A From Idea to Realisation – Bringing a Big Idea to Life

Part A: From Idea to Realisation – Bringing a Big Idea to Life

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Chapter 1:
Planning and Implementing Botanic Garden Design Projects

Annette Patzelt and Andrew Anderson, Oman Botanic Garden

1.0 DEFINITIONS

Business case: A compelling justification of the added value of the proposed action and resources needed for the investment, intended to convince decision makers to approve a proposed action.

Business plan: A document outlining how an institution will be governed, marketed and funded to successfully achieve its goals and objectives. Depending on the context, the business plan may either be short-term or long-term.

Design brief: A document containing very detailed information about the project to guide the design process. It is a more exhaustive expansion of the scope of work.

Detailed design: Development phase that comprises the production of detailed information and construction specifications.

Feasibility study: Evaluation and analysis of the potential of a proposed project which is based on extensive investigation and research to support the process of decision making.

Master plan: An essential document of any botanic garden development that identifies activities, opportunities and facilities that need to be considered to deliver the vision and mission of the organisation. It can be used to translate the requirements defined in the scope of work and design brief into a concept design solution. It may comprise to-scale plan drawings, illustrations and sketches, as well as cost estimates of the construction work.

Mission: Concise statement articulating an institution's fundamental purpose.

Pre-operations: A vital component during the planning and design phases of the botanic garden which establishes the preliminary governance and organisational structure, the plant collection and initial programmatic activities including research, outreach and education.

Assessing project site suitability in Madagascar. (Image: Paul Smith)

Request for proposals (RFP): A comprehensive document that outlines the aims of the project and allows bidders to produce a proposal.

Scope of work: Most critical component of the Request for Proposal (RFP). It provides comprehensive information about the project and defines the expertise and experience required.

Strategic plan: Description of the overarching direction or directions during a specified period, often over three to five years. Strategic plans set the tone and targets for the entire organisation and identify the highest programme priorities.

Tender documents: Provide the highest level of detail for all technical construction specifications.

Vision: The long term aspiration(s) of an institution.

1.1 INTRODUCTION

KEY MESSAGE

Time and resources are often underestimated – botanic gardens do not happen overnight but are long-term endeavours with considerable ongoing operational requirements.

The conceptualisation, design, renovation, transformation or expansion of a botanic garden or any of its parts is a unique and rewarding experience, with ecological, cultural, educational and economic benefits that may last for generations. Comparatively few resources exist to date to guide the development process of a botanic garden. This chapter is intended to provide an outline of the steps and strategic thinking recommended for the planning, design and construction of a botanic garden project of any scale or complexity.

Time and resources are often underestimated – the development of a botanic garden is a long-term endeavour with considerable ongoing maintenance requirements. Appropriate allocation of time and resources during the preliminary planning will maximise the chances of the project meeting its budgetary and scheduling needs in the ensuing phases. This will also help attract further support and funding at a later stage, as illustrated in Case study 1.1.

CASE STUDY 1.1

How to establish a botanic garden? The example of the Australian Arid Lands Botanic Garden, Port Augusta

John Zwar, Port Augusta, Australia

How do you establish a botanic garden? The short answer is: with difficulty and extreme persistence in the case of The Australian Arid Lands Botanic Garden at Port Augusta in South Australia.

My horticultural training was undertaken at the Botanic Gardens of Adelaide. Following an overseas study tour looking at amenity horticulture in arid regions, I proposed to the Port Augusta City Council in 1981 that a botanic garden featuring arid zone plants, both for its scientific and educational value and as a tourist attraction, should be established. Although not enthusiastic, the Council gave approval to investigate the proposal. There was no budget and the help of some keen local supporters of the idea was enlisted. The concept was publicised using local and state media, letters to politicians, by talking to interested groups and mounting public displays over many years. There was considerable interest and support in the wider community.

A site of more than 250 ha of Crown land at Port Augusta West was identified. It included the best remaining natural vegetation close to the city with a range of soil types and access from a national highway. In 1984, a 'Friends' support group was formed. This group became incorporated and, with an active committee, vigorously promoted the project and commenced fundraising. Regular meetings were held and a newsletter produced. Petitions were prepared and more than 30000 signatures of people supporting the development of the botanic garden were presented to both state and federal parliaments. Assisted by volunteers, a site clean-up and fencing were initiated, funded by the Friends group, City Council and government unemployment relief schemes.

After further investigation by a state government committee, support for the concept came from the state, but without financial commitment. There were occasional meetings held by the City Council to discuss the proposal with interested parties but progress was slow and little happened for long periods. Eventually the state government commissioned a plan for the botanic garden which proposed displaying collections of arid zone plants from around the world but, with no funding, this lapsed.

In 1988, the Port Augusta City Council established a Management Advisory Committee to seek funding and oversee development. At this time corporate sponsor Western Mining Corporation (WMC) became interested and funded initial botanical surveys of the site and commissioned a detailed master plan by landscape architect Grant Henderson, which was adopted as the basis for future development. WMC successfully put pressure on both state and federal governments to provide some funding for the project whilst they made a substantial contribution as well. The City Council also contributed and, after more than 12 years, AUD 1.2 million was available to develop the botanic garden. Its first permanent worker commenced work in 1994 which greatly advanced site progress, aided considerably by Friends volunteers.

In February 1996, a Board of Management reporting to the Council met for the first time replacing the Advisory Committee. Stage 1 of The Australian Arid Lands Botanic Garden opened in September 1996. The City Council operates and funds the botanic garden which continues to develop on a low budget with a small number of paid staff. Up until 2004, WMC resources provided a total of almost AUD 1 million. State and federal governments have had little further input. Friends' volunteers with appropriate skills assist substantially with the development and maintenance, plant propagation, tour guiding and working with visiting students. The Friends have provided close to AUD 1 million for the botanic garden since its inception.

The development of The Australian Arid Lands Botanic Garden has been difficult, slow and drawn out and would not have happened without the dogged persistence of the Friends group, wider community support and substantial input from a corporate sponsor (WMC). The botanic garden now has an impressive plant collection, visitor interpretive centre, meeting room and nursery facility, as well as a research area looked after by a small number of paid staff and a group of dedicated volunteers. It plays an increasingly important role in the scientific and cultural life of the region and the state.

The central courtyard in The Australian Arid Lands Botanic Garden features plants from the Great Victoria Desert. Swainsona formosa, Sturt's Desert Pea (Fabaceae), South Australia's floral emblem, is the impressive ground cover in the foreground. (Image: John Zwar)

1.2 THE FOUNDATION: THE BIG IDEA

1.2.1 Envisioning the Botanic Garden

"We have a big idea!" Botanic garden development projects of any scale begin with someone having a vision for a new botanic garden or the redevelopment of part of an existing one. A comprehensive, well-thought-out process will ensure that the initial creativity and passion nurture the big idea and continue to inspire the project through to its completion and launch. While the structure and organisation of a new development, as well as of the stakeholders involved, vary significantly between different projects and locations, answering the following key questions will get the process going:

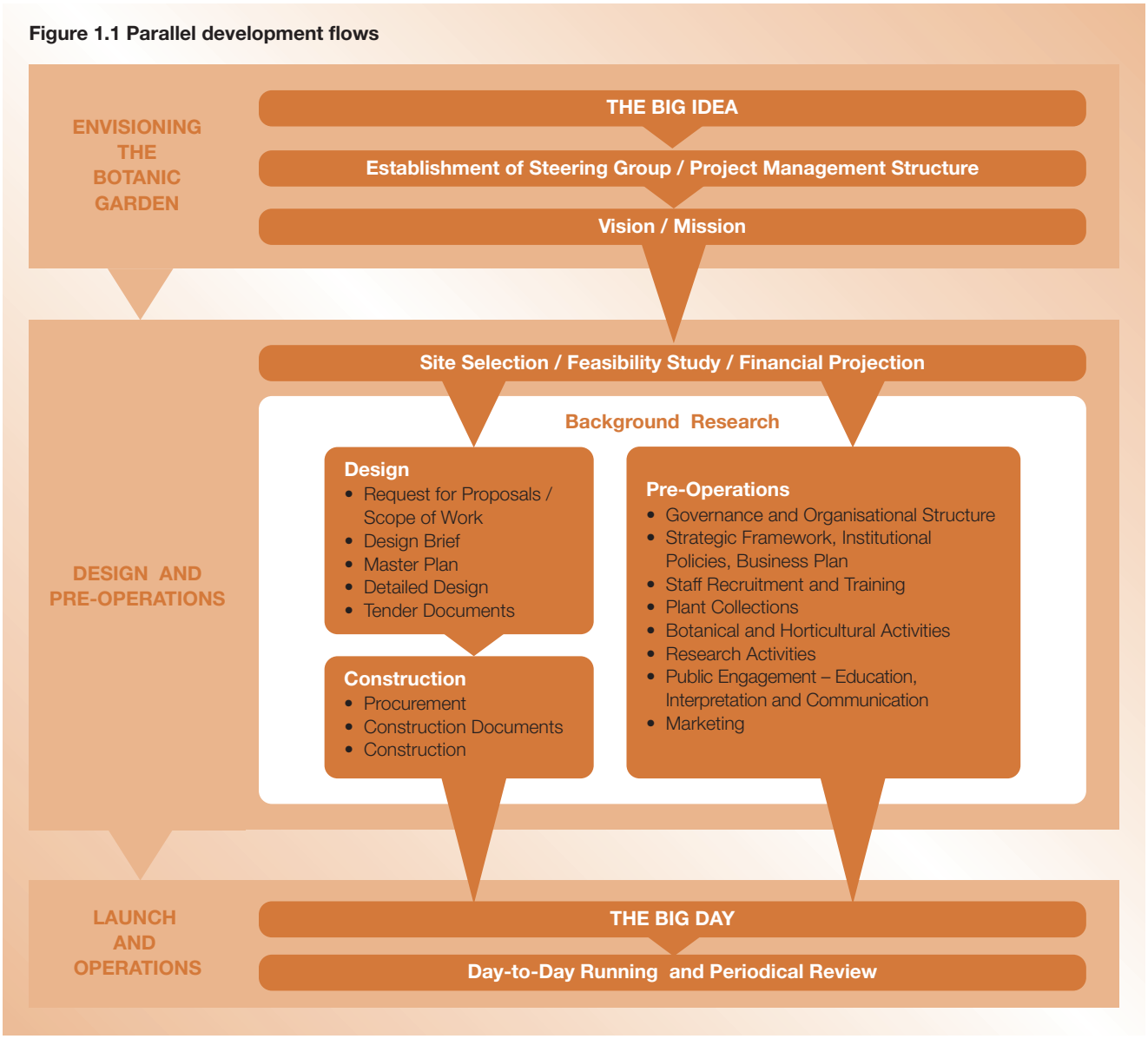
- What are we trying to achieve?
- Is it possible?
- How can we make it happen?

Having generated the big idea, the project owner – be it an enthusiastic individual, a community group, an organisation or the general public – will actively engage in the entire development process, including:

- Fine-tuning the big idea;
- Developing support;
- Assuming responsibility for the viability, planning and eventual success of the project;
- Establishing a steering group;
- Approving the project budgets;
- Entering into contracts with funding bodies, consultants and/or contractors;
- Approving design decisions and authorizing the project manager and design team to proceed at key milestones;
- Reporting to regulating agencies.

Depending on the type and magnitude of the project, whether it is a new botanic garden venture or the redevelopment of an existing institution, not all steps outlined in this chapter will be relevant to each undertaking. Further, implementation is not a linear process throughout: pre-operational management occurs in tandem with design and construction, progressing and complementing each other in parallel (Figure 1.1).

Figure 1.1 Parallel development flows



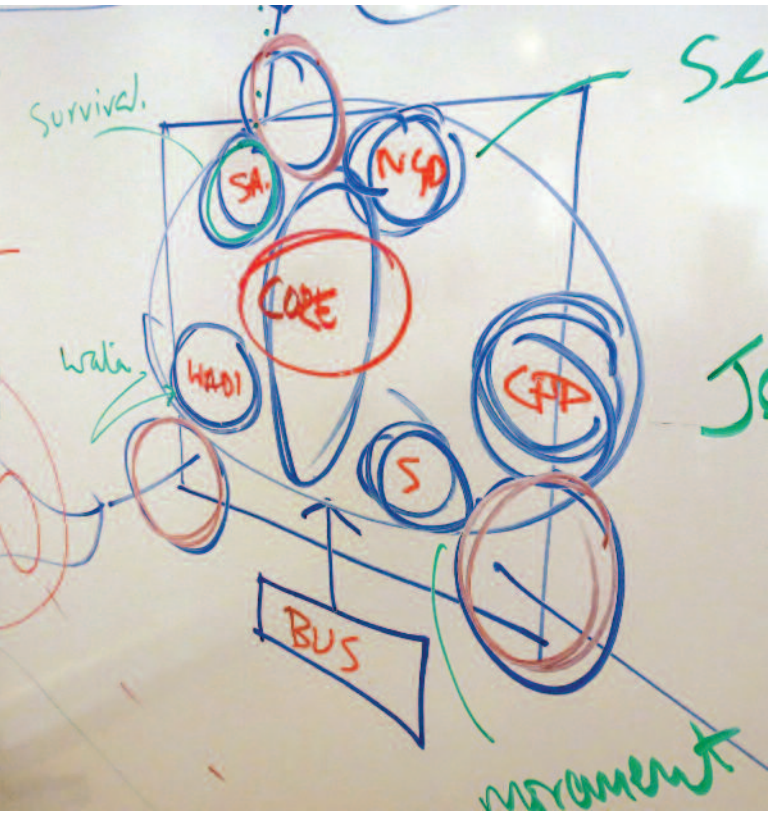
1.2.2 Directing the Project – The Steering Group

The steering group represents the core group of stakeholders of the botanic garden development venture and capitalises on a wide range of areas of expertise. As a highly multi-disciplinary group it may include:

- The project owner;
- The project manager/botanic garden director;
- Senior botanic garden staff;
- External, independent stakeholders, e.g. specialist consultants, sponsors, representatives from other botanic gardens or members of the public;
- Volunteers.

The steering group has executive oversight of the development process, and formulates clear objectives and terms of reference for the project. Specific roles and responsibilities of the steering group may include:

- Develop, confirm or refine vision, mission (Section 1.2.4) and other objectives;
- Approve design decisions and deliverables;
- Oversee the project, and contract management;
- Provide overall guidance and direction to the design team, project management team or any consultants;
- Prepare, revise and manage business plans and other policy frameworks.



A typical work-in-progress design diagram, produced during a collaborative, multi-disciplinary design workshop at Oman Botanic Garden. (Image: Andrew Anderson)

1.2.3 Managing the Development – The Project Manager

Thorough project management expertise is required throughout the entire development process from inception through to the opening day of the botanic garden. This may be provided by the botanic garden director, the design team (Section 1.5.1) or by an external, professional project management consultant. Frequent consultation with the steering group is essential to ensure that the project is delivered on time and budget.

Key roles of the project manager include:

- Establishing and monitoring the budget;
- Establishing and monitoring project schedules and timelines;
- Procurement of the appropriate consultants and/or contractors
- Monitoring risks and quality;
- Overseeing and managing the project scope, keeping a close watch on 'scope creep';
- Ensuring effort and expenditure are appropriate to expectations;
- Resolving differences and disagreements during the project development process.

1.2.4 Defining the Purpose – Vision and Mission Statements

The vision and mission are short statements that capture the main aspirations of any organisation or project. When a botanic garden is being developed it is vital that the intention of the institution is clearly articulated from the outset. The vision and mission inform the identification of specific goals and objectives of the project and provide a tangible direction for the design, development and realization of the project. The vision and mission statements relate to the institution's target audience and specify which aims are to be achieved, which experiences a botanic garden would like its audience to have, and how a botanic garden sees its position within the education, science and conservation communities. While the vision generally expresses the botanic garden's aspirations over a number of years or even decades, the mission (also called a corporate mission or corporate purpose) distils the vision into a more specific statement that explains the aims of the project (Box 1.1).

The development, confirmation or fine-tuning of a concise vision and mission should inform all stages of design, construction and pre-operations (Sections 1.5, 1.6 and 1.7). If such statements have already been formulated for existing botanic gardens, confirmation or modification as part of a review should be undertaken at key project milestones, i.e. submission of the master plan or detailed design documents (Sections 1.5.4 and 1.5.5) to ensure that the vision and Mission and any new developments are in line with each other. For instance, a review of The Australian Botanic Garden Mount Annan of the Royal Botanic Gardens and Domain Trust initiated in 2005, recommended a renewed emphasis on engaging with the local community. The earlier vision statement from 2000 was therefore deemed to be amended to: *'By 2016, Mount Annan Botanic Garden will be a highly valued botanic garden and sustainable parkland embraced by the community and recognised both locally and internationally for its botanic, cultural and natural landscapes'*, with the organisation's bicentenary celebrations in 2016 providing an opportune occasion to take stock of progress made.

Box 1.1 Examples of vision and mission statements

Oman Botanic Garden, Muscat, Oman – a new botanic garden in development
Vision: To inspire people to conserve and cherish the biodiversity and botanical heritage of Oman for a sustainable future.
Mission: Discover, cultivate, showcase and protect Oman's unique plant diversity and ethnobotany through innovative research, exciting displays and engaging communication.

Shanghai Chenshan Botanical Garden, Shanghai, China – a large botanic garden opened to the public in 2011
Mission: To conserve plants of Eastern China, discover sustainable ways of using them, and share our knowledge and enthusiasm with the public.

Tooro Botanical Garden, Fort Portal, Uganda – a dynamic young botanic garden established with limited resources
Vision: We look forward to a society with a well conserved green environment.
Mission: To promote community-centred conservation of botanical resources in the Albertine region.

Tooro Botanical Garden, Fort Portal, Uganda. (Image: Sara Oldfield)

Jerusalem Botanical Gardens, Jerusalem, Israel – a forward-looking botanic garden run by a non-profit organisation
Vision: The Jerusalem Botanical Gardens, where Plants Grow People.
Mission: Protecting biodiversity and welcoming human diversity.

South African National Biodiversity Institute, South Africa – a well-established government organisation including a network of national botanic gardens
Vision: Biodiversity richness for all South Africans.
Mission: To champion the exploration, conservation, sustainable use, appreciation and enjoyment of South Africa's exceptionally rich biodiversity for all South Africans.

Jardín Botánico Carlos Thays, Argentina – a historical institution of the municipality of Buenos Aires
Mission: To contribute to the conservation of plant diversity, especially the flora of Argentina, and advance the knowledge and appreciation of the world's plant kingdom.

The steering group (Section 1.2.2) should be involved in all stages of the formulation or refinement of the botanic garden vision and mission. Often developed through collaborative workshops, the preliminary statements should be reviewed by peers or relevant organisations as part of a final refinement process.

The vision and mission statements constitute an important part of a botanic garden's strategic framework documents (Section 1.7.3). Generally drawn up by the steering group in consultation with other botanic garden staff, these documents set out the broad framework within which a botanic garden will operate and define key roles and responsibilities of the stakeholders involved. While these documents do not usually confer any legal power or responsibilities, they form a key part of accountability and governance and should be reviewed and updated as necessary to reflect change.

1.3 ESTABLISHMENT OF A DESIGN PROGRAMME

KEY MESSAGE

During the continued refinement of the design programme it is important that all stakeholders are involved, and agree on the programme elements and time frame before initiating the next design stages of the project.

It is helpful to establish a comprehensive list of programme elements that form the foundation of the physical design of the botanic garden development project. These components will correspond directly with the vision and mission (Section 1.2.4) of the botanic garden, and provide an overview of physical and operational elements to achieve the project goals. While individual components of the design programme vary considerably based on individual project requirements, potential elements include:

- Specific buildings and functions (e.g. interpretation centre, research facilities, storage areas);
- Key project components (e.g. plant displays, recreation and special events areas);
- Operational or 'back-of-house' programme elements (e.g. nursery and maintenance facilities);
- Vehicular and pedestrian circulation infrastructure for visitors, employees and operational activities (e.g. path- and roadways, parking areas).

A design schedule should be defined early in the process to establish an overall target for the completion of key milestones of the botanic garden project. The schedule will inform the preparation of a feasibility study (Section 1.4.2) and will be further refined in the following development stages. The schedule is essentially a linked series of work activities that help establish a forecast against which the project implementation can be tracked. The forecast should be realistic, taking into account a broad range of factors based on project complexity, from availability of resources to construction seasonality. A pragmatic project timeline

and schedule will also help to identify factors and activities that pose a threat to timely delivery, and will allow adjustment to unanticipated changes. Obtaining feedback and consensus from all stakeholders when the schedule and sequence of project tasks are established is essential to developing realistic forecasts.

The design programme is initially a planning tool for the project owner and the steering group. When moving to the design and construction stages (Sections 1.5 and 1.6), the design team (Section 1.5.1) and the contractors are responsible for translating the overall project timeline into increasingly detailed schedules to meet the project requirements.

1.4 SITE SELECTION AND FEASIBILITY STUDY

1.4.1 Selecting the Botanic Garden Project Site

The idea of a new botanic garden development is often linked with a site already in mind, or with several potential sites from which the most appropriate location is selected. A list of possible sites for consideration may be developed as appropriate, based on criteria to achieve the project's vision and mission. These potential sites should be evaluated for suitability. Criteria for the assessment and selection of the site may include:

- Present ownership and availability;
- Existing bylaws, zoning or legal restrictions on site uses;
- Access and suitability for visitor and operational access;
- Existing buildings and infrastructures;
- Biophysical site conditions (climate, topography, solar aspect, soils, geology, hydrology, vegetation, wildlife habitat);
- Key views into and out of the site into the surrounding landscape;
- Special or distinctive attributes of a particular site;
- Sensory experiences (views, sounds, seasonality);
- Size (and scope for expansion in the future).

These criteria, along with any other project-specific considerations, should be evaluated and scored by the steering group or a team designated to select the site. A comprehensive feasibility study (Section 1.4.2) should then be carried out for the preferred location.

Drain construction, Pha Tad Ke Botanic Garden. (Image: Rik Gadella)

1.4.2 Conducting a Feasibility Study

KEY MESSAGE

The outcome of any feasibility study should be the answer to one key question: is the project realistic and achievable?

Any new botanic garden development should ideally be preceded by a comprehensive feasibility study. This comprises an evaluation and analysis of the potential of a proposed project, and is based on extensive investigation and research to support the process of decision making. External expertise may be required to prepare a feasibility study, depending on the scale and complexity of the botanic garden project. For smaller projects, a small group of informed stakeholders may be sufficient to ascertain if the project is feasible.

A feasibility study typically includes a preliminary analysis of the project, potential sites and ideas for its development. A feasibility study should be conducted in an objective, unbiased way to provide information upon which decisions can be based. A well-designed feasibility study will provide a historical background, a description of the project, a detailed site analysis, financial projections, information on operations and management, estimated timeline, and marketing research.

A key part of the feasibility study is a multi-disciplinary site assessment that cumulatively assesses and analyses existing site conditions. Generally, the same criteria as for those used for the site selection (Section 1.4.1) will be applied to establish the detailed site analysis, but these will be studied in much greater detail. Additionally, operational aspects, the cultural context, education and interpretation provisions and how they influence each other, should be considered. Further, potential risks should be identified, such as relating to the physical environment, visitor numbers, financial needs, marketing, etc. Likewise, ways of maximising local, regional and national benefits of the botanic garden should be evaluated and compared (Case studies 1.2 and 1.3).

The feasibility study should ideally be performed by the design team (Section 1.5.1), with extensive input from the steering group (Section 1.2.2), and will contribute to a thorough understanding of the site before exploring detailed design (Section 1.5.5) options. It will conclude with a case either for or against the project. If its establishment proves feasible, an outline of its facilities, location, organisation, role and design can be presented, drawing together the major conclusions of the study and identifying risks and opportunities.

CASE STUDY 1.2

Feasibility studies in the Pha Tad Ke Botanic Garden, Laos

Rik Gadella, Luang Prabang, Laos

As the first botanic garden in Laos, the emerging Pha Tad Ke Botanic Garden aims to establish a prime *ex situ* living collection of the national flora. It will serve practical conservation of threatened native plants, education and eco-tourism development.

As part of the due diligence required by the sponsor of the project, three feasibility surveys had to be conducted: a financial and legal study, a marketing study as well as an environmental and a social impact study. Although these analyses did not come cheap, the botanic garden staff learned considerably from the process as well as from the results, including how to issue a public tender, how to judge the proposals and how to accompany the consultants in undertaking the feasibility studies.

Especially the establishment of a financial model can be laborious and tedious, but it also provides a good opportunity to confirm figures and budgetary assumptions. If one does not have a head for numbers, support by a professional should be sought to explain and translate the 'accounting language'. A robust financial model and financial statement will be needed by most grant providers and donors, and perhaps even to open a bank account.

It quickly became apparent for all staff of Pha Tad Ke Botanic Garden that thorough and clear terms of reference for carrying out the feasibility studies were essential, and it cannot be overstated that one should spend sufficient time to establish these conditions. Consultants may at times come up with unexpected and new ideas. Experts from other relevant fields – such as PR and marketing specialists and lawyers, may have their own particular views of the project. Even if these are not taken on board ultimately, one should keep an open mind and listen carefully; there may always be something to learn from on how to develop a new venture successfully.

View to the Mekong river from Pha Tad Ke Botanic Garden. (Image: Alexandre Espenel)

CASE STUDY 1.3

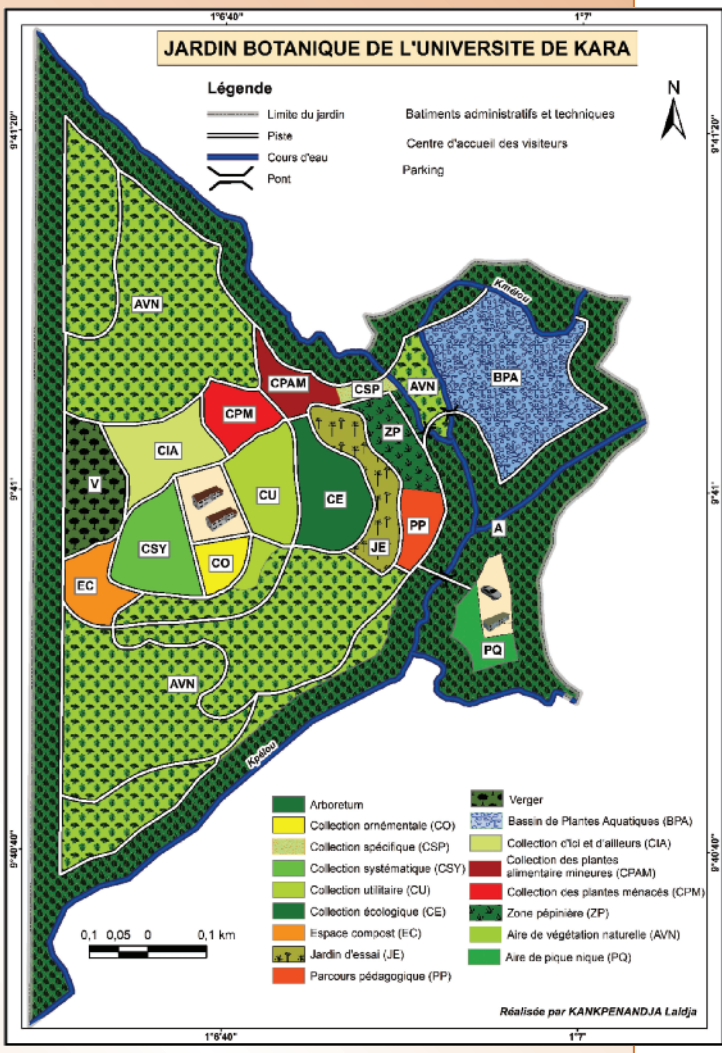
Site selection and feasibility assessment for the development of the Kara University Botanic Garden, Togo

Atato Abalo, Kara, Togo

With the opening of the University of Kara in northern Togo in 2004, initial ideas for a university botanic garden were drawn up to support and enhance the country's plant sciences development. Over the years, a number of studies have been carried out to identify the most appropriate site of the botanic garden.

The main, natural vegetation on the 1050 ha large grounds of the university is represented by savannah (woody on well-drained soils and more grassland-type in humid areas) as well as riparian forests along the two main rivers. Studies of the geomorphology of the area have yielded data on risk factors and have in turn informed the development of countermeasures to manage potential threats. These include high-intensity precipitation during the rainy season, triggering possible landslides and falling rocks, while inundating the sandy plains in the lower areas. Despite these risks, the establishment of the university as well as of the botanic garden were gauged as feasible, as long as a carefully drawn up zoning plan was respected during all subsequent development stages. This plan includes the delineation of areas for construction, zones with limited development potential, as well as areas not suitable for construction.

Situating and integrating pathways into the landscape of Kara University Botanic Garden. (Image: Abalo Atato)



Zoning plan Kara University Botanic Garden. (Image: Laldja Kankpenandja)

Based on this zoning plan, the definite site of the botanic garden was identified by applying the following, additional criteria:

- Hold the potential of connectivity of the various habitats represented on the grounds of the university;
- Offer zones for managed, living collections as well as fragments of wild areas;
- Permanent availability of water for irrigation;
- Make use of natural boundaries (rivers) to enhance the independence of the botanic garden in the long run.

The contour lines of the site were used to situate and delineate the individual plant collections and wild areas. In this way, the botanic garden makes maximum use of the existing topography, and, with the exception of the construction of a bridge to provide permanent access to the site, will retain most of the features of the natural landscape.

1.4.3 Projecting and Valuing the Investment – the Business Case

The business case provides a compelling argument for the added value of the project and justifies the resources needed for the investment. As such, the financial projection for the establishment and ongoing maintenance of the botanic garden (Table 1.1) constitutes the central component of the business case. It should be conducted at an early stage of the project, either as part of the feasibility study or as an independent analysis. It is critically important for the business case to be reviewed and revised during the master plan (Section 1.5.4) and detailed design (Section 1.5.5) phases. The business case may be produced by a specialist company, by the design team (Section 1.5.1) or by botanic garden staff, with substantial input from the steering group (Section 1.2.2).

Table 1.1 Botanic garden budget checklist (depending on the scale of the botanic garden project, not every item listed here may be applicable)

REVENUE
Self-generated income:
Admission Fees (if any)
Events: Public
Private and corporate
Retail
Catering
Consultancy services
External sources of income:
Sponsorship
Endowments

EXPENDITURE
Start-up costs
Exhibition, seminar rooms and auditorium – initial fit-out
External consultancies
Interpretation – initial set-up
Initial recruitment
IT systems: Botanical software subscriptions and training
HR & payroll system
Finance/accounting system
IT equipment purchase
IT training and support
Laboratory equipment – initial fit-out
Launch event
Library – initial fit-out
Machinery and vehicles – initial fit-out
Maintenance of pre-operations facilities
Marketing (pre-operations promotional activities and materials)
Multi-media guides
Non-capex fit-out (furniture and fixtures which are not included into the capital cost)
Nursery – initial fit-out
Rent of pre-operations facilities
Restaurants and cafes – initial fit-out
Retail – initial fit-out
Salaries
Security equipment – initial fit-out
Services of pre-operations activities
Staff training
Storage, warehouse, logistics – initial fit-out
Telecommunications
Utilities of pre-operations facilities
VIP area – initial fit-out
Other general start-up costs (including bins, fire extinguisher, internal artwork, etc.)
Contingency

OPERATING COSTS
Asset repair and replacement
Corporate social responsibilities
Depreciation
Education material
Events
External consultancies
Field work expenses (equipment, travel cost, daily allowances)
Finance costs (audit, bank charges, tills, legal fees, insurance)
Fundraising
IT software support and upgrades
Maintenance: Horticultural and landscape
Exhibition
Facilities
Interpretation
Marketing (promotional materials, advertising, events)
Outsourced operational activities (e.g. retail)
Printing, stationary and postage
Recycling/refuse collection
Rent
Salaries
Security
Staff training
Storage, warehouse, logistics operational cost
Sundries (e.g. staff uniforms, office artwork, etc.)
Telecommunications
Transport costs
Utilities
Contingency

1.5 THE DESIGN PROCESS: FROM CREATIVE IDEAS TO TECHNICAL SOLUTIONS

The design process marks the beginning of an inherently creative and exciting stage of the project, transforming the vision, mission and business case of a project to physical form. While the complexity, timeframe and outcomes of each project are different, the process outlined in this section can be applied to projects of many different sizes and levels of complexity.

The terminology used to describe the design process varies widely, and different terms are often used interchangeably. However, regardless of the terminology, the design process evolves from the initial big idea to a more detailed refinement of the original concept and eventually to the production of the drawings or documents that will enable the project to be built. This is a collaborative, cumulative process, and the success of any given design project is heavily reliant upon frequent and direct communication and collaboration among all the stakeholders involved, in particular the steering group, the design team and the contractors (Sections 1.2.2, 1.5.1 and 1.6.1).

1.5.1 Design Team Composition and Design Process Options

KEY MESSAGE

While every project is different, the steering group typically works with a designer or a design team to bring the project to life.

Who should design the project?

The steering group typically works with a designer or a team of designers to translate the project goals into reality. The design team may vary considerably in size and composition depending on the specific needs of each individual project and may include:

- Landscape architects or landscape designers;
- Architects;
- Botanists and horticulturist;
- Irrigation designers;
- Lighting designers;
- Interpretation designers and education experts;
- Engineers;
- Transportation and circulation experts;
- Operational experts;
- Business planners;
- Other specialist designers and experts tailored to the project.

Which design process to select: design–build or tender–construction?

The steering group may opt to follow a design–build process for a small-scale, botanic garden project. One company is contracted to complete both the design and construction; this involves only one contract between the project owner and the contractor.

Alternatively, the tender–construction process is used for large and more complex projects and includes several separate steps:

1. A design team is hired by the project owner to complete the design work and produce the required tender documents (Section 1.5.6).
2. Potential contractors then submit bids that detail how much it will cost them to undertake and complete the construction.
3. The project owner selects the preferred contractor and awards the construction contract.

1.5.2 Request for Proposals and Scope of Work

KEY MESSAGE

One of the most valuable investments that the project owner can make is to allocate the appropriate time, effort and resources to prepare a coherent and comprehensive request for proposals (RFP) document.

To appoint a suitable design team, the steering group (sometimes with the help of a project manager) prepares a comprehensive document that outlines the aims of the project, the required professional services and expected outcomes. This request for proposals (RFP) document will allow potential bidders to produce thorough, accurate and cost-effective proposals to carry out the work. Key elements of a RFP document may include the following:

- General instructions;
- Background information, including maps and photographs;
- Scope of Work;
- Deliverables;
- Schedule;
- Financial and administrative terms;
- Submission requirements.

The scope of work is the most critical component of the RFP document. Regularly revisited and reviewed as the botanic garden project evolves, the scope of work aims to:

- Provide the potential design team with as much information as possible about the project;
- Minimize uncertainty and ambiguity about the project requirements;
- Clearly define the expertise, skills and experience that are required to produce the work.

The development of the RFP should be an open, collaborative process that includes all project stakeholders and captures the true goals of the project. This is best achieved through a series of workshops to identify the key components of the scope of work, and to establish the submission deadlines and evaluation criteria. A coherently written RFP will result in proposals that are as thorough and cost-effective as possible and can be compared against each other at the evaluation stage. This will save untold time and effort, resulting in more accurate and competitive budgets.

A shortlist of potential design teams may be developed and invited to submit proposals in response to the request for proposals, or a fully public invitation to present proposals may be issued by the steering group. Potential bidders should be required to visit the site and meet the steering group. The end result is the selection of a highly qualified and experienced design team (Box 1.2) that is informed and excited about the project.

1.5.3 Design Brief

KEY MESSAGE

The design brief includes very detailed project information to guide the design process and is a valuable strategic design management tool. It is focused on outcomes and results of the design; the more detail, the better!

Once the design team has been awarded the project, one of the first tasks to complete is the preparation of a design brief. The design brief is prepared by the project owner and the design team and provides a detailed description of the goals, objectives, and components of the project. The design brief is an expansion of the scope of work (Section 1.5.2), explaining what the design team is required to do and what programme elements are required to be included in the design (Box 1.3).

The level of detail of the design brief depends on the complexity of the proposed work. Any project – whether a small addition to an existing garden or the development of a new site – requires a design brief document to clearly state the project requirements. While the length of a design brief varies from project to project, the principle remains the same.

The design brief focuses goals and expectations, capturing the essence of the project from the outset of the design process. It is a very valuable tool that can be referred to throughout the design process, to act as a check to ensure that the project is staying on track. At the completion of the design process, the design brief provides a record of the project goals and programme elements.

The preparation of the design brief should be a collaborative process involving both the steering group and the design team, although the latter generally is in charge for managing the process and producing the document. The steering group is responsible for providing as much information about the project as possible to help the design team capture the goals and expectations of the project.

The key to developing a successful and useful design brief is open communication and collaboration. It is critical for all stakeholders and members of the project to participate in this process: informal workshops, information-gathering sessions, conversations and site visits all provide invaluable opportunities to share knowledge. Depending on the complexity of the project, several drafts of a design brief may be warranted prior to its completion and initiation of the master plan (Section 1.5.4) and detailed design documents (Section 1.5.5).

Box 1.2 Key steps to selecting a design team

1. Confirm the scope of work. What are the objectives of the project? What are you trying to achieve?
2. Determine if the professional services of a design consultant are required, or if the skills, expertise and availability to perform the design work exist within the project team.
3. Confirm the procurement requirements. What kind of process is required for you to enter into a contractual agreement with a design consultant?
4. Confirm who will write the request for proposals (RFP) document to solicit bids (proposals) from appropriately experienced design teams. Determine if the request for proposals can be written by the project team, or if an external consultant is required to write the document.
5. Prepare a comprehensive and detailed request for proposals document.
6. Develop a list of potential bidders who you may invite to respond to the request for proposals (this depends on your procurement requirements).
7. Confirm what method will be used to advertise your request for proposals.
8. How are you going to decide who you hire? Establish a proposal evaluation committee who will review the proposals.
9. Advertise your request for proposals.
10. Address queries from the bidders as required during the bidding process.
11. Organize and conduct a 'bidders' site meeting' during the bidding process.
12. Review and evaluate the proposals.
13. Develop a short-list of preferred bidders, if required.
14. Arrange and conduct interviews with the shortlisted bidders, if required.
15. Visit past projects, call references, and thoroughly research the shortlisted bidders.
16. Award the contract to the most suitable design team.

Box 1.3 Key components of a design brief

- Identity of the project owner / company profile;
- Vision and mission of the botanic garden project;
- Goals and objectives – what are you trying to achieve?
- Quantifiable expected results;
- Target user groups;
- Schedule and timeline;
- Detailed requirements for all elements highlighted in the scope of work*;
- Design references and precedents.

* *The detailed requirements for all scope of work elements are the primary purpose of the design brief document.*

1.5.4 Master Plan

KEY MESSAGE

The goal of the master plan is to provide a comprehensive document that presents a possible solution to the intended project outcome and guides all subsequent design phases leading to project realisation. The master plan is not just a drawing – it is a strategic document that includes sketches and illustrations as a key feature besides explanatory specifications and cost estimates.

The master plan is a central document of any botanic garden development that identifies activities, opportunities and facilities that need to be considered to deliver the vision and mission of the organisation. It can be used to translate the requirements defined in the scope of work and design brief into a concept design solution. It may comprise to-scale plan drawings, illustrations and sketches (Box 1.4). It may also include a cost estimate of the construction work and operations, typically prepared by a qualified cost consultant. The costs are continually refined as the design process evolves and more information becomes available. The master plan offers an opportunity for the project owner to review and confirm that the botanic garden development is in line with the available funding. It also provides an important support-building and fundraising tool should further resource mobilization be necessary.

The master plan may include a series of design options or a single design solution. It should reflect the outcomes of the site analyses, opportunities and constraints identification, and design exploration. The master plan drawings and their supporting documentation, including the cost estimates, should incorporate all programme requirements as set out in the scope of work and the design brief.

Box 1.4 Key components of a master plan document

- Vision, mission and goals of the project;
- Summary of background research;
- Relevant examples of precedent projects – photos and illustrations;
- Spacing of components and activities;
- Site analyses – biophysical, operational, contextual;
- Diagram and sketches to illustrate the conceptual options;
- Potential garden operations;
- Design options and relationship diagrams;
- Analysis of design options – strengths, weaknesses, opportunities, challenges;
- To-scale plan drawings, illustrations, sketches;
- Cost estimates.

Continued public consultation throughout the master plan development process is essential to address the needs and gain the support of all stakeholders involved. This may include a series of presentations, workshops and informal, open-house discussions. These are aimed at exploring design options in a collaborative, transparent manner, and to communicate proposed design solution(s) to the public and provide a platform for discussion. While the design team is responsible for producing any design drawings or materials used in the public consultation process, the project owner may choose to manage the development process and may contract the services of public consultation experts to facilitate the process. Expectations and requirements regarding the public consultation should be clearly outlined in the scope of work.

As with all institutions and organisations, botanic gardens operate in an environment of change. Periodical review of existing strategic documents, including the master plan, is required for the institution to remain relevant. Successful reviews are highly participative, and give an opportunity to all interested parties and individuals to comment on development intentions and design solutions (Case studies 1.4 and 1.5).

CASE STUDY 1.4

Developing a new master plan – Denver Botanic Gardens

Brian Vogt, Denver, United States

Nearly 50 years in the making, Denver Botanic Gardens had hit a crossroads in 2007. Facilities built in the 1960s were showing their age and emergency repairs had become the prime focus of fundraising. A series of failed master plans gathered dust on shelves, largely because they were created by a small number of insiders and were immediately attacked by members and neighbours. If progress was to happen, something had to change.

The Board of Trustees hired a local architect to lay the foundation for a master plan that could actually be executed. A thorough analysis of infrastructure, as well as strengths and weaknesses, began to prioritize immediate needs and the groundwork necessary to begin achieving loftier goals. An early priority was to list elements that were obvious and enduring assets, covering most of the existing gardens and buildings. This baseline reassured those engaged with Denver Botanic Gardens over decades.

Four projects were launched simultaneously. The first was to focus on a package of obvious projects to be included in the Better Denver Bond election, which entails City funding of projects. Eventually, the City selected a core infrastructure system rebuild and total replacement of the greenhouses with a new greenhouse complex, including an orchid house, orangery, horticulture offices, labs and storage. The total amount of City support would be USD 18.6 million.

→→→

CASE STUDY 1.4 (CONT.)

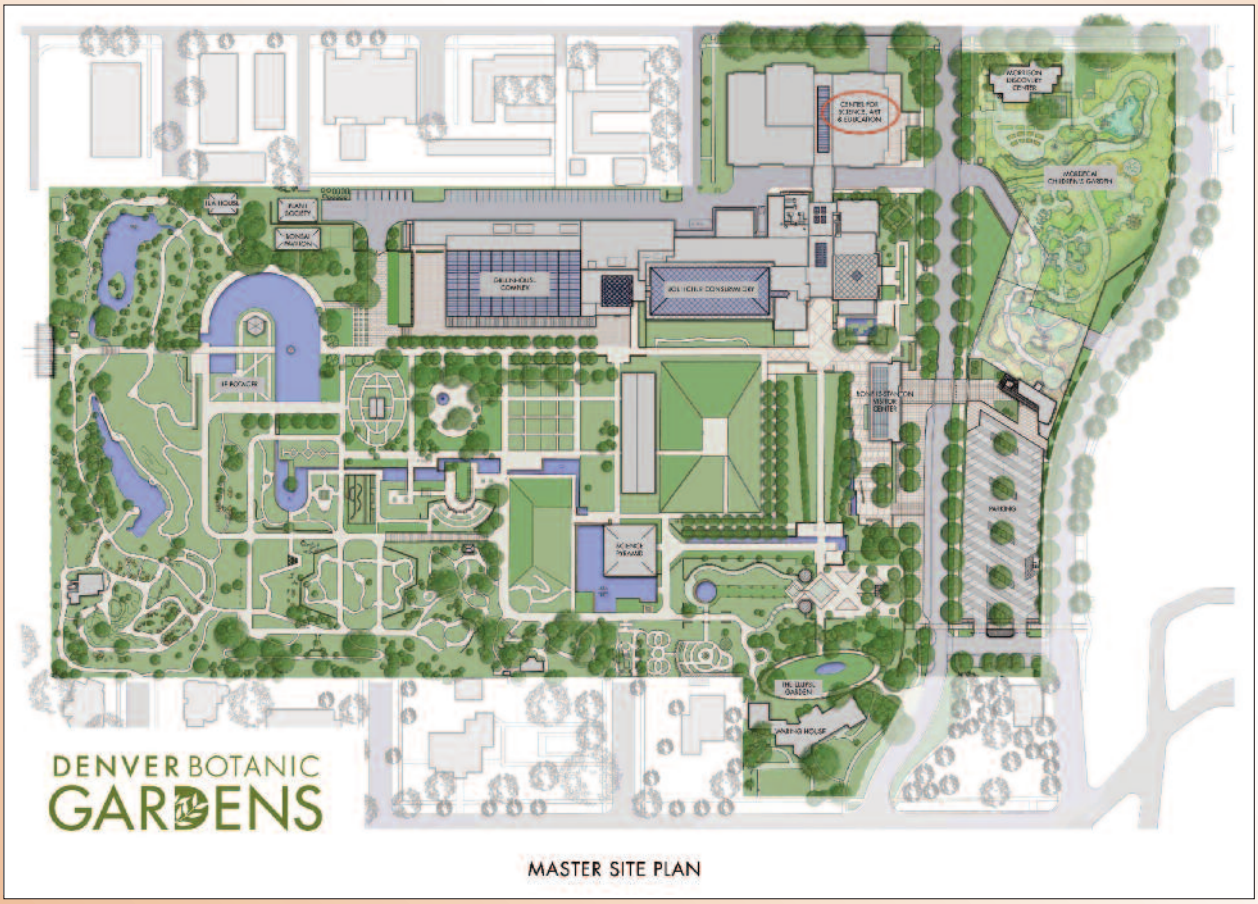
The second initiative was to rebrand the botanic garden. This involved over 100 people to review core values, the mission and programmatic goals of the institution giving not only the master development plan but also daily activities a common context.

The third initiative was the creation of the Master Development Plan (MDP) itself. Trustees worked with staff, volunteers, donors, neighbours, City officials, and specialistes to dream, refine and lay down specific visions on paper. This 'all hands on deck' approach produced a surprising revelation. There were few real arguments. As the MDP reached its conclusion, enthusiasm and confidence grew. And by the time the plan reached the City for all of the complex approval processes, it had strong support across the board, including formal resolutions by neighbourhood organisations.

The final step was to launch a capital campaign. In January of 2008, the Flourish campaign was unveiled to a packed house. The campaign's strategy was to cluster all of the projects into four phases, give the Gardens benchmarks and the chance to celebrate interim successes. A wall within the main lobby showcased every project by phase and as each one was ticked off, a 'completed' banner stretched across. Even now, visitors linger in front of the wall to see what has been accomplished, where the funding came from, and what was still in need of support. A plan that involved hundreds of people was now completely transparent to thousands more.

The Science Pyramid, Denver Botanic Gardens. (Image: Scott Dressel-Martin)

Six years later, the results of this grand convergence is seen in all aspects of the operations of the botanic garden. Over USD 64 million in projects have been completed, with only one significant project remaining. Visitation, membership and the operating budget have all doubled. Most important, the capacity and confidence of everyone involved in the Gardens has skyrocketed.



Site Master Plan, Denver Botanic Gardens. (Image: Denver Botanic Gardens)

CASE STUDY 1.5

Botanic Gardens of South Australia Master Plan Development – Adelaide, Mount Lofty and Wittunga Botanic Garden sites

Trevor Christensen, Adelaide, Australia

Master Plans were completed for the Adelaide and Mount Lofty Botanic Gardens in 2006 after a process taking some 18 months. The Wittunga Botanic Garden Master Plan was completed in 2012 after a 10 month process. These plans were developed by consultants chosen through a select tender process and in each case were prominent Landscape Architectural firms with a good understanding of the roles and functions of Botanic Gardens and the South Australian context and within the local environment.

Aims of the Master Plans

- The Botanic Gardens of South Australia (BGSA) Master Plans provide a framework for day-to-day operational and long-term decision making, facilitate prioritisation of activities and provide a basis for accountability: long-term collections development and maintenance requirements;
- Visitor facilities and services including opportunities to enhance accessibility and usability of the BGSA;
- Priority of investment programmes to facilitate dialogue during the BGSA's budget bilateral programmes and to assist negotiations with sponsors.

Accordingly, the Master Plans consider timelines of fifty and more years. In the case of BGSA, recommendations were prioritised as high, medium or low and consisted of a mixture of operational or recurrently funded projects as well as those more significant projects funded through capital budget allocation.

Ethnobotanist Saif Al-Hatmi of Oman Botanic Botanic Garden exploring interpretation signage at Adelaide Botanic Garden. (Image: Annette Patzelt)

Development of the Master Plans

The scope of work, as defined in a project brief, was further developed through the requirement for a return brief from the consultant, the aim being to gain a thorough understanding of the existing plans and policies, historical considerations and the physical features, opportunities and constraints of the BGSA. The following issues needed to be considered:

- Landscape character (including hard and soft landscape elements) and visual values;
- Thematic planning;
- Key collections and individual specimens of significance;
- Education and interpretation;
- Garden access and circulation (including entry experiences);
- Site access including public transport, management, emergency vehicle, private vehicle (including parking), bicycle and pedestrian;
- Safety and security considerations for garden users;
- Visitor facilities and services (including functions and events, future commercial or business opportunities);
- Operational facilities and services;
- Linkages to and collaborative opportunities with the community and business sectors.

The Master Plan Reference Group

The Master Plan Reference Group was a critical factor in the success of the process and ensuring community acceptance of the direction being developed for each site. This does not mean that all recommendations were fully supported by all members however it did ensure that there was at least a firm understanding of why particular directions were decided upon and recommended. The Reference Group consisted of representatives from:

- Government;
- Local government;
- Schools;
- Community Groups;
- Community members;
- Business sector;
- Board;
- Staff.

Consultation with the Reference Group was a critical factor in ensuring acceptance by its members as community representatives. A formal presentation by the Master Plan consultants was given to the Reference Group members at each of the key milestones.

Issues

- Stakeholder and Reference Group members expectations – ensure that they feel they are being heard and their ideas considered;
- Some major stakeholders (e.g. neighbours) not wanting to engage in the process;
- Practicality or relevance of some ideas presented by stakeholders;
- Expectation from Reference Group/stakeholders that everything will be implemented;
- Inadequate reference to the historical context, strategic plans and collection policies. →→→

CASE STUDY 1.5 (CONT.)

- Continual communication;
- Staff concerns regarding change of and impact on workload;
- Priority projects and priority setting of the Master Plan recommendations;
- Financial and human resource mobilisation to implement Master Plan recommendations.

Benefits for the BGSA

- Future planning and development with appropriate consideration of site history and site conservation analysis;
- Controlled sense of development and project development, rather than ad hoc and random ideas;
- Information and recommendations enabled development of a forward capital plan;
- Enabled development of communication channels and ongoing professional dialogue with active community groups who at times may have had conflicting or special interest ideas and priorities for Garden development, usage and future direction;
- Provides a platform to lobby the government, donors, partners and demonstrate that proposals have been thought through in a complete organisational context with proper consideration of the past and long term future.

1.5.5 Detailed Design

KEY MESSAGE

The detailed design process advances the master plan into achievable, specific design solutions.

While a number of terms are used to describe the detailed design process including 'concept design', 'schematic design' and 'design refinement', this phase entails the refinement of the master plan as approved by the project owner, and comprises the production of detailed drawings and construction specifications. A concept design may be established first to refine elements of the master plan prior to initiating the detailed design. Informed by the master plan and tested against the content of the design brief, the detailed design explores the options for the resolution of the detailed design challenges and proposes practical and achievable design solutions (Box 1.5).

The detailed design is led by the design team, with continued involvement and input from the steering group, the project manager and other stakeholders. The detailed design may be developed by the same team that developed the master plan or a new design team may be required.

Guilfoyle's Volcano Project, Royal Botanic Gardens Victoria (RBGV), Australia – a model of project management – constructed from the renovation of a century-old reservoir and integral part of RBGV's water recycling plan. (Image: Katie O'Brien)

While any combination of drawings, sketches or illustrations may be prepared by the design team during this stage, the drawings need to achieve the objectives of the project. The goal is to demonstrate the design intent and to ensure that the project owner understands all design components. The detailed design drawings provide significantly more detail than the master plan, including preliminary construction details in order to offer sufficient information for the preparation of refined construction cost estimates.

As with all botanic garden development and review phases, continued communication between the design team and the project owner during the detailed design stage is critical to the success of the project. Design workshops form an integral part of the collaborative design development. The project owner should be familiar with the content of the drawings and review them in detail in close association with the design team. Regulating agencies may also be involved to ensure that the drawings and specifications comply with any applicable legal requirements. The end product of the detailed design stage is a suite of detailed drawings, draft specifications and detailed cost estimates that will guide the development of the tender documents (Section 1.5.6).

Box 1.5 Potential deliverables – the detailed design stage

- If required, revised design brief document;
- To-scale plan drawings, elevations and sections;
- Illustrations and sketches to convey content and character of the design;
- Preliminary construction detail drawings: how are the project components going to be built?
- Construction cost estimates;
- Presentation of drawings, supporting materials and other visuals to convey the design intent to the steering committee or stakeholders.

1.5.6 Tender Documents

KEY MESSAGE

The tender documents are used by the contractor to submit a price to construct the project, and they include the highest level of detail for all drawings and technical specifications.

Any new botanic garden project – regardless of its scale and complexity – is not built based solely on design drawings. A comprehensive set of tender documents, including both drawings and written specifications, is typically required to provide adequate detail for a contractor to prepare a thorough cost estimate and bid to undertake the construction (Section 1.6). The tender documents enable the contractor to submit a price to carry out the work, while the construction documents are used by the contractor after the project has been awarded, in order to construct the works in line with the drawings (Section 1.6.2). The tender drawings contain a project-specific selection of scaled plan drawings, cross-sections, elevations and construction details. Typically they include:

- The architectural/building plans (as articulated in the scope of work);
- Site preparation plans;
- Layout plans;
- Phasing plans;
- Grading, drainage and storm water management plans;
- Hardscape plans;
- Planting plans;
- Electrical plans;
- Irrigation plans;
- Technical construction details;
- Signage and wayfinding plans;
- Interpretation design plans.

The drawings are accompanied by written specifications (Section 1.6.2). These documents typically follow detailed industry formats and standards specifying the state the materials, equipment, systems, standards and workmanship that are required for the construction.

The tender documents are prepared by the design team, with detailed input, review and approval by the project owner. Regulating agencies may also be involved to review and approve the plans. The tender documents are a continuation and refinement of the detailed design drawings, and include the highest level of detail for all drawings and specifications. As with all other development stages, the project owner should be involved in the development of the tender documents by means of regular reviews of the plans as they evolve: the design team should submit in-progress drafts of the tender documents to the project owner for review and approval at key completion stages (i.e. at 50%, 90% and 100% completion). It is vital for the project owner to understand as much of the content of the drawings as possible by means of open and frequent communication with the design team prior to approval and initiation of the construction.

1.6 CONSTRUCTION: BRINGING THE DESIGN TO LIFE

The construction process is very complicated, and is rarely – if ever – explained to the public. The construction industry rarely publishes its own processes. As a result, this information is not widely understood within the botanic garden community.

Andrew Anderson, Landscape Architect, Oman Botanic Garden

1.6.1 Procurement

KEY MESSAGE

The evaluation of bids submitted by contractors should be based both on cost and the technical merit. Awarding the contract mainly or solely on the basis of price is not recommended.

Procurement is the widely variable process through which a builder or contractor is hired to build the project. The procurement process may be managed by either the project owner or a project manager with the direct involvement of the project owner. A selected group of pre-qualified contractors may be invited by the project owner to submit bids to carry out the work, or offers may be solicited from any interested party. The contractors prepare their bids by reviewing the tender documents to determine the construction costs. A project visit should be organized to provide potential bidders with an opportunity to view issues on-site and raise questions directly with the project owner.

It is of central importance for the project owner to award the construction of the project to an appropriately skilled and experienced contractor. The criteria for evaluating the bids should be based both on the cost and the technical merit (Box 1.6). This is the start of a new and critically important relationship between the project owner, the design team and the contractor.

BOX 1.6 What to look for in a contractor

- Relevant experience – examine previous work;
- Availability;
- Track record – check references;
- Attitude;
- Professionalism;
- Commitment to environmentally sustainable construction practices;
- Fair pricing: remember, you get what you pay for!

1.6.2 Construction Documents

KEY MESSAGE

In the case of a discrepancy between the construction drawings and the construction specifications, the written specifications typically take precedence over the drawings.

The construction documents include the drawings to build the project along with written specifications that provide further, detailed information on construction methods and materials. These documents are 'issued for construction' by the design team following the selection of a contractor. The construction documents form part of the legal contract between the project owner and the contractor. They are typically very similar to the tender documents (Section 1.5.6). Fundamentally, the tender documents enable multiple contractors to prepare and submit bids for how much the construction of the project will cost; the construction documents are used by the successful contractor to build the project.

Construction specifications are written documents that follow specific formats and standards to clearly state the materials, equipment, systems, standards and workmanship that are required for the construction (Box 1.7). Cities, municipalities or regulating agencies may have standard construction specification formats that should be followed. Construction drawings, by their very definition, are visual representations that are unique to each and every project.

The design team is responsible for preparing the construction specifications. The contractor is legally bound to adhere to these details; in case of a discrepancy between the construction drawings and the construction specifications, the specifications typically take legal precedence over the drawings.

Box 1.7 Typical construction specifications

Construction specifications are as varied as the potential design elements of a project, although they are typically organized into specific categories within the construction industry. Typical landscape construction specifications may include any of the following:

- Site clearing and preparation;
- Existing landscape and vegetation protection;
- Topsoil stripping and stockpiling;
- Grading and earthworks;
- Drainage and storm water management;
- Unit paving;
- Concrete works;
- Stone masonry;
- Bed and tree pit preparation;
- Soil preparation;
- Plant material – installation, staking, mulching.

Depending on the scope of work (Section 1.5.2), the contractor, sub-contractor or specialist fabricator may also prepare detailed 'shop drawings' that also form part of the construction documents, following review and approval by the project owner and design team. Shop drawings are very detailed construction and fabrication drawings that specify the size, shape, materials, parts assemblies and the overall installation of the item.

1.6.3 Construction

KEY MESSAGE

A collaborative culture of open communication should be established in the early stages of the botanic garden development and will prove to be critically important during the construction phase to minimise delays and unforeseen costs.

The historic building at the heart of the symmetrically designed botanic garden complex in the Flora – the Botanic Garden of Köln, Germany – reopened in 2014 after a three-year renovation period. Continued communication with all involved stakeholders ensured that the budget for the renovation was secured. (Image: Annette Patzelt)

The construction phase includes the building, supervision of the contractors, inspection of the project components during construction and after completion, as well as the overall administration of the construction contract (Table 1.2). The importance of accurate and thorough construction documents (Section 1.6.2) cannot be overstated.

Depending on the scale of the project, a variety of contractors, sub-contractors, specialist installation experts and sometimes even members of the project owner team or volunteers may be involved in the physical construction of the project. If the project follows the design–build process (Section 1.5.1), then the construction is carried out by the design team.

Table 1.2 Construction responsibilities

PHASE OF WORK	PERFORMED BY	APPROVED BY
Tender Documents	Design Team	Project Owner or Steering Group, Project Manager, Regulating Agencies
Construction Drawings and Construction Specifications	Design Team	Project Owner or Steering Group, Project Manager, Regulating Agencies
Procurement	Project Owner or Project Manager	Project Owner or Steering Group
Construction Supervision	Project Owner or Design Team	Project Owner or Steering Group
Construction Inspection	Design Team	Project Owner or Steering Group, Project Manager, Regulating Agencies
Contract Administration	Design Team, Project Manager	Project Owner or Steering Group, Project Manager
Construction	Contractor (if Tender–Construction option) Design Team (if Design–Build option) Project Owner (if sufficiently experienced) Skilled Volunteers (for very small-scale projects)	Project Owner or Steering Group

Construction contract administration includes supervision, inspection, and overall administration of the construction contract. This can be very time consuming and is often underestimated in the scope of work (Section 1.5.2). The project owner and project manager should ensure that sufficient time and resources are allocated to this task.

It is imperative for the project owner to be actively involved in the construction process from start to finish and to approve all works, while the responsibility for overseeing the contractors and inspecting the construction work typically lies with the project manager and design team. The involvement of the design team throughout the entire construction process should be anticipated and included in the scope of services during the procurement phase (Section 1.6.1). Adjustments on-site are a common aspect of any project, especially when tackling landscape construction or unforeseen issues. The design process does not end when the construction begins – on-site design refinements frequently occur throughout the construction work.

While it is the responsibility of the contractor to designate appropriately skilled and experienced staff in a supervisory role, the project manager and design team must also be involved in construction supervision and keep the project owner abreast of any new developments. Construction inspection requires technical expertise and project familiarity by the project manager, design team and relevant regulating authorities.

Construction may be divided into multiple phases for any number of reasons, although the strategy for phased construction – especially to allow for fundraising – should be integrated in the project schedule at the outset of the botanic garden development. The time allocated for construction is often underestimated, and the adherence to schedules in the detailed design (Section 1.5.5) and construction phases (Section 1.6.3) should be closely monitored by the project owner, the project manager and the design team. The schedule should be updated by the contractor throughout the construction of the project. Regular joint meetings on-site with the project owner, the design team, the project manager and contractor are vital to the success of the project. Allocating sufficient time and resources to allow for adequate site meetings should be a priority of all stakeholders.

An often overlooked aspect of the construction process is the opportunity to emphasize and demonstrate a commitment to sustainability and environmental stewardship through sensitive and appropriate construction methods and environmental protection measures, including for the existing vegetation, topography, topsoil, groundwater, etc. Equally, it is critical for the design team to integrate sustainable construction practices and environmentally responsible materials into the tender and construction documents (Sections 1.5.6 and 1.6.2).

The entire construction process should be documented for future reference for educational, training and archival purposes. 'Before and after' photographs and videos are invaluable and are a tangible record of the botanic garden development project and of the accomplishments of all those involved.

This stage also provides valuable opportunities for learning and building a sense of ownership and achievement. Every effort should be made to involve and engage all stakeholders – including the public when feasible – in the construction process: visiting the site, interacting with the contractor, asking questions and seeing the results of months or years of work appearing before one's eyes.

When followed and properly managed, the construction process should result in a project that is complete, on time and within the construction budget. The time and effort invested in a collaborative, transparent design process and in the preparation of a comprehensive scope of work as well as accurate and thorough construction documents should result in a successful project that fulfills the vision, mission and goals of the botanic garden and brings the design to life.

1.7 PRE-OPERATIONS: THE EARLIER THE BETTER!

KEY MESSAGE

The significance of pre-operations cannot be overstated – the earlier the better! While this aspect of establishing a new botanic garden is often overlooked, everything from establishing the governance and organisational structure, to building up the plant collection and initial programmatic activities, including research and education, are all important to the eventual success of the project.

This section addresses operations management prior to the garden opening to the public. It presents general considerations for pre-operations that should be tailored to the individual context of a particular site. These can be extremely complex, with many parallel work streams that need thorough coordination (Figure 1.1).

Pre-operations will transition to ongoing operational management (Chapter 2) following the completion of the botanic garden development.

Based on the vision and mission (Section 1.2.4) of the botanic garden development, pre-operations may comprise:

- Setting up a new or amending an existing botanic garden organisation;
- Recruiting and training staff;
- Developing the plant collection and documentation;
- Providing expert advice on the design;
- Developing strategic frameworks and policies;
- Carrying out horticultural and botanical work;
- Developing education, interpretation and communication programmes, including marketing.

The steering group and design team need to establish pre-operational planning and management components during the feasibility study, master plan and detailed design stages by defining priorities, identifying necessary resources and addressing strengths and weaknesses. As with the operational phase of an established botanic garden, challenges during pre-operations often relate to financial and human resource management and marketing. The development of strategic plans, institutional policies and business plans will ensure that the botanic garden has clear targets and procedures to address these issues (Case study 1.6).

CASE STUDY 1.6

Bringing a big idea to life – The Oman Botanic Garden

Annette Patzelt, Andrew Anderson, Ghudaina Al-Issai; Muscat, Oman

The Oman Botanic Garden, 420 ha in total, is a new botanic garden, currently under construction in Muscat, Oman. The botanic garden focuses on the native flora and vegetation displayed in carefully created habitats, the rich ethnobotanical relationships between plants and people, and sustainability in all aspects. The more fragile habitats of the high altitude mountains and the arid cloud forest will be displayed in large biomes; the remaining habitats will be displayed in external habitat gardens. The botanic garden will also house research facilities, a herbarium, a seed bank, seminar facilities, and a field study centre for visitors.

While construction of the main elements of the botanic garden is yet to be completed, the nursery, together with initial administrative buildings, was built in 2008. This allowed the pre-operations processes to start very early on.

This ambitious project is highly complex. The formulation of policies, development of work processes, and staff training and education are fundamental processes that continue to take place during construction.

The scale and beauty of the Oman Botanic Garden site was sensitively addressed during the design phases. (Image: Annette Patzelt)

Initial Idea

The idea to build a unique botanic garden in Oman dedicated to the presentation and interpretation of its native flora and vegetation was started in 2004. In response to this opportunity, a steering committee was formed and core elements of the botanic garden were identified.

Formulation of Vision, Mission and Strategic Documents

The steering committee – together with key staff members – formulated the vision, mission and principles to guide all aspects of the development of the botanic garden.

→→→

CASE STUDY 1.6 (CONT.)

RFP (Request for Proposal) and Design Brief

The garden produced a clear, focused RFP. A design brief was drawn up by the design consultant in close partnership with the client to guide the concept design stage. The design brief set out the parameters from the outset and has become a cornerstone document that continues to evolve with the various design phases of the project.

Master Plan Phase

A Master Plan was commissioned in 2006 and revised and updated in 2013. Its revision was prefaced by an intense period of all-encompassing critical analysis which considered authenticity, botanical content, site fragility, transport, operations, landscape, and technical responsiveness.

All Master Plan elements considered that the botanic garden should be convenient and enjoyable for the visitor and focused on visitor comfort and the overall visitor experience, while respecting the ecological integrity, beauty and the fragility of the site. Based on this vision, the consultant was tasked with creating an inspiring and immersive visitor experience.

Design

The design of the botanic garden was inspired by the complexity and the richness of Oman's flora, landscapes and ethnobotanical traditions. The design produced innovative and individual solutions that are inextricably linked and respond to the local site conditions. A holistic, multi-disciplinary, and integrated approach proved to be critical for the success during the design process.

Pre-Operations Management

While construction continues to move forward, a wide variety of pre-operational processes have continued since day one, including staff capacity building, the development of a governance model and staff structures, a comprehensive production list, as well as institutional policies. All this is occurring in tandem with the operation of a globally unique plant collection that consists of the living collection, seed bank and herbarium.

Pre-operations considerations and management are absolutely essential to ensuring that the garden will be fully operational once construction and planting are completed and the botanic garden opens its doors to the public.

Following spring rains, the site of the Oman Botanic Garden becomes green seemingly overnight. (Image: Annette Patzelt)

1.7.1 Expert Advice During the Design and Construction

Continued scientific and technical support by experienced, senior botanic garden staff will be required throughout all major stages of the development. This may include advice on horticultural or botanical aspects, operational processes, interpretation contents and social issues. Monitoring and evaluation of the design and construction outcomes should follow a multi-disciplinary approach with regular involvement of all botanic garden staff. For large, new botanic garden projects or redevelopment of existing institutions, seeking international advice is desirable to capitalise on a wide range of expertise and experiences and identify the most appropriate solutions.

1.7.2 Governance and Organisational Structure

KEY MESSAGE

A variety of governance models and organizational structures exist, and each botanic garden will need to find a model that best addresses its unique circumstances.

Very early on in the development of a new botanic garden, consideration needs to be given to the overall governance and staffing structure of the garden. For example, the organisation might be established as a government agency (under local, regional or national control), an autonomous research institution, a commercial company, an institution linked or incorporated into an existing body, an executive agency, or a not-for-profit foundation. Often, botanic gardens are established to include elements of several of these options (Wyse Jackson, 2003). Which organisational structure and governance model to adopt will generally be determined by complex and inter-related political and pragmatic realities of the specific project. The choice will also have to consider potential sources of funding and other support by stakeholders (Chapter 2). Staff structures for all departments need to be established; they will guide the staff recruitment process and will inform the business plan development.

1.7.3 Development of a Strategic Framework – Multi-Year and Business Plans, and Institutional Policies

Planning and developing action to accomplish objectives – strategic planning – provides the foundation for the management and future success of the botanic garden. Presented in strategic, multi-year plans, business plans and institutional policies, this strategic framework will ensure realistic targets and clear rules and procedures for the management of the botanic garden in accordance with its vision and mission. It may include:

- Strategic plan, usually over a period of 3-5 years and updated periodically;
- Business case and business plan;
- Institutional policies, e.g. for:
  - Plant collections including access and benefit-sharing and biosafety;
  - Research and education;
  - Staff recruitment;
  - Staff training;
  - Environmental sustainability;
  - Health and safety.

As part of the strategic planning process, priorities need to be defined, resources identified and weaknesses addressed that have a bearing on achieving the goals and objectives of the botanic garden. This is a collaborative process in which all staff are involved in one way or another. For example, at the Oman Botanic Garden, senior managers and mid-level staff participated in a series of half-day workshops, assisted by senior staff from the Royal Botanic Garden Edinburgh. The strategic framework that emerged from these workshops was circulated and presented to all members of staff in Arabic and English. This provided an opportunity to obtain feed-back and foster ownership of the objectives and targets to be achieved as set out in the strategic framework document.

The business plan outlines how an institution will be governed and run, or marketed and funded to successfully achieve the botanic garden's goals and objectives in accordance with its vision and mission. Depending on the context, the business plan may either be short term or long term and can include an annual financial plan that derives from the strategic long-term plans.

The business plan represents an analysis, decision-making and communications tool. It usually includes sections on goals and objectives, an institutional niche analysis, a governance, operations and implementation plan including a time schedule, a marketing strategy, revenue and funding targets, alternative options, as well as an analysis of risks and challenges. A solid business plan leads to well-informed decisions that are most appropriate for a given botanic garden setting, while failure to provide adequate level of detail, not undertaking the necessary research in the required breadth, disregarding relevant data, or making incorrect inferences, may lead to suboptimal conclusions and choices in terms of the time, money and opportunities. The business plan may be established in-house, depending on the availability of appropriately qualified staff, but often is also taken on by experienced consultants. It should be reviewed periodically to reflect change.

It is vital for all the botanic garden personnel to identify with the botanic garden's strategic framework documents. This includes familiarity of the staff with:

- Their role in the botanic garden's strategy and their place in the staff structure;
- Their responsibilities and accountability;
- Their agreed targets to be achieved;
- How their performance will be measured and evaluated.

Botanic gardens exist within a rapidly changing environment. To this end, regular reviews and amendments of the strategic framework documents are required to anticipate and respond to changes. One way of achieving this is for annual work plans to be derived from the business plan, and in this way be kept under constant review. All strategic documents drawn up during the pre-operations phase should be revisited once the botanic garden is fully operational.

1.7.4 Staff Recruitment and Professional Training

KEY MESSAGE

Staff recruitment and continued capacity building for all existing staff should not be seen as a cost but as a benefit to the botanic garden.

Early staff recruitment in line with the organisational structure is a strategic priority. The strategic framework documents, including staff requirements, determine which skills are needed. Continued and targeted training is important to develop staff to an expected level of expertise and performance. Training at all staff levels should not be seen as a cost but rather as a benefit and obligation of the botanic garden, and staff should be regarded as an asset.

On-the-job training represents a significant proportion of capacity building, for instance through the daily work in the botanic garden nursery or during field expeditions, or simply through team discussions and workshops. If sufficient budget is available, attending international training courses is always extremely valuable.

Botanic gardens themselves are leading training centres in all fields of botany, horticulture, etc. They enhance national and international capacity in plant biology and conservation science for instance through undergraduate and graduate degree programs, diplomas, internships or project partnerships.

1.7.5 Developing the Plant Collections

KEY MESSAGE

The plant collections are the very essence of a botanic garden and should be based on a thorough collection policy.

The collection, propagation or procurement of the required plant material represents an enormous task, requiring rigorous planning, data management, plant propagation and cultivation and/or purchasing detail, pest and disease control and plant maintenance. Supported by an appropriate collection record management system (Chapter 5), this may include:

- Field work to collect the required plant material;
- Propagation or acquisition of plants;
- Species identification and verification;
- Labelling and accessioning;
- Horticultural and plant maintenance protocols;
- Establishment of a seed bank, field genebanks, cryopreservation facility, etc.;
- Establishment of a herbarium and processing of herbarium vouchers;
- Facilitating partnerships locally, nationally and internationally to encourage sharing of expert knowledge.

Figure 1.2 Eurobodalla Regional Botanic Garden collection target model
Basic template offering comprehensive information on collections targeting, production and management used at the Eurobodalla Regional Botanic Gardens, New South Wales, Australia. (Image: Michael Anlezark)

***Eurobodalla Regional Botanic Garden Collection Target Model** (excerpt)*

Creating a species Target list, species selected on their ability to provide certain qualities

Family	Genus	Species	Found in Endangered Ecological Community EEC	Desirable in Conservation Projects	Valuable in Amenity Horticulture	Not found in ERBG collection	Saleability	Found outside ERBG region	Total Score
MYRTACEAE	Eucalyptus	melliodora	3	3	2	6	4	1	19
PITTOSPORACEAE	Bursaria	spinosa ssp lasiophylla	3	3	2	6	3	1	18
CYPERACEAE	Gahnia	aspera	3	3	2	6	3	1	18
CYPERACEAE	Gahnia	melanocarpa	3	3	2	6	3	1	18
MYRTACEAE	Kunzea	ericoides	3	3	2	6	3	1	18
CYPERACEAE	Lepidosperma	concavum	3	3	2	6	3	1	18
ERICACEAE	Monotoca	elliptica	3	3	2	6	3	1	18
THYMELAEACEAE	Pimelea	axiflora	3	3	2	6	3	1	18
THYMELAEACEAE	Pimelea	curviflora	3	3	2	6	3	1	18
POACEAE	Austrostipa	rudis ssp australis	3	3	2	6	2	1	17
ASTERACEAE	Cassinia	longifolia	3	3	2	6	2	1	17

A production list should be developed with clear targets of the plant material needed, specifying species, number, size, and other information as required (Figure 1.2). The production list needs to be updated frequently. For example, the Oman Botanic Garden is updating its list weekly, incorporating the newest data from the field collection, seed bank, propagation and production. This makes the production list a very strong and strategic tool that needs to be appreciated and implemented by all relevant botanic garden staff.

1.7.6 Initiating Research Activities

A series of research activities may be initiated during pre-operations. For instance, this could include botanical, taxonomic, ethnobotanical, horticultural or conservation research relevant to the particular context of the botanic garden. Such early investment could lead to the establishment of a particular research niche or centre of excellence that establishes the institution as of national or international significance.

Such research programmes may offer contributions to solving present-day ecological problems by integrating theoretical research, applied solutions, and adaptive management to save individual species – as well as communities of species – at varying geographic scales.

Although often hidden from the public, botanic gardens have a unique opportunity to exhibit research activities to their visitors, thus also embracing their social and environmental responsibilities. Botanic gardens can act as a 'window into plant science', and it is important that these activities are included in the interpretation and visitor programmes of the botanic garden.

1.7.7 Developing Education, Interpretation and Communication Activities

KEY MESSAGE

Botanic gardens have the responsibility and the perfect opportunity to communicate the importance of plant conservation and environmental sustainability to the general public

Botanic gardens are increasingly concerned with becoming more relevant to the public by working with visitors and communities to address present-day concerns including food security, water scarcity, sustainable energy, climate change and biodiversity loss (BGCI, 2010). While there is tremendous scope and potential for botanic gardens to take on a much broader role in society, this will require in-depth, thoughtful planning and should be considered when establishing the institution's vision and mission (Section 1.2.4).

Main aims when developing education, interpretation and communication strategies during pre-operations may include the following:

- Preparing education and outreach programmes and resources;
- Formulating key interpretive messages;
- Conveying the key interpretive messages to the visiting public, for instance via interpreting displays, exhibitions, the website, etc.;
- Developing branding and marketing strategies including a pre-operations strategy and a botanic garden opening launch strategy;
- Facilitating partnerships nationally and internationally to encourage a diverse range of education and interpretation programmes.

Education and interpretation are a core priority for botanic gardens. Early during the design phase, education and interpretation strategies should be explored and decisions should be made on the key themes for the botanic garden. As the development moves on, the botanic garden should, ideally, be seen as a leader in creating the best education and interpretation possible by unlocking information on plants for the public, both on-site and online.

1.7.8 Preparing a Marketing Strategy

KEY MESSAGE

A good brand is distinctive, memorable, timeless and practical, with versatile graphics, simple in form and unmistakably conveying the institution's intended message.

During pre-operations, a marketing strategy closely linked with the education and interpretation programmes, should be established. This should include the development of a brand and a brand manual. The main purpose of a brand is to identify the garden and its products as being distinct. A brand should be immediately recognisable, inspiring trust, admiration, loyalty and an implied authority. A brand manual provides a strategic overview of how to apply the brand and logo on the institution's products, in education, interpretation and communications. The logo is one aspect of a botanic garden's commercial brand, and its shapes, colours, fonts, and images usually should be strikingly different from other logos. A good brand is distinctive, memorable, timeless, and practical, with versatile graphics and simple in form, unmistakably conveying the institution's intended message.

Marketing, in its widest sense, is at the core of a successful botanic garden. Botanic gardens live within a competitive market, and it is important to recognise which stand-alone factors attract visitors to botanic gardens, including people's motivation and objectives for coming to the garden. Communications, at any stage of the development, will use the distinctive brand of the institution, thus preparing all stakeholders for the big day – the opening of the new botanic garden!

1.8 CONCLUSION: CRITICAL SUCCESS FACTORS TO ESTABLISHING OR REDEVELOPING BOTANIC GARDENS

Botanic gardens are special places, and each one is unique. The design and construction of a new botanic garden, or the renovation or expansion of an existing one, are in many instances a once-in-a-lifetime venture. Critical evaluation and review are vital throughout the entire development process and a flexible, adaptive management approach will have a major bearing on a successful project outcome (Table 1.3).

Typically emerging out of an initial, big idea (Section 1.2), there follows a number of steps that need to be tailored to each individual project to achieve its goals and objectives. Prior to the beginning of the design process (Section 1.5), the establishment of a steering group (Section 1.2.2) and the development of vision and mission statements (Section 1.2.4) are critical first stages. The ensuing establishment of a feasibility study (Section 1.4.2) followed by the development of a business case (Section 1.4.3) and design process (Section 1.5) will build a strong foundation for the detailed design and construction phases (Sections 1.5 and 1.6).

A successful design is reliant on a highly skilled and experienced design team (Section 1.5.1) working in close cooperation with the project owner and other stakeholders. The efforts invested in finding the right design team will prove extremely valuable in bringing the project to life. Similarly, it is essential that the project is built by highly skilled and experienced contractors with the close involvement of the project owner, project manager, design team and botanic garden staff.

The significance of pre-operations (Section 1.7) cannot be overstated – the earlier the better! While this aspect of establishing a new botanic garden is often overlooked, everything from establishing the governance and organisational structure, the plant collection and initial programmatic activities including research and education, are all vital for the eventual success of the project.

Botanic gardens celebrate plants. As the collections grow and develop, it is natural for the design of a botanic garden to evolve. Design refinements will continue long after the ribbon has been cut on opening day, and will always remain an integral part of the operations of any botanic garden.

Table 1.3 Critical success factors for new and existing botanic gardens

Organisation	New	Existing
What are the goals and objectives? Requirement for clear vision and mission statements	✓	✓
What is the best governance model?	✓	
What is the appropriate legal and administrative structure?	✓	
What is the optimal staff structure?	✓	✓
Planning	**New**	**Existing**
How to approach getting an appropriate design for the garden?	✓	✓
What is the timeline and schedule?	✓	✓
What are any likely challenges and risks?	✓	✓
SWOT analysis (strengths, weaknesses, opportunities, threats)	✓	✓
Infrastructure	**New**	**Existing**
Where will the project be located?	✓	✓
What are the required programme elements?	✓	✓
What are the overall space requirements?	✓	✓
How can the site be secured?	✓	✓
Budget	**New**	**Existing**
How much budget is required for development and construction?	✓	✓
How will the project be funded?	✓	✓
How much budget is required for operations and maintenance?	✓	✓
Contributions to the society and community	**New**	**Existing**
What contribution can it make to the scientific and cultural community, both on the national and on the international level?	✓	✓
How can support from relevant stakeholders (e.g. governmental, municipal, official and local authorities, private) be secured?	✓	✓
Pre-operations and operations	**New**	**Existing**
How many staff are required and how and from where can they be recruited?	✓	✓
How can highly and appropriately qualified and motivated staff be recruited?	✓	✓
How can an effective information management system be set up?	✓	✓
Who will be the likely visitors?	✓	✓
How many visitors and which user groups might be expected?	✓	✓
How can interpretation be capturing, making it relevant to the visitors?	✓	✓
How can the marketing be effective?	✓	✓
How can the garden provide easy access for visitors?	✓	✓
How can the garden provide an enjoyable visitor experience?	✓	✓

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