Botanic Gardens Resources: Linking Biodiversity and Human Well-being

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Introduction

World Botanic Gardens (BGs) are innovative institutions that can help people in many ways via the introduction of new economically valuable plant species, creation of a friendly and secure environment, an improvement and beautification of settlements, a city greening, an ecological restoration, the "horticultural therapy", a continuous education and public awareness promotion, etc. (Waylen, 2006). Modern BGs became a global treasure in an age of ecological crisis especially when gardens can be traced to human beginnings and are found in all cultures, past and present (Rinker, 2002). They made important contributions in understanding how humankind benefits from plants and from biodiversity. International and national networks of BGs should be considered as a unique combination of different resources based on biodiversity and representing natural and cultural heritage. They provide tangible things (material things that can be *touched* physically) as well as intangible benefits for life quality improvement and sustainable development. The classical paradigm for the BGs mission shows a unidirectional link or a channel of transfer of biodiversity resources from nature to people (Figure 1) via the botanic garden.

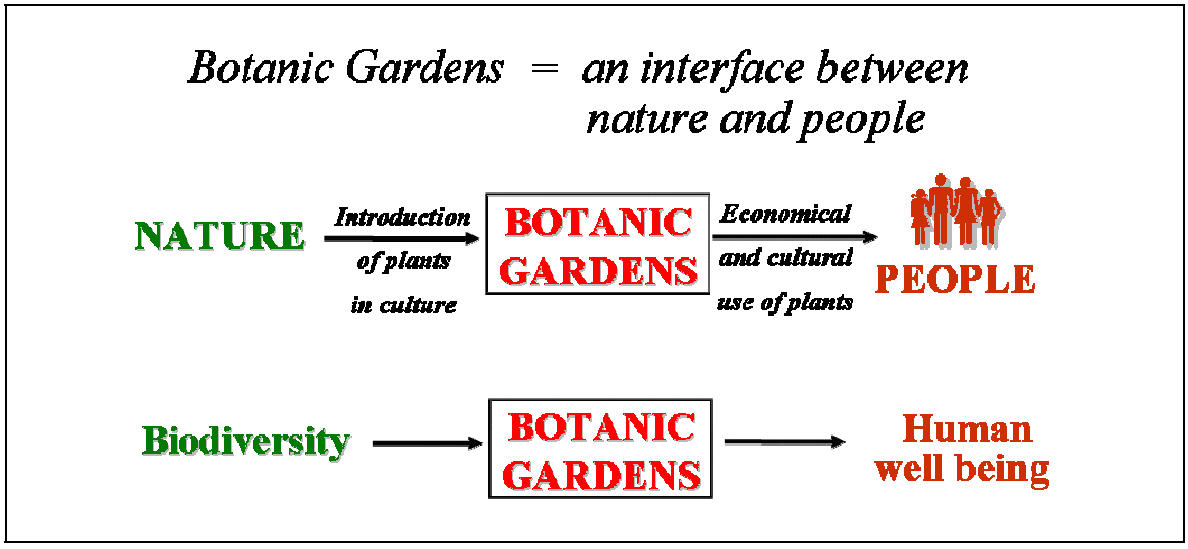

Figure 1. The classical paradigm of a botanic garden's role as an active interface between nature and people. Introduction of economically valuable plants (edible, medicinal, ornamental and others) provides resources of biodiversity for the survival and improvement of human well-being (Kuzevanov, Sizykh, 2006a)

There is an agreement worldwide today that Quality of Life or, equivalently, Well-being is and should remain one of our core values. The well-being is an important concern in economics and political science. We are living in a world of science and technology. Based on wrong interpretation of some very sound scientific principles man has created an environment that is poised to destroy human society. Over the past

century, humans have had a tremendous impact on their environment particularly in cities. The cost of these technological changes in terms of consumption of natural resources and degradation has been enormous. At the same time, people possess an insatiable desire to enjoy a perfectly comfortable living environment. To meet these requirements natural resources have been exploited to the maximum possible extent. Natural resources - resources occurring in nature that can be used to create wealth (examples include oil, coal, water, land, plants, etc.). Since the requirements are enormous, therefore, the demand on natural products is also enormous. To get all these things, it is necessary to use natural resources sustainably and to put them to various kinds of transformations. Understanding well-being is today particularly important in a concept of green economics and welfare economics, which also reflects sustainability. World BGs are involved in management, rational use and conservation of different natural resources related to plants mostly. Of renewable resources, the most important are plant genetic resources. That is why BGs are becoming valuable players on a world arena. Actual interests of governmental authorities and public in the role of botanic gardens in communities are connected with many reasons: a problem of conservation and use of biodiversity for the purposes of sustainable development (Convention on Biological Diversity, 1992), ecological education and enlightenment of the society for its improvement, economical activities.

Transformation of tangible and intangible resources of botanic gardens

Garden plants have been always recognized as tangible resources providing us with food, clothing, fuel, shelter and medicines. At the same time, gardens are associated with a sense of peace and peaceful life. Unlike material resources, such things as the working time, intellectual properties, and skills belong exclusively to certain persons and can be identified as intrinsic characteristics of human resources of the garden (Table 1). People and material things could be considered as temporary carriers for intangible resources. Intangible resources may be easily copied unlimited number times without any loss of quality. Intangibles are renewable resources, which can be freely transferred or transmitted to other BGs.

Tangibles (material resources)	**Intangibles (Non-material resources)**	**Human resources (people, staff)**
Plants and derivatives;	Information;	Working time;
Living creatures;	Technologies, traditions;	Intellectual resources;
Land, water;	Ideas, policies;	Skills;
Buildings, facilities;	Educational programs;	Knowledge;
Tools/Machinery;	Public programs/rituals;	Others
Computers+;	Senses;	
Other material resources	Other non-material resources	

Table 1. A list of principal tangible, intangible and human resources of botanic gardens

Some botanic gardens are involved in transformation of plant genetic resources into material products and benefits (material and non-material ones) where the feedback links and benefit-sharing provide a support for biodiversity conservation and development of biotechnologies and goods (Figure 2). For example, plants sales at BGs and in cooperation with commercial plant nurseries provide seeds and plants of economical importance for people's gardens and homes.

Many of tangibles and intangibles as well as human resources could be mutually substituted or transformed in terms of final impact of any botanic gardens on the society or nature. For instance, labor-intensive working time for planting trees or weeding could be substituted by alternative technologies, new instruments, ideas and proper land management. Therefore, such intangibles like knowledge, skills and technologies

could save working time substantially. Computers and new machinery/tools could save staff working time and could require fewer people. New information technologies, horticultural technologies or even old traditions of natural resources use could save land, water, plants, construction materials, human resources. Such spectrum of a list of mutual substitutions and transformations is broad.

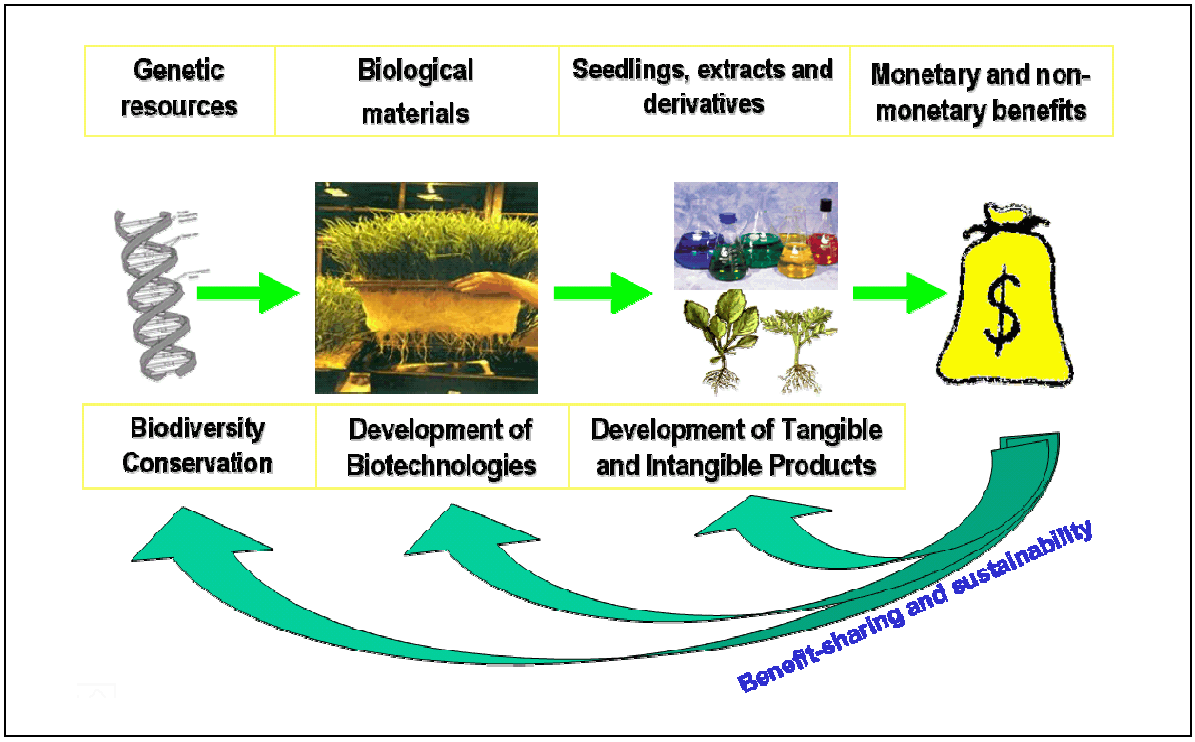

Figure 2 Transformation of plant genetic resources into material products and benefits (material and non-material ones) when the feedback links and benefit-sharing provide a support for biodiversity conservation and development of biotechnologies and goods

Visitors and customers value the botanic gardens due to the senses or a feeling, which the gardens give to any person. Different groups of visitors use the tangible and intangible resources of botanic gardens in order to achieve certain satisfaction or intangible goals connected with health, nutrition, safety and security. For instance, people with disabilities or children visiting the botanic garden could bring home feeling of great satisfaction, a great life experience if they have a chance to put their hands into a mud, to touch a texture of a plant and to smell flowers. Such experience and intangible value of the BG could be greater if a boy or a girl personally puts a sunflower seed into a plastic pot and takes it home for further observation of a new life birth.

Moreover, many decisions on possible allocation of a financial support from the granting agencies (governmental bodies, foundations, private donors, etc.) to any botanic garden depend on availability of intangibles in the BG for the actual or future use, which the garden could provide for the society, for the well-being of people, for the environment. Intangible aspects of BGs are as important as their tangible resources and they cannot be discriminated in relation to human well-being.

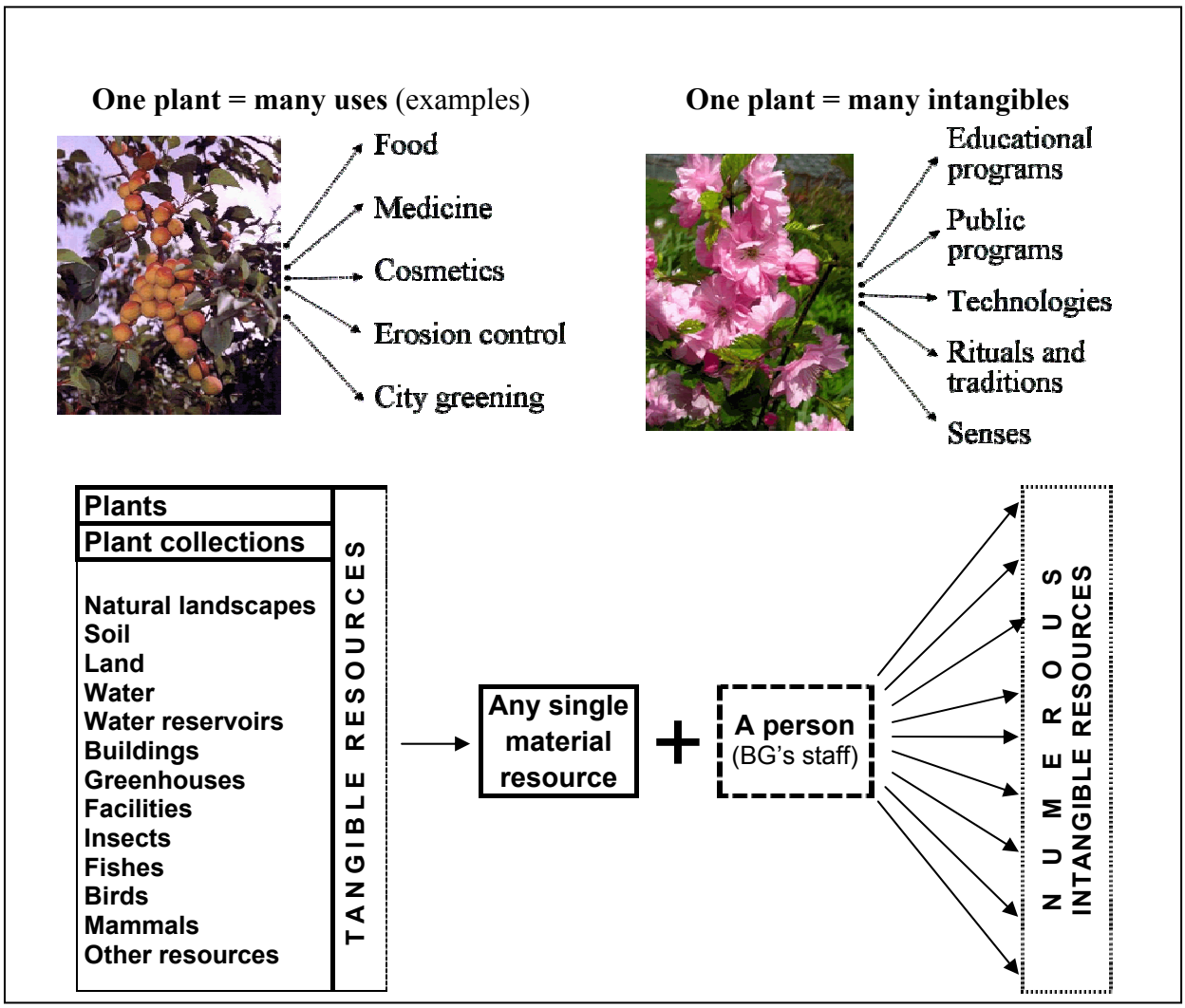

Figure 3 Generation of numerous intangible resources from any single material (tangible) resource via activities of botanic garden's staff. Documented plant collections and plant specimens are principal ***renewable*** *materials for unlimited number of intangible resources for human well-being. The botanic gardens staff plays a crucial role as a principal generator and temporary carrier of intangible resources of the garden*

Resource allocation arises as an issue because the material resources of a society (tangibles) are in limited supply, whereas human wants are usually unlimited, and because any given tangible resource can have many alternative uses. It means that any single tangible resource of the Botanic Garden (any plant, a soil, a water, etc.) can be a source of numerous intangible resources used by the garden staff and customers in order to produce unlimited number of intangible resources (Figure3).

Planned management of a natural and cultural heritage of the Botanic Garden is important for the future sustainable use of its tangible and intangible resources.

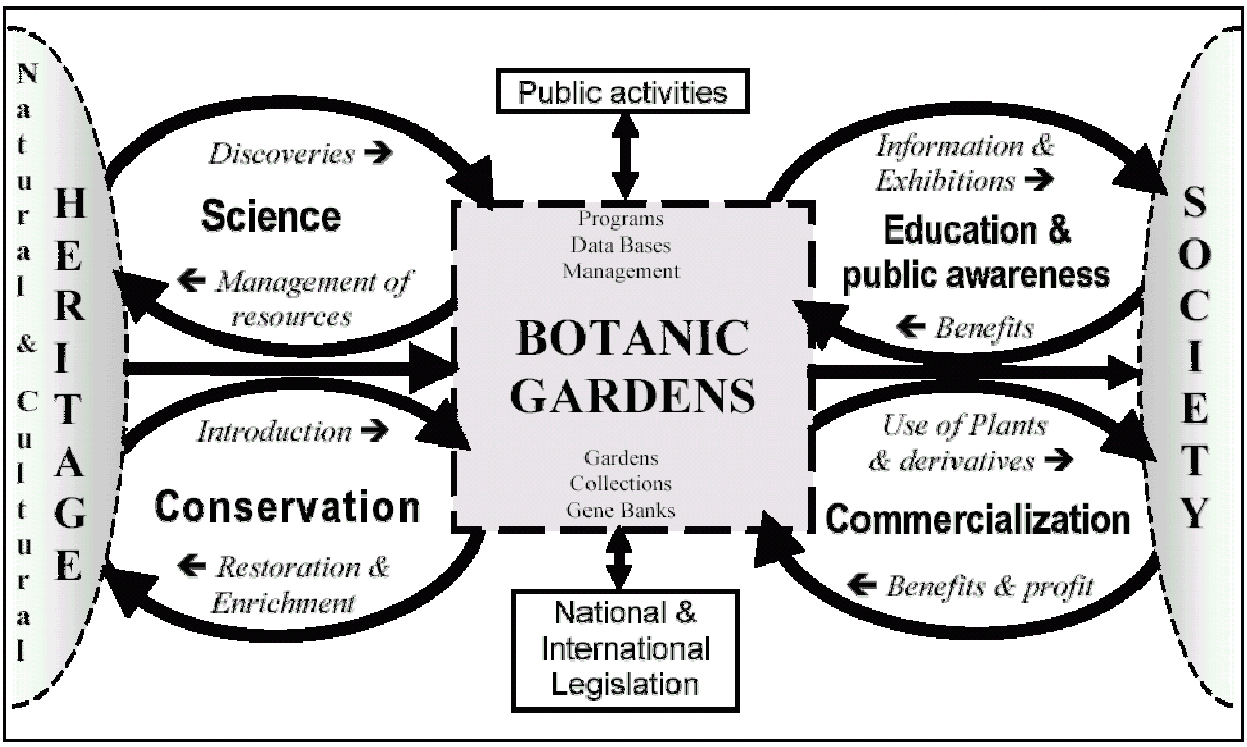

Figure 4. Positioning of botanic gardens as an intellectual and innovative resource and interface between natural/cultural heritage and society (Kuzevanov, Sizykh, 2006b). Feedback arrows in fields of science, education, conservation, and commercialization show the links for the balance of tangible and intangible resources in the sustainable development

New paradigm?

Both tangible (material) and intangible (non-material) resources of BGs are equally valuable for the sustainable development and linking biodiversity with public education, secure environment, nutrition, healthcare, poverty alleviation, socio-ecological and economical benefits for communities, including commercialization (Kuzevanov, Sizykh, 2006a). So, the new paradigm (Figure 4) shows that any modern BGs has to be in a position of intellectual and innovative interface with multifunctional links between a natural/cultural heritage and the society in fields of science, education, conservation and commercialization. The scheme (Figure 4) gives some ideas on circulation and transformation of resources on the way from the natural and cultural heritage to the society and *vice versa* in main fields of BGs' activities. Every BG has its own unique combination of resources. A pattern of activities within this frame depends on strengths and weaknesses of the BGs in different areas. Therefore, this scheme can be a prospective methodological tool for the self-analysis and sustainable development of any BG or a botanic institution linking biodiversity with human well-being.

Understanding of the role of tangible and intangible resources transformation is principally important for botanic gardens strategic management because such resources is a potential of any institution with a specific mode of formation, a character of use and strategic directions for actions. The BG is a self-renewable tangible and intangible resource based on scientific ideas. It goes beyond the garden's borders and actively changes the urbanistic environment as well as a climate on all levels of the society. This paper explores the concept of the world BGs linking human well-being with biodiversity (or with a natural heritage in a broader

sense). BGs appear to have the potential to inspire a fundamental shift in the political process towards a more humane and sustainable society.

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