
# HIBAR Research Alliance

***Expanding integrative basic and applied research to accelerate service to society***

**STRATEGIC PLAN**
**for 2020-2025**

**Approved by HRA Council**

**June 8, 2020**

*www.hibar-research.org*

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### TABLE OF CONTENTS

## EXECUTIVE SUMMARY

The Highly Integrative Basic and Responsive (HIBAR) Research Alliance (HRA) is a network that brings together contributors that share the vision of an improved research and innovation ecosystem that better contributes to solving society's critical problems. The HRA is largely decentralized, with most activities carried out by a network of interconnected working groups, and the primary purpose of this strategic plan is to guide the action of the working groups, enabling the Alliance to optimize its success.

Participants in HRA activities recognize that progress toward solving society's critical problems can be greatly accelerated by integrating basic and applied research within individual research projects, and this integration is more effectively achieved when university-based researchers and non-academic researchers work together as equal partners. HIBAR research at universities is not a new phenomenon, but contributors to the HRA believe that the time is ripe for significant increase in that activity. The stated goal of the HRA is to facilitate that increase four-fold over the next decade.

**The HRA Vision:** An improved research and innovation ecosystem that better contributes to solving society's critical problems.

**The HRA Mission:** Catalyzing significant expansion of collaboration between university-based researchers and non-academic researchers, working together as equal partners, in order to discover new knowledge that greatly accelerates progress toward solving society's critical problems.

**Strategy for accomplishing the HRA mission:** The HIBAR Research Alliance will facilitate collaborative action through HRA working groups and through existing networks in the research and innovation community in order to achieve the cultural and structural changes necessary for a substantial increase in the quantity and quality of highly integrative basic and responsive (HIBAR) research projects. This strategy will be achieved through:

- Outreach and Dialogue to build more general awareness of and appreciation for HIBAR research and to engage collaborators;
- Collaboration to identify barriers and opportunities for more HIBAR research in order to better target outreach and development of support tools and resources; and
- Collaboration to develop supporting tools and resources to inform and enable action of HRA allied organizations, networks, and the target audiences.

Two years of planning exercises have considered the key stakeholder groups the HRA needs to reach and identified how these groups play a role in supporting the conditions needed for a substantial expansion of HIBAR research projects. The conditions and stakeholder groups and what each can contribute to the desired but complex web of changes in attitudes, behaviors, policies, and practices are described in some detail. Thinking through the "Impact Pathways" sharpened thinking on the strategies for accomplishing the HRA mission.

The HRA will develop and carry out a monitoring and evaluation plan to assess the implementation of this strategic plan, and the stakeholder groups will be integral to this process. Targets have been set for 2030: By 2030, twenty percent of research projects at universities will be HIBAR research,

and a distributed network of collaborating teams complemented by top-down endorsements will have achieved positive organizational change and a critical mass of influence to sustain that change.

# A. INTRODUCTION TO HIBAR RESEARCH AND THE ALLIANCE

## A1. What is HIBAR research?

Research results that benefit society often are generated by multiple, long-term projects that focus either on curiosity-driven basic research or application-oriented applied research. However, this is often a slow process, and it can be accelerated by integrating basic and applied research within individual projects. Integrated projects of this type fall within a time-honored class of projects popularly known as "Pasteur's Quadrant" research. This subset of Pasteur's Quadrant research is referred to as "Highly Integrative Basic And Responsive" (HIBAR) research, because these projects combine all aspects of basic and applied research while also engaging with partners in society in an integrative and recursive manner. This subset is a small but important part of the larger research and innovation ecosystem.

A research project is considered HIBAR if it combines basic and applied research in all four of the following key ways:

- Integrating motivations, through a desire for discovery and an intent to solve problems;
- Integrating methods, using traditional academic investigation and creative methods;
- Integrating leadership, by academics co-leading projects with societal partners;
- Integrating time frames, by maintaining a strong sense of urgency over a long haul.

HIBAR, the acronym for the label "Highly Integrative Basic And Responsive", was developed to emphasize the essential characteristics of this type of research project, by signifying their integrative and recursive characteristics. Academic researchers in all fields (including social sciences, humanities, science, engineering, and medicine), working alongside societal partners that bring key expertise, have much to offer in the diverse collaborations that are central to most HIBAR projects.

HIBAR research has historically been highly generative, contributing to breakthroughs such as the transistor and penicillin, and, indirectly, the internet, cell phones, and the GPS system. More recent examples include the work of Esther Duflo and Abhijit Banerjee, awarded the 2019 Nobel Prize in Economics for their experimental approach using randomized controlled trials about alleviating global poverty, the creation of the Google "pagerank" algorithm that has revolutionized the internet search engine, and key material science developments in battery technology that have enabled the electric vehicle industry to flourish. HIBAR research also leads to solving societal problems in a less dramatic but no less important fashion, such as understanding institutional and behavior changes needed to reduce poverty in inner cities.

Figure 1 shows a Venn diagram that portrays the expanse of university research projects, in order to position HIBAR research projects in the context of Pasteur's Quadrant research project. As shown, the legend along the lower left axis labels three "bands" of research – those that are discovery oriented, those that are both discovery oriented and solution oriented, and those that are only solution oriented. Similarly, the legend along the lower right depicts an orthogonal perspective, and also labels three bands of research – those that involve partnerships with leaders in society that are close to the problem and can thus inspire productive creativity, those that couple

those partnerships with a long term solution focus, and those that lack the partners, but maintain the long term focus. These possibilities portray a 3X3 matrix. As shown, a central band from bottom left to top right is the range for Pasteur's Quadrant research projects, which is both basic and applied. HIBAR research projects occupy the space at the center of the diagram.

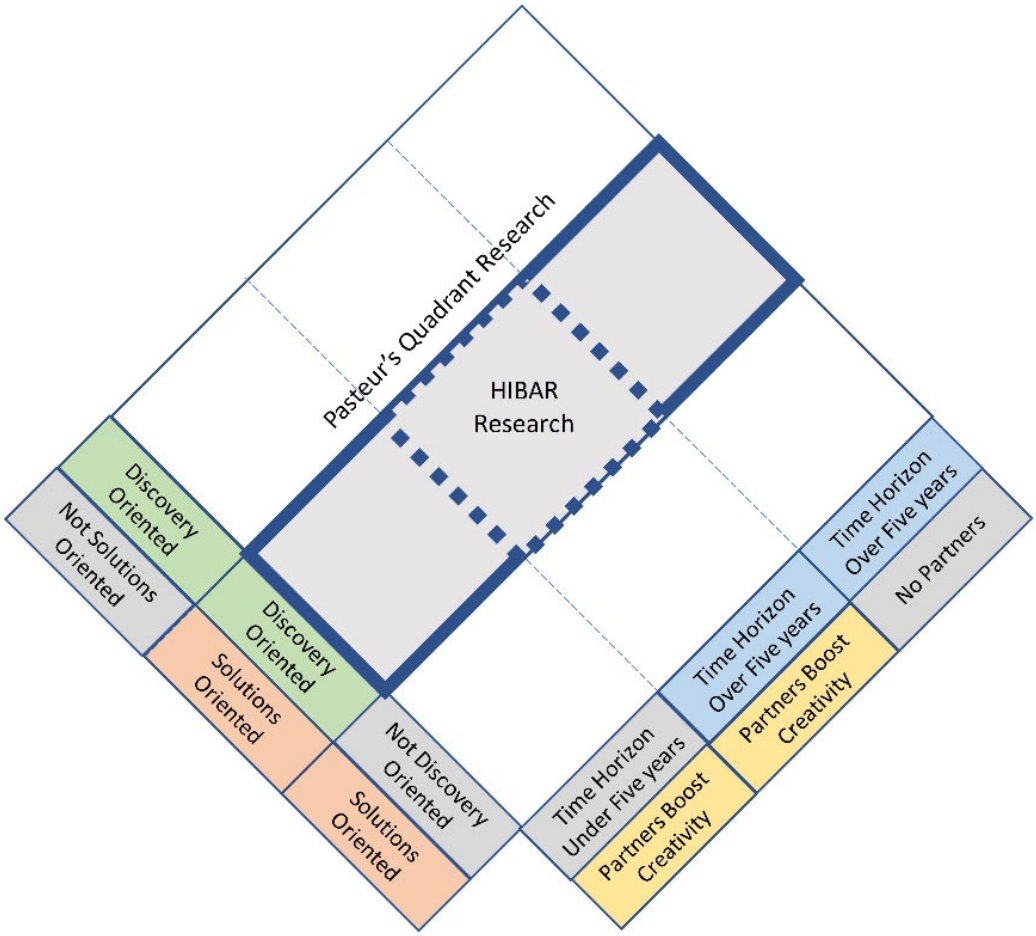



***Figure 1.*** *A Venn diagram portraying the expanse of university research projects, in order to position HIBAR research projects in the context of Pasteur's Quadrant research projects.*

## A2. Why is HIBAR research more likely to be highly generative?

Before addressing this question, it may be helpful to consider an often described, but highly unrealistic view of the transfer of research discoveries into practical application, as shown in Figure 2(a). This figure depicts that basic research occasionally yields results that appear to have the potential for practical usefulness, and these results are transferred to applied research. Applied researchers then adapt these findings for application, with some communication with basic researchers, and the results are then transferred to an innovation ecosystem that completes the work to get applied research to the place where it benefits a grateful society. This model of the relationship between basic and applied research is appealing in its simplicity, but it is not realistic. A more realistic model of the relationships is shown in Figure 2(b), in which a subset of this is HIBAR research which spans both basic and applied research, increasing the communication and

collaboration between them. The integrative and responsive nature of HIBAR research creates multiple feedback loops: with society, with applied research, and with basic research, and this much more complex reality more often leads to breakthrough discoveries that greatly benefit society.

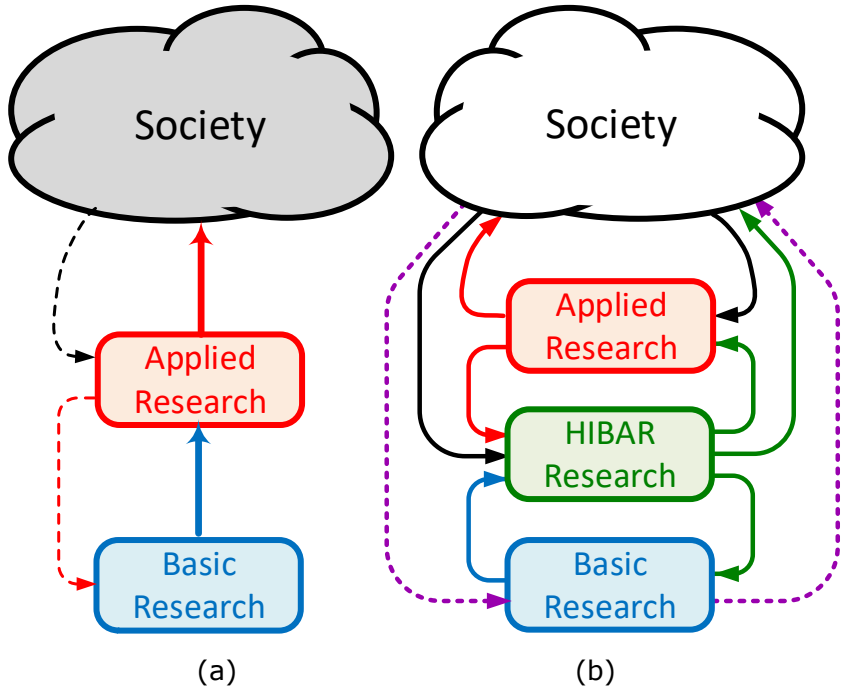



***Figure 2.*** *(a) A symbolic depiction of a linear relationship in which basic research occasionally develops ideas that transfer into applied research and ultimately benefit society—sometimes described as the linear model for technology transfer. (b) A depiction of a more effective approach in which HIBAR research is bi-directionally coupled to society and to basic and applied research projects via multiple feedback loops.*

The multiple feedback loops depicted in Figure 2(b) are the essence of the integrative aspect of HIBAR research. HIBAR research projects succeed by integrating basic and applied research in motivations, methods, leadership, and time frames, as shown here in Table 1:

| Highly Integrative | Basic | And | Responsive |
|---|---|---|---|
| Motivations | desire for discovery | *and* | intent to solve problems |
| Methods | traditional investigation | *and* | creative methods |
| Leadership | fundamental researchers | *and* | hands-on practical partners |
| Time frames | long-term objective | *and* | a strong sense of urgency |

***Table 1.*** *The integrated elements of HIBAR research projects*

HIBAR projects comprise all eight of the elements shown in the table (perhaps not equally, but at least to a significant extent). Particularly interesting are the four shaded elements because they can be challenging to include simultaneously in a research project. There is often a "creative tension" among these eight HIBAR elements. While this might seem uncomfortable at first, through careful project design and management, the creative tension often leads to new perspectives, alternative approaches, and constructive debate. Together these elements make HIBAR projects powerfully generative.

Some may ask how important it is for projects to include all eight HIBAR elements. The answer that they are powerfully synergistic, and the stronger the balance and integration is of all eight elements within a project, the more likely it will be to avoid pitfalls that impede highly generative research results.

### A3. Why is more HIBAR research needed, and how can universities best contribute?

It is widely agreed that there are major societal problems, and research and innovation are needed to help solve them. Universities can be valuable partners in developing solutions to these problems, both in discovering the required new knowledge and guiding its application. HIBAR research projects have always existed in universities, with numerous excellent examples, but they remain less common than projects that are considered solely basic or solely applied.

This is in part because, since World War II, universities were encouraged to focus mainly on curiosity-based research, with corporations, think tanks, consulting firms and non-profit organizations carrying out practical work. HIBAR projects have historically been a significant component of the research supported by a wide range of government funding programs, including the work carried out by national laboratories, social research clusters, policy institutes, and governmental social programs and this type of research continues to be significant. However, the HIBAR research that once flourished in major corporate laboratories is, today, substantially diminished. Consequently, the total amount of HIBAR research underway today is diminished, at a time when arguably it is needed more than ever. (This is explained in further detail in a paper titled "Re-Invigorating HIBAR Research for the 21st Century", published in the National Academy of Inventors Journal of Technology & Innovation 21(2) and accessible here.)

Universities are poised to more effectively partner on HIBAR projects with other organizations, both in the public and private sectors, to advance breakthrough research and this can help compensate for the overall reduction in this research over the past decades. As universities increase their involvement in HIBAR research projects, great care must be taken to strengthen basic research and preserve academic excellence. Fortunately, these goals are not in conflict – on the contrary, HIBAR research enables universities to deeply partner with societal experts in ways that ultimately enhance fundamental knowledge generation.

### A4. What is the HIBAR Research Alliance?

The HIBAR Research Alliance (HRA) is an ad-hoc network that brings together contributors from research universities and related organizations. Participants in HRA activities recognize that

progress toward solving society's critical problems can be greatly accelerated if university-based researchers and non-academic researchers work together more often as equal partners. In order to expand these collaborative efforts, it is essential for the perspectives of both academic and non-academic research organizations to develop a shared understanding of their unique challenges and to develop an integrated perspective of how they can each adapt to overcome them. HRA activities are aimed at improving academic culture, using established organizational change methods, so that universities can become better partners, as well as catalyzing and supporting key changes identified by other stakeholder organizations. All interested organizations and individuals are sincerely invited to participate in the HRA.

Specifically, the Alliance aims to catalyze research collaborations which will lead to systemic improvement in the quantity and quality of HIBAR research: research that has societal impact because it combines fundamental research discoveries with their practical and effective application, and generates results that are able to be adopted often within 7 to 10 years by those in society who can benefit from them. The HRA has an established goal of catalyzing a system-wide increase in HIBAR research, from about one project in 20 today, to one in 5 by 2030, while strengthening all types of research excellence. This change will enable universities to become more responsive to the needs of society while strengthening their basic research excellence.

Bolstering HIBAR research in this way requires a key shift in the culture of the university system: Incentives in the academic system today are not ideally aligned with HIBAR research and the academic culture within universities needs to adapt in order for the HRA's goal to be achieved. It is essential that these changes in academic culture are made in such a way that they also strengthen the commitment to research excellence and academic freedom. Carefully managed, this change is realistic and achievable.

To date, the participants in HRA activities have been predominantly affiliated with organizations based in North America, but given the immense need to address global problems and the interconnectedness of the world-wide academic research system, the Alliance aspires, over time, to have a much more international focus.

### A5. The relationship of HIBAR research and the HRA to the research ecosystem

The overall research ecosystem is vast and complex, but for the purpose of providing context for how HIBAR research fits into the overall research ecosystem, a very simplified overview is offered here.

Table 2 depicts how HIBAR research complements other forms of research, and thus fills a key gap. Most projects comprise many individual research tasks, each of which could be placed somewhere on the range from highly theoretical to very practical. Various styles of projects have their tasks distributed differently over that range. For example, Basic Research projects emphasize more theoretical activities and Applied Research projects emphasize more practical work. In sum, Basic Research projects and Applied Research projects still leave a gap of emphasis in the middle of that range. The tasks of HIBAR Research projects are more broadly distributed throughout the range, with their distribution approximately centered in the middle. This broad central distribution is very amenable to the recursive exchange of diverse ideas that often generates breakthroughs.

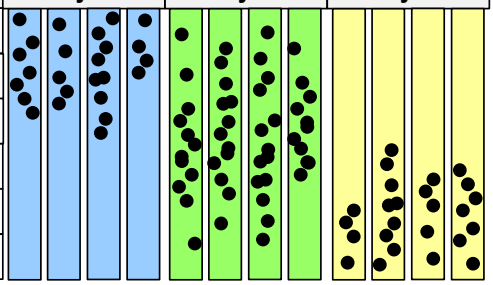
| Character of Subtasks within Research Projects | Research Project Categories | | |
|---|---|---|---|
| | Basic Projects | HIBAR Projects | Applied Projects |
| **Intellectual:** Broadly applicable, generates new ideas |  | | |
| **Insightful:** Thoughtful, creative and visionary | | | |
| **Explanatory:** Provides valuable understanding | | | |
| **Use-Inspired:** Motivated and informated by societal issues | | | |
| **Engaged:** Carried out in partnership with society | | | |
| **Practical:** Quickly solves a specific practical problem | | | |

***Table 2.*** *A depiction of how HIBAR research complements other forms of research*

Recognizing that some basic research ultimately has significant societal impact in the long term, the focus here is on projects that are specifically and directly designed to have accelerated societal impact. HIBAR research is one of a number of forms of research in this overall category, including convergence research, grand challenges research, community-based research and public impact research. Each of these forms of research have clear definitions and there is only partial overlap between them. Examples of some of these differences with HIBAR research are:

- Some HIBAR projects address problems that, while important, are not "Grand Challenges".
- Some HIBAR projects are not interdisciplinary and so are not "Convergence Research".
- Some Convergence projects do not require the deep societal partnerships that characterize HIBAR.
- Community Based Research does not necessarily include external partners who co-lead the research, which is key to HIBAR research.
- Public Impact Research includes all research that primarily emphasizes positive public impact. HIBAR research projects are a subset within this category, referring to those projects that emphasize positive public impact and also emphasize new knowledge generation.

In addition to the forms of research itself, there are well-known initiatives focusing on improving research impact. These efforts are all mutually compatible, synergistic, and non-competitive, but they are different in their approach and focus. The HIBAR Research Alliance specifically aims to improve academic culture, using established organizational change methods, in order to bolster HIBAR research. It is very likely that this intended culture change will also help the other forms of research listed above.

## B. MISSION, VISION, STRATEGY AND VALUES

### B1. The HRA Vision Statement

The vision of the Highly Integrative Basic and Responsive (HIBAR) Research Alliance (HRA) is an improved research and innovation ecosystem that better contributes to solving society's critical problems.

### B2. The HRA Mission Statement

The Highly Integrative Basic and Responsive (HIBAR) Research Alliance (HRA) will achieve its vision by catalyzing significant expansion of collaboration between university-based researchers and non-academic researchers, working together as equal partners, in order to discover new knowledge that greatly accelerates progress toward solving society's critical problems.

### B3. Strategy for accomplishing the HRA mission

The HIBAR Research Alliance will facilitate collaborative action through HRA working groups and through existing networks in the research and innovation community in order to achieve the cultural and structural changes necessary for a substantial increase in the quantity and quality of highly integrative basic and responsive (HIBAR) research projects.

### B4. HIBAR Research Alliance sub-strategies

*Outreach and Dialogue* to build more general awareness of and appreciation for HIBAR research and to engage collaborators

- Targeted outreach to possible ally organizations
- Outreach to the academic community, targeted and broad
- Outreach to ecosystem players (funders, social change groups)
- Outreach to organizations interested in joint cultural change efforts

*Collaboratively identify barriers and opportunities for more HIBAR research* in order to better target outreach and development of support tools and resources

- In the academic environment
- In areas of the research and innovation ecosystem that partner with universities
- In arenas that provide funds and other resources for HIBAR research

*Collaboratively develop supporting tools and resources* to inform and enable action of HRA allied organizations and networks and improve support for expansion of HIBAR research

- HIBAR success stories, models of best practice in team and research design
- Other tools and resources to fill gaps, seize opportunities
- Recommendations to funding organizations

## B5. Values Statement

The HRA conducts its work to accelerate and expand exemplary HIBAR research by prioritizing inclusivity, transparency, effectiveness, and sustainability. The organization strives to achieve diversity in its membership, leadership, and collaborative efforts; to enact decentralized, pragmatic processes using minimalistic organizational structures promoting the expeditious solving of urgent societal problems; and to make decisions democratically and fairly.

## C. THE IMPACT PATHWAYS FOR ACHIEVING INCREASES IN HIBAR RESEARCH

The initial strategy for the HIBAR Research Alliance was developed during a series of three workshops, one in January, 2017 in Washington hosted by the Association of Public and Land-Grant Universities, the second in October, 2017 at the University of British Columbia in Vancouver and funded by the Natural Sciences and Engineering Research Council of Canada, and the third in March, 2018 at the University of California San Diego, funded by the US National Science Foundation. The HRA was launched in November, 2018, and members and contributors have continued to work collaboratively to further explore and define the HRA strategy. This strategic planning has been informed by literature on organizational change and organization of research and innovation efforts to stimulate research and innovation success, and by dialogue with many people deeply embedded in these pursuits.

The result is this strategic plan which will guide the activities and outputs of the HRA. These activities and outputs will achieve the mission and vision by catalyzing a web of changes in attitudes and behaviors, which in turn lead to new ways of thinking and operating that achieve the desired end state. The changes forming this web often referred to as "impact pathways".


This section describes current thinking about the HRA impact pathways and the major elements in those pathways. Figure 3 at the end of this section is a graphic summary of the HRA strategy, the impact pathways, and the mission and vision.

### C1. A picture of the desired end state

*The desired end state is the achievement of the HRA vision and mission. The vision is an improved research and innovation ecosystem that better contributes to solving society's critical problems. The HRA mission, a significant expansion of quality HIBAR research by 2030, can help to achieve this vision because the integrative nature of HIBAR research will both increase knowledge discovery and accelerate responsiveness to societal challenges.*

The ideal end state eliminates the gap between the amount of HIBAR research urgently needed for society and the amount the current research and innovation ecosystem is likely to produce. The HRA was formed with a recognition that HIBAR research is already underway to some extent within universities and non-academic research organizations including federal laboratories, corporate for-profit research centers, social change organizations, and non-profit research institutes. Opportunities exist to substantially increase it, however, by increasing awareness and appreciation of its value, by identifying barriers and opportunities for expansion, and by catalyzing changes in conditions that support increased participation.

Using universities as an example, no single current model represents an ideal end state, but universities in which HIBAR research currently thrives include higher levels of some of these characteristics: cross-disciplinary research fostered by an administration that values this environment in tenure and promotion; aggressive efforts to support interactions of faculty with industry and government laboratories; large centers both within the university or with other universities to address broad societal needs; partnership with non-university organizations focused on arts and humanities; partnership with local communities and intense focus on local economic and educational needs; and, of course, outstanding faculty and students in all areas of focus.

A distinguishing characteristic of the HIBAR Research Alliance is the networking of research leaders, at all levels, both within their own institutions and through network-facilitated exchanges between institutions. This distributed networking aspect generates a multitude of personal conversations among them, and with other colleagues which will be complemented by appropriate messaging from administrative leaders. Together these two forms of influence can collectively provide the persuasive impact needed for widespread adoption and eventually achieve positive culture change. Indeed, studies of organizational culture change have established that these are essential features for successful organizational improvement. The desired end state for the HRA is that its work will be completed because a critical mass of influence will enable sustainable organizational improvements that support an expanded level of quality HIBAR research projects at universities and other research organizations.

## C2. Conditions key to the impact pathways

Considerable thought has been given to possible impact pathways during the strategic planning process. Nevertheless, further dialogue is needed to develop the plan for implementing this strategy, and the HRA will have an ongoing process for evaluating progress and adjusting the implementation plan as activities proceed.

As part of developing this strategic plan, the HRA identified the following conditions required to support expanded participation in HIBAR research by key stakeholder groups. The first two conditions enable the others.

A. Awareness. An increasing number of people in key stakeholder groups need to be aware of HIBAR research, both what it is and why it is important.

B. Capacity Development. Those who are inclined and persuaded to consider participating in HRA activities must have the required knowledge and skills, and other capacities to decide to participate in either (a) well-designed HIBAR research projects immediately, or (b) participate in HRA efforts to reduce barriers and increase incentives for HIBAR research. As system changes occur over time, required capabilities may change.

C. Recognized as Important. HIBAR research needs to be recognized as an important part of the research and innovation ecosystem, and appear in research and innovation policy documents and agendas of all/most research, innovation, and social change funding and promoting organizations.

D. Funds. More funding possibilities for HIBAR research are needed. Other needed research support may be "in kind" such as research facilities, equipment, and expertise.

E. Mix of Expertise. Participation is needed by diverse experts (including non-academic expertise) on HIBAR research projects, with the right team members capable of achieving the specific projects objectives.

F. Incentives and Rewards. Incentives and rewards, both monetary and non-monetary, are needed for researchers to participate in HIBAR research. Non-monetary considerations include recognition through promotion and tenure and publication in respected journals, and the well-being that results from pursuing a desired career path and making a contribution to society.

G. Related Research and Deployment. Related research and development (R&D) and deployment efforts can support HIBAR projects and it is helpful to consider these, both in planning and assessment. No HIBAR project's progress and success comes in a vacuum. Examples would be HIBAR research in areas of a university's strengths, or HIBAR projects in a research organization that is already very skilled and connected to efforts to help the developing world.

### C3. Key players on the impact pathways to HRA success

In order to expand collaborative efforts between academic and non-academic research organizations, it is essential to develop a shared understanding and an integrated perspective of how they can each adapt to overcome them. HRA activities are aimed at improving academic culture, using established organizational change methods, so that universities can become better partners, and activities that work towards this goal and area also beneficial to key stakeholder groups are integral to the HRA strategy.

In addition to its own members, the HRA has identified six groups of stakeholders key to its achieving its vision and mission. The six groups are:

- HRA allied organizations
- Academic leadership
- Government policy makers and research program managers
- Business and related research organizations
- Economic and social development organizations
- Researchers both academic and non-academic

Impact pathways provide a mechanism for overcoming complexity and identifying key strategic actions. An analysis of how and why key stakeholder groups will bring about the desired changes is a difficult but important part of strategic planning. A brief description of each stakeholder group, its possible contributions to the HRA mission, and the value it could receive in return, is provided below. Further dialogue with individuals within these groups will sharpen the understanding of shared goals and identify opportunities for joint action.

### 1. HRA Allied Organizations and their leaders at multiple levels

These are organizations with agendas that share common goals with the HRA. This group includes partners focused on change in policy, process or practice rather than direct participation with HIBAR research. The HRA, as a small organization, will depend on its allies to extend its reach and achieve results. Examples in this stakeholder group include the Association of Public Land Grant Universities, the National Academy of Sciences, and the Responsible Research in Business and Management Network.

The HRA can work with these organizations to collaboratively develop key resources that are mutually beneficial. For example, with an organization also wanting to increase the broader societal impact of basic research, resources that demonstrate the value of HIBAR research to society, tools for identifying and assessing the quality of HIBAR research projects, and best practices for encouraging HIBAR research would be mutually beneficial. The organizations can cross-promote events that are of interest to all allied organizations sharing common goals and identify collaborative activities and joint events that would give mutual benefit. Organizations can share their expertise, in particular lessons learned through their own engagement activities with the research and innovation ecosystem.

Importantly, allied organizations will benefit from working with the HRA as joint action will help them achieve greater progress toward their own agenda through cooperation on shared goals, and recognition within their organization for their key role in these accomplishments.

### 2. Academic Leadership

The HRA plans to reach the leaders of academic organizations, from provosts to Assistant Deans of Research to department heads to promotion, tenure and hiring committees. Academic associations such as disciplinary groups, journal editors, and accreditation agency leaders are also of interest.

This group can contribute a great deal to support HRA activities. Twelve universities are already members of the HRA, and individuals from other universities are active in collaborative action groups helping to develop the HRA strategy and resources and tools to assist with garnering additional awareness and interest within universities and other key stakeholder groups. Specific capabilities the HRA has identified as needing to be strengthened within academic institutions that collaborative action of the HRA and academic leaders could contribute to include investigation and some guidance on criteria and metrics for assessing HIBAR research proposals and progress of funded projects that fairly values both the research and societal impact. Models and training on design of HIBAR projects are needed, as well as training for graduate students in this type of research, examples of supportive promotion and tenure policy and processes, and cross-organizational and interdisciplinary teaming.

The value of action by academic leadership is the greater organizational success that can be achieved through cooperation on shared goals shared with the HRA. Just a few of the possible shared goals are informing and adding value to areas that are already university research and technology transfer strengths, increasing social impacts of research, and motivating researchers who want to educate but also make a contribution to particular societal challenges. Individuals

within academic leadership may also value the personal recognition for contributing to these accomplishments and the comradery, learning, and a sense of satisfaction arising from participating in these collaborative efforts.

### 3. Government Policy Makers, Research Program Managers

At Federal, state/provincial, and even local levels, government entities and staff control research agendas, fund research programs, and often act as a catalyst for collaboration and innovation. These include mission agencies and national laboratories that are typically engaged in some HIBAR research.

At the Federal level, individual agencies are often highly interactive with industrial sectors (e.g. agriculture, energy, health, defense, space, environment, etc.) with research agendas already targeted to address societal problems. Opportunities for significant enhancement exist through direct funding of universities and enhanced collaboration between government laboratories. Once identified as a significant and valuable element of their portfolios, agencies could do more to include HIBAR research when calling for research proposals, setting requirements for grants and acquisitions, and seeking appropriate cross-agency interaction. HIBAR research expansion may be reflected in the whole range of agency program activity including in funding selection, operational changes at agency laboratories and program evaluation. To facilitate HIBAR expansion it will be desirable to review and possibly modify the wide range of government controlled rules that affect it, including regulations, tax and subsidy policies; standards, and sharing of intellectual and financial products.

In return, government entities whose mission is to provide for the public good will see accelerated, specific progress that leads to accomplishing to their mission, achieved by reorganizing rather than adding resources. Recognition, personal satisfaction, and rewards flow from mission accomplishment.

### 4. Business and Related Research Organizations

Private sector organizations and related organizations such as foundations fund research for interests specific to that organization, though public good could result. Health-related businesses and research institutes such as pharmaceutical companies and the Howard Hughes Medical Institute are examples, as are businesses and research institutes that include renewable energy research and development in their portfolio. Many industrial associations engage in and/or encourage research related to long-range shared interests of that industry. Their engagement with academic research varies widely from one to another and offers a path to enhanced HIBAR activity if pursued.

This stakeholder group, working with the HRA or on its own, could investigate how much of its current research is HIBAR, how much of that is with universities, and if more HIBAR is desirable, what changes would be necessary for that to occur and in what areas. This could include cross-organizational contracting processes with universities, IP rules, and knowledge of nearby university strengths related to organization's research interests. The organization could put out policy supporting intention to do more HIBAR, put funds in university HIBAR projects, provide

needed equipment or data, and dedicate personnel to HIBAR research projects. They can recognize employees' HIBAR contributions to the business or organization, and publicize success stories.

The business or related organization expanding participation in HIBAR research will receive a positive return on its investment in the HIBAR research. This return would be a contribution to a specific firm or sector objective. It will also receive the added benefit of contributing to public good, serving a social responsibility goal. Individual HIBAR participants as well as the organization feel satisfaction, and receive praise for contributions to the organization and to knowledge and to helping solve a societal problem.

### 5. Economic and Social Development Organizations

These organizations have objectives around economic and social development. Some focus on developing countries and troubled inner cities, and others more broadly on social change generally. Public good, including topics such as racial justice, gender equality, mitigation of poverty, and protection of political rights and civil liberties, are a priority for these organizations.

Individuals affiliated with these organizations can make significant contributions to HRA activities in a number of ways, including by participating in HRA working groups to identify meaningful economic and social challenges that represent significant HIBAR research opportunities, encouraging dialogue and connecting researchers and non-academic experts in key areas where HIBAR research is needed, and making essential data available to research teams. Importantly, these organizations can include in their processes and strategic agendas a mechanism for identifying those problems that require basic fundamental research advances to solve and facilitate generation of relevant data to address such problems, thereby enabling HIBAR research projects to flourish. The organizations have a deep understanding of specific societal problems and as a result they are uniquely positioned to provide valuable in-kind resources to help these HIBAR research projects advance. These organizations also typically have unique and necessary capabilities and strategic connections in their ecosystem to more quickly adopt and implement solutions based upon the research advances made as a result of the HIBAR projects they co-created.

These organizations will receive value in return. They are typically non-profit, serving the public good. In some cases, they have substantial resources they have difficultly deploying effectively and HIBAR collaborations can help with leveraging the benefits of such resources. New fundamental basic research advances in the social sciences and technology can also increase the effectiveness of their work towards their organizational and societal goals. For those with fewer resources, collaborating on HIBAR projects can generate resources to advance goals as well. Additionally, HIBAR collaborations can help shed light on, and generate additional efforts to solve, economic and societal issues these organizations care about.

### 6. Researchers both Academic and Non-Academic

It is the individual researchers themselves who must be interested and able to participate in HIBAR research projects, whether they reside in a university, a partnering organization, or strictly non-academic research effort. Incentives and other conditions must align with the interest to enable

participation. Organizational change comes from a combination of top down and bottom up changes in attitudes, behaviors, processes, and practices coming together to align incentives and actions. For example, in addition to searching for traditional publication outlets, researchers involved in HIBAR projects can consider alternative outlets that are well suited to the discoveries resulting from this kind of research such as applying for patents, working with startup firms, or continuing to assist those working to implement the societal application.

Researchers bring a wide range of skills and knowledge, be that about cutting-edge fields of research or societal needs, to their work, from design to implementation. They also typically understand how to pursue relevant funding opportunities and, in many cases, how to conduct their work as members of diverse teams. After deciding to develop or join a HIBAR project, researchers will need to display strong leadership and/or function as a responsive team member, implementing the project in a way that makes the most of their particular expertise. These are all valuable skills that can be learned and improved with experience.

Researchers will receive value in return for participating in HIBAR research projects. Value could be in the form of making fundamental discoveries, publications, patents, or making a contribution to a particular societal challenge. Individual researchers may also value the personal recognition for contributing to these accomplishments and the comradery, learning, and a sense of satisfaction arising from participating in these collaborative efforts.

### C4. Developing an action plan for working with key stakeholder groups

Having developed this overall strategic plan, the next phase will be the development of an implementation plan. A key part of this implementation plan will be a specific joint action plan for the HRA and each of the key stakeholder groups, in order to achieve the shared goals identified above.

Draft 13 May 2020

**The HIBAR Research Alliance (HRA) Impact Pathways**

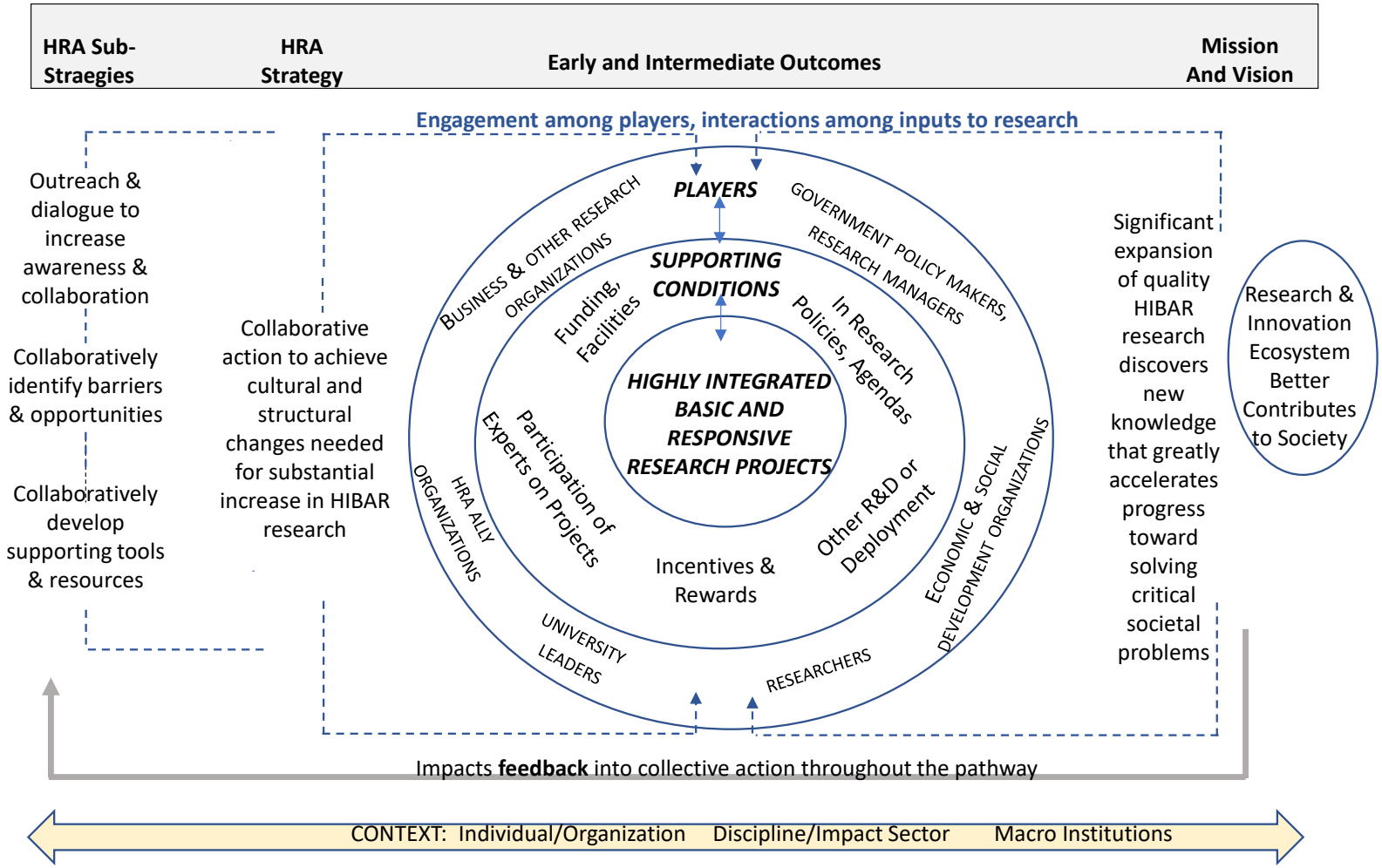



***Figure 3.*** *The HRA strategy achieves its mission and vision through collaborators and impact pathways*

## D. ORGANIZATIONAL STRUCTURE OF THE HIBAR RESEARCH ALLIANCE

The HRA is a largely decentralized organization, with considerable operational interaction and communication between the governing body and the various working groups, and both individuals and organizations participating in HRA activities:

Individuals: There are two categories of individuals participating in HRA activities: "Contributors" are individuals contributing time, effort, and/or expertise to an HRA activity but not representing a specific organization; and "Representatives" are individuals representing a specific organization in an HRA activity.

Organizations: Organizations can participate as either "Institutional Members" or "Institutional Affiliates." A higher level of commitment is required for Institutional Members than for Institutional Affiliates, and the structure enables organizations to transition between these two categories of membership as their circumstances evolve.

There are two main governing and management bodies that guide the Alliance: The Council is the main governing and decision-making body overseeing and managing the priorities and policies of the HRA. The Council includes both university and non-university participants, ensuring that there is true integration and partnership. Council Members will be elected by the Institutional Members for a term of three years. One important intent of the term limits is to give other Institutional Member universities the opportunity to have a seat on the Council in the future. The Management Group functions as the operational and coordination group of the HRA and also serves an advisory role, prioritizing issues that should be addressed by the Council.

Most activities of the HRA are conducted by small, focused working groups comprised of people from the HRA founding universities, other universities, and non-university organizations. In particular, Collaborative Action Groups (CAGs) of 10-20 people carry out intervention-related activities related to the cultural changes required for the HRA to achieve its goal. Specifically, each CAG is pursuing well-defined contribution toward the overall goal, and it has an evolving, clearly articulated action plan for achieving it. The HRA also has task groups that are much shorter term and focus on specific tasks, with clear, specific deliverables. Generally, the task group provides its results to a working group and its work is then complete.

The schematic diagram in Figure 4 on the following page shows the relationship of these working groups within the overall HRA organizational structure. (Dotted lines indicate working group topics that have been identified but are not yet underway.)

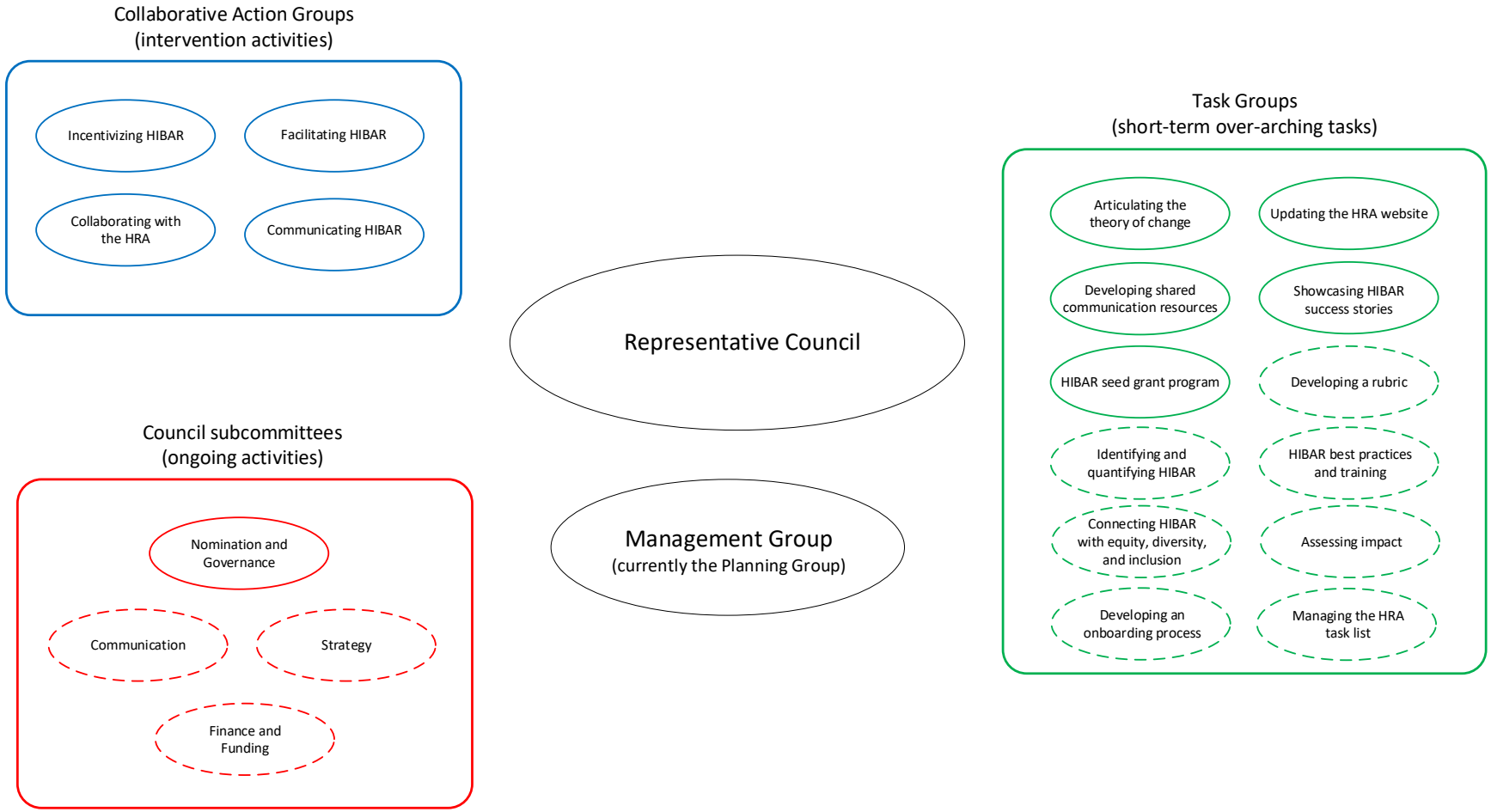



***Figure 4.*** *The relationship of working groups within the overall HRA organizational structure*

## E. ASSESSMENT QUESTIONS, PERFORMANCE INDICATORS, AND METHODS

The HRA will develop and carry out a monitoring and evaluation plan to assess the implementation of this strategic plan. As part of this monitoring and evaluation, the HRA can assess the changes in awareness, behavior, and action that have occurred as a direct result of interactions. Beyond this initial sphere of influence, the HRA will work with its member organizations and allies to perform and participate in activities to assess early and intermediate outcomes, all of which result from collaborative activities catalyzed by the HRA's initial and continuing influence. All key stakeholder groups will benefit from collaboration on development and promotion of common protocols for assessing the success of this HRA strategic plan.

Early on, it was identified that tools and resources are needed to assess both the number of HIBAR research projects underway over time, and the societal impact of those projects. These assessment tools do not currently exist, and the HRA strategic plan therefore includes actions to collaboratively develop and promote their development. Adoption of common assessment protocols and sharing of the assessment burden would be voluntary, and it is anticipated that adoption of the protocols will increase as the benefits of their use are demonstrated.

### E1. Initial outline of an HIBAR research assessment protocol

- Monitor progress and evaluate, learning more about what is needed, what is working or not, and adjusting along the life-cycle of the HRA or organization leading the effort.
- Set performance expectations and some performance targets for positive motivation and data for lessons learned. This must be done carefully (measure what is important, and prevent goal displacement, e.g., offset measures of quantity with measures of quality).
- Plan assessment as a multi-year effort. It is important to collect data now and as efforts go along in order to establish a base of data for tracking over time and for more cost-effective in-depth evaluation in the future.
- Best practice assessment begins with a theory of change and questions that follow from that covering all the phases of the effort:
    - Are we doing the right things? (prospective, planning)
    - Are we doing them the right way? (process, implementation)
    - Are we making the changes we had hoped? (outcome, impact)
    - Are we done? What do we do next? (learning, redesign)
- Assessment of performance answers the questions using indicators of performance and related metrics. Methods are chosen to answer questions and get data on related metrics. Since much cannot be quantified, both qualitative and quantitative data are needed.
- The major areas of assessment questions are the following:
    1. Did activities and outputs of these activities occur as planned and reach the target audiences?

2. Did target audiences react to the outputs as anticipated?
3. Have HRA networks expanded the audience and participants?
4. Have the changes above influenced the outcomes important to the HRA?
5. What has been learned about the influence of context and best practices for HIBAR?
6. Have there been spillover effects? unexpected consequences?

## E2. Performance targets, indicators and data sources

Table 3 shows a draft version of the current baseline and performance targets for the ultimate/desired end goal of this HRA strategic plan and the three sub-strategies. These performance targets are intended to guide and motivate the actions needed to implement the strategy. The entries in this table are example, and these will be refined as the implementation strategy is developed.

| HRA Strategic Plan Baseline and Targets | | | |
|---|---|---|---|
| **Performance Area** | **2020** | **2025** | **2030** |
| Engagement (Members, Contributors) | 12 member universities, 200 diverse contributors | Substantial increase in contributors and their networks | There is a distributed network of collaborating teams plus top-down endorsements |
| Knowledge of Needs, Opportunities | Needs and opportunities have been identified, particularly in the academic sector | More are identified in dialogue with and among other groups; these are prioritized | Networks achieve positive culture change and add to or reinforce the changes desired by many partner organizations |
| Availability of Supportive Resources | Website, webinars, best practice examples available | Priority supporting resource gaps have been/are being filled. | A critical mass of influence enables sustainable improvements in culture and structure |
| Amount of Quality HIBAR Research Underway | HIBAR research is estimated to be five percent of university research | The percent of HIBAR research of university research will increase (to around 12 percent) | Twenty percent of research projects at universities will be HIBAR research |

***Table 3**. A draft table showing the current baseline and performance targets for the ultimate/desired end goal of this HRA strategic plan and the three sub-strategies.*

Table 4 shows a detailed draft list of performance indicators by measurement area. It is based on the assessment questions, which follow from the impact pathways summarized in Figure 3. Metrics need to be specified more carefully, but these examples are both quantitative and qualitative (e.g., "extent of"). Initial ideas on sources for the data are included. A task group will be able to improve on this draft once the strategic plan is completed.

| **Table 4. Monitoring and In-Depth Evaluation of the HRA Effort (Initial Draft)** | | |
|---|---|---|
| **Measurement Area/Major Question** | **Performance Indicators/ (Metrics)** | **Data Sources** |
| **Inputs to HRA** | Funds,<br>In Kind contributions, grants, etc. | HRA Administrative data |
| **Activities/Outputs**<br>(ongoing, 1 year or less)<br><br>HRA and in collaboration with HRA Groups | Outreach: papers, presentations, events (number, with whom)<br>Identify Barriers and Opportunities: studies & workshops underway/completed, lessons learned, feedback to planning<br>Develop Tools & Resources: website, outreach & guidance materials, models (type, quality/quantity) | HRA Administrative data |
| **Reach of Outputs** HRA and HRA Groups | Number reached for each type of output, by type of stakeholder (Ally, Academic, Business, etc.), and t sphere of influence<br>Awareness (% of target audience who are aware) | HRA Administrative data |
| **Early Outcomes**<br>(1-2 years)<br><br>Key Stakeholder Groups, Individually and In Collaboration | Changes in Behavior and Action by Type of Organization(s):<br>-Perception of value of HIBAR research<br>-Become Involved (member, ally, collaboration, etc.)<br>-Provide/Use HRA resources (training, etc.) to fill need<br>-Reach out to others about HRA, HIBAR research<br>-Participate in pilot projects; seize opportunity | HRA Administrative data;<br><br>Web surveys of known participants |
| **Intermediate Outcomes**<br>(3-7 years)<br><br>Key Stakeholder Groups and Collaborations | Changes in Key Institutions, Groups (progress, reach of):<br>(e.g., in academic promotion & tenure, relationships between social change and academic organizations)<br>-Define desired changes<br>-Gather, gain support for change<br>-Decide, implement change & validate | Data collection by member and allied orgs.;<br>Case studies |
| | Extent of change in Supporting Conditions for HIBAR research:<br>-included in policy, on research agenda<br>-included in calls for proposals<br>-funds to projects, facilities/in-kind contributions<br>-experts participate on, lead projects<br>-incentives and rewards for participation<br>-support from other R&D, deployment action | Data collection by member and allied orgs.;<br>Case studies |
| | Progress on HIBAR projects:<br>-Number underway (start/end date, topic, $, etc.)-Research and social challenge context (level of challenge)<br>-Extent to which project integrates the 4 HIBAR dimensions<br>-*Research Progress* from define problem to find solution<br>-Advance knowledge, research tools, researcher expertise and communities of practice (pubs, , citations, students trained)<br>*Social problem Progress* and solution type: new/improved policy, product/technology, process, or practice<br>-*Phases*: investigate, develop, validate, launch, transfer, scale-up<br>*Impact of solution*: benefits of solution compared to next best alternative, number impacted, where | Self reports by projects using a template;<br>Bibliometric studies;<br>Case studies;<br>Selected impact studies; |
| **External Influences** | Specific factors in context that influence success | Interviews, Case studies |
| **Ultimate Outcomes**<br>(7-10 years) | -Increase in percent of research that is HIBAR in universities, research institutes, etc.; Quality of that research<br>-Impact of HIBAR research on Knowledge base & research community and Solutions to societal challenges<br>-Sustainability of favorable changes in structure and culture in the Innovation Ecosystem | S&E Indicators;<br>Questions on National surveys; Expert judgement |

***Table 4****. A draft list of performance indicators by measurement area*

## F. NEXT STEPS FOR IMPLEMENTING THE STRATEGIC PLAN

The purpose of this strategic plan is to guide actions that HRA contributors can take to achieve their shared vision of an improved research and innovation ecosystem that better contributes to solving society's critical problems. Specifically, the plan:

- enables HRA working groups to better identify and prioritize their activities;
- outlines a process by which the HRA can assess and optimize its success;
- informs the evolution of the HRA's governance and operational procedures;
- provides a foundation for developing HRA communication plans; and
- assists with the onboarding of new HRA participants and partners.

The next step will be to develop a plan for implementing the strategies outlined in Section B: outreach and dialogue, collaborative identification of barriers and opportunities, and collaborative development of supporting tools and resources.

Consistent with the HRA's decentralized structure, the development of the implementation plan will be a collaborative process with different elements of the plan contributed by the existing HRA working groups. As a first step, the Collaborative Action Groups and active task groups will be invited to review the actions they have identified and/or carried out so far, identify how they fit within the HRA strategies and sub-strategies. The assessment from each group will be consolidated and shared with all groups, as a means of identifying priority actions, outliers, and gaps. This consolidated assessment will form the basis of an initial implementation plan.

A number of supplemental resources key to implementing the strategy have been identified, including a more detailed description of HIBAR research, brief case studies of exemplary HIBAR projects, a further description of the relationship of HIBAR to the overall research ecosystem, and related publications and other references. It is anticipated that the development of these resources will be one of several priority activities described in the implementation plan, to be developed by individual CAGs or task groups. These will serve as companion resources for this document and will be made available on the HRA website.