

# 28 From Monitoring Design to Operational Program: Facilitating the Transition under Resource-Limited Conditions

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## 28.1 INTRODUCTION

No matter how good the technical design of a monitoring program, the intended benefits or value can only be realized if the program is effectively implemented. For the purpose of this paper, implementation is defined as putting a theoretical concept or a new product, program, or service into practice. "Putting into practice" can be

described as carrying out, executing, achieving, or accomplishing. Taylor<sup>1</sup> warns that "... nothing is more powerful than a great idea. And nothing is more deadly than its poor execution." Because of the universal elusiveness of putting a new idea into practice,<sup>2</sup> the implementation challenge has been the topic of many studies. These studies are generally in the context of organizational transformation and change management.<sup>3-5</sup> However, a study that documents the 10 most important lessons for implementing an integrated watershed approach to protecting wetlands, streams, rivers, and estuaries<sup>6</sup> shows that many of the principles that apply to effective implementation are generic.

The South African River Health Program (RHP) has, over a period of 9 years (1994 to 2003), grown from a mere idea to a national operation. This is especially significant when considering that adoption and implementation of the RHP are largely voluntary. To add to the achievement, program implementation is taking place in an environment characterized by limited financial resources, a multitude of competing social and economic priorities, and a severe scarcity of appropriately skilled people.

The RHP was designed in response to a specific information need, namely, to assess the ecological state of riverine ecosystems in relation to all the anthropogenic disturbances affecting them. It is a screening-level monitoring program operating on a low sampling frequency and a low resolution of sites scattered semi-randomly across catchments. The program's assessment philosophy is based on the concept of biological integrity<sup>7</sup> and use is made of biological indices (fish, invertebrates, riparian vegetation), as well as indices for assessing in-stream and riparian habitats. The RHP is geared to assess the general ecological state of rivers rather than site-specific impacts or conditions. A description of the design criteria and process is presented in Roux.<sup>8</sup>

While the design, development, and standardization (concepts, methods, processes) of the RHP is coordinated at a national level, implementation activities largely take place at the provincial level. Due to the relatively flexible and learn-by-doing approach that has been advocated for provincial adopters of the RHP, a diversity of implementation models has developed across the country. As a result, there are nine provincial "case studies" regarding the implementation of the RHP. These implementation models have resulted in varied levels of success — from two provinces being nearly self-sufficient in conducting routine surveys, health assessments, and reporting to two provinces still needing to take the basic step of establishing an implementation team.

Reflecting on the RHP successes and failures in South Africa provides an opportunity to better understand the transition of environmental monitoring programs from theoretical design to sustainable operation, particularly in resource scarce environments. A previous paper has used the RHP as case study to focus on this transition from a technological maturation perspective.<sup>9</sup> This communication focuses on three semi-social themes that appear to be key drivers of successful implementation of the RHP. The three themes are:

- A compelling vision and strategic conversations
- Shared ownership by means of virtual governance
- Creative packaging of scientific messages

## 28.2 A COMPELLING VISION AND STRATEGIC CONVERSATIONS

Collins and Porras<sup>10</sup> pointed out that companies that enjoy enduring success have a core purpose that remains fixed while their strategies and practices endlessly adapt to a changing world. An ability to effectively manage this balance between continuity and change is equally important for sustaining a national monitoring initiative. This ability is closely linked to the development of a vision and is based on the following pillars<sup>10</sup>:

- A *philosophical foundation* that defines why a particular venture exists and what it stands for (its reason for being)
- An *envisioned future* that radiates what we aspire to achieve
- The *strategic conversations* that form wide and consistent communication of both the philosophical foundation and the envisioned future to capture the imagination of people

### 28.2.1 Philosophical Foundation

A key step in enabling effective implementation is to understand what needs to be implemented. The “what” is commonly described by a core set of objectives or principles. However, the robustness and timelessness of the “what” is often a function of how well the “why” is understood. During the embryonic phase of the RHP, a substantial effort went into deliberating why this program is necessary, in addition to discussing what it will achieve. A deeper analysis of the latent needs of water resource managers, a scrutiny of motives, and an effort to understand the underlying concepts characterized this early phase. The result was a committed nucleus of thought leaders who shared a deep understanding of why developing this new monitoring program was important as well as what could be achieved with it.<sup>9</sup>

From this philosophical foundation emerged the overall objective or purpose of the program, namely, to measure, assess, and report on the ecological state of rivers in order to improve decision making regarding the sustainable use and protection of these systems. The methods and processes used to achieve this purpose may evolve, but the purpose remained unchanged ever since it was first published.<sup>11</sup> This was important for protecting the focus of the program. Having a program with a clear and rather simple focus is necessary to build critical capacity around the program, whereas the same number of people involved in a more diverse program will have to spread their attention too wide and thin to make real impact.

When the success of the program became visible, there were a number of temptations to dilute this focus. It was suggested that the program should also take on the monitoring of estuaries. However, these ecosystems fall outside the boundaries of the purpose. Similarly, since the program was in the process of establishing a network of monitoring sites, associated infrastructure, and human capacity, there was pressure to include variables that relate to human health, such as fecal coliforms, as part of the program. Adding a human health perspective could have skewed the true purpose, as high fecal coliform counts may be undesirable from a human health

perspective but may be perfectly natural from an ecological perspective (for example, downstream from a pool inhabited by hippopotami). In both cases, the articulated purpose provided guidance for deciding against taking these additional components on as part of the program. In retrospect, staying true to the purpose promoted the development of a strong program identity as well as long-term loyalty among collaborators and stakeholders. In addition, a clear and simple purpose has a better chance of being implemented, whereas an all-inclusive purpose may easily become an end in itself with very little emerging beyond.

### **28.2.2 Envisioned Future**

Where the purpose or objectives provide focus, the envisioned future or goal provides direction. Contrary to the purpose of the program, the envisioned future or goal has a restricted lifespan and should evolve to reflect improving understanding of both capabilities and constraints. This has certainly been the case with the RHP. The program essentially followed a phased design — through scoping, conceptualization, pilot application and testing, and operational rollout phases. Each of these phases started off with a goal, a target date for achieving the goal, and a vivid description of the future reality once this goal has been achieved.

An advantage of a phased approach is that the end of each phase can be used for reflection and strategic review. The goal for the next phase can be scaled up or down according to the insights gained during the previous phase. As an example, an ambitious 3-to-6-year goal was set during 1997 to implement and maintain the RHP on all major rivers of South Africa and to expand program implementation to other key rivers within southern Africa.<sup>12</sup> A reality check during a subsequent pilot application exercise<sup>13</sup> led to the setting of a more realistic goal for the next phase, namely to achieve successful implementation on one river per province by 2003.

### **28.2.3 Strategic Conversations**

Communication of the program purpose and vision provides the glue that holds an initiative together as it grows, decentralizes, and diversifies. In the RHP model of national development, standardization and quality control, and local ownership and implementation, it was important that the vision effectively dispersed to the multiple stakeholder levels. The RHP stakeholder system includes national government departments, R&D organizations, universities, as well as many provincial agencies responsible for nature conservation and environmental management (see section on governance). In order to compete for and direct the attention and resources of these groups, the RHP vision had to be effectively communicated.

The most critical success factor in dispersing the RHP vision was that a number of committed leaders took ownership of the message. Collectively, these leaders had influence in government, the academia, and conservation agencies, and their direct communication and endorsement were key to gathering wider support for the program. The influence of opinion leaders started with preexisting personal networks, extending outward to motivate other key groupings to get involved and allocate priority time and funding to the associated work.

In addition to having appropriate human carriers of the message, the content and tailoring of the message are of utmost importance. On the political front, and in a country where short-term social and economic needs override conservation aspirations, it was important to communicate very clearly the rationality of a monitoring program designed to diagnose the ecological state of rivers. For example, we can make plain the practicality of research by asking a series of simple “whys.” If we analyze why we want to measure river health, we say it is to know whether rivers are healthy or not. Why? So that rivers can be effectively managed. Why? So that people can have sustained benefit from the services that these ecosystems provide. Why? Because these ecosystem services contribute to societal well-being and economic prosperity. Therefore, we do not monitor river health for the sake of aquatic biota but rather as an ecological means to a socio-economic end.

Annual symposia and specialist workshops contributed significantly to developing a common language, cohesion, and a sense of belonging among all those involved in RHP activities. In addition to people-to-people communication, a range of products was produced to make the river health message as pervasive as possible. These products carry subtle branding characteristics, such as the omnipresent picture of a dragonfly, to make them recognizable as part of the same program. Products include technical reports, implementation manuals, newsletters, popular articles for magazines, a coloring book for school children that was translated into four languages (Finny Fish tells about “my home, a healthy river”), generic posters explaining how the RHP works, an Internet Home Page ([www.csir.co.za/rhp](http://www.csir.co.za/rhp)), and State-of-Rivers (SoR) posters and reports (see Section 28.4 this book on creative packaging of scientific messages).

In a demographically highly diverse country, multiple communication formats and distribution media are advisable. For example, the Internet provides a mechanism for collating formidable amounts of information. Yet, access to the Internet is not readily or reliably available in some institutions and parts of the country. For some of these users, including a university, the complete RHP home page was stored and distributed on CD.

A final learning point is that patient and persistent communication gets rewarded. One water resource manager listened somewhat skeptically to talks on the value and benefits of biomonitoring for close to 2 years. Then he suddenly became one of the most passionate proponents of the RHP. It just took a while for this individual to internalize the message and its implications into his personal reference framework. The need for strategically directed communications never comes to an end. There is always the risk that regression may set in among some adopters, while an ever-evolving vision must continuously be entrenched in the hearts, minds, and budgets of old and new “subscribers.”

### **28.3 SHARED OWNERSHIP BY MEANS OF VIRTUAL GOVERNANCE**

When human and financial resources are at a premium, *networking* (reaching out and getting in touch with others) and *collaboration* (to work in combination with others) become key success factors in bridging capability/capacity gaps and achieving demanding goals. Advantages associated with collaborative ventures include

such initiatives leading to wider acceptance and quicker implementation of projects and programs. Exposure to collaborators can also provide an element of peer review of R&D functions and challenge in-house researchers and managers with new ideas. In addition, concepts, tools, and methods developed through collaboration will carry more weight in promoting a uniform standard, increasing goodwill across government and public sectors, and positively influencing future legislation.<sup>14</sup>

The true value of networking and collaboration probably lies in the formation of informal arrangements and relationships. In this regard, the RHP was particularly successful. This section looks at some of the interventions that resulted in the formation of a virtual network of developers and implementers across the country, with the key objectives being to:

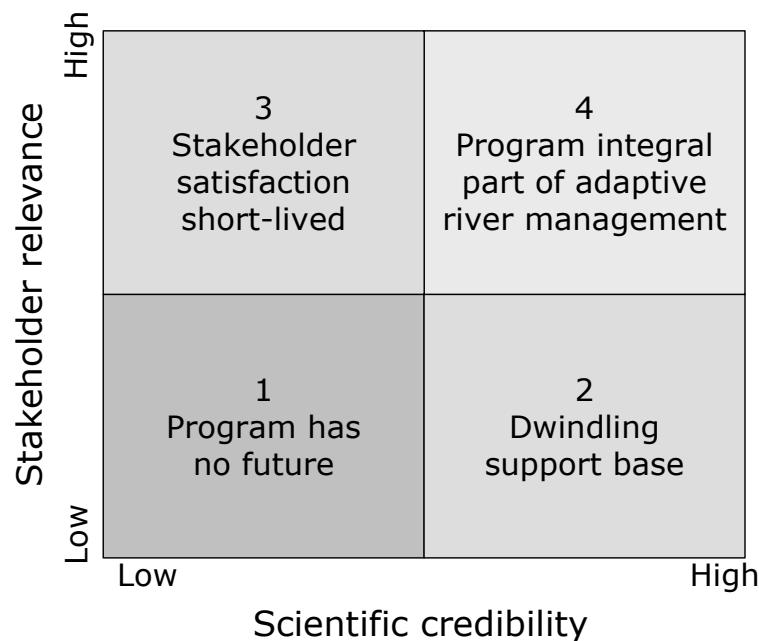
- Unite researchers and implementers into one team
- Promote collaboration through regional implementation networks
- Progress from individual enthusiasm to organizational capability and accountability

### 28.3.1 Uniting Researchers and Implementers into One Team

The national Department of Water Affairs and Forestry, as the legal custodians of water resources in South Africa, has played the leading role in initiating and designing the RHP. This department is particularly strong in policy development and managing water resources in the conventional areas of quantity and chemical quality. They had the foresight to drive the development of a biological-response monitoring program but realized that they did not have the expertise and capacity to implement such a program across the country. The RHP could only become an operational reality given the collective resources of a number of national and regional (provincial) agencies and organizations.

A model of national development and coordination and provincial or local implementation (operational ownership) was adopted. The one side (national) was characterized by visionary thinking, concept and method development, and quality assurance; the other (provincial) by pragmatic considerations. This dual focus (scientific rigor and practical feasibility) was not merely a convenient arrangement but increasingly became a key factor for the sustainable implementation of the program. Based on the two foci or value propositions, four possible future scenarios can be delineated (Figure 28.1):

- *Scenario 1:* Both the scientific credibility and the value that the RHP presents to its stakeholders are lowered, and the program has no future. Increasing regression of efforts will eventually lead to the disappearance of the program, and both river managers and researchers will pursue more relevant options.
- *Scenario 2:* Resources are primarily directed towards technical design and ongoing improvement through research and development. The RHP is recognized for its scientific and technical excellence but stakeholders are not experiencing benefits from the program. Too little attention is given



**FIGURE 28.1** Two key factors influencing the continued relevance and impact of a monitoring program.

to understanding and satisfying the needs of the nontechnical stakeholder community. These end-users of river health information lose their enthusiasm for the RHP and redirect their support to other initiatives. The RHP largely remains of academic interest and will not become an operational program.

- *Scenario 3:* All attempts are made to understand and satisfy stakeholder needs but insufficient resources are allocated to scientific development, testing, verification, and ongoing improvement. Initial support by stakeholders is replaced by skepticism as the gaps in the program's science-base become evident. The end result is a program that will have ever-decreasing support and that will not be able to contribute to ecologically sound management of rivers.
- *Scenario 4:* The importance of adding real value for stakeholders as well as remaining technically relevant is recognized and pursued with sufficient resources. Scientists, river managers, and environmental policy makers interact frequently, which results in reconciliation of perspectives, development of a deep understanding of each other's needs and limitations, and adaptive improvement of the program over time to ensure continued scientific and managerial relevance. The program impacts positively on decision-making and on the health of rivers.

Early and ongoing interaction between researchers and perceived end users of a research product is the surest way to increase the likelihood that the product will be used. From the earliest stages of conceptualizing the RHP, a dedicated effort was made to seek the real end users (not necessarily the same as the client paying for the program design) and to uncover their real needs. These end users included both organizations responsible for environmental policy and agencies that would actually

conduct river surveys. Researchers helped to shape these needs and ensured that a clear scope and design criteria were defined.

The inclusive style adopted for the development of the RHP resulted in virtually all groups, organizations, and authorities that would ultimately be involved with or responsible for the implementation of the RHP becoming involved at an early stage.<sup>9</sup> This approach led to the design of a user-oriented and pragmatic program where the operational manual was shaped through the collective expertise and expectations of a large and diverse group of stakeholders.

The value of an inclusive developmental approach lies in reducing the inherent lag between knowing what to do and actually applying this knowledge.<sup>2</sup> Scientists came to learn firsthand that the adoption of a new scientific tool is not driven by the scientific status of the tool or its underlying concepts but rather by convention, past practice and experience, social and economic considerations, and perceived value (determined by the user) and availability of required infrastructure. In addition, appropriate user skills and logistical support and a sufficiently knowledge-intensive environment must be in place before a new program can be deployed successfully.<sup>15</sup> In turn, river managers were able to experience the new protocols in action during pilot applications which promoted user “readiness.” A lack of user readiness is regarded as a common constraint to the adoption of R&D outcomes.<sup>16</sup> The result of implementing readiness is that a natural progression is fostered, among all parties, from research to design to adoption and subsequent implementation. Part of this progression is the gradual creation of capacity in participating organizations.

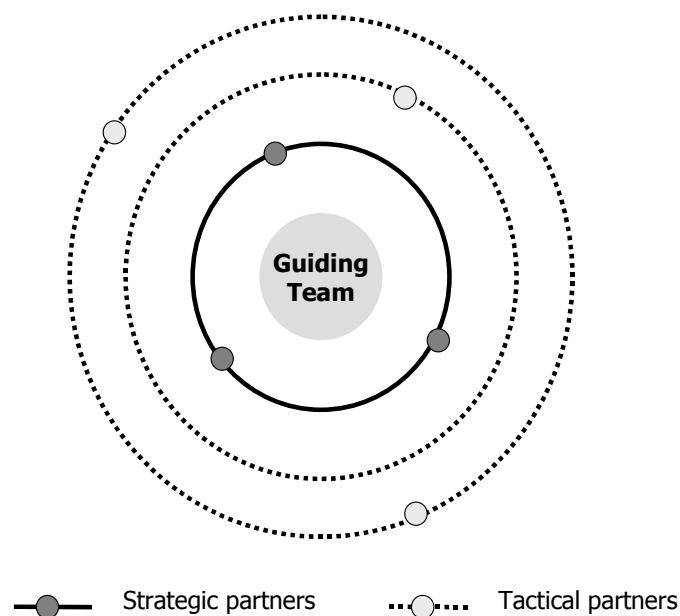
### 28.3.2 Provincial Implementation Networks

The most acute challenge that had to be overcome was (and still is) to achieve critical capacity and endorsement of the program at operational levels. The provincial scale was selected for deploying the program, primarily due to the presence of agencies with relevant expertise and equipment that operate at these levels. Provincial conservation boards and provincial departments of environmental affairs were typically the organizations that could contribute the required expertise and equipment — for example, fish biologists and nets for sampling.

During a consultation meeting held in 1996, an “implementation champion” was elected for each province.<sup>17</sup> These champions were tasked with establishing and mobilizing a provincial implementation team (PIT) who would be responsible for provincial scale implementation and demonstration of the program. Although the responsibility of implementation was decentralized to provincial level, no financial resources accompanied this delegated responsibility. Success or failure of initiating a provincial initiative was largely a function of every champion’s enthusiasm, ownership, ability to influence others and to mobilize funding, as well as the degree to which his/her organization would endorse river health activities. The latter is often somewhat dependent on the presence of the first mentioned qualities.

No single organization in any province could master all the expertise required for implementing the RHP. During a rather comprehensive pilot implementation and demonstration exercise,<sup>13</sup> a theoretical model for an interorganizational PIT was





**FIGURE 28.2** Positions for collaboration in a networked implementation team.

suggested (Figure 28.2). This model relates to the concept of communities-of-practice<sup>18</sup> which provides insight into how informal networking can be applied in support of a formal goal. The suggested networked PIT allowed for three distinct positions, based on the commitment, resources, and knowledge that a specific organization is willing to contribute as well as the relative permanence with which a network position is occupied:

- The guiding or *core group* essentially fulfills the leadership function and is constituted by the provincial lead agents of the study. These are the relatively permanent members of the network, who participate actively and largely determine the agenda and activities of the whole team. Ideally, a number of statutory bodies should be represented in the core group, and individual members should display strong leadership characteristics.
- *Strategic partners* constitute those individuals and organizations with whom a long-term relationship will be mutually advantageous. This may include the lead agents of a neighboring province with which a catchment is shared or a university that agrees to provide strategic support in method development, training, and student involvement with monitoring activities.
- *Tactical partners* would have a relatively short residence time in the network, based on the temporary requirement of a specific skill or expertise. These partners may be professional service providers that would be contracted to fill a temporary skills gap — for example, to coordinate a first river survey, assist with once-over selection of monitoring sites, develop a data management system, or compile a report.

Where the core group is intended to provide stability, the tactical partners provide flexibility as these members can be substituted as specific needs arise. Although the generic positions can be recognized in every provincial initiative in South Africa, every one of these initiatives are also distinctly different in composition, management style, and operational culture. However, those that have applied the networking principles of effective and inclusive communication and purposeful development of interorganizational relationships and trust have generally experienced a significant increase in workforce diversity and strength, access to a larger pool of capabilities, and a stronger standing both in their provinces and at national forums.

### **28.3.3 From Individual Enthusiasm to Organizational Accountability**

Every province that participates reasonably successfully in the RHP finds itself somewhere on a maturation trajectory with three chronological stages, starting with individual enthusiasm, progressing to informal networking, and ending in organizational endorsement. Champions started off armed only with enthusiasm for the task ahead. Most of these champions have a background in the environmental sciences. The primary reason why they agree to championing their provincial initiative is because they care about rivers and they believe that the RHP would help them to generate the information that would contribute to sound river management.

The initial responsibility of the champion is to bring a group of people together to accomplish something collectively that they could not accomplish separately. The lobbying for team members is usually based on the need for certain basic skills as well as for having the representation of key organizations in the province. The alliance is still completely informal and individual members join based on their perception of the value that the initiative brings to them and to their organizations. The opportunity to expand professional networks, exchange knowledge, and make new friends is commonly cited as reasons for joining the PIT.

Either before or after joining the PIT, individual members would request official approval from their organizations for getting involved in RHP activities. Their case is strengthened if they can show examples of what the program produces and how this relates to their organizational mandates. Organizations would then consider whether and to what degree they would endorse the program. This decision may be in the form of allowing a staff member to spend a certain percentage of his or her time on program activities.

The predominantly bottom-up approach described above is supplemented with a top-down approach where, for example, the national Department of Water Affairs and Forestry would extend an official request to heads of key provincial agencies to commit resources to the RHP. Accountability for executing the RHP is likely to be much clearer and legitimized when and where Catchment Management Agencies (CMAs) come into being. These agencies are likely to have the delegated mandates — from national government — and statutory powers to coordinate monitoring and reporting on the ecological state of rivers. For South Africa, the establishment of CMAs is foreseen to take place systematically over the next two decades.

## 28.4 CREATIVE PACKAGING OF SCIENTIFIC MESSAGES

The overall goal of communicating natural resource information should be to change the behavior of the recipients of the information.<sup>19,20</sup> In the case of the RHP, the program must (1) communicate ecologically sound management of rivers in South Africa and (2) inform and educate the people of South Africa regarding the health of their rivers. Changed behaviors relate to the degree to which resource managers incorporate river health information in their decision-making processes. Similarly, a positive change in civil society's perception and appreciation of rivers would testify to effective communication. To achieve these goals, RHP practitioners had to rethink the formats used for packaging information as well as the strategies used for disseminating information.

Three communication strategies are highlighted in this section, namely:

- Reduction of the complexity of scientific messages
- Developing a flagship communication product
- Uncovering and utilizing tacit knowledge

### 28.4.1 Reduce the Complexity

Scientists are often very well trained in packaging their work for, and disseminating it to, other scientists; for example, by means of peer reviewed papers. However, this does not help the cause of spreading the message widely through diverse audiences.<sup>21</sup> Ultimately, effective dissemination of resource information is about ensuring that information becomes available to those that might best use it, at the time they need it, in a format they can use and find comprehensible, and which reflects appropriate spatial and temporal scales.

In an era of information overload there is a major demand for products that are simple yet credible. This reminds us of Albert Einstein's quote: "Everything should be made as simple as possible, but no simpler." Due to the wide audience to whom the RHP needs to communicate, it was inevitable that the normal complexity associated with science had to be reduced. This is reflected in the evolution of the name of the program, which started as the National Aquatic Ecosystem Biomonitoring Program. In an attempt to be correct, scientists played with words such as *integrity*, *aquatic ecosystems*, and *biological monitoring*. It was quite a breakthrough when the name River Health Program received consensus approval. "River health" is readily interpreted by most people and, as such, is quite liberating terminology from a communication perspective.<sup>22</sup>

In early communication attempts, it became clear that decision makers are not all that interested in scientific explanations, references, graphs, and diagrams of aquatic invertebrates. A map showing the river of interest with color-coded dots that indicated the relative health of the river at various monitoring stations would commonly receive the most attention. This realization gave rise to the development of a river health classification scheme (Table 28.1) to allocate a specific category of health to each river reach. The health categories used by the RHP are simply called

**TABLE 28.1**  
**The River Health Classification Scheme Used for Reporting Information**  
**Generated from Findings of River Surveys**

| <b>River Health Category</b> | <b>Ecological Perspective</b>   | <b>Management Perspective</b>   |
|------------------------------|---|---|
| Natural                      | No or negligible modification of in-stream and riparian habitats and biota  | Relatively untouched by human hands. No discharges or impoundments  |
| Good                         | Ecosystem essentially in good state. Biota largely intact   | Some human-related disturbances but mostly of low impact potential  |
| Fair                         | A few sensitive species may be lost; lower abundances of biological populations are likely to occur or, sometimes, higher abundances of tolerant or opportunistic species   | Multiple disturbances associated with need for socio-economic development, e.g., impoundment, habitat modification, and water quality degradation   |
| Poor                         | Habitat diversity and availability have declined; mostly only tolerant species present; species present are often diseased; population dynamics have been disrupted (e.g., biota can no longer breed or alien species have invaded the ecosystem) | Often characterized by high human densities or extensive resource exploitation. Management intervention is needed to improve river health, e.g., to restore natural flow patterns, river habitats, or water quality |

*natural, good, fair, and poor.* This classification system and the associated protocols used to assess data in their regional reference contexts allow the health of rivers to be directly comparable across the country.

The classification scheme provides a simplified “front end” to a much more intricate assessment process. This front end provides a tool for communicating technical concepts to nontechnical audiences. At the same time, stakeholders can use the river health classes in catchment visioning exercises to arrive at a desired state for their river. This desired state or goal could be decomposed into measurable management objectives which, in turn, relate to the same biological and habitat indices that were used to derive the present state.

#### **28.4.2 Develop a Flagship Product**

As part of national developments in the RHP, the design of an effective reporting format for river health information was seen as a priority. In the process, a number of alternative communications and dissemination media were experimented with. It was realized that, to effectively compete for attention amid the multitude of messages and an overall information bombardment that most people are exposed to, ecological messages must be communicated in highly attractive and professional formats.

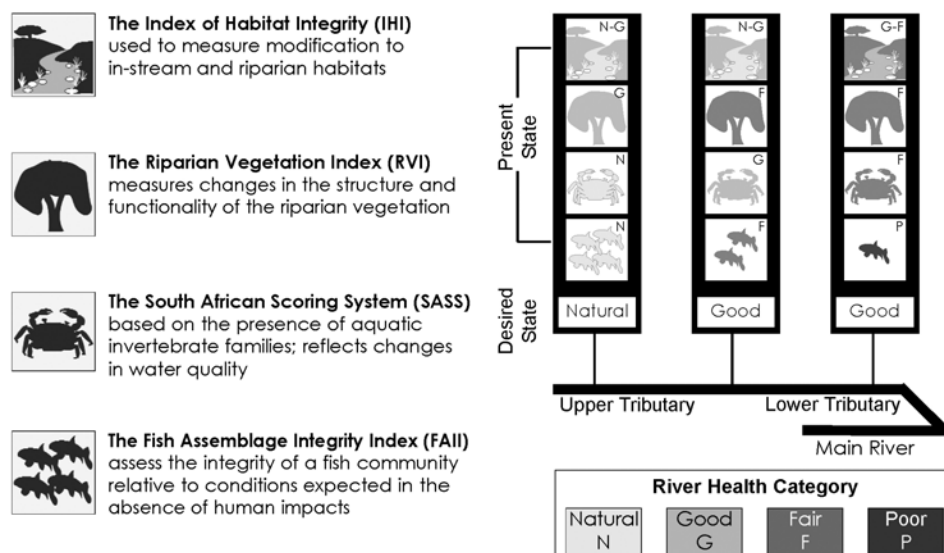
Gradually, the State of Rivers (SoR) reporting concept emerged and matured to form the flagship products of the RHP.

Aligned with national State of Environment reporting, the RHP's SoR reporting initiative makes use of the Driving Force–Pressure–State–Impact–Response (DPSIR) Framework<sup>23</sup> to explain what is causing environmental degradation, how good or bad the conditions are, and what we can and are doing about it. Whereas the RHP focuses primarily on the present state and trends in river health, an effort is made to link the present state to specific driving forces and pressures on the river as well as to specific policies and management actions in place to manage the rivers.

The SoR reports are essentially brochure-style reports in full color, usually less than 50 pages in length and of quality print. Posters contain highly synthesized information presented in A0 size for display against walls. These products are primarily distributed in hard copy format. A simplified presentation of a SoR map is indicated in Figure 28.3.

A flagship product can only have the desired impact if it reaches its intended audience. In several instances where a batch of reports were dispatched to a specific contact person for further distribution, it was found that the reports remained in the first recipient's office — sometimes for many months. Personalization of report distribution is the ideal, where key recipients receive a hand-delivered report with a brief contextual explanation.

Even where people do receive a personal copy of an SoR report, there is no guarantee that they will make the time to read it and internalize the information, let alone initiate a required management intervention. An important element in the evolution of SoR reporting is a continuous process of assessing reader satisfaction. Based on actual feedback, the structure, style, and specific presentation features used for reporting information are updated and improved. As an example, feedback is used to refine the balance between text, graphics, information boxes, and white



**FIGURE 28.3** Format used in State of the Rivers reports to summarize the present ecological state in relation to a future desired state for rivers.

space, as well as to address evolving information needs of stakeholders such as river managers. Satisfaction reviews for two subsequent reports<sup>24,25</sup> have indicated an increase of 27% in the proportion of readers and read more than 60% of the content. This improvement could largely be ascribed to adjustments related to content, presentation format, and style.<sup>26</sup>

### **28.4.3 Uncovering and Utilizing the Richness of Tacit Knowledge**

While the design and structure of a communication product are important, the substance of the material that is available to make up the content is just as critical. In compiling SoR products, a conscious decision was made to utilize the knowledge that resides with relevant people to complement formally collected data and derived information. For some rivers, very little scientific or formal information was available prior to conducting the first RHP survey and producing the subsequent SoR report. In other instances, ecologists and river managers may have collected relevant information over extended periods of time. In all instances, the informal knowledge possessed by scientists, managers, farmers, or people from local communities has the potential to present a much more holistic and comprehensive picture of the river than data available in formal databases or publications. This section documents some of the process learning acquired in extracting the tacit and often latent knowledge of individuals and converting this knowledge into explicit form.

Explicit knowledge can be expressed in words and numbers and shared in the form of data, scientific formulae, specifications, and manuals. This form of knowledge can be readily transferred among individuals and within organizations. In contrast, tacit knowledge is highly personal and hard to formalize, making it difficult to communicate or share with others.<sup>27</sup> To uncover tacit knowledge is inherently difficult since even those with knowledge may not be conscious of what they know or what its significance is. Knowledge has an intrinsic tendency to stay where it was first internalized. Three issues were found to be particularly significant factors in influencing whether and how people would share their knowledge: trust, as the bandwidth for getting knowledge to flow from one person to the next; the environment (place and time) in which people are comfortable to share knowledge; and the degree of overlap in personal aspiration or professional goals between the people involved in communicating.

Nothing can compare with long-term personal relationships for cultivating the required levels of trust that get people to freely share their knowledge. In the context of river monitoring, these relationships often start as a result of sharing a common interest (e.g., an endemic species) or solving a common problem (e.g., controlling alien weeds). This issue reflects on the importance of the composition of the reporting team. Some form of overlap in the social networks or professional interests of the reporting team with those that are knowledgeable regarding the river in question represents a significant advantage. As an additional or alternative resort, the reporting team has to spend time with identified stakeholders in order to get them to share their tacit knowledge relevant to the report.

A second issue is that different individuals have different time and place requirements for sharing their tacit knowledge. In general, we have found that resource managers of relative seniority have a high premium on time. Once they understand and buy into the objectives of the RHP, they are willing to share their knowledge in a time-efficient manner. A short meeting in his or her office may prove sufficient, whereas some prefer to be away from their offices and associated demands on their attention. Some share more freely in small groups and one-to-one meetings. For field practitioners, “field meetings” have generally resulted in better returns. These meetings may take the form of a one-day visit to some monitoring sites followed by a day of work-shopping the results of the river surveys. The second day should preferably also take place in an informal environment, and a meeting facility on the banks of a river of concern may work well.

For the second type of knowledge exchange/conversion, the editorial team is responsible for interpreting the tacit knowledge that was shared among the stakeholder groups and for capturing this in explicit form — that is, the conversion from mind to report. This step requires multiple iterations of draft version between editors and knowledge contributors to ensure that context-specific knowledge has been captured correctly. The outcome is a report that provides much more context than could be derived from purely using collected and interpreted data. As an example, observations regarding the decline and subsequent recovery of a hippopotamus population as a result of a drought that happened almost a decade prior to the river survey in question, the occurrence of rare bat species and fish owls in the riparian forest, and the exceptional abundance of crocodiles in a particular river reach are all bits of information that were not found in a database but that surfaced during knowledge-sharing sessions.<sup>25</sup> It was felt that such tacit knowledge has the potential to significantly increase reader interest and the contextual orientation provided by SoR reports.

## 28.5 CONCLUDING REMARKS

The long-term vision of the RHP is that the information generated through its river surveys and SoR reports will eventually cover all the main rivers of South Africa to allow a qualified statement on the overall health of the nation's rivers. Repetitive surveys and reporting would provide a scientific indication of whether the ecological condition of rivers is deteriorating or, in fact, improving over time. Such information would be useful to “audit” the effectiveness of the policies, strategies, and actions of both the national custodian department and the decentralized agencies responsible for the sustainable management of river ecosystems.

The RHP is often lauded as an example of an environmental program that achieved the transition from being a good design to becoming an operational practice. Many factors played a role in stimulating the popularity, support, and growth that the program enjoyed. The three primary factors noted previously have played a significant role in the development, character, and dispersal of the program. However, the challenge is far from over and even these three factors need continued nurturing in order to leverage limited resources towards achieving future goals.

During its life, the RHP has developed a strong identity that is well entrenched in the minds of a wide stakeholder group. The effective diffusion of the vision has

been a key success factor in drawing the human and financial resources that the program has achieved to date. This in turn is a function of the program leadership at all levels over the past 9 years. Tom Peters said: "The only constant that correlates with success is top leadership." Continued nurturing of an appropriate leadership cadre is probably the most critical investment that can be made to ensure the future success of the program.

A significant concern is the lack of redundancy in program leadership. In an environment with a small pool of skilled human resources and an overwhelming list of developmental imperatives, it has been extremely difficult to do succession planning in the RHP leadership group. At both national and provincial levels, the program often relies on individuals, where the loss of a provincial champion or a national task leader (through promotion or needs/opportunities elsewhere) may render a particular initiative vulnerable to regression. The fact that any long-term program will, and should to some degree, experience turnover of key role players must be recognized and managed. Without significant overlap between old and new leaders, the memory and knowledge base associated with early developments can only erode.

From a program governance perspective, a model of fostering collaboration based on informal relationships and networks, promoting shared ownership, and allowing flexibility to cater for a diversity of resource realities and capabilities proved to be most successful. However, the relatively high degree of institutional flux and people mobility that prevails in the country remains a constraint to institutionalizing the program. Mandates, roles, responsibilities, and agendas of organizations and individuals change more rapidly than is desirable and informal arrangements leave the program vulnerable. It is perhaps time to introduce a more formal model of program governance where institutional responsibilities are made explicit and the advance towards covering all the main rivers of the country can be managed in a more systematic fashion.

On the technical side, SoR reporting epitomizes many of the underlying technical components that make up the RHP. Through testing and refinement, the SoR reporting initiative has developed into a state-of-the-art capability. Stable prototype tools make it possible to accelerate the rate at which rivers are incorporated in the monitoring and reporting cycle. However, the need for a monitoring program to continuously and dynamically evolve and improve should not be neglected. Internal learning, international benchmarking, and changing needs of key stakeholders need to be incorporated on an ongoing basis to ensure long-term relevance. The danger is that a program that is perceived to be successful and relatively mature in terms of its technical development may have difficulty in securing resources for further developmental work in the face of competing national and regional priorities. The reality is that, in order to capitalize on its successes to date, substantial funding and leadership are required to continue with the coverage of all the main rivers of South Africa over the next 5-to-7-year period.

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