

Health Impact Assessment Report

National Botanic Garden of Wales

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Health Impact Assessment Report on National Botanic Garden of Wales

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1. Background to this Health Impact Assessment

The National Assembly for Wales has expressed its intention to develop Health Impact Assessment as a tool to improve decision making by public bodies at all levels¹. A key part of the development process will consist of applying the process to important projects and policies in Wales and learning from those efforts what constitutes good practice and how it can be improved. The National Botanic Garden of Wales represents a prestige project with a major investment of financial and other resources in order to create a valuable resource for Wales. It is, therefore, very appropriate that the National Botanic Garden of Wales should offer itself as one of the first subjects for a Health Impact Assessment in Wales. It is intended that this assessment should have three fruits.

- First it should provide the National Botanic Garden of Wales with insights as to how the project might affect health and so assist them in their future operations and planning.
- Second it should provide practical experience of carrying out Health Impact Assessments in Wales and allow lessons to be learnt on how to make future Health Impact Assessments better.
- Third it should be of use to those who might be planning similar projects in the future.

2. Actions whose health impact is being assessed

Build and develop the National Botanic Garden of Wales at Middleton Hall, Llanarthne and operate as an educational resource, scientific institute, leisure facility and tourist attraction.

Construction of the Garden began in June 1996
The Garden will officially open on 24th May 2000

3. Stakeholders

The Garden project staff
Members of the Garden
The residents of Llanarthne
Funding organisations
Visitors
Health Advisory Group of Garden
Trustees of the Garden

4. Process

Gather views on intermediate factors from Garden staff, residents and Garden Health Advisory Group

Gather information on baseline state from routine statistics and key informants

Estimate change in intermediate factors from technical experts and key informants

Estimate effect of intermediate factor changes on health from literature and key informants.

Refine report and estimates by discussion with stakeholders and key informants

Present finalised report to Health Advisory Group of Garden.

Collect follow up data to test predictions of report.

5. Groups affected

Employees of Garden

Garden volunteers

Local residents

Educational groups

General visitors

6. Details of project

The project involves the construction of a National Botanic Garden of Wales in the estate at Middleton Hall. The project is not only a garden with the largest single span glasshouse in the world but also a centre for horticulture, conservation, science, education and leisure. There will also be a farm estate (144 of the total 220 hectares) which is being converted to organic management. This will concentrate on retaining the richness of wildlife and biodiversity and preserve such threatened habitats as meadows, natural broad leaf woodland and water fringes. Good practice in energy conservation and water conservation will be features of the project. Education will be a major feature of the project with facilities for school children and adults to study scientific aspects of horticulture, biodiversity, conservation and sustainability. Facilities for this educational work are being constructed.

The total project cost will be £43.3 million divided between the core phase one (£22.7 million) and phase two (£20.6 million). A policy of local sourcing of materials and use of local labour has been pursued. When fully operational the Garden is expected to have 62 full time employees plus 50 seasonal employees and numerous volunteers. It is anticipated that there will be 170,000 visitors in the first year building up to 250,000 visitors per year by 2004.

7. Intermediate factors

Employment (construction phase)

Employment (operational phase)

Cash injection to local economy

Travel

Effect on visitors

Experience of visit for general visitors

Educational visits for schoolchildren

Educational visits for adult learners

Effect on volunteers

Social involvement -Volunteers (with learning disability)

Social involvement -Volunteers (general)

8. Background situation

Data from

- Welsh Health Survey 1998²
- Mapping social exclusion in Wales ³
- An Atlas of health Inequalities between Welsh Local Authorities⁴

8.1 Administrative Boundaries including National Botanic Garden of Wales

There are a number of standard areas for which statistics are aggregated. All are fairly large and so small areas of deprivation may be masked because they are included in larger areas whose average status is better.

Boundary	Title	Description
Local authority area	Carmarthen	
Assembly constituency	Carmarthen West and Dinefwr	As local authority area but excluding Llanelli and Carmarthen East
Travel to work area (TTWA)	Carmarthen	As local authority area but excluding Llanelli, and Southern parts of Lampeter TTWA and Landeilo TTWA

8.2 Health status

	Carmarthenshire LA		Wales	
Population				
% over 75 years	8.9		7.9	
Death rates per 100,000*	Men	Women	Men	Women
All causes	959	639	956	623
All neoplasm	226	174	249	171
Lung Cancer	55	24	65	29
All circulatory disease	416	258	404	246
All respiratory disease	148	87	142	91
General health				
SF36 Physical component **	47.0		48.2	
SF36 Mental component **	49.8		49.5	
% with limiting long term illness	18		16	

- * age standardised to European population Average for 1995-1998.
- ** SF36 stands for Short Form 36⁵ and is a standardised measure of perceived health. Higher values indicate better health.

Most indicators suggest that the health of Carmarthenshire is similar to the average for all Wales.

8.3 Socioeconomic data

	Carmarthen (TTWA)		Wales	
	Male	Female	Male	Female
Unemployment (claimant count)	4.2	1.3	7.9	2.8
Long term unemployed	1.2	0.2	2.2	0.5

TTWA = Travel to work area

	Carmarthenshire LA		Wales	
	Male	Female	Male	Female
Economically inactive	16%	34%	21%	31%
Youth Unemployment	12%		12%	
Income support claimants and dependants	16%		17%	
Households				
% with income <£10,000	40%		34%	
% with no savings	23%		23%	
% with dependant children but no earner	16%		18%	

Socioeconomic indicators give a mixed picture for the Carmarthenshire area. Unemployment rates are lower than the average for Wales but the proportion of households with low incomes is one of the highest in Wales. In interpreting these statistics it must be remembered that unemployment may be underestimated in rural communities. Also the former mining areas within Carmarthenshire and adjacent to the National Botanic Garden site are much more disadvantaged than the area as a whole.

A study of deprivation indicators by electoral ward is being undertaken in Wales and will shortly be available. This will give a much clearer picture of the economic status of the area around the National Botanic Garden.

9. Employment (construction phase)

Although construction is still continuing and will go on for some time longer the glasshouse and buildings required for opening have been completed. The first phase of construction involved major civil engineering works but, as the site was fairly isolated, did not involve much disruption of the local community. There were no major injuries on the construction worksite. As far as possible a policy of hiring local labour was followed.

Construction to be completed in the future includes the science centre, the business incubator, the field study centre, the artists in residence centre, restoration of the double walled garden and restoration of the great water park.

10. Employment (operational phase)

10.1 Employment levels

The Garden currently employs 35 staff of whom 17 lived locally and 18 were new to the area.

When fully operational the Garden is expected to employ 62 full time staff and 50 part time staff. These jobs will include horticulture and garden maintenance, "front of house" services (tickets, security, guides, shop sales etc), catering and cleaning. It is expected that the necessary skills for most of these jobs are available locally and that the majority of these jobs will be filled by local residents. In March 2000 a jobs fair organised by the Ammanford job centre was held at the Garden and attracted over 600 applicants.

The peak demand for staff for the Garden will be April to September. The peak demand for labour in other occupations in the area such as tourism services, horticulture and agriculture will also be April to September.

10.2 Employment and health

Increasing employment will influence health in two ways

- Paid employment for those currently without paid employment
- Increased income for those already with some paid employment

The health effect of employment is discussed in this section.

The health effect of increased income is discussed in the next section

10.3 Unemployment and health

The association between ill health and unemployment is well recognised^{6 7}. Unemployed persons experience a higher mortality from all causes⁸ but especially from suicide⁹, higher rate of physical and mental ill health and higher rates of symptoms.¹⁰ The children and spouses of unemployed people also experience higher illness rates than those of employed people. The degree of harm seems to depend on the circumstances. There is some evidence that being unemployed is less damaging to the individuals health in communities where unemployment rates are high than in communities where rates are low¹¹. However other studies do not show the unemployed to suffer any less harm in times of recession.¹² Brenner, using economic modeling, demonstrated that unemployment, along with long term economic growth and short-term economic growth, predicted most of the observed changes in mortality¹³. There are many plausible mechanisms by which unemployment could damage mental and physical health. These include lower income, loss of social contact, reduced self esteem and loss of structure for the day.

Unemployment may in part exert its influence on health through health related lifestyle such as smoking and drinking. Several studies show an association of smoking¹⁴ and binge drinking with unemployment in men¹⁵. However longitudinal studies suggest that on becoming unemployed men are more likely to reduce consumption of cigarettes and alcohol.¹⁶

10.4 Quantifying the effect of employment

Scott Samuel¹⁷ by simple extrapolation from the OPCS longitudinal study of mortality estimated that each increase of 2000 in men seeking work was associated with an extra 2 deaths per year of the unemployed men and an extra 1 death per year of their spouses. Other estimates produce different figures. Most studies have explored the health damaging effects of increasing unemployment. The health benefiting effect of reducing unemployment have been less studied and cannot be assumed to be simply the reverse of increasing unemployment. Assessing the impact of unemployment on health is complicated by the reciprocal relationship between health and unemployment. Not only does unemployment increase the probability of ill health but ill health also increases the probability of unemployment.

10.5 Occupational risks

Some types of employment incur considerable health risks. Agricultural employment has a high injury rate¹⁸ and is associated with considerable health risks including working alone, working in wet and difficult conditions, moving heavy objects, using toxic materials, using dangerous machinery and working with beasts. It may be assumed that working for the Garden will not incur these risks, that the Garden will be a good employer and ensure that the best occupational health and safety practices are followed.

The National Botanic Garden of Wales has a policy of encouraging learning for all staff and uses a staff appraisal scheme. It is about to be assessed for the Investors in People Scheme.

10.6 Health Impacts through employment

In conclusion provision of extra employment can be expected to improve the health of those employed and of their children and partners but the size of that effect is difficult to estimate.

11. Cash injection to local economy

11.1 Effect on local economy

The Garden will benefit the local economy in a number of ways. One business study estimated the direct and indirect financial benefit of the Garden to the region as four million pounds. A more conservative estimate might be

• Increased earnings by persons employed at Garden.	£500,000
• Purchases by visitors to Garden	£500,000
• Accommodation for visitors to Garden staying overnight in area	£25,000
• Increased attraction of holiday makers to area due to Garden	£25,000
• Multiplier effect (doubling)	<u>£1,050,000</u>
Total	£2,500,000

Overall this might increase net income by £10 per head per week for residents of the area.

Already local hotels have noticed an increase in business. The Garden has interviewed over 300 craft companies in Wales and should have no difficulty in implementing its policy of trying to source products for catering and shop from local suppliers.

The estimates in this section are crude and that for the multiplier effect particularly so. Better predictions of economic effects would be helpful. A report on the economic impact of the Garden and its status as an icon in Wales has been commissioned by the Institute of Welsh Affairs.

A further component of the Garden, the Business Incubator is intended to foster the start up of new businesses. It will offer premises for small businesses together with other support. Health of staff and health of customers will be part of the ethos of the Business Incubator and it is to be hoped that this will continue to be a feature of businesses after they move on to premises outside the Business Incubator.

11.2 Effect of income on health

The effects of increased income on health are complex. In general it would be expected to increase health by allowing more choice of housing, nutrition and leisure opportunities. It could harm health by leading to increased expenditure on smoking and alcohol. One of the most powerful effects is probably through increased self esteem and feeling of control. Lower income is associated with higher mortality^{19 20} poorer physical health²¹ and poorer mental health. The work of Wilkinson²² and others suggests that relative wealth is more important than absolute wealth and therefore that one of the most powerful health effects of income operates through self esteem and position in the social hierarchy. An American study suggests that there is probably a long (15 years) lag period between any change in income inequality and effect on health²³. To the extent that extra income reduces income inequalities it would be expected to benefit health.

Several Health Impact Assessments have noted the difficulty of estimating the health impact of an increase in income of a specified amount. The same difficulty has been noted in an academic review²⁴. A very crude calculation (Appendix 2) suggests that an increase in an individuals income of £10 might be associated with a 2% decrease in mortality risk but this calculation is based on several very uncertain assumptions and should be treated as a possible figure rather than anything more reliable. However it seems safe to assume that increased income will be beneficial to health although the effect cannot be quantified with any degree of certainty.

A possible negative impact on the local economy could be increased demand for housing, making house prices rise.

12. Travel

12.1 Modes of travel to the Garden

Road access is via the A48. Nearest rail stations are Carmarthen, Llandeilo and Llandybie. There will be bus links from the station to the Garden. It is anticipated that there will ultimately be 250,000 visitors per year.

Forecasts of visitor levels for the year 2000 are

• People residing within 2 hrs of Garden	58%	98,000
• UK residents holidaying in South Wales	18%	31,000
• Overseas tourists	4%	7,000
• Transit visitors (passing to and from Eire)	6%	10,000
• Educational	6%	10,000
• Special Interest groups	8%	14,000
	Total	170,000

23% of visitors who have prebooked for the first month have indicated that they will travel by coach but in the longer term the expected breakdown for mode of travel is

• Car	85
• Coach	10
• Train/cycle/foot	5

The Garden will operate a green transport policy. Improved public sector transport links are being negotiated and it is hoped to increase the proportion arriving by public transport. Train operators have been lobbied to make increased provision for carriage of cycles on trains. An extension linking the Garden to the national Cycle Route has been negotiated with Sustrans. Incentive pricing to encourage use of bus/rail and cycling is being discussed.

12.2 Public transport

The Garden may increase the viability of local transport services making transport more available for all. Already a bus service has been re-routed to serve the village and increased in frequency.

12.3 Travel injuries

The Garden is likely to generate a large number (85,000 per year) of extra car journeys. For car travelers one may expect 67 casualties with 0.7 deaths and 8.1 serious injuries per 100 million vehicle kilometers travelled²⁵. At this rate seven people each year are likely to be injured in a road accident travelling to the Garden. One person every sixteen months is likely to be seriously injured and one person every sixteen years is likely to be killed. (See Appendix 1). It must be emphasised that these calculations involve several very uncertain assumptions and may be several fold too high or too low.

12.4 Other health impacts

Other health impacts of travel include noise and traffic fumes. The most noticeable increase in traffic density will be on the rural roads in the immediate vicinity of the Garden. Currently traffic density is very low on these roads and the raised levels are unlikely to produce health damaging levels of noise or fume. During the pre-opening phase another health impact was minor nuisance with lost motorists asking directions, reversing in private driveways and so on but when the Garden is open improved signage should prevent this problem.

13. Effect on Visitors

13.1 Visits can be categorised as

- Visits for general visitors
- Educational visits for school children
- Educational visits for adult learners

13.2 Visits for general visitors

13.2.1 Visitor characteristics

Market research of visitors attending pre-opening tours in 1999 showed the following profile of visitors.

Age	26% aged 55-64 years 43% 65 years and over
Gender	67% Female 33% Male
Occupation	56% retired 10% housewives
Newspaper readership	50% Daily mail 18% Telegraph 12% Times 25% Local paper

13.3 Experience of visit for general visitors

13.3.1 A healthy lifestyle experience

The philosophy of the Garden is to raise questions rather than preach. Visitors will be encouraged to think of their preferred futures (personal, family, community, world).

Visitors will typically experience a gentle walk in the fresh air of 2 miles lasting one and a half to two hours.

Ways in which the Garden visit will model healthy living are

- Enclosed areas within the Garden are no smoking zones
- Raising awareness of need for sun protection
- The foods served in catering facilities will include healthy options.

Biodiversity and sustainability will be a particular theme of the Garden. Exhibits will illustrate the dangers of unsustainable practice and possible solutions. Visitors will be encouraged to see how the Garden puts these into practice (e.g. the biomass burner and reed bed water filters). There will also be an exhibit on genetic engineering compared to traditional breeding of plants.

13.3.2 Lifestyle and health

A healthy lifestyle is characterised by supportive social contacts, purposive activity to provide interest and stimulation, a sense of being valued and belonging to a community, seeking help when appropriate, being adequately physically active, eating a healthy diet while not smoking, drinking too much alcohol, or engaging in other health damaging behaviours.

The beneficial effects of physical activity on mortality^{26 27 28}, physical health and mental health are well established. While most benefit is obtained at higher activity levels worthwhile health gain is associated with quite moderate levels of activity which can be spaced out over the day and does not have to take place in single blocks of time.²⁹

A “healthier” diet can be summarised as one rich in complex carbohydrates (fibre and starch) and micronutrients (minerals and vitamins) but with lower levels of saturated fat, refined sugars and salt than are generally found in UK diets³⁰. Inclusion of plenty of fruit and vegetables is one way of achieving a healthy diet. Current consumption of fruit and vegetables in Wales (Fresh green vegetables 286 g/wk, other fresh vegetable 537 g/wk and Fruit 1076 g/wk) are similar to those in England³¹ but well below recommended levels. One major barrier to healthier eating is the perception that such a diet is unappetising. Demonstrating that foods, which could contribute to a “healthier” diet taste good and give pleasure when eaten will help to overcome this barrier. Another barrier is the belief that healthier diets are more expensive than current ones and the Garden will demonstrate how those with access to a Garden can produce healthy foods for themselves. There is evidence that interventions in catering outlets to promote choice of healthier food items are effective³².

13.3.3 Sunsafe

While physical activity in the open air is generally healthy excessive exposure to ultra violet radiation increases the risk of malignant melanoma and other skin cancers. For this reason people are advised to avoid sunburn by seeking shade, covering their skin with clothing or using a sun cream³³. During some pre-opening visits the Garden gave practical encouragement to follow this message by issuing free sun cream.

13.3.4 Avoidance of Garden Hazards

People encounter some hazards in their gardens at home and nearly 350,000 injuries requiring hospital treatment occur in gardens in the UK each year³⁴. Some parts of some plants are toxic when eaten and others give rise to rashes and skin problems³⁵. Many pesticides and herbicides are potent toxins. While the most hazardous have been removed from the home gardening market a great deal of very old stock remains stored in garden sheds. Sometimes they are not stored in the original containers. Young children are particularly at risk since they are more likely to eat attractive looking plant parts or drink from attractive looking bottles found in garden sheds. Young children may also drown in open water in gardens such as goldfish ponds or water butts³⁶.

Garden machinery such as lawnmowers, hedge cutters and chain saws can cause very severe injuries. An estimated 38,000 people injure themselves with garden or farm equipment each year in the UK³⁷. Electrocution may result from inappropriate use of electrically operated tools unless a RCD (Residual Current Device) is used. Back injuries and other musculoskeletal injuries are common results of injudicious physical activity in the garden.

While encouraging people to work in and enjoy their gardens The National Botanic Garden of Wales needs at the same time to make them aware of the hazards associated with gardening and the ways in which these hazards can be avoided. Clear labeling of toxic plants will increase visitor's awareness of which plants are toxic.

13.3.5 Effect on lifestyle of general visitors

While being a pleasant and healthy time the few hours in the National Botanic Garden of Wales will not appreciably affect the visitors health unless it contributes to sustained changes in behaviour after the visit. The Garden can attempt to model the experience of healthy lifestyles, and, if it is a pleasant experience then people will be more likely to modify their future behaviour in a healthy direction. An interactive health display in the exhibition area may serve to further reinforce healthy living messages for those who choose to use it. The most likely effect is that an increased interest in gardens may encourage people to spend more time indulging in moderate activity tending their own gardens at home. In most cases the visit will not be a life altering experience but it may be a small addition or reinforcement of numerous other

learning experiences. Such small influences may have a major effect on population health because so many people are influenced but they are exceedingly difficult to detect because the effect on any single individual is so small. The Garden management might regularly review aspects of the visit experience to check the extent to which it models healthy lifestyles while ensuring that there is no “health preaching”.

13.3.6 Biophilia

Visitors may benefit through biophilia³⁸ (the theory that association with other living organisms meets some deep seated need and contributes to feelings of well-being). This hypothesis is plausible but again the effect on individuals is likely to be small and difficult to measure.

13.4 Educational visits for schoolchildren

The Garden will provide a service to schoolchildren who will make educational visits. These visits will help children understand

- How the human species is dependent on the natural world,
- How food plants and other useful plants are grown,
- The variety of vegetation and environments in this world,
- The fragility of many environments and the importance of sustainability and biological diversity
- Ways in which natural resources can be conserved

This experience will encourage children to take care of their environment and thus of something that supports their health. It may also make them more aware of plant food sources and conceivably increase the proportion of plant foods in their diet. It may encourage them to engage in physically active horticultural pursuits.

13.5 Educational visits for adult learners

Adult learners will also study the dependence of humans on the natural world, the plant science, the variety of vegetation and environments and how to increase sustainability and biological diversity. They will of course do so at a much higher level and may well develop knowledge and skills that will help sustainable development and protection of biodiversity in Wales and throughout the world.

14. Effect on Volunteers

14.1 Volunteers can be categorised as

Volunteers (general)

Volunteers (with learning disability)

Volunteers contribute to the work of the Garden by undertaking various tasks necessary for its running. Tasks undertaken include office work and horticultural work.

14.2 Volunteers (general)

14.2.1 Characteristics

The volunteers are typically older adults. 80% are aged 55 or over. About 60% were male and 40% female.

14.2.2 Effect of volunteering on health

The main effect on health is likely to be on mental health and through building social networks. There is good evidence that time spent in purposeful activity^{39 40} and increasing number of social contacts improves health as evidenced by reduced mortality^{41 42 43}.

Volunteers will also be physically active while involved in garden work. Even those doing office tasks are likely to have to walk appreciable distances while at the Garden in order to find people at different locations and so on. In addition the experience is likely to encourage them to be more active in their garden at home. Volunteers also comment on the pleasant environment.

14.3 Volunteers (with learning disability)

The Garden also provides opportunities for volunteers with learning disabilities. There is a very long tradition in the mental health services of encouraging persons with mental health problems or learning difficulties to participate in horticultural or agricultural activity. Not all aspects of this tradition were good but at its best it undoubtedly provided a very therapeutic activity.

For volunteers in the Garden the experience is likely to be entirely beneficial providing opportunities for work experience and satisfying purposeful activity at an intensity matched to the volunteers requirements. It also offers opportunity for social contact, for physical activity and for being in the open air and a pleasant environment. The scheme for volunteers with learning disabilities is still being developed. Volunteers were enthusiastic about the experience describing it as fun and making them happy. Volunteers give feedback to MENCAP after their first day at the Garden. They are generally very positive about the experience and want to return to the Garden.

Carers of volunteers expected the experience to be a good one for their clients and also enjoyed it for themselves. MENCAP are pleased to be involved with the Garden feeling that it adds to the quality of life for people with learning disabilities. They further feel that it is good for the public understanding of issues to see people with learning difficulties doing a good job for, and being associated with, a high profile prestige project.

The National Botanic Garden of Wales has now negotiated a contract with MENCAP for them to place 10 volunteers and a full time officer on the site.

15. Effect on Community Pride

The National Botanic Garden of Wales is a prestige project and will affect the light in which local residents see the area and themselves.

The Garden has paid particular attention to involvement of the local community through open days, liaison groups and other methods. These seem to be appreciated by the residents. Effective communication between Garden staff and residents reduces the likelihood of misunderstandings, allows the residents to maximise the opportunities provided by the Garden, and gives the Garden the benefit of residents' perceptions and ideas. The communication work minimises the theoretical danger that the Garden might be seen as an isolated project requiring skills and knowledge not available to residents. The policy of ensuring good community links contributes to the local sense of ownership and pride in the Garden. There is evidence that a sense of pride in ones locality contributes to good mental and physical health though the size of this impact is difficult to estimate.

16 Contribution to sustainability - Sustaining the biosphere

There is concern that current practice and development is no longer sustainable. Depletion of non-renewable resources, loss of biodiversity, saturation of pollution sinks and increasing pollution are all reaching a level at which the biosphere is being irreversibly changed.⁴⁴ Tropical forest is being lost as a result of being exploited for forestry and agriculture, desert regions are extending due to overgrazing, fertility of agricultural areas is being reduced due to irrigation and salt accumulation, areas are becoming uncultivable due to depletion of aquifers, and numerous other environments are being degraded in many ways.

Excessive use of fossil fuels and non-renewable energy sources are resulting in increased emission of carbon dioxide and other greenhouse gases. These gases are being produced at a rate faster than can be absorbed by natural sinks and are accumulating in the upper atmosphere producing global warming and climate change. The loss of tropical forests, which are an important sink for carbon dioxide, exacerbates these changes. The time scales of these changes are very long. Even if production of greenhouse gases were to be immediately reduced (which is quite impossible) global warming would continue for at least 70 years because of changes that have already happened.

The Garden will contribute to a solution by setting an example of good practice and by educating others (See environmental policy Appendix 4). This education will enable individuals to make changes in their own use of resources, which will make a small contribution to solving the problem. More important the education will help produce an informed electorate that will support the difficult political decisions that will be needed to produce a long term solution.

Ways in which the Garden will provide an example of good practice are:-

- Careful conservation of water
- Energy efficient buildings to minimise energy requirements
- Production of energy from biomass
- Use of organic methods and biological control wherever possible to conserve biodiversity.
- Minimise waste to land fill by best waste management practices.

The Garden will also consider environmental and social responsibility when selecting suppliers. For example catering products for staff are purchased from “Fairtrade”.

The educational effect of the visit will be increased if visitors are able to take away leaflets or other supporting material on the sustainability messages that have been demonstrated in the Garden.

17 Plants as a source of medications

A particular theme of the Garden will be the development of medicine and the use of plants as sources of medication. An exhibition will cover the early origins of healing and the place of herbalism with a special section on the Physicians of Myddfai⁴⁵. Other sections will look at the wide range of modern pharmaceutical products, which were originally isolated from plants. An underlying message of this exhibition will be the importance of plants as a source of medicinal compounds for humans and the importance of keeping biodiversity since the plant kingdom contains many useful compounds, which have not yet been discovered. This is one more reason why learning about biodiversity will have a positive impact on human health.

18. Summary of Impacts

Intermediate Factor	Impact
Employment construction phase	Provision of jobs Annoyance from noise
Employment operational phase	62 full time jobs 50 part time Increased availability of employment good effect on physical and mental health
Effect on local economy	Increase income of £10 per head per week. General increase choice. Good effect on physical and mental health. Possibility of disappointment due to unrealistic expectations.
Travel	Large number of extra car journeys. Will increase noise, fume and nuisance on local roads but unlikely to be major health impact.
Effect on general visitors	Expected 170,000-250,000 visitors per year. Short experience of physical activity in a pleasant environment. Also educational experience on healthy lifestyle (smoking, eating, avoidance of sunburn, safety in garden). Overall impact of a very small change affecting a very large number of people difficult to estimate.
Effect on school children visitors	Learn about environment. Able to play role in safeguarding environment that can support human health. Brief episode of physical activity.
Effect on adult educational visitors	Train individuals able to make scientific contribution to safeguarding environment and biodiversity.
Effect on general volunteers	Good opportunity for physical activity in pleasant environment and for social contact and support. Both these likely to have very positive effect on health.

Intermediate Factor	Impact
Effect on volunteers with learning disabilities	Volunteers have improved quality of life with very positive experience of useful activity in a pleasant environment. Provides very positive image of people with learning difficulties for the public.
Effect on community pride	Increase local sense of pride in area and self. Positive health effect.
Contribution to sustainability	Set example of good environmental practice. Educate visitors about importance and possibility of good environmental practice.

19 Impact on Health Inequalities

Much of the new employment will require skills that are available in the vicinity and the Garden will try and hire locally. Similarly the stimulation of the local economy will create jobs (catering and hospitality) which can be filled from local skills. This will benefit unemployed people and increase equity.

If the Garden has the effect of increasing demand for houses, and, therefore prices locally that will harm those on the edge of the housing market and increase inequity.

The increased provision of public transport will chiefly benefit those who do not have their own transport and thus increase equity.

There must be concern that the Garden will be most accessible to those with their own transport. Similarly it is possible that gardens will appeal more to privileged sectors of the population (who have houses with gardens). It is predicted that in the initial period 85% of visitors will be from socioeconomic groups ABC. The Garden needs to try and counteract this danger that it may appeal most to privileged sectors by making it as easy as possible to reach by public transport and by making its appeal as wide as possible. Participation of the National Botanic Garden of Wales in the Gateway project which aims to attract to gardens people who have never visited gardens is a very positive step.

The schools visits programme is a way of making the benefits of the Garden more widely known. The Garden will try to reduce inequity by making particular efforts to attract schools from deprived areas.

Great thought has been given to access for those with impaired mobility. This is a good example of reducing inequality.

20. Further studies

20.1 A Health Impact Assessment attempts to predict the health consequences of some action. In the process many assumptions have been made. Further studies are required to assess to what extent those assumptions are correct.

20.2 Activity levels

What is the number of visitors? What are their characteristics and what sorts of visits are made?

20.3 Economic consequences.

Will the prediction about impact on local economy be realised and will the predicted multiplier operate? What will happen to local employment levels? To what extent will increased activity around the Garden be new activity and to what extent displacement from elsewhere?

20.4 Employee experience

Will the anticipated health benefits of being an employee materialise?

20.5 Visitor experience

The greatest difficulty in making this prospective Health Impact Assessment has been uncertainty about what sort of experience visitors will have during their visit and how they will be affected. Will visitors be changed in anyway as a result of the Garden experience? One can attempt to explore this issue by enquiring about feelings, knowledge, attitudes and intent.

- Did they enjoy the experience and how do they feel about it
- Do they think they have learnt anything - can any change in knowledge be objectively demonstrated?
- Have their attitudes to sustainability, physical activity or health related aspects of lifestyle changed?
- Do they intend to change behaviour in anyway as a result of the Garden experience?

These questions might be answered by undertaking a survey of visitors leaving the Garden.

The most important question, and the most difficult to answer, is can any long term change in behaviour be attributed to the Garden experience. It is possible that this might be answered by a longer term follow up of selected groups of visitors.

20.6 Change in health status of local residents?

The health of local residents might be monitored through GP records or through enhanced samples of national surveys (e.g. Welsh Health Survey) or special surveys. This would detect change but it would be very difficult to know whether any such change should be attributed to the Garden or to some other factor (e.g. a general change in economic well being).

21. Treatment of economic gains

21.1 Transfer payments

An issue in all impact assessments is the limit to the community under consideration. This becomes particularly relevant when considering economic issues. Economists argue that when one group receives a benefit from the state or from another group there is no net gain in utility since an equivalent sum has been taken from others. Such movements are referred to as transfer payments. If the impact assessment considers the whole country there has been no net gain. If on the other hand the impact assessment is restricted to the group receiving the benefit then there has been a real gain to that group. In this particular project transfer payments are not a particular issue.

21.2 Displacement

A similar issue arises when considering creation of new employment or sales of goods. When the capacity of a sector is limited then creation of employment in one place may be at the expense of employment in another. Similarly where demand for a particular good is limited, sales of goods by one supplier may be at the expense of sales by another. In this situation there has been no net creation of employment or increase in sales, merely a displacement from one place to another. For the purposes of Health Impact Assessment how such events are treated depends on the limits of the community under consideration. If the community includes both the gaining and the losing locations then there has been no net gain. However, if consideration is restricted to the community in which increased employment or sales occurs then for that community there has been real gain.

Displacement is likely to be an important consideration in this assessment since it is possible that some of the increased economic activity linked to the Garden may be due to displacement from other locations such as the Pembrokeshire coast, other leisure attractions in Wales, other holiday and leisure locations in the UK or other parts of the World.

22. Reflections on HIA Process

This is one of the first Health Impact Assessments to be attempted in Wales. It has certain similarities to a Health Impact Assessment of the International Astronomy and Space Exploration Centre in Wirral⁴⁶ in that much of its impact was through relatively small impacts on relatively large numbers of people.

The Health Impact Assessment was undertaken long after the major decisions about the Garden had been made. It was undertaken because the Garden is a major national project and a systematic examination of how it would affect health could both guide its further development and give experience for Health Impact Assessments of future high prestige projects in Wales.

The Health Advisory Group of the National Botanic Garden of Wales was used as the steering committee for the Health Impact Assessment. This had the advantage of a group of people well informed about the Garden and about life in Wales. In theory it also had the advantage of locking the Health Impact Assessment process into the decision making process for the Garden. In practice this was not fully achieved and the Health Impact Assessment process was somewhat detached from other thinking about the Garden. More time planning and scoping the assessment might have produced a Health Impact Assessment, which was more relevant to the issues that concerned those making decisions about the Garden.

The interviews with stakeholders proved very valuable and highlighted certain concerns such as fears that the economic benefits could have been overestimated. They also gave better understanding of certain benefits such as the improved quality of life of volunteers and the sense of pride of locals. In future Health Impact Assessments it would be a good idea to devote more effort to this type of investigation.

An attempt has been made to quantify certain impacts in the calculations shown in Appendices 1 and 2. It is recognised that a very high degree of uncertainty attaches to these figures and they cannot be regarded as anything more than possible figures. These make a large number of assumptions that are likely to contain large errors. It is hoped that by showing such uncertain figures others will be encouraged to challenge them and offer more defensible assumptions leading to figures to which a lesser degree of uncertainty attaches.

Many of the issues identified have only been treated superficially. It would have been better to explore these in much more detail but time and the knowledge and skills of those undertaking the assessment were not sufficient to allow this. It proved difficult to obtain a satisfactory background picture of the locality. Routine published statistics cover much larger areas. An ability to access small area statistics together with techniques to interpret them would have been very helpful.

The time spent on this assessment was about 160 person hours (JK about 80, LD about 50, Others about 30).

23. Recommendations

23.1 The National Botanic Garden of Wales obviously has a generally positive impact on health. However, consideration may be given to the following points.

23.2 The impact on the local economy depends heavily on the time visitors spend in the area. If they simply come to the Garden and leave straight away it will not create much trade for local accommodation and catering suppliers. The Garden is a partner in the “Towy Valley Arts Partnership”, the “Gardens and Parks of South Wales” and the “Premier Garden Route” schemes which all seek to attract visitors to spend several days in the area. By these joint marketing strategies and in other ways the Garden must seek to maximise the health benefits flowing from increased local employment and income.

23.3 The Garden should seek to minimise the harmful impacts of car travel and maximise the health benefits of physical activity by encouraging visitors to reach the Garden by using public transport or cycling or walking. To this end it should continue its efforts to make public transport convenient and it should consider pricing incentives to encourage cycling and walking.

23.4 Care has to be taken that the experience is as enjoyable as possible while still modeling healthy living. The policy on smoking is one example of this dilemma. Smokers among visitors and staff may wish to enhance their enjoyment by smoking while non smokers may resent being required to breath air filled with tobacco fumes. The policy of restricting smoking to non enclosed areas seems a reasonable compromise. The Garden should employ good management practice to ensure that its policies on smoking are fully implemented. In the long term it should aspire to a situation in which the whole site is smoke free and everyone is able to smell all the flowers but in the short term this is not a viable option.

23.5 Similar considerations apply to catering. On the one hand the Garden will need to maximise earnings from catering. Convenience foods often have high profit margins and long shelf lives making stock control easier. The Garden will want to sell food that looks good and tastes good. It will also want to be a model for healthy catering. Good judgement will be required to keep a range of foods that meet all tastes, allow the catering services to make a good profit margin and, at the same time, make it easy for people to choose healthy options. The catering outlet should use appropriate labeling and promotions to encourage the choice of healthier options

23.6 The Garden is a champion of best environmental management of which minimising waste is an important aspect. In its purchasing of food and other products it should seek to ensure that packing materials are kept to the minimum compatible with safety and that wherever possible packaging materials are recycled.

23.7 The Garden offers an excellent opportunity to promote the need to avoid excessive sun exposure. In the past the Garden has offered visitors free sun screen oil. At the very least sun protection products should be available for purchase by visitors. The sale of protective clothing (caps with neckshades, longsleeved T-shirts and

sunshades) offers a marketing opportunity, which could benefit both Garden finances and visitors, health.

23.8 Visitors to the Garden will expect ideas on how they can enjoy and improve their gardens at home. The National Botanic Garden of Wales should not miss the opportunity of reminding them that there is a health benefit in addition to the many other pleasures to be obtained from this activity. At the same time there is an opportunity to remind people of the hazards associated with gardens and the ways in which these can be avoided.

23.9 The sustainability element is an important part of the Gardens educational purpose. Availability of leaflets and other materials (e.g. home projects) to be taken home will increase the effectiveness of this education.

23.10 Development of the Garden is a continuing process. At the time of writing planning of some elements such as the science centre and business incubator were at a very early stage. A further health impact assessment of these elements, which might have considerable implications for health, may be merited when options for them can be formulated more clearly.

24. Use of the report

This Health Impact Assessment was intended to serve three purposes.

- **To provide the National Botanic Garden of Wales with insights as to how the project might affect health and so assist them in their future operations and planning.**

The trustees and staff of the Garden found the report helpful in highlighting health issues related to the Garden and will use it as a benchmark for further work. They will be able to act upon some of the recommendations in this report and for recommendations, which lie outside their capacity, they will use the report to influence others.

- **To provide practical experience of carrying out Health Impact Assessments in Wales and allow lessons to be learnt on how to make future Health Impact Assessments better.**

Experience has been gained and lessons learned on the ways in which evidence can be gathered, the ways in which that evidence should be evaluated and interpreted, the skills and resources needed and the problems to be overcome. Building on this experience should allow better Health Impact Assessments in the future.

- **To be of use to those who might be planning similar projects in the future.**

It is suggested that those planning similar projects might find it helpful to consider how their project in the light of the issues raised in this report.

Appendix 1

Calculation of travel casualties

Visitors to NBGW		250,000
Estimated % car travelers	$250,000 \times 0.85$	= 212,500
Estimated vehicle trips	(2.5 persons per car)	85,000
Estimated vehicle kilometers	(mean journey 150 Km)	12,750,000
Car user casualties	$12.75 \times 57/100$	7.27
Pedestrian casualties	$12.75 \times 10/100$	1.27
Of whom Car user deaths	$12.75 \times 0.5 /100$	0.063
Pedestrian deaths	$12.75 \times 0.2 /100$	0.025
Car user seriously injured	$12.75 \times 5.8 /100$	0.74
Pedestrian seriously injured	$12.75 \times 2.3 /100$	0.29

Rates are per 100 million vehicle kilometers

Taken from Table 26 Casualty and accident rates 1997
DETR Road Accidents in Great Britain 1997: The Casualty Report London HMSO

It should be noted that these are not all additional injuries since in many cases the vehicles would have been travelling somewhere else if they had not been travelling to the NBGW.

Appendix 2

Calculation of effect of increased income of £10

Difference in mortality lowest income decile compared to highest decile	60% ⁴⁷
Reduction in mortality per centile	0.6%
UK deciles weekly income* lowest 10%	£98
2nd lowest 10%	£132
£10 increase equivalent to Centile rise	3
Reduction in mortality	2%

*Equivalised household income before housing costs median for decile

Assumptions

This calculation is highly speculative. In particular the following assumptions should be noted.

1. Ratios from data derived from Middle aged white US men can be extrapolated to UK situation.
2. Observed associations used are due to causal links between income and mortality rather than other confounding factors.
3. Relation between income and mortality is linear.
4. Adjustments for household size used in calculated UK income deciles are appropriate.
5. Median income of centiles in UK population is linearly distributed.
6. Changing income of individuals does not alter centile distribution of population.
7. Association between income and health is explained by low income causing poor health not the reverse.
8. Calculation applies to household member whose income is increased by £10

None of these assumptions are strictly true but the size of error introduced is very hard to estimate.

Appendix 3

Themes from Interviews with Key informants

Interviews were undertaken with

- Volunteer
- Volunteer with learning difficulties
- Mencap Support Worker
- Member of Technical/Science staff
- Member administrative staff
- School teacher (primary)
- School teacher (secondary)
- Residents liaison group meeting

Experience of working in the Garden

All reported that they enjoyed working in the Garden. They enjoyed the fresh air and the environment (even those with office jobs found their job required them to walk around the gardens a considerable amount). Several mentioned that a walk round the gardens was a good way of improving their mood and giving them space to think out problems.

Social aspects

Many mentioned the opportunity to meet and work with other people. Those who were retired particularly mentioned this aspect. One person said that it had taken them a little time to make friends at the Garden.

Staff development

Several staff mentioned the organisations commitment to staff development. They felt that they had learnt new skills while working with the Garden.

Catering

Some staff brought their own food and others ate in the canteen.

Smoking

Interviewees included both smokers and non-smokers. Most mentioned that the contractor's works canteen, which Garden staff used as a temporary eating place, was a smoking area.

Educational aspects

Teachers stressed that school visits must have a real educational element and must be linked into appropriate key stages of the national curriculum. They were prepared to

concede that a visit to the Garden could have educational value but had not thought about making use of the Garden in this way

Sustainability

All were generally interested in sustainability. Contact with the Garden had increased this interest. Some were planning to increase the sustainability of the way they lived at home.

Expectations of economic boost

There was considerable discussion of how the local economy would be influenced by the Garden. There was some anxiety that visitors might be mostly day visitors and that hopes of increased economic activity might not be realised.

Traffic

The increased traffic had already been noticed (Mostly motorists getting lost). There was hope that better signage should reduce the nuisance effect of traffic.

Public transport.

Several mentioned that public transport had already been improved due to the Garden. There was hope for further improvements.

Local pride

A feeling of pride at being associated with a prestigious national project was evident in most of the interviewees.

Appendix 4

The National Botanic Garden of Wales Environmental Policy

The National Botanic Garden of Wales is the first National Botanic Garden to be created in the UK this century, and a new institution for Wales; a place of international significance, dedicated to conservation, horticulture, science, education and the arts.

In demonstrating its commitment to environmental issues the Garden has identified and analysed the environmental impacts of its activities, and as a result has set the following objectives

1. To comply with and wherever possible exceed all relevant environmental legislation.
2. To improve continually our understanding and control of environmental impacts to prevent pollution.
3. To endeavour to use and promote the use of sustainable resources.
4. To minimise waste to land fill by championing responsible waste management practices.
5. To ensure the well being of staff and visitors to the Garden through the adoption of best practices.
6. To use organic methods and biological control wherever possible.
7. To protect and, where appropriate, seek to enhance the biodiversity within the site.

These objectives will be implemented through an Environmental Management System, which incorporates all the elements of ISO 14001.

A regular review of the Environmental Management System will ensure a continual improvement in our environmental performance.

This policy will be made available to the public and be communicated to all employees and visitors to the Garden.

Appendix 5

National Botanic Garden of Wales' Health Advisory Group Membership

Fiona Peel	Gwent Health Authority – Chair
Terry Turner OBE,	Pharmacologist
Peter Farley	National Assembly for Wales
Linda Davies	Health Promotion Specialist
Sylvia Jones	Lay Member
Dr. Chris John	General Practitioner
Dr. Jana Zantovska	CEO of @Solutions
Dr. Rhodri Griffiths	Science Development Officer NBGW

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