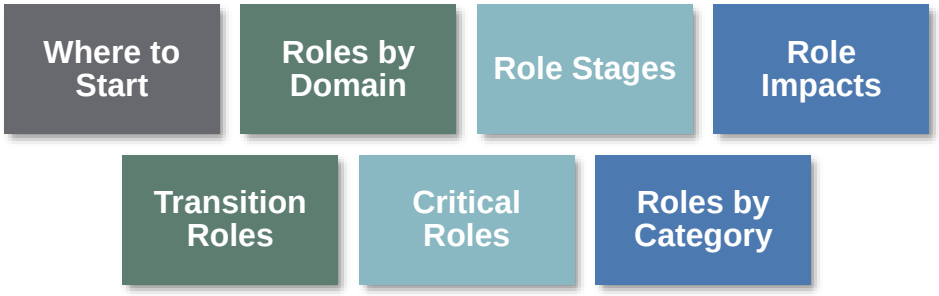
All 775+ sustainability roles are important, and we acknowledge there are more to be added as the taxonomy matures. Yes, 775+ roles may seem quite broad, yet the breadth is meant to enable most anyone to answer the question "where do I fit". To arrive there, multiple "where do I start" perspectives are needed. It's hard to begin a review of a company's talent looking at over 775 roles at once. This is why we tag roles through several workforce planning filters. From an awareness and early adoption point of view, being able to classify, sort, and filter the many roles through multiple lenses can accelerate Sustainability Workforce conversations. These many lenses are the backbone of our community of roles and the approach we take to labeling and tagging the individual roles.

Why are these primary groupings and multiple lenses so important? Sustainability workforce planning, hiring and development represents a required shift for many, and less of a shift for others who are early adopters and longer-term practitioners. What most organizations and communities have in common today is the criticality, urgency, and pressures to accelerate solutions and therefore get the right mix of capabilities in place. This is coming from increasing awareness of the crises and broader demands about the climate and resource concerns, changing preferences, supply change pains no longer abstractions for the everyday consumer, as well as expanded ESG expectations and requirements. These demands for change to the practices of the 5Ps is no longer just coming from conventional environmental advocates but from customers, community members, insurers, bankers, government, and other groups. Delivering on many of our most pressing sustainability needs requires having a multi-lens understanding of what better versions and innovations in business models, products, and processes are possible, along with what new workforce capabilities can deliver and do well by doing good.

Sustainability workforce planning, hiring and development represents a required shift for many, and less of a shift for others who are early adopters and longer-term practitioners. What is accelerated for most all organizations and communities is the criticality, the urgency, the pressures coming from expanded stakeholder concerns including ESG expectations and requirements.

With the broader scope established by the subcommunities in the previous section, we can look at other characteristics of the taxonomy to provide richness on how the workforce is changing and evolving. Designating subsets of roles is part of Manpower's overall approach to taxonomy work. Spotlight roles help introduce and focus sustainability needs.

These sub-designations of the overall community of roles are additional filters or lenses to segment the roles for use in your workforce planning efforts. On your way to using this workforce dictionary, we'll continue to introduce the roles by covering these additional views, lists and filters:



Roles by Domains: The backbone mapping of roles to the ten domains/stages of the Sustainability Solution Life Cycle.

Role Stages: Roles mapped to adoption: modernized (updated existing, conventional roles), sustainability-native, and emergent.

Role Impacts: Roles mapped to the impact the role has on the development and evolution of the Sustainability Workforce and the sustainability capability of an employer or organization. These are organized by Pioneer, Keystone, and Producer.

Transition Roles: A designation of identified roles that are destinations for transitioning workers. With upskilling, additional experience, or formal education or certifications, these destination roles may be achievable with 2 years or less of additional development.

Critical Roles: A designation of identified roles that are positioned as early focus for employers, educators, government, and the workforce. Seen as important to the ecosystem for a number of reasons, these roles are not the only critical roles but a solid set of the 'first critical' roles to consider.

Roles by Categories: From executives to labor roles, we categorize the roles across a spectrum.

These simple designations provide robust and useful ways to segment the broad community of roles and can help with many workforce planning and development decisions.

Where to Start

As described in the Domains Section (Section 5), when it comes to a Sustainability Workforce, our point of view is that a holistic perspective is best served by framing the workforce across a Sustainability Solution Life Cycle (SSLC) that generically describes sustainability work in a continuous approach. This allows us to capture and map a wide range of sustainability roles at all levels and across every function and organize them in the more stage-by-stage and "process" way that the roles work together to create sustainability solutions. Here in Figure 1, you see how some roles align to the 10 stages.

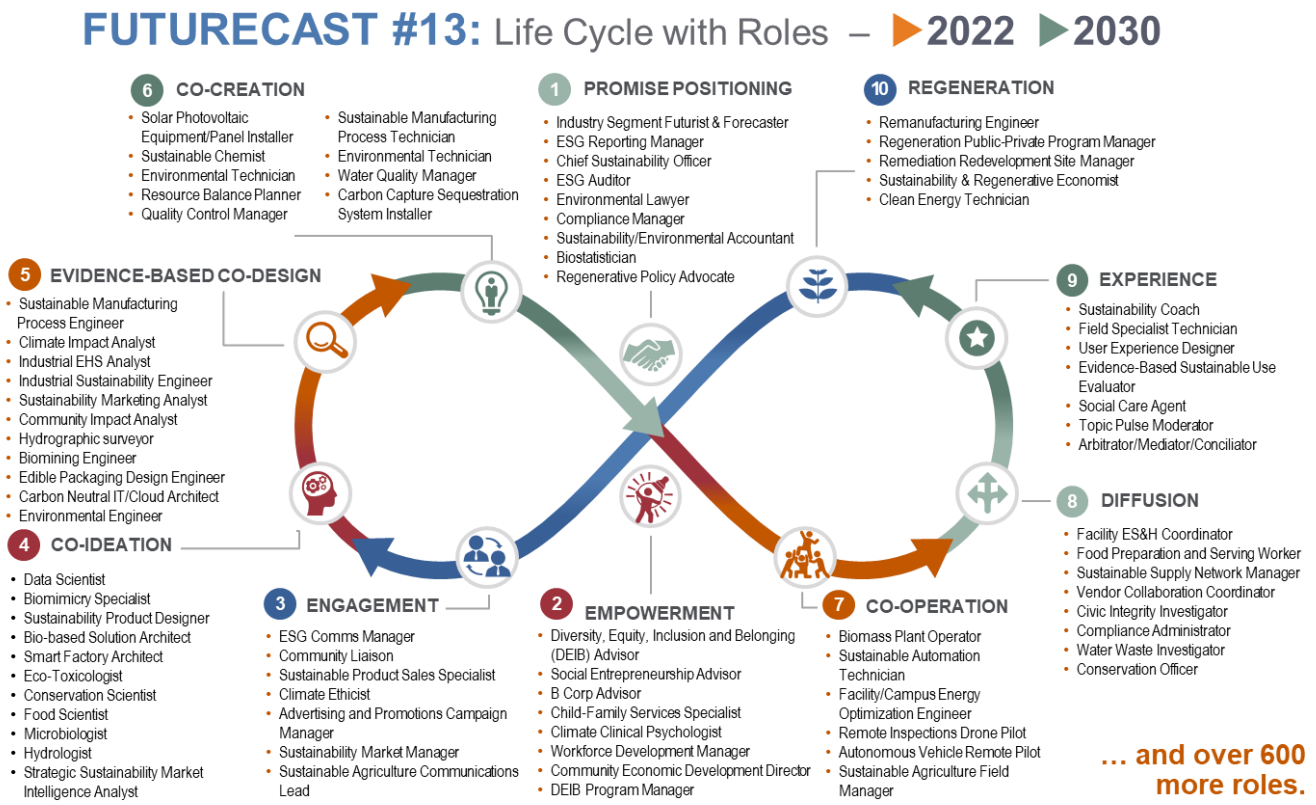


Figure 1: Futurecast #13 SSLC with Roles

Some may say all work roles are or will be impacted in some way by "greening" of the workforce. This research wouldn't argue that. In fact, that premise would be suggested to most organizations as a first assumption when determining the New Mix of roles needed. Yet, in creating the Sustainability Solutions Workforce taxonomy, we focus on a representative wide base of roles that fit with our ten-stage SSLC, a sampling of which is shown in Figure 1. This approach creates a minimally viable taxonomy of roles that exemplify the domains. They also leave plenty of room for further additions at the individual role level all the way up to stratifying additional subcommunities.

Well over 1500 job and role titles from various sources were considered and envisioned for inclusion in our Sustainability Workforce research and design efforts. Drawing from a wide range of published "green job" research ranging from global sustainability reports, national structures such as O*NET and proprietary and public jobs data bases (TalentNeuron and other similar sources), we collected, created, and structured modernized and native sustainability roles. Additionally, we applied our themes, drivers, known challenges, identified skills, etc. and identified additional emergent or underrepresented roles. Our inclusion is driven by existing and original qualitative and descriptive research and development. (See Section 4 for more discussion on our development of the Green+ and turquoise spectrum).

Our original SSLC design, applied research, expert interviews, and project team sustainability knowledge enabled us to expand the existing commonly available base sources to assemble a more cohesive and expansive view of the roles and capabilities. Ultimately, the project team envisioned and first mapped the 775+ modernized roles, native roles, and emergent roles to the six subcommunities shared in Section 6 and shown in Figure 2.

Figure 2: Futurecast Sustainability Subcommunities

Any organization can use this dictionary to identify its own sustainability workforce mix and write its own sustainability jobs story.

Roles by Domain

The following sub-sections present the community of 775+ roles via lists of roles by each of the 10 SSLC domains. Other views show sub-lists of the roles using the filters of role impact and other descriptors (highlighted, transition, critical, etc.).

Figure 3 shows how the roles were distributed across the domains.

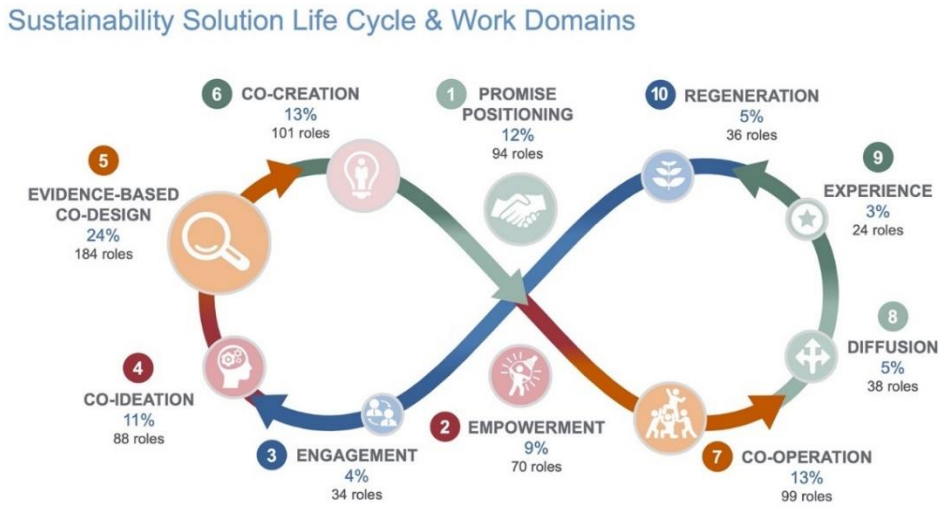


Figure 3: SSLC Stage Role Allocations

A key aspect of the role alignments with a life-cycle stage is that each role was placed where you could expect to first see that role involved in the solution cycle work. Most roles continue on to additional domains, and most roles will drop off at some points in the cycle. Roles re-appear and ebb and flow as the life cycle in whole or part iterates.

Each role was placed in a life-cycle stage/domain where you could expect to first see that role involved in the solution cycle.

The following lists show each domain and the included roles as well as their impact.

Domain 1: Promise Positioning

This domain holds a total of 92 SSLC roles, approximately 12% of the roles

Primary Subdomain	Green/Turquoise Role	Role Impact (Pioneer, Keystone, Producer)
Policy	Climate Policy Development Specialist	Keystone
	Government Agency ESG *Slate*	Keystone
	Government Regulator	Keystone
	Regulatory Affairs Manager	Keystone
	Regulatory Affairs Specialist	Producer
	Sustainability Policy Development Specialist	Producer
Proof	Biostatistician	Producer
	Biometrician	Producer
	Chief Risk Officer	Keystone
	Compliance Manager	Keystone
	Data Custodian	Producer
	Data Engineer	Producer
	Data Lab Director	Producer
	Data Owner	Keystone
	Data Services Manager	Keystone
	Environmental Lawyer	Pioneer
	ESG Auditor	Keystone
	ESG Reporting Manager	Pioneer
	External Auditor	Producer
	Industry Segment Futurist & Forecaster	Keystone
	Industry Sustainable Enterprise Researcher and Advisor	Keystone
	Intellectual Property Manager	Keystone
	Internal Sustainability Futurist	Keystone
	Lead Internal Auditor	Keystone
	Resilience Researcher and Advisor	Keystone

	Risk Advisor	Keystone
	Risk Manager	Pioneer
	Sustainability Governance Business Analyst	Producer
	Sustainability Insurance Specialist	Producer
	Sustainability Intelligence Specialist	Keystone
	Sustainability Metrics Manager	Keystone
	Sustainability Nowcaster	Producer
Prosperity & Economics	Climate and Social Equity Specialist	Producer
	Climate Investments Manager	Keystone
	Closed Loop Economist	Pioneer
	Economic Development Specialist	Producer
	Economist	Producer
	Fund Control & Reporting Director	Keystone
	Funding Disbursement Director	Keystone
	Non-profit Development Director	Keystone
	Sustainability Economist	Producer
	Sustainability Financial Risk Specialist	Producer
	Sustainability Financing Strategist	Keystone
	Sustainability Funding Mechanism Connector	Pioneer
	Sustainability/Environmental Accountant	Pioneer
Purpose	All Leaders	Keystone
	Business Ethicist	Keystone
	Chief Executive Officer	Keystone
	Chief Biosafety and Security Officer	Keystone
	Chief Diversity, Equity, Inclusion & Belonging (DEIB) Officer	Keystone
	Chief Information Officer	Keystone
	Chief Information Security Officer	Keystone
	Chief Innovation Officer	Keystone
	Chief Mission Officer	Keystone
	Chief Operations Officer	Keystone
	Chief People Officer	Keystone
	Chief Research and Innovation Officer	Keystone
	Chief Security Officer	Keystone
	Chief Strategy & Brand Officer	Keystone
	Chief Sustainability Officer	Keystone
	Chief Sustainability Resources Officer	Keystone
	Chief Sustainability, Environmental & Safety Officer	Keystone
	Climate Change Program Director	Keystone
	Environmental Justice Specialist	Producer
	ESG Associate	Producer
	ESG Program Chair – Diversity, Equity, Inclusion & Belonging	Keystone
	ESG Program Chair - Org and Workforce Transformation	Keystone
	ESG Program Chair - Processing & Production	Keystone

	ESG Program Chair- Community Outreach	Keystone
	ESG Program Chair- Environment and Sustainability	Keystone
	ESG Program Chair- Ethics and Corporate Responsibility Officer	Keystone
	ESG Program Chair - Facilities and Resources	Keystone
	ESG Program Chair- Marketing & Communications	Keystone
	ESG Program Chair- Product Design	Keystone
	ESG Program Chair- Risk, Internal Audit, Compliance, IT	Keystone
	ESG Program Chair-Operations	Keystone
	ESG Program Management Integrated Initiatives Lead	Keystone
	ESG Program Managing Chair	Pioneer
	General Manager	Keystone
	Health & Wellness Advocate	Producer
	Manufacturing Operations Leader	Keystone
	Merger & Acquisition Director - Sustainability	Keystone
	Regenerative Policy Advocate	Keystone
	Senior Government Affairs Advocate, Conservation	Keystone
	Social Innovation Advocate	Producer
	Sustainability Activist Investor	Producer
	Sustainability Advocate	Producer
	Sustainability Director	Keystone
	Sustainability Ethicist	Keystone
	Sustainability Evangelist	Producer
	Sustainability Transformation Leader	Keystone
	Sustainable Small Business Owner	Producer

Domain 2: Empowerment

This domain holds a total of 70 SSLC roles, approximately 9% of the roles

Primary Subdomain	Green/Turquoise Role	Role Impact (Pioneer, Keystone, Producer)
Individual Development	Child-Family Services Specialist	Producer
	Climate Clinical Psychologist	Keystone
	Counselor	Producer
	Early Childhood Care Delivery	Producer
	Early Childhood Educator	Producer
	Educational Instructor	Producer
	Educational, Guidance, and Career Counselor	Keystone
	Human Service Care Assistant	Producer
	Mental Health Incident Responder	Producer
	Neurodiversity Workplace Coordinator	Producer
	Occupational Coach	Pioneer

	Rehabilitation Counselor	Producer
	School Social Worker	Producer
	Social Worker	Producer
	Student Health, Wellness & Safety Coordinator	Producer
	Student Success Transition Specialist	Producer
	Sustainability Environmental Content Instructor	Producer
	Sustainability Governance Content Instructor	Producer
	Sustainability Instructor/Sustainability Faculty	Producer
	Sustainability Interdisciplinary Content Instructor	Producer
	Sustainability K-12 Teacher	Producer
	Sustainability Social Content Instructor	Producer
	Sustainability User Trainer/Coach	Producer
Organizational Effectiveness	All Senior/C-Level Managers	Keystone
	Compensation, Benefits, and Job Analysis Specialist	Producer
	Curriculum Developer/Planner	Producer
	Diversity, Equity, Inclusion and Belonging (DEIB) Advisor	Keystone
	Diversity, Equity, Inclusion and Belonging (DEIB) Coordinator	Producer
	Diversity, Equity, Inclusion and Belonging (DEIB) Program Manager	Keystone
	Diversity, Equity, Inclusion, and Belonging (DEIB) Director	Keystone
	Enterprise Sustainability Culture Change Management Specialist	Producer
	Human Factors Engineer/Ergonomist	Producer
	Human Resources Manager	Keystone
	Human Resources Specialist	Producer
	Industrial-Organizational Psychologist	Keystone
	Job/Role Architect	Keystone
	Neurodiversity Workforce Advisor	Producer
	Organizational Biologist	Pioneer
	Organizational Designer	Producer
	Remote/Hybrid Work Designer	Keystone
	Sustainability Knowledge Bank Manager	Producer
	Sustainability Talent Recruiter	Pioneer
	Sustainability Workforce Manager	Keystone
	Sustainability Workforce Planner	Keystone
	Training and Development Manager	Producer
	Training and Development Specialist	Producer
Social Systems Innovation	B Corp Advisor	Keystone
	Climate Equity & Community Partnerships Program Manager	Keystone
	Climate Social Psychologist	Pioneer
	Community Development Liaison	Producer
	Community Economic Development Director	Pioneer
	Community Justice Liaison	Producer
	Correctional Officer	Producer
	Eligibility Interviewer, Government Program	Producer
	Environmental Educator	Producer

	Equal Opportunity Program Representative	Producer
	Health & Wellness Program Coordinator	Producer
	Health Care Delivery *Slate*	Producer
	Health Care Support Services *Slate*	Producer
	Healthcare Social Worker	Producer
	Social Entrepreneurship Advisor	Keystone
	Social Program Manager	Producer
	Social Services Senior Administrator	Keystone
	Sustainability Behavioral Psychologist	Pioneer
	Sustainability Workforce Developer	Producer
	Workforce Development Manager	Keystone
	Workforce Equity Recruiting Strategist	Keystone
Team Improvement	All Managers	Keystone
	Remote/Hybrid Work Coach	Producer
	Team Improvement Facilitator	Keystone

Domain 3: Engagement

This domain holds a total of 35 SSLC roles, approximately 4% of the roles

Primary Subdomain	Green/Turquoise Role	Role Impact (Pioneer, Keystone, Producer)
Individual Development	Child-Family Services Specialist	Producer
	Climate Clinical Psychologist	Keystone
	Counselor	Producer
	Early Childhood Care Delivery	Producer
	Early Childhood Educator	Producer
	Educational Instructor	Producer
	Educational, Guidance, and Career Counselor	Keystone
	Human Service Care Assistant	Producer
	Mental Health Incident Responder	Producer
	Neurodiversity Workplace Coordinator	Producer
	Occupational Coach	Pioneer
	Rehabilitation Counselor	Producer
	School Social Worker	Producer
	Social Worker	Producer

	Student Health, Wellness & Safety Coordinator	Producer
	Student Success Transition Specialist	Producer
	Sustainability Environmental Content Instructor	Producer
	Sustainability Governance Content Instructor	Producer
	Sustainability Instructor/Sustainability Faculty	Producer
	Sustainability Interdisciplinary Content Instructor	Producer
	Sustainability K-12 Teacher	Producer
	Sustainability Social Content Instructor	Producer
	Sustainability User Trainer/Coach	Producer
Org. Effectiveness	All Senior/C-Level Managers	Keystone
	Compensation, Benefits, and Job Analysis Specialist	Producer
	Curriculum Developer/Planner	Producer
	Diversity, Equity, Inclusion and Belonging (DEIB) Advisor	Keystone
	Diversity, Equity, Inclusion and Belonging (DEIB) Coordinator	Producer
	Diversity, Equity, Inclusion and Belonging (DEIB) Program Manager	Keystone
	Diversity, Equity, Inclusion, and Belonging (DEIB) Director	Keystone
	Enterprise Sustainability Culture Change Management Specialist	Producer
	Human Factors Engineer/Ergonomist	Producer
	Human Resources Manager	Keystone
	Human Resources Specialist	Producer
	Industrial-Organizational Psychologist	Keystone
	Job/Role Architect	Keystone
	Neurodiversity Workforce Advisor	Producer
	Organizational Biologist	Pioneer
	Organizational Designer	Producer
	Remote/Hybrid Work Designer	Keystone
	Sustainability Knowledge Bank Manager	Producer
	Sustainability Talent Recruiter	Pioneer
	Sustainability Workforce Manager	Keystone
	Sustainability Workforce Planner	Keystone
	Training and Development Manager	Producer
	Training and Development Specialist	Producer
	B Corp Advisor	Keystone

Soc. Sys. Innov.	Climate Equity & Community Partnerships Program Manager	Keystone
	Climate Social Psychologist	Pioneer
	Community Development Liaison	Producer
	Community Economic Development Director	Pioneer
	Community Justice Liaison	Producer
	Correctional Officer	Producer
	Eligibility Interviewer, Government Program	Producer
	Environmental Educator	Producer
	Equal Opportunity Program Representative	Producer
	Health & Wellness Program Coordinator	Producer
	Health Care Delivery *Slate*	Producer
	Health Care Support Services *Slate*	Producer
	Healthcare Social Worker	Producer
	Social Entrepreneurship Advisor	Keystone
	Social Program Manager	Producer
	Social Services Senior Administrator	Keystone
	Sustainability Behavioral Psychologist	Pioneer
	Sustainability Workforce Developer	Producer
	Workforce Development Manager	Keystone
	Workforce Equity Recruiting Strategist	Keystone
Team Improvement	All Managers	Keystone
	Remote/Hybrid Work Coach	Producer
	Team Improvement Facilitator	Keystone

Domain 4: Co-Ideation

This domain holds a total of 95 SSLC roles, approximately 12% of the roles.

Primary Subdomain	Green/Turquoise Role	Role Impact (Pioneer, Keystone, Producer)
Ideate & Innovate	Accountant	Producer
	Bio-Based Business Solution Architect	Keystone
	Biomass Optimization Solution Advisor	Keystone
	Biomimicry Director	Pioneer
	Climate Adaptation Strategist	Keystone
	Climate Resilience Specialist	Keystone
	Cost Estimator	Producer
	Decarbonization Solution Architect	Keystone

	Digital Nudge Technologist	Keystone
	Digital Transformation Advisor (Green IT Transformation)	Keystone
	Digital Transformation Strategist	Keystone
	Electro-Mechanical and Mechatronics Technologist	Keystone
	Emergent Market Finance Strategist	Keystone
	Engineering Technologist	Keystone
	Environmental Engineering Technologist	Keystone
	Environmental Planner	Keystone
	Environmental Science and Protection Advisor	Keystone
	Geoinformatics Technologist	Keystone
	Industrial Engineering Technologist	Keystone
	Mechanical Engineering Technologist	Keystone
	New Loop Economy Strategist	Keystone
	Pollution Solution Advisor	Keystone
	Product Life Cycle Manager	Keystone
	Quality Manager	Keystone
	Renewable Energy Advisor	Keystone
	Renewable Materials Technologist	Producer
	Smart Cities Architect	Keystone
	Smart Cities Engineer	Keystone
	Smart Contract Advisor	Keystone
	Smart Factory Architect	Keystone
	Supply Network Sustainability Global Compliance Manager	Keystone
	Sustainability as a Product Strategist	Keystone
	Sustainability Brand Strategist	Keystone
	Sustainability Product Designer	Keystone
	Sustainability Solutions Architect	Keystone
	Sustainability Strategic Advisor	Keystone
	Sustainable Construction Materials Technologist	Keystone
	Sustainable Procurement Advisor	Keystone
	Sustainable Product Innovation Strategist	Keystone
	Sustainable Smart Grid (Meta Systems) Engineer	Keystone
	Urban Planner, Principal	Keystone
	Zero Waste Strategist	Pioneer
Research	Astrobiofuturist	Pioneer
	Catastrophe R&D Director	Pioneer
	Catastrophe Risk Modeler	Pioneer

	Computer Scientist	Producer
	Data Scientist	Pioneer
	Energy & Climate Research Analyst	Producer
	Integrated Sustainability Researcher	Keystone
	Management Analyst	Producer
	Risk/Opportunity Modeler	Pioneer
	Strategic Sustainability Market Intelligence Analyst	Producer
	Sustainability R&D Specialist	Producer
	Weather Hedger - Climate Disaster Modeler	Producer
SME	Agricultural and Food Scientist	Producer
	AI Sustainability Engineer	Producer
	Air Quality Scientist	Keystone
	Aquarist	Producer
	Aquatic Ecologist	Producer
	Atmospheric Scientist	Producer
	Biologist	Pioneer
	Biomimicry Specialist	Pioneer
	Botany Specialist	Producer
	Coastal Scientist	Producer
	Conservation Scientist	Pioneer
	Consulting Forester	Keystone
	Ecologist	Pioneer
	Eco-Toxicologist	Pioneer
	Environmental Biologist	Pioneer
	Environmental Geologist	Pioneer
	Environmental Scientist	Pioneer
	Food Scientist	Pioneer
	Geoscientist	Pioneer
	Human Biologist	Pioneer
	Hydrogeologist	Pioneer
	Hydrologist	Pioneer
	Industrial Ecologist	Pioneer
	Limnologist	Keystone
	Marine Biologist	Pioneer
	Materials Scientist	Keystone
	Meteorologist	Producer
	Microbiologist	Keystone

	Municipal Ecologist	Producer
	Natural Resources Biologist	Pioneer
	Plant Pathologist	Producer
	Precision Biologist	Keystone
	Restoration Ecologist	Pioneer
	Science Director	Producer
	Social Anthropologist	Pioneer
	Social Scientist	Pioneer
	Soil and Plant Scientist	Pioneer
	Synthetic Biologist	Producer
	Wetland Scientist	Pioneer
	Wildlife Biologist	Pioneer
	Zoologist	Pioneer

Domain 5: Evidence-Based Co-Design

This domain holds a total of 190 SSLC roles, approximately 24% of the roles

Primary Subdomain	Green/Turquoise Role	Role Impact (Pioneer, Keystone, Producer)
Assess & Analyze	All Source Analyst - Biosafety and Security	Producer
	Biosafety & Security Analyst	Producer
	Business Analyst	Producer
	Business Impact Analyst	Producer
	Carbon Offset Advisor and Sourcer	Keystone
	Climate Change Policy Analyst	Producer
	Climate Impact Analyst	Producer
	Climate Justice Policy Analyst	Producer
	Climate Migration Specialist	Keystone
	Coastal Program Analyst	Producer
	Community Impact Analyst	Producer
	Demand Planner	Producer
	Ecological Value Assessor	Pioneer
	Energy Analyst	Producer

	Environmental Analyst	Producer
	Environmental Policy Analyst	Producer
	Equity Achievement Assessor	Producer
	ESG Analyst	Producer
	Financial and Investment Analyst	Producer
	Flood Hazards Specialist	Producer
	Geoinformation Analyst	Producer
	Hazard Assessor	Producer
	Health and Wellness Assessor	Producer
	Hydrographic Surveyor	Producer
	Industrial EHS Analyst	Producer
	Industrial Hygienist	Producer
	Logistics Compliance Analyst	Producer
	Marketing Analyst	Producer
	Mobility Modernization Analyst	Producer
	Policy Analyst	Producer
	Senior Biosafety Specialist	Producer
	Social Impact Advisor	Keystone
	Storm Weather Specialist	Producer
	Surveyor	Producer
	Sustainability Analyst	Producer
	Sustainability Assessor/Planner	Keystone
	Sustainability Data Analyst	Producer
	Sustainability Impact Analyst	Producer
	Sustainability Marketing Analyst	Producer
	Systems Analyst	Producer
	Vulnerability Assessor	Producer
	Water Resource Management Specialist	Keystone
	Zero Waste Analyst	Producer
Audit & Assure	Industry Sustainability Standards Developer	Keystone
	Internal Manufacturing Sustainability Standards Developer	Keystone
	Smart Contract Reviewer	Producer

	Supply Network Sustainability Compliance Auditor	Keystone
	Sustainable Water Infrastructure Inspector	Producer
Design & Prototype	Aerospace Engineer	Producer
	Air Quality Engineer	Producer
	Architectural and Civil Drafter	Producer
	Automotive Engineer	Producer
	Aviation Engineer	Producer
	Biochemical Engineer	Pioneer
	Biofuels Engineer	Producer
	Biofuels/Biodiesel Technology and Product Development Manager	Keystone
	Biomass Optimization Engineer	Producer
	Biomedical Engineer	Producer
	Biomimetic Process Designer	Keystone
	Biomimetic Product/Component Designer	Keystone
	Biomimicry Manufacturing Specialist	Pioneer
	Biomining Engineer	Producer
	Decarbonization Engineer	Pioneer
	Desalination Engineer	Keystone
	Design Engineer	Producer
	Drafter	Producer
	Edible Packaging Design Engineer	Producer
	Electrical and Electronics Drafter	Producer
	Electrification Engineer	Producer
	Electronics Engineer	Producer
	Engineer (All Others)	Producer
	Fuel Cell Engineer	Producer
	Hardware Engineer	Producer
	Hydrogen Power Engineer	Producer
	Landscape Architect	Keystone
	Long-Duration Energy Storage Engineer	Keystone
	Marine Engineer	Producer
	Materials Engineer	Pioneer
	Mechanical Designer	Keystone
	Mechatronics Engineer	Producer
	Metallurgy Engineer	Producer
	Nano Systems Engineer	Producer
	Network Redundancy Engineer	Producer
	Nuclear Engineer	Producer
	Petroleum Engineer	Producer
	Photonics Engineer	Producer
	Photonics Fabrication Engineer	Producer
	Photonics Solution & Design Engineer	Keystone
	Product Designer	Keystone
	Product Engineer (adjacent industry)	Producer
	Product Specialist	Producer

	Robotics Engineer	Producer
	Software Engineer	Producer
	Solar Design Engineer	Producer
	Solar Electrical Engineer	Producer
	Solar Energy Engineer	Producer
	Solar Performance Engineer	Producer
	Solar Project Engineer	Producer
	Sustainability Hardware Engineer	Producer
	Sustainable Additive Materials Engineer	Pioneer
	Sustainable Application Engineer	Producer
	Sustainable Architectural and Interior Designer	Keystone
	Sustainable Creative Artist/Designer	Producer
	Sustainable Design Specialist	Producer
	Sustainable eGame Designer	Producer
	Sustainable Factory Designer	Keystone
	Sustainable Fashion Designer	Producer
	Sustainable Interior Designer	Producer
	Sustainable Operating Tech Specialist (IoT/Edge)	Keystone
	Sustainable Operating Tech Specialist (Network)	Keystone
	Sustainable Packaging Engineer	Producer
	Sustainable Product Designer	Keystone
	Turbine Aerodynamics Engineer	Producer
	Vehicle Electrification Engineer	Producer
	Water Resources Engineer	Producer
	Watershed Engineer	Producer
	Wind Energy Engineer	Pioneer
Plan & Scale	Agricultural Engineer	Producer
	Architect	Keystone
	Bioengineer	Pioneer
	Carbon Neutral IT/Cloud Architect	Keystone
	Carbon Project Pilot Lead	Keystone
	Civil Engineer	Producer
	Conservation Specialist	Producer
	Data Architect	Keystone
	Drinking Water Engineer	Pioneer
	Electrical Engineer	Producer
	Energy Engineer	Producer
	Energy Source Integration Engineer	Keystone
	Energy Systems Engineer	Pioneer
	Environmental Engineer	Pioneer
	Environmental Planner, Principal	Keystone
	Event Planner/Manager	Keystone
	Facilities Engineer	Producer
	Factory Automation Engineer	Producer
	Factory Automation Manager	Keystone
	Geophysical Engineer	Producer
	Grid Architect	Keystone
	Industrial & Community Water Process & Compliance Coordinator	Producer

	Industrial (Process) Automation Engineer	Producer
	Industrial Engineer	Producer
	Industrial Sustainability Engineer	Producer
	Infrastructure Engineer	Keystone
	Land Trust Director	Keystone
	Manufacturing Engineer	Producer
	Mechanical Engineer	Producer
	Mobility Modernization Engineer	Keystone
	Mobility System Electrification Engineer	Producer
	Naval-Fleet Operations Manager	Keystone
	New Loop Economy Architect	Keystone
	Operations Management Engineer	Producer
	Power to X Optimization Architect	Keystone
	Process Engineer	Producer
	Product Manager	Keystone
	Quality Engineer	Pioneer
	Rural Enterprise & Community Justice Specialist	Keystone
	Smart Grid Sustainability Engineer	Keystone
	Streaming Service Energy Optimizer	Producer
	Sustainability Engineer	Keystone
	Sustainability IT/OT Integration Engineer (Internal)	Keystone
	Sustainability Program Management Office (SPMO) Leader	Keystone
	Sustainable Artificial Intelligence Specialist	Producer
	Sustainable Engineer	Pioneer
	Sustainable Entertainment Designer	Producer
	Sustainable Factory Architect	Keystone
	Sustainable Factory Engineer	Keystone
	Sustainable Info Tech Specialist (App)	Keystone
	Sustainable Info Tech Specialist (Cloud/Network)	Keystone
	Sustainable Infrastructure as a Service ~~(SaaS))~~ Migration Engineer	Keystone
	Sustainable IT Transformation Architect	Keystone
	Sustainable Manufacturing Process Engineer	Pioneer
	Sustainable Water Infrastructure Engineer	Producer
	System Architect	Keystone
	System Engineer	Producer
	Textile and Leather Processing Engineer	Producer
	Transportation Climate Change Specialist	Producer
	Transportation Engineer	Producer
	Transportation Planner	Keystone
	Urban Planner	Keystone
	Waste Management Engineer	Producer
	Wastewater Engineer	Producer
	Water Recovery Specialist	Producer
	Water Systems Engineer	Producer
	Watershed Manager/Planner	Keystone
	Wind Energy Development Manager	Keystone
Test & Validate	Sustainability Solution Testing & Commissioning Engineer	Keystone
	Sustainability Systems Testing and Evaluation Specialist	Keystone
	Sustainable Software Quality Assurance Tester	Producer
	Test Engineer	Producer
	Validation Engineer	Producer

Domain 6: Co-Creation

This domain holds a total of 98 SSLC roles, approximately 13% of the roles

Primary Subdomain	Green/Turquoise Role	Role Impact (Pioneer, Keystone, Producer)
Process	Automotive Engineering Technician	Producer
	Biological Monitor Assistant	Producer
	Biological Technician	Producer
	Electrification Program Manager	Keystone
	Engineering Technician	Producer
	Environmental Engineering Project Manager	Producer
	Environmental Program Manager	Keystone
	Environmental Program Specialist	Producer
	Environmental Technician	Pioneer
	Global Decarbonization Project Manager	Keystone
	Hydroelectric Plant Technician	Producer
	Hydroelectric Production Manager	Keystone
	Hydrologic Technician	Producer
	Infrastructure Manager	Keystone
	Project Manager	Producer
	Quality Control Manager	Keystone
	Solar Communication Technician	Producer
	Solar Electrician	Producer
	Sustainability Program Manager – Energy & Water	Keystone
	Sustainability Security Risk Manager	Keystone
	Sustainable Chemist	Pioneer
	Sustainable Cloud Engineer	Producer
	Waste Management Specialist	Producer
	Water Quality Field Technician	Producer
	Water Quality Manager	Keystone
	Wellhead Pumper	Producer
Produce	Carpenter	Producer
	Construction Equipment Operator	Producer
	Construction Laborer	Producer
	Construction Manager	Producer
	Construction Trades Worker	Producer
	Crane Technician	Producer
	DevOps Engineer	Producer

	Earth Driller	Producer
	Eco-Infrastructure Builder	Producer
	Edible Packaging Production Engineer	Producer
	Electrician	Producer
	E-Mobility Grid Installer	Producer
	Foundry Mold and Coremaker	Producer
	Helper, Laborer, and Material Mover	Producer
	Inspector, Tester, Sorter, Sampler, and Weigher	Producer
	Insulator	Producer
	Millwright	Producer
	Operating Engineer	Producer
	Photonics Technician	Producer
	Plumber, Pipefitter, and Steamfitter	Producer
	Prepress Operator	Producer
	Production Assembler	Producer
	Programmer	Producer
	Roofer	Producer
	Software Developer	Producer
	Structural Welder	Producer
	Sustainable AI Trainer	Producer
	Sustainable Application Developer	Producer
	Sustainable Builder	Producer
	Sustainable Software Developer	Producer
	Team Assembler	Producer
	Urban Farmer / Hydroponic Farmer	Producer
	Welder, Cutter, Solderer, and Brazer	Producer
Protect	Business Continuity Coordinator	Producer
	Business Continuity Manager	Keystone
	Conservation Action Coordinator	Producer
	Construction Inspector	Keystone
	Emergency Preparedness and Response Services Manager	Producer
	Emergency Preparedness and Response Specialist	Producer
	Environmental Science & Protection Technician	Producer
	Health and Safety Specialist	Producer
	Occupational Health and Safety Technician	Pioneer
	Security and Fire Alarm Systems Installer	Producer
	Vulnerability Manager	Keystone
Provision	Carbon Capture Sequestration System Installer	Producer
	Computer Technician	Producer

	Electrical and Electronic Technician	Producer
	Equipment Installer (other)	Producer
	HVAC System Retrofitter	Producer
	Industrial Engineering Technician	Producer
	Industrial Machinery Mechanic	Producer
	Inventory Specialist	Producer
	IT Specialist	Producer
	Lead Solar Installer	Producer
	Network Administrator	Producer
	Network and Computer Systems Administrator	Producer
	Passive/Sustainable HVAC System Installer	Producer
	Permitting Specialist	Keystone
	Physical Asset Controller	Producer
	Recycling Maintenance Mechanic	Producer
	Resource Balance Planner	Pioneer
	Robotics Technician	Producer
	Solar Energy Installation Manager	Producer
	Solar Photovoltaic Equipment/Panel Installer	Producer
	Solar Turbine Assembler	Producer
	Supply Chain Architect	Keystone
	Sustainable Innovation Partner Liaison	Producer
	Sustainable Manufacturing Process Technician	Producer
	Sustainable Water Infrastructure Installation & Maintenance Laborer	Producer
	Weatherization Installer	Producer
	Wholesale and Retail Buyer	Producer
	Wind Turbine Installer	Producer

Domain 7: Co-Operation

This domain holds a total of 99 SSLC roles, approximately 13% of the roles

Primary Subdomain	Green/Turquoise Role	Role Impact (Pioneer, Keystone, Producer)
Conserve	Bear Conflict Manager :-)	Keystone
	Biosafety & Security Field Supervisor	Producer
	Conservation Technician	Producer
	Forest and Conservation Worker	Producer

	Global Oceans Program Manager	Producer
	Invasive Species Coordinator	Producer
	Land Firefighter and Prevention Specialist	Producer
	Managing Forester	Keystone
	Mitigation Banking Specialist	Producer
	Pesticide and Vegetation Management Technician	Producer
	Storm Water Compliance Inspector	Keystone
	Watershed Forester	Producer
Obtain	Financial Examiner	Producer
	Sustainability Partner Integration Planner	Keystone
	Vendor OEM Collaboration Manager	Producer
	Vendor/Alliance Collaboration Coordinator	Producer
	Venue Sustainability Coordinator	Producer
Operate	Agro Forestry Manager	Keystone
	Alternative Agricultural Grower	Producer
	Aquaponic Farm Operator	Producer
	Autonomous Vehicle Remote Pilot	Producer
	Autonomous/Remote Plant Manager	Keystone
	Autonomous/Remote Plant Operator	Producer
	Beekeeper :-)	Keystone
	Biofuels Production Manager	Keystone
	Biomass Plant Engineer	Producer
	Biomass Plant Operator	Producer
	Biomass Technician	Producer
	Biomining Field Lab Technician	Producer
	Business Operations Specialist	Producer
	Clean Energy Systems Operator	Producer
	Climate Change Program Associate	Producer
	Computer Numerically Controlled Tool Operator	Producer
	Conservation Laborer	Producer
	Data Security Analyst	Producer
	Desalination Operator	Producer
	Drinking Water Treatment Plant Operator	Producer
	Drone Engineer	Producer
	Ecological Field Crew Laborer	Producer
	Ecological Field Crew Technician	Producer
	EHS Specialist	Producer
	Electrical Technician	Producer
	Electro-Mechanical and Mechatronics Technician	Producer

	Emergency Management Specialist	Producer
	Environmental Management Specialist	Producer
	Environmental Records Specialist	Producer
	Environmental Services Director	Pioneer
	Farmer, Rancher, and Other Agricultural Manager	Producer
	Farming, Fishing, and Forestry Laborer	Producer
	Farmworker and Laborer, Crop, Nursery, and Greenhouse	Producer
	Frog Watcher	Keystone
	General Laborer	Producer
	Geoinformatics Technician	Producer
	Geoscience Program Coordinator	Producer
	Geothermal Production Manager	Keystone
	Geothermal Technician	Producer
	Hand Packer and Packager	Producer
	Hazardous Materials Removal Technician	Producer
	Housekeeper/Janitor	Producer
	Integrated Sustainability System Operator	Pioneer
	International Compliance Manager	Keystone
	Laboratory Technician	Producer
	Landscaper, Lawn Service/Groundskeeper	Producer
	Logging Equipment Operator	Producer
	Machinist - Setter, Operator, and Tender	Producer
	Material Processing Operator	Producer
	Metal Worker	Producer
	Office and Administrative Associate	Producer
	Oil & Gas Service Unit Operator	Producer
	Plant Manager/Site Manager	Keystone
	Plant Operator	Producer
	Plastic Worker	Producer
	Power Plant Operator	Producer
	Quality Assurance Technician	Producer
	Recycling Plant Operations Manager	Keystone
	Remote Inspections Drone Pilot	Producer
	Renewable Energy Operations and Maintenance Specialist	Producer
	Renewable Energy Program Director	Producer
	Solar Cell Technician	Producer
	Solar Operations & Maintenance Supervisor	Producer
	Sustainability Program Coordinator	Producer
	Sustainable Agriculture Field Manager	Keystone

	Sustainable Automation Technician	Pioneer
	Utility Operations & Maintenance Manager	Keystone
	Vulnerability Specialist	Producer
	Wastewater Treatment Plant Operator	Producer
	Water Distribution Plant Operator	Producer
	Water Management Lab Technician	Producer
	Wave Energy Producer - Operator	Producer
	Wind Energy Operations Manager	Keystone
Optimize	Ecosystem Management Services Lead	Pioneer
	Efficiency & Optimization Specialist	Pioneer
	Energy Auditor	Keystone
	Energy Monitoring System Operator	Producer
	Energy, Water and Material Balance Planner	Pioneer
	Environmental Compliance Officer	Keystone
	Facility/Campus Energy Optimization Engineer	Pioneer
	Predictive Maintenance Specialist	Producer
	Quality Assurance Specialist	Producer

Domain 8: Diffusion

This domain holds a total of 38 SSLC roles, approximately 5% of the roles

Primary Subdomain	Green/Turquoise Role	Role Impact (Pioneer, Keystone, Producer)
Distribute	Field Service Manager	Producer
	Field Service Representative	Producer
	Field Service Technician	Producer
	Food Preparation and Serving Worker	Producer
	Food Service Manager	Producer
	Product/Service Tracer	Producer
	Production, Planning, and Expediting Clerk	Producer
	Shared Transit Driver	Producer
	Transit Driver	Producer
	Transport Driver	Producer
	Transportation Manager	Keystone
Network	International Supply Chain Manager	Keystone
	Logistics Engineer	Producer
	Responsible Sourcing Specialist	Pioneer

	Supplier Diversity & Sustainability Manager	Keystone
	Supply Network Sustainability Compliance Manager	Keystone
	Sustainable Supply Network Manager	Keystone
	Vendor Collaboration Coordinator	Producer
Regulate/ Balance	Air Traffic Controller	Producer
	Civic Integrity Investigator	Keystone
	Compliance Administrator	Producer
	Compliance Analyst	Producer
	Compliance Auditor	Keystone
	Compliance Specialist	Producer
	Conservation Officer	Producer
	Customs and Border Protection Officer	Producer
	Environmental Investigator	Keystone
	Facility ES&H Coordinator	Pioneer
	Fraud Examiner, Investigator and Analyst	Producer
	Land Fire Inspector and Investigator	Keystone
	Law Enforcement Officer	Producer
	Probation Officer and Correctional Treatment Specialist	Producer
	Sustainability Auditor	Pioneer
	Transit Law Enforcement	Producer
	Water Waste Investigator	Keystone
	Weather Derivatives Analyst/Trader	Producer
Store	Procurement Manager	Producer
	Transportation, Storage, and Distribution Manager	Producer

Domain 9: Experience

This domain holds a total of 25 SSLC roles, approximately 3% of the roles.

Primary Subdomain	Green/Turquoise Role	Role Impact (Pioneer, Keystone, Producer)
Return	Customer Return Experience Coordinator	Keystone
	Product Recovery Specialist	Producer
	Return Lead Technician	Producer
	Return Material/Inventory Stream Facilitator	Keystone
	Warehouse Damage/Returns Processor	Producer
	Arbitrator/Mediator/Conciliator	Keystone

Review	Citizen Science Grid Sentinel	Producer
	Digital Impact Auditor	Keystone
	Evidence-Based Sustainable Use Evaluator	Producer
	Sustainability Activist Consumer	Producer
	Topic Pulse Moderator	Producer
Use	All Employees	Producer
	Brand Manager	Keystone
	Brand Sustainability Behavior Coach	Keystone
	End Consumer/Customer (Products/Services)	Producer
	End User/Customer (Systems)	Producer
	Environmental Experience Specialist	Producer
	Field Specialist Technician	Producer
	Natural Resources Youth/Comm. Program Coordinator	Producer
	Responsible Use Ecosystem Guide	Producer
	Social Care Agent	Producer
	Sustainability Behavioral Change Specialist	Keystone
	Sustainability Coach	Pioneer
	Sustainable Fashion Stylist	Producer
	User Experience Designer	Keystone

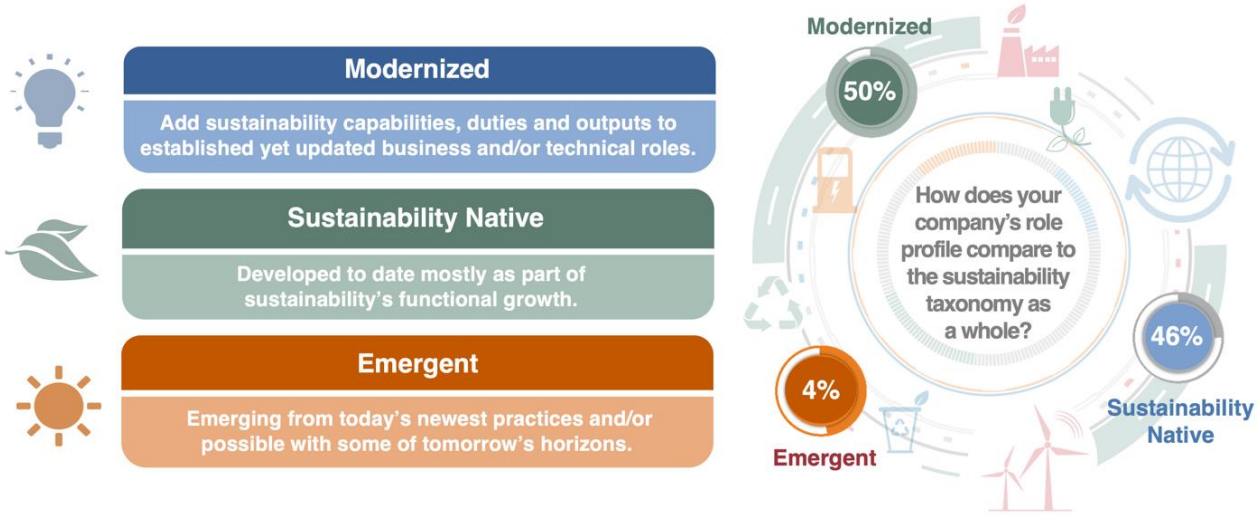
Domain 10: Regeneration

This domain holds a total of 38 SSLC roles, approximately 5% of the roles.

Primary Subdomain	Green/Turquoise Role	Role Impact (Pioneer, Keystone, Producer)
Rebuild	Brownfield Redevelopment Specialist and Site Manager	Keystone
	Remediation Redevelopment Site Manager	Keystone
	Water-Sewer Remediation and Construction Engineer	Pioneer
Recover	Decarbonization Specialist	Producer
	Decarbonization Technician	Producer
	E-Waste Recovery and Recycling Specialist	Producer
	Recycling Material Collector/Sorter	Producer

	Refuse Materials Collector	Producer
	Resource Recovery and Reclamation Specialist	Producer
	Waste Management Collector-Operator	Producer
Recycle	Deconstruction and Decontamination Waste Operations Specialist	Producer
	Ferrous/Non-ferrous Recycling Specialist	Producer
	Household Hazardous Waste Recycling Worker	Producer
	Recycling Coordinator	Producer
	Transfer Station Operator	Producer
Reimagine	Decarbonization Analyst	Producer
	Product End of Life Specialist	Pioneer
	Regeneration Public-Private Program Manager	Keystone
	Remanufacturing Engineer	Pioneer
	Reprocessing Engineer	Pioneer
	Retro Commissioning, Remediation & Reclamation Engineer	Pioneer
	Sustainability & Regenerative Economist	Keystone
Repair	Bus and Truck Mechanic and Engine Specialist	Producer
	Clean Energy Technician	Producer
	E-Automotive Service Technician and Mechanic	Producer
	Electrical and Electronics Repairer, Commercial and Industrial Equipment	Producer
	Farm Maintenance Technician	Producer
	Maintenance and Repair Specialist	Producer
	Mechanic/Repairer	Producer
	Solar Turbine Overhaul Test Technician	Producer
	Wind Turbine Service Technician	Producer
Restore	Forest Restoration Officer	Producer
	Land Conservation Specialist	Producer
	Landscape / Restoration Designer	Keystone
	Native Areas Specialist	Pioneer

	Restoration Field Specialist	Producer
	Restoration Land Specialist Post Fire	Producer
	Water-Sewer Remediation and Construction Laborer	Producer



Role Stages

Role stages are defined in terms of the maturity of the role and its uniqueness to the field of sustainability. Roles map to where they sit on an adoption and evolution curve for sustainability overall: modernized, sustainability-native roles, and emergent roles. Stages include previously existing roles that have been updated and changed (modernized) by sustainability needs and practice; roles that are native to sustainability, both legacy and more recent roles; and those that may emerge in the future.

Three stages were established:

- Modernized
- Sustainability Native
- Emergent

Figure 4 defines the stages. The percentages to the right indicate the final distribution of the roles across the stages.

Half (50%) of the roles are existing roles that have been modernized, updated, or retooled to address sustainability skills needs. Only 4% are listed as emergent, potentially on the horizon as tomorrow's newest jobs. Almost half of the taxonomy (46%) can be seen as sustainability native: they are primarily roles that are native to sustainability, and they exist today. Many of them need to scale to significant levels as companies mature their sustainability capability. Their scale and population and their supply and demand are dependent on whether they are Pioneer, Keystone, or Producer roles, along with the sustainability needs and maturity of the organizations who employ them.

Figure 4: Role Stages

A running list indexed by Role Stages is not included here. The Role Stage for each role is shown as the sub-organizer in the lists indexed by Impacts in the next sub-section.

Role Impacts

Consideration of Role Impact

Another way that each role of the taxonomy is defined is through the impact that role has on the development and evolution of the Sustainability Workforce and the sustainability capability. These impacts consider the relationships of the roles to each other in terms of when they often appear – earlier or later as an organization matures its sustainability focus - and the relationship to the organization in terms of general impact.

As part of the Manpower workforce transformation approach, three initial types of impact are identified: Pioneer, Keystone, and Producer. Looking at the broad taxonomy with this lens should help companies as they examine the blend of capabilities they need based on where the company is in its evolution and where it wants to move to in its sustainability organization and capability. Identifying each role in this way makes possible discussion of:

- Which roles serve which purpose in terms of order or cadence when examining or planning a workforce overall?
- Which roles help sooner in a transformation?
- Which roles are more able to jumpstart the overall sustainability capability within an organization?
- Which roles evolve to be ‘workforce valves’ to enable the flow of work and information?
- Which roles offer specialization and generalization at scale?

As shown in Figure 5 below, three types of roles emerge – each with important contributions from a workforce planning perspective.

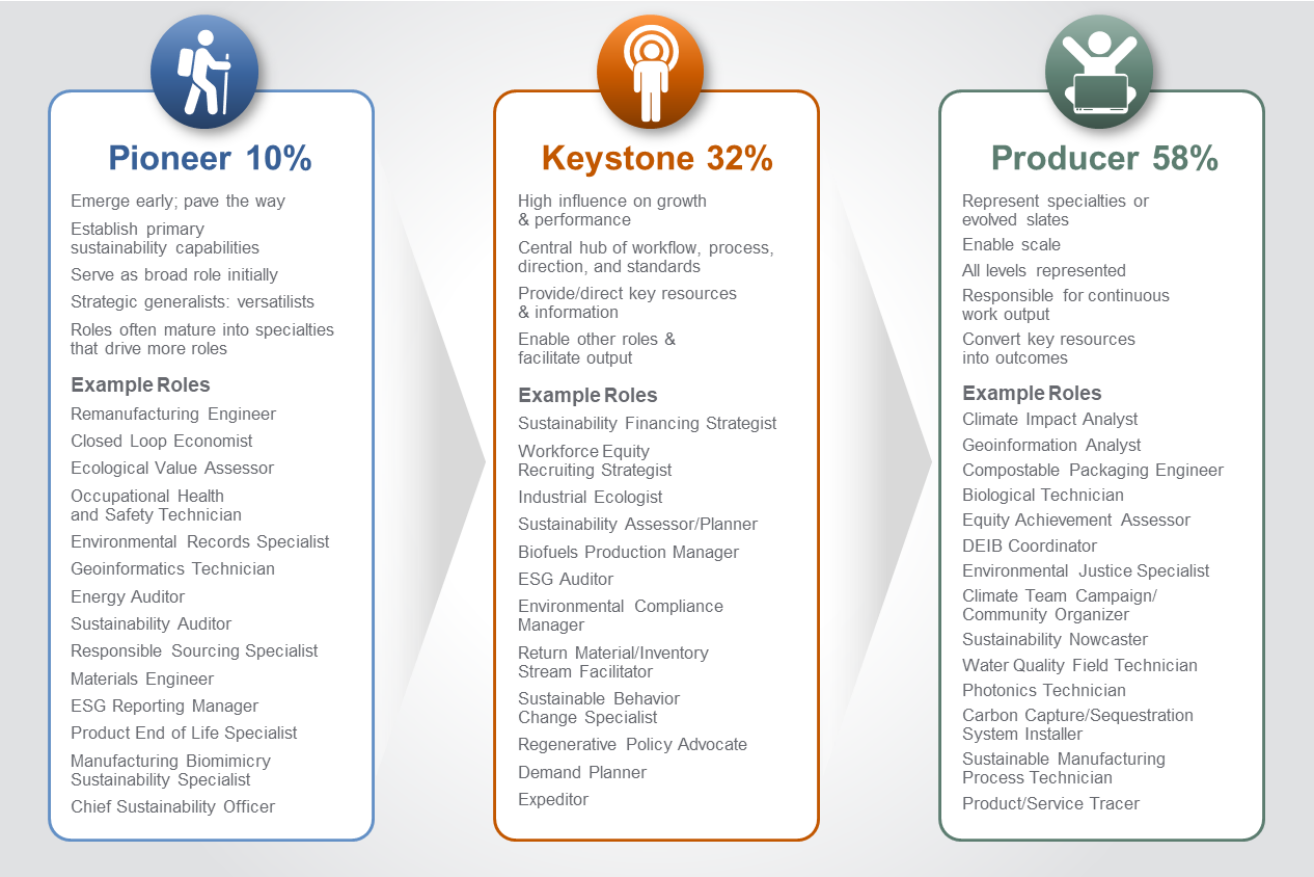


Figure 5: Role Impacts

Considering the Pioneer, Keystone and Producer role types – all important and required in a sustainability organization, or any organization – should inform an owner's or leader/planner's view of what capabilities to hire, develop, or position as business and talent planning occur. As companies are executing on their business plans to advance sustainability, this framework of role impact should become key language and method for considering what roles to grow, position, or leverage to achieve business goals.

Each impact type and their set of roles is listed below.

The Pioneers

As we worked across the broad view of sustainability activity and outputs, some roles appeared as important initial sets of capabilities and outputs. Pioneer roles are just that – roles that emerge early as foundational when looking at a large work arena. Pioneer roles in sustainability establish primary sustainability capabilities and play broader roles initially that can lead to other related yet more specialized roles. These Pioneer roles may be roles that organizations develop and hire for earlier in the workforce planning, or roles that evolve faster and appear to take on large amounts of early effort to build out company capability. People in these roles themselves tend to learn and evolve rapidly as their roles can consist of both generalized and specialized responsibilities. These roles expand or refine quickly as the organization matures and grows. About 10% of the SSLC Role Community is comprised of these forerunner roles.

Role Impact	Primary Domain	Green/Turquoise Role
Pioneer	Promise Positioning	Closed Loop Economist
		Environmental Lawyer
		ESG Program Managing Chair
		ESG Reporting Manager
		Risk Manager
		Sustainability Funding Mechanism Connector
		Sustainability/Environmental Accountant
	Empowerment	Climate Social Psychologist
		Community Economic Development Director
		Occupational Coach
		Organizational Biologist
		Sustainability Behavioral Psychologist
		Sustainability Talent Recruiter
	Engagement	Climate Ethicist
	Co-Ideation	Astrobiofuturist
		Biologist
		Biomimicry Director
		Biomimicry Specialist
		Catastrophe R&D Director
		Catastrophe Risk Modeler
		Conservation Scientist
		Data Scientist
		Ecologist
		Eco-Toxicologist
		Environmental Biologist
		Environmental Geologist
		Environmental Scientist
		Food Scientist
		Geoscientist
		Human Biologist
		Hydrogeologist
		Hydrologist
		Industrial Ecologist
		Marine Biologist
		Natural Resources Biologist
		Restoration Ecologist
		Risk/Opportunity Modeler
		Social Anthropologist
		Social Scientist
		Soil and Plant Scientist
		Wetland Scientist
		Wildlife Biologist
		Zero Waste Strategist
		Zoologist
	Evidence-Based Co-Design	Biochemical Engineer
		Bioengineer

		Biomimicry Manufacturing Specialist
		Decarbonization Engineer
		Drinking Water Engineer
		Ecological Value Assessor
		Energy Systems Engineer
		Environmental Engineer
		Materials Engineer
		Quality Engineer
		Sustainable Additive Materials Engineer
		Sustainable Engineer
		Sustainable Manufacturing Process Engineer
		Wind Energy Engineer
	Co-Creation	Environmental Technician
		Occupational Health and Safety Technician
		Resource Balance Planner
		Sustainable Chemist
	Co-Operation	Ecosystem Management Services Lead
		Efficiency & Optimization Specialist
		Energy, Water and Material Balance Planner
		Environmental Services Director
		Facility/Campus Energy Optimization Engineer
		Integrated Sustainability System Operator
		Sustainable Automation Technician
	Diffusion	Facility Environmental, Health and Safety (EH&S) Coordinator
		Responsible Sourcing Specialist
		Sustainability Auditor
	Experience	Sustainability Coach
	Regeneration	Native Areas Specialist
		Product End of Life Specialist
		Remanufacturing Engineer
		Reprocessing Engineer
		Retro Commissioning, Remediation & Reclamation Engineer
	Regeneration	Water-Sewer Remediation and Construction Engineer

The Keystones

Working across the broad view of sustainability work effort, some roles appear as important sets of capabilities and outputs that also have a pivotal place in the flow or influence on the work volumes and outputs of others and the broader processes.

To some extent, all roles can act in this way; however, some roles contribute to the expansion of roles around them. These roles are called Keystone roles. In any one organization or at any employer, often there are few people or often even only one person in a position that aligns with this role. This makes sense as the keystones are often the direction setters, resource allocators, overseers, strategy creators, and senior coordinator roles. Approximately 32% of the defined roles in the Sustainability Taxonomy are Keystone roles.

Even when fewer employees serve in Keystone roles, whether a single individual or a very small set of actual jobs with that role, they usually exert a high impact on the growth and performance results of sustainable solutions overall. Keystones support the other types of roles and facilitate their output often by creating outputs that make the case for employing other Pioneer or Producer roles, increasing the demand for those other roles, and guiding their impact. Keystones provide or direct key resources and information even more than other roles, and they establish the Keystone category as the central hub of workflow and direction for an organization focused on sustainable solutions. These Keystone roles are in central positions for setting and extending key policies, designs, processes, and workflows.

Lastly, the requirement for integrated, cross-discipline, systemic, and life cycle-oriented solutions in sustainability creates the need for a substantial number of keystone roles to enable the collaboration aspect of successful sustainability; therefore, it is understandable that 1/3 of the roles carry the Keystone designation in the Sustainability Workforce.

	Primary Domain	Green/Turquoise Role
Keystone	**Promise Positioning**	All Leaders
		Business Ethicist
		Chief Biosafety and Security Officer
		Chief Diversity, Equity, Inclusion & Belonging Officer
		Chief Executive Officer
		Chief Information Officer
		Chief Information Security Officer
		Chief Innovation Officer
		Chief Mission Officer
		Chief Operations Officer
		Chief People Officer
		Chief Research and Innovation Officer
		Chief Risk Officer
		Chief Security Officer
		Chief Strategy & Brand Officer
		Chief Sustainability Officer
		Chief Sustainability Resources Officer
		Chief Sustainability, Environmental & Safety Officer
		Climate Change Program Director
		Climate Investments Manager
		Climate Policy Development Specialist
		Compliance Manager
		Data Owner
		Data Services Manager
		ESG Auditor
		ESG Program Chair – Diversity, Equity, Inclusion & Belonging
		ESG Program Chair - Facilities and Resources
		ESG Program Chair - Org and Workforce Transformation
		ESG Program Chair - Processing & Production
		ESG Program Chair- Community Outreach
		ESG Program Chair- Environment and Sustainability
		ESG Program Chair- Ethics and Corporate Responsibility Officer
		ESG Program Chair- Marketing & Communications
		ESG Program Chair- Product Design
		ESG Program Chair- Risk, Internal Audit, Compliance, IT

		ESG Program Chair-Operations
		ESG Program Management Integrated Initiatives Lead
		Fund Control & Reporting Director
		Funding Disbursement Director
		General Manager
		Government Agency ESG Slate
		Government Regulator
		Industry Segment Futurist & Forecaster
		Industry Sustainable Enterprise Researcher and Advisor
		Intellectual Property Manager
		Internal Sustainability Futurist
		Lead Internal Auditor
		Manufacturing Operations Leader
		Merger & Acquisition Director - Sustainability
		Non-profit Development Director
		Regenerative Policy Advocate
		Regulatory Affairs Manager
		Resilience Researcher and Advisor
		Risk Advisor
		Senior Government Affairs Advocate, Conservation
		Sustainability Director
		Sustainability Ethicist
		Sustainability Financing Strategist
		Sustainability Intelligence Specialist
		Sustainability Metrics Manager
		Sustainability Transformation Leader
	Empowerment	All Managers
		All Senior/C-Level Managers
		B Corp Advisor
		Climate Clinical Psychologist
		Climate Equity & Community Partnerships Program Manager
		Diversity, Equity, Inclusion and Belonging (DEIB) Advisor
		Diversity, Equity, Inclusion and Belonging (DEIB) Program Manager
		Diversity, Equity, Inclusion, and Belonging (DEIB) Director
		Educational, Guidance, and Career Counselor
		Human Resources Manager
		Industrial-Organizational Psychologist
		Job/Role Architect
		Remote/Hybrid Work Designer
		Social Entrepreneurship Advisor
		Social Services Senior Administrator
		Sustainability Workforce Manager
		Sustainability Workforce Planner
		Team Improvement Facilitator
		Workforce Development Manager
		Workforce Equity Recruiting Strategist
	Engagement	Business Development Manager
		Cause Marketing Strategist
		Ecological Entrepreneur

		ESG Comms Manager
		Sustainability as a Service Strategist
		Sustainability Market Manager
		Sustainability Sales Account Manager
		Sustainability Service/Product Incentive Strategist
		Sustainability Solutions Sales Engineer
		Sustainable Product Sales Specialist
	Co-Ideation	Air Quality Scientist
		Bio-Based Business Solution Architect
		Biomass Optimization Solution Advisor
		Climate Adaptation Strategist
		Climate Resilience Specialist
		Consulting Forester
		Decarbonization Solution Architect
		Digital Nudge Technologist
		Digital Transformation Advisor (Green IT Transformation)
		Digital Transformation Strategist
		Electro-Mechanical and Mechatronics Technologist
		Emergent Market Finance Strategist
		Engineering Technologist
		Environmental Engineering Technologist
		Environmental Planner
		Environmental Science and Protection Advisor
		Geoinformatics Technologist
		Industrial Engineering Technologist
		Integrated Sustainability Researcher
		Limnologist
		Materials Scientist
		Mechanical Engineering Technologist
		Microbiologist
		New Loop Economy Strategist
		Pollution Solution Advisor
		Precision Biologist
		Product Life Cycle Manager
		Quality Manager
		Renewable Energy Advisor
		Smart Cities Architect
		Smart Cities Engineer
		Smart Contract Advisor
		Smart Factory Architect
		Supply Network Sustainability Global Compliance Manager
		Sustainability as a Product Strategist
		Sustainability Brand Strategist
		Sustainability Product Designer
		Sustainability Solutions Architect
		Sustainability Strategic Advisor
		Sustainable Construction Materials Technologist
		Sustainable Procurement Advisor

		Sustainable Product Innovation Strategist
		Sustainable Smart Grid (Meta Systems) Engineer
		Urban Planner, Principal
	Evidence-Based Co-Design	Architect
		Biofuels/Biodiesel Technology and Product Development Manager
		Biomimetic Process Designer
		Biomimetic Product/Component Designer
		Carbon Neutral IT/Cloud Architect
		Carbon Offset Advisor and Sourcer
		Carbon Project Pilot Lead
		Climate Migration Specialist
		Data Architect
		Desalination Engineer
		Energy Source Integration Engineer
		Environmental Planner, Principal
		Event Planner/Manager
		Factory Automation Manager
		Grid Architect
		Industry Sustainability Standards Developer
		Infrastructure Engineer
		Internal Manufacturing Sustainability Standards Developer
		Land Trust Director
		Landscape Architect
		Long-Duration Energy Storage Engineer
		Mechanical Designer
		Mobility Modernization Engineer
		Naval-Fleet Operations Manager
		New Loop Economy Architect
		Photonics Solution & Design Engineer
		Power to X Optimization Architect
		Product Designer
		Product Manager
		Rural Enterprise & Community Justice Specialist
		Smart Grid Sustainability Engineer
		Social Impact Advisor
		Supply Network Sustainability Compliance Auditor
		Sustainability Assessor/Planner
		Sustainability Engineer
		Sustainability IT/OT Integration Engineer (Internal)
		Sustainability Program Management Office (SPMO) Leader
		Sustainability Solution Testing & Commissioning Engineer
		Sustainability Systems Testing and Evaluation Specialist
		Sustainable Architectural and Interior Designer
		Sustainable Factory Architect
		Sustainable Factory Designer
		Sustainable Factory Engineer
		Sustainable Info Tech Specialist (App)
		Sustainable Info Tech Specialist (Cloud/Network)
		Sustainable Infrastructure as a Service (SaaS)) Migration Engineer

		Sustainable IT Transformation Architect
		Sustainable Operating Tech Specialist (IoT/Edge)
		Sustainable Operating Tech Specialist (Network)
		Sustainable Product Designer
		System Architect
		Transportation Planner
		Urban Planner
		Water Resource Management Specialist
		Watershed Manager/Planner
		Wind Energy Development Manager
	Co-Creation	Business Continuity Manager
		Construction Inspector
		Electrification Program Manager
		Environmental Program Manager
		Global Decarbonization Project Manager
		Hydroelectric Production Manager
		Infrastructure Manager
		Permitting Specialist
		Quality Control Manager
		Supply Chain Architect
		Sustainability Program Manager – Energy & Water
		Sustainability Security Risk Manager
		Vulnerability Manager
		Water Quality Manager
	Co-Operation	Agro Forestry Manager
		Autonomous/Remote Plant Manager
		Bear Conflict Manager :-)
		Beekeeper :-)
		Biofuels Production Manager
		Energy Auditor
		Environmental Compliance Officer
		Frog Watcher
		Geothermal Production Manager
		International Compliance Manager
		Managing Forester
		Plant Manager/Site Manager
		Recycling Plant Operations Manager
		Storm Water Compliance Inspector
		Sustainability Partner Integration Planner
		Sustainable Agriculture Field Manager
		Utility Operations & Maintenance Manager
		Wind Energy Operations Manager
	Diffusion	Civic Integrity Investigator
		Compliance Auditor
		Environmental Investigator
		International Supply Chain Manager
		Land Fire Inspector and Investigator
		Supplier Diversity & Sustainability Manager

		Supply Network Sustainability Compliance Manager
		Sustainable Supply Network Manager
		Transportation Manager
		Water Waste Investigator
	Experience	Arbitrator/Mediator/Conciliator
		Brand Manager
		Brand Sustainability Behavior Coach
		Customer Return Experience Coordinator
		Digital Impact Auditor
		Return Material/Inventory Stream Facilitator
		Sustainability Behavioral Change Specialist
		User Experience Designer
	Regeneration	Brownfield Redevelopment Specialist and Site Manager
		Landscape / Restoration Designer
		Regeneration Public-Private Program Manager
		Remediation Redevelopment Site Manager
		Sustainability & Regenerative Economist

The Producers

Over half of roles (58%) are known as Producer roles. In any broad community of related workers, certain roles are responsible for ongoing operational delivery or production of the group/company's major accomplishments and output. These are the roles that usually have higher numbers of resources in the positions (headcounts) associated with the roles. Through their work, producer roles and incumbents scale the organization and elevate the volume of output that the overall organization accomplishes. Producer roles also often include roles that increase the specialization and maturity of the workforce.

The mix and size of the workforce in these roles is a business factor for each organization based on their size and their "niche" or area of business across the SSLC. Producers can be at any level or any type (technician to engineer to manager, etc.). In their work, they magnify and amplify the resources provided, and with their skills, they create scale, volume, and increased operational output and success. These essential roles, across all the domains, see some Producer roles that are more specialized and others that are more generalized. Producer roles are responsible for much of the continuous work output of an organization - they convert key resources into outcomes for the business and produce the lion's share of the overall operational value. Producers enable the enterprise or the entire ecosystem to flourish by optimizing and converting resources and optimizing outcomes.

Role Impact	Primary Domain	Green/Turquoise Role
Producer	**Promise Positioning**	Biometrician
		Biostatistician
		Climate and Social Equity Specialist
		Data Custodian
		Data Engineer
		Data Lab Director
		Economic Development Specialist
		Economist

		Environmental Justice Specialist
		ESG Associate
		External Auditor
		Health & Wellness Advocate
		Regulatory Affairs Specialist
		Social Innovation Advocate
		Sustainability Activist Investor
		Sustainability Advocate
		Sustainability Economist
		Sustainability Evangelist
		Sustainability Financial Risk Specialist
		Sustainability Governance Business Analyst
		Sustainability Insurance Specialist
		Sustainability Nowcaster
		Sustainability Policy Development Specialist
		Sustainable Small Business Owner
	Empowerment	Child-Family Services Specialist
		Community Development Liaison
		Community Justice Liaison
		Compensation, Benefits, and Job Analysis Specialist
		Correctional Officer
		Counselor
		Curriculum Developer/Planner
		Diversity, Equity, Inclusion and Belonging (DEIB) Coordinator
		Early Childhood Care Delivery
		Early Childhood Educator
		Educational Instructor
		Eligibility Interviewer, Government Program
		Enterprise Sustainability Culture Change Management Specialist
		Environmental Educator
		Equal Opportunity Program Representative
		Health & Wellness Program Coordinator
		Health Care Delivery *Slate*
		Health Care Support Services *Slate*
		Healthcare Social Worker
		Human Factors Engineer/Ergonomist
		Human Resources Specialist
		Human Service Care Assistant
		Mental Health Incident Responder
		Neurodiversity Workforce Advisor
		Neurodiversity Workplace Coordinator
		Organizational Designer
		Rehabilitation Counselor
		Remote/Hybrid Work Coach
		School Social Worker
		Social Program Manager
		Social Worker

		Student Health, Wellness & Safety Coordinator
		Student Success Transition Specialist
		Sustainability Environmental Content Instructor
		Sustainability Governance Content Instructor
		Sustainability Instructor/Sustainability Faculty
		Sustainability Interdisciplinary Content Instructor
		Sustainability K-12 Teacher
		Sustainability Knowledge Bank Manager
		Sustainability Social Content Instructor
		Sustainability User Trainer/Coach
		Sustainability Workforce Developer
		Training and Development Manager
		Training and Development Specialist
	Engagement	Advertising and Promotions Campaign Manager
		Climate Justice Communicator
		Climate Team Campaign/Community Organizer
		Communications Associate
		Community Liaison
		Community Network Coordinator
		Digital Content Manager
		Energy Broker
		Environmental Interpreter
		Ethnographer
		Food and Agriculture Campaigner
		Marketing Manager
		Merchandiser
		Public Relations Specialist
		Renewable Energy Sales Consultant
		Residential Solar Canvasser
		Sales Consultant
		Social Cause Entrepreneur
		Solar Sales Representative
		Sustainability Awareness Communications Specialist
		Sustainability Campaign Associate
		Sustainability Historian/Archivist
		Sustainable Agriculture Communications Lead
		Web Designer/Developer
	Co-Ideation	Accountant
		Agricultural and Food Scientist
		AI Sustainability Engineer
		Aquarist
		Aquatic Ecologist
		Atmospheric Scientist
		Botany Specialist
		Coastal Scientist
		Computer Scientist
		Cost Estimator
		Energy & Climate Research Analyst

		Management Analyst
		Meteorologist
		Municipal Ecologist
		Plant Pathologist
		Renewable Materials Technologist
		Science Director
		Strategic Sustainability Market Intelligence Analyst
		Sustainability R&D Specialist
		Synthetic Biologist
		Weather Hedger - Climate Disaster Modeler
	Evidence-Based Co-Design	Aerospace Engineer
		Agricultural Engineer
		Air Quality Engineer
		All Source Analyst - Biosafety and Security
		Architectural and Civil Drafter
		Automotive Engineer
		Aviation Engineer
		Biofuels Engineer
		Biomass Optimization Engineer
		Biomedical Engineer
		Biomining Engineer
		Biosafety & Security Analyst
		Business Analyst
		Business Impact Analyst
		Civil Engineer
		Climate Change Policy Analyst
		Climate Impact Analyst
		Climate Justice Policy Analyst
		Coastal Program Analyst
		Community Impact Analyst
		Conservation Specialist
		Demand Planner
		Design Engineer
		Drafter
		Edible Packaging Design Engineer
		Electrical and Electronics Drafter
		Electrical Engineer
		Electrification Engineer
		Electronics Engineer
		Energy Analyst
		Energy Engineer
		Engineer (All Others)
		Environmental Analyst
		Environmental Policy Analyst
		Equity Achievement Assessor
		ESG Analyst
		Facilities Engineer
		Factory Automation Engineer

		Financial and Investment Analyst
		Flood Hazards Specialist
		Fuel Cell Engineer
		Geoinformation Analyst
		Geophysical Engineer
		Hardware Engineer
		Hazard Assessor
		Health and Wellness Assessor
		Hydrogen Power Engineer
		Hydrographic Surveyor
		Industrial & Community Water Process & Compliance Coordinator
		Industrial (Process) Automation Engineer
		Industrial EHS Analyst
		Industrial Engineer
		Industrial Hygienist
		Industrial Sustainability Engineer
		Logistics Compliance Analyst
		Manufacturing Engineer
		Marine Engineer
		Marketing Analyst
		Mechanical Engineer
		Mechatronics Engineer
		Metallurgy Engineer
		Mobility Modernization Analyst
		Mobility System Electrification Engineer
		Nano Systems Engineer
		Network Redundancy Engineer
		Nuclear Engineer
		Operations Management Engineer
		Petroleum Engineer
		Photonics Engineer
		Photonics Fabrication Engineer
		Policy Analyst
		Process Engineer
		Product Engineer (adjacent industry)
		Product Specialist
		Robotics Engineer
		Senior Biosafety Specialist
		Smart Contract Reviewer
		Software Engineer
		Solar Design Engineer
		Solar Electrical Engineer
		Solar Energy Engineer
		Solar Performance Engineer
		Solar Project Engineer
		Storm Weather Specialist
		Streaming Service Energy Optimizer
		Surveyor

		Sustainability Analyst
		Sustainability Data Analyst
		Sustainability Hardware Engineer
		Sustainability Impact Analyst
		Sustainability Marketing Analyst
		Sustainable Application Engineer
		Sustainable Artificial Intelligence Specialist
		Sustainable Creative Artist/Designer
		Sustainable Design Specialist
		Sustainable eGame Designer
		Sustainable Entertainment Designer
		Sustainable Fashion Designer
		Sustainable Interior Designer
		Sustainable Packaging Engineer
		Sustainable Software Quality Assurance Tester
		Sustainable Water Infrastructure Engineer
		Sustainable Water Infrastructure Inspector
		System Engineer
		Systems Analyst
		Test Engineer
		Textile and Leather Processing Engineer
		Transportation Climate Change Specialist
		Transportation Engineer
		Turbine Aerodynamics Engineer
		Validation Engineer
		Vehicle Electification Engineer
		Vulnerability Assessor
		Waste Management Engineer
		Wastewater Engineer
		Water Recovery Specialist
		Water Resources Engineer
		Water Systems Engineer
		Watershed Engineer
		Zero Waste Analyst
	Co-Creation	Automotive Engineering Technician
		Biological Monitor Assistant
		Biological Technician
		Business Continuity Coordinator
		Carbon Capture Sequestration System Installer
		Carpenter
		Computer Technician
		Conservation Action Coordinator
		Construction Equipment Operator
		Construction Laborer
		Construction Manager
		Construction Trades Worker
		Crane Technician
		DevOps Engineer

		Earth Driller
		Eco-Infrastructure Builder
		Edible Packaging Production Engineer
		Electrical and Electronic Technician
		Electrician
		Emergency Preparedness and Response Services Manager
		Emergency Preparedness and Response Specialist
		E-Mobility Grid Installer
		Engineering Technician
		Environmental Engineering Project Manager
		Environmental Program Specialist
		Environmental Science & Protection Technician
		Equipment Installer (other)
		Foundry Mold and Coremaker
		Health and Safety Specialist
		Helper, Laborer, and Material Mover
		HVAC System Retrofitter
		Hydroelectric Plant Technician
		Hydrologic Technician
		Industrial Engineering Technician
		Industrial Machinery Mechanic
		Inspector, Tester, Sorter, Sampler, and Weigher
		Insulator
		Inventory Specialist
		IT Specialist
		Lead Solar Installer
		Millwright
		Network Administrator
		Network and Computer Systems Administrator
		Operating Engineer
		Passive/Sustainable HVAC System Installer
		Photonics Technician
		Physical Asset Controller
		Plumber, Pipefitter, and Steamfitter
		Prepress Operator
		Production Assembler
		Programmer
		Project Manager
		Recycling Maintenance Mechanic
		Robotics Technician
		Roofer
		Security and Fire Alarm Systems Installer
		Software Developer
		Solar Communication Technician
		Solar Electrician
		Solar Energy Installation Manager
		Solar Photovoltaic Equipment/Panel Installer
		Solar Turbine Assembler

		Structural Welder
		Sustainable AI Trainer
		Sustainable Application Developer
		Sustainable Builder
		Sustainable Cloud Engineer
		Sustainable Innovation Partner Liaison
		Sustainable Manufacturing Process Technician
		Sustainable Software Developer
		Sustainable Water Infrastructure Installation & Maintenance Laborer
		Team Assembler
		Urban Farmer / Hydroponic Farmer
		Waste Management Specialist
		Water Quality Field Technician
		Weatherization Installer
		Welder, Cutter, Solderer, and Brazer
		Wellhead Pumper
		Wholesale and Retail Buyer
		Wind Turbine Installer
	Co-Operation	Alternative Agricultural Grower
		Aquaponic Farm Operator
		Autonomous Vehicle Remote Pilot
		Autonomous/Remote Plant Operator
		Biomass Plant Engineer
		Biomass Plant Operator
		Biomass Technician
		Biomining Field Lab Technician
		Biosafety & Security Field Supervisor
		Business Operations Specialist
		Clean Energy Systems Operator
		Climate Change Program Associate
		Computer Numerically Controlled Tool Operator
		Conservation Laborer
		Conservation Technician
		Data Security Analyst
		Desalination Operator
		Drinking Water Treatment Plant Operator
		Drone Engineer
		Ecological Field Crew Laborer
		Ecological Field Crew Technician
		EHS Specialist
		Electrical Technician
		Electro-Mechanical and Mechatronics Technician
		Emergency Management Specialist
		Energy Monitoring System Operator
		Environmental Management Specialist
		Environmental Records Specialist
		Farmer, Rancher, and Other Agricultural Manager
		Farming, Fishing, and Forestry Laborer

		Farmworker and Laborer, Crop, Nursery, and Greenhouse
		Financial Examiner
		Forest and Conservation Worker
		General Laborer
		Geoinformatics Technician
		Geoscience Program Coordinator
		Geothermal Technician
		Global Oceans Program Manager
		Hand Packer and Packager
		Hazardous Materials Removal Technician
		Housekeeper/Janitor
		Invasive Species Coordinator
		Laboratory Technician
		Land Firefighter and Prevention Specialist
		Landscaper, Lawn Service/Groundskeeper
		Logging Equipment Operator
		Machinist - Setter, Operator, and Tender
		Material Processing Operator
		Metal Worker
		Mitigation Banking Specialist
		Office and Administrative Associate
		Oil & Gas Service Unit Operator
		Pesticide and Vegetation Management Technician
		Plant Operator
		Plastic Worker
		Power Plant Operator
		Predictive Maintenance Specialist
		Quality Assurance Specialist
		Quality Assurance Technician
		Remote Inspections Drone Pilot
		Renewable Energy Operations and Maintenance Specialist
		Renewable Energy Program Director
		Solar Cell Technician
		Solar Operations & Maintenance Supervisor
		Sustainability Program Coordinator
		Vendor OEM Collaboration Manager
		Vendor/Alliance Collaboration Coordinator
		Venue Sustainability Coordinator
		Vulnerability Specialist
		Wastewater Treatment Plant Operator
		Water Distribution Plant Operator
		Water Management Lab Technician
		Watershed Forester
		Wave Energy Producer - Operator
	Diffusion	Air Traffic Controller
		Compliance Administrator
		Compliance Analyst
		Compliance Specialist

		Conservation Officer
		Customs and Border Protection Officer
		Field Service Manager
		Field Service Representative
		Field Service Technician
		Food Preparation and Serving Worker
		Food Service Manager
		Fraud Examiner, Investigator and Analyst
		Law Enforcement Officer
		Logistics Engineer
		Probation Officer and Correctional Treatment Specialist
		Procurement Manager
		Product/Service Tracer
		Production, Planning, and Expediting Clerk
		Shared Transit Driver
		Transit Driver
		Transit Law Enforcement
		Transport Driver
		Transportation, Storage, and Distribution Manager
		Vendor Collaboration Coordinator
		Weather Derivatives Analyst/Trader
	Experience	All Employees
		Citizen Science Grid Sentinel
		End Consumer/Customer (Products/Services)
		End User/Customer (Systems)
		Environmental Experience Specialist
		Evidence-Based Sustainable Use Evaluator
		Field Specialist Technician
		Natural Resources Youth/Comm. Program Coordinator
		Product Recovery Specialist
		Responsible Use Ecosystem Guide
		Return Lead Technician
		Social Care Agent
		Sustainability Activist Consumer
		Sustainable Fashion Stylist
		Topic Pulse Moderator
		Warehouse Damage/Returns Processor
	Regeneration	Bus and Truck Mechanic and Engine Specialist
		Clean Energy Technician
		Decarbonization Analyst
		Decarbonization Specialist
		Decarbonization Technician
		Deconstruction and Decontamination Waste Operations Specialist
		E-Automotive Service Technician and Mechanic
		Electrical and Electronics Repairer, Commercial and Industrial Equipment
		Farm Maintenance Technician
		Ferrous/Non-ferrous Recycling Specialist
		Forest Restoration Officer

		Household Hazardous Waste Recycling Worker
		Land Conservation Specialist
		Maintenance and Repair Specialist
		Mechanic/Repairer
		Recycling Coordinator
		Recycling Material Collector/Sorter
		Refuse Materials Collector
		Resource Recovery and Reclamation Specialist
		Restoration Field Specialist
		Restoration Land Specialist Post Fire
		Solar Turbine Overhaul Test Technician
		Transfer Station Operator
		Waste Management Collector-Operator
		Water-Sewer Remediation and Construction Laborer
		Wind Turbine Service Technician

Transition Roles

The list of the roles identified as Transition roles are shown in Figure 6. With upskilling, additional experience, or formal education or certifications, these destination roles may be achievable with 2 years or less of additional development. Often but not always they also are available without post-secondary education and do not require a four-year degree. They are destinations for transitioning workers because of the lower formal development requirements.

It should be noted that some of these roles – as with many early careers or new-to-work or semi-skilled roles in any field - will also be possible targets for increased automation and technological support. The evolution in sustainability and additional investments may change the lifespan for these roles after initial transitions.

Once initial experience has been achieved by a transitioned worker in these areas, additional reskilling or secondary transitions and progressions may be required for those that are evolving more quickly than others, whether because of increasing value and responsibilities, automation, role redesigns or other factors.

Manpower also sees that additional roles will be added to the Transition list as some of today's professional roles that currently require a 4-year degree will themselves become Transition roles. The future will likely bring additional technology and integrated processes to engineering, business/technical roles, and other business and economic arenas specific to sustainability. As this happens, some of those professional level roles can be performed by workforce incumbents after two years or less of additional development versus a four-year degree program completion.

- Alternative Agricultural Grower
- Aquaponic Farm Operator
- Biological Monitor Assistant
- Biological Technician
- Biomining Field Lab Technician
- Carbon Capture Sequestration System Installer
- Carpenter
- Citizen Science Grid Sentinel
- Clean Energy Technician
- Climate Change Program Associate
- Climate Justice Communicator
- Climate Team Campaign/Community Organizer
- Communications Associate
- Community Liaison
- Community Network Coordinator
- Compliance Administrator
- Computer Technician
- Conservation Action Coordinator
- Conservation Laborer
- Conservation Officer
- Conservation Technician
- Construction Laborer
- Construction Trades Worker
- Crane Technician
- Customer Return Experience Coordinator
- Decarbonization Analyst
- Decarbonization Technician
- Desalination Operator
- Early Childhood Care Delivery
- Eco-Infrastructure Builder
- Ecological Field Crew Laborer
- Ecological Field Crew Technician
- Electrical Technician
- Electronic Data Interchange (EDI) Analyst
- E-Mobility Grid Installer
- Energy Monitoring System Operator
- Engineering Technician
- Environmental Interpreter
- Environmental Management Specialist
- Environmental Program Manager
- Environmental Science & Protection Technician
- Environmental Technician
- Event Planner/Manager
- Farm Maintenance Technician
- Farming, Fishing, and Forestry Laborer
- Farmworker and Laborer, Crop, Nursery, and Greenhouse
- Food and Agriculture Campaigner
- Forest and Conservation Worker
- Forest Restoration Officer
- Geoinformatics Technician
- Geoscience Program Coordinator
- Geothermal Technician
- Hazard Assessor Health & Wellness Advocate
- Health & Wellness Program Coordinator
- Health and Wellness Assessor
- Housekeeper/Janitor
- Human Service Care Assistant
- Hydroelectric Plant Technician
- Industrial & Community Water Process & Compliance Coordinator
- Insulator
- Inventory Specialist
- IT Specialist
- Laboratory Technician

- Lead Solar Installer
- Material Processing Operator
- Merchandiser
- Natural Resources Youth/Comm. Program Coordinator
- Occupational Health and Safety Technician
- Oil & Gas Service Unit Operator
- Passive/Sustainable HVAC System Installer
- Pesticide and Vegetation Management Technician
- Photonics Technician
- Prepress Operator
- Product/Service Tracer
- Production Assembler
- Quality Assurance Technician
- Recycling Maintenance Mechanic
- Recycling Material Collector/Sorter
- Remote Inspections Drone Pilot
- Renewable Energy Sales Consultant
- Residential Solar Canvasser
- Return Lead Technician
- Sustainable Manufacturing Process Technician
- Sustainable Software Quality Assurance Tester
- Sustainable Water Infrastructure Installation & Maintenance Laborer
- Topic Pulse Moderator
- Urban Farmer / Hydroponic Farmer
- Warehouse Damage/Returns Processor
- Return Material/Inventory Stream Facilitator
- Shared Transit Driver
- Social Innovation Advocate
- Solar Cell Technician
- Solar Communication Technician
- Solar Electrician
- Solar Photovoltaic Equipment/Panel Installer
- Solar Turbine Assembler
- Solar Turbine Overhaul Test Technician
- Structural Welder
- Sustainability Activist Consumer
- Sustainability Activist Investor
- Sustainability Advocate
- Sustainability Campaign Associate
- Sustainability Evangelist
- Sustainability Historian/Archivist
- Sustainability Systems Testing and Evaluation Specialist
- Sustainable Automation Technician
- Sustainable Fashion Stylist
- Water Management Lab Technician
- Water Quality Field Technician
- Water-Sewer Remediation and Construction Laborer
- Wave Energy Producer - Operator
- Weatherization Installer
- Wind Turbine Installer
- Wind Turbine Service Technician

Figure 6: Transition Roles

Critical Roles

The last and most often cited additional view is that of Critical Roles. A Critical Role is a role from the SSLC Role Community which we expect to contribute significantly to the sustainability evolution and to possibly attract major interest for more definition and development focus. These roles suggest a focus of new emphasis in various sectors, 'sooner than later' for consideration, and possible early direction for workforce planning or workforce scaling efforts. In identifying Critical Roles, we asked ourselves:

- **Which roles are some of the best examples of the wider sustainability community showcasing the breadth and depth of sustainability solution roles, whether conventional, native, or emergent, and establishing a more integrated view of sustainability?**
- **Which roles as an initial set can be better understood in terms of being important, innovative, or differentiating across all sizes and types of employers?**
- **Which roles do industry and academia partners see as appropriate for early messaging and introducing the taxonomy as whole?**

- **Which roles may deserve more mass development efforts to accelerate their place in the broader sustainability workforce?**

Several images and Futurecasts of Critical Roles are provided.

- Figure 7 shares the percentages of Critical Roles in each subcommunity.
- Figure 8 shares the Futurecast of the full list of all Critical Roles.
- Figure 9 through 13 show the Critical Roles list in each subcommunity.

As a preview to generally understanding the importance and usefulness of classifying Critical Roles, consider the following:

1. There may be some overlap of Critical Roles with some of the roles we have identified as having major impacts such as Pioneer or Keystone Roles. That replication aligns to both categorizations. Critical Roles that are also Pioneer and Keystone deserve even more attention or further consideration as a kick starter role for focus or leadership.
2. That said, some of these critical roles may be newer, future or emergent roles but not all future roles are necessarily the same as Pioneer Roles. They are just newer to the workforce and employers and could be Pioneer, Keystone or Producer. They may also be solo players of sorts but important new Producer roles.
3. Some Critical Roles are some of the most novel roles that showcase how the broader set of roles establishes differentiators in sustainability-oriented workforces. The Critical list is notable as specific roles and capabilities that showcase the transition of conventional sustainability; some can qualify as game-changing roles for broader sustainability development and use.
4. Critical Roles won't be the only ones to be seen as important – that is certain – but we believe it is essential that in this research a good portion of the roles overall are suggested to receive initial further study and consideration. We suggest the Critical Roles may or should get some early special attention

from workforce development resources, academia, employer hiring managers, government reskilling programs. They also should be on high alert as interesting and opportunistic employment for potential or current candidates.

These groups and employers generally should consider how Critical Roles would have significant importance for the associated organization or be attractors for workforce that want to make contributions, develop key skills, and have opportunities for progression. And if they are not needed for direct employment, what do they mean to supply chains, community efforts, direction setting and partnerships for an organization?

Figure 7: Allocation of Critical Roles by Subcommunity

FUTURECAST #14: All Subcommunities, All Critical – ▶2022 ▶2030

Ecological and Environmental

Biomimetic Process Designer
Biomimetic Product/Component Designer
Biomimicry Specialist
Chief Sustainability, Environmental & Safety Officer
Ecological Value Assessor
Energy, Water and Material Balance Planner
Environmental Engineering Project Manager
Environmental Science & Protection Technician
Environmental Technician
ESG Program Management Integrated Initiatives Lead
Geoinformatics Technician
Geoinformation Analyst
Global Decarbonization Project Manager
Pollution Solution Advisor
Renewable Energy Advisor
Restoration Ecologist
Sustainable Chemist
Water Quality Field Technician
Water Quality Manager
Water Waste Investigator

Infrastructure

Drinking Water Treatment Plant Operator
E-Mobility Grid Installer
Energy Source Integration Engineer
Facility/Campus Energy Optimization Engineer
Lead Solar Installer
Long-Duration Energy Storage Engineer
Power to X Optimization Architect
Recycling Coordinator
Solar Energy Installation Manager
Solar Operations & Maintenance Supervisor
Solar Photovoltaic Equipment/Panel Installer
Solar Turbine Assembler
Streaming Service Energy Optimizer
Sustainable Builder
Sustainable Construction Materials Technologist
Waste Management Specialist
Wastewater Treatment Plant Operator
Water Recovery Specialist
Water Resource Management Specialist
Wind Energy Operations Manager
Wind Turbine Installer

Manufacturing

Biomimicry Manufacturing Specialist
Industrial Ecologist
Industrial Sustainability Engineer
Materials Engineer
Materials Scientist
Photonics Technician
Product Designer
Remanufacturing Engineer
Sustainability as a Product Strategist
Sustainability Product Designer
Sustainable Additive Materials Engineer
Sustainable Automation Technician
Sustainable Factory Engineer
Sustainable Manufacturing Process Engineer
Sustainable Manufacturing Process Technician
Sustainable Packaging Engineer
Sustainable Product Designer
Sustainable Product Innovation Strategist
Sustainable Product Sales Specialist

Community

Climate and Social Equity Specialist
Climate Change Policy Analyst
Climate Justice Policy Analyst
Climate Migration Specialist
Community Economic Development Director
Economic Development Specialist
ESG Program Managing Chair
ESG Reporting Manager
Sustainability Behavioral Change Specialist
Sustainability Policy Development Specialist
Sustainability Talent Recruiter
Sustainability Workforce Planner
Workforce Equity Recruiting Strategist

Cross-Industry

Bio-Based Business Solution Architect
Carbon Neutral IT/Cloud Architect
Chief Diversity, Equity, Inclusion & Belonging Officer
Chief Mission Officer
Chief People Officer
Chief Risk Officer
Chief Sustainability Officer
Climate Ethicist
Community Network Coordinator
Digital Nudge Technologist
Digital Transformation Advisor (Green IT Transformation)
Diversity, Equity, Inclusion and Belonging (DEIB) Program Manager
Efficiency & Optimization Specialist
Enterprise Sustainability Culture Change Management Specialist
ESG Auditor
Evidence-Based Sustainable Use Evaluator
New Loop Economy Architect
Organizational Biologist
Procurement Manager
Product End of Life Specialist
Product Life Cycle Manager
Product Manager
Product Recovery Specialist
Quality Assurance Specialist
Quality Control Manager
Quality Manager
Remote/Hybrid Work Designer
Renewable Energy Operations and Maintenance Specialist
Resource Balance Planner
Responsible Sourcing Specialist
Risk/Opportunity Modeler
Social Innovation Advocate
Supplier Diversity & Sustainability Manager
Supply Network Sustainability Compliance Manager
Supply Network Sustainability Global Compliance Manager
Sustainability & Regenerative Economist
Sustainability Analyst
Sustainability Financial Risk Specialist
Sustainability Financing Strategist
Sustainability Metrics Manager
Sustainability Partner Integration Planner
Sustainability Sales Account Manager
Sustainability Solutions Architect
Sustainability Solutions Sales Engineer
Sustainability Transformation Leader
Sustainable Cloud Engineer
Sustainable Engineer
Sustainable Supply Network Manager
Vendor Collaboration Coordinator
Quality Assurance Technician

Critical Roles for Adjacent Sub-Community Not Identified

Figure 8: Futurecast #14 All Subcommunities, All Critical Roles

Figure 9: Futurecast #15 Cross-Industry Critical Roles

Figure 10: Ecological & Environmental Critical Roles

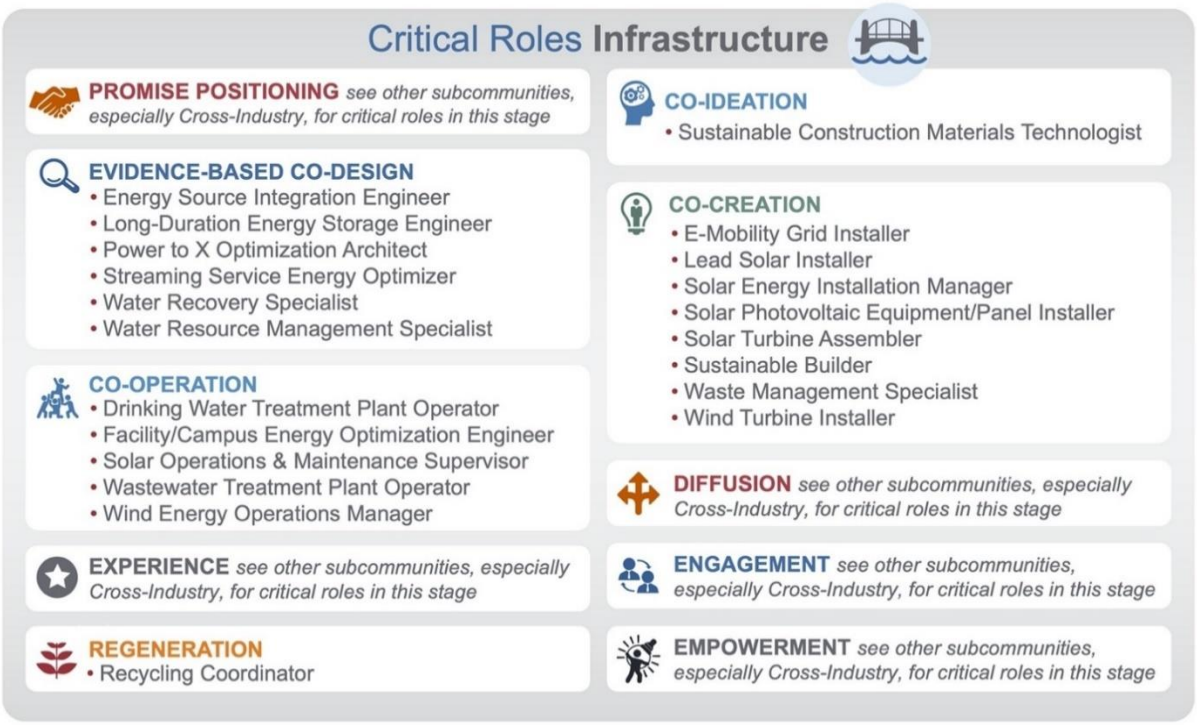


Figure 11: Infrastructure Critical Roles

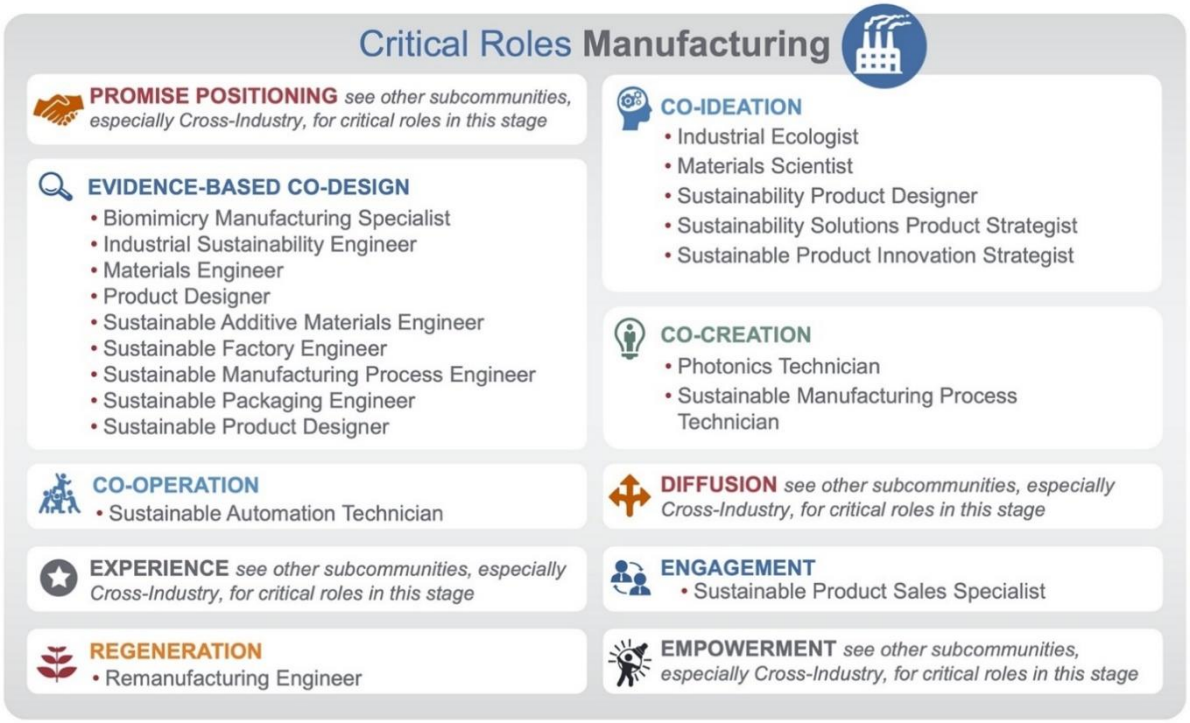


Figure 12: Manufacturing Critical Roles

Figure 13: Community Critical Roles

All stakeholders should consider how Critical Roles would have significant importance for their organization or be attractors for the workforce that wants to make contributions, develop key skills, and have opportunities for progression. Again, these are only 20% of the taxonomy and are not established as the specific mix for success. Stakeholders need to look at roles beyond these but use these as a litmus test for criticality, especially those in the Cross-Industry and Eco/Environmental subcommunities, as well as learning about the broader Sustainability Workforce.

Last Look at the 775+: Role Categories and Range of Roles

Across all of these 775+ roles, one last way to look at them is how they relate to each other by general function, level, and education.

There are **seven role functions** that we use to classify the level of each role from laborer, service/office/clerical roles through other individual performer roles, first line leaders and senior professionals and then managers and senior leaders. This basic classification helps position and manage similar scopes of responsibility and general educational or experience backgrounds across the taxonomy. Our role identification and analysis of levels revealed:

- **23%** of the roles (~170 in our review scope) are likely available to candidates not needing a 4-year degree (total of laborer, et.al., technical/representative; skilled technical and paraprofessional).
- **61%** of the roles - the majority (~450 in our review scope) are professional roles and likely require at least a bachelor's degree. However, we project that with the increased focus on filling sustainability roles, some of these will be achievable by 2-year certification programs or equivalent for experienced skilled technical and paraprofessional workers as more of those programs become available and target the essential skills of those professional roles.
- **16%** of the roles (~125 roles in our review scope) are senior professional, management, and executive roles with likely the same academic readiness as the broad professional category.

Category of Role	% of total roles in Taxonomy
1. Laborer; Laborer+; Service/Office/Clerical Representative	4%
2. Technical/Representative	4%
3. Skilled Technical	8%
4. Paraprofessional	6%
5. Professional	61%
6. Senior Professional	10%
7. Management/Executive Leadership	6%

Note: lists of all 775+ roles by role level category are not published in this edition.

Summary

Our initial structures of the Sustainability Solution Workforce community – at the overall community level and with the many filtered groupings - provide a "Gen 1" dictionary of the workforce. Building out the role framework results from additional data tags, filters, and segmentation views that enrich the perspective of how the workforce is changing and evolving.

We defined roles by *role domains* as the backbone mapping of roles to the ten domains/stages of the SSLC. Next, we looked at how the roles range in terms of their generations or *role stages* of adoption and legacy in the workforce. Roles were classified as *modernized* (updated existing and conventional roles), those roles that are *sustainability-native*, and other roles that are still coming into mainstream sustainability work and so are seen as *emergent*. Hopefully smiles happened when roles including Frog Watchers, Bear Conflict Mangers, and Beekeepers appeared in the same list as Chief Sustainability Officers, Environmental Engineers, Edible Packaging Engineers, and other roles; all of these are examples of the specific roles in the Sustainability Workforce.

Additional tagging of the roles was based on their *impact* to the overall transformation of the workforce and the work occurring at solution providers, users, and the broader business ecosystem**.** Roles mapped to impact position how the role influences the development and evolution of the Sustainability Workforce and the sustainability capability of an employer or organization – these are organized by *Pioneer*, *Keystone*, and *Producer*.

Two other key designations of roles were 1) *transition* role destinations for transitioning workers showing roles that are likely achievable with upskilling, additional experience, or formal education or certifications of 2 years or less; and 2) roles identified as *critical***,** positioned as early focus for employers, educators, government, and the workforce as a solid set of the "first critical" roles versus "only" to consider. And lastly, we shared roles by *levels*: from executives to clerical or basic service roles to see the initial organizational connections and initial education and experience requirements.

These simple designations provide robust and useful ways to segment the broad community of roles and can help with many workforce planning and development decisions. They become the lexicon and vocabulary for sustainability in action and serve as the dictionary of work and workers. Each organization can see themselves and their better versions through the New Mix of these roles as they envision, manage, plan, develop, and embrace the needed people and capabilities.

Section 8: Selected Roles in Action

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Section 8: Selected Roles in Action

Introduction

Our view on sustainability roles have been introduced, domains set, roles mapped, and key filters applied to align roles to impact, stage, and levels. It's time to view the roles from a few other *applied* points of view. Provided in this section are six additional vistas, each providing a view of resources or actions to advance the Sustainability Workforce.

Sharing early actions for leaders to establish the necessary culture to support the Sustainability Workforce in action is a good starting gate. From there, we provide three categories of skill, knowledge, and capability foundations that give insights on where to assess broad learning and development needs and get workforce development moving. Next are two approaches of how roles can be profiled to set models of expected performance and give realistic previews. We finish off with looking at the roles from their specialization categories and then seeing them in action chains for team or process groupings.

1. **Culture of Sustainability and Leadership:** If you are interested in sustainability being more than a slogan or empty promise, you should review this subsection carefully. We share our initial thoughts and basis for future work on culture. The Culture of Sustainability Leadership preview establishes the underlying need to orient holistically around sustainability (e.g., a 5P perspective) and incorporate it into company values, expectations, and target behaviors as an essential foundation for sustainability progress in any organization.
2. **Highlighted Skills:** Our extensive lists of highlighted skills provide a menu of needed skills, knowledge, and capabilities (SKC) across the role taxonomy. In a skill-based workforce development market, collections of these are useful for many talent management and workforce development purposes. Further detailing and mapping of SKCs to roles or progressions or for comparison to existing learning courses and paths are just some of many options for their use. While certainly only a framing for higher level SKCs, these lists are the most comprehensive and broad list that we've seen to help inform what are essential skills, knowledge, and capability requirements across the wide arena of sustainability Green+ and turquoise roles.
3. **Success Profiles:** An example of our success profiling work showcases one of our key sustainability roles. How can we detail a critical role and identify what it takes to be successful? See how an identified critical role - the Manufacturing Biomimicry Specialist - is profiled using our industry-leading approach, presenting the broad and deep information describing and positioning a critical role and what it brings to the organization, customers, and other stakeholders. Our success profiles have been used for job design, workforce and staffing business case development and funding, compensation mapping, and career counseling and curriculum development for certifications, community college programs, and university degree-granting courseware design.

4. **Talent Snapshots:** Examples of our talent snapshots illustrate three sustainability roles in a targeted format to highlight key candidate attributes. These formats communicate needs and desired candidate backgrounds and aspirations in realistic and inviting ways. Our talent snapshots help recruiters, workforce planners, trainers, and job seekers alike to get a preview of both the work and candidate profiles.

5. **Callouts on Specializations:** A special section reminds us of some macro high-value talent groups across the Sustainability Workforce where we see increasing interest and need from our clients at the same time that we see expanding opportunity. Six callouts introduce another lens to use to see today's and tomorrow's demand for modernized, native, and emerging skills and experience that are essential to sustainability success.

6. **Action Chains:** Our Action Chains bring together 10-12 roles in a networked set of skills and capabilities usually working together on a key process or initiative in sustainability. We suggest you revisit the Action Chains housed in our Perspectives Section 3. Those Action Chains showcase many roles - over 100 - in action across the 10-stage SSLC.

Leadership and a Culture of Sustainability

Culture in most any context is important to understand and address as it's the background to unifying and identifying people as well as driving the priorities and the actions of those who adopt the culture. Members usually preserve and promote their culture and will often go to great lengths of effort to either protect, or, if they aren't in alignment with the prevailing culture, to change or create barriers.

So why also consider the culture of sustainability and the role of leadership when focusing on workforce transformation? For the last several decades in corporate and business arenas, leaders have had very public responsibilities to manage and improve corporate culture to optimize employee engagement and performance. Culture has been seen and measured as a driver of business performance. As Forbes reported, today's market is hyper-competitive, and employees expect a lot more from the companies they work for. Employee expectations are closely tied to their values. When employers deliver on these expectations, they see more loyal and productive employees, which in turn improves business outcomes and propels company growth. Companies with strong cultures have seen a 4x increase in revenue growth. Furthermore, companies that have appeared on Fortune's annual 100 Best Companies to Work For list also see higher average annual returns, with cumulative returns as high as 495% instead of 170% (Russel 3000) and 156% (S&P 500).

When analyzing a business organization, community, or society, social and organizational experts often think of culture in terms of two sets of cultural attributes. First are "**the seen**": the overt elements of the lifestyles and living environments, the actions and behaviors undertaken, and the stories and histories told. Culture also includes – and is often driven by or reinforced in ways that make change a challenge by – "**the unseen**": the less observable and more internalized values, attitudes, behaviors, expectations, and inherited customs that actually steer the overt parts of the culture.

Most people act or hope to act in concert with the groups and affiliations where they associate, and most people strive to act in alignment with their personal beliefs and accepted values and beliefs. Humans also want their actions, settings, values, and beliefs to be transmitted to future generations, especially if they would increase the ability for those generations to continue.

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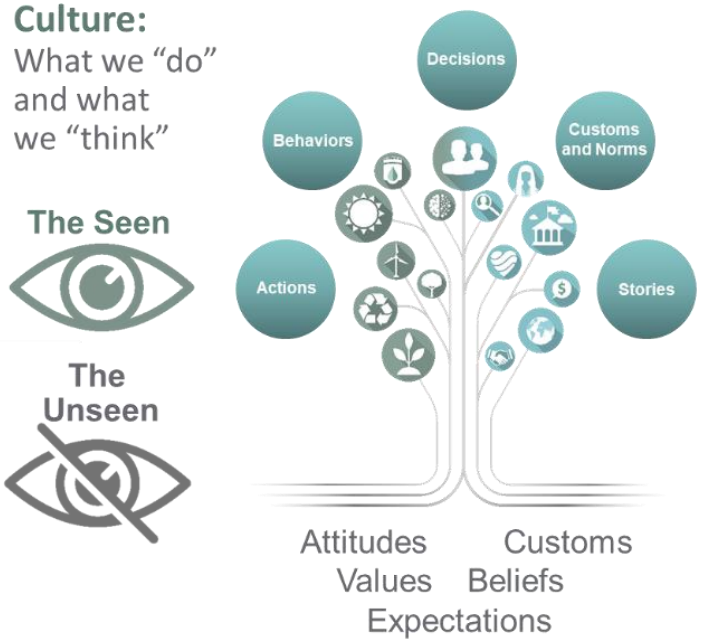
Sustainability, like culture, ideally also has the goal of preserving, progressing, and providing both for today and tomorrow. So, it would follow that a lasting culture that supports longevity and resiliency would line up easily with a culture of sustainability as we position it. Sustainability would be the culture of choice in all settings with a focus on continued ability to thrive across generations. We obviously haven't always achieved that alignment in equitable and holistic ways!

Focus on building and maintaining an aligned culture of sustainability will be essential for workforce transformation. Ties between culture and sustainability can be built with a look at three layers of connection.

In Figure 1 we can first apply a generic framework of business culture to our 5P view of sustainability.



We can translate generalities into specifics that will support the workforce transformation plans and strategies. The "seen" (those specific actions, behaviors, decisions, norms, and customs) take the form of our experiences and interactions with the world – the structures, infrastructure, products, processes, and environmental interactions also known as the "built world"; our social and workforce patterns; our policies, economies, profit seeking behaviors and other governing behaviors - all driven by the less obvious and the "less seen" and often unexplored or unrecognized values, beliefs, and innate customs.

Figure 1: Seen Unseen Culture

A second layer is for leaders to connect operational sustainability to meaningful ESG programs (Figure 2).

This is an invitation for leaders to begin or continue to build their cultures of sustainability. Working to understand where in communities and organizations cultural alignment to achieve sustainability needs attention, leaders can consider several reasons why addressing culture is essential:

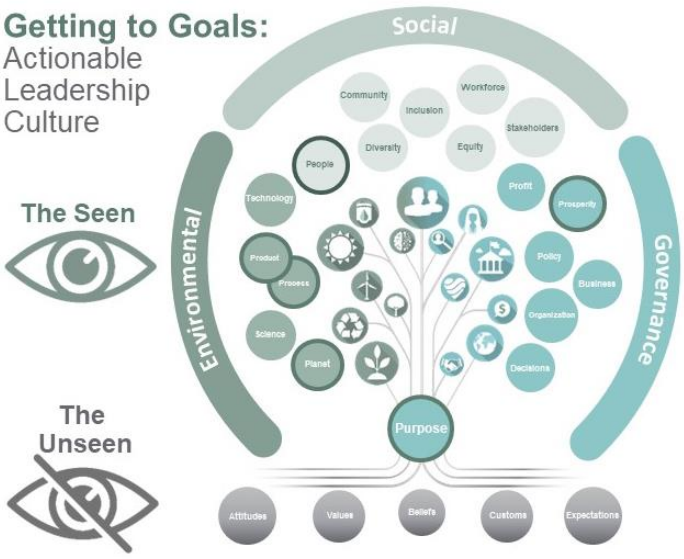


Figure 2: Seen Unseen Actionable ESG Leadership

- **Aligning identity and priorities**: Companies and other elements of society as a whole are still defining what sustainability actually means to them, and regardless of a calibrated definition, they think and perform across a range of maturity on their way to a more sustainable status. Especially for businesses, that often still approach movement towards sustainability "only if a business case supports it", one could suggest a look across the 5P framework. Businesses often need to look a bit harder and at more of their unseen culture first – both to align and then to determine both opportunistic and then obligatory priorities. What actually are they valuing? Easier short-term profit or longer-term prosperity that may require some changed and shared investment? Prosperity at the expense of people or planet? Or at the cost of lost innovation and efficiencies on product or process? Preserving an increasingly outdated focus on ego-centered purpose?

- There are many debates these days about the role of commercial business in social agendas. And even if the effort to (re)align in consideration of social challenges, companies can still at the very least consider how their values around their processes, product offerings, and resource utilization contribute to environmental impact, increased costs, and the stall of innovation that can impact their business viability. So, to resolve any scope of an identity crisis, leaders need to be sure the seen and the unseen aspects of culture align and that they work for all the stakeholders in the current and future arena where that business operates.

- **Agendas and business strategies**: Actioning identity and priorities into agendas, business strategies, and related initiatives gets its energy and power from how strong the alignment is between the seen and unseen. We know that culture is the sum collection of our seen and unseen beliefs and actions. And we know that "culture eats change for breakfast". If the seen and unseen, the beliefs and the actions don't align, then any change - especially hard and needed change - is in jeopardy and status quo likely continues. Many a business initiative or entire strategy has been undone by an opposing and often hidden culture that resists the change. So, making sustainability a conscious exercise and a regular part of the business and organizational agenda, regardless of the current level of providing or using sustainable solutions, gives it the oxygen to grow at any step of the way.

- **Be obvious!** Nothing says the company or organization is making a commitment like staffing sustainability roles and setting expectations that they deliver. Through expanding or initiating the New Mix of sustainability roles, the rest of the stakeholders see the change and the chain of new and different actions, beliefs - the new aligned culture.

Another layer of connection is of both seen and unseen culture, not only aligning to ESG but aligning to our 5Ps (Figure 3).

Expect action and change from your organization. Give proper placement to a Sustainability Workforce on the commercial, social, and economic agenda. We invest in people, their contributions, and their potential performance where we think there is value. Workers, jobs, and employment are a proxy for what society values – and the values don't have to be, and often can't be, only economic. Show the well-rounded value of the workforce and their current and future contributions to the organization and more broadly by first giving them a badge, a set of goals, and the environment in which to succeed and grow.

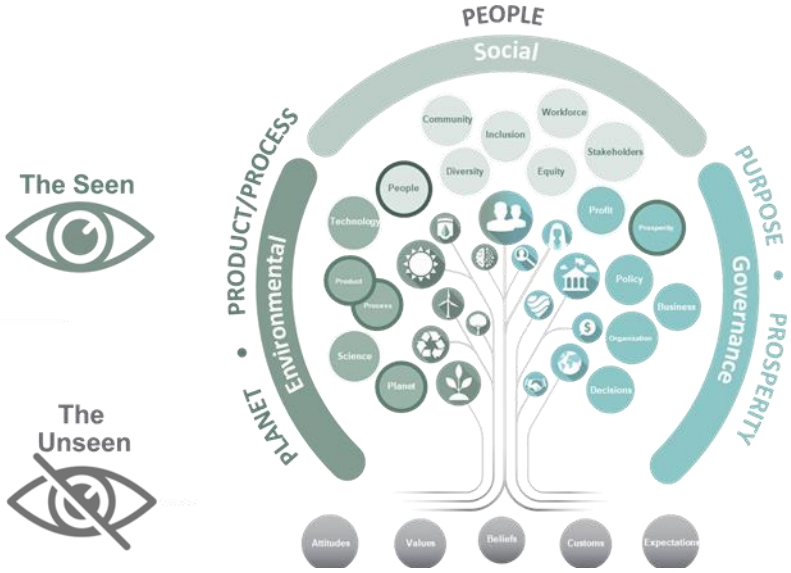


Figure 3: Seen and Unseen - The 5P Alignment

Is there some other early guidance can we generally share around improving and moving to a better and more prosperous business culture and aligned workforce that nurtures sustainability solutions and opportunities? We offer a "First 4" set of broad practices for kickstarting a cultural consideration. Aspects of this are more strategic and foundational. We also share some practices later on this topic that are more solution oriented and tactical.

First, let's consider these first four sustainability culture actions for leaders below in Figure 4:

Figure 4: Leadership "First 4" Kickstarting Culture

1. **Get smart about culture's impact on business results;** create culture for advantage. Here we suggest first getting real and getting smarter about how culture can derail even intentional business strategy whether it's currently sustainability-oriented or not. Considering there are many advantages to both a business strategy and a culture of sustainability, the right set of beliefs and values around sustainability can better align to some of the modernized beliefs and values of employees and stakeholders, such as collaboration, inclusion, diversity, environmental stewardship, and systems thinking. Conversely, outdated alignment between values and expectations with behaviors and decisions will stall any agenda and

chip away at employee engagement. It gets very expensive to derail one's own plans by not considering the impact of culture on results. *The first step to aligned culture being an advantage is to realize that the "softer side" of business may actually be the harder side of leadership.*

2. **Evolve values; use principles of sustainability as a path** to long term resilience and innovation. We encourage leaders to revisit, explore, and adopt modernized and future-focused company and commercial values around sustainability benefits. The opportunities – whether gaining first educator advantage, first mover advantage, or faster pivoting – can be exactly what business needs to enable future growth as well as resilience.

3. **Encourage study, learning and exploration** of what is behind the beliefs and convictions related to sustainability challenges, opportunities, and potential performance. Beyond conversations on mission and values, encourage leaders, strategy or planning groups, and operational teams to identify and align the seen and unseen. Look for and understand facts, evidence, reality, data, proof, experience around the issues, and opportunities for all the sustainability drivers – from resource management to innovation. Working with additional information and evidence on how sustainability can benefit business as much as society and the environment informs values setting and extends to agenda setting, action planning, opportunity positioning, and performance.

4. (Set expectations and then…) **Raise your expectations**: Winks and nods aren't going to be enough to either support more sustainability-oriented change or with the changing dynamics and disruptions that are enough to keep a brown agenda as either conscious direction or an acceptable default. Translating possibilities into actualities benefits from setting goals and accountability, and this couldn't be truer in the sustainability arena. Be direct and to the point about setting specific goals, expectations, and accountabilities across the workforce for their part of the effort to capture the opportunities as well as be a measurable problem solver. Some of the failures and stalls on sustainability in the past have been a lack of information, imagination, and inspiration. Setting expectations in overt ways should accelerate the progress now that many areas of opportunity and know how have their baselines.

Society, communities, companies, and workforces have a big hill to climb when it comes to changing aspects of their cultures, values, and actions to those of and in support of sustainability. While it's been centuries in the making to get to this point of having to think differently of our relationship with earth and with each other and to find economic philosophies that are sustainable, there are immediate and increasing demands to make those changes and put our actions in parallel with more informed and realistic beliefs, expectations, and values for a broader group of stakeholders.

It's no small effort. It's not a new program. It's not a "project" or series of declarations or annual reports that will improve or change culture. The book of best practices for sustainability solutions is in its early drafts. However, there are more short term and tactical actions to be taken as continuous culture change occurs.

Below in Figure 5 are examples of several seen and unseen practices that, when consistently implemented, can be obvious signals of different times, opportunities, and the settings for expanded sustainability workers, skills, and performances.

Figure 5: Actionable Culture of Sustainability: Practices

Taking these actions and their many related approaches reinforces the values and beliefs that sustainability is an opportunity, a resource efficiency strategy, a social commitment, a consumer response, and an act of environmental stewardship.

This Culture of Sustainability call to action for leadership comes at this critical time for sustainability workforce transformation. Leaders will also need to be reoriented to setting up and leading in the 5P operating environment. They have a workforce transformation amongst themselves as leaders as much as the rest of the workforce. They need reskilling. The conventional approach of awareness and general literacy for leaders isn't enough, but awareness and basic sustainability literacy is still needed by many. If the effort by leaders isn't actionable leadership and if cultural alignment and work doesn't evolve as well, it is actually a barrier. Old habits die hard, "culture eats change for breakfast", and thinking the old culture can support the new sustainability opportunities and needs is actually part of a weak default position or some stage of denial. All is lost opportunity.

With our current challenges and disruptions, we don't have that luxury. Actionable leadership is essential, and culture is part of the foundation. There are many opportunities for doing well by doing good that leaders should welcome as their responsibility. It leads to adaptability and resiliency as well.

These initial thoughts remind us that there is foundational work - some decades in the making, and more that will take decades to evolve - to establish a better shared culture for sustainability to be successful. Culture enables people to communicate, build relationships, and create social structures at any level, whether team, company, country, or region where shared interests and tolerance of differences enables the exchanges of resources, talents, and products more efficiently and effectively.

Many of the roles we view here are squarely aimed at setting the right business and social 'environment' where culture exists. From business leaders, solution strategists, financial modelers, behavioral change experts, community coordinators, and others, some of their contributions will be measured by how well they move culture overall towards more sustainable provisioning and use. Their KPIs include establishing and maintaining a Culture of Sustainability Leadership, a zone for opportunity and improvement in any sector or at any level of current sustainability progress.

Highlighted Skills

The next stop on this action tour provides a view of the wide landscape of knowledge, skills, and areas of capability (SKCs) needed across the sustainability solution roles. Our extensive lists in three categories provide a starting menu of the broad range of business, technical, and professional knowledge, capabilities, and experiences that will transform our futures and create value and growth in new, more sustainable arenas. While certainly only a framing for higher level SKCs, these lists are the most comprehensive broad lists that we've seen to help inform what are essential skills, knowledge, and capability requirements across the wide arena of sustainability Green+ and turquoise roles. Three categories organize over 350 skills that can be further aligned with specific tasks and performances, roles, processes, profiles, learning designs, and many other capability readiness, assets, and activities.

These next assets are a resource to help answer:

What are some of the essential skills, knowledge, and capability requirements across roles that employers need?

What studies and training should our education system expand as we ready students for employment?

What should our ongoing professional development, continuing education, or reskilling/upskilling in any form provide to improve our workforce capability?

What capabilities should I develop next as I enter or advance a sustainability job?

In the World Economic Forum's Future of Jobs Report 2020, employers estimate that four in 10 workers will need to be reskilled. Almost half of young people feel they don't have the right skills, according to the World Economic Forum's Davos Labs Youth Recovery Plan 2021.

The good news, however, is that the transition to a green economy will add an estimated 60 million new jobs to the market by 2030. According to ILO, "The green transition can generate millions of jobs, but these are conditional on the availability of relevant skills and training." In a skill-based workforce development market, having a head start on collections of SKCs are useful for many talent management, assessment, and development purposes.

Who should consider this list? Any stakeholder needing to better understand the roles and assemble the combinations of skills needed. Whether one is a sustainability-focused business leader planning their sustainability function, a trainer, a university or community college course instructor, a green and turquoise jobs recruiter, a workforce researcher, a curriculum planner in a school district, or a candidate updating their LinkedIn profile, your search is over for a composite list of sustainability skills, knowledge, and practice areas. Figure 6 provides broader category definitions.

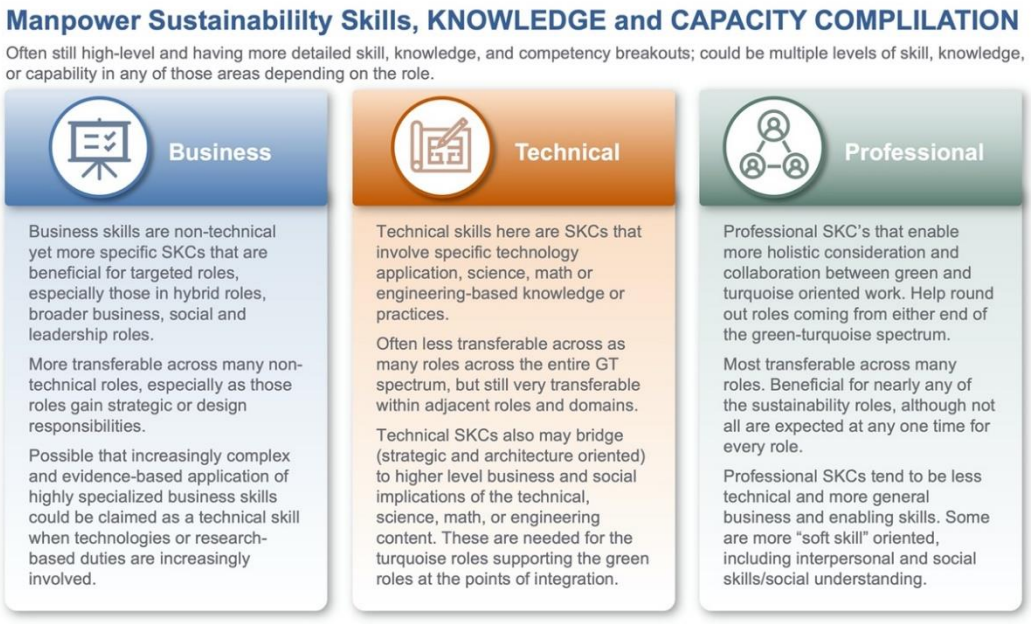


Figure 6: Manpower Sustainability Skills - Category Definitions

The following Figures 7-10 present the initial view of Manpower's collection of sustainability skills.

FUTURECAST #16: Sustainability Business Skills – ▶2022 ▶2030

CURRENT & FUTURE – Representative Skills, Knowledge and Capabilities

5P Orientation (People; Planet; Process/ Product; Purpose; Prosperity/Profit)
Bio-business arenas, opportunities and connections
Biomimicry Life's Principles application to social innovation and governance
Biopiracy laws and mitigation strategies
Biosystems measurement(s)
Business to science abstraction
Circular (closed loop) economies/economic development, strategies and practices
Circular business models
Circularity general principles
Cities and lifestyles sustainability assessment
Climate impact/carbon reduction issues per stakeholders
Community and economic development
Community cultural awareness
Community relations
Conscious sourcing
Consumer energy system access practices
Consumption habits impacts
Customer expectations management
Debt relief practices, policies and regulations
Disclosures and standards systems
Diversity, equity, inclusion, and belonging strategies and practices
Eco-Bio-Chemical or assigned domain business issues and opportunities
Economic development
Emergent markets development
Emergent markets financing
Equitable loans and financing alternatives
ESG auditing
ESG planning, program management and reporting advising
ESG reporting
ESG standards
Global sustainability economic development collaboratives
Global/national sustainability standards and goals management
Green financing
Greenhouse gas emissions reduction
Health & safety management
Hybrid work management
Innovation
Interdisciplinary solutioning
Land reform
Lead generation for sustainability solutions
Leadership and culture
Learning, training and development
Life cycle total impact/total cost of ownership analysis
Life cycle-oriented solution development
Life-friendly science basics for non-science professionals
Local labor conditions, practices & policies intelligence
Managed migration and relocation
Management and organizational leadership
Measurement and reporting
Multi-use plastics innovation
Net zero carbon offset planning
Offset Alternatives Improvement Strategies
Optimal resource use advising
Optimization & constraint management
Parity, equity & justice management fundamentals
Partnership facilitation & management
Process innovation
Product innovation
Product life cycle management
Product stewardship
Public-private partnerships
Public-private resource conservation and management
Public-private solutioning
Reduced material use
Renewable energy powered infrastructure design and management
Renewable energy strategies and systems
Reputational capital
Resiliency risk modeling
Resource efficiency/optimization
Responsible sourcing
Social entrepreneurship
Soft mobility
Stakeholder representation
Supply chain sustainability
Sustainability disasters, disruptions & conflicts
Sustainability solutions sales
Sustainable brand capital management
Sustainable brand strategies and communications
Sustainable commuting and transportation engineering and management
Sustainable event planning and management
Sustainable fossil fuel management
Sustainable procurement
Sustainable product development
Sustainable supply networking
Sustainable travel planning
Sustainable venue and event planning and management
Sustainable materials use
Systems thinking & design
Transparency in communications and decision making
Waste minimization
Waste reduction strategies and processes
Water conservation and stewardship strategies and processes
Water Replenishment Engineering
Workforce development
Workforce planning
Workforce recruiting

Figure 7: Futurecast #16 Sustainability Business Skills

FUTURECAST #17: Sustainability Technical Skills – ▶2022 ▶2030

CURRENT & FUTURE – Representative Skills, Knowledge and Capabilities, Part 1

Additive materials engineering
Air quality monitoring and management
Atmospheric science (short-term weather patterns and long-term climate processes)
Battery engineering
Battery management systems
Benign material compositions
Biochemistry
Biodiversification
Biodiversity systems management
Bioengineering
Biofuels processing
Biological/scientific content translation to socio/economic/business content
Biology
Biomass conversion
Biomass plant management
Biome/biodiversity disruption
Biomimicry
Biomimicry Life's Principles application to built world, material, product & process innovation
Biomimicry Life's Principles application to environmental and natural systems management
Biomining engineering and technologies
Bioprocess photonics and sensor technology
Biosafety
Botany
Byproduct optimization
Carbon footprint/impact analysis
Carbon neutral cloud architecture design
Charging station installation
Climate action
Climate psychology
Climatology
Community impact
Compliance penalties
Compostable materials
Compostable packaging
Conservation
Considerate construction
Construction new technologies
Consumption behavioral change strategies
Deconstruction
Digital transformation
Disposable culture
Drone monitoring
Drone piloting
Drought management
Ecology
Ecology & ecosystem management services
Ecosystem management services
Eco-toxicology
Edible Packaging
Education & environment
Electric motors
Electric powertrains and controls design
Electrification system component maintenance
Electrification systems engineering
Emission reduction
E-mobility conversion
E-mobility engineering
Energy
Energy and material cost management
Energy efficiency analysis
Energy management and optimization
Energy Source Integration
Enriched whole systems mapping (eco-geo-socio)
Entrepreneurial science
Environment under review
Environmental biology
Environmental degradation
Environmental engineering
Environmental geology
Environmental rights and governance
Environmental science
Environmental systems monitoring
Environmentalism movement
ESG liabilities
Extended producer responsibility strategy and design
Extractives
Facility remediation
Fast fashion mediation
Feedstock identification and utilization
Food science
Forests
Fossil fuel conversion
Fuel cell technologies
Future cities planning and design
General Sciences
Generous design
Geology
Geospatial mapping
Geospecific design
Global positioning systems
Green chemistry (life-friendly) principles and practices
Green economy
Green engineering principles & practices
Green house gas emissions reduction
Grid management: front of the meter
Habitat measurement and monitoring
Hazardous materials handling
Hazardous waste management
Hazardous waste removal
Health and wellness
Human biology
Human factors
Human health and wellness - public health impact analysis
Human impact analysis
HVAC system component installation
HVAC system component maintenance
Hydrogen energy management
Hydrogen system engineering and design
Hydrogen system Installation
Hydrogeology
Hydrology
Inclusive and accessible human factors design
Industrial Ecology
Industrial incidents and accidents
Inequality
Internal liability
Invasive species transport and removal
Inventory optimization
Lack of social innovation
Land reclamation

Figure 8: Futurecast #17 Manpower Sustainability Technical Skills 1

FUTURECAST #17B: Sustainability Technical Skills
▶2022 ▶2030

CURRENT & FUTURE – Representative Skills, Knowledge and Capabilities, Part 2

Land remediation
LEED architecture
LEED building design and construction
LEED building operations and maintenance
LEED cities and communities
LEED construction
LEED interior design and construction
LEED residential building design & construction
Literacy in Eco-Bio-Chemical domains
Logistics Optimization
Long-duration energy storage technologies
Marine Biology
Material Processing
Materials Reclamation
Materials Science
Meteorology
Microbiology
Mobility modernization
Modular/component design
Municipal ecology
Natural materials and chemicals (Nature's spice rack & pantry)
Natural resource sciences
Natural systems management
Natural systems regeneration and restoration
Natural world emulation
Nature's operating conditions
Navigation system
Neurodiverse talent management
Nonrenewable material bio decomposition
Ocean management
Operational technology sensing & remote management
Packaging design and production
Passive design
Plant pathology
Poaching control and management
Precision biology
Process optimization
Proper and improper waste removal
Public health delivery
Public health education
Public health policy
Reforestation
Remanufacturing engineering
Remote work management
Research design and management
Resource efficiency
Restoration ecology
Scientific to business abstractions
Sector sustainability models (e.g. Factory as a Forest)
Sensors and actuator design and utilization
Signal and image processing
Simulation systems and tools
Social justice principles and practices
Social science principles and practices
Soil and plant science
Soil quality measurement and monitoring
Solar energy management
Solar energy system component maintenance
Solar energy systems engineering and design
Solar systems installation
Species measurement and monitoring
Sustainable (re) skilled technical skills
Sustainable automation engineering
Sustainable cloud engineering
Sustainable design
Sustainable hardware design
Sustainable IT and DevOps
Sustainable nanotechnologies
Sustainable skilled trades-applied trades
Synthetic biology
Textile processing
Toxic materials elimination
Toxic chemical processing
Toxic material removal
Toxicology
Transportation engineering and management
Usage and waste monitoring and management
Vehicle systems integration
Vertical ecology
Water management operations - usage/ waste/ pollution systems remediation
Water management services
Water quality measurement and monitoring
Water toxicology analysis
Watershed management
Wetland sciences
Wildlife biology
Wind energy system component maintenance
Wind energy system installation
Wind energy systems design and management
Wind system engineering and design
Zoology

Figure 9: Futurecast #17B Manpower Sustainability Technical Skills 2

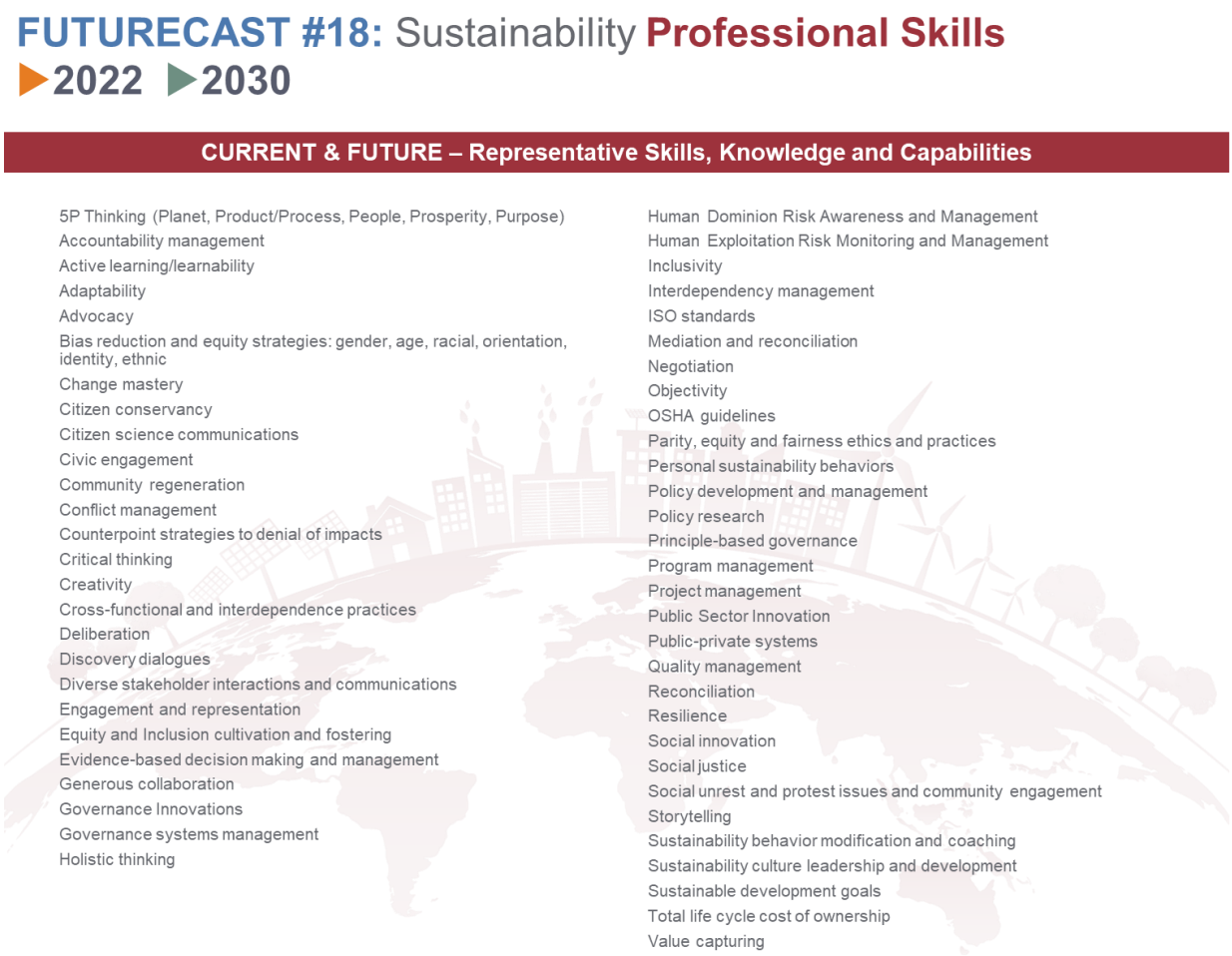


Figure 10: Futurecast #18 Manpower Sustainability Professional Skills

Highlighting Sustainability Roles via Success Profiles

Stakeholders often need a deeper understanding of a role – especially an identified critical role - that drives success in various fields and domains. Long before a candidate can be recruited, it's essential to understand more thoroughly what the role is and how it brings value to the organization. We use Success Profiles – sometimes thought of as "job descriptions on steroids" – to provide this detailed view of an essential role.

Why are success profiles needed?

- There isn't always a current industry-wide objective view of the complete scope of how a role can be structured, nor is there always a detailed source that can be adjusted for a particular organization as they update their job descriptions, job models, etc.
- When redesigning jobs or work teams, employers are not always aware of subject matter experts' views of how jobs have changed, what new jobs/roles are emerging, how conventional jobs/roles are evolving, and how to redesign roles for success or to capture new capabilities and bring new value to the organization.
- Job description efforts lace elements that clearly make a business case for deploying those roles.

A success profile helps many stakeholders (Figure 11). Who can benefit from these profiles?

Employers, including hiring managers and budget approval leaders needing a solid base for considering position approvals, interview questions, and role integration.

Workforce and economic development sponsors (institutes, workforce agencies, industry consortiums, etc.) looking for realistic previews of employment scenarios and performance targets for program development.

HR and business professionals doing organizational design, job analysis, workforce planning, talent acquisition, business and functional transformations, and strategic talent functions.

Compensation professionals looking for a deep profile of a job/role and the outcomes, value, and contribution it can bring.

Education design/curriculum designers looking for robust views of what employers require of particular roles. Universities use our profiles for degree granting and certification program development, enabling them to see the Line of Sight from employer needs to candidate development and career progression.

Representative Success Profile:

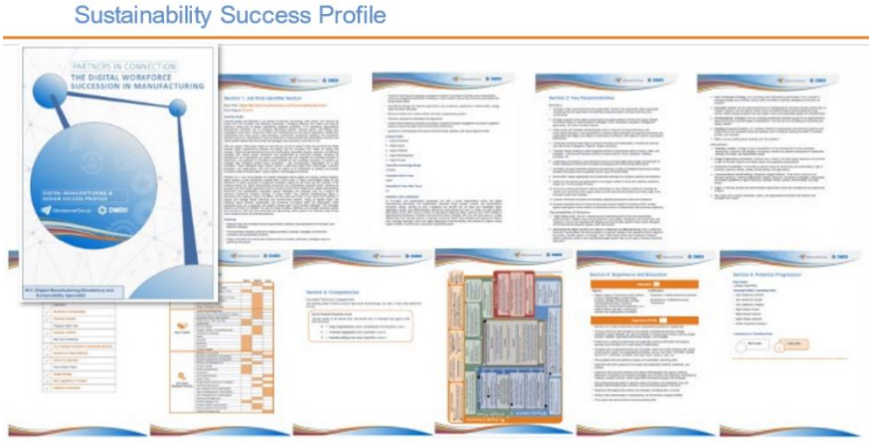


Figure 11: Manufacturing Biomimicry Specialist Success Profile Thumbnail

Here is a thumbnail of the Success Profile for a Manufacturing Biomimicry and Sustainability Specialist. Manpower profiled this role as part of a federally funded workforce transformation project for advanced manufacturing. For a full copy download and access to other success profiles and the full report go to https://www.mxdusa.org/taxonomy/ for the gated content registration and downloading.

Highlighting Sustainability Roles via Talent Snapshots

In these challenging times, human resource and talent acquisition teams are always looking for ways to optimize their sourcing and hiring efforts. The last decade has seen a war for talent, and another battle more targeted to sustainability talent is on the horizon. So, putting together a picture of in-demand candidates can focus recruiting and development efforts. It's also a great advantage to offer a realistic preview of the kinds of roles and candidates that the employer hopes to add to their teams. Supply of talent is restricted, and Talent Snapshots (Figure 12) can be a highly effective asset to communicate broadly and tap scarce talent.

Figure 12: Talent Snapshots Thumbnail

Who benefits from these Talent Snapshots?

Any size employer - not just large and mid-size can benefit. Especially for sustainability role and capabilities hiring, employers can leverage Talent Snapshots to showcase their workforce futures by highlighting desired roles and then inviting candidates to bring their capabilities to the organization.

In many cases, talent snapshots are highly valuable for hiring managers across the spectrum from scientific to business and management who are trying to educate HR about what they're looking for. They serve as a great conversation starter between hiring managers, recruiting managers, and business leaders to set the parameters of the types of candidates to attract, often coming together to develop a talent snapshot, help stretch the range of traits and aspirations (some of the softer side of job requirements), and increase identified diversity and flexibility in targeted candidates and diverse potential labor pools.

Talent Snapshots can communicate to prospective workers about the kinds of capabilities and career aspirations welcome in their career and education planning and employment pursuits.

Our three representative sustainability talent snapshots (Figures 13-15) showcase the future-focused skills and workers essential to these roles' success. Each snapshot is a representative future-focused mini-role "persona". Each are research driven, yet lightly fictional, profiles of workers who perform key jobs representing where the skills base and future workforce can go – and grow.

The three Sustainability Roles profiled in our sample Talent Snapshots include:

Quality Engineer, a modernized role that plays an increasingly important role as conventional quality takes a lead on sustainability standards of performance becoming synonymous with effectiveness and efficiency, conventional goals of the quality professionals.

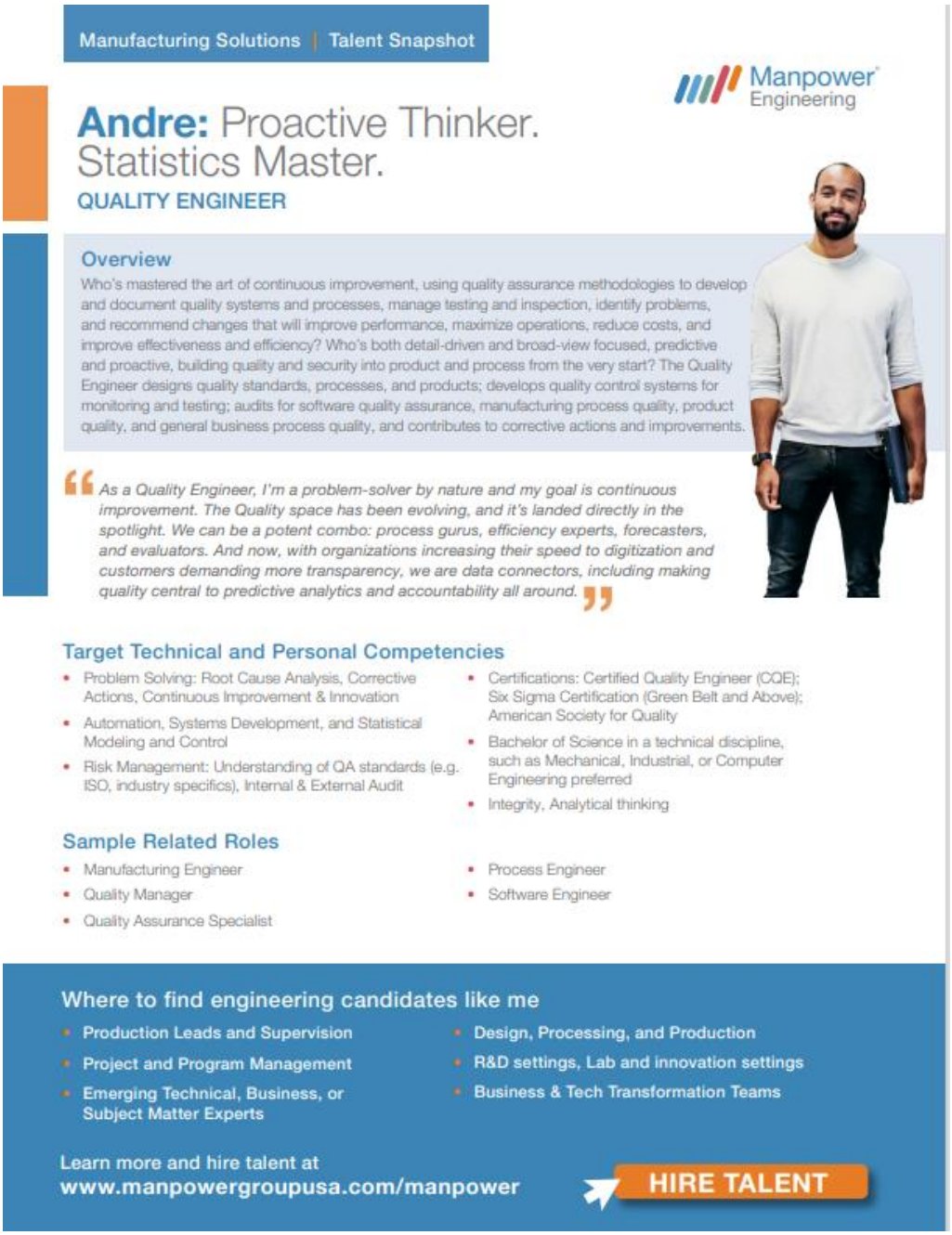


Figure 13: Talent Snapshot - Quality Engineer

Sustainable Manufacturing Process Engineer is another role central to collaborating with others to improve the processes that produce sustainable products more sustainably.

Figure 14: Talent Snapshot - Sustainable Manufacturing Process Engineer

Sustainable Manufacturing Process Technician partners with engineers, operators, and other production and processing teammates to implement, service, and bring to scale more sustainable processes and innovations.

Figure 15: Talent Snapshot - Sustainable Manufacturing Process Technician

Roles in Specializations

Earlier we introduced our view of Green+ and turquoise roles, the broadened tent which covers our expanded workforce spectrum. This broader spectrum shown in Figure 16 is the bigger tent of roles and the workforce helping to achieve sustainable solutions across all sectors of our industries, economies, and communities. Across the green and turquoise spectrum are a range of workforce specializations - a gradation of role groupings that position them in major categories ranging from the most scientific and technical to the most strategic - organizationally, socially, and commercially. Six connecting specializations organize to further describe the spectrum.

Why is this important? Seeing this view of role alignment increases higher level understanding and planning for the roles within those specializations. This can be very useful for direct workforce planning, strategic and tactical organizational design, team and project resourcing, and other workforce, organizational, and business planning decisions. From funding, to staffing, to calibrating role designs, seeing into the specializations can be useful.

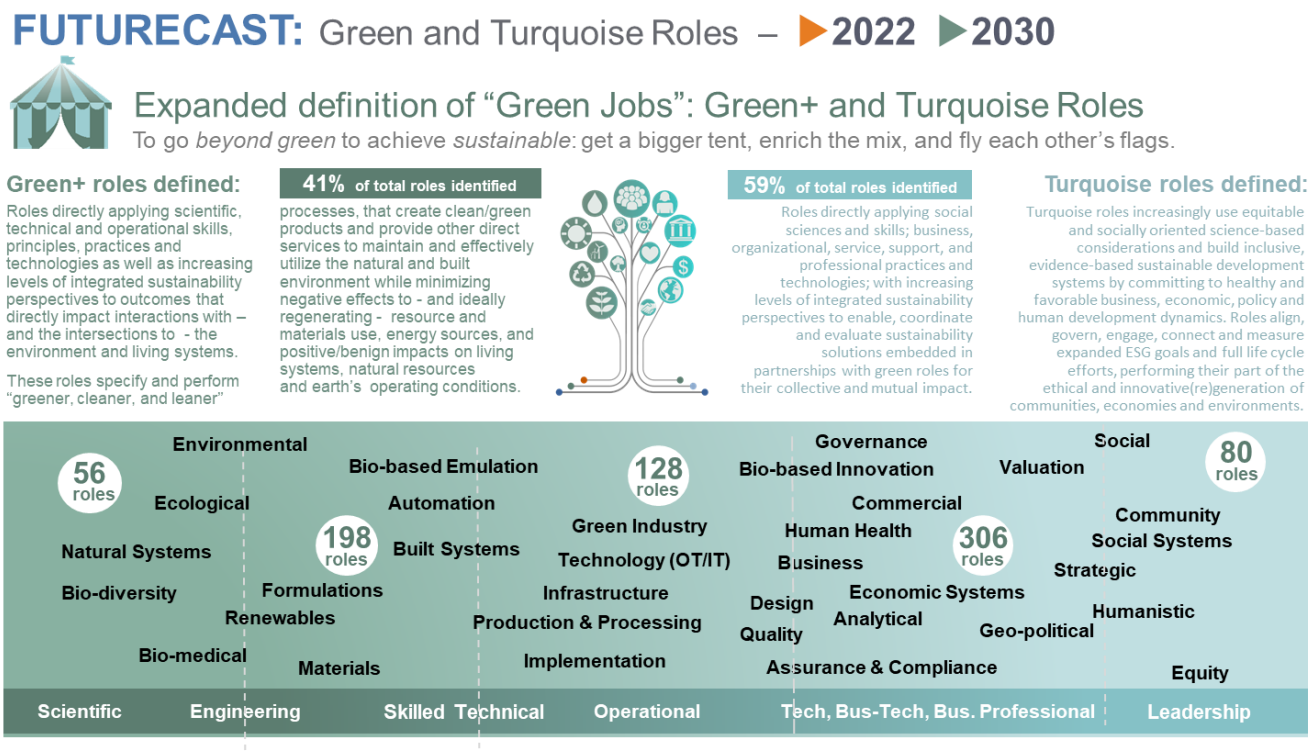


Figure 16: Futurecast Green+ and Turquoise Roles

Here are brief introductions to these specializations and where representative increased demand may likely occur as the workforce transforms to a sustainable solutions orientation and better supply and demand.

Specialization		Introduction
	***Scientific***	Mostly comprised of professional level and senior professional level positions, the scientific specialization offers work and workers who bring deep knowledge and practice in science, technology, advanced engineering, and math. Armed with deep base content knowledge in related disciplines and augmented with laboratory or practical field research experience, scientific workers propose and test new – as well as apply and interpret established - theories, principles, and practices that evolve or provide applied capability in many areas and roles of sustainability work. We looked at almost 60 scientific roles to establish this specialty. Additional workforce planning may likely reveal increasing demand for people with the skills, experience, and capabilities who can fill these roles within this specialization. **Natural science scientists:** Biologists Ecologists Geologists Hydrologists Renewable Material Scientists Green Chemists Technologists And others!
	***Engineering***	Mostly comprised of highly trained and experienced professional level and senior professional level engineering positions, the engineering specialization plays a major role in the sustainability workforce landscape. Many processes, systems, products and their materials, chemical formulations, energy use and sources, and biological and ecological interactions need to be re-engineered for increased life-friendly efficiency and effectiveness. Across sustainability solutions of any type – new, improved, and reengineered - engineers will be key roles and one of the most sought-after specializations. We looked at almost 200 engineering and highly skilled technical and operation roles to establish this specialty. Additional workforce planning may likely reveal increasing demand for people with the skills, experience, and capabilities who can fill these roles within engineering, including but not limited to: Bioengineers Biomimicry Engineers Decarbonization (Re)Manufacturing Engineers Various Ecosystem (Air/Water/ Soil, etc.) Engineers (Quality and Solutions) Long-Duration Energy Storage Engineer Renewable Energy System Engineers Sustainable Additive Materials Engineers Waste Management Engineers And others!

Skilled Technical and Operational

From laborers, service delivery representatives, and technicians - many who will be reskilled to add sustainability practices and knowledge - to advanced native sustainability technicians, this category brings the skillsets that span an increasingly wider life cycle of operational and technical functions. From analysis and design support to implementation to service and maintenance to retrofitting and improvement, Skilled Technical roles power the modern life cycle of work, especially user and customer support, processing, production, and distribution. These roles offer key contributions through broader responsibilities, bridging solution engineering with adoption and transformation through use of digital, automation, and sustainability technologies and higher impact customer and user experience duties.

We looked at almost 130 additional skilled technical and operational roles to establish this specialty (remember there is some strong adjacency to Engineering arenas on one side and solution architecting on the other).

Additional workforce planning may likely reveal increasing demand for people with the skills, experience, and capabilities to deliver on role areas like these - and others - within this specialization:

- Renewable Systems Installation and Maintenance Technicians (Solar, Wind, Hydropower)
- Fossil Fuel Improvement and Conversion Reskilled Technicians
- Other Infrastructure roles from construction laborers to specialists and builders
- Autonomous/Remote Plant Operators
- Quality Technicians
- Manufacturing Technicians
- Automation Technicians
- Engineering Technicians
- Operators, Testers
- And others!

Technical Professional and Business Professional

Beyond professional engineers, we looked at almost 300 technology-oriented roles as well as diverse business professional roles to establish this specialization of the Green+/turquoise spectrum. From software developers to sustainability solution sales architects, from quality managers to auditors, from diversity advisors to climate psychologists this Technical and Business Professional specialization houses other core tech roles, business focused roles, and hybrids who push beyond conventional green jobs that may not be direct environmental or science professionals but bring the technology, business, commercial, social, and organizational skills to advance the sustainability performance of organizations and communities.

Additional workforce planning may likely reveal the increasing demand in these role areas within this specialization:

- Technical and Business “Architects”, Strategists and Analysts, Advisors
- Community Economic Development Directors
- Social Entrepreneurship Advisors
- Sustainable Design Specialists
- Green IT Architect
- Emergent Market Finance Strategists
- Sustainable Product Innovation Strategists
- Responsible Sourcing Specialists
- Energy, Water and Material Balance Planners
- Sustainability Talent Recruiters
- Product End of Life Specialists
- And others!

Leadership

We looked at almost 80 senior business management, organizational leadership, and strategic advisor roles to establish this specialty. While some leadership and management roles (CEO, COO, etc.) are conventional roles that need to add sustainability, functional, or strategic capabilities, some are sustainability-native roles (think Chief Sustainability Officer or Sustainability Ethicist) who bring a more specific and newer set of capabilities to inform and set direction.

In this specialization are roles like:

CEOs
COOs
CIOs
Chief Biosafety and Security Officers
Chief Risk Officers
Chief Sustainability Officer
General Managers
ESG Program Chairs
Closed Loop Economists
Regulatory Affairs Managers
And others!

The demand will be for new positions for some of the sustainability native leadership and strategic roles, but the major demand will likely be more for existing leadership positions to add sustainability literacy, ESG literacy, Bio-business literacy, Eco literacy, Socio-economic literacy, Circular economy literacy and other essential baselines for leaders in the sustainability era.

Action Chains

Looking for more action via a view of how over 100 roles connect across 10 essential, high value sustainability related processes and/or initiatives? Our Action Chains (also known as Capability Network Maps), begin to tell rich stories of how roles work together. See the 10 action chains included in our Perspectives Section (Section 3), for more ways to envision 'roles in action'. We've assembled Action Chains for: pitching a circular economy business, evolving an impactful ESG program, assessing life-cycle costs and values of sustainability solutions, justly transforming the green-turquoise workforce, sustaining supply chains, leveraging community in building a new production site, greening product designs, greening facilities, greening manufacturing processes, and regenerating abandoned sites and cities.

Figure 17: Action Chain Thumbnail

These mini-visual showcases (see Figure 17) provide high-level guidance to what roles do when they collaborate on those process/work initiatives or major tasks. Action Chains provide a realistic preview for some of the primary roles in those capability chains.

Action Chains enable stakeholders to tell stories for many talent management and development purposes. For many, this is a valuable extended workforce development asset, giving educators on this program and elsewhere directional guidance for connections between roles, showing prospective candidates a range of possible roles for

shared education and development, providing career coaches with a broader view, giving recruiters a holistic picture of who works together, and giving business types and workforce planners a view into their group level casting and talent investment decisions.

Summary

So many roles, so little time!

There are boundless examples of how to position, energize, and view our representative sustainability roles to apply their skills, experience, and capabilities in the sustainable solutions workspace. Each sustainability solutions provider or user organization has their own mix, but they all share the need to transfer possibilities into actualities and potential into accomplishments. Actions to jumpstart culture, skills development, candidate and position envisioning, understanding hiring specializations, and seeing how roles work together for critical achievements are all ways to take action in the workforce transformation journey.

In Section 9, we'll share some broader and longer-term calls to action and recommendations to advance the potential of the Sustainability Workforce.

Section 9: Recommendations

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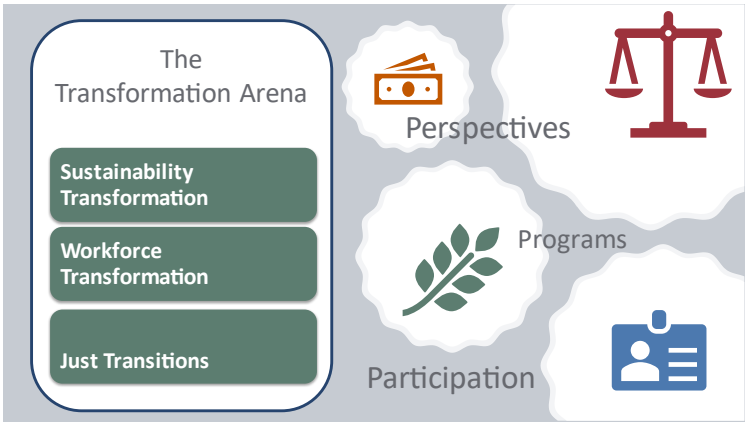
Introduction

By highlighting suggestions for action in this summary section, Manpower will reinforce the most essential connected insights of the research and provide additional considerations for effort, no matter where stakeholders stand with their sustainability plans. The Futurecasts to this point have sketched a picture of where Sustainability is today in its' transformation. It is a body of practice, a workforce arena, an industry that crosses all industries. Its time is here. This Sustainability Transformation is occurring at the same time as - and heavily influencing - the ongoing Workforce Transformation. So, for this consolidated set of resources to be genuinely transformative, it needs to close with a set of practical recommendations that can generate improvement.

Whether a business leader, a workforce planner, an individual performer or a new or experienced sustainable solution stakeholder, many can benefit from generalized strategies along three main paths of *perspectives, programs,* and *workforce actions*. We encourage you to evolve your own sustainability mindsets, capabilities and commitments and do the same for your organizations, teammates, and communities. These summary thoughts and actions can make for important assessment and planning conversations no matter your role or the current status of your sustainability performance.



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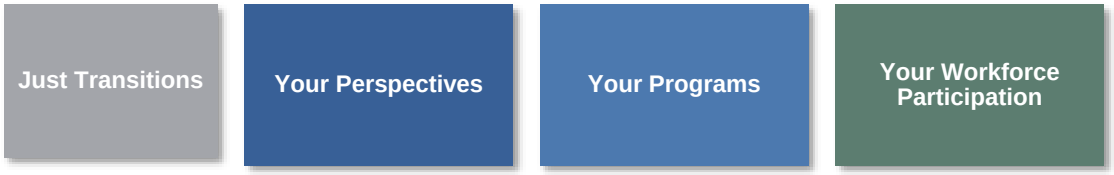

- **Just Transitions:** This topic serves as a starting point for all actions. A few thoughts on just transitions are called out and highlighted. No matter the current or future state, the action plan, or the journey, there is a need to make *any* transition a *just* transition.
- **Your Perspectives:** Changes in culture, business, individual behavior etc. all start, continue and ultimately transform based on values and beliefs combined with operating conditions, which then drive behavior and actions. Which contributing changes to mindsets should be considered on the road to successful and sustainable organizations and their workforces? Food for thought is here.
- **Your Programs:** Changing beliefs and values leads to decisions and action. With best wishes for success in the ESG era impacting many organizations, what are some key connections between workforce and ESG program evolution in terms of program architectures that will benefit sustainability and set up the sustainability solutions workforce for success? Highlighted high-impact reminders are here.
- **Your Workforce System Participation:** There are primary stakeholders in the workforce system including: 1) individuals 2) employers; 3) government and policy advisors; 4) education and academia and 5) workforce economic and community development. What top actions can be suggested for consideration as they best position themselves as contributors and participants in sustainability transformation? Here are 25 actions.

- **Summary:** Our last topic is our thank you for considering and using these assets and their insights.

Just Transitions: A Starting Point for All Actions

So where are you moving from? What about your current state most demands an intersection with the current or future workforce and their sustainability skills and capabilities? What have been the intentional or unintentional consequences of the work you do, or how you employ people, or the solutions you use or the services and solutions you offer?

Whether intentional or an unintended consequence, there are patterns of outcomes from our history of business and commerce that have resulted in groups and locations who have been high-impact targets from both modernization and from sustainability transitions. Examples include:

- Climate and economic development impacts felt in locations with lower carbon footprints, such as industry-induced,climate-change driven rising sea levels impacting island nations with less developed economies and documented low contribution to greenhouse gases.
- A lack of reinvestment in communities impacted by abandoned facilities and geographies damaged by previous industrializations, leading to downward spiraling home values, cycles of unemployment and little to no business development.
- Pay inequities, especially with women, people of color and/or communities of high immigrant populations.
- And one of the most off-cited just transition targets - the increasing concerns about transitioning from fossil fuels to the renewable energies sector and displacement of oil, gas and coal mining workforce and other extraction and processing related jobs.

The sustainability transformation will be accelerated and more fully embraced when it is targeted towards innovation and job (re)creation and not seen as the nefarious 'gotcha' for elimination of "dirty" jobs, roles, or industries. Earlier we positioned that *roles and jobs are proxy for what society values*. The transformation will be helped by shifting values and culture around how we think about environmental and social justice broadly, such the 'Just Solutions' movement that originated in the 1970's labor union efforts. Excellent coverage and information used here can be found online and at the Climate Justice Alliance.

All Solutions Deserve Just Solutions

What is the Just Transition approach and outcome goal?

> ***Just Transition*** **is a vision-led, unifying and place-based set of principles, processes, and practices that build economic and political power to shift from an extractive economy to a regenerative economy.**

Although workers remain an essential element, the *just transition* concept is today considerably broader, encompassing other aspects of potential harm raised by the prospect of broad-scale transitions. The concept draws on a wide range of perspectives, which share the common theme of carefully considering and managing equity issues associated with structural change (and, alternatively, of inaction on structural change).

A *just transition* means actually engaging impacted people, especially those at most direct risk, to help create new maps to different work and living situations. From reskilling and offers of other employment or relocation, regenerative communities, or other support and opportunity, just transitions find ways to address future change and do not leave people or existing workforces behind. A just transition engages them to bring about the turn of

the ship and the new maps to different horizons. Engaging their participation and counting on their mutual interest, talents and efforts makes these transitioning communities potentially one of the most self-actualizing, innovative, and renewable resources of all.

A just transition means not leaving people behind and actually engaging them to bring about the turn of the ship and the new maps to different horizons.

Whatever their fulfillment of obligation to remedy and/or opportunity to be a leader in sustainability answers, solutioners will do well to make those transformations fitting and fair to the most impacted of people. As organizations increase their decisions to focus their livelihoods and practices in more sustainable ways, they need to also consider how the disruptions have had - and the solutions will have - proportional impact on people.

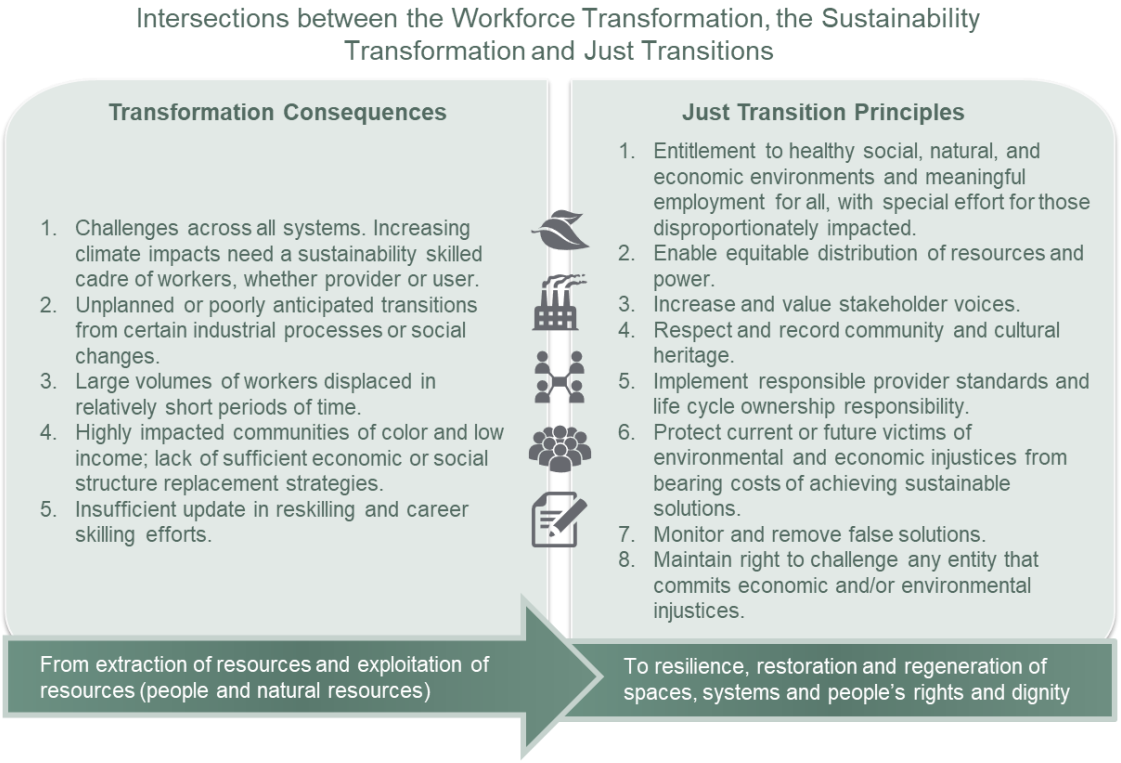

Figure 1: Intersections between Workforce, Sustainability & Just Transitions

As a result of disproportionate impacts, part of the sustainability solution drivers and actual solutions designs will need to have solutions that are just and fair to the individuals most impacted. Some strategies for just transition considerations include:

- Valuing that residents and workers should not have to exchange their health, environment, jobs, or economic assets for a change in Sustainability.
- Understanding the micro, macro, and meta contexts of the transitions: from local workforce impacts to major industry policies and related global trends.

- Making impacted stakeholders, especially at the local and direct level (residents, workers, local existing businesses, etc.), part of the conversation and decision making.
- Focusing on social, workforce, economic and redevelopment policy, program, and investment efforts. This can include programs such as:
  - Reskilling
  - Job placement
  - Economic/wage/unemployment subsidies
  - Relocation
  - Family support services
- Losses should be fairly compensated, and/or alternatives to the losses should be available, scaffolded and reinforced through the transition cycles.

These and other components of just transitions add to the actions and strategies of meeting the sustainable solution era workforce transformation. Just transition thinking and doing also has the prospect of preserving or growing labor pools, maintaining health and welfare for communities, sharing the prosperity of the new sustainability economy which can stimulate other Green+ solutions, etc. Regardless of other actions and strategies, the macro recommendation we make is to consider the needs for, components of, and benefits from a just transition and just implementations of more sustainable solutions.

No matter the current or future state, the action plan, or the journey, there is a need to make *any* transition a *just* transition.

Your Perspectives. Enhanced.

Progress all starts with the perspectives that guide values and beliefs, actions and decisions, investments and purchase, and support and criticisms. Broadened perspectives, constructive feedback between parties, and greater expectations are needed. Other broadened perspectives can include validation and necessary changes to what we do and how we make decisions, as well as where we put our resources, endorsements, and efforts.

What are the top perspectives or mindset shifts you are encouraged to consider? Some of these are related to the workforce and some are indirect, yet strategic, as they relate to culture more broadly or business strategy or organizational management. Follow “our walk around the tree” reminders of essential do’s and critical don’ts offered as a reminder baseline for broadened perspectives. Some of these may seem generalized, but when asked of a targeted group – whether community, business, or environmental etc. – these perspectives enliven and accelerate needed sustainability conversations, plans and actual changes.

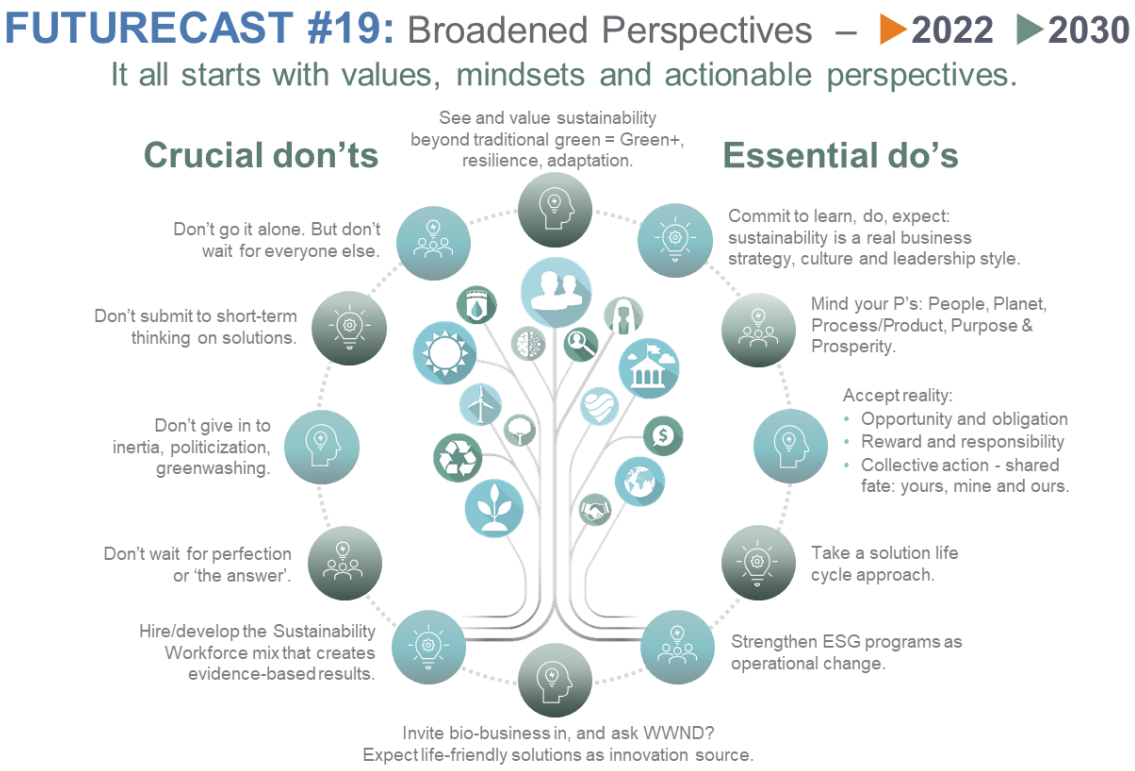

Figure 2: Futurecast #19 Essential Do's and Crucial Don'ts

Essentials Do's

Our first category of recommendations offers some best practices to surely put on the TO DO list. From including these in business and sustainability planning to using each of these DO's as a discussion topic with leaders and employees alike, these Essential Do's drive home key practices we have covered.

These are a summary of many of the key principles this research has used as essential foundations for the way we view the Sustainability Workforce across the value of sustainability progress, the approach to get there as in the SSLC, the domains of work, the role design principles and many other frameworks, there are better and best practices emerging as take aways for the Essential Do's as shown in Figure 2, including:

1. ***See and value sustainability beyond conventional green including the resulting major shifts***.

These shifts are to business models, cultures, and teams in the era of nature-positive and human-centric efforts creating the space where Green+ and Turquoise workforces transform organizations.

- How do you and those around you really view what green means?
- How are you working and solving issues today without jeopardizing future generations and their rights to a life-friendly world?
- What color flag are you raising – old green, new green, turquoise, or both?
- Will you and your organization be seen as champions for now and into the future?

Go beyond green to have better answers to all of those questions.

2. *Commit to learn, do, expect.*

Sustainability is a bona fide business strategy. It can be the defining character of an organization and the prime value of its' actionable culture. It has distinct responsibilities for leadership styles and decisions. It transforms creation, operations and use. But only if it is powered by another recommendation: to put earnest and visible goals and commitments in place at every level to get smarter on what sustainability means.

The goals and commitments needed include investments and changes to all areas of strategies, tactics, and culture. The skills of many functions need to change, modernize, and expand as the lists of our highlighted skills show.

And maybe the most important aspect of learning, leading, and doing is to set goals and to clarify *expectations of others* - employees, partners, clients, fellow citizens - to bring and act with default behaviors of Sustainability. Rewards for anything less than accelerated transitions to this type of thinking and doing only serve to reinforce the poor behaviors, lack of resource stewardship and delays of innovation that have created many of today's disruptions and concerns.

Seth Godin combines these last two Do's by showing the contrasts between the free-wheeling play of not having goals and the reality that progress and impact go to those who do have them:

> "The thing about goals is that living without them is a lot more fun, in the short run. It seems to me, though, that the people who get things done, who lead, who grow and who make an impact… those people have goals." — Seth Godin

And maybe the most important aspect of learning, leading, and doing is to set goals and to clarify expectations of others - employees, partners, clients, fellow citizens - to bring and act with default behaviors of Sustainability.

3. *Mind your P's: People, Planet, Process/Product, Purpose, and Prosperity*

Another best practice, another Essential Do, is the shared mindset across the organization towards the 5P's. Over 30 years after its original inception, *3P* thinking not only needs to become default thinking, but it also can expand to clear *5P* thinking as Manpower offers as a baseline perspective. We advocate the 5Ps as an essential frame of reference to adopt that extends People, Planet and Profit to include two essential expansions and one major shift from the original P's.

Those enhanced 3P to 5P thinking includes the practice of:

- Orienting around a view of Planet to distinctively focus on cleaner, leaner, and greener exchanges with our environments. The most direct intersection is through the *products* created and the *processes* deployed to use or create products.
- Add Purpose as an equal component. A business or organization forming around life-friendly missions is not just brand speak anymore. Purpose is a valuable business component of market, talent, and ethical capital, and where focused on Sustainability, it can hold its own as sole or part purpose of any public or private entity.

- And third, shift the original view of Profit to the more generous view of Prosperity. Prosperity recognizes that commercial or financial profit is not the only measure of value or wealth. A view of prosperity allows for wider and broader characterizations of success. Beyond financial measures, Prosperity - especially from generation to generation – can include increased quality of life, educational improvements, health and wellness, economic development, and other definitions of successful conditions or a state of abundance for a community or a group as a whole.

So ask and answer of your organization:

- How holistic is the operating perspective of the organization, the function, the team?
- Are we skewed too far towards one factor?
- While we may have a certain focus, how are we oriented across all of the factors and stages of work?

4. ***Accept duality.*** We all need to learn that reality brings some contrasts and taking on sustainability requires acceptance of both sides of a situation, without taking sides. Repeatedly, the current era of disruptions and opportunities brings a reality that comes with a dual nature.

- These are times that call for accepting obligation and prospects for success: obligation in terms of helping to improve or fix and being part of the solution even if not considered a top cause of the problem, and opportunity, in terms of the prospects for prosperity and profit to those who participate.

Another obvious aspect of the duality of sustainability is the the reminder that there are always risks *and* rewards of both taking on challenges and not doing anything.

- Some of the risks and responsibility to act will come from regulators, and others will be demands from key stakeholders who can exert other pressures. Some risks are major (e.g., not innovating towards sustainable materials thereby exposing major product lines to supply chain disruptions) and some risks can easily be mitigated (lack of considering community needs can be helped by routinely sponsoring citizen meetups, solution design conferences, and membership on ongoing review efforts).
- Rewards of many categories – financial, social, brand, environmental, generational, etc. - that are available to all who deliver sustainable solutions.

But perhaps a key mindset to adopt is accepting the reality that there is a need for collective action sooner than later due to the reality of a shared fate and that there is less and less room between short term business decisions and longer-term community, social or economic impacts.

Aesop's fable gave us the idiom of 'killing the goose that lays the golden egg' and short-term thinking for sustainability needs to hear that story again. Customers today will be priced out of being customers tomorrow. Fires are raging, destroying natural systems, natural resources, and commercial markets. Floods are on the move putting unchanging cities under water. Shipping vessels cannot pass through dried rivers and lowered seabeds. Seeing the impact of behaviors, some of their own creation, is not easy for any industry, business, or community. And even if one is outside the direct cause chain or operates decades after the damage was done by predecessors, "sustainability is no longer about doing less harm. It is about doing more good."

Possibly that is the most important dichotomy of all.

"Sustainability is no longer about doing less harm. It's about doing more good." -Jochen Zeitz

5. Take a solution life cycle approach

Manpower's view on organizing the sustainability workforce is to place and align roles in the context of where they can contribute their capabilities in the earliest and most directly actionable stage of a sustainability solution life cycle (SSLC). We believe the value in seeing roles aligned to stages of a circular life cycle is immense. It supports several key factors:

- Life cycles are a framework for the growing diversity and sophistication of various business models, from risk assessments to product design and management to supply chain management and other disciplines. Some companies may only be involved in ideation and design, but they need to enable and interact with others that continue the life cycle. Some companies that may have focused on operations and production may now be focused equally on aftermarket experiences and services. Whichever extent or focus, a complete view of the sustainability life cycle can help frame the many roles and skills needed overall to create and implement solutions that are sustainable.
- Life-cycle views are being adopted across a range of sectors as life-cycle considerations are applicable to most any product or service or sector or industry.
- Life cycles are also synonymous with the nature of business, pun intended, and the notion of continuous life-sustaining efforts brought into everyday business and organizational operations. Sustainability is a continuous business, social and governance mindset and effort. It is not a project; it isn't a one-time effort. People who work with a sustainability approach are not one trick ponies; they don't offer only isolated contributions. They are able to cycle and contribute continuously. Like sustainability solutions, the work is never done, and it contributes continuous value.
- Life cycles used for role design, job requisitioning, and the employability of sustainability workers is a rich landscape for work processes. It offers both specific and generic ways to view what, where and how employees in various roles contribute value.
- Life cycle considerations and the capabilities that align with each stage reflect more modernized capabilities, transferable across industries and sectors.

A life cycle approach can help us make choices. It implies that everyone in the whole chain of a product's life cycle, from cradle to grave, has a responsibility and a role to play, taking into account all the relevant impacts on the economy, the environment, and the society.

The Life Cycle Initiative, sponsored by the UN

6. Strengthen ESG programs as operational changes.

Yes, an ESG program and leadership can drive strategic positioning of sustainability work and initiatives.

Yes, an ESG program, where applicable and adoptable with accountable roles and tied to specific and tangible initiatives and measures, is an increasing opportunity to achieve operational change towards positive sustainability performance.

But where across environmental, social or governance targets does an ESG program set up the cross-functional network of champions, change agents, operational and support functions, actual workers and roles producing the targeted standards, and those responsible for aligning the systems to measure and monitor their coordinated truth in accountability and impact? This has to be the case for being both a 'user' of sustainability solutions and a 'provider' of sustainability solutions. While not the same, they will share ESG DNA.

Focusing on ESG programs and workforce connections is critical both from an action perspective as well a mindset. ESG leaders, whether external or internal, must connect with operational change initiatives. Without this tangible connection, ESG misses being at its full potential. Being the voice and view to where the real action is – upgraded and new processes, new products, innovations, and changes in all the opportunity areas of use and provision is where the action is.

- Where is your ESG program, standards and performance goals connected directly to sustainability workforce considerations across the Green+ and Turquoise spectrum?
- Is your ESG program overfocused on messaging and reporting and less invested in actually making changes or improving your workforce mix and capabilities to produce better sustainability results?

7. Invite bio-business in and ask WWND? The era of nature-positive business and champions is here.

Over many decades, business has been benefiting from biology without even knowing it. Our original views of organizations were based on how 'organs' worked and were arranged to enable life. And over the decades we have increasingly looked for inspiration from what is outside our window or in the space where we interact with biology and other natural and physical sciences. Natural life of all kinds has been working her genius for over 3.8 billion years.

From specific biological interactions of cellular functioning and genetic engineering that helps us manage the DNA or RNA in biopharmaceuticals to nanotechnology inspired by the way our smallest particles and organisms function and process to artificial intelligence that builds from our best cognitive and intellectual human functions to new structures for organizations that optimize the flow and vitality of resources, they all offer examples of using

Carbon-negative will be eclipsed by nature-positive.

Nature positive means enhancing the resilience of our planet and societies to halt and reverse nature loss.

It has become a movement, with leaders from governments, businesses and civil society committing to action.

G7 leaders recently announced that "our world must not only become net zero, but also nature positive, for the benefit of both people and the planet."

This represents a real paradigm shift in how nations, businesses, investors and consumers view nature. In the past, the mantra among a growing number of inspired leaders has been to do less harm, to reduce impact and to tread lightly across our world. Of course, this mantra remains.

But now there is a new worldview gathering pace: "nature positive." This asks: What if we go beyond damage limitation? What if our economic activities not only minimize impact, but also enhance ecosystems?

A nature positive approach enriches biodiversity, stores carbon, purifies water and reduces pandemic risk. In short, a nature positive approach enhances the resilience of our planet and our societies.

nature's success patterns for possible built world or human health progress. All these natural systems and life-friendly conditions offer endless possibilities for improvement, innovation, and commercialization.

BCG has estimated that 'nature co-design' will affect more than $30 trillion of economic activity over the next 30 years - the equivalent of 40% of current global GDP. The World Economic Forum has estimated that the disruption could lead to annual business opportunities worth $10 trillion (about $31,000 per person in the US) and create 395 million jobs by 2030. For companies in such industries as pharmaceuticals, chemicals, agriculture and food supply, and advanced materials and manufacturing, the disruption is likely to be greater than anything that digital technologies have wrought.

In every industry, there are opportunities to consider the biologization of business and organizations. Bullet trains are redesigned to emulate bird beaks, wind turbines emulate whale skin, and transport routes are redesigned to emulate efficient beehive and ant hill movements. Be sure to ask ***What Would Nature Do?***

- What of nature's genius about its' forms, functions, and systems can be emulated for application into our world without actually depleting nature?
- How do the combinations of organic, life-friendly, and biological applications - direct and indirect - grow into new opportunities, innovations, and inspirations as they apply into every arena of life?
- How does nature's inspiration not only create *novel* solutions but *sustainable* solutions as well?

8. Hire/develop the sustainability workforce mix that creates evidence-based results.

Consider the challenges to be addressed, the opportunity trends available for innovation, and delivery across our economies and communities. Roles are identified, more can be added, skills and capabilities are known, and all can be incorporated into education, career skilling, and upskilling.

Along with the Crucial Don'ts and the Workforce Participation guidance, this transformation can accelerate.

Crucial Don'ts

The above examples of perspectives driving what TO DO should get real attention. But honorable mention goes to the suggestions we make of what NOT TO DO when it comes to adopting supportive perspectives.

There are many, but our contributors and other research recommend organizations consider the following crucial don'ts

1. ***Don't go it alone.*** But don't wait for everyone else. (Collaboration is essential and so is courage). Pilot Programs, Community Initiative Sponsorship, Business Roundtables, Consumer/Customer/Client Design Sessions and more. These times call for all the players on the technology side, on the financing side, the governments, the regulators, to come together with the innovators and operators in the broader workforce.

2. ***Don't submit to short-term thinking on solutions.*** Don't adopt careless solutions for the sake of action NOR only consider short-term thinking on solutions. (Some thoughtless solutions may look like sustainability in action but may cause more unintended and costly consequences. Be sure to do a fuller life cycle and holistic analysis. We are in a short- and mid-term battle for the all-term horizons. Now is the time to improve your distance vision and stand up to look beyond your immediate zone so that you can also be positioned for resilience and adaptation).

3. ***Don't give in to inertia of politicization or greenwashing…*** present times and current offerings that haven't benefitted from a sustainability update. (They are likely too costly for the times, and often exist under the illusion of lower costs because full costs are ignored, and change is viewed as an unsubstantiated cost versus investment in a new value proposition. Yes, it requires energy and thinking and creativity. But not moving forward or seeing reality almost always costs more). Don't give in to the politicization of whether a healthy 5P world is our obligation to our children and future generations. (Yet, expect participation towards a more sustainable future for the generations here now and the generations to come). Don't participate in greenwashing in its many forms. (There will be as much at stake for trying to look green but actually hiding poor sustainability performance as not trying at all. Headlines are already being made for those who proclaim to be sustainable and are either 'faking it till they make it' or 'sharing their story' without a plot, with essential chapters being left out, and where the guilty party always seems to go free).

4. ***Don't wait for perfection or think there is only one answer. (***We just don't have the time for it. And opportunity waits for those willing to be pioneers and keystones in this era).

Your programs. Enhanced.

Our second category of recommendations focuses on the link between 'sustainability programs' and the 'sustainability workforce.' When it comes to sustainability in any country, state, organization, community or group, there could be a number of "programs" in progress with goals of contributing to social innovation, improved governance, and environmental focus. This could include better performance and resource use, less toxicity and pollution, increased innovation, or specific progress like net-zero or negative greenhouse gas emissions targets, more diverse hiring targets, contributions to community efforts, community engagement programs, and more shared information. In particular, the rise of ESG goals, programs, and reporting specifically is intended to directly inform markets, shareholders, and stakeholders about the environmental, social and governance performances of their actual or potential investments.

At its best, ESG will also directly and indirectly accelerate more businesses, organizations, and communities towards healthier environmental and social practices. At its more problematic version, ESG may drive only cursory change, or even some disingenuous actions in the form of immature or unrelated data gathering and reporting. That and other levels of "greenwashing" and other unintended consequences are not purposeful outcomes; nor is there a desire to incite more politicization over perceived or actual additional regulations and/or governmental interference in "free" markets.

Figure 3 ESG Positives and Negatives

While the broader success of ESG as a management and reporting framework will be in several arenas and not only in the workforce sphere of influence, two factors are of direct importance between ESG and sustainability workforce: a) ESG targets, scope and actual process, product, and social strategies reflect the people and workforce mix involved and the mix of targeted roles and skills, and 2) how ESG programs impact real work outputs and activities makes all the difference to actual sustainability solutions, uptake, and effect.

Almost regardless of the specifics of an ESG program, positive action connecting ESG and the sustainability workforce includes good leadership roles, good program roles, and, most importantly, the right mix of actual sustainability solutioners across the green and turquoise spectrum.

It isn't an automatic translation from chartering an ESG program to making a difference in the world. ESG programs are going through their own evolution. Some organizations are quite mature in their programs, their actions, and their results, while others are still assuring and obtaining sponsorship and are next to look at programmatic support or actual sustainable roles across their processes and operations.

We support building out ESG programs as essential in these early days and in the future to focus and hold accountable the scaling across the organization for its embedded sustainability culture and capabilities. To help sustainability capabilities overall, as well as to enhance ESG program affiliated efforts and results, we recommend concentrating at least on these 5 key synergies and dependencies that build out the connections between the workforce and ESG Program enhancements:

Synergy and Dependency: The Sustainability Workforce Transformation and ESG

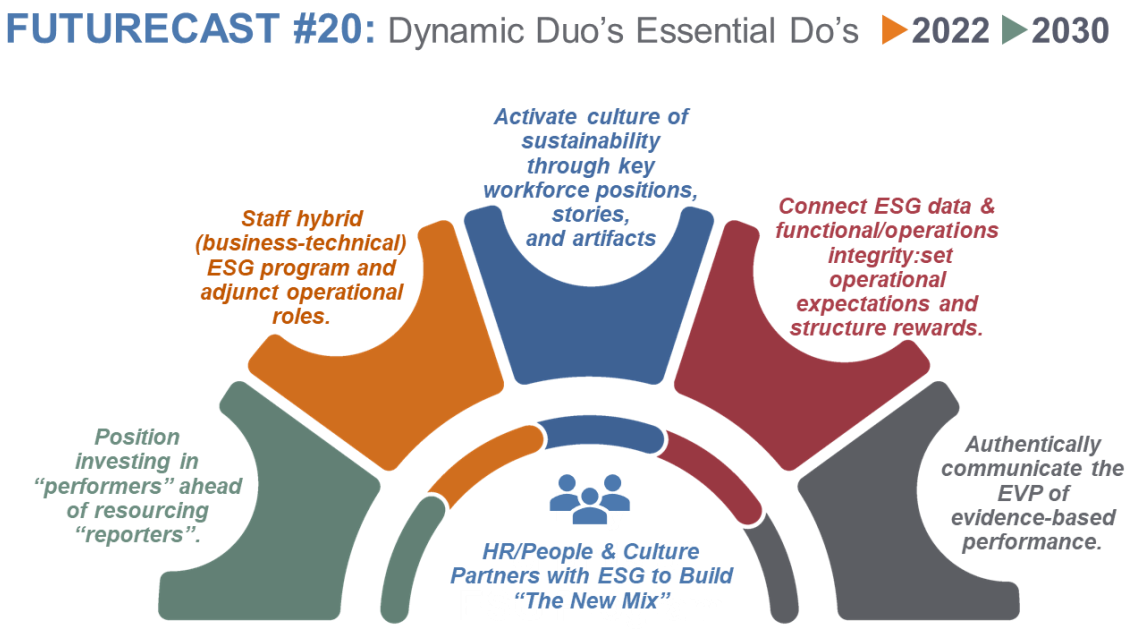

Figure 4: Futurecast #20 Dynamic Duo's Essential Do's

Connections for ESG Progress

What is behind these workforce connections? It's not simply the story of your ESG Program, it's what's behind the actual storytelling. It's the ongoing operational capability that produces outcomes that become the theme and chapters of your ESG reporting, the proof of your business' or organization's sustainability progress, all with the expectations that it is significant and nature positive.

And we can say with certainty that it is the New Mix of the workforce and their work that makes the ESG Program and Reporting come to life and have something to report about.

What else can we offer as a summary of best practices and reminders of action to be taken to tighten the relationship between the Sustainability Workforce and ESG programs?

When it comes to actions to connect the workforce and ESG programs:

1. ***Position investing in performers ahead of resourcing "reporters."***

Businesses and organizations must put skilled people in performance roles ahead of and more so than the program and reporting roles. You do not need too many people telling the story or sharing the news until you have one of significance to tell. You need the people that make the news and the story to be funded and deployed first, more than those who plan and report.

2. ***Staff hybrid ESG program and adjunct program roles.***

ESG roles are one of our hot job trends. Whether large or small, there is need for the right mix and number of organization-wide network members of ESG program coordinators, advocates, trainers, and communicators. There are ESG program direction, management audit, and finance roles as well as reporting roles that are in demand as ESG gets traction and matures.

3. ***Activate your culture through key workforce positions, stories, and artifacts to connect ESG aims and results to the people who made them and need to see themselves in the proof and payoff.***

ESG progress and the proof of it have a strong relationship to aspects of both the seen and unseen culture we have presented. As real people make real change and create real examples, make those workers, experiences, and outcomes the sustainability stories your organization tells.

4. ***Connect ESG data & functional/operations integrity.***

Align and calibrate honest ESG data reporting to work process outcomes. You will need operations and process experts to work with ESG program staff well ahead of asking for ESG data to identify and calibrate the work and the data that reports that work, or one will fall straight into greenwashing territory. Internal integrity is lost even before external disconnects appear.

5. ***Make ESG positives part of the employee value proposition.***

ESG outcomes and sustainability can be one of the most powerful attraction and retention tools in addition to meaningful data to investors, financers, and shareholders. Keep it authentic, individualized, and honest.

As recommendations, these five are a solid core of where ESG programs and workforce planning need to intersect.

Your workforce actions. Accelerated.

The third category of strong recommendations Manpower provides are those that support participation in the workforce ecosystem. Whether an industry employer, a community and economic developer, a professional in education and academia, or in government, there are five high value actions to consider as one plans their way into this in-demand arena. Figure 5 walks you through a series of actions for key stakeholders.

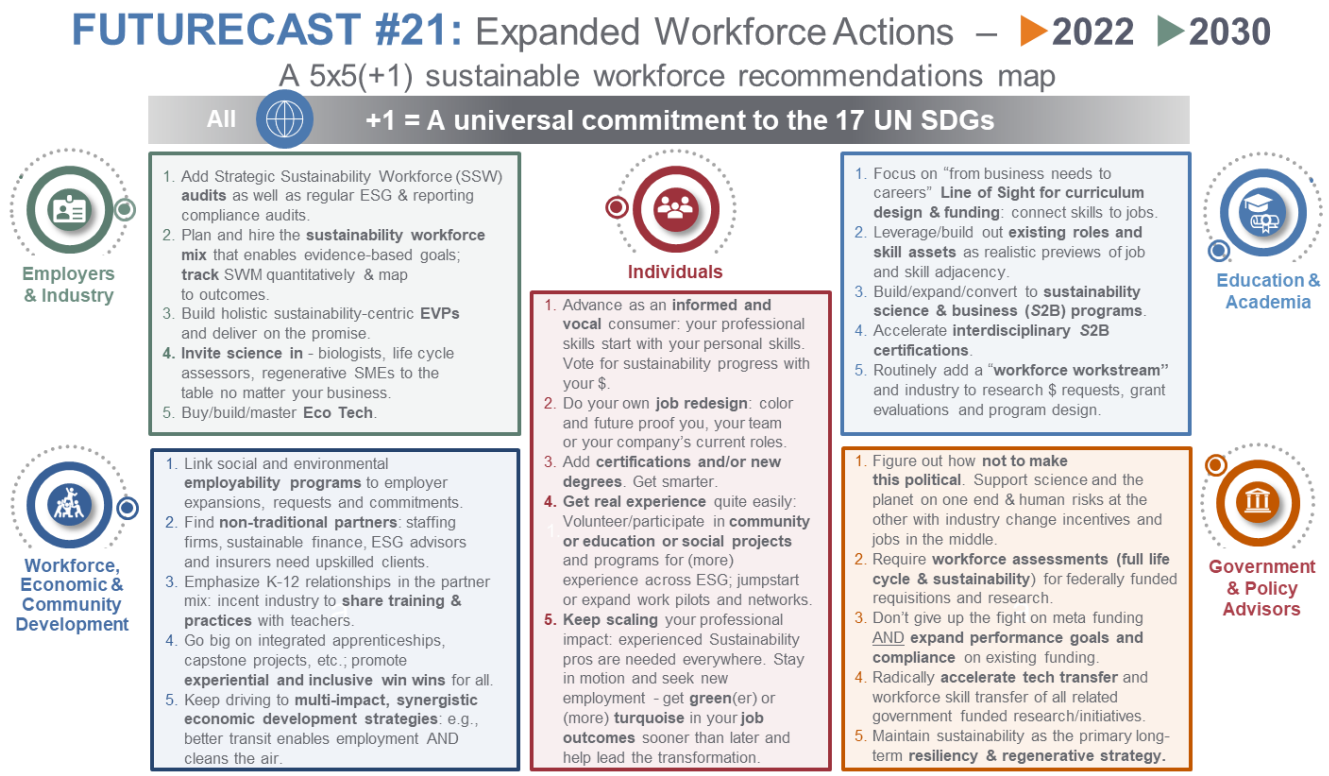

Figure 5: Futurecast #21 Expanded Workforce Actions

Which of these actions should transfer to your to do list? What is your part in bringing the New Mix to life? How can you be part of the effort to create sustainability solutions and enable the Sustainable Workforce?

As one thinks of what their role might be and what their goals and tasks can be, we make the loop and consider the possibilities of Where do I fit? Who do I employ? How am I employed in this sustainability era?

- ☐ Well, some of us install systems that capture the sun.
- ☐ Some of us work on food security and lowering the inorganic footprint of big Ag (agriculture).
- ☐ Some of us use bacteria to mine precious material scrap.
- ☐ Some of us will work on regenerative use of previous buildings and recycle material components.
- ☐ Some of us assess the impact on our community from past environmental, social, and economic factors.
- ☐ Some of us canvas our community and work in the political system to advocate for change and government alliances to private sector efforts.
- ☐ Some of us work on DEIB hiring.

- ☐ Some of us train our operations people using the newest automation system with better energy and material use sensors.
- ☐ Some of us organize our performance measuring for our operations and hold each other accountable through reporting and transparent discourse.
- ☐ For others it is EV's all the way, or new building designs that self-cool, or engineering edible packaging formulations.
- ☐ Some of us work on policies to inspire change in communities.
- ☐ Some of us architect just transitions.
- ☐ Some of us cost out the life cycles of current and future processes.
- ☐ Some of us sell sustainable solution offerings and products and help the change process.
- ☐ Some of us report to our shareholders the good decisions they made investing in our organization to shift our products and processes to sustainable solutions.
- ☐ Some of us plan and hire the workforce that can bring these diverse capabilities to an ever-widening employer base.

It is all good work to be done by great workers in all these important workspaces. Whether provider or user or both, it will be the best work we ever do.

Summary and Conclusion

Yes, it is all good work and ideally this research has enabled progress. Yet, even with the identification of 775+ roles, 350+ skills, hundreds of opportunity and solution areas identified, there is more to come from us as a global workforce leader on this sustainability workforce and the steps to make them a reality. More is needed and we are committed.

The tent Manpower has built is bigger and more colorful - more shades of green and turquoise – than imagined before, bringing continuous expansion of what the 'green' jobs spectrum is. Having the workforce that we envision achieves sustainability strategies and practices that enable resilience as well as results. Someday, it is assumed like major trends before it, that the sea change of sustainable thinking and doing will be built in around us. Sustainable solutioning will be the new standard operating procedure - default, ever-present and pervasive without having to be positioned and qualified. Likely role and job titles that have "sustainability" or "sustainable" in their titles will move forward without the need to highlight the sustainable capability label we need today.

Bodies of "proof" and ROI and will also be available, understood, and already built in as baseline expectations. Technology, conscious digitalization, and data utilization will power the "process and the proof" – with or without legislated actions - and will inform a sustainability conversant society, consumer sector, and provider base, and will provide routine tools and measures to continuously monitor, assess and improve. Employers will accelerate their positions, maturity, and innovation by hiring an employee mix that brings together many of these redesigned, innovative, or emergent roles and skills. Certain industries are poised as big winners - take energy, manufacturing, infrastructure, consumer products and others – and we have seen them work to get traction on more sustainable new and improved versions of themselves. It's everybody's game, the tent is big. It may be tough at times to quantify the speed, the volume, the exact trajectory to a more sustainable world. But we all can see the need, the opportunities, and the direction. Just keep looking out that window.

Manpower's sustainability workforce effort provides tools and insights and enables certain progress for parts of the workforce development system. Yet one of the biggest contributions for projects like this is to solve for some factors and *to also track and keep asking more questions, giving insights to other stakeholders to keep solving for additional issues*. The speed and trajectory of sustainability's challenges and solutions to this point indicate sustainability is an evolving but very opportunistic and valuable career arena that is here to stay, ever changing and challenging and needing continuous and deep attention as to the foundations, especially the workforce and their capabilities.

Let's keep the conversation going while we remember it is…

us in continuously
Everybody's Game

Biggest Tent:

Join us in continuously expanding the "Green+ and Turquoise" spectrum.

Body of Proof:

Together we can improve transparency, evidence, data, and experience about the impacts of the sustainability solution skills the New Mix delivers.

The New Mix:

Across the Green+ and Turquoise spectrum, let's build, employ, and partner with the New Mix of workforce skills and capabilities. Even with challenges and market and sector specifics, we can advance the contributions of this new cross-industry workforce.

Legitimate Debate:

Let's work together to build the workforce and while we debate the count, let's accept the direction, the need, the opportunity.

Sea Change (and land, air, ground, economic, human…)

Our goal is to bring positive change to the world, to do well by doing good, and live our values.

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Around and supporting climate care, innovation and resourcefulness, just transitions, environmental stewardship, social innovation, improved human and community health, and equitable prosperity, we make new commitments. We commit to a view of the sustainability workforce as cross-sector, life-cycle centric solutioners with skills, capabilities, and role structures to deliver value and results embracing the 5Ps at every stage.

Manpower is accelerating efforts to enable a bold, built world based on resource efficiencies, process and product innovations, transparent and smart governance, and a widening respectful use of nature's wisdom into a new "nature of business" (bio-business) mindset. We position hybrid essential roles across a new spectrum that can enable new policies, promises, business models, sustainably-native services, products and outputs, all equating

to innovation and prosperity opportunities. Remember what society values turns into jobs. And at Manpower, we value the innovation, community, and resourcefulness of the sustainability solutions workforce. Manpower endorses and sponsors solutions to this future world of work driven by this workforce of sustainability solution leaders, designers, builders, and operators.

The perspectives, practices and workforce actions for an era driven to and by sustainable solutions are part of the current and future path to sustainability. With those stones of the path more illuminated, we also need energy for the journey, and we need to know where the road hazards are. We need to quickly navigate this new world and, in hiking parlance, make the loop to be sure we see all sides and horizons.

Completing the arc of intention with these assets, Manpower has staked the path forward and encourages consideration and use by our clients and partners across locales, industries, and communities. Increasing our collective participation, expertise, and commitment to the roles, jobs, and careers presented here offers a defining view of the future world of work with early roadmaps to get there. Accepting the opportunities and obligation, risks and rewards in every arena that are propelling us forward, let's take together the path to tomorrow's sustainable solutions workforce direction marked here for us all today.

Remember what society values turns into jobs. And at Manpower, we value the innovation, community, and resourcefulness of the sustainability solutions workforce