Penarth Pavilion and Esplanade

Revival

Looking into the sustainable regeneration of the waterfront.

ART431 Sustainable Design

Practice

Episode 2 & 3

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become sustainable.

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Acknowledgements

Preface

Penarth Pavilion is a historic building on the seafront of a small town, just outside Cardiff, South Wales. As an 80+ year old building, it is soon to undergo a multi-million pound renovation in a scheme lead by Penarth Arts & Crafts Ltd. and designed by Bristol based architects Purcell Miller Tritton.

At present, the project has finally achieved full planning permission to proceed and the detailed design of the building is underway. In February 2011, four Cardiff University Students entered the project with the aim of injecting the principles of sustainable design into the scheme. Seeing that the Pavilion and the Esplanade go hand-in-hand, this report looks into the sustainability of both.

ACKNOWLEDGEMENTS

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http://www.panoramio.com/photo/36155877

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Introduction

Section 1: Introduction

Summary

Penarth Pavilion is a historical icon and a major feature of the Pier and Esplanade. Over the years it has gone through many

changes and it is currently going through yet another change to hopefully revive the building and serve the community once again. In this

report, the sustainable options for the current proposal of the building are explored. By making the building more sustainable, it can

serve as an example for the rest of Penarth and mark the beginning of a more sustainable future for the "Garden by the Sea".

Each of these sections has reviewed and suggested a range of scenarios and possibilities to actively improve the social,

economic and environmental sustainability of Penarth Pavilion and the wider Esplanade upon completion of the imminent renovation.

This has been supplemented by recommendations as to how some of these scenarios could potentially be integrated.

While the renovation of Penarth Pavilion will be an exciting and no doubt a successful venture, the potential to achieve

further success depends on how the Pavilion links with the Esplanade which has, in recent years, lost its identity. What was once a

thriving Victorian seafront is now a mix of high class restaurants, apartments and buildings in various stages of deterioration. It can be

argued that, for the Pavilion to reach its full potential, the Esplanade on which it stands must join in the renewal process to become an

interlinked attraction.

Upon analysis of an ambiguous Sustainable Options Report supplementary to planning documents, this report provides

further analysis of sustainability in relation to this project under 3 main sections:

Socio-Economic Sustainability – How can the Pavilion become a self-sufficient building which is the hub of the local community of Penarth?

Environmental Sustainability – How can the options suggested by the architect"s be further explored and integrated into the proposed scheme?

Esplanade – How can the Esplanade, on which the Pavilion stands, use this renovation project as a kick-start to returning the area to a vibrant and

engaging part of a town steeped inWelsh history.

One of the features of all of the successful piers and pavilions discussed later in Section 3, was that none of them were

single entities – they were all the iconic features of a wider seafront which embraced them. This report will focus on how the Esplanade

can use the Pavilion as a kick-start in the process of regenerating the whole area for Penarth to be proud of once again.

Section 1 Introduction – Public Event (9/4/2011)

During the public event held by the students of the MSc

Theory and Practice of Sustainable Design course for the various projects

proposed in Penarth, members of the community were given an

opportunity to express their thoughts, ideas and opinions on the projects.

Although attendance of the event was too low to get a wide,

representative view of the community"s opinions, it was useful in getting an

idea of how they view sustainability and their commitment to endorsing it

in Penarth.

In terms of the Pavilion/Esplanade Project, posters were used

for each allowing the public to draw, write, scribble their ideas and thoughts. There was a common attitude amongst the attendees towards the project; people were mostly positive and excited about the prospect of regenerating the Pavilion (pamphlets of current plans for renovation were distributed – see Appendix E) and Esplanade. The general notion was found to be disappointment in the lack of attention given to the area from relevant bodies.

As mentioned, although attendance was low, there was insight gained to direct the project. The priority for this project is to benefit the community and restore the Esplanade to its historic glory. This is what the report intends to achieve, primarily infusing various concepts with a universal goal: sustainability.

The following list sums up the ideas members of the public shared:

Informal concert hall for spontaneous performances Art gallery/café Space for gallery and craft stalls Fisherman teaching, traditional skills and crafts Rent roller skates in the summer Pavilion is iconic building (should reflect Penarth"s future) – wind turbine? Somewhere for young and old to meet Accessible to all

Food hub Fun Mini interactive space Community centre – run for

the community, by the community Art and performance

space Community space – multi-purpose flexible use Café, social club,

cinema, stores, market, tourist info, events Art venue/gallery, café,

performance space/cinema Cinema, café, performance of

music and drama, market Free access to encourage public Café

(healthy food) and bar Make the most of the interior

visually/architecturally Multi-use space, local food/market,

community meeting space, children's creative space/activities Art

exhibition, coffee shop (view)

Posters used in public event: (Left) Esplanade poster double A0. (Right) Pavilion poster A0

Section 1 Introduction

Being a Sustainable Options Report, this chapter will begin by

briefly exploring the niche market in sustainable development which is

Ecotourism. In summary, it was found that ecotourism is aimed at

building a tourist market on natural features – something which

Penarth has used in abundance, but not as a principle tourist attraction

in the past. Ecotourism does however embody many of the values of

another term dubbed Sustainable Tourism. Sustainable Tourism looks to provide sustainably focused attractions which look to balance the Sustainable Triangle presented in the Sustainability Assessment Section. By ensuring environmental as well as social and economic sustainability is maintained for the local area, sustainable tourism strategies could potentially become a major part of life as global sustainable development becomes more important.

Renovation of the Pavilion as a Grade II listed building, not only has the potential to regenerate and re-use the building itself, but also it would act as a catalyst to regenerate the wider area. In this report, the definition of regeneration and the effect of historic buildings on the wider regeneration area in terms of social, economic and environmental aspects are investigated. The practical measures that could be significant influences to regenerating an area are considered in terms of the Pavilion and Esplanade and the potential overall effect on Penarth. This acts as a stepping stone to guide the rest of the project. From learning about the concept of regeneration and its influencing factors, the approach to regenerating the Esplanade begins

to take form.

The objective of this report is to explore the process of

regeneration in the context of Penarth waterfront. By considering

the environmental, social and economic aspects of this process, the

aim is to explore how to regenerate the area sustainably.

As illustrated in the diagram above, the renovation of the

Pavilion cannot be done in isolation. It must be viewed in the wider context

of the Esplanade, which goes on to consider the context of Penarth. The

Pavilion Project acts as a catalyst for regeneration which can potentially

increase the value of the town as a whole - environmentally, socially,

economically and culturally.

This report aims to address how this project can, above all,

benefit the community. The priority is for this to promote Penarths

Esplanade and Pavilion for the people. Further down the line, the effects of

this regeneration could restore the town"s status as "Garden by the Sea" and

give value to one of only six piers inWales.

As a historic, listed building, Penarth Pavilion is exempt from the

Welsh Assembly Government requirement that all construction projects

receiving public funding must achieve a minimum of BREEAM (British

Research Establishment Environmental Assessment Method) "Excellent"

certification. While this is true, building regulations require an improvement

in environmental performance and the social-economic benefits of basic

sustainable principles are simply too important to be missed.

Pavilion

Esplanade

Penarth

Section 2: Background Research

2.1 Eco-Tourism

2.2 Regeneration

Section 2: Background Research

Summary

Sustainable Tourism looks to provide sustainably focused attractions which look to balance

the Venn diagram presented in the Sustainability Assessment. By ensuring environmental as well as social and

economic sustainability is maintained for the local area, sustainable tourism strategies could potentially

become a major part of life as global sustainable development becomes more important.

Renovation of the Pavilion as a Grade II listed building, not only has the potential to

regenerate and re-use of the building itself, but also it would act as a catalyst to regenerate the wider area. In

this section, the definition of the regeneration and the effect of historic buildings on the regeneration area in

terms of social, economic and environmental aspects are investigated and in the next step, the practical

measures that could be significant influences to regenerate the area are considered in Esplanade within

Penarth. This section acts as a stepping stone to guide the rest of the project. From learning about the

concept of regeneration and its influencing factors, the approach to regenerating the Esplanade begins to take

form.

With this background research, the basis for this report is outlined which will then inform

more detailed aspects of the project with regards to both the Pavilion and the Esplanade.

Author: MA:EG: HA 40:40:20

Section 2.1 Ecotourism

Introduction

The question of tourism in Penarth could be posed in terms of; do the residents of Penarth want tourism to redevelop? While the answer is yes and no – due to natural tendencies for the "host population" to have different views as to how they want their town to be shaped – when establishing how the Esplanade (the centre of Penarth"s historically built tourism trade) can be regenerated, it must be suggested that to return the Esplanade to its original state, a significant portion of this operational revenue must come from outside Penarth. Whether it be for simple afternoon outings (for a couple of hours say), or for a longer holiday, any visit to Penarth for recreational reasons from individuals who do not have direct ties to the location is dubbed "tourism".

In the wave of alternatives to conventional ways of living, tourism is also a key feature of human life (certainly in developed countries) which is moving towards alternatives. Two intertwining terms which have been highlighted and hotly debated by academics and professionals are the concepts of ecotourism and sustainable tourism.

These two concepts will now be briefly compared and contrasted.

Ecotourism

Ecotourism is essentially the promotion of alternative tourism by concentrating the focus of leisurely travel back towards natural attractions. It is a fairly basic concept, which is considered by many to be the key to sustainable development that for successful sustainable development to take place, a greater human awareness and appreciation of the beauty and fragility of nature is required. While this shift in human conscious may take a considerable amount of time to establish, natural attractions such as Uluru (Hall, below left) and Mount Everest (Gurung & De Coursey, bottom left) already illustrate the considerable human attraction towards unspoiled nature. Essentially, ecotourism, as part of a global sustainable development strategy, looks to build on the success of these attractions as well as promoting smaller, natural, attractions – from ornithology to small scale camping.

What is the principle objective of ecotourism is that while these natural attractions are being taken advantage of in an economic sense, ecotourism and the pursuers of it attempt to reduce the impact on the local environment to a minimum – if at all. By promoting sustainable transport, construction projects and lifestyles whilst on "eco-holidays", ecotourism is

setting travel into (certainly in developed countries) the traditional annual lives of the general public. However, another key aspect of ecotourism is the socio-economic sustainability which is also required for sustainable development. This is achieved by ensuring the equal input and sharing of benefits to the local community or host population, which is essentially the prime support of the artificial inserts of ecotourism to allow this to take place.

SustainableTourism

While ecotourism is a noble concept and does indeed share a number of similar principles with sustainable tourism – ecotourism is based primarily on natural features which are unspoiled by human development. It is true that ecotourism is attempting to draw holidaymakers away from unsustainable, man-made attractions (a prime example being locations such as Las Vegas, left), but to simply abandon locations where human developments have destroyed natural

Uluru Source: crystalinks.com

Mount Everest Source: hubpages.com

Las Vegas Strip Source:

environments is almost a lost sacrifice. At the other end of this scale, Penarth is a "seaside resort" which has a history in the tourism industry. Following the much publicised decline of the town as a tourist hotspot for other locations around south Wales and further afield, Penarth is a prime example of what could happen to many locations around the world if ecotourism was to be the only strategy implemented.

Sustainable tourism is a term with much wider scope in that it embodies the principles of sustainable development, whilst enabling acknowledgement that some existing human habits will either be hard to change or are advantageous to society as a whole.

Tourism itself is an industry built on the development of a piece of land to accommodate the movement of individuals for a limited period of time. While in most cases the environmental impact of such development and movement of people is significant and irreversible, it is also true that the socio-economic changes which occur are beneficial to the human race. As humans have developed and technology has allowed travelling and tourism

to be accessed by a widening market, it has become an essential part of the health, wellbeing and enlightening of an individual as they journey through life. It seems that to hinder what is such an integral part of the human lifestyle could indeed have a negative impact on human development – making people less happy, less enlightened and less interlinked with each other. Sustainable development allows for this factor, but suggests that, like buildings, transport and every aspect of daily life, there are environmental, social and economic elements which can be considered to encourage a more sustainable aspect of life.

Discussion and Conclusions

It is clear from this brief outline and discussion of the difference between eco and sustainable tourism that Penarth most definitely falls into the sustainable category. While it is true that returning the Esplanade to a natural landscape cannot be ruled out of the question, a sustainable tourism strategy must be implemented to ensure each of the three essential factors:

1. Environmental Sustainability – to interlink sustainable considerations with regard to the Pavilion with the rest of the Esplanade.

2. Social Sustainability – to ensure the local community is an

integral part of the design and implementation process which will encourage local support when the inevitable seasonal trends continue following completion.

3. Economic Sustainability – to encourage business growth so that the Esplanade does not require financial assistance from the council.

As a former tourism location which is attempting to redeem itself in the locality, it is fair to call the Esplanade project a regeneration scheme. We can see from other examples and case studies in the "Piers and Pavilions" section (3.3) that the Pavilion Project can be regarded as a spark, on which the Esplanade Regeneration can push forward from, but it is clear that further research and discussion of regeneration projects and their sustainable credentials is required. The next section of this report will examine this research and discuss its application to the Esplanade.

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Section 2.2 Regeneration

Introduction

Renovation of Pavilion as a grade II listed building, not

only has potential to regenerate and reuse of the building

itself, but also it would act as a catalyst to regenerate the

wider area. In this section, the definition of the regeneration

and the effect of the historic buildings on regeneration area

in terms of socio economic are investigated and in the next

step, the practical measures that have significant influence to

regenerate area are considered in Esplanade within Penarth.

Definition of Regeneration

Regeneration is related to the places and people. The

objectives of the regeneration are enhancing the quality of

people"s life and work through making the sustainable places during the long-term (Davies, 2010)

Regeneration area by historic building

To regenerate the area, buildings play major role more than any other factors. Especially, historic buildings which are treated as intense identity for people have significant influence to regenerate area. Historic buildings are more successful to engender the fondness and to catch the public"s imagination rather than the new buildings (RIBA, 2003). So, the renovation of historic buildings not only can provide benefits for buildings but also, surrounding area can be boosted. However, it must be considered that to have successful regeneration scheme, the provision of the buildings and infrastructure should be responsive to the users of the urban areas (Treasury, 1998). The features of successful regeneration scheme by historic building are as follow:

Acting as a catalyst to regenerate the surrounding area.

Improving the local economy and providing occupations for local people.

Reinforcing the culture of local people, and

Instilling a sense of confidence in a district and provide civic pride in the neighborhoods (ODPM, 2004).

The role of historic building for regeneration is defined by the Institute of Historic Building Conservation:

"In many parts of Britain, historic buildings have been a positive catalyst in achieving structural economic change, attracting higher value investment and jobs, and providing the context for creative, high quality contemporary design in new development. The historic environment and good urban design are key elements in achieving "urban renaissance" (ODPM, 2004).

Indeed, if the historic buildings provide environment in which people want to work, would like to live and wish to visit, it would be treated as a successful historic quarter and people are attracted to this environment because they provide sophisticated architectural features, better quality of life, creating a sense of place and local character, as well as strong social interaction and etc (Heritage

work).

Source:http://www.sciencedaily.com/releases/2007/05/070520091842.htm

Socio-Economic

As it mentioned above, historic building cause straightforward influence for local economy. Regeneration causes to generate employment across the whole employment spectrum. It means that people would be more invigorated to local economy (Starge, 2006).

Section 2.2 Regeneration

Furthermore, it is believed that the reuse of historic buildings for commercial schemes have more value than new buildings and can act as a foundation to regenerate an area. This influence of historic buildings on the surrounding area with regard to the economy is split into two parts: direct values and indirect values.

Direct value

Direct value of regenerating historic buildings could be considered at either level of rent for community building or other activities as stream revenue for the building itself. For instance, shops are rented at higher prices in newer buildings than older buildings. The below

figure shows the concept of the new economic use for historic buildings.

Source:http://www.rics.org/site/download_feed.aspx?fileID=267&fileExtension=PDF

Indirect value

The indirect value of regenerating historic buildings relates to the district properties. Historic buildings also create wider economic and social values by creating job opportunities and local investment within neighboring areas.

For example, at the Museum of Science and Industry in Manchester, the indirect value is more than the direct value of the museum (per 1 pound spent at museum, 12 pounds is paid for indirect value in the neighboring economy). The other social and economic positive influences for this case are as follows:

Enhancement of image of urban area

Promote the quality of life by increasing personal safety and reduction of crime

Strong interaction within communities and

Improvement the social confidence and a sense of civic pride

(Heritage Work).

Social advantages

Following the economic advantages; there is a good deal of merits from social perspective. These advantages include: Long term employment; a sense of community and social cohesion; and promoting the civic pride (DETR, 2000).

One of the most important benefits of the regeneration area is improving civic pride. The high quality of physical design of the historic buildings which are accompanied by the provision of the new bars, restaurants and other leisure amenities, as well as large scale of public events lead to the improving the confidence of the people and civic pride within neighboring (Davis, 2001), (New development, 2001).

Section 2.2 Regeneration

Case study 1: The Tobacco Factory

The Tobacco factory, with 4,000 square meters is located in the south of Bristol and was built in 1912. George Ferguson, RIBA President bought this building which was placed in a depressed area

in 1995 and renovated it. The regeneration of this building kick started the gentrification process of this district (Grimm, 2009).

Ferguson had a dream to provide "a one million square foot flourishing mixed use "urban village" prior to their senseless demolition". Its architect was successful and now this building plays a prominent role and act as a catalyst to provide sustainable and economical urban regeneration (Tobacco Factory, 2010).

This project has redeveloped to provide theatre space, restaurant, café bar, a dance studio, academy for performing arts, as well as loft apartments (UWE Bristol, 2003).

Source: http://blog.mcfaulstudio.com/?m=200811&paged=2

Case study 2: Cardiff Bay

"By the 1980s the Docklands had deteriorated into a run-down area as a result of the collapse of the coal exporting trade, and deindustrialisation of steel making and dependent industries. The foreshore, rivers and bay area was a major site for waste disposal and its unattractive image made it suitable only for low grade industrial use." – CBDC Report.

The bay had the potential for regeneration and could make an important transformation for the whole of Cardiff. Thus the regeneration process started in 1987 (CBDC report). It has been a phase by phase regeneration, that included the construction of a Barrage, the Bay, the West, the East and the Core. The regeneration had a mixed development of commercial, industrial, retail, community, tourism and leisure, housing, etc.

Public Art, in front of the Senedd Building.

Source: Author

Section 2.2 Regeneration

Cardiff Bay:

The Cardiff bay is an important location in Cardiff"s coastline and has played a great role in the history of the city and of Wales. It was an important trade point and served as a coal port for a long time. Later after the trade faded away, the docklands were left disused and derelict. While there was a lot of potential for this place, it was not used for the right purpose and with the right potential.

The regeneration of this area was seen as an important process in

making Cardiff an impressive city. Thus, a strategy for regeneration

was formulated by Cardiff Bay Development Committee (CBDC).

This strategy included ideas of potential development,

character and form of each part of the bay, the economic, social and

planning policies, the urban design, landscape, conservation, access

and servicing requirements, the phasing, investment and

implementation. (Cardiff bay regeneration strategy).

The CBDC"s mission was thus:

"To put Cardiff on the international map as a superlative maritime city, which will

stand comparison with any such city in the World, enhancing the image

and economic well-being of Cardiff and of Wales as a whole."

Cardiff Bay regeneration

The Cardiff Bay regeneration was based on a step by step approach, but

was based on a framework as follows:

It included a consideration for social, economic and environmental values,

the holistic sustainability being made pronounced.

The public art being a cultural reflection of the city and the bay, the

natural bio-diversity being balanced to newer interventions, bringing

up environmentally-friendly buildings, regeneration to serve the people, it was a successful sustainable regeneration to its possible limits.

The regeneration has transformed Cardiff Bay from an industrial to a tourist hotbed.

The Cardiff bay pre-barrage Source: CBDC Report

Section 2.2 Regeneration

History and character:

The bay lies at mouths of rivers Ely and Taff and flows into the Severn estuary – a location with the 2nd highest tidal range in the world.

The existing Cardiff Bay is a reflection of its historic use and activities, that includes land reclamation and Cardiff dock construction and alterations made to access the docks. The docks were late 19th century developments, which lost its importance after the dwindle in coal demand after the 1stWorldWar.

After this, the land became derelict and was under used or even misused. There was a lot of unemployment, which did affect this

area. The spaces came to be used for wrong purposes. Thus, the regeneration aimed at bringing back its glory with cliché of the history and character of the bay. The public art, [the tide mark seawall, the Celtic ring, the water tower, etc] the buildings [Senedd, pier house, the WMC, the adventure quay, etc] also intended to reflect the nature of the bay and its associated past. This way it preserves the history and culture of the place while making it feel more location specific and connected to its population.

the tide mark - public art along path way The dock and its access, the Cardiff bay Pedestrian and cyclist route connecting the bay and Penarth

Section 2.2 Regeneration

Public art:

It is a means of conveying the history and heritage of the area. The art found in the Bay and Barrage is a collection of small references all around the place and along with the history and its change over time. It relates closely to the time and the unique identity of the place or the area, it also gives the area the sense of place.

The work in the Bay and the Barrage has also been a collection of

artists based locally in the south Wales.

Each of these pieces of art are directly accessible by the people

which gives them a sense of belonging.

Celtic ring – marks the end of Taff trail

The Senedd building – a sustainable venture

Old moorings for coal ships

Roald Dahl Basin – the centerpiece of the Bay

"This bronze sculpture of a young couple

was sculpted by John Clinch in 1993 and

celebrates the people who lived and

worked in Cardiff Bay."

Section 2.2 Regeneration

The map showing the proximity of Cardiff Bay with Penarth

Seating and landscape as public art Interactive wall- a reflection of culture Bio diversity retained in form of landscape and thus cycle

Wood – structure retained and reused as a café.

Penarth pier and

Esplanade .

Cardiff Bay.

Section 2.2 Regeneration

Conclusion

Based on the definition of regeneration and influence on the historic buildings in surrounding areas, it is clear that Pavilion has potential to regenerate the Pier and Esplanade within Penarth. As case studies have shown, the renovation of historic building is not only a result in regenerating building itself, but could also regenerate the wider surrounding area. The regeneration of the Pavilion has significant effect from an environmental, social and economical perspective;

Environmental sustainability: the reuse of the building is treated as a key issue in terms of sustainability through saving energy, reuse of the existing materials and by these measures carbon dioxide emission are reduced and air quality improved.

Economic sustainability: the regeneration of the Pavilion would act as a catalyst and not only this, while it could be beneficial for the Pavilion itself, it also could be more beneficial for Esplanade. It means

that renovation of this building could have an effect on the neighboring properties, creating jobs for local people, as well as boosting the local economy in wider context. Moreover, based on the Royal Institution of Chartered Surveyors" research, it can enjoy additional advantages over new buildings, because the level of the rent in a listed building is higher (ODPM, 2004).

Social sustainability: the regeneration of this building by creating job opportunities would cause an increase in the employment of local people, community cohesion, as well as promotion of the people"s confidence and civic pride within Penarth.

In the Esplanade section, the practical measures are proposed within Esplanade along with environmental, social and economical merits.

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Sustainable Options Report

Penarth Pavilion

Section 3: Penarth Pavilion

3.1 History of Penarth Pavilion

3.2 Current Project Progress

3.3 Sources of Inspiration – Piers/Pavilions

Section 3: Penarth Pavilion

To better understand where the Pavilion is going, his section will look at where the Pavilion has been up to this point. With a brief history of the building, it can be seen that it holds value to the people of Penarth as well as the town itself.

To adequately advise on the topic of sustainability for a pavilion and pier, the final part of this section presents a series of piers and pavilions where lessons can be learned with regard to either allowing them to deteriorate, regularly maintaining them or investing with large cash injections. This section presents these case studies in 5 sections, notably "lost piers", "successful piers", "piers with plans", "pavilions" and "international piers". The basic principles behind the following suggestions have been based upon analysing the success or failure of each of the case studies in reaching out to the local community and becoming a draw for the wider "touristy" market.

Source: Author

Author: MA:LA 70:30

Summary

Section 3.1 History of Penarth Pavilion

Penarth Pavilion was constructed during the 1920s, in order to increase attraction to the pier. Following the construction of the 685-foot Pier in 1895, which proved a great success along with the promenade on the seafront, suggestions for the Pavilion were proposed in 1926. At that point there already was a small wooden pavilion on the seaward end of the Pier called the Bijou; built in 1907 and served as a venue for entertainment and various shows.

However on May 18th 1929, the construction of the Pavilion was finally complete and officially openned after years of delay which subsequently caused a decline in the number of visitors to Penarth. When the Pavilion was finally open and in use it served as source of pride for the people of Penarth, which was becoming a premier resort and attraction. (Thomas, 1997)

The Pier remained with two Pavilions at either end up to August of

1931, when the Bijou caught fire causing severe damage to both the building and the Pier. The Council repaired the damage to the Pier without plans to rebuild the Bijou. Thankfully, the new Pavilion was not greatly affected by the fire. (Thorne, 1982)

In 1934, a group of local businessmen took over the Pavilion and made necessary changes and repairs. It was reopened under the name "Marina" which served as a ballroom. This proved quite successful up until it closed down during World War II. When it reopened in 1946, there seemed to have been a decline in popularity due to the change in local recreation. In 1970, it reopened yet again as the Commodore Club and Restaurant as a youth orientated dancehall. However that did not last long for after a little over a decade it was refurbished as a snooker club. After a brief life as a snooker club, it was closed down for several years for structural works. After that, there was a lack of use of the building leaving it to deteriorate into the state it is in today. (Thomas, 1997)

(Source: http://www.francisfrith.com/articles/celebrate-the-great-british-pier)

(Source: http://www.simplonpc.co.uk/Wales-Piers.html)

Section 3.2 Current Project Progress

At the moment, the Pavilion, a Grade II listed building. is in poor condition, having been used as a gymnastics gym/arena for some time now. The structure remains mainly as it was built, apart from the raised timber floor at ground level. It is a simple concrete frame building, with cast in situ ribs and barrel vault roof. The main fabric comprises mostly of reinforced concrete of 120mm thickness, finished with waterproofing which has been painted several times over the years.

In 2004-5, the Penarth Arts and Crafts Ltd (PACL) began to collaborate with the local council with a bid to refurbish and revive the Pavilion and consequently regenerate the area. The current proposed building, which is aimed to re-open in 2013, will serve as a multi-purpose building for the community. It will offer a range of activities such as films, exhibitions, festivals and other various events. It will also include a bar, restaurant and café as well as function/meeting rooms for use by the public.

In terms of funding, it has currently obtained approximately half of

the required funding, with continuous efforts to continue raising

more. The Pavilion Project, thus far, has been awarded £99,600 from

the Heritage Lottery Fund in November 2009, £800,000 promised by

the Vale of Glamorgan Council, with another bid to the Heritage

Lottery Fund for £1.68 million recently being granted.

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narth_Pavilion_project/# [accessed 7 March, 2011]

Source: Author

Source: http://penarthpavilion.co.uk/

Section 3.3 Sources of Inspiration – Piers/Pavilion

A pier is defined in the dictionary as being, "a platform on pillars projecting

from the shore into the sea." (Oxford English Dictionary, 2011).

It is this unique characteristic which presents piers and the activities which take place upon them with such a synonymous relationship with us as humans. In their earliest form, piers were a connection between the land and the sea, which is why, as an island nation, the UK has become so encapsulated with piers and the feats of engineering achieved in the previous two centuries.

This section will explore some of the piers and pavilions around the UK and further afield which are successful, have a planned future or have demised due to lack of investment. This is to gain an understanding of what makes a pier successful, what is needed to turn a pier into a success and what will happen if these landmark buildings over Britain"s coastline aren"t saved.

For a full summary of all of the case studies presented here, please turn to AppendixA.

Lost Piers

Rhyl Pier was once the crowning jewel of one of the primary seaside resorts of North Wales. Built in 1867, Rhyl pier was originally a pleasure

pier with a steam railway track linked to Liverpool. A pavilion was added to the pier in 1891 which provided a base for inside entertainment.

The history of this pier from then on was a long line of ship impacts, storms and fires (beginning with a fire which burnt the pavilion down just 10 years after it opened). Although limping on until 1966, the pier was finally closed for safety reasons. It was demolished in 1973 due to lack of funding to repair damage and worries over what damage would occur once the pier re-opened.

This is an example of a pier designed with the best intentions which, for some time, served the local community and tourists well. However, due to a string of bad luck and lack of investment, the pier was lost to the generations to come forever.

Rhyl has continued to be a major seaside town in the North of Wales until the present day. However, with the growth of international tourism, this town has declined and, without a pier, has no major focal point which harks back to its past which the town can be rebuilt on.

A suggestion, in terms of energy generation, has been to build a tidal lagoon which could double as a harbour extending from the seafront in

Rhyl, but this is simply a pipe dream based upon something which was already there. The concept of using a tidal lagoon as a source of electricity is given specific consideration with regard to Penarth Pier in Chapter #.

Aberavon Pier was originally built at the steelworks town of Port Talbot, near Swansea in South Wales in 1898. Designed as nothing more than a breakwater by the Port Talbot Rail Company, the pier was eventually opened to the public as a pleasure pier in 1902 due to the potential for the pier to earn enough revenue to pay for its upkeep.

Following a number of decades of minor restorations, the pier suffered terribly from the lack of public or private attempts to take advantage of a prime site on what is, locally, a fairly popular tourism site throughout the year. The pier was finally abandoned due to lack of enthusiasm in 1964 to become nothing more than a breakwater once again.

What is clear is that Aberavon pier is unrecognisable today. What is slowly becoming an exciting part of the South Wales coast has no pier to build the local tourist economy around – hence a much uncoordinated feel to the location when visiting. Returning to Penarth, at present, the pier is still an integral part of the esplanade area, but, not exactly, but in the same vein,

Penarth is losing out because the pier is not operating at its full potential.

Section 3.3 Sources of Inspiration – Piers/Pavilion

Successful Piers

A number of successful seaside towns around the UK all have the iconic landmark of a pier which distinguishes them from other similar towns. Towns such as Blackpool, Bournemouth and Brighton are all enhanced as tourist destinations by the reputation for having a pier along the seafront. With respect to Penarth, these towns are clearly on a completely different scale in terms of tourism potential, however, the smaller town of Weston-Super-Mare provides a more direct comparison on a scale not too much greater than Penarth.

Weston-Super-Mare (W-S-M) Grand Pier as a pier, along with its neighbour, is an integral part of the seaside experience when visiting the West Country town.

The pier was opened in 1904 as a pleasure pier, with a pavilion included in the design. During the 1930"s the pavilion was destroyed by fire, but was replaced and preceded a number of large scale investments which added attractions to the pier and pavilion to increase the appeal of the

development to the wider audience.

Following its sale to private owners in 2008, the pavilion was once again destroyed by fire. But following a near £50million investment, mainly of private money, a contemporary pavilion has now been completed and opened in October 2010. The pier is now looking forward to its first summer season with a list of events to enhance the reputation of the town. What is also noticeable about the pier is its distinct relationship to a modern image. An aspect of sustainable tourism is a clear focus on the intended audience and the new pavilion expresses this desire for a young generation to become involved in high-excitement activities.

This pier exemplifies the endless number of problems and disasters which can befall the maintenance and running of a pier exposed to the sea, but it also illustrates what can be achieved if enough money and effort is invested into a project with the potential to remain an important part of the towns" economy.

The 3 Piers at Blackpool are a set of piers which enhance Blackpool"s reputation of being the "LasVegas of the North".

Built over the course of roughly 30 years, the piers are a symbol of the

steady increase in seaside tourism in Victorian England as the Industrial Age gave working class people the opportunity to visit other parts of the country to spend excess income they had earned.

Similar to Penarth, the piers at Blackpool (although not the main attraction) are central to the entertainment facilities on the seafront area – where the town applies its primary trade.

Over the years, the tourism trade in the UK has steadily decreased due to cheaper holidays abroad, cheaper air fares (Milmo, 2008) and individuals earning more money. However, whilst some seaside resorts have declined as a result of this, Blackpool and the examples to follow has remained at the forefront of British holiday destinations for those who elect to stay in the country – a number growing due to the economic climate according to the "weak pound" claimed by VisitBritain (Paskin, 2010).

What it seems to have retained Blackpool"s and other similar seaside resort standings as prominent tourist destinations is the continued financial investment by private firms and local councils in retaining these facilities. As a result, the piers are well kept and in optimal position to take advantage of business returning to an area – something not quite being

continued in Penarth.

Blackpool South Source:

John Bennett

WSM Grand Source: Geof

Sheppard

Section 3.3 Sources of Inspiration – Piers/Pavilion

Bournemouth Pier is a pier with numerous

links. It has a pavilion at its landward end, a

theatre at its seaward end and very close ties

with the Bournemouth International Area

located over the road. The pier itself is a

result of numerous reconstruction projects

which took place during the late 19th and

early 20th Centuries. The theatre on the

seaward end was added in the early 1960"s

and subsequently the pier has undergone

rigorous restoration and refurbishment when

needed to retain its and the towns status

among seaside resorts.

What can be learned from Bournemouth is that on a beach which is the longest in the UK (7 miles) the pier provides a central location, on which further attractions can be built around and based upon. The numerous and deep-rooted links between the pier and the facilities surrounding it provide a singular identity for the area and Bournemouth as a whole. The esplanade in Penarth at present is a collection of restaurants and apartments which don"t have many links or complement each other. The renovation of the Pavilion and subsequent investment in this part of the esplanade is critical to establishing the identity that Penarth wants to provide for its residents and project to the wider public.

Following numerous refurbishments of the pier and continuous growth in the piers prosperity, disaster struck when a barge crashed into the pier 1973. In 1986, the theatre was dismantled by its new owners. Although Brighton has never seen the restoration of a theatre on the pier, continuous investment has seen new attractions being added every few years to push the pier away from being a show pier to a fairground

attraction. Once again, Penarth can learn from this project. The former use of the Pavilion was as a ballroom and then a nightclub – however, existing proposals aim to give the building back to the people of Penarth. The focus and use of the Pavilion will therefore clearly change to facilitate the needs of a 21st Century community. What is clear is that whatever uses the Pavilion houses in the future, these must be supported wholeheartedly by the stakeholders and community for the building to succeed.

Great Yarmouth has two very contrasting piers which were both completed and opened within 2 years of each other. The earlier Wellington Pier was a simple pleasure pier until council investment in 1900 built a pavilion which was used as a theatre. The Britannia Pier was built just two years after and has housed no less than 4 pavilions over its lifetime and 2 ballrooms.

At present, both piers are owned by a company which has run them both as a play off each other. By managing the amusements on offer on each pier – the Britannia Pier being the base for a well-attended theatre – neither pier builds up too much business to push the other into financial trouble. What is clear is that each pier has a standard set of attractions to

enable them to complement each other.

In Penarth, the existing situation with regard to the esplanade has the potential to place different attractions in different places. The lesson to be learned from Great Yarmouth is that by managing what is on offer to the public, the esplanade shouldn"t become too crowded with what could be a counter-productive over facilitating the area.

Bournemouth Source:

principiadialectica.co.uk

Brighton Palace Pier was opened in 1899 to replace an existing pier deemed too small and inadequate to support the growing ambitions of the town. A 1,500 seat theatre was also an important addition to the new pier.

Brighton Source: freefoto.com

Section 3.3 Sources of Inspiration – Piers/Pavilion

In summary, the successful piers presented here all have something in

common – they all have a local community which embraces the "touristy" nature of the town. Dables (2000) explains this with the numerous small businesses which set up in response to the facilities on offer. Hence, without the support of locals to maintain, run and essentially support the buildings throughout the year (especially in the quieter winter months), these tourist destinations would become ever reliant on external forces to sustain them. As a key notion shared by sustainable tourism and sustainable development in general, a very important factor to remember is that although the will to draw in outside support is always at the forefront of schemes like Penarth Pavilion and subsequently, the Esplanade, without local support, the businesses will become economically unsustainable.

Piers with Plans

Some piers around Britain are taking the lead from W-S-M Grand and investing in their future. The plans vary in size, but have relevance to Penarth in showing how other projects at the same point in completion are tackling the challenge of rejuvenation.

Mumbles Pier near Swansea is a local example of a pier which,

following recent decline has plans to upgrade significantly. The pier was originally built in 1898 as the terminus for the Swansea-Mumbles railway line. It quickly became a pleasure pier attracting residents of nearby Swansea and further afield.

Towards the latter 20th Century, a significant budget was set aside by the owners to pay for regular maintenance; however, with the slow decline in local tourism, this has not been able to halt the slow decline of the pier and its buildings – even with an extensive entertainment complex. The current plans for the pier are to invest £39million (mostly private money) in demolishing the existing complex and rebuilding a new family entertainment complex in addition to a new hotel and conference centre adjoining the pier. The proposals are in fact a part of a larger regeneration scheme for the whole of Swansea Bay, with links to the Marina and other developments. The Mumbles proposals aim to attract not only tourists, but passing trade and other markets by building this range of facilities.

The proposed restoration is to go ahead in 2013, and is an example of a local attempt to revive an area around a pier. What is clear is that the pier has been designed to link directly to the adjacent attractions and build the

Mumbles area of Swansea as a singular asset to the city of Swansea.

Of all the piers mentioned in this chapter, Colwyn Bay Victoria Pier probably has the most in common with Penarth. Although at an earlier stage of project than Penarth, the plans can draw a number of parallels. The Victoria Pier was built in 1899 with a 2,500 seat pavilion/theatre crowning it. This has since been replaced twice due to fire damage. Over the years since, the pier has suffered from gradual deterioration which has not been halted by insufficient investment. The pier has also fought two attempts to demolish it, which have been overturned due to pressure from locals.

At present, a pressure group is fighting to retain the pier following council plans to demolish it. Now free from the restraints of private ownership, the group aims to apply from public funding from similar sources that have been seen in Penarth to renovate the pier. At the time of writing, the council has officially announced its intentions to demolish the pier at some point in the future – listed building status and a few determined locals are all that stands in its way.

Great Yarmouth Source: greatyarmouth.

co.uk

Mumbles, Swansea Source:

themumblesbook.co.uk

Section 3.3 Sources of Inspiration – Piers/Pavilion

This sad story of this pier is one which should give hope to Penarth.

Penarth Pier could have been in the same situation as Victoria Pier

had significant investment been available to stop it from deteriorating

as badly as Victoria. What is evident is that without the support of

the people of Conwy, Victoria Pier would not be still fighting for

existence today. Thus, the eventual success of Penarth Pier is partly

due to tourism, but ultimately up to the people of Penarth – hence a

project which should be considerate of the views of the people.

This is no clearer than in Trossachs (Caffyn, 2000), Scotland.

Following a regeneration strategy in an attempt to rekindle the

tourist trade which the region was dependant on. What was found

was that two years after the beginning of the strategy, the handover

to the local community uncovered holes in research and assumptions.

Although rigorous efforts were made to then converse with the local

community, views that were given were reactive to what had been done rather than proactive to what would be useful. As the future users of the Pavilion and Esplanade, an early and routine engagement with all social bands of the local community is an essential part in the process of beginning a scenario of sustainable usage.

Pavilions

As the key buildings crowning the piers they are built on, pavilions, even on land, have a rich history in British architecture – with a long standing presence in British society.

The De La Warr Pavilion at Bexhill-on-Sea is a prime example of pavilions and seaside towns. As one of the first, well published modernist buildings to be constructed in the UK, the De La Warr Pavilion has significant architectural merit in addition to its deep-roots in the local community. Designed by Erich Mendelsohn in 1935, the De La Warr Pavilion was the subject of a design competition overseen by RIBA. Having been at the heart of the local community for a number of decades, the pavilion today is much like it was originally intended to be. The building originally held an auditorium, exhibition space (inside and out) as well as a

restaurant.

Following a long decline towards the end of the 20th Century, the building was lifted by a Grade I listed status in 1986 and a £6million renovation project in 2005. It now boasts a 1000 seat auditorium in addition to an art gallery, exhibition space and restaurant/café. This is all in addition to a new piece of modernist public sculpture which was commissioned especially for this project.

The key to the restoration of the De La Warr Pavilion is its now restored importance to the local community. A building, with high architectural standing, the De La Warr Pavilion has been carefully restored and reenergised to have added significance to locals. It is now an attraction for visitors to the town on its own, but with the location – it has flourished once again. The strangest part of this renovation project – if there can be one – is the fact that the building has been restored to provide activities which lead to its decline – however, in the 6 years since its completion, it has not showed any signs of losing popularity.

De La Warr Pavilion Source: dlwp.com

Colwyn Bay Source: rhyl-life.com

Section 3.3 Sources of Inspiration – Piers/Pavilion

Porthcawl Grand Pavilion is located just a short drive along the coast from Penarth and is an example of a slightly larger seaside town whose reputation only spreads locally. The pavilion was built in 1932 as a theatre and conference centre and has remained a prominent figure on the esplanade at Rest Bay on the South Western side of the town. Although no significant renovation projects in its long history, the pavilion has benefited from the reputation it has built up locally, with no significant competition in terms of what it offers the town.

The pavilion today hosts a number of shows involving notable acts and is the centrepiece of the annual Elvis Presley Festival – known throughout the world. By also offering adaptability for conferences and parties, and through rigorous maintenance and upgrades to keep the building in a condition to make the most of opportunities which

present themselves, the pavilion has remained at the heart of the town"s economy.

What can be achieved by Penarth is some of the principles which have been applied to the pavilion to keep it in its prominent position.

What is interesting for the pavilion in Penarth is the chance to have a Unique Selling Point. What does occupy the pavilion upon completion must offer customers something that can"t be found anywhere else in the town or further afield if possible.

Brighton Royal Pavilion is located a short distance from the seafront and the pier in Brighton. As a building of significant architectural importance (at the beginning of the British Empire) and history to the people of Brighton this is possibly the biggest tourism boast the town has. Originally built in 1787 as a summer retreat for King George IV before he came to the throne, the pavilion remained in Royal possession until its sale to the people of Brighton by Queen Victoria in 1850.

Following this, the town used the Pavilion for a number of activities including an assembly hall and a military hospital during the First World

War. However, following the return of many of the original fixtures and fittings by Queen Elizabeth II in the 1950"s, the Pavilion was restored and opened to the public as a tourist attraction. It now permits around 400,000 visitors a year (Antram and Morrice, 2008).

Although on a vastly bigger scale than Penarth, what should be mentioned is that the project was based around an historical building which had been central to the town for hundreds of years. The Pavilion in Penarth holds a similar standing in the town. Being a building which is advertised as the symbol for the town, and the historical significance of the building should not be lost in the renovation.

Overseas Piers

Although typically British, piers have spread across the world with a number of variations and interesting themes which make them unique to their location.

Chelsea Piers were built in New York in the early 1900"s along the Hudson River to receive cruise liners from Europe and around the world. Having been the destination of H.M. Titanic on its maiden voyage and the site where the US Olympic team departed for the 1936 Berlin Olympics,

the piers were the centre of a bustling complex around the Hudson

incorporating pleasure and industry.

Porthcawl Pavilion Source:

theatresonline.com

Brighton Royal Pavilion Source: zionchapel.co.uk Chelsea Piers Source: earthdocumentary.com

Section 3.3 Sources of Inspiration – Piers/Pavilion

Over the years however, this part of the river slowly became quiet

following the 1929 Wall Street Crash. After struggling into dereliction in

the following decades, the piers were finally awakened by the possibility of

a large scale redevelopment in 1992.

By 1995, over $100million had been invested in to complete restoration

and alteration of the Chelsea Piers into the premiere sports complex in

New York. Including full size facilities to play basketball, ice hockey and golf

– in addition to a spa and health club, this development has redefined what

was becoming an eyesore on the banks of the Hudson.

Although hard to draw comparisons between New York and Penarth, this

project (more than most) epitomises the potential to completely revitalise

an area with the correct investment and backing of the community.

The organisation has reached out to the community by using a community relations program with extensive public access to the site free of charge (similar to Penarth Pier during out of summer months), sports scholarships which are granted to local children to use the facilities and numerous "passports" which are donated to charities to encourage locals to use the facilities. The pier has also built up a relationship with the local community by placing members on a number of local panels such as the 23rd Street Association. By having such an integral role in the local community – the pier has become an interlinked community of its own.

This project has not only created a hub to develop a new community in what is a large city, but has also been able to draw people from all over New York and beyond due to the reputation which has been built on what was there, and what is there now.

Scheveningen Pier is located in the seaside resort of Scheveningen, close to the Dutch city of Den Haag. The pier is one of the landmark attractions of what is a well-known part of the Netherlands. Originally built as a pleasure pier with fishing facilities, the pier has evolved over the years onto a two storey pier with further jetties, and a hotel and

entertainment complex.

Following its establishment as a prominent feature of the seafront in Scheveningen, the pier has retained its former character whilst simply adding more. This is a lesson which should also be listened to by Penarth. Whilst the long-term intentions are to revitalise the entire esplanade area, fishermen and other individuals who use the pier at the moment should not be discounted from the proposals – they should be included in anything which changes the pier due to the fact that they are the main reason the Pavilion hasn"t been demolished yet.

Santa Monica Pier, in California USA, is quite possibly the most famous pier in the world. Opened in 1909, the pier was upgraded from what originally was a structure to carry sewage pipes out beyond the breakwater. As the pier became more popular, a ballroom was built on it to accommodate the growing tourism trade that was befalling the Golden Coast.

Over the years, it has undergone numerous maintenance projects and has had facilities for fishing, boating and a fairground added to it to cover a wide range of activities. Although, once again, much larger than Penarth,

the pier does attempt to present a tourist attraction to facilitate the needs of a wide range of visitors to the city.The publicity of the pier is probably one of the key features, although not a great deal more significant than any other pier, Santa Monica has been featured in a number of films and video games sold outside the US, making it a landmark attraction for no other reason than the wide recognition it has attracted. Penarth already uses the Pavilion as a publicity tool and shows the opportunity that renovating the Pavilion has in the attempt to attract more business from further afield and change the general image of the town.

Scheveningen Source:

panoramio.com

Santa Monica Source:

cart66pf.org

Section 3.3 Sources of Inspiration – Piers/Pavilion

Conclusions

In conclusion, these buildings all demonstrate the different challenges faced by piers and pavilions nationally and on a global scale. Each has taken on the problems faced with building on the coast – the weather, sea traffic, crime,

economic issues and the communities which sustain them.

Many lessons can be learnt from these developments and numerous others. What is clear is that to prevent these buildings from disappearing, is that any redevelopment should clearly consider the following aspects – how can the building be protected from natural and intended harm? How can the building become an economic hub for the local economy? and How can the building be integrated into the local community, who will have the task of maintaining and supporting the building throughout the year?

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Section 4

Sustainability Assessment

Section 4: Sustainability Assessment

Summary

The task of renovating Penarth Pavilion out of its current deteriorated state is currently projected to require a sum of

money exceeding £4 million (PMT, 2010). With this sum in mind, the client has approached a number of public bodies in

search of the capital investment to facilitate this scheme – including the Welsh Assembly Government and Heritage Lottery

Fund. As part of the Welsh Constitution (WAG, N/A), any construction project requiring public funding must achieve a

minimum BREEAM (British Research Establishment Environmental Assessment Method) certification of "Excellent". However,

as a historic Grade II listed building, Penarth Pavilion is exempt from this.

However, measures must be taken to ensure the building conforms to institutional standards and construction regulations to

improve the building"s performance. Seeing that it is about to be renovated, it is an opportunity to address the sustainability

of the building. The idea of sustainable development is to equally sustain all three aspects of sustainability; namely economics,

society and the environment. The economics refer to namely cost; initial, running and whole life cycle cost of the building as

well as economic benefits and return the building provides for Penarth. The social side closely relates to people and the way

of living of the specific demographic considered. The environmental aspect looks into the resources, energy efficiency,

environmental management, etc. of the building as a whole. To ensure that sustainability is not just acknowledged, but integral

to the project, this section looks at what the major issues pertaining to the sustainability of the project are. From there, the

report has been divided into three chapters to deal with, not just the 3 characteristics of total sustainability, but the wider

integration of the Pavilion into its immediate environment.

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•Welsh Assembly Government (N/A) - http://wales.gov.uk/topics/sustainabledevelopment/design/standards/?lang=en Accessed 10/4/11.

Author: HA:EG:MA 80:10:10

Section 4 Sustainability Assessment

Introduction:

A Sustainability Assessment is a comprehensive, far sighted approach and

tool used to make decisions that would have a positive contribution to

sustainability. While assessing the sustainability of design generally, the

most important consideration is the environmental and energy concern.

But sustainability is a holistic combination of the social sustainability,

economic sustainability and environment sustainability. Further, Culture is

also considered as the 4th ingredient of the sustainability diagram.

The Sustainability Diagram:

The idea of sustainable development or sustainability is to equally sustain all three spheres of economics, society and the environment. The social sphere closely relates people and the way of living of the demographic considered. The economic deals with the cost – initial, running and the life cycle cost of the system considered. The environment is obviously related to the resources, energy efficiency, environmental management, etc. The overlap of these spheres fills the spaces between to ensure the approach a holistic one ... this allows the system to be interlinked and work as one whole towards sustainability.

Existing Assessment Methods:

As sustainability has gained importance and popularity, there are already a few reasonable assessment method and tools which have been developed to assist in ensuring sustainable development. As far as the construction industry is concerned there are standardised methods / tools to asses any new construction or development. Few of such assessment tools include the BREEAM assessment and rating, LEED Rating, SBEM modelling, DEC

DEC rating, Integrated sustainability assessment toolkit (ISAT), Strategic environmental assessment(SEA), Passive Haus, etc.

These assessment tools are specific to various building types, countries, etc. and each method demonstrates an approach to an assessment that can include various factors or dimensions. The frame work for sustainability assessment tool/method could be categorised on:

• Temporal characteristics – assessing the past or predicting the future like policy change, etc.

• Focus – the coverage area

• Integration – fusing of economic, social and environmental aspects.

These are further categorised in the areas as

• Indicators – integrated and non integrated,

• Product related assessment tools – material, energy flow, life cycle, etc.

• Integrated assessment

This framework further branches into other categories specifically based on the nature of the project assessed. (http://www.earthscan.co.uk accessed 15th April 2011)

The diagram below shows a skeleton structure of the framework:

Source:

http://courseware.finntrack.

eu/learners/busmodels.html

Source:

http://www.sciencedirect.com/science?_o

b=MiamiCaptionURL&_method=retrieve

&_udi=B6VDY-4KXDWJR-

2&_image=fig1&_ba=1&_user=129520&_

coverDate=01%2F15%2F2007&_rdoc=1

&_fmt=full&_orig=gateway&_cdi=5995&

_issn=09218009&_pii=S09218009060036

36&view=c&_acct=C000010758&_versio

n=1&_urlVersion=0&_userid=129520&m

d5=f2464456cdc1ace2b96c7d581e3dabb

4 accessed on 15 April 2011.

The highlighted parts of the diagram are

relevant to the project of the pavilion and

have been considered for the assessment.

The building being a listed building has

the restriction of not being able to make

drastic changes, in order to preserve the

culture and heritage dimensions of the

pavilion and the pier.

Section 4 Sustainability Assessment

As stated earlier, with relation to the building industry, a few assessment tools

(in the context of UK) include BREEAM, DEC etc. These are used to define

the sustainable criteria for a new building but similar approaches include:

BREEAM:

BREEAM is an assessment method used to rate building for their

sustainability and was first launched in 1990. the document sets standards for

best practice f or sustainable building, construction and operation. It

recommends measure for the environmental performance of the building.

it has established bench marks for a broad range of categories in making the

building sustainable. This document uses a straight forward rating system that

rates the performance of a building for various criteria and awards the

respective assessment rating. The BREEAM excellent is the highest rating

presently.

Display Energy Certificate (DEC)

A Display Energy Certificate is required for any public building over 1000 m2 from October 2008. DEC"s were introduced to improve the energy performance of a building. The DEC label is to be prominently displayed in the public realm of buildings. It is a reflection of the actual energy consumption of a building and is supplemented by an advisory report, when it is annually renewed.

Strategic Environmental Assessment (SEA)

This focuses on collecting and analysing in formations for possible environmental problems and their future effects. Planning for them throught mitigation and monitoring the environment effects of a project during its execution.

In Wales, the bodies to be consulted for the SEA assessment process includes:

- Cadw
- The Countryside Council forWales (CCW)
- The Environment Agency (EA)

The four stages working of the SEA process, requires consultation from the

above bodies.

"1. Screening: determining whether a plan or program requires SEA.

2. Scoping: deciding on the scope, extent and level of detail of the information

which must be included within the Environmental report.

3. Reporting: consulting on the Environmental Report and accompanying draft

plan or program.

4.Adoption: information to be made available on the plan/programme adopted."

"CADW: (http://www.cadw.wales.gov.uk/ accessed April 15 2011)

The Welsh Assembly Government, is responsible for conserving and promoting the

historic environment in Wales. CADW provides advice on matters relating to the

historic environment and elements of the cultural heritage and historic landscape

listed buildings.

Environment Agency (http://www.environment-agency.gov.uk/default.aspx

accessed 15th april 2011)

The Environment Agency in Wales (EA), provides advice for a wide category of topics.

This includes water quality and resources, soil, waste, contaminated land, air quality,

climatic issues (including strategic flood risk), biodiversity (especially flora and fauna

associated with the aquatic environment) some material assets including our

infrastructure and some aspects of the cultural heritage and landscape.

Countryside Council for Wales (http://www.ccw.gov.uk/?lang=en accessed 15 April 2011)

The Countryside Council for Wales (CCW) can provide advice on a wide range of topics relating to the natural heritage of Wales (terrestrial and marine). It will normally give particular attention to the landscape, historic landscape, biodiversity, flora and fauna and issues affecting soil, water and climate change."

Simplified Building Energy Model (SBEM): (http://www.ncm.bre.co.uk/ accessed 15 April 2011)

The SBEM is a computer modelling programme for analysing a building"s performance in energy consumption. The model calculates CO2 emissions and energy use of the project,w.r.t building form, HVAC etc.

Section 4 Sustainability Assessment

All these resources have been successful in assessing new buildings and in maintenance of historic precincts. But there is still lacks a clear holistic assessment approach for renovation of a historic listed building.

What is a historic listed building ?

"They [historic buildings] should not be retained as artefacts, relics of a bygone

age. New uses should be allowed in the buildings and sensitive adaptations facilitated, when the original use of a historic building is no longer relevant or viable." - House of Commons ODPM: Housing, Planning, Local Government and the Regions Committee The Role of Historic Buildings in Urban Regeneration Eleventh Report of Session 2003–04Volume I

Listing a building helps in the understanding of a shared history of a place.A building is marked and listed for its "architectural and historic interest".

"All buildings built before 1700 which survive in anything like their original condition are listed, as are most of those built between 1700 and 1840. The criteria become tighter with time, so that post-1945 buildings have to be exceptionally important to be listed. A building has normally to be over 30 years old to be eligible for listing."

Listed buildings are graded as below:

"Grade I buildings are of exceptional interest, sometimes considered to be

internationally important; only 2.5% of listed buildings are Grade I

Grade II* buildings are particularly important buildings of more than special interest; 5.5% of listed buildings are Grade II*

Grade II buildings are nationally important and of special interest; 92% of all listed buildings are in this class and it is the most likely grade of listing for a home owner."

(http://www.english-heritage.org.uk/caring/listing/listed-buildings/ accessed 15th April 2011)

Listing identifies buildings with distinct architectural and historic interests and where changes in them have to be considered meticulously. These buildings can be altered and extended but within a set of government planning policy. The local authority abides by the guidance to take decision regarding changes and alterations concerned with such buildings, balancing the site"s historic significance with its new issues like space function, condition or viability. According to part L regulations for buildings in use, a few considerations for listed buildings include, reasonable improvement of energy efficiency without prejudicing the character of the building, or increase the risk of long term deterioration of the building. Even while altering the fixed or non fixed services,

care has to be taken and any change due to ducting or puncturing the fabric has to be very carefully considered and appropriate planning guidance has to be followed.

Apart from the building regulations code, other standards could be referred to make an informed decision on sustainability for the building under consideration. The CIBSE guides and the British Standards gives us examples of how to approach a sustainable retrofit to buildings. Retrofits for energy efficiency should be integrated with other drivers and considerations related to building refurbishment. The other considerations, for example, includes health, flexibility, adaptability, occupancy comfort, maintenance and other such issues. This improves the sustainability and improves the performance of the building. Having the ideas of assessment methods and tools existing for general buildings and understanding the concept of a listed building, provides us with the limitations, opportunities and adaptability for a sustainable refurbishment and renovation for the building under consideration [The Penarth Pavilion]. The fabric of the building or the identity of its face value cannot be compromised, the use of any alternative material for replacement of deteriorated components of the fabric, shall have to be closest possible to the original material or the

original material itself.

Retrofit for energy efficiency should not be undertaken in isolation from the other drivers and considerations relating to building refurbishment.

Examples include occupancy comfort, health and productivity, future flexibility and adaptability of services and maintenance and upkeep issues.

•Listed buildings: [Part L 2B – energy efficiency, repairs and other considerations, PPG-5, British Standards] The situation is even more different when it comes to listed buildings.

•Limitations – materials, technology, cost and appearance. Highlighting and summarising what these specific issues are for the building fabric services = environmental sustainability....

•Opportunities: social potential, economic opportunities. Perhaps even more related to social and economic sustainability.

Our Goal

As a Grade II listed building, Penarth Pavilion falls into the category of buildings that don"t require BREEAM classification to satisfy public

funding requirements. However, measures must be taken to ensure the building conforms to institutional standards and construction regulations. To ensure that sustainability is not just acknowledged, but integral to the project, this report has been divided into three chapters to deal with, not just the 3 characteristics of total sustainability, but the wider integration of the Pavilion into its immediate environment.

With this in mind, the BREEAM Assessment Method provides a framework for how this assignment can tackle the issues of environmental sustainability, but also illustrates gaps where sustainability can be explored further to balance the three sides of the triangle in addressing social and economic issues.

The technique of construction is also expected to be unaltered. This means the cost of the process could be significantly higher than for a normal building, but helps maintain the significance and importance and the value of the building. Simultaneously, the opportunities or potentials of this project in terms of social and economic sustainability in the long term is significant. The project can help in regeneration of the site and its vicinity bringing back the population

and popularity it had once in its peak times. The more wider use of the building and regular usage by the community implies continuous income generation and thus continuous maintenance of the building and could serve as a social space for the community. Summarising this analysis below:

For a historic building the, renovation or revival of the building can mean a lot in terms of sustainability and the community/ space it is in. It can have a significant impact on the locality and the culture of the place. A few criteria considered in general for sustainability assessment of the renovation are as follows:

- Consideration of planning rules and listed building regulations.
- Does the preservation/conservation or renovation enhance or preserve the character of the area and the setting.
- Contribution to management of historic asset and historic environment.
- Promotion of quality urban design.
- Promotion of environmental economy and heritage led regeneration
- The repair and reuse of the building. (best use of existing building and physical infrastructure)
- Indication of significant cumulative or synergistic effects over time.

Listing is a tool to identify those buildings that should be celebrated as having architectural and historic interest, and where changes should be carefully considered. Listed buildings can be altered, extended and sometimes even demolished within government planning guidance. The local authority uses this consent process to make decisions that balance the site's historic significance against other issues such as function, condition or viability.

Section 4 Sustainability Assessment

The structure for BREEAM an the interpretation of it used for this report is as follows:

Hence, the three principle chapters of this report are as follows:

1. Socio-Economic Sustainability – This chapter is concerned with the element of sustainability that is not measured as heavily by environmental assessment methods such as BREEAM and LEED. However, social acceptance and economic sustainability are two of the most critical elements which make the designed potential of a building reality. By focusing on the primary space in the Pavilion – the main hall – a range of operational scenarios will be discussed and tested to determine a

recommended set of activities for the Pavilion. This will be supplemented by examination of the auxiliary spaces and activities associated with the existing proposals and other ideas suggested by local residents in Penarth.

2. Environmental Sustainability – To build on the Sustainable Options Report already in existence as part of planning documentation, the features which could provide a sense of environmental sustainability will be investigated and a range of options presented. By investigating energy efficiency and renewable energy sources, this report will educate the reader about the possibilities and details about some of the aspects which have already been introduced to the client by the design team.

3. Esplanade – A topic which is often overlooked in renovation projects is the wider environment. Unless a larger regeneration scheme is proposed, individual projects can sometimes be caught up within the boundaries of the site. To expand this project, this chapter will investigate the regeneration of the Esplanade in a sustainable manner so the Pavilion becomes a catalyst for new life in the area rather than a single project. A local example is the renovation of the Washington Gallery – now the home of Penarth Arts & Crafts Ltd. which sparked a "domino effect" of renovation and cleaning projects along the high street in Penarth

town centre. By using this as inspiration and including the Esplanade as part of the

long term operating strategy of the Pavilion – the joint success of the two entities

could become a long and prosperous one.

Section 5

Modelling with Ecotect

Section 5: Modelling with Ecotect

Using Autodesk Ecotect to model various aspects of the building to inform decisions on various options

explored.

Due to the Pavilion"s historic value, as well as architectural, it is important to refurbish it to maintain its identity

as much as possible. However, since the building is being refurbished, it is an opportunity to improve the building"s

performance whilst respecting the building as it stands. By improving the performance of the building, the occupant comfort

will also improve as well as the energy consumed by the building, ultimately allowing it to be used by the public more. The

process of refurbishment can be an ongoing process which occurs in stages while the building is still in use, or it can be

completely stripped down and redone. In this case, with the Pavilion the latter would be more suitable since the current

state of the building is in great need of repair. In order to properly improve on the building"s performance, the energy

consumption of the building must be monitored before and after refurbishment. In this case, it was seen as more

appropriate to model the energy demand prior refurbishment and use the computer model to test different options to

compare performance. This way, the model can be used as a guide to narrow down some of our options. (Burton &

Kesidou, 2005)

To model the building"s performance, a sustainable design analysis software was used - Autodesk Ecotect – as a

tool to assess various aspects of the building which affects its performance. On evaluating various socio-economic

scenarios, as well as materials to use to improve the fabric, we have assumed likely occupancy patterns and energy demand

for any additional specialised equipment. It is important to define these parameters first in order to get an estimate of the

required electrical and thermal demand for the building. Using this bottom-up approach we are able to get an idea of the

passive gains and losses as well as the subsequent heating and cooling loads required to keep the building in a comfortable

state.

References

•Burton, S. and Kesidou, S. (2005) Refurbishement of old buildings for sustainable use IN: PALEC Conference, Santorini, Greece, May.

[ONLINE] available at: http://www.revivaleu.

net/infobnk/docs/PALEC%20Conference%20Paper,%20Santorini,%20Greece,%20May%202005.PDF [accessed 15 January, 2011]

•Peacock, A., Banfill, P.F., Turan, S., Jenkins, D., Ahadzi, M., Bowles, G., Kane, D., Newborough, M., Eames, P.C., Singh, H., Jackson, T. and Berry, A.

(2008) Reducing CO2 emissions through refurbishment of non-domestic UK buildings. Improving Energy Efficiency in Commercial Buildings

(IEECB) Conference, 10 - 11 April 2008.

Author: LA:Group 90:10

Section 3 Modelling with Ecotect

Examples of the results generated by the Ecotect modelling analysis are

displayed here (for detailed analysis results – see Appendix D & F). There are different graphs with different formats and scales displaying the required information. The graphs (a) and (b) are results of analysing the Pavilion in its current state. Graph (c) is taken from the analysis of one of the investigated socio-economic scenarios; casino/gaming activities. A brief explanation of each graph will be given along with the information it is used for:

a) This graph shows the estimated monthly heating/cooling loads (in watts) of the Pavilion as it is now over a typical year. The central axis has a value of 0 meaning no heating or cooling is required in that space to maintain a comfortable environment. However this is averaged out over the whole month meaning there may be fluctuations within each month which amount to that average. The same goes for anything above the central axis – the estimated heating load – and anything below the line – the estimated cooling load. This graph indicates the Pavilion requires a considerable amount of heating for over half the year.

b) The second graph shows the fabric gains of the building i.e. losses (or gains) of heat energy through the actual building skin such as the walls, floor, roof and windows and doors. This is also shown over the year and

uses the colour scale on the right to indicate approximately how much heat energy is lost (towards blue) or gained (towards red) throughout an average day in each month. It can be seen from this graph that most of the gains occur later on in the day which is possibly a result of the concrete fabric acting as a thermal mass; storing the heat and releasing it slowly.

c) The final graph illustrates the passive gains occurring in the building from conduction through the fabric and internal gains from equipment or occupants in the building, to loss of heat through ventilation and heat gain from the sun. Similar to the first graph, the central axis is 0, above which there is heat gain and below which is heat loss. This is expressed in Wh/m2 (on the left) and as a percentage (on the right). This is a good tool to see whether or not the gains and losses balance out. In this example, the internal heat gains (in blue) greatly affect the heat balance in the space.

(a)

(b)

(c)

Section 6: Evaluation of Socio-

Economic Scenarios

6.1 Evaluation Criteria

6.2 Multi-purpose Space

6.3 Ancillary Functions

Section 6: Evaluation of Socio-Economic Scenarios

Summary

Following the critical sustainability assessment section of this report, it is clear that, in addition to the environmental sustainability

measured by institutions such as BREEAM (British Research Establishment Environmental Assessment Procedure), the social and economic

sustainability of a building are just as important when attempting to achieve total sustainability. While environmental sustainability has been

growing as a political issue on a global stage in direct action to prevent the effects of Climate Change, issues surrounding community

acceptance and economic self-sufficiency have plagued building projects for years. This can clearly be seen in any business park around the

UK with empty – new – office buildings, completed before the recent recession.

At the time of writing, the proposals granted full planning permission were distributed in a pamphlet devised by the authors for a recent

community participation event (see Appendix E).With this, we were able to get an idea of what people thought of the proposals as well as

what they would hopefully like to see, which was informative in deciding which scenarios to investigate.

This section begins by exploring the evaluation criteria used to assess and judge each of the individual scenarios proposed for the main

hall in the Pavilion and the subsequent sub-scenarios used for auxiliary spaces around it. This has been composed, in part, from the critical

assessment and makes use of both quantitative (numeric) and qualitative (narrative) means of comparison to ensure the best judgement is

made for the Pavilion.

The principle use of this section of this report is to compare 4 scenarios for use in the main hall of the Pavilion. These scenarios include: a

Conference Hall/Market (section 6.2.1) , a Gymnasium for indoor activity (section 6.2.2), an Amusement /Arcade (section 6.2.3) and an Art

Gallery (section 6.2.4). Using the evaluation matrix and Ecotect modelling, it was found that a combination of both the Conference

Hall/Market and Gymnasium (section 6.2.5) had the potential to satisfy most of the points raised in the evaluation criteria.

Subsequent to this, no comparison was made of; however, the auxiliary scenarios around the main hall are presented to offer judgement

regarding how each of these would perform in a social, an economic and an environmental sense.

Author: Group

Section 6.1 Evaluation Criteria

The evaluation criteria used to directly compare scenarios in the main hall

and to illustrate sub-scenarios in general is detailed below:

Essentially the matrix is based upon the relevant factors regarding

sustainability in relation to Penarth Pavilion.

Environmental

1. In terms of energy demand, is it too energy intensive to run?

– This question relates to the amount of energy which will required by the

space. For example, the first principle of the PassivHaus mantra is to

reduce energy demand before installing any sustainable features. By

attempting to house activities that require less energy, the task of installing

and sourcing sustainable energy is reduced substantially.

2. Would it be difficult/energy intensive to maintain? – This question is directed

to the services of a room. For example, if a high level of ventilation is required

(for example in a kitchen), then the additional mechanical ventilation units which will need to be installed around the room will require regular maintenance and occasional replacement – adding work to the ordinary maintenance schedule of a conventional building.

3. Does it require specific parameters to achieve a good level of comfort? - This question relates to the environmental comfort requirements for a space. Depending on the activity, fabric (walls) and occupant clothing in the room, temperature, humidity, light levels and ventilation will differ to ensure the occupants of a room are comfortable to carry out whatever activity they are doing.

Economic

4. Does this function create revenue for the Pavilion? – As an entity which is being addressed using public money, the need for the Pavilion to sustain itself financially upon completion is paramount. Though the awareness of the facilities on offer at the Pavilion will establish the market for revenue to be built, it is the facilities on offer which will determine the potential revenue available.

5. Will it be used often enough to make significant revenue? – Coupled to the

previous question, an activity which can be held regularly in the Pavilion will not only begin to build a relationship with the local community, but will instil an element of confidence.

6. Would it be costly to run/maintain? – Returning to question (2), the extra cost incurred with regard to buying, installing and maintaining these extra services should be taken into consideration.

7. Would it ultimately improve the economic state of the area? – This relates directly to the Esplanade. The Pavilion is an integral part of the seafront in Penarth; however as a part of this, a renovation project should not just be focussed inwardly, but towards the wider audience. As such, the local small businesses (i.e. the bars and restaurants along the Esplanade) should benefit from increased tourism or locals venturing down to the Esplanade for leisure and commercial reasons.

Section 6.1 Evaluation Criteria

8. Does it provide job opportunities for locals? – In addition to income for local businesses, the Pavilion should have the potential to provide jobs for a wide range of locals wishing to seek part time or full time placements.

Social

9. Does it offer a variety of activities? – By offering a number of different activities, the Pavilion will have the opportunity to explore a number of different commercial and leisure options which link to the history of the building and with the intended audience locally and further afield.

10. Is it limited to a certain age group? – In addition to question (9), the need for the Pavilion to be a public space which welcoming to anyone from the wider general public is paramount. By being a building that can accommodate all age ranges, once again, the audience base is widened.

11. Would people use this often? – This relates to question (5). The key to the Pavilion being accepted and once again embraced by the local community is a regular usage pattern. By once again making the Pavilion a part of everyday life, it will become more of a cornerstone of the community than an icon placed on a pedestal at arm"s length.

12. Would people enjoy this function? – Use and enjoyment go hand in

hand. To retain a positive image for the Pavilion locally and further afield, individuals must enjoy themselves to want to come back and enjoy it again.

13. Does the function meet the needs of the people of Penarth? – As a building which, due to seasonal swings in tourism, will require the local community to support it, the Pavilion must embody the wants and needs of the people of Penarth. By housing functions that have been asked for by the people or intended directly for the people of Penarth, the Pavilion will move away from being a pavilion and move towards becoming Penarth Pavilion.

Each question has been judged using the analysis software, Ecotect – and where a quantitative study has not been possible, practical judgement has played a part in deciding how good each scenario is in addressing the relevant issue.

Modelling

In addition to this set of mainly qualitative evaluation criteria, the principle scenarios have been modelled and analysed in Ecotect to ascertain how much energy they will use from a heating and cooling perspective. While the software is not completely accurate in the projection of exact heating and cooling loads, in the process of

direct comparison between these scenarios, Ecotect is a very useful tool.

For the principle functions presented in the first instance, please refer also to

Appendix F, for a breakdown of the modelling work undertaken and how this has

influenced the recommended scenario.

References

1. PassivHaus - http://www.passivhaus.org.uk/index.jsp - Accessed 1/4/11

Section 6.2.1 Conference/Market

Social Scenario – Conference / Events Hall / Indoor Market

Although the proposed plans for Penarth Pavilion indicate a community

lead space in the main hall, a means of achieving significant revenue for

the building could lead to the requirement for a potentially commercial

aspect to the building. The scenario suggested here demonstrates the

requirement for Penarth Pavilion to become an economically sustainable

venture which can support itself without the need for council subsides.

Introduction – Conference Halls

Conference and Events Halls are an interesting source of income for a

building. As a building, conference centres are notable in a range of

different sizes – ranging from the SECC (Scottish Exhibition and

Conference Centre, below) designed by Foster and Partners, to smaller buildings such as the All Nations Centre in Cardiff.

As a conference centre, Penarth would not only benefit from the increase in business from the daily trade that would make use of the hall, but also the subsequent free exposure that would bring those visitors back on leisure visits. A further use for hall suited to conferences is a bookable events venue for public gatherings and meetings.

In terms of capacity, the rough area of usable space in the main hall of the Pavilion is of the order of 300 square meters (allowing for storage space to be allocated on the ground floor below balcony). Using the Metric Handbook [3] as a guide for meeting rooms and assembly halls, it was decided that a conservative allowance of 1.875m2 per person would generate a room capacity of 160 people when full – a reasonable number for conference spaces and the like.

In addition to conference usage, the ability of the building to be used as a public meeting space (for council events) and even private events such as weddings would revitalise the relationship that the local community would develop with the space.

Introduction - Market

A point made by members of Gwyrddio Penarth Greening (GPG) and following a public consultation on 9th April 2011, is a need for a permanent home for a local farmers and business market. Though the town centre has an array of retail outlets, a market in the Pavilion would not only act as a link between the town and the seafront, but also provide the Pavilion with a regular activity which is open to and predominantly aimed at the local residents of Penarth. As will be discussed in following sections, an outdoor market on the Esplanade itself could have a unique and enlivening aspect to it – but employing the Pavilion during times of rain, wind or cold weather (a regular occurrence in South Wales), to be a shelter for this market would begin the process of linking the Pavilion with the Esplanade as a single entity.

In terms of capacity, measured market stalls from local indoor markets including Cardiff, Bridgend and Swansea have deduced that a typical market stall should have in the region of 4m of table frontage on which to sell items. The cross plan of market stalls has enabled the Pavilion to provide space for 9.25 stalls (i.e. 8 standard stalls and two smaller ones).

SECC Source: glasgowarchitecture.co.uk

Market Scenario Source: Author Model

Schedule

The daily, weekly and monthly schedules regarding conference and market usage is a complex one which requires different scenarios to be simulated. For simplicity, these have been devolved into maximum, intermediate and minimum usage patterns which allow for fluctuations of usage at different times of the day and year. The daily fluctuations will be detailed in the modelling section of this report.

The weekly patterns of usage are tabulated over the page:

Section 6.2.1 Conference/Market

Table 4.2.1.1Weekly Schedule:

*Every other Saturday over the course of 1 month.

**Once a month.

The yearly patterns of usage are tabulated as follows:

Table 4.2.1.2Yearly Schedule:

These yearly schedules are generated with regard to the summer tourism peak that is notable in most seaside resorts and also the increase in consumer spending in the lead-up to Christmas.

The following sections will undertake an overview as to how this scenario performs under the relevant sections of the Evaluation Matrix,

right:

Environmental Factors

The environmental factors to consider when addressing conference halls are as follows:

1. In terms of the energy demand for the scenario, both uses have differing demands. The conference hall requires electricity mainly for laptops and projectors which will be used quickly and at a fairly consistent rate except for comfort intervals. In contrast, the market will only require a small amount of electricity to maintain freezers and similar equipment for a limited number of stalls. Both scenarios require no further lighting than the 300 lux available by the conventional system as set up in the modelling exercise in the environmental section of this report.

2. In terms of maintenance, so long as a continual supply of light and electricity is made available for the periods of occupation, the scenario requires not a great deal else except cleaning.

3. In terms of comfort parameters, according to the Metric Handbook [3], light levels are to be between 100-200 lux, temperature within the region of 18-

240C, air infiltration in the region of ½ an air change per hour and water should only be required for WC"s on site. These fairly mainstream parameters should be less than difficult to achieve and (due to the outsideinside nature of indoor markets) should be negotiable and flexible on Saturdays when the market is occupying the space.

Section 6.2.1 Conference/Market

Economic Factors

The economic factors to consider when addressing this scenario are as follows:

1. Revenue – is the amount of money which is gained by the building before profit. To calculate revenue for the conference hall, 5 similar sized conference centres were researched to ascertain a reasonable cost per person to hire a hall. With an average price of £1.50 per person discovered, a competitive price of £240 to book Penarth Pavilion for a day was decided.

Likewise, to calculate market stall revenue, a price to rent 1 stall from a similar indoor market in Bridgend was contacted [1] to determine a competitive value of a 4m stall equalling £140 per week. Thus for 1 stall,

£20 for a single day could be charged and in effect, 9.25 (the approximate capacity of the Pavilion) stalls would equate to a revenue of £185 per day.

Without including private events and council meetings, the following annual revenue can be calculated using the 3 scenarios discussed earlier:

Conference Market

Max = (£240 x 3days x 4 weeks x 4months) + (£185 x 1day x 4weeks x 4months) = £14,480

Int. = (£240 x 2days x 4weeks x 4months) + (£185 x 1day x 2weeks x 4months) = £9,160

Min = (£240 x 1day x 4weeks x 4months) + (£185 x 1day x 1week x 4months) = £4,580

Total Revenue = £28,220

2. Regular usage is a key topic with regard to the amount of revenue possible to achieve. As has been discussed with regard to the scheduling, at peak times of the year, the Pavilion could be used for a considerable portion of the week. However, it is the flexibility of this timetable that could lead to its downfall. With a regular market in place,

the rest of the week is essentially given up to the potential for commercial usage and public occupation. Without a guaranteed income, the first months and year following the completion of the Pavilion are critical in building a reputation as a venue among the local community for events and wider afield as a conference centre.

3. In terms of links with the Esplanade, as discussed, the conference hall will provide some trade in terms of occupants on lunch breaks and the like. This has potential to increase tourism once those people have visited. However, by introducing an outdoor-indoor market, the Pavilion has a direct link to the Esplanade which, as a retail focussed activity, can encourage the Esplanade not as a separate entity, but as an extension of the town centre of Penarth.

4. Finally, in terms of employment for the local community, the conference hall/market does offer little opportunity for staff. Other than a hall manager and subsequent people responsible for running the centre and general upkeep, there is a limited amount of employment which is available in this scenario. In terms of indirect employment, the market could encourage part time positions to become available in running

individual stalls and the events hall could encourage entertainment positions to become available for the activities taking place within that space.

Social Factors

1. In terms of variety, the name conference/events/market implies a range of activities. By opening the hall to a range of professional and leisure activities, the Pavilion has the potential to engage with people not only from Penarth, but from wider afield. By engaging with a range of activities, the Pavilion can then, after some time, develop a strategy as to what is the best way to develop the building further to cater for a better economic or social market in the long term.

2. Although the conference hall is primarily aimed at professionals of a working age, the market would provide an opportunity for locals young and old to come together to buy local produce supporting the local economy. With the view of when tourism does peak in the summer months, the market would provide the tourists the chance to buy something truly local to take home.

Section 6.2.1 Conference/Market

In summary of the other points in the evaluation matrix, though the conference hall is not a suggestion from locals at the public consultation or in recent local press, the market is something which has long been driven by some members of the community – with the potential to link with the community orchard scheme and annual food festival currently run by GPG. Although the conference and events options are available on booking, the market can become a regular event in the town which is part of many residents weekly routine on a Saturday morning.

Conclusion – Recommendation

In conclusion, the conference hall / market scenario is a means of combining a number of different schemes. The different activities provide two primary functions which can go ahead without interfering with each other – whilst reaching the commercial market in the public and private, local and wider sense. This scenario also provides the opportunity for the Pavilion to link directly with the Esplanade on which it is situated and form ties (not too dissimilar to the Chelsea Piers in New York) with the wider community by forming bonds with other sustainable schemes.

Whilst the clear drawback lies in the lack of permanent tenants (especially

during the time immediately post-completion), or income from anything other than the market, a combination of activities from this and other scenarios could potentially fill the existing gaps in this scenarios timetable with a more confident source of revenue.

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Section 6.2.2 Indoor Activity

Gymnasium

During last 16 years, the Pavilion has been used as a gymnastics club.

During these years, at the beginning of summer, children of Penarth

Gym Club started their own gymnasium practices (Penarth Time,

2010)

So, to renovate this building, it is important to investigate whether

having the gymnastics class is feasible with regard to the other

functions of the Pavilion or not. By considering learning spaces,

shops, cinema and a restaurant in the Pavilion, it is estimated that the

remaining spaces is approximately 13* 14= 182 m². However,

minimum requirements for gymnasiums for space is more than this

number which is illustrated in the figure1. This space includes:

Floor exercise= 14*14 = 196 m

Balancing beam= 8*3 = 24 m

Asymmetric bars= 5*4.5 = 22.5 m

Vaulting horse= 24*2 = 48 m (Littlefield, 2008).

Source: Littlefield, D. (2008) Indoor sport facilities, metric handbook, planning and design data.

So, it must be considered that the gymnasium is not feasible with this surface

area. However, because almost 280 young gymnasts train six days a week in

the Pavilion during summer, meeting their requirements are significantly

important in the culture and history of Penarth. Potentially, it could be sorted

out by considering renovation St Paul"s Church in Arcot Street as a community center for a Boxing Club and Penarth Gymnastics. Because they need a purpose-built training facility with a large surface area, the Pavilion cannot be good option for it. The Pavilion was historically only offered as a short term temporary base not as permanent solution for gymnasium during this period (Penarth Time, 2009). However, it could be reasonable that other options of indoor sport activities taken into consideration.

Source:http://www.penarthtimes.co.uk/sport/latestsport/8196084.Success_for_Penarth_Gymnastics_Club_members_/

Aerobic, Gym, Pilates, Zumba and Dance hall

Penarth Pavilion is proposed as a community building, however, indoor sport activity can cause economically sustainable revenue to enable this building to support itself to some extent. By considering the surface area, indoor sport activities suggested for this building including: aerobics, gym, pilate, zumba and dancing. These activities require small equipment with surface area that meets the requirement for them (Ductless Guide, 2011)

What aged group will be served?

These activities would be served with all aged group, but some of them

relates more to young people as it is suggested bellow.

Aerobic:Adult/ Senior/ children Yoga:Adult/ Senior/ children

Pilate:Adult/ Senior/ children Dancing and Zumba:More young people

Section 6.2.2 Indoor Activity

Capacity

To calculate the capacity of the hall, it is required to find out how

much space would be needed by storage, entrance and a wallmounted

dresser. Then by subtracting this figure from the surface

area, the useful surface area is calculated.

13 * 14= 182 mArea

2 (2 *4) = 16 m Storage

2.5 * 4 = 10 m Entrance

0.5 * 6 = 3 mWall-mounted dresser

182- (16 + 10 + 3) = 153m

By considering 6 m per person it accommodates 25 people.

Max: 25 people Min: 10 people

Schedule

The daily patterns of usage for this sports hall are illustrated

below. The numbers of people are suggested with regard to the common pattern of sport hall in community buildings. So, the usage of sport hall at the early of the morning and in the evening which is the out of the working hours is more than other hours.

Environmental factors

In terms of energy demand for heating, lighting and maintenance, there is no need for specific parameter to achieve appropriate comfort level. It only requires installation of ductless air conditioning in the winter and combining the extract fans and natural ventilation for summer.

Heating

The required temperature for sport hall should be between 13 and 16 ºC. So, under floor heating meet the requirement without installation of radiators (Compton, 2002).

Lighting

The installation of lighting should be provided on average horizontal luminance 300 lux and 60 color rendering. The array of luminaries should be provided from a ceiling-mounted to provide uniform

illumination. Also, the positioning of luminaries and source light"s type should be chose to decrease the possibility of glare (Austin, 2006) .

ventilation

Ductless air conditioning should be considered for sport hall. Based on CBISE guide for ventilation rate 8- 12 l/s/person is recommended. So, standard size for air conditioning is approximately 12,000 btu for 180 square meters (Wiley, 1999).

Economic factor

The economic factors for this scenario are as follows:

Aerobic, Pilate and Yoga, as well as Zumba are considered as training courses that it would estimated £35 per person per month and dropin session £4 per session.

Between working hours, the sport hall could be allocated to schools without need to spend money for it. So, by encouraging students to have an active lifestyle, the Pavilion could be involved in a program that could access funding from SportWales.

Section 6.2.2 Indoor Activity

Minimum income

Course: 6 * 10 * 35 = £2100 per month

The number of course: 6 People: 10 Cost: £35

Drop-in: 72 * 1 *4 = 288 £ per month

The number of session: 18* 4= 72 per month People: 1

Cost: £4

Dancing and Children party's venue: dancing and children party"s

venue are considered as revenue streams for this hall which is

estimated £35 per hour.

35 * 16 = £560 per month

Cost: £35 per hour Hours: 4 * 4 = 16 hours per month

So, 2100+ 288+ 560= £2948 per month

6954* 12 = £35,376 per year

This grant could be applied by the community group and local

authority and it can cover these measures for Pavilion: purchasing

new equipments; coach education; reasonable marketing costs; and

building work such as architect"s fees. The cost is offered from 1501

to 25000 pound (Sport Wales, 2010). Moreover it would be a part of

Welsh assembly government"s fitness and food grant scheme which

provides financial support for community projects by motivating

active lifestyle (Foot and fitness, 2011).

In terms of job opportunity for local people, it offers different kind of

occupations such as: yoga trainer, aerobic trainer as well as pilate and

Zumba trainer. Also, it has a potential to link with the Esplanade by

considering outdoor sport activities that could be treated as an

income source. The maximum and minimum revenue are estimated

bellow:

Maximum income

Course: 6 * 25 * 35 = £5250 per month

The number of course: 6 People: 25 Cost: £35

Drop-in: 72 * 3 *4 = £864 per month

The number of session: 18* 4= 72 per month People: 3 Cost: £4

Dancing and Children party's venue: dancing and children party"s

venue are considered as revenue streams for this hall which is

estimated £35 per hour.

35 * 12* 4 = £1680 per month

Cost: £35 per hour Hours: 12 * 4 = 36 hours per month

So, 5250+ 864+ 1680= 7,794£ per month

7,794* 12 = £93,528 per year

Section 6.2.2 Indoor Activity

Social factor

A range of different activities are considered with this scenario and

different age groups can engage to this program. In addition to

engaging people in Pavilion, it provides occupation opportunities for

local people which could be an important social factor for the

Pavilion. Also, by using the free program for schools, students can

benefit from this program with having active lifestyle.

To sum up, the below table identifies the environmental, economic

and social factors considered.

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Section 6.2.3 Gaming Arcade

Social Scenario – Gaming Arcade:

The main space in the pavilion could be potentially used as a space for a

gaming arcade. There are no existing gaming arcades in Penarth and

this will be the first one if proposed. The gaming arcade is a possible

option because, the pavilion is a leisure space and along the beach,

[there are numerous arcades throughout the UK along the seafront

which are successful].

Introduction – Gaming Arcade:

Amusement arcades house two types of activities, video games and penny

machines. Apart from coin slot machines and video games, they may include

other games like pinball machines, merchandise stalls, coin operated game boards, and other legally permitted gambling machines.

As an option for the function of the renovated pier, the feasibility and sustainability of the function and space had to be evaluated, and compared with other scenarios to make an educated decision.

By considering learning spaces, shops, cinema and restaurant in the Pavilion, it is estimated that the remaining spaces is 13* 14= 182 m.

Possible arrangement of the equipment and machines in the space available

Ground Floor Plans Copyright: Purcell Miller Tritton

Section 6.2.3 Gaming Arcade

Evaluation Matrix

The following sections will undertake an overview as to how this scenario performs under the relevant sections of the Evaluation Matrix, below:

Economics

"Slot machines are known as the one-armed bandits. They seem like such fun devices that can cost you as little as a penny to play, although most are at least a quarter per pull. The ringing buzzers, the flashing lights, the large jackpot flashing on top--they can be so alluring. The next thing you know, you still haven't hit that jackpot but you've burned $25 in quarters in less than 30 minutes. It's no wonder that casinos can make money at that rate!"- http://www.ehow.com/how-does_4587911_casino-money.html

1.What aged group will be served?

Amusement games and table games is preferred by a wide range of people, that includes kids to elderly persons. The arcade itself could be used as a place for group of friends to hang out. Thus it serves as a wide age group of people.

Now looking on to the standard spatial requirements for various equipments in an arcade and a model space arrangement of the same in the available space:

Video game unit = 650mmX610mmX1670mm

Pinball unit = 1300mmX560mmX1930mm

Gaming stand unit = 550mmX1680mmX1810mm

Card game unit = 1330mmX1640mmX1330mm

Driving simulator = 1700mmX1200mmX1600mm

Billiard table = 2600mmX1500mmX800mm

Mini bowling machine = 750mmX2900mm.

Source: .Neuferts Architect"s data – 3rd edition

Source: http://www.aidan.co.uk/photo9251.htmth

Section 6.2.3 Gaming Arcade

Energy consumption of equipments:

This graph shows the energy gains and requirements for the casino on a running day. It is very clearly a large energy consumer.

The energy consumed by a gaming arcade per square foot is as high as 5 times as that consumed by an average large hospital qualitatively. Slots and other average machines consume from 430 – 600 watts. Considering the arcade to run from 12.00 pm to 12.00am every day, it runs for 13.5 hours (it will be switched on one hour before the arcade opens to allow warming up, and shut down half an hour after the arcade closes) a day. Each machine consumes 0.205kwh. so running a machine for a day consumes 2.77kw/day/machine. A total of 60.89kw is consumed for 22 machine.(source:

http://www.gamingfloor.biz/forum/showthread.php?t=3264 accessed 29th April 2011)

References

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Picture of interior of a gaming arcade: ttp://www.peterandmarian.com/EA3Seaside1.htm

Gaming arcades are places that can earn in income very easily when used by the people, they are at times addictive and are qualitative income generating places. This can help the pavilion run and be maintained regularly but the economy of the place may not improve as expected.

Heating

While calculating the temperature for gaming arcade, the internal gains by heat released by the equipments shall also have to be considered. During summers there are chances of over heating and thus the temperature might have to be lowered. At an average 19 to 21 ºC is

recommended.1

The Ecotect modeling results for comfort show that everyday the

casino needs cooling

Lighting

Lighting specifications are general for internal spaces with Average

horizontal luminance 500 lux. Uniform illumination for the space and

spot light for the tables (cards and billiards) could be used. The slot

machines and other equipments have their own in built lighting. The

external façade of the building may include flashy neon light for

advertisements, which can be left on option for a energy efficient

solution.

Section 6.2.4 Gallery/Exhibition Space

To promote the cultural and artistic side of Penarth, the option

of converting the main multi-functional space in the current proposed plans

to an exhibition space has been explored. This option was also something

that the public expressed as something that they would like to see this

space used as in the Pavilion. This space could also be used for hire for

various events.

As a gallery, movable walls may be used in various

configurations to provide space to display artwork. The walls of the Pavilion

are lined with storage cupboards so these walls are the only option for

display. As a venue hired it may fit up to approximately 16 round tables, each

table seating 6-8 people, or with a bar with a few tables. (Matthews, 2007)

Capacity

The total area of the space is approximately 180 m2. When

used as an exhibition space, giving each person a generous 1 m2, technically

it could fit 180 people. However this would be unlikely, so for this scenario I

have assumed 50 people as a maximum. As a hired venue, it could seat a

maximum of 128 people. (Matthews, 2007) & (Neufert et al, 2002)

Patterns of Use

Looking at similar examples, the use of this space was assumed

to be as follows:

A single exhibition is 1 week long

Two exhibitions a month, 1 using all surfaces to display work and 1 using only half.

August and December has exhibitions running all month long

The venue is hired 3 times a month, once every other month for an event

requiring dinner tables

Social

As a gallery and events hall, this space allows for flexibility in

use however the uses offered are limited to a certain demographic. Art

galleries do not necessarily appeal to all. Also, Penarth has the

Washington Gallery, so another 5 minutes away in such a small town

would seem redundant. Allowing the space to be hired for events

however is something that could benefit Penarth. Being such an iconic

building with a historical significance, people would be interested to

hold special events in the Pavilion.

Exhibition Space Venue Space – Tables

Venue Space - Bar

Ground Floor Plans Copyright: Purcell Miller Tritton

Section 6.2.4 Gallery/Exhibition Space

Economic

Looking at various galleries of similar size, with the option to

hire for exhibitions as well as events, I have assumed a figure for this

scenario. However, the prices varied from gallery to gallery based on

exclusivity, reputation, demand and location. It seems the gallery is run differently, therefore, the most suitable example to base prices on was the Troubadour near Earl"s Court in London, which has a café, bar and gallery with its own history and distinct character (Troubadour, N/A).

This is similar to what the Pavilion can become as a whole. The prices for hiring the space for any purpose is the same, the only variable being the time of day/length of time

Full day hire 9 am – midnight £250.00 a day

Half day hire 9 am – 5 pm £150.00 a day

Evening hire 6 pm – midnight £175.00 a day

Based on the assumed yearly schedule, there will be shows running for 28 weeks of the year (half days) which would cost a total of £29,400.00 to hire. With 3 events a month, that would cost £6,300.00 to hire. This is assuming the tables and/or bar would be provided by the client.

Total possible revenue per annum £35,700.00

Energy

This particular function does not require very specific conditions. Perhaps the main concern is lighting, where varying levels of

spotlighting might be required for different forms of art in order to enhance the work without damaging it. Also, the space could be naturally ventilated alone since it only requires 0.5 air changes per hour. Unlike a museum which houses artwork on a long-term basis which requires very strict internal condition, a week-long exhibition would not be so demanding. (Matthews, 2007) & (CIBSE, 1994)

Heating

To achieve a good level of comfort, the required internal temperatures is between 21-23 ºC in the summer and 19-21 ºC in the winter (BSRIA, 2003). Using underfloor heating would be sufficient to heat the space with the provision of preheating the space at the start of each day during exhibitions.

Lighting

The level of lighting required for this activity is 200-300 lux of general lighting as well as supplementary spotlighting to highlight works displayed. (BRE, 2004) & (CIBSE, 1994) In the event where daylight is insufficient for general lighting, or in the winter when the sun sets early, a basic array of fluorescent tubes will be used to achieve the needed 200-300

lux. The power density is approximately 3 W/m2 (Field and Soper, N/A).

Using energy efficient LED spotlights for the specialised lighting, each uses 7 watts. With 16 display surfaces, that would give a total of 140 watts. (LEDBulbsandlights.com, 2010)

Evaluation matrix

Section 6.2.4 Gallery/Exhibition Space

Conclusion

After evaluating the social, economic, environmental aspects of this proposal, it seems the idea of making the main space of the Pavilion an art gallery is not very feasible despite its basic requirements for comfort parameters. Although it may seem economically viable, this is assuming it is rented out for exhibitions and events frequently. There is a chance people do not use this as a gallery with the option of displaying their work in the Washington Gallery, which makes having a second gallery in Penarth redundant. Also, as an art gallery, the Pavilion would not necessarily be used by all. Only those who have an interest in art would visit the gallery. However as an events hall, the Pavilion could potentially be

more used and more accessible to all. The prospect of holding an event in such a grand, unique building by the sea is an idea found appealing by many. For this reason, this option has been take forward for further exploration of the ideal scenario for this central part of the building.

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Section 6.2.5 Recommended Scenario - Analysis

By combining the criteria for all four scenarios, we are able to decide what would be a feasible option to be the main use of the Pavilion (occupying the main atrium of the building).

After investigating the merged criteria, it was evident that the idea of a casino/arcade, did not match up to what the other options may potentially offer. The machines used for such a space causes a lot of internal heat gains (3a) which would need a large cooling system all year round to expel the excess heat entering the space (3b).

The internal gains from the conference and gallery scenarios are similar (1a and 4a– blue) are similar and not very significant, mainly arising from the general lighting required. Also they scoring in the table shown right are also similar. There is a difference however in the additional energy from the equipment used for the markets on Saturdays while the gallery has a higher expected revenue. The two scenarios are also similar in that they both allow for high capacity of users at any one time. The overall good score and low performance requirements is what ultimately led to combining the two into a single scenario and incorporating the idea of a conference space, market and events hall.

The highest expected revenue is from the gym, which has many social, as well as health, benefits for the town of Penarth. The main concern with the gym is the comfort range varies depending on how strenuous the activity is (2a). This requires mechanical services to maintain a comfortable level, which calls for both heating in the winter and cooling in the summer (2b). Nevertheless, after evaluating all the scenarios, it was felt that the idea of a gym should also be incorporated to a certain degree to reduce the energy demands it would

necessitate running solely as a gym. (N.B. Detailed results of graphs in Appendix F)

(1a) Scenario 6.2.1 Conference Market – Passive Gains Breakdown (1b) Scenario 6.2.1 Conference Market – Monthly H/C Loads

Section 6.2.5 Recommended Scenario

(2a) Scenario 6.2.2 Gym – Passive Gains Breakdown

(3a) Scenario 6.2.3 Casino/Arcade – Passive Gains Breakdown

(4a) Scenario 6.2.4 Gallery/Exhibition Space – Passive Gains Breakdown

(2b) Scenario 6.2.2 Gym – Monthly H/C Loads

(3b) Scenario 6.2.3 Casino/Arcade – Monthly H/C Loads

(4b) Scenario 6.2.4 Gallery/Exhibition Space – Monthly H/C Loads

Section 6.2.5 Recommended Scenario

Following the comparison of each scenario using the evaluation matrix

evident in each individual scenario and the Ecotect model following these

descriptions; this report will now recommend not a single scenario, but a

hybrid of the two scenarios with the most potential to achieve maximum

environmental, social and economical sustainability for the Pavilion.

Introduction

As a building that must fulfil the three key principles of sustainability

(social, economic and environmental) Penarth Pavilion must be a flexible space that can suit the needs of both the local population and the wider visiting multitude.

The decision has been taken to recommend a blend of using the main hall of the Pavilion as a Conference Hall, a Market and a smaller Gym.

By using the Pavilion as a conference hall, the Pavilion has a unique selling point in not only being a specific commercial, revenue based enterprise, but, as discussed in the scenario itself, has the potential to attract tourism through work. As a building of significant cultural heritage, not only would the Pavilion become an interesting and formidable building to be used as a conference hall, but through visitors using the building on a professional basis, they could be encouraged to revisit on a more leisurely basis.

However, by establishing that fact that the needs of the local residents of Penarth are more important, two key activities are recommended to be housed in the building which directly link with those needs.

Firstly, as the current home of a gymnastics group, who have enabled the building to remain in a usable condition; the recommendations make use of remembering this link and chapter in the buildings history. Though not

accommodating the existing gymnastics class which currently occupies the hall, the Pavilion should house a series of exercise activities and classes that encourages healthy living as the focal point of the town. This can be linked to a series of exercise equipment which could be specifically placed along the Esplanade (which will be discussed in more detail later in this report).

Secondly, Penarth is currently home to the Vale of Glamorgan Farmers Market on a monthly basis. With no other market in the town promoting locally sourced goods from small businesses, (other than the annual Food Festival organised by GPG (Gwyrddio Penarth Greening)) the need to locate a prominent home for the VoG Farmers Market and a more regular market are evident. Once again linking to the Esplanade, the Pavilion could be the primary home for a market and the Food Festival when weather (on most occasions) doesn"t permit the market from being located outdoors on the Esplanade itself.

Schedule

The proposed schedule combining the above scenarios essentially makes use of the Conference / Market Scenario, filling in unused days with

exercise classes and sessions aimed at residents of Penarth of all ages and social backgrounds. This schedule is illustrated below:

Section 6.2.5 Recommended Scenario

Evaluation Matrix

The evaluation matrix establishing how combining these two scenarios has resulted in a more beneficial final scenario is illustrated below:

Conclusions

Essentially, the benefit of using Penarth Pavilion for the combination of activities proposed above is variety.

Firstly, the activities on offer retain a link with the former uses of the Pavilion, as an events hall and as an exercise based room. By retaining a link to former uses, the Pavilion is retaining an essence of its character over the course of its development as a historical and cultural landmark for the town.

Secondly, housing a range of activities, the Pavilion will have something to offer numerous parts of society. With the conference hall offering something for professionals at a commercial level – to attract business to the town, the market and exercise features are a regular event which is

aimed at the older and younger residents of Penarth respectively, which is accessible.

Thirdly, by establishing a schedule whereby more gaps are specifically filled with guaranteed events, the economic sustainability of the Pavilion is particularly more viable.

Fourthly, using the results from the Ecotect analysis (Appendix F), it is clear that the conference has significant heating requirements in the winter months and the gym, cooling in summer. A potential passive energy sink could be designed here to use absorbed heat in the summer to supply part of the required heat in the winter and vice versa.

Finally, this scenario enables linkage between events in the Pavilion (i.e. the restaurant could be used to cater for the conference), and between the Pavilion and the Esplanade. With exercise activities and a market being located in the Pavilion and (as will be discussed later in this report) similar activities being located on the Esplanade, the Pavilion will become a more interlinked part of the entire seafront. As has been seen in case studies such as the Chelsea Piers in New York and, more locally, Weston-Super-Mare Grand Pier, the relationship between the Pavilion, the Pier, the

Esplanade and the local community is an everlasting one which must develop through time. With the deterioration of the Pavilion, the relationship between it and the community has deteriorated as well.

With regard to this recommended scenario and indeed any of the other scenarios mentioned in this section, the important point to make is that the first year is extremely important to the economic future of the Pavilion. Almost as a new business, the rebuilding of the relationship of support from the local community and wider commercial awareness is vital to setting a precedent on which the Pavilion can continue to build and grow into the future as a self sufficient entity.

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Section 6.3.1 Restaurant/Bar/Cafe

In addition to main hall scenarios, supplementary spaces in the Pavilion around the periphery of the main hall have the potential to supplement or even provide the primary income for the building.

Introduction – Restaurant/Bar/Café

As part of the existing proposals to receive visitors to the Pavilion, space has already been allocated to accommodate three principle food/beverage outlets in numerous spaces around the Pavilion.

As can be seen in the proposed plans (below) a significant portion of the first floor at both land and seaward ends of the Pavilion, as well as the seaward ground floor end of the Pavilion, have been dedicated to eatery space.

The aim of this section is to assess the scenario of using the entire space as an extended restaurant, retaining the concept that a bar and café will be installed in the actual renovation, but allowing for the fact that financial takings will balance out and environmental parameters will be significantly less than those required for the restaurant. By doing this, the supplementary services provided by the restaurant as a first point of call for occupants of the conference hall for example and café as an additional destination following a visit to the market, will make the Pavilion not a singular activity based building, but a destination to visit for a range of needs which can be catered.

Evaluation Matrix

The following sections will undertake an overview as to how this scenario performs under the relevant sections of the Evaluation Matrix, below:

Ground Floor Plan Copyright: Purcell Miller Tritton

First Floor Plan Copyright: Purcell Miller Tritton

Section 6.3.1 Restaurant/Bar/Cafe

Environmental Factors

1. In terms of the restaurant itself, the lighting only requires 200 lux (Carbon Footprint, N/A), which is achievable by conventional and energy efficient lighting fixtures. However, in the kitchens (outlined on the previous plans in purple) a significant energy demand will be evident from not only the 500 lux minimum light requirement, but extensive equipment to store and prepare food for the restaurant. Although freezers will be on at all times and lighting will remain on during occupied hours, ovens and other appliances will be turned on when the restaurant is open and working at peak output during busy periods – lunch and dinner.

By simply combining the energy consumption of a cooker with a grill and hob, 12kW is the electrical demand of a single unit. With the fact that a number of these will be required to meet the differing demands of

customers at peak times, it is clear that the kitchen will be the most energy intensive space in the entire building.

To maintain the above light conditions and ventilation rate of 10-15 air changes per hour (Carbon Footprint, N/A), considerable ventilation extract systems will also need to be installed. This will be addressed further in the environmental section of this report. However, due to the intense conditions which these services will be needed for, a regular program of maintenance will also be required to reduce the risk of occupant discomfort if one of these systems does fail.

Economic Factors

1. Revenue is something which the restaurant will heavily contribute towards the building. As will be shown below, it may also contribute the majority of revenue to economically sustain the Pavilion. Using the existing proposals of bar/café/restaurant space, and the table configurations which have already been proposed in accordance with the Metric Handbook and rule of thumb, it can be assumed that (provided all spaces are used as restaurant space), the approximate capacity of the restaurant will be for 100 diners at any one time.

Once again using the Metric Handbook, a commercial restaurant equates to approximately (100customers /7.6 customers per employee) 13 employees whom will be required to work by the restaurant.

Assuming a mid-range menu, roughly 116 meals will be served per employee per week. Therefore, 116 x 13 = 1508 meals sold total per week.

1508 meals x 4 weeks x 6 months = 36,192 meals (6 months at full capacity)

Assuming each meal costs £10, including drinks, total revenue £361,920

By only using a 6 month marker for capacity to compensate for undercapacity times of year (i.e. outside tourism season) would mean the restaurant can easily make a profit.

2. Because of the issue of capacity during quiet periods, the restaurant will rely heavily on customers being attracted in from the pier and activities on-going in the Pavilion itself to maintain an income during the winter months, when the local community is the only source of income.

3. Another restaurant could be poorly received on the

Esplanade. Due to the number of fine-dining establishments on the Esplanade, another competitor could pull custom away from parts of the street. On the other hand, another restaurant could prove a further attraction to the Esplanade, providing more choice of eateries for visitors as well as locals. This could add to the notion of returning the Esplanade as the cultural hub of the town.

4. As an employer, the restaurant could provide a number of fulltime and part-time job opportunities for locals – from waiting staff, kitchen staff and managers, the employment opportunities will create placements for a range of individuals and of all ages.

Section 6.3.1 Restaurant/Bar/Cafe

Social Factors

1. Depending on whether the plan to go ahead with a bar, café and restaurant separately or together will decide the variety of environments in which visitors to the Pavilion can enjoy a drink, coffee or meal.

2. The regularity of usage of this facility is very dependent on what the main hall is used for and when it is open. Although not

specifically in the minds of residents (due to the number of cafes along the Esplanade at present) an indoor space in which people can look out to the sea and the pier (especially when weather doesn"t permit it outside) from such an iconic building was a very evident feature from the recent public consultation on 9th April. If a well-known and well received function takes place in the main hall which does indeed revive the Pavilion, the restaurant will be firmly placed to take advantage of this – however (due to the proximity of local restaurants) as a singular business, this scenario cannot provide an income for the Pavilion.

Conclusion – Recommendation

As has been seen from simple revenue calculations with considerable safety factors to account for the seasonal fluctuations in custom attributed to the Esplanade, a restaurant would provide a significant portion of the Pavilions income and provide further employment for the wider community.

However, the acceptance and success of the restaurant depend on a number of key considerations:

What type of bar/café/restaurant is opened? In terms of environment and menu.

How well is the restaurant run? By experienced managers and staff?

How does the restaurant interact with the rest of the Pavilion to create a single

entity?

References

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3. Littlefield, D (2008) Metric Handbook: planning and design data.

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Section 6.3.2 Shop

A Shop is one of the functions proposed in the Pavilion with 4 * 4.2 =

16.8 m² surface area. This place would be used for local and healthy

food.

Source :http://penarthpavilion.co.uk/renovation-plans/

Pattern of use

This place would be used during whole week and weekend days.

During week 9:30am- 8pm and over the weekend days 9:30am -5pm

could be used.

Environmental factor

The environmental factors of this function are as follow:

In terms of energy demand, by considering the required facilities including: display cabinet, refrigerator and food storage, as well as employee appliance, the energy benchmark based on the original CIBSE is assumed 310 KW.h/m², as long as the shop is used in a typical pattern (2448 hours per year). By considering the maximum allowed hours per year (3672 hours per year) which is proposed for this shop in the Pavilion, the energy consumed is increased 22% (378 kW.h/m²). (Field, 2008)

The required temperature for comfort level is between 19-21°C (Compton, 2002). So, for heating load, in addition to under floor heating requires low temperature radiator in winter and duct less air conditioning for cooling during summer.

In terms of lighting, this place requires general lighting at 500 lux (CIBSE, 2006). The fluorescent triphosphor is frequently proposed for shop, because they are energy efficient and have a long life..

Pattern of use

This place would be used during whole week and weekends. During week 9:30am- 8pm and over the weekend days 9:30am -5pm could be used.

Section 6.3.2 Shop

Social and economic factor

By allocating this place to local healthy food, this function is involved in food and a fitness grant scheme from the Welsh Assembly Government. This scheme was launched to provide financial support for community projects that encourage people into healthier eating.

By improving access to healthier food, the Pavilion could use this grant. This scheme is provided by the Department for Health and Social Services and Public Health Improvement Division, as well as Local Authorities (Foot and fitness, 2010).

Source:http://www.physicalactivityandnutritionwales.org.uk/Documents/740/food-fitnessimplement-e.pdf

Moreover, this function would be accompanied by some other activity such as providing some tucks from fruit by students and through it, encourage them to eat healthier food. The other factors

of this function are illustrated in right image.

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ood-fitness-implement-e.pdf

Social Scenario – Reception and ticket counters:

Reception counter of the Pavilion works throughout the working hours of

the day. It is a small space in the foyer with 5.36 m² plan area. This space is

used as ticket counter and reception.

Pattern of use

This space might be used all days of the weeks as the Pavilion also houses cinemas and shops. The counter may also be used during the week from 9:30am- 8pm and over the weekend from 9:30am -6pm.

Environmental factor

The environmental factors of this function are as follow:

In terms of energy demand, by considering the required facilities including: display cabinet, a computer, employee appliance, the energy benchmark based on the CIBSE guide is assumed as 95 KW.h/m². (1)

The required temperature for comfort level is between 19-21°C (2).

In terms of lighting, this place requires general lighting at 200 lux (3). The lighting chosen shall have to be considered to be energy efficient and run for long life, because it is going to be on continuous usage.

Social and economical factor:

The space is basically a supplementary functional space for the theatres and the complex as a whole, thus the users of the pavilion and its functions are to be counted for this space too. This auxiliary space is a part of the function and the economy of the other functions and combine to contribute in part to this function/ space.

Evaluation Matrix

The following sections will undertake an overview as to how this scenario performs under the relevant sections of the Evaluation Matrix, below:

Bibliography

[1]. Field J, Energy benchmarks, engineering a sustainable built environment, CIBSE, TM46; 2008.

[2]. Compton P. Heating, CIBSE Guide B1, Norwich; 2002.

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Section 6.3.3 Reception

Floor Plans Copyright: Purcell Miller Tritton

Section 6.3.4 Auditorium/Cinema

This space would be used for movies, plays or lectures. There is a small concession stand providing basic snacks. Prices for such theatres are not officially documented so assumptions have been made on patterns of use as well as prices.

Capacity

The cinema seats up to 70 people plus 2 wheelchair spaces.

Patterns of Use

The use of this space has been assumed as follow:

Weekdays – 1 2-hour show every evening with a matinee twice a week on

Mondays and Wednesdays

Weekends – 3 2-hour shows

School holidays (Christmas, Easter and Summer – 18 weeks) – 1 extra show a day

Occupancy averaged out at 50% to take possible fluctuations of use into

consideration

Economic

Matinee tickets - £4.00 (104 shows a year) 50% occupancy £14,976.00 per

annum

Standard tickets - £6.00 (698 shows a year) 50% occupancy £150,768.00 per

annum

Concession stand – assuming half of the viewers spend an average of

approximately £6.00 on snacks £86,616.00 per annum

Possible annual revenue £252,360.00

Floor Plans Copyright: Purcell Miller Tritton

Section 6.3.4 Auditorium/Cinema

Energy

This particular function does not require very specific conditions.

Perhaps the main concern is ventilation to accommodate the large

numbers in the space, as well as the video and audio equipment. To

achieve a good level of comfort, the required internal temperature is

between 21-23 ºC in the summer and 19-21 ºC in the winter (BSRIA,

2003).

Ventilation

With large numbers occupying the space, and 8 l/s/person of air to

supply (BSRIA, 2003), this room would require mechanical ventilation

to ensure an adequate level of comfort.

Lighting

For use as a lecture theatre, this space would require general lighting

levels at 300 lux whereas only 100 lux is needed for use as a cinema

(Field and Soper, N/A). Therefore dimmable lights would be required

for this space.

Equipment

The following is to get an idea of the energy consumption of the equipment likely

to be used:

REALiS SX7 Mark II – high-end projector consumes about 350 watts (5)

Krix kx-1470 – surround sound system consumes about 300 watts per

speaker(6)

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Section 7: Environmental

Factors – Energy and Water

7.1 Heating

7.2 Ventilation

7.3 Energy Generation

7.4 Water Management

Section 7 – Environmental Factors

Summary

While the previous chapter dealt with the socio-economic scenarios that form a part of becoming sustainable, it is

clear from the recent popularity of BREEAM and other construction regulations and guides, that environmental sustainability is

perceived to be the measuring stick used by the general public. In addition to the reduction in Carbon Emissions associated with

environmental sustainability, an added incentive is the potential to reduce operating costs from energy reduction, energy efficiency

and renewable energy production.

With this in mind, this chapter will focus on some of the options recommended in the Sustainable Options Report

[1] produced in accordance with planning documentation. This chapter will also focus on some of the options discarded and

propose an argument for they"re inclusion in sustainable feasibility studies.

To move further into other environmental factors, heating, ventilation and water management efficiency were were

studied looking at possible alternatives. Once an idea of the possible energy demand after the use of efficient services, different

sources of renewable energy were studied and application of solar and hydro electricity projects to the Pavilion were proposed.

Alternative building materials were finally considered in this project with the intention of providing a list for comparison in

different parts of the building. Specifically, insulation was modelled using the computer software Ecotect and a series of

recommendations were made depending on two characteristics of the material in addition to cost and distance from the supplier.

References

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3.Welsh Assembly Government - http://wales.gov.uk/topics/sustainabledevelopment/design/standards/?lang=en Accessed 10/4/11.

Section 7.1: Heating

Penarth Pavilion has been utilized for diverse functions such as lectures, concerts, a cinema, dance hall and restaurant. However, due to the inappropriate heating system from the outset of the construction until now it was not filled to capacity, especially during winter months (The Penarth Society, 2010). So, one of the most important issues that should be addressed for renovation of the Pavilion is installation proper heating. The heating section will investigate different types of renewable heating systems and the compatibility of them with this grade II listed building, as well as environmental, social and economical issues. These systems include biomass boilers; air source heat pumps; ground source heat pumps; and

water source heat pumps.

Consequently, after investigation of them with regard to the visual impact, air quality, transport, local source, public access, heritage, as well as environmental, social and economical aspects it is concluded that the water source heat pump could be optimal solution. In addition, in the next sections, the features and characteristics of different types of water source heat pump are studied. Also, based on this heating system, the appropriate distribution system (under floor heating) is proposed for Pavilion.

Author: EG

Summary

Section 7.1 Heating

Introduction

Penarth Pavilion was utilized for different functions like lectures, concerts, a cinema, dance hall and a restaurant. However, due to the inappropriate heating system from the outset of the construction until now it was not filled to capacity, especially during winter months (The Penarth Society, 2010). So, one of the most important issues that should be addressed for renovation of the Pavilion is installation proper heating. To achieve proper comfort conditions for

this building, not only it requires the installation of the heating facilities, but also some other issues should be addressed such as insulation of building fabric, replacing single glazing to double glazing and etc. This section will investigate different types of renewable heating systems and the compatibility of them with this grade II listed building, environmental and economical issues. Thereafter, the appropriate heating facility will be proposed for Pavilion.

Renewable energy

Fossil fuel based energy such as natural gas, coal and oil form the primary source throughout the world. By increasing the associated problems with these resources, there is a need to reduce the utilization of the fossil fuels-based energies in the 21st century. One of the associated problems with fossil fuel energy is that the fossil fuels are finite resources and it is predicted that depletion of them will occur during next 5o years (Saidur, 2011). In addition to mentioned problems, the major problem which has arisen owing to environmental issues are global warming, climate change, air pollution, acid rain, ozone depletion and other problems due to the

rapid change of the composition of the atmosphere.

The importance of the these environmental issues is reported by the Intergovernmental Panel on Climate Change (IPCC):

"The Intergovernmental Panel on Climate Change (IPCC) reported that continued emissions will lead to a temperature increase of between 1.4 and 5.8 ˚C over the period from 1990 to 2100. The accelerated increase in temperature rise is greater than the estimated maximum average temperature increase that the environment can withstand" (Watson, 2001).

These environmental issues not only have negative impact on the environment, but also have a serious affect on the human health. So, for investigating the appropriate heating system for Pavilion, exclusively renewable energies are studied.

different types of renewable energy

biomass boiler

Biomass is considered as an initial resource for heating used by human that has a less harmful impact on the environment. Biomass fuels are infinite sources and seem appropriate from a recycling point

of view. The carbon dioxide emission of combustion biomass is released back to the atmosphere and this produces a net carbon that is absorbed through photosynthesis by growing plants. Hence, it is considered as a carbon neutral source of energy. The Carbon Cycle for biomass is illustrated in the figure below (Saidur, 2011).

Source: http://asasystemholding.com/biomass-energy.html

Section 7.1 Heating

Although, the utilization of a biomass boiler is benefited by many environmental, economical and social benefits, the compatibility of utilization of biomass boiler should be investigated for the Pavilion. The advantages and disadvantages of biomass boiler are as follows.

Advantages of biomass boiler

The conservation of the fossil fuels is one of the most important advantages, also this carbon neutral cycle result in decreasing air pollution and greenhouse gases. In addition to environmental benefits, it is inexpensive in comparison to other renewable energy resources (Demirba, 2005). The application of a biomass boiler provides considerable economical, social and environmental merits

including:

Long-term income for farmers local to Penarth and transport operators throughout the supply of biomass fuel and usage of residues of agriculture.

Offering job opportunities for local people.

Reducing the harmful emission from the combustion of fossil fuels.

Mitigating hazardous emission such as carbon dioxide,Nitrogen oxide and methane (Saidur, 2011).

Disadvantages of biomass boiler

Although, it improves social sustainability with regard to the employment rate and the occupational health, safety problems could be increased through utilization of a biomass boiler.

In terms of environmental impact, although it is considered as a carbon neutral source of energy, the other environmental impacts such as land sources, loss of biodiversity, deforestation and soil erosion should be taken into account (Saidur, 2011).

Also, another issue that it has an impact on the environment and the economy is subject to the provision of fuel for combustion.

Although, it could be provided locally, the accessibility and transport should be considered (Essex Country Council, 2010).

The compatibility with Pavilion (Grade II listed building)

It has been proved that installation of biomass boiler has environmental, social and economical benefits; however the condition of the Pavilion, heritage considerations in terms of location and kind of building should be investigated. So, the compatibility of its installation is discussed below.

Visual impact: The visual impact in the Pavilion as a grade II listed building should be given priority as one of the major issues for providing heating. For instance, the visual impact of the installation of a biomass boiler could be considered the impact of a flue fitted through wall.

Source: Author

Section 7.1 Heating

Air quality: The emission of gases such as nitrogen, carbon dioxide emission and sulphurous that originate from the operational process has negative effect on the air quality.

Storage: the scarcity of space for storage the fuel for combustion is another challenging issue in Pavilion and in consequence, providing combustion during short time cycle increase the movement. It means due to the insufficient storage in the Pavilion, the transport issues could cause problem.

Access: the pavilion is located on the Pier and the delivery of fuel could be challenging by Lorries due to the narrow width of the entrance space on the Pier (WAG, 2009).

Source: http://www.wilbytree.co.uk/environmental.html Source: Author

Heat pumps

The trend of energy expenditure in the world is increasing and it is estimated than it would be more than twice of the current level according to current trend. Since buildings consume approximately 40% of global energy and half of this energy consumption is associated to the heating and cooling demand, it is required to minimize the energy consumption in that field (Zhai, 2011).

Heat pump has great potential to reduce energy demand in the buildings and also, they have equivalent heating and cooling.

From environmental perspective, they play prominent role in the successor of fossil fuels. Heat pumps are one of the most energy efficient heating systems in the moderate and mild climate and provide approximately 3 times more useful heat than the equivalent consumed electricity. It means by 100 kWh of electrical power into heat pump, it produces approximately 300-400 kWh heat.

As it is mentioned above, heat pumps have influential effect on preserving fossil fuel energy and consequently reduce carbon dioxide emission. Heat pumps produce low emission of carbon dioxide, less than half of the fossil fuel-based energy such as gas, oil and electricity.

Heat pumps are comprised three main parts:

1. The evaporator: the evaporator absorbs heat from surrounding medium.

2. The compressor: the compressor compresses the gaseous to the required temperature for distribution system.

3. The condenser: The condenser gives heat to feed the distribution system.

Section 7.1 Heating

Source: http://www.filterclean.co.uk/informationpage1geothermal.htm

The efficiency of heat pumps depends on: "climate; type of heat pumps; size of the heat pump; refrigerant used; thermostat controls; quality of work during installation; energy efficiency of building"s planning, insulation and ducts; safeguards against damage to coils from construction and equipments" (Omer, 2008).

Although, some people argue that heat pumps are not renewable energy sources because of their requirement to electricity for pumping, they are considered as influential renewable energies. In fact, the environmental benefits of heat pumps are due to the high level of energy efficiency (per unit consumed electricity, 3-4 output heat). Also, if the energy demand can be provided by other renewable energies like photovoltaic, the CO_2 emission will reduce considerably and provides clean and efficient heating systems.

Heat pumps are categorized in three types: Air source heat pump; Ground source heat pump and water source heat pump. Heat pumps collect and extract heat from surrounding ground, air and water and then it is distributed in the inside of the buildings. These three types

are investigated from different aspects to consider within Pavilion (Omer, 2008).

Air Source Heat Pumps (ASHP)

The heat for air source heat pump is extracted from surrounding air. In cold region, providing heat from extracting air in low ambient temperature is not considered as high efficient system than other kind of heat pump like ground source heat pump (Lohani , 2010). Because the efficiency of air source heat pump is affected by outdoor air temperature, the performance of ASHP is measured by heating season performance factor (HSPF). HSPF is calculated through dividing the seasonal heating output by seasonal power consumption (the unit of HSPF is BTU/watt-hours). The actual seasonal efficiency in a cold climate is lower than mild climate during heating season and for this reason it is not recommended in cold climate for heating building (Omer. 2008).

Furthermore, to install air source heat pump, a large space is required to locate large plant of this system in outside of building. The installation is relatively easy and it exclusively requires creating a

hole in the façade of the buildings to accommodate the required pipes works (English Heritage).

The compatibility with Pavilion

Environmental factor

By utilizing the ASHP with higher energy efficiency more than electric or fossil fuel based heating systems, some benefits are achieved with regard to the environment including:

Air quality: the operational process for ASHP does not emit carbon dioxide. Only embodied carbon emission could be due to the input electricity demand for operation. If the required electricity provides by micro generation system like PV, it could be considered as a zero carbon heating system to provide heat.

Section 7.1 Heating

Visual and landscape: due to the installation of this system in the outside of the building has a negative impact on pier where is considered as conservation area.

Social factor

Heritage: It is clearly evident that installation of ASHP not only has a

negative effect on the heritage feature of Pavilion, but also the operational procedure produces noise where exactly people use for sitting on the bench. As it is illustrated in bellow picture, these benches are very popular for people in Penarth and installation ASHP destroy people"s calm.

Economical factor

In comparison with other renewable energies, ASHP does not require high capital cost, but the point is that during heating seasons the efficiency of ASHP due to low ambient temperature drops and it results in increasing the required electricity to achieve adequate heat.

Source: http://www.sourcerenewable.com/en/pages/services-technologies.aspx

Ground Source Heat Pumps (GSHP)

Ground source heat pump extracts heat from the constant temperature of ground. Due to the moderate temperature of the earth during heating and cooling seasons, ground source heat pumps are more energy efficient in comparison to the air source heat pumps and electric resistance heating systems (approximately 3-4 times more energy efficient). Since GSHP are high energy efficient

technology, they are considered as renewable energies (Omer, 2008).

The installation of pipe works are spilt two methods including horizontal collector loop and vertical collector loop. Horizontal collector loops require large site to install to meet the required heat for building. When the site confronts the scarcity of surface area, collector loops could be located in the borehole, although the installation of vertical pipe work is too expensive.

Sourcehttp://www.eco-flame.co.uk/

Environmental factor

Sanner et al reported that the application of ground source heat pumps offer environmental and economical advantages in commercial and community buildings (Sanner, 2003). The environmental features of GSHP are as follow:

Section 7.1 Heating

Air quality: Although GSHPs are electricity powered, due to not producing carbon dioxide emission in operating process and also, because of their high energy efficiency they are categorized as renewable energies (for per electricity unit produce 3-4 unit useful

heat).Consequently, they save carbon dioxide emission considerably.

Visual and landscape: Because the installation of pipe work is under ground, consequently there is no impact on the heritage features and conservation area.

Geology: Owing to the location of the Pavilion on the Pier, the horizontal pipe works are not feasible. So, due to the confining space, vertical collector loops could be considered for Pavilion. Vertical collectors could led to undesirable hydraulic connections and borehole could have geological impact on the local geology.

Social factor

The installation of ground source heat pump do not have negative impact on the public access to pavilion, also, there is no damaging effect for recreation and transportation. GSHP could be considered as social sustainable heating systems.

Economical factor

Installation of ground source heat pump have high installation cost to place pipe works, especially for vertical one and also, have long payback period. However, the cost for maintenance is considerably

low.

Source: Author

Water Source Heat Pumps (WSHP)

Water source heat pumps work as the same as GSHP. They extract heat from water to provide sufficient heat for buildings. The pipe works should be submerged at the level of water where temperature maintains at a relatively constant level.WSHPs are energy efficient as much as ground source heat pumps and, also WSHPs are more appropriate for buildings are situated near a sufficient water source than ground source heat pump.

Environmental factor Source: http://www.ag-energy.co.uk/products/water-source-heat-pumps

The environmental impacts ofWSHPs are as follow:

Hydrogeology: due to the possible leakage of additive chemical utilized in water source heat pump, it could be resulted in pollution of ground water and negative hydrological impact. To sort out this possible problem, the utilized equipments should meet the standard of environmental agency by obtaining advice of them and utilizing the high quality facilities.

Social factor

Visual impact: there is no visual impact of installation of WSHP on characteristic of conservation area (Esplanade). Also, it terms of heritages feature, due to not being visible external unit of WSHP there is no negative influence on the character of the Pavilion, in addition, WSHPS work almost silent. Consequently,WSHPs offer good potential with regard to social factor.

Economical factor

Although, the initial capital costs are relatively high, the maintenance costs are at least and also, WSHPs as a modern technology cause to promote the value of the building. Furthermore, there are generous grants available which is explained in following section.

Section 7.1 Heating

Appropriate heating system

Different types of renewable heating systems are investigated in above sections such as Biomass boiler, Air source heat pump, ground source heat pump and water source heat pump. Consequently, after investigation of them based on the visual impact, air quality, transport,

local source, public access, heritage, as well as environmental, social and economical aspects it is concluded that the water source heat pump could be optimal solution. In the following sections, the features and characteristic of different type ofWSHP are studied.

Water source heat pump's features

Water source heat pump Advantages

The utilization of water source heat pumps has largest growth since 1995 (9.7% annually in Europe) and this growth is due to the numerous advantages that WSHP offers to building and its occupants (Ozgenera, 2007).These advantages including:

Low maintenance cost

Environmentally friendly

Long life cycle

More energy efficient: per 1 unit electricity produce 3-4 useful heat units

More preferable by Government and Energy planner: significant reduction in the level of CO_2, SO_2 and NOx emissions

Providing heating, hot water and cooling

Proposed for new buildings, as well as renovating projects

Approximately 15-70 % reduction in CO2 emission

Generous grants (available in UK)

Financial incentive for WSHP

The Renewable Heat Incentive policy is the first financial support

was established 10 March 2011 in UK. The renewable heat incentive

(RHI) offers financial support to companies who select the renewable

technology to provide heat. The support levels are distinguished by

the size, technology and consumer groups. Also, the level of supports

depends on efficiency of heat pump and the price of electricity in the

future. In addition, the tariff payment could be considered higher than

the cost of required electricity to produce heat (DECC, 2011).

Consequently, this policy could be as a sufficient incentive for pavilion

(community building) and it can sort out the economical barrier of

the high capital cost ofWSHP.

Table:RHI for non-domestic heat pump

Source:http://www.decc.gov.uk/en/content/cms/what_we_do/uk_supply/energy_mix/renewab

le/policy/incentive/incentive.aspx

Section 7.1 Heating

Different types of water source heat pumps

Surface Water source heat pump (SWSHP)

If a reasonably water source is available close to the building, pipe works can be submerged by water. The closed and open loop could be utilized for surface water source heat pump. The required surface area and depth of water should be responded to meet the heating loads under local weather conditions. These applications need special consideration that should be discussed with relevant experienced engineer (Omer, 2008).

Generally, in closed loop system, the fitted pipe works in loop bound to concrete anchors. These anchors protect pipe working and restrict their movement. It is suggested that the loops be fitted at least 1.8-2.4 meter below the water surface. If these pipe works installed in deeper level, they can be achieve more sufficient thermal mass, in turn, they become more energy efficient (Omer, 2008). These submerged loops offer at least length of pipe and consequently decrease the cost of it.

Surface water: (Pond Loop, SurfaceWater Loop)

Source: http://www.cres.gr/kape/pdf/geotherm/7.pdf

Case study: Surface Water source heat pump

Stanwick Lake

A unique countryside attraction placed in Northamptonshire and it plays as significant role to attract people to this conservation area.

This new building comprises a wide range of sustainable technologies.

For heating system, water in the lake is utilized as a source for surface water source heat pump. The pipe works are carefully protected with anti freeze and water mix. "These collectors were formed of 4 rafts and each raft was comprised of six, fifty meter coiled pipes, fastened onto a mesh based". The application of SWSHP meets the required heat for the whole of the building. The generated heat is distributed to the building by under floor heating systems which are appropriate with the high ceiling of this building (RES, 2010).

Source: http://www.nndev.co.uk/case-studies/new-stanwick-lakes

Section 7.1 Heating

Ground Water source heat pump (GWSHP)

The GWSHP extract heat from earth through ground water. The temperature of the ground water is moderately constant at depth of 10-15 meter below the surface (Omer, 2008).

In addition to constant temperature, ground water temperature is relatively higher. So, GWSHPs do not need supplemental heat when the outside temperature drops extremely low (Ozgenera, 2007). Although, the installation cost of this system should be considered, because its price is approximately twice more than SWSHP (Abesser, 2010).

Pipe work

The open loop system virtually are utilized for ground water source heat pump. In this system, instead of the heat transfer liquid used for closed loop, the ground water is utilized as heat transfer medium. For application of the open loop two major factors should be considered. The most significant factor is the quality of water which could be subject to corrosion and fouling, as well as blockage. In addition,

based on the configuration of well, can have high pumping load demands.

Open loops offer better thermodynamic performance than closed one due to the fact that wells are utilized as a medium at ground temperature rather than heat transfer fluid at temperature other than temperature of ground. However, the cost of pumping is considerably high, unless it is pumped for other targets like irrigation. Also, if it is controlled poorly or oversized, the energy requirement for pumping could be excessive (Omer, 2008).

Source: http://www.cres.gr/kape/pdf/geotherm/7.pdf

To sum up, it is concluded that considering GWSHP is not cost effective for Pavilion according to the application of open loop used for GWSHP. In addition, one of the major barriers to utilize it is considering the water quality that it could not be guaranteed in the sea water. So, it is required to investigate the feasibility of SWSHP in the sea water with lower temperature than the water of the pond or lake.

Section 7.1 Heating

SEA water source heat pump

The pavilion is located in front of the Celtic Sea. The Celtic Sea is situated in the North Atlantic Oceans, between south west England and southern Ireland. Due to the proximity of Celtic sea with North Sea, the temperature of the water is relatively low. As it is illustrated in the bellow image, the temperature of the sea is approximately 9˚C and it is relatively low for WSHP (GOA, 2004). So, it is required to probe case studies that sea water used as a source forWSHP and the feasibility of them should be investigated.

Source: http://www.internalwaveatlas.com/Atlas2_PDF/IWAtlas2_Pg067_CelticSea.pdf

Case study 1: Sea water as a source for SWSHP

The National Waterfront Museum Swansea:

The National Waterfront Museum is situated in a very impressive building with unique combination of new and old architecture. A new slate and glass is combined with the old (Grade II listed building) part imposingly.

Source: http://www.museumwales.ac.uk/en/2234/

This former dockside storehouse was constructed in 1902 and this

grade II listed building was refurbished and opened since 2005. The Kensa designed a heat pump for this building based on ISO9001 and for designing and installation of heat pump, UK generation Award National Museum as an excellent design led regeneration project (National Museum, 2010).

This project is very similar to the Pavilion project. Not only it is a Grade II listed building with own constraints and limitations, but also, it uses the same sea water (Celtic Sea) as a source for heat pump. Accordingly, the usage of sea water for National Museum proves that the surface water source heat pump is feasible for Pavilion.

Source: http://www.swansea-waterlinks.com/heritage_sites.htm

Section 7.1 Heating

Case study 2: Sea water as a source for SWSHP

Another cast study is Barry water front. To achieve maximum advantages for domestics and commercial buildings at the Barry, water source heat pump is proposed for the whole district by Atkins. Atkins is one of the most successful sustainable design consultancy and lead engineering in the world.WSHP could be most sustainable

option for providing heat for the whole district due to the large surface available area and this low grade of heat make efficient heat for district by heat pump.

From former work in National museum Swansea, it is conclude that the recirculation of outlet and inlet position from heatexchanger is subject to such system. So, one of the major issue is that the abstraction of inlet and outlet should be taken into consideration to avoid circulation of water between inlet and outlet. Also, the material contacted with sea water should be properly specified. For instance, utilizing the titanium plates in the heat exchanger and filtering issue should be considered (Tuthill et al, 2009)

It is estimated that per each unit of electricity, 4-5 units of useful heat will be generated (Tuthill et al, 2009) and it has a significant potential to reduce the carbon footprint. This sustainable option, not only reduces the carbon dioxide emission, but also it could be treated as a modern feature of this district resulting in economical benefits for local people.

Source:

http://www.valeofglamorgan.gov.uk/living/planning/major_applications/barry

_waterfront.aspx

Source: http://en.wikipedia.org/wiki/File:Barry_Waterfront.jpg

Section 7.1 Heating

Applied to the Pavilion

Regarding the two above case studies, it is proves that the usage of

sea water as a source is feasible for WSHP. Although, the installation

of WSHP requires special consideration such as titanium heat

exchanger and maintenance of filtering, it is relatively cheaper than

ground water due to utilizing closed loop for pipe works. To install

theWSHP the following feature should be considered:

Specifying material in contact with sea water, such as: titanium plates

in the heat exchanger.

Filtration and maintenance of the filters to avoid problem in the

operation of theWSHP.

Prevention of recirculation of water between inlet and outlet

position.

Agreement of relevant bodies such as the Environment Agency for

abstraction and returned water.

The installation of WSHP offers a numerous benefits in terms of environment, economic and society.

Environmental factor: One of the most evident merits of the installation WSHP is associated to the environment. With this high energy efficient system, the considerable carbon dioxide emissions are prevented. Also, by considering the micro-generation technology such as PV, to some extent of the required electricity for this system are generated, hence, it conserves and preserves the finite source of fossil fuels.

Economical factor: Although, the capital cost of theWSHP is relatively high, the generous grant is available for Pavilion by RHI from 10th March 2011. In addition, the cost of maintenance and running the system is negligible. Furthermore, installation such modern technology causes to improve the character of the building and, in turn it boosts the economic factors such as rent.

Social factor: Due to the submerged pipe works and internal units, there is no negative impact on the heritage features of the Pavilion

and Pier, also,WSHP works virtually silent. So,WSHP as a state of the

art technology has potential to improve the civic pride of the local

people.

The proposed closed loop circuit embedded in the seabed and

protected by the structure of the pier. In bellow images the proposed

area and installation of pipe work is illustrated.

Source: Author Source :http://penarthpavilion.co.uk/renovation-plans/

Section 7.1 Heating

Plant room's size for water source heat pump

After modeling the building in the Ecotect software, based on the proposed functions for Pavilion and alternation fabric of building, the calculated peak

loads in Ecotect is 32757 W (see Appendix D for tabulated resulted for EnviroCork) . For sizing the plant room, the information of the Kensa heat

pump is utilized (the water source heat pump for National Museum waterfront was designed by Kensa) for proposed size.

As it is mentioned above, the peak load for Pavilion is 32.75kW. Kensa designed the plant room ranging from 20 kW to 75 kW. So, for Pavilion with

30 < 32.75< 40 kW, the bellow dimension are proposed (Kensa Heat Pump, 2009).

This figure shows the roughly size of the plant form. For accurate sizing, it is require more complicated calculation by specified engineers, also due to

this fact that, the result of Ecotect are not accurate, the 40 KW heat pump is recommended.

Source: http://www.kensaengineering.com/Library/Technical%20Data/TIS%20Plantroom.pdf

Section 7.1 Heating

References

(references for this section combined with the bibliography in Section

7.2 Ventilation)

Distribution system

Under floor heating systems are proposed as an efficient way to

heat building with high ceiling. This system warms objects and people

by radiant, instead of heating air and circulating warm air like

convector radiator. So, by transferring the heat directly to the people

the less energy is required to achieve thermal comfort for occupants.

Sattari (2006) identifies that the type, diameter and number of pipes

have a minimum influence on the thermal performance and major

features that should be considered are thickness and type of the

cover. A good emission behavior of the covered material offer

appropriate thermal performance.

So, under floor heating systems which heat building by radiation not only is efficient way, but also is more preferable for occupants due to the similarity of the heat with the natural one (sun). By installing the under floor heating, Pavilion with high ceiling gain more benefit than other types of heating. Also, the radiant mechanism to transfer heat provides appropriate heat with no draught for occupant. It could be argued that for building with large surface area like Pavilion, exclusively by installing of under floor heating, the sufficient heat provide for the center of the floor area.

To sum up, under floor heating provides background heat for Pavilion, especially for multi-use space and restaurant with high ceiling. In addition, low temperature radiator which is controllable and more responsive than under floor heating is proposed for small rooms like learning space, shop and reception. Consequently with such energy efficient system and appropriate level of control thermal comfort is provided.

Section 7.2: Ventilation

Air conditioning systems are utilized both for providing thermal comfort and improving the indoor air quality. The condition of air quality is one of the major factors in indoor environment that affects on the human health and work efficiency (Yua et al, 2009). In this section, the three types of ventilation are studied including; Water-Source Air Conditioning Systems (WRF); Under floor air conditioning; and natural ventilation, also the compatibility of them with condition of Pavilion is investigated.

After investigation different types, it is concluded that natural ventilation offers more environmental, economic and social advantages for building. Although there are some barriers and restriction (opening window) for having natural ventilation, it is proposed that by sorting out these barriers Pavilion achieve more benefits than installation mechanical ventilation.

Author: EG

Summary

Section 7.2 Ventilation

Ventilation

Air conditioning systems are utilized both for providing thermal comfort and improving the indoor air quality. The condition of air quality is one of the major factors in indoor environment that affects

on the human health and work efficiency (Yua et al, 2009). In this section, the three different types of air conditioning are studied including: water source air conditioning system; under floor air distribution; and natural ventilation.

Water-SourceAir Conditioning Systems (WRF)

"Water and refrigerant flow (WRF) technology has potential to be altered to both conventional air conditioning and reverse cycle heat pump system" (WRF, 2009). This technology, by combining the advantages of heat pump and VRF offers a building to have minimum impact on the environment and use water as a source for two functions. This water based technology offers more advantages than conventional air conditioning to the buildings such as efficiency, as well as flexibility.

Also, this technology is controlled locally which enables occupants to have control individually. The most important feature of this technology is that they are simply combined with WSHP and through it achieve high recovery of thermal energy. To installation requirements of WRF, three components are required: indoor unit;

external energy resource such as water source heat pump; and

neutral water loop. The function of WRF is illustrated in the right

figure (WRF, 2009).

To consider this technology for the Pavilion, some issues should be

considered.

Because the Pavilion is a Grade II listed building, the internal unit is

subject to the heritage impact.

The pipe work into the building has a negative visual effect. In

addition, because the Pavilion was formerly ventilated naturally, this

system causes extra cost.

Although, as it is presented in the below image, the internal unit

could be accommodated in the ceiling void and decrease the negative

impact. nevertheless, the pipe works are subject to harm heritage

features of the Pavilion.

Source: Author

source: http://www.multimodeventilation.co.uk/water-source-heat-pump-systems/

Section 7.2 Ventilation

Under FloorAir distribution (UFAD)

"Instead of air being introduced through a ducted overhead system, air is distributed via the plenum space under a raised access floor system and introduced through a series of diffusers which are installed in the raised floor panels" (Stenftenagel, 2009).

The installation of under floor air distribution is associated with some advantages. The main features of under floor air distribution are as follows:

The flexibility of system improves the accessibility to building services (Daly, 2002).

The efficiency of ventilation is boosted and consequently the air quality, health and productivity are improved.

Not only does the local controllability improve the condition of thermal comfort, but also it could be result in decreasing energy consumption.

The initial usage of conditioned air is gotten by occupant. So, it cause to improve air quality (below).

The energy consumption is less than over head air conditioning.

They are more cost effective than overhead HVAC system due to the

saving ductwork, Power, Plug and Cabling System.

Source: Daly, P. (2002) Under floor Air Distribution: Lessons Learned, ASHRAE Journal

Although, it improves the air quality of the building and is treated as cost effective kind of air conditioning, nevertheless it increases the energy consumption.

Natural ventilation

Natural ventilation offers more environmental, economic and social sustainability for building. So, it is required to investigate the potential of the Pavilion for naturally ventilated.

The Pavilion has a high ceiling and located windows at both high and low level has potential to be naturally ventilated. In fact, natural ventilation is created by stack effect. By opening the window the warm and pollutant air goes up and clean air replaced at occupant level. However, the point is that the windows at high level are not openable windows. It should be addressed that if these windows were changed to opening windows by an automatic system, the Pavilion could potentially be naturally ventilated. So, by considering the alteration of the condition of the window, the Pavilion is

benefited in terms of environmental and economical factor.

However, some functions such as shops, indoor sport activites, conference rooms, as well as the restaurant require some kind of ventilation to be provided with ductless air conditioning. This is because natural ventilation cannot meet the air change requirements of these spaces. So, by combining the natural ventilation and ductless air conditioning, the Pavilion will benefit from environmental and economical factors (save carbon dioxide emission, save cost of installation of mechanical ventilation, running and maintenance).

Source: http://www.columbia.edu/cu/gsapp/BT/EEI/HEATING/heat.html

Section 7.2 Ventilation

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Section 7.2 Ventilation

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Section 7.3.1 – Solar Energy

Introduction

Source: http://www.photovoltaics.co.uk/what-are-photovoltaics/

With refurbishment projects, solar electricity generation is a viable option. Although it is unlikely to produce enough energy

to allow the building to be autonomous, it is a quiet alternative to micro-wind turbines as well as a symbol of commitment to

sustainability. The argument against solar energy has always been cost and longevity. However with current technology, it is becoming

more and more cost effective and more efficient (Parker, 2009).With a government-backed scheme such as the "Feed-In Tarrif ", the payback

period for the cost of the panels plus installation becomes considerably shorter, allowing for a profit for solar electricity generated

(up to 12%).With the feed-in tarrif, a photovoltaic (PV) system can return between 43.3p – 30.7p for every kWh generated, and this is

locked in for 25 years.Also, there is a further 3p per kWh of electricity generated if exported back to the grid. (SolarGuide, 2011)

The performance and therefore output of solar PVs are likely to decline over time due to possible weathering, dust, bird

droppings, etc. However it is difficult to determine to what extent that may effect the overall efficiency. However with regular

maintenance it is likely to retain its performance and efficiency, lasting over 25 years. (Parker, 2009)

A new trend in solar energy is building integrated photovoltaics (BIPVs). In the case of difficult roof installation, or lack of

space on the roof or the site to place a photovoltaic system, there are innovative solutions which integrate the same technology into the

building fabric. They do not produce as much electricity as the conventional PV modules, however it adds to the aesthetic of the building.

With the pavilion, it is an alternative to placing PV modules on the roof of the building, maintaining the overall integrity of the building

without being too invasive. BIPVs is a subtle way to incorporate electricity generating technology without being too invasive. Also, BIPV is

seen as more cost effective seeing that it has the dual function of replacing elements of the building fabric as well as generating electricity.

Conventional PV systems require dedicated mounting systems which BIPV does not need. (Eiffert & Kiss, 2000)

In this section, the possible output from roof-mounted PVs as well as alternative options of BIPVs will be estimated.

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Author: LA

Section 7.3.1 Solar Energy - Case Studies

An example of the use of building integrated PVs in existing

buildings is the substation of Electricité de France (EDF) built in 1929

which has recently been converted into an "Industrial Hotel". This

building is not a historic monument of any kind, it has undergone a

change of use along with a necessary renovation. The completed, newly

renovated building by Emmanuel Saadi Architecture opened in October

2007. However the architect responsible for the 9-story energy generating façade design was Christophe Dujancourt.

The two main façades are south- and west-facing, 80% of the south façade and 60% of the west façade were covered in PC cells. Along with panels on the roof acting as railing, there are a total of 50,000 solar cells incorporated into this building estimated to produce approximately 76,000 kWh per year. (Source: Roach, T. (2003) Transformations with Building-Integrated Photovoltaics [ONLINE] available at: http://rmhf2009.com/index.php?itemid=245 accessed 7 March, 2011)

Name project Student Union building in Malmö

Country Sweden

Year 2006-09-01 (Start operation date)

PV application

Façade - integrated in fixed sunscreens,

Façade – mounted

PV power total 25.6 kWp

Location Malmö

Name project

Primary Health Care Centre

"Roger de Flor"

Country Spain

Year 2007-11-01 (Start operation date)

PV application

Façade - transparent PV facade,

Flat roof - mounted & mechanical fixing

PV power total 10 kWp

Location Barcelona, Barcelona

"Actual production on 17 March 2010 as displayed in building entrance lobby"

Source of images : http://rmhf2009.com/index.php?itemid=245

(Source:

http://www.pvdatabase.org/projects_view_detailsinf

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(Source:

http://www.pvdatabase.org/projects_view_detailsinf

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Section 7.3.1a – Roof-mounted Photovoltaics

The addition of roof-mounted Photovoltaics (PVs) have been approved by the council. In this section, the options of incorporating different types energy generating PVs into the building will be explored.

The assumed configuration for the roof-mounted PVs are as follows:

Using Sharp Monocrystalline Solar Cell modules (model NU-180(E1) details in Appendix B), with an array of 30 modules, the output is as follows:

- nominal power output approximately 0.81 kW
- estimated total output in a year= 747 kWh

The images shown (below and right) illustrate where it will be placed on the roof and how it might be fixed.

Product Specifications :

High performance monocrystalline silicon solar cell module

Nominal output 180 Wp

Solar module conversion efficiency 13.7%

Dimensions: 1,318 x 994 x 46 mm

Bypass diodes to minimise power loss with

shading

BSF structure (Black Surface Field) for

optimising cell efficiency

Textured cell surface for especially high

current yields

Made in EU

Source: Solar Electronics (UK) Ltd. (2011)

http://www.sharp.co.uk/cps/rde/xchg/gb/hs.xsl/-

/html/monocrystalline.htm

Manufacturer details

Original drawings obtained from: Purcell Miller Tritton

Copyright:

Section 7.3.1a – Roof-mounted PVs

With an array of 30 modules (2 rows, 15 across) spanning 19.77 m

(length of roof >25 m), the modules are at an inclination of 35º on

the South-facing side of the roof.

Total power capacity of the system: 5.4 kW

With 13.7%efficiency, the peak power output would be 0.81 kWp.

Using an online calculator provided by European Commission,

Joint Research Centre: Institute for Environment and

Sustainability – Renewable Energies Unit, the estimated power

output for this PV configuration is as follows:

Estimated losses due to temperature: 6.3% (using local ambient

temperature)

Estimated loss due to angular reflectance effects: 3.0%

Other losses (cables, inverter etc.): 13.7%

Combined PV system losses: 21.5%

PVGIS © European Communities, 2001-2010

Ed: Average daily electricity production from the given system (kWh)

Em: Average monthly electricity production from the given system (kWh)

Hd: Average daily sum of global irradiation per square meter received by the modules

of the given system (kWh/m2)

Hm: Average sum of global irradiation per square meter received by the modules of

the given system (kWh/m2)

(Source: European Commission, JRC http://re.jrc.ec.europa.eu/pvgis/apps4/pvest.php)

Fixed system: inclination=35°, orientation=0°

Month	Ed	Em	Hd	Hm
Jan	0.79	24.5	1.18	36.6
Feb	1.37	38.4	2.06	57.7
Mar	1.95	60.4	2.98	92.5
Apr	2.88	86.3	4.51	135
May	3.13	97.1	4.98	154
Jun	3.10	92.9	4.99	150
Jul	3.15	97.5	5.10	158
Aug	2.82	87.4	4.56	141
Sep	2.30	69.1	3.65	109
Oct	1.49	46.2	2.31	71.6
Nov	0.97	29.0	1.46	43.8
Dec	0.60	18.6	0.90	27.7
Yearly average	2.05	62.3	3.23	98.2
Total for year	747		1180	

Section 7.3.1b – Solar Awning

As one alternative to roof-mounted PVs, using solar panels as fixed solar shading over the south-facing windows has the dual benefit of generating electricity and protecting the interior from direct solar gain.

A thin film solar panel is located above each of the 4 large south-facing windows. The approximate dimensions of panel each panel is 2 m x 1.9 m at a 30º inclination.

Using Ertex Solar high efficient monochrystaline laminated safety glass panels with 15% transparency (see Appendix B for manufacturer details), the output is as follows:

Approximate power capacity 2.7 kW

With 18% efficiency, the peak power output would be 0.5 kWp.

Nominal power output approximately 0.5 kW

Estimated total output in a year= 436 kWh

Manufacturer details

Source http://ertex-solar.at/cms/images/stories/ertexfile/VSG.pdf

Detail illustrating how the solar awning may be fixed to the existing building above the dormer windows.

Example of the proposed application (Source:

http://sungreensystems.com/2011/02/solar-electric-panels-no-longer-taking-the-shortbus-

to- design-school%E2%80%A6/)

Source: Author

Section 7.3.1b – Solar Awning

Using an online calculator provided by European Commission, JRC, the

estimated power output for this PV configuration is as follows:

Estimated losses due to temperature: 11.6% (using local ambient temperature)

Estimated loss due to angular reflectance effects: 3.0%

Other losses (cables, inverter etc.): 18.0%

Combined PV system losses: 27.1%

PVGIS © European Communities, 2001-2010

Ed: Average daily electricity production from the given system (kWh)

Em: Average monthly electricity production from the given system (kWh)

Hd: Average daily sum of global irradiation per square meter received by the modules of

the given system (kWh/m2)

Hm: Average sum of global irradiation per square meter received by the modules of the

given system (kWh/m2)

(Source: European Commission, JRC http://re.jrc.ec.europa.eu/pvgis/apps4/pvest.php)

Fixed system: inclination=30°, orientation=0°

Month	Ed	Em	Hd	Hm
Jan	0.50	15.5	1.30	40.2
Feb	0.78	21.9	2.07	57.9
Mar	1.24	38.3	3.37	105
Apr	1.63	48.8	4.61	138
May	1.74	54.0	5.03	156
Jun	1.84	55.3	5.39	162
Jul	1.69	52.4	4.97	154
Aug	1.54	47.8	4.52	140
Sep	1.36	40.7	3.87	116
Oct	0.88	27.2	2.42	75.1
Nov	0.69	20.5	1.81	54.2
Dec	0.43	13.3	1.11	34.4
Yearly average	1.19	36.3	3.38	103
Total for year	436		1230	

The images below is a basic shading analysis showing the

extent of shade from the sun provided by the solar awning at different times of the year. They display the shadow range of the solar shades alone. During the summer, it sufficiently protects the large windows from direct sunlight, consequently reducing the extent of solar heat gain. During the winter, it allows the majority of sunlight to enter the building.

Spring Equinox

Summer Solstice

Autumn Equinox

Winter Solstice

Shadow range of solar awnings modelled on Ecotect. Source: Author

Section 7.3.1c – Solar Glazing

Another alternative is using the large expanse of glazing in the south façade to also produce energy. Using insulated glazing panels which incorporate solar cells, it adds to the aesthetic and character of the building better that conventional roof-mounted PVs.

Using Ertex Solar high efficient monochrystaline insulated safety glass panels (see Appendix B for manufacturer details) the output is

as follows:

Glazing type A polycrystalline

Power output 125 W/m2

Area (2x785x755=1.19 m2 x 4 windows ~ 4.74 m2)

Total power output = 592.5 W

Transparency 13%

Glazing type B polycrystalline

Power output 84 W/m2

Total area (4.93 m2 + .88 m2)

Total power output: 487.7 W

Transparency 43%

System power capacity approximately 1.08 kW

Estimated total output in a year= 117 kWh

By using these thin film solar glazing, it increases the

functionality of the window. To maintain visibility and allow daylight to

penetrate, the solar cells are spaced out which also creates interesting

shadow patterns in the interior. However, using such glazing would require

the windows to be fixed to ensure the integrity of the performance it was

designed to retain. Also, seeing that this is a Grade II listed building, it is

probable replacing the existing glazing with solar glazing would not be

allowed.

Manufacturer details

Source: http://ertex-solar.at/cms/images/stories/ertexfile/VSG-ISO.pdf

Glazing type A

Glazing type B

Section 7.3.1c – Solar Glazing

Using an online calculator provided by European Commission, JRC,

the estimated power output for this PV configuration is as follows:

Estimated losses due to temperature: 5.3% (using local ambient temperature)

Estimated loss due to angular reflectance effects: 4.1%

Other losses (cables, inverter etc.): 15.0%

Combined PV system losses: 22.8%

PVGIS © European Communities, 2001-2010

Ed: Average daily electricity production from the given system (kWh)

Em: Average monthly electricity production from the given system (kWh)

Hd: Average daily sum of global irradiation per square meter received by the modules of

the given system (kWh/m2)

Hm: Average sum of global irradiation per square meter received by the modules of the given system (kWh/m2)

(Source: European Commission, JRC http://re.jrc.ec.europa.eu/pvgis/apps4/pvest.php)

One major concern with solar glazing is the possible overheating of the space behind the glass, which may ultimately increase the incident gains and greatly overheat the interior space. With the insulated panels, overheating of the panel itself is another concern. If the glazing panel, or any solar panel for that matter, is too overheated, the efficiency would be reduced. Therefore the configuration below illustrates and alternative to fixed solar glazing. By placing the solar glazing almost as a second skin, it would reduce the heat gains (although a proportion of the heat may still be transmitted through the glass). It is vital that this glazing panel is not sealed on all sides to allow the back of the panel to be vented hence removing a proportion of the heat from that space. This would allow the main window to retain its integrity as part of the original Pavilion windows (or a close replacement) and it would allow the windows to be opened as well. However the sual benefit of BIPVs as part of the fabric and a source

of energy is lost and with it, its economic viability.

Fixed system: inclination=90°, orientation=0°

Month	Ed	Em	Hd	Hm
Jan	0.21	6.47	1.50	46.4
Feb	0.29	8.04	2.08	58.2
Mar	0.39	12.0	2.85	88.5
Apr	0.41	12.3	3.11	93.3
May	0.36	11.1	2.83	87.6
Jun	0.34	10.2	2.78	83.3
Jul	0.33	10.2	2.68	83.0
Aug	0.35	11.0	2.82	87.3
Sep	0.39	11.8	3.02	90.5
Oct	0.30	9.46	2.28	70.7
Nov	0.29	8.58	2.08	62.3
Dec	0.18	5.74	1.33	41.1
Yearly average	0.320	9.73	2.44	74.3
Total for year		117	892	

Source: Author

Section 7.3.1 – Solar Energy

Another alternative to roof-mounted PVs, using solar panels as fixed solar panels over the south-facing balustrade on the pier seeing the long stretch of railing on the pier could be used to generate electricity as well.

Using 25 (0.8x0.5m² per panel) Ertex Solar high efficient monochrystaline laminated safety glass panels with 15% transparency, the output is as follows:

- system power capacity approximately 1.78 kW
- estimated total output in a year= 220 kWh (vertical)

= 307 kWh (35° incl.)

However this option was not considered further due to lack of viability. As previously mentioned, the main benefit from BIPVs is that it replaces building material by being part of the fabric while producing energy (as seen in the example below left). However with this configuration, it places panels on an existing element, placed in a position where it is vulnerable to theft, vandalism, deterioration, sea water, etc all of which may lead to decrease or even total loss of

efficiency.

Discussion and Conclusion

With government grants and schemes such as Feed-In-Tariffs and Renewable Heat Incentives, solar energy is becoming more and more popular, as well as economically viable, in the industry as a source of renewable energy. Technology in this field is constantly advancing to make it more efficient.

Although the current Pavilion Project has attained permission for roof-mounted PVs, building integrated photovoltaics could be a more attractive feature which would respect the integrity of the historic building. It is clear the most energy could be generated from conventional PVs, BIPVs could be installed in addition to that which is on the roof to further increase the energy generated by solar power.

Source:

http://www.abakussolar.com/en/download.html

Source: Author

Section 7.3.2 – Hydro-electricity

Introduction

Hydro-electricity has long been seen as a reliable source of renewable energy. For years, large scale projects involving the use of dams to drive water through turbines to generate electricity have seen iconic structures such as the Hoover Dam [8](right) in the US and Three Gorges Dam [13] in China become world renowned feats of engineering.

Closer to home, although now cancelled by UK Government funding, the Severn Barrage [6](stretching from Lavernock Point near Penarth to Somerset) would have joined these infamous structures – with the potential to provide roughly 5% of the UK"s energy needs (Wales and South West of England) using only the natural movement of water.

At a smaller scale, small micro-generation projects involving rivers and other small sources have enabled the electrical needs of a building or community to be supplemented by hydro-electricity. These projects have benefitted from grants available to pay for the capital cost of installation and have then provided an income via the Feed-in-Tariff (a payment made by the UK Government to renewable energy projects below 5MW. This payment is initially for energy generated, with the potential for further payment for surplus energy fed into the national grid).

This Section will introduce two potential sources of renewable energy using the sea on the doorstep of the pier.

Author: MA

Section 7.3.2 Hydro-electricity

Criteria – Benchmark

This section will undertake a review of two means of generating hydroelectric energy applicable to Penarth Pier. The primary aim of this project will be to facilitate the electrical requirements of the Pavilion building itself.

Using the benchmarks suggested in Northern Ireland [9], and assuming the existing proposals for the Pavilion is to be a "community centre" with good practice energy uses – the typical electrical requirements of the building will be in the region of 29kWh/m2 over the course of a year. This figure is confirmed by CIBSE1 with regard to a community centre typically using 40kWh/m2 per annum [2]. This figure can be scaled using the floor area of the proposed building of 1050m2 – giving an estimate of electricity requirements equal to 42,000 kWh per year. Although this figure is sourced from a journal published for use in Northern Ireland, the similarities in building conditions and regulations allows a fairly similar estimate to be assumed inWales.

In addition to the predicted power output of each scheme, a number of

further considerations will be discussed to provide a rounded suggestion in the case of each scheme.

Pier-mountedTurbines

The notion of pier-mounted turbines, whereby the turbines are mounted close the base of the piers is a concept which has never received much attention. Very few journals have ever been written on the topic and not a great deal of exploration has been made in this area of research.

Hydro-turbines placed on "piers" below water level are becoming a fashionable area at present, with large projects underway [11] off the Isle of Skye near Scotland and Anglesey off the North-West coast of Wales.

These projects have made use of new piers, which have the turbines attached, and are sunk below water level up to a mile out to sea.

However, these require careful positioning to ensure safety of vessels and the piers which actually support the turbines.

By positioning turbines on existing piers, the issue of new equipment is reduced and is only a consideration for docking vessels at the pier. A basic model of how this could occur on the end of the pier is illustrated over the page.

1 Using TM46, published by CIBSE, a community centre is classified as a "Public building nominally used for part of the year".

Hoover Dam

Source: worldbestspot.com

Tidal Turbine Source: dailytech.com

Pier-mounted Turbines Source: Author

Section 7.3.2 Hydro-electricity

To assess the potential for a pier-mounted turbine, an idea of how the

turbine will interact with the site is required to ensure some kind of

accuracy with regard to the Power calculations which will come later.

Below is a section of the pier, legs and turbine placement:

Using the Power Equation for Hydro-Turbines [3]:

Power = 1/2 x r x A x Cp x V3 - (1)

Where Power is expressed in Watts, r is the density of the fluid – in

this case, water has a density of 1000 kg/m3,

Area of turbine = p x 1.52 = 7.1 m2 - (2)

1.5 = radius of each turbine.

Cp = Coefficient of Performance of turbine [3] = 0.3 (conservative

estimate)

V = Velocity of Tidal Stream [10] = 1.3m/s

Peak Power = ½ x 1000 x 7.1 x 0.3 x 1.33 = 2340 Watts - (3)

To find potential, us above diagram and tidal range [14] to estimate

14m head difference within 6 hours. I.e. the tide will drop vertically by

14/6 = 2.3m per hour.

Therefore:

At Full Potential: 6.5m/2.3 = 2.8hours x 2 = 5.65hours = 5hours 39mins - (4)

Reduced Performance: 3/2.3 = 1.3hours x 2 = 2.6hours = 2hours 36mins- (5)

No Performance: 12hours – 5.65 – 2.6 = 3hours 45mins. - (6)

Therefore, Full Potential of 1Turbine = 2.34 kW

Actual Potential of 1 Turbine = 12 – 3.75 – 2.6/2 = 7 ~ 60% - (7)

Therefore, total potential of 1 turbine = 2.34 x 0.6 = 1.4 kW - (8)

Use 6Turbines => 1.4 x 6 = 8.4 kW - (9)

Based upon the above assumptions in terms of electrical requirements for the

pavilion, the investment here would be almost negligible in its impact, even with

the considerations that the River Severn provides one of the highest tidal ranges

in the world, the currents aren"t significant to take advantage of, even assuming

the Severn Barrage won"t be built within the lifetime of these turbines. This is further impeded by the rule of thumb that hydro-electric turbines cost roughly £10,000 + £2,500 for every kW. This implies a total cost just to install the system of £30,000 – with little realistic benefit.

Tidal Lagoon

A tidal lagoon is a slightly larger project to consider in terms of the sheer size, but it also has potential to provide many more benefits to the local area in terms of power generation and economy.

A tidal lagoon has the effect of pushing a bucket (with no water inside) into a bath, opening a hole in the bottom to fill it then closing the hole once the bucket is filled. The bath (tide) can be emptied below the bottom of the bucket, once this occurs, the hole can be opened again for water to flow through. The process of water gushing into and out of the hole in the bucket is exactly the same principles of a tidal lagoon, except the hole is filled with turbines which turn generators producing electricity.

Legend:

H.T. = High Tide

L.T. = Low Tide

Section 7.3.2 Hydro-electricity

Unlike the pier-mounted turbines, tidal lagoons are in use all over the world. Closer to home, a series of tidal lagoons were suggested as an alternative to the Severn Barrage by Friends of the Earth [4] among others in 2004. Numerous tidal lagoons have been suggested since, including one in Swansea Bay and a harbour style one in Rhyl, North Wales.Tidal Lagoon Source: AuthorExisting Strengthened PierTurbinesConcreteWall

Because of the presence of the pier as an existing dock, the hypothetical solution (right) makes use of a strengthening of the existing structure to form one side of the tidal lagoon attached to the land.

Calculations for Tidal Lagoon

Using the basic plan below and section of the proposed tidal lagoon:

And using equations from Power Hydraulics [12];

Mass outflow = rQdt = rAoCD square root (2gh) dt - (10)

Ao = Area of turbines, d = head of water,Q = flow rate, g = acceleration of gravity = 9.807m/s.

Change in mass in control volume = r A dh - (11)

A = Area of impoundment, dh = head drop over interval.

Ao = 5 x p x 1.52 = 35.34m2 - (12)

A = 162960m2 – hypothetically measured and CD = 0.75 – assumed

Therefore, assumeT = time to empty = 6 hours.

Rearranging (10) & (11) gives; dt = 162960 / (35.34 x 0.75(square root

2g)) - (13)

Therefore dt = 1389 for 5 turbines - (14)

Substitute intoT = 1389 [h1/2 / 1/2] = 8332 l/s => 2.3 hours to empty - (15)

AndV = 8332/1000 = 8.332m3/s

Power = ½ x 1000 x 35.34 x 0.3 x 8.3323

Power = 3066236Watts = 3066 kW = 3 MW.

This is a much more reasonable option, and would add another iconic image to the

Penarth seafront, with potential for a dock, specific to Penarth to be established in

open sea water once again.

However, as a part of a renovation project, this idea would simply cost too much

(rule of thumb suggests £20million+). But as part of a regeneration project of the

entire local area, this is a consideration which could be taken further as a source of

energy for the entire community.

Discussion & Conclusions

This section has experimented with a source of energy which is normally overlooked for obvious reasons with regard to renewables. However, due to its prominent location on the seafront in Penarth, water as a source of energy shouldn"t be neglected so easily.

The results of a basic design of two potential sources of electricity concluded the following points:

1. A pier-mounted hydro-turbine scheme wouldn"t be able to generate any significant amount of electricity to make the scheme viable.

2. A tidal lagoon/harbour would have some merit if taken further in the realm of a community based scheme which involved a significant portion of the esplanade support.

If either project were to go ahead by the client, or another interested party, the following considerations would require further attention:

With regard to the pier-mounted turbines:

Concrete Wall

Existing

Strengthened Pier

Turbines

Section 7.3.2 Hydro-electricity

Generator position – which would require placement somewhere on the pier to receive the electricity and manage it depending on building requirements.

• Protection of the turbine from oxidation and hydraulic attack – due to the tidal range leaving the turbines exposed to air.

• Structural improvement of the pier to support turbines and subsequent vibrations.

• Cordoning off area below turbine at low tide to prevent injury to walkers.

• Alerting incoming vessels of turbines below landing base and assessing ability of those vessels to miss the turbines.

• Arrangements with Feed-in-Tariff to earn financial benefits from the scheme – currently set at 20.9p/kWh generated [7].

With regard to the tidal lagoon, the following points should be addressed during initial interventions:

• How the lagoon will influence local hydro-dynamics – and

subsequently how this will affect localised biodiversity.

• The use of sustainable concrete in construction – refer to

Chapter # Materials.

• The potential for the system to be connected to the national

grid or a community based system.

• Subsequently, the opportunity, via Feed-in-Tariff, to earn

4.7p/kWh generated [7].

• The potential for docking bays to be located on the outer

rim of the lagoon for boats, yachts etc.

• Further guidance from Consulting Engineers, Admiralty

Authorities,VoG Council andWAG.

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Section 7.4: Water Management

One of the most important resources that needs to be conserved and used judiciously is water. In an existing building, there may not really be a well planned water management system and there is potential for reducing the usage of water. This section discusses the possible ways of reducing use of and conservation of water in different ways. Although there are many ways of doing this, and the building has potential to conservation of water significantly, the listing, economics and practicality of these solutions may be restricted. The two aspects discussed in this section are the reduction, conservation and reuse of water as a resource.

Author: HA

Summary

Section 7.4 Water Conservation

Water resources :

Water is an important source of energy and is a potentially important resource which has to be efficiently used and conserved. The importance of conservation of water has already been justified and accepted. The resource could be conserved by two main ways:

Reduction and conservation – optimising the water usage by using energy efficient equipment and monitoring the wastage by means of detection and control devices. Also, water collected from natural sources [rain] should be collected and treated for use.

Reuse and treatment – this is to reuse the water more than once, without just disposing of it after a single use. The used water can be appropriately segregated and treated, reused and cycled down before being letting it to be disposed.

Conservation of water is an efficient method of saving water because rain water is a natural form of water that gets down to the ground to form

part of the water table over time. This water can be collected, filtered

and used to cater the water needs of a building. The concept is basically

collecting water that falls on the roof of the building that is collected and

directly used or stored over a period of time and used as per demand.

Rain water conservation: According to (British Standard BS 8515:2009

Rainwater Harvesting Systems – Code of Practice)

Three types of rainwater harvesting system are :

"a) water collected in storage tank(s) and pumped directly to the points of use.

b) water collected in storage tank(s) and fed by gravity to the points of use.

c) water collected in storage tank(s), pumped to an elevated cistern and fed by

gravity to the points of use."

The Pavilion, being an existing building and being used for mixed use purpose -

a detailed approach of rainwater conservation strategy is required.

Roof profile

This involves an experts evaluation of the site and its hydrological behavior

for precisely designing the system. This proves to be an expensive process.

But to understand the scale and potential feasibility and affordability of a

rain water harvesting system for the Pavilion, an approximate method has

been used to just to see if it is an profitable and a practical solution.

The result of this evaluation may not be accurate but approximate. For this purpose the simplified approach specified by the British Standard BS 8515:2009 was used. This specification includes "The simplified approach" which has been used for this estimate. The effective roof surface area for the pavilion is approximately 880 m^2, using this area as a reference and the hydrological map of the UK (see diagram below), the sizing of the water storage comes to 28,000 litres approximately. This seems to be a large size which may require a large sized tank. This may not economically and practically possible for the existing pavilion because of the lack of space and the cost of having one built off site and connected.

Section 7.4 Water Conservation

The water collected cannot be used for portable purposes without prior treatment but can be used for other purposes like garden use or other low grade uses or for flushing toilets.

The rainwater could be collected in small external tanks of say 100 – 200 liters and be used to water the landscape around or for other cleaning purposes.

When the rain water is filtered enough for solid and oil impurities, it can be diverted to underground plastic tanks available commercially (3000 – 8000 liters) and pumped up to flushes and be used as and when required.

These rain water tanks may have to concealed from direct sunlight to avoid algae growths. And during the non monsoon seasons where the rain water may not be able to fill the tanks the supply shall be automatically to mains supply, but at any point the usage of mains shall be kept to minimum.

Apart from these the water usage can be reduced by means of using water efficient fixtures and water control instruments like cut off sensors, automatic flushing systems, water less urinals, bi – flush urinals, etc. the affordability and user comfort has to be kept in mind while deciding them.

The roof water alternately could be collected and used directly when ever possible without having to store them, in addition to the normal water supply to support during the dry periods. For this the existing gutters which directly collect the water and drain it through the drainage. This could be

altered to have a roof washer that directly filters the rainwater that is

collected from the roof and be used for various water demands of the

building. This again may not be an effective solution in the extreme winter

when the water gets frozen.

Existing gutter system that collects

water run off from roof and directs it

to the drain system directly without

being reused

Source: http://www.solarhaven.org/WaterStorage.htm

The Pavilion is a stand alone

structure that has been supported on

structural piers, and alterations for

external storage tank may not prove

practical

Use of occupancy sensor systems to

shut off supply when un used: this way

unnecessary faulty leakage of water

could be prevented.

Upgrading to efficient

fixtures is an easy way to

save on water.

Section 7.4 Water Conservation

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CONTINUOUS PROFESSIONAL DEVELOPMENT PROGRAMME for

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http://www.rainwindsun.com/faqs/grey-water.html 14th April 2011.

Water recycling process map Auroville - Source : by author

Alternate use of water : grey water recycling:

Principle:

Grey water is the used water from sinks, kitchens, baths and showers. This water can be collected and be used to flush WC, used in garden etc, before being let into the drains. The water collected shall be treated to remove impurities and other undesirable particles and also disinfecting it. The water can then be sent to a supply unit that supplies water for flushing and other general cleaning purposes, or landscape uses. Using the recycled water for these purposes can reduce demands from the mains up to 40%. Various systems to suit various conditions are available commercially.

The Basic system:

It is a system that has pipes connected to tanks that collects water from the above mentioned areas after use and stores the water. The water is

then disinfected to the required level to be used in flushing of the WC"s. A

separate pipe collects the water and stores it in a tank, which is fitted

with an overflow to the main sewers. The collected water is then sent to

another unit that disinfects the water with chlorine or bromine. The

header unit also has a mains tap to fill up when required and the water is

then pumped to the flushing or tap units.

Section 7.5: Materials

Source: Author

The renovation of Penarth Pavilion is that of an effectively derelict building. To ensure a comprehensive

renovation takes place to meet both Health & Safety and Building Regulations, new materials will be required

to supplement the strength, thermal performance and aesthetics of the Pavilion.

Where possible, alternative building materials have been researched and suggested in this section based upon

a simple quantification of tabulated values including suppliers and prices available. This is in addition to a

sustainability measurement known as Embodied Energy and a more common measurement specific to that

material. Using this data, it is hoped the client will have a well-rounded idea as to different points to consider

when attempting to source materials for a building such as the Pavilion.

Author: MA:HA 60:40

Summary

Section 7.5 – Materials

Introduction:

Penarth Pavilion was built in 1928. As a building of historic proportions as

well as significance to the town of Penarth, numerous materials still in

existence in or on the building have become inadequate as the years in

which the building has been allowed to decline have taken its toll.

In accordance with requirements to fulfil basic building regulations, the

aspirations of planning and conservation departments at the Vale of

Glamorgan council and with the sustainable intentions of the client in

mind, the materials selected to replace, make new and restore areas of the

Pavilion which require attention must be in accordance with all of the

above.

This section will undertake a sweeping survey of some of the notable

"sustainable" materials in currently in existence and present a case for why some should be selected for implementation within the building over others.

To view all of the options studied for this section, information on them and the benchmarks set, please consult Appendix C.

Structure:

The existing structure of Penarth Pavilion has been standing for over 80 years, receiving considerable treatment due to its exposed position on the seafront. The client proposals also indicate some new additions internally to the Pavilion to facilitate a new cinema and balconies in the main hall for example.

To ensure the strength of the existing structure of the building and to allow the new facilities to be easily incorporated, sustainable construction materials do provide an element of environmental awareness in an industry which is traditionally one of the heaviest polluters during the construction stage of a project.

The compressive strength of a material, in addition to the tensile strength, are considered to be the key parameters of a structural material.

A number of parameters are also of concern to structural engineers which determine how a structure behaves including brittleness etc. The main concern regarding materials which aren"t traditional materials manufactured using traditional methods is a question as to the reliability of these values. So long as correct certification is sought, the materials will perform to, if not better than, standardised materials. In this instance, recycled steel is considered to be the most versatile building material with a compressive strength of between 275 and 350 MPa. This is clear in the Pavilion itself with some reinforcement of the existing structure being undertaken using steel.

The embodied energy is a measured value for how much energy is required to produce a material. When assessing the embodied energy requirements for reclaimed material, there is much debate as to how to gain an accurate measure to compare different materials with different backgrounds. It was found in this section however, that Hempcrete had the lowest embodied energy value – or in principle is Carbon negative due to its potential to replace Carbon in the atmosphere during its lifetime as a plant. The problems that can occur with hemp are that its strength tends

to be much lower than other structural solutions, limiting its use in mainstream construction projects.

The closest supplier is a consideration due to the client intentions of sourcing as much material and labour locally as possible. It is also a consideration due to an addition of embodied energy for transport above. When attempting to locate a local supplier, the importance of locating local labour with the ability to install products which have been bought is imperative. In terms of locating local suppliers, the "sustainable concrete" known as GGBS (Ground Granulated Blastfurnace Slag) concrete is supplied by a company based in Cardiff Dock, just 4.5 miles away from the site. Thus in retaining as much work locally as possible, this solution out ways many of the others considerably.

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Finally, cost, as always, is a project concern. As a project funded primarily by public bodies, the optimal value for money must also be sought. GGBS was found to be the cheapest solution in terms of pure tonnage, alternatively another form of sustainable concrete known as PFA (pulverised fuel ash) concrete is also available at a similar price.

Steel is well known as one of the most unsustainable materials available. And although unsustainable to produce when new, the sheer number of steel projects that have been undertaken in recent years has provided a good supply of demolitions with steel sections being otherwise cast away. Reclaimed steel can either be melted down for recycling or, with specialist treatment and inspection by consulting structural engineers, directly reused in a different building.

Timber, although not as easy to recycle as steel can be reused for numerous applications following an initial project. Similar to steel, reclaimed sections of timber from demolition projects which have been adequately dealt with by consultants can achieve similar strength and aesthetic values as when they were brand new.

On a wider scale though, GGBS (Ground Granulated Blastfurnace Slag) and PFA (Pulverised Fuel Ash) are among a series of products which have been used to gradually reduce traditional OPC (Ordinary Portland Cement) ratios in concrete mixes – a material extensively used in the Pavilion. GGBS is simply molten slag from steel mills which is quenched (rapidly cooled) then ground down to a fine cement powder. Likewise,

PFA is a heavily pulverised fuel for power stations, such as coal. Both of these products are readily available in the existing economy reliant on steel production and, although the process by which they come from isn"t sustainable, the use of a more efficient production method to use less energy to achieve these direct replacements for cement is a step towards a more sustainable future.

Finally, Hempcrete and Lime Crete are both natural replacements to concrete. Due to the plant base used for Hempcrete, it has been found to be a Carbon negative material due to the offsetting of Carbon emissions required to process it during its natural lifetime. Although questions over the strength of the material are not without good reason, these materials are gradually being used in larger projects of no too dissimilar size to the Pavilion.

The issue of strength has argued as the major consideration when using a material to replace or add to a structure. It was found that a reclaimed steel section would have the best potential to have retained its original design strength of 250-350 MPa. However, in a building which is primarily a concrete structure, the substitute materials such as GGBS and PFA have

been found to achieve the same, if not higher, strengths than that of the equivalent OPC mix.

The issue of embodied energy is also an interesting one. Due to the fact that timber and steel are reclaimed materials, they only need minimal restoration themselves to be used in further projects, the embodied energy is considerably lower than, for example, PFA which is in effect a new material made from waste. Overall, Hempcrete does record the lowest embodied energy value – with its natural ability to replace Carbon and reduced manufacture process. It should be noted here that embodied energy will be explained further in the next section (Insulation) which contains a number of materials which are much more comparable in terms of embodied energy.

When dealing with suppliers, once again the manufactured products are much easier to confirm a set location from which they will be obtained. As with the reclaimed timber and steel products, the intention to achieve the required location can incur a time penalty which then puts financial burden on the project. For simplicity, the notion of distance to supplier has considered timber and steel from a warehouse source where numerous

sections are regularly stocked.

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Likewise, with cost, the price of reclaimed products is variable depending on supplier, location and ultimately what treatment is required to the material to bring it up to a reasonable standard which can be used in the building. Because of this, the lower price of manufactured materials is not purely due to the production processes in place to deal with them, but the confidence of a demand which ensures they are the cheapest available to the client.

Insulation:

The existing walls of Penarth Pavilion are (in the majority of cases) a simple reinforced concrete slab, 120mm thick. As part of building regulations and from a sustainable point of view, renovation work on this building is obligated to improve the insulation in the walls to reduce the heat loss of the building, implying a reduction in overall heat demand.

It has been noticed in winter months that, due to the poor insulation of the building, it can become even colder inside the building than outside (a problem only worsened by its exposed location).

By increasing the insulation value in the building to at least building regulations, if not better, not only the efficiency of the building will be increase, but its attractiveness to visitors during the winter months when trade from tourism is naturally reduced.

The four requirements presented for this section are Thermal Performance, Embodied Energy, Closest Supplier and Cost.

The thermal performance is based on the most efficient material in terms of thermal efficiency. In the case of thermal performance, the lowest amount of insulation required to meet the minimum required thermal values as set out by building regulations was a form of insulation known as Spacetherm. This fairly new material, comprised mostly of air, only requires 37mm of insulation attached to the inner side of the reinforced concrete walls to achieve minimum requirements.

This will naturally increase when an internal wall finish is proposed.

Though difficult to measure thoroughly, the embodied energy can indicate which material is the most sustainable to produce. In this case, straw bale was the least "manufacture heavy" due to an estimated 0.24 MJ/kg (Mega Joules per kilogram produced) before the bales leave the

supplier. This is due to the only energy required being the combine harvester used to shape the bales themselves.

When attempting to establish the closest supplier,Warmcel, or a type of recycled paper is produced by a manufacturer only 5 miles away from Penarth in Cardiff.

The cheapest product which can be fairly easily predicted, found that straw bale was the cheapest option in this category. Rough estimates placing straw at around 64p per square meter.

Straw Bale is a natural by-product. It is used on farms to grow crops such as wheat and rice. Following this, it has been used for numerous purposes such as bedding for livestock; however these thermal properties have since been taken up by humans. Using bales designed to size, straw bale can be used in small dwellings up to considerable sized developments.

Thermafleece is processed sheep"s wool. Once again, a natural material produced on farms, thermafleece is a form of blanket insulation that can be pinned or attached in numerous ways to non-conventional walls.

Spacetherm is a composite of aerogel – a glazing material used on space shuttles. The alteration to blanket insulation has achieve a thermal

performance lower than almost any material known to man. Although expensive, Spacetherm allows minimisation of wall footprint to be achieved.

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Warmcel, is processed, recycled paper. This is mainly found as a spray insulation which requires some form of casing once it has been sprayed into a cavity.

Homatherm is a wood-fibre insulation material. This tends to be sourced from wood chips from saw mills and processed into an insulation material with a woollier feel to it.

EnviroCork is a rigid form of cork insulation. It can especially be used across flat surfaces.

Breathe is hemp insulation. Hemp, like straw, is a natural product which can become a building material. Also used as a form of concrete, hemp has the ability to provide a healthier internal environment for occupants.

Innotherm is a cotton batt. Cotton batts are blanket insulator formed from processed cotton – for example denim from jeans

The thermal performance of the completed renovation must conform to a

U-Value (thermal conductivity) of 0.28 W/m2K. The thermal conductivity of a material identifies the amount of heat which can pass through the material for every square meter. This is dependent on things such as the type of material, how dense the particles are etc. The current U-Value estimate for the 120mm reinforced concrete walls of the Pavilion are in the region of 1.33 W/m2K at best. Thus, the addition of each material to obtain a U-Value of 0.28 is paramount to remain as low as possible. Spacetherm was the best option here, requiring only 37mm to obtain the specified value. However other considerations such as embodied energy, supplier distance and cost could be deciding factors which rule this out. With regard to embodied energy, this value represents the energy required at various stages in the extraction, manufacture, transportation, assembly and sometimes removal of a product from a building throughout its life. Due to the undecided nature of the materials, suppliers etc. that are apparent at the current early stages of project, it has been decided to compare embodied energy values each product from "Cradle-to-gate". I.e. from extraction to the point the product leaves the factory. Clearly the embodied energy for straw bale was lowest due to lack of processing

required to achieve a finished state. However, considering the thermal performance of the product, and subsequent room required to achieve minimum ratings, it is advisable to use Warmcel, the next lowest product on the list.

The client intentions to use suppliers as close to Penarth as possible to retain products and work from the local area is admirable. As discussed earlier, by retaining a close contact, transport distances are limited in addition to short journeys for maintenance issues at some point in the future. Warmcel, was the closest manufacturer, located in Cardiff.

In terms of providing the cheapest solution to remain within budget and give value for money, straw bale was once again notable. However, to with previous points in mind, Cork was found to be the cheapest solution.

Cladding – External:

External cladding is a significant issue with regard to Penarth Pavilion. Due to the conservation constraints that have been imposed on the project (see Planning Application for further details) that indicate the character of the building must be maintained during any attempts to renovate the building.

Thus, any external cladding device must be in keeping with what is

exposed concrete which has been painted.

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Similar to the insulation materials, the external finishes have been assessed over 4 key criteria – thermal performance, embodied energy, closest supplier and estimated capital cost.

With regard to thermal performance, the value obtained is the thickness required to reduce the existing 120mm thick concrete wall from an estimated U-Value (thermal conductivity) of 1.33 W/m2K to a more reasonable 1.00. This will reduce the thickness of insulation layers on the interior wall to achieve the above U-Value of 0.28 to achieve building regulations. It was found however, that the best thermal performance was achieve by using EWIS (External Wall Insulation System) which required 88mm to reduce the overall wall U-Value to 1.

To achieve the lowest embodied energy, it was found that lime render would be the lowest energy requirement. Due to its mainly natural composition, the primary energy requirements are from the quarrying and mixing of lime into the render mix. At 0.84 MJ/kg, this material is considerably lower than the other suggested materials.

Lime render was also found to be available from the closest supplier, at only 48 miles away – less than half of all competitors.

However, due to its wide availability, copper cladding which, at present, is the suggested material to clad the vaulted roof of the Pavilion. This is also aided by the low cost which has been achievable by mass production.

Copper tiles are currently the proposed material to be used in the renovation of Penarth Pavilion. The main benefits of this material are its well established methods of use, availability, low cost and low maintenance requirements.

EWIS (or External Wall Insulation System) is a system for providing further insulation on the external walls of a building. By using a range of materials, the thermal performance of the wall can be improved, allowing a lower amount of insulation to be required on the inside to meet regulations.

Lime Render and in some cases Hemp render, are a natural material infused into traditional render mixes to create a more sustainable insulation material with the same, if not better thermal performance than traditional systems.

Solar Paint, in addition or instead of traditional solar panels can be an

interesting addition to the façade of a building. Although very expensive and rare to find in the market place, photovoltaic paint has the potential to provide a source of electricity to the Pavilion without compromising the characteristic look of the building.

These materials have a number of pros and cons in differing areas. With regard to insulation, the lime and EWIS render systems provide a means to supplement the thermal efficiency of the existing walls without altering the characteristics of the building. When looking to achieve a low embodied energy, the lime render or copper systems seem to have the lowest impact due to the natural qualities and industrial efficiencies respectively.

Although the closest supplier was found to be a lime render supplier, the key considerations when attempting to source external cladding products is the market availability of the products. Especially with cladding systems, industry advances in the technology can be hard to source until they become mainstream.

Paints / Finishes:

The interior of Penarth Pavilion is currently in a very poor condition. As a result, a number of finishes have been researched and suggested as a

means of covering what will be a new wall construction with added insulation to bring the building up to building regulations at a minimum. In terms of activities in the building, different wall finishes may suit different needs, hence the variety of paints and suppliers presented in this section.

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An initial point to make about paints especially is the certification – in terms of an industry-wide process of standardising what products contain or emit different chemicals. Many of the paints discussed in this chapter are certified to EU VOC 2004 – a paints directive which details restrictions to harmful chemicals being used in paints.

This section, unlike others does not include an investigation into embodied energy. Due to the fact that paints, although bought in significant quantities, haven"t undergone the same rigorous work towards establishing embodied energy values in terms of production, a serious lack of reliable information is available to directly compare these materials in this fashion.

The environmental credentials have been compared for paints due to the differing selling points that suppliers who claim to produce sustainable paint market their products on. In this section, the key organic nature of

the paints themselves has been assessed in terms of how much of the paint is actually a natural product. It was found that Tierrafino Clay Paint was the most environmentally friendly of the paints researched. This was due to the fact that, barring a few additives to ensure the product could be applied as "paint", the essential composition is a naturally occurring clay product. The added benefit of this material is an element of breathability – the paint can move with the walls. Due to its location and pier based foundations, numerous cracks will and have appeared in what is essentially a concrete structure to the Pavilion. As these completely natural and unimportant cracks appear in the concrete, the use of a breathable paint allows these cracks to remain covered and not imposing on the aesthetics of the surface.

In terms of retaining the low cost element to the project, Tierrafino, is also the cheapest paint to buy per litre. This remains a consideration for the Pavilion as the cost of paints tend to increase (like all sustainable products) as they become more sustainable, due to the alternative manufacturing processes which are required, but not widespread at present.

With regard to locating the closest supplier, it was found that a matt emulsion paint produced by Auro, just 5 miles from Penarth would provide a local solution. With no chemical additives, Auro has a fairly conventional paint which, although not essentially natural, is less harmful to the environment and human health in use.

Helmi Primer is essentially water based paint with a matt finish. It is a paint which is on the limit of the EU VOC directive in terms of incorporation of chemicals which are harmful to the environment.

Earthborn is a form of clay paint with no additives in terms of harmful chemicals. Earthborn also has a breathability aspect to it – implying a natural movement, reducing crack and other common blemishes.

Oikos paint, though having a reduced solvent level, is primarily sold on the basis of being thermally insulating. The paint incorporates numerous microspheres of glass which are have the potential to retain heat. By retaining a warmer internal wall surface, the ambient temperature in the room will remain at a higher temperature than without it.

Auro produce a number of different paints for different finishes. Once again, now chemical additives are present in the mix, which allows

certification to EUVOC 2004.

Biofa provide a product which comprises a list of completely natural products. It is a matt paint with the potential to dilute heavily with water and hence use even less product.

Tierrafino is another source of clay based paint. Using completely natural materials, the paint is also the cheapest of the eco-paints suggested. However, due to its suppliers being based in Ireland and further afield in Europe, the transport considerations proposed by the client would imply this product would be unadvisable to use.

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Furniture:

The existing Pavilion has minimal furniture – most of which is degraded to such a state that reuse would not be advisable when seeking to entice the public into a newly renovated building. As such, this does not mean that reclaimed furniture or reused materials shaped into furniture are out of the question. With careful restoration and proper integration, the character of the Pavilion could be added to with the extensive use of furniture which has already had a long life.

Please refer to Appendix C, Table 5 for a summary of the suppliers presented here.

City Furniture Clearance is essentially a source of numerous items of furniture which are being sold on second hand. The supplier buys furniture from independent sellers, then houses them in a warehouse. What is clear is that, although the process of sourcing an entire collection of reclaimed furniture is a lengthy and agonising one – whereby restoration is a key issue, this supplier presents a central means of acquiring a variety of different goods in addition to traditional tables and chairs.

The other suppliers presented in Table 5 are a range of timber specialists. By using reclaimed timber beams from demolition projects, old railway sleepers, fencing and furniture, these companies have generated a new market in the shaping, refining and restoration of timber for use as furniture. The concept of designing for dismantle in the construction industry is an important driver not just for structural reuse of a material, but to enable this industry to gain the maximum potential from reworking timber products for a longer working life.

Flooring

Flooring to the Pavilion is an important factor visually and in terms of fabric. The existing flooring in the Pavilion is timber, which is a relay over an old existing wooden floor. The space is now just used as a gymnasium and thus there is no change in flooring material throughout the space. In the proposed plans, there are mix of functions and spaces and the flooring may or may not be proposed as a mix of materials (compatible and similar).

The sustainable flooring: Traditional conventional flooring systems may be less energy intensive but have products that are toxic or harmful to environment by some way. In response to this new flooring types have been developed and been used in the market. These may be products that are made from recycled materials, or naturally occurring sustainable sources like cork or bamboo etc. They include materials that are managed responsibly (like hardwood from sustainable forests), or products that are not toxic and have a long life span, etc.

Another factor that has to be considered is the availability and transportation of those materials. Reducing the energy consumption or damage to the environment by selecting sustainable flooring, but

transporting them to long distances may reverse the idea of sustainability.

Previously in this project we have explored the option efficient heating as Under floor heating. For this, the thickness and the material of the flooring has to be considered for efficiency. Wooden flooring (existing) does respond well to under floor heating. Like the other materials the flooring has also been assessed with key criteria of – thickness, embodied energy, closest supplier and estimated capital cost.

The thickness of the flooring is important for various reasons, for example, the heating systems, the insulation, etc. Being an existing public building and a building of local importance, the space has to have some visual relation to itself. The options thus explored has considered this.

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The wooden flooring (reclaimed) has a lesser thickness for the required U-value making it suitable for use, and advantageous for under floor heating. Further being made of reclaimed wood, the material has been recycled once and is eco friendly. The other option explored close to this thickness is the Welsh Slate, a naturally occurring native material to Wales. This has a long life span as well. The thickness expected to achieve the

required u value is 12mm. Thirdly, resin flooring is a material which is a comparatively less suitable material to the scenario, but is easy to maintain and resistant to wear and tear better than the rest in its useful life time. Comparing the densities of these materials, reclaimed wooden flooring has a lowest density of 480 – 720 Kg/M3, while slate has highest density of 2797 Kg/M3.

In terms of embodied energy, being naturally occurring material or naturally reclaimed material, wooden flooring and Welsh Slate have low embodied energy. The reclaimed wooden floor as less as 10.00 MJ/Kg, and the resin flooring also has a negotiable embodied energy value of 25.00 MJ/Kg.

Considering the transportation factor the closest supplies are 7 miles for reclaimed wood, while about 150 miles for Resin flooring, and for Welsh Slate. However, these have to be considered along with the embodied energy values and other comfort factors of the system. Finally, comparing the price factor, the resin flooring comes in different ranges and the whole cost of laying the flooring depends heavily on site conditions and the preparations necessary before the flooring. Whereas on an estimate the

cost of wooden flooring materials about 20 – 35 pounds per unit area.

From the options explored above, the reclaimed wooden flooring and the Welsh Slate are possible combinations of flooring for the different functions of the pavilion. Places where less heating is required could be floored with slate, while the rest of the Pavilion could have reclaimed wooden flooring. This also replicates the existing flooring material, keeping the visual connection of the existing pavilion flooring.

Partitions:

The internal spaces in the Pavilion have been partitioned into smaller spaces in the proposed plans and be used for various functions. The partitions can also be temporary ones that can be dismounted at a later stage if the spaces have to be altered or reused for alternative future plans. The partitions compared here are based on possible partitions for the spaces in the Pavilion and the functions the spaces are used for. The partition again can be a combination of more than one of the options discussed based on the use and function of the partition required for the plans.

The important aspects that have to be looked in for this are the embodied

energy, the suppliers and the cost. Further, it has to be made sure that the products does not have any toxic and is environment friendly.

The embodied energy of the materials chosen are relatively reasonable. The brick partitions have the lowest embodied energy (3.00Mg/Kg) which can be used for separation of the spaces into different functional spaces. The plaster boards, glass partitions and timber partitions are relatively more convenient to partition the spaces temporarily and flexibly. The plaster boards have a low embodied energy of 6. 75Mg/kg. Glass partitions can be used for decorative or just visual separation of the spaces. It has a high embodied energy of 15.00Mg/kg, and shall thus be restricted to where necessary.

While considering the availability and location of the materials, all the materials are locally available and are within 6 miles. Thus the energy lost in transportation is negligible. The cost of these in terms of material are also economic except of glass which is about 480 pounds – available only in bulk. The bricks are priced in numbers ie. 300 pounds per 1000 bricks. Thus the spaces could be divided using bricks walls and the glazed partition kept to minimum. The list of materials considered and the

energy values are available in appendix C,Table 7.

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Ceilings:

Ceilings section looks into the possible materials for the ceiling in different spaces. Table 9 (Appendix C) gives the summary of materials discussed for the options considered for the doors and windows .

The options looked in are already filtered as the ones that are environment friendly. But they are options, which differ in the appearance, performance and costs. The options include wooden ceilings, the metal boards and the gypsum plaster boards. The embodied energy of the metal boards are obviously higher than the other two materials. The availability of the materials are also within 10 miles, while the cost of the metal ceilings is higher than the other two.

Doors andWindows:

The Pavilion now has much less number of doors in the Pavilion as it is used as one single space. The proposed plan has multiple spaces and also partition for zoning the spaces flexibly. The windows cannot be altered as they form a part of the facade and the pavilion is a listed building. Thus

even while renovating the pavilion the material for the frame has to be replicated and kept as the closest possible match to the existing material. The glazing can upgraded till it doesn't make a difference in appearance to improve the performance of the internal space.

Table 8 gives the summary of materials discussed for the options considered for the doors and windows. The options look into are timber or PVC doors for doors and double glazing low e glazing for windows.

The timber doors are the ones that match the building"s existing doors and obviously preferred/ accepted because of the same reason. The PVC doors could be an option for store spaces and bathrooms doors that directly are not open to the main spaces. These options are locally available within a distances of 6 and 20 mile from the site, timber and PVC doors respectively.

The glazing options explored are double glazing and the low e glazing that may help improving the performance of the pavilion, while considering these solutions the glazing units may have to be tailor made to suit this building. Thus looking at the options in these terms it may be more easier to put in the low e glazing although it may have a difference in

performance while compared to double glazing.

Also in another section of this report there is an option for fitting the photovoltaic panels on the windows (if accepted by conservation authorities) . In which case the glazing type shall be different.

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Section 8: Esplanade

8.1 Introduction

8.2 Urban Space

8.3 Shared Space

Section 8: Esplanade

Summary

The Esplanade is one of many spaces in Penarth which has the potential to become a thriving public space.

A public space is an important element of the built environment. It is an inclusive area open to all regardless of age,

gender, race or social status. It is a place of gathering where people can congregate and mix. There are various types of public spaces,

but no matter what form it takes, its role in a city or town is clear. It is what gives that city or town charm and character. It is what

gives people a sense of belonging and shared ownership in the place they call home. There is more to it than good design, the

management and maintenance of a public space is equally significant. For this reason the British Government has made a point to create

better public spaces in its towns and cities.With institutions such as the Commission for Architecture in the Built Environment (CABE),

the role of public spaces is starting to get its fair share of consideration.

There are many factors to consider which differs with context. From the type of public space to the facilities, the

openness to the maintenance, all must be investigated in relation to the local identity and habits. However complex it is, the benefits of

providing a town or city with good public spaces are clear. Having an space open to all for people to use for socialising, playing,

relaxation, promenading, etc can positively affect people's physical and mental health. This section will look into what constitutes a good

public space to gain a better perspective on what can improve the Esplanade as a part of the public realm.

One of the concepts chosen to be explored in relation to the Esplanade is Shared Space. The idea of shared space is to

blur the lines between pedestrian side walks and vehicular roads. It focuses more on designing for people rather than cars. Giving people

priority in such a space would make it more vibrant, dynamic and inviting. It allows more room for movement and activities and gives

people more freedom rather than restricting them to the pavement. Therefore this section looks at the theory behind shared space to

determine the extent of its viability in Penarth Esplanade.

Author: LA: HA 50:50

Section 8.1 Introduction

There are many factors to consider when

regarding the Esplanade as a public space, which differs with context

when compared to other examples of convivial public spaces. From the

type of public space to the facilities, the openness to the maintenance,

all must be investigated in relation to the local identity. However

complex it is, the benefits of providing a town or city with good public

spaces are clear. Having a space open to all for people to use for

socialising, playing, relaxation, promenading, etc can positively affect

people's physical and mental health. Penarth having a waterfront is

something that should be given the utmost attention as it acts as the

gateway to the rest of the city, the face of the city, and thus should be welcoming.

By exploring the measures of creating an urban public space, along with the background on ecotourism and regeneration, the strategy for the Esplanade begins to take shape.

To begin the strategy on Penarth Esplanade, the access to and around the Esplanade was studied. By understanding the existing scheme whereby cars were the principle option to access and movement, it was decided to focus on a more pedestrian / cyclist orientated scheme. By removing the ability of vehicles to park along the Esplanade (except for disabled, elderly and delivery vehicles) it is suggested that the most convenient way to access the Esplanade will be via walking or cycling. A proposed expanded car park to the south and maintaining bus routes will hopefully combat the initial reduction in visitors due to existing reliance on cars to access the seafront.

With the reduction of cars usage on the road the space gets more publicly used for various mix of activities and the freedom of the pedestrians increases. The spaces starts to appear as a

harmonic environment where the pedestrians,, cars and other activities happen together.This idea of public space is also referred as Shared spaces.

To compliment the gymnasium scenario in the Pavilion, it is proposed to make Penarth Esplanade a centre for healthy living with activities to match. With provisions for outdoor activities as well as fixed outdoor equipment, it will be an encouraging space for fitness in a natural setting.

A market is also proposed for use on the Esplanade. In addition to the proposed indoor market in the Pavilion, it is suggested, in this chapter, that when weather conditions allow for it, the indoor market should be allowed to sprawl onto the street outside the Pavilion. It is hoped that from initial revenue and awareness, this market could be expanded in the future to one which utilises weather-proof stalls along the central section of the Esplanade to make it a fully pedestrianised zone on days in the calendar year.

To fully illustrate all of the above sections (Transport, Access, Shared Space, Activities), this chapter will include a series of maps. These maps will show how the Esplanade is at present, how it will change and 3

zoomed in views of the 3 principle zones of the Shared Space Scenario which has been presented.

Section 8.2 Urban Space

It is easy to experience a space and think of it as a successful public space. However it is difficult to pin point what exactly makes this space successful and whether or not what makes one space successful will prove the same elsewhere. The difficulty in defining in detail what parameters make a good public space stems from the difficulty of confining ‗public space' to a single definition. There is so much to consider when it comes to the public realm and it differs depending on context. Carmona et al (2008) have endeavoured to come up with a broad definition of ‗public space':

With such a broad definition, including both internal and external public spaces, it can be seen how the parameters may vary depending on the nature of the space. Although difficult to define, the benefits of good public spaces are evident. Much literature has explored these benefits in various aspects. Some economic benefits of a successful public space are the effects on property prices, local

commerce and trade, land values and levels of investment in the area. Socially; people are more active in the community around them, providing a platform for them to socialise. Consequently, fostering social and cognitive skills in children and adults alike gives them a sense of community and belonging, even equality since the public realm is open to all. The environmental benefits, among others, are the possible decrease in car dependency hence a reduction in pollution and overall better air quality. Ultimately, these factor into the possible mental and physical health benefits of people using the space. With so many promising benefits, it is clear how the design, and more importantly the management, of a public space can be complex. (Carmona et al, 2008;CABE, 2004)

Urban public space design addresses the physical aspect of the space, the juxtaposition of positive and negative space and how it is arranged within itself. From the physical arrangement of space stems the sensory perception of space people experience within it. This perception surpasses human sensory systems i.e. vision, hearing, touch and smell and also refers to cognitive, interpretive and evaluative perception of a space.

(Carmona et al, 2007)

Making of place with regards to urban spaces goes beyond the sensory and physical aspects to a more psychological, almost spiritual, experience. People are able to relate to the spirit of a space, sense and respond to the identity of the place. This is where people can feel a sense of belonging to a certain space and a sense of shared ownership.Memories are created, experiences are shared, days are spent all in the public realm which would explain how people may create emotional links with a certain public space.

Creating a space for people to use does not necessarily mean they will. In order to attract users and invite them in, it is important to animate the public space in an effort to keep it alive. With things such as markets, festivals, cafes and even street performers will attract more people to the space, hence giving people a sense of security in the presence of a crowd.More importantly, it will give people more reasons to visit and use the particular space. An increase in uses means an increase in users. (Shaftoe, 2008)

"Public space (broadly defined) relates to all those parts of

the built and natural environment, public and private, internal and external, urban and rural, where the public have free, although not necessarily unrestricted, access. It encompasses: all the streets, squares and other rights of way, whether predominantly in residential, commercial or community/civic uses; the open spaces and parks; the open countryside; the "public/private" spaces both internal and external where public access is welcomed – if controlled – such as private shopping centres or rail and bus stations; and the interiors of key public civic buildings such as libraries, churches or town halls." –Carmona et al, 2008

"Individuals need to express a sense of belonging to a collective entity or place, and of individual identity, which may be achieved by physical separation or distinctiveness, and/or a sense of entering into a particular area."

–(Carmona et al, 2007)

Section 8.2 Urban Space

Needless to say, the economic state of an urban space plays a

great role in defining the space. It also has a part in attracting people to the area. Diverse functions in a public space include the availability of economic activity. Therefore, the type of _economic activity' of the area may affect its identity. An example of this is having locally owned shops or independent businesses which are unique to the area. It would better define an area and allow people to create ties with the space. On the other hand, chain stores, which can be found in any context, would rob the space of that unique quality. Also, activity in the form of street markets or street performers would help to draw people in without it being directly economic activity. Bringing the activity outdoors would create a more inviting space. People tend to feel a sense of security among a crowd of strangers and outdoor activity is a way to achieve that. (Carmona etal, 2007;CABE, 2004)

In addition to economic activity is allowing for social activity in a public space. A good public space would allow for socializing, directly or indirectly. Directly being where people arrange to meet in a certain space or enjoy a space together as a group. Indirectly could be seen in the form of _people-watching', simply being around people

even when in the space alone will relieve the sense of isolation one would feel sitting alone at home. And for people to be encouraged to use a particular space, it should allow for certain factors which address the psychological aspect of a public space. It is important for the space to be comfortable, inviting, safe, clean and open. This is where urban space design comes in; addressing the aforementioned issues is a way to help create successful public spaces. (Carmona et al, 2007)

Green infrastructure is also an important aspect of public spaces. Parks and trees placed in urban areas are the lungs of the city. It not only has environmental benefits, such as collecting surface water run-off, improving the air quality, urban heat island effect, but it also affects one's health mentally and physically. Greenery gives a sense of calm and safety, and lack of it has been proven to affect negative behavioural patterns in people (CABE, 2004).

Allowing the public to have a link and access to natural areas, green or in the case of Penarth Esplanade blue, spaces where people can feel the sun and the wind has endless benefits on physical and mental

health. The proper design of public space cannot ignore public opinion for they are the end users and therefore should have a say. Also, designing public spaces in isolation is not as strong as creating a network of spaces linked with open corridors. (Lo et al. 2003)

Management of a public space goes above and beyond mere maintenance. Although maintenance is surely a major factor of a public space, there is more to the management of public spaces. Traditionally in the UK, it is the local authority who is usually responsible for the management of the majority of _public' public spaces (not on private commercial property). According to Carmona et al (2008), the qualities of well-managed public spaces are:

However the level of management as well as level of responsibility differs with the different local authorities. So it is up to the respective local authority to ensure the space is well managed to encourage its use and allow the city/town and its inhabitants to benefit from a well-managed, active, clean, safe public space. An example of this is seen in Bristol, which as of February 2008 have adopted the Bristol's Parks and Green Space Strategy. This strategy aims to improve the quality,

accessibility, facilities, variety of activities and safety of the parks and green spaces across Bristol. (Bristol City Council, 2008)

Clean and well maintained

Pedestrians and traffic in harmony

Well lit and safe

Good attractions and associated activity

Sensitive alterations and quality landscaping

Accessible (pedestrian and vehicular)

Comfortable to use

Human, attractive and distinctive

Section 8.2 Urban Space

In some cities, local authorities see community involvement as a key part of the management of public spaces. This has been seen in the form of local meetings or council hotlines, such as the Cleansweep hotline in Greenwich where people can raise their concerns about public spaces to the council. This can also be done through active engagement of the community such as graffiti cleaning or, for example, the _Adopt a Plot' scheme in Newcastle which allows

people to tend to council owned land, providing they can prove they can meet the council's standards. (Carmona et al, 2008)

Waterfronts are a very special kind of public space which needs special considerations. The Project for Public Spaces Organisation (PPS) have highlighted waterfronts can greatly impact the rest of the city in every possible way.

In order to achieve a good public waterfront, keeping the waterfront public and accessible at all times is important. This is done by minimising residential and private developments, limiting vehicular access, and above all allowing access to the water itself through the provision of various activities. A lively and vibrant waterfront sets the scene for the rest of the city and acts as a gateway. (PPS, 2011)

An example of regeneration of public waterfronts is in Milbay and Sutton Harbour in Plymouth. The main objectives of this project was to improve access from city centre, allowing a public access corridor right into the heart of the bay and increasing the variety and number of pedestrian access routes to the area (in addition to improvements on industrial and residential projects in the area). The

effect of the regeneration on areas further inland was critically

examined. Then the focus became on linking these two areas to

create a ‗public realm'. "These proposals aim to stimulate movement,

drawing people along this unrivalled coastline, and secure moments of rest,

protection and interest along the route." Another focus was on making

the waterfront act as an inviting façade for the city – at all times of the day,

so a night-lighting scheme along the waterfront to create a more

welcoming, safe space for people at night. Therefore the waterfront

maintains active at all times of the day linking well to the bustling activity in

the city centre as well. (Harridane et al, 2004)

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"People are not attracted by water or public space alone;

it is the range and diversity of activities that take place

there, the characters involved in them, and other

characters observing the same that make these pieces of

the city attractive and enjoyable" - (Harridane et al, 2004)

Source: http://www.rudi.net/node/21696

Section 8.2 Urban Space

Case Study: The Highline, New York City, USA

The High Line in New York City is an abandoned elevated

railway track that goes through the West Side of the city into the

Meatpacking District. A local, community-based organisation called

‗Friends of the High Line' pushed to keep it from being demolished as

it has become an integral part of that area. Instead they looked to

restore it creating a space for the public.

It was abandoned for years since the freight trains stopped

running in the 1980s, and it was left to self-seed, growing a multitude

of different species through the tracks, creating a strip of green

running between the buildings. However it was not opened to the

public and access was not officially allowed. (Stalter, 2004)

Since the establishment of _Friends of the High Line' by members of the community led by Joshua David and Robert Hammond in 1999, they have endeavoured to preserve the structure and use it to create a public park/walkway within the dense city. The first section opened in 2009 and the second section will be expected to open to the public in June of this year.

The park preserved the green life however they did so through more controlled planting. The train tracks themselves are still there and is incorporated with the landscape to commemorate the history of the space. It provides people with a green walkway as well as a range of different seating areas. It also has an indoor and outdoor viewing point over 10th Avenue Square. It has become the venue of choice for various community-led programs, most of which involve local school children. It has successfully revived the area as a whole and increased its economic, social and environmental values. The High Line is a good example of the direct and indirect value of public space to the community. By enhancing the space itself, it consequently enhanced the space around it and with it gave the community a new found sense of civic pride.

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183_bbeb616bdd_b.jpg?rand=638103547

BEFORE

AFTER

http://farm3.static.flickr.com/2790/4154247

570_38626b7afa_b.jpg?rand=333644115

Section 8.3 Shared Space

Shared Spaces is an outdoor urban design approach to improve interaction between users of the road/ public space and making it a rules-free but responsible and social environment that is inclusive for all its users. It is a common platform or a space shared and used by everyone from pedestrians to drivers, thus integrating its uses. It denounces the concept of traditional segregation of lanes for vehicles, cyclists, pedestrians and other users with the use of kerbs, signals lane divisions etc, but makes the space more public oriented and works on the understanding between the users and mutual respect within themselves.

The term 'shared space' was coined by Tim Pharoah which described an street with informal functions, no demarcated layout, traffic signals or prescribed rules, that made it a formal main street which gave an advantage to the vehicle users and had divided space meant for the pedestrians or shopping areas etc. The term later extended to squares, main streets, intersections and other spaces, esp. by Ben Hamilton Baillie, in Europe. It works on the observation that the behaviour of people and traffic in built environment without

traffic regulators is more responsible and positively influenced by understanding of the users of the space. [http://www.hamiltonbaillie.co.uk/_files/_publications/6-1.pdf accessed 20.05.2011]

The main idea of this shared space is to improve the road safety, while encouraging negotiation of the space within its users with due consideration for others.

The idea and its working:

Effective designing and management of the space allowing traffic with other human activities, and not separating it out from other functions while tackling safety, congestion, economic vitality, leisure, etc. An important feature of this space concept is the behaviour of the users are influences and controlled naturally by human interactions rather than regulations.

According to Monderman: "We're losing our capacity for socially responsible behaviour, ...The greater the number of prescriptions, the more people's sense of personal responsibility dwindles." [http://www.spiegel.de/international/spiegel/0,1518,448747,00.html accessed 20.11.2011]

He also says "When you don't exactly know who has right of way, you tend to seek eye contact with other road users... You automatically reduce your speed, you have contact with other people and you take greater care." [http://www.dwworld. de/dw/article/0,2144,2143663,00.html accessed 20.05.2011].

This works on the principle of _risk compensation effect'. The spaces designed to be shared are successful because there is always a perception of risk and that becomes like a pre requisite for increased safety. This makes people more alert and thus lesser cases of accidents.

Although this concept has proved successful in many places there is an argument for the concern for blind people due to the removal of familiar features like kerbs and railings. Shared surfaces are elements of shared spaces, which may not be easily recognisable for the visually impaired and they may not be able to negotiate with the traffic elements as the others could do to feel safe. Thus care has to be taken in designing the surfaces, that makes the visually impaired included.

http://www.vector1media.com/spatialsust

ain/shared-space-intersections.html

http://eyeofthefish.org/sharedpictures-

shared-spaces/

Section 8.3 Shared Space

Shared spaces in UK:

The Seven dials, London has been converted to a shared

space, with the roads being re laid to remove the difference between

the lanes, other street barriers have been removed or reduced to

increase mobility of the pedestrians.

[http://www.timesonline.co.uk/tol/news/article1295120.ece accessed

20.05.2011].

Also there has been a significant drop in the accident levels

[43%] at Kensington high street in London. Brighton city council

implemented shared space design for a new road next to Royal

Pavilion, with just small differences in materials on surfaces, but

positioning of the street furntures appropriately. This reduced up to

93% of motor vehicle traffic and lowered the speed, supplemented

with an increase in the number of cyclist and pedestrians. [cited as "New Road City Centre Shared Space, Brighton (December 2007)". Scheme of the Month: January 2008. Cycling England. December 2007. in http://en.wikipedia.org/wiki/Shared_space accessed 20.05.2011]. similarly there are many more examples of successfully designed shared spaces in the united kingdom and has proved to have made the space more safe and interactive attracting more people to the space, inducing further human related activities like shopping, outdoor leisure etc.

The behaviour of the traffic on a public road is heavily influenced by its character and the environment of the space than the traffic tools. The traffic behaviour/ speed is also determined by the —psychological retreat from roads to streets by residents and others. Traffic regulators must be used only if necessary. The traffic works much efficiently without them in these spaces. In this case the space, its context , history and landscape has to be properly used. Understanding of the street function gives a better understanding of this concept. It has been explained in the diagram below:

street function classification – [source:

http://acocksgreenfocusgroup.org.uk/wp-content/uploads/2010/08/Ben-

Hamilton-Baillie-et-al-Designs-for-life-learni2.pdf]

Section 8.3 Shared Space

"An appreciation of risk compensation effect is central to an approach to a

rural roads protocol based on preferred design speeds. It provides the key

to the application of environmental factors to achieve desired speed

outcomes, and underpins the research into "psychological traffic calming".

Drivers interpret the road ahead based on an assessment of risk, and

respond by selecting a speed within their particular "risk thermostat". The

greater the perception of potential hazards, the slower the speeds."

[source: http://acocksgreenfocusgroup.org.uk/wpcontent/

uploads/2010/08/Ben-Hamilton-Baillie-et-al-Designs-for-lifelearni2.

pdf]

According to Appleyard, 1981 and Hillman et al, 1990 , speed

in a locality is largely determined by the extent of potential or actual

human activity in the immediate surroundings. It is closely related to

extent of —psychological retreat by residents and others from the

street.

There are few changes that are not standardised but

psychologically prepares the driver o expect a change in the

environment brings in a consciousness of change in environment thus

making the driver alert.A few such strategies includes:

Dimensions: road widths: perceived road widths have been found to be

effective in determining traffic speeds. Narrower road widths

promote informal crossing thus increased human presence is

perceived by the drivers.

Sight lines: reducing the visibility of the road forward is an important

factor that influences reduce in speed thus making the users cautious,

this could be done by various natural means like landscaping,

boundary treatments etc.

Verge details: sharper and clearly demarcated edges gives a feeling of

segregation of pedestrians and drivers, whereas softer, not implied edges

extending into the road enhances the relationship of the drivers with the

surroundings.This influences on the speed again.

Road markings: careful omission of road markings [like centre line] has

shown positive relationship in speed reduction (Winnett, 2002). These can be potentially used in such areas.

Materials and paving: materials used for the ground surface, the colour, texture and qualities does influence on the speed and the road character. Use of block paving and other such patterned pavements help set the vocabulary of the space.

Signs and signals: The size and the readability of signs and boards at different speeds also unconsciously help in influencing the traffic. The frequency and spacing also promote in the appropriation of the vehicular speed in order to read those.

Gateways and transitions: The visual clues and design of a transition zone or gateway can help in determining the traffic flow, the influence could be brought about by use of buffer zones, landscapes, natural boundaries, material, dimensions, lighting, public art etc. that can determine the scale of the space and thus the character.

Incidents and features: —The richness of the built and natural environment in the public realm provides opportunities to make maximum use of any elements within the road environment that can introduce variety,

distinctiveness, promote intrigue, and generate a series of —punctuation marks in the road network appropriate to the desired speed.

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Elements like hump-back bridges, water courses, trees, railings, telephone boxes, mileposts and other elements can be meticulously exploited to achieve the appropriate speed character for the relevant stretch of the road.

To design the shared spaces successfully, understanding the behaviour of the drivers is an important factor. The social traffic behaviour is a reflection of the social component of the traffic behaviour. Explaining that below...

Social traffic behaviour:

"Traffic behaviour" displayed by drivers always has a social and a technical/legal component.

These components are complimentarily used by the drivers depending on the space – its layout, speed limit, and personal aspects.

In a more public space/ environment the social behaviour is more pronounced while in a fast lane technical component is more used.

Thus for a successful working of the shared space it is

necessary to keep the transition spaces as small as possible. This

space is generally where there can be misunderstanding between the

people- cyclist and the pedestrians, generally have a relaxed social

behaviour from the drivers who are from a rushed road presume a

traffic behaviour.

The figure below shows the representation of the difference

in behaviour of the users. The differences in the spaces have an

impact on the behaviour. – the behaviours described as, social

behaviour, social traffic behaviour, and traffic behaviour. There is a

necessity to make a clear choice of the behaviour pattern when a

space is shared between all the users. And this choice has to be

induced by design

Differences between the social behaviour, social traffic behaviour and

traffic behaviour.

Source: [http://www.sharedspace.

org/files/18445/SharedSpace_Eng.pdf Accessed on

20.05.2011]

Section 8.3 Shared Space

Dominance of activity:

From the diagram above it is clear that an inclusive space becomes more difficult to interpret in terms of behaviour by different users and thus may cause misunderstanding between users. For this, the space has to be defined by activity or design on how it has to be perceived by the users. The dominance of one kind of activity – social or traffic can again lead to become unpopular with the other. But when there are choices made and balanced with a clarity the space becomes well used and thus successful in its function too. In a public space, enhancing the social character of a space by defining its spatial or natural elements is more obvious. While, in a traffic space the engineered traffic tools could be employed. The space carries a message for itself and defines its traffic behaviour. For a shared space, if it encourages a part of the users to follow the legal/ technical behaviour and others a social residential behaviour it becomes ambiguous, and can be misunderstood easily. So for a safe traffic movement and pronounce the clear social message of the space, the

traffic control tools have to be avoided.

Monderman's steps: frustration tolerance graph of car drivers with time. –

Having discussed about the behaviour of the users/ drivers

and various character of a shared space, we have to decide on what

does the shared space actually have to consist or have.

What does Shared Space require?

Shared Space helps to generate public spaces where traffic, social

and all other spatial functions can be in harmony – people can move, meet

each other, do things together or get to know somewhere. Social space is

designed in such a manner that we do not conceive it as traffic space, but

as people space – a space where the social functions of the public space

take centre stage. A person travelling through is aware of the fact that he is

a guest because of the layout of the space, and in response he adjusts his

traffic behaviour to the social behaviour of the context. – Shared spaces-

[http://www.shared-space.org/files/18445/SharedSpace_Eng.pdf

Accessed on 20.05.2011]

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Design for people: There has been records a lot of —right of way

accidents occurring just because of lack of interaction between participants. This is when the people take the —right of way but they are not given that. But in a more social pattern of space, the interaction is restored and the social nature of the space also induces patience and understanding, thus reducing the number of accidents. This approach is a key in designing the shared spaces. This also treats people as intelligent species, allowing them to self regulate, rather than just making them follow a set of rules blindly.

Detailing the design: The smallest of details are the ones that tune the space and give it the flavour. Each element, like the materials, its colour and texture, does matter in the perception of the users. The furniture and the public art also influence the environment and are very important to have them positioned correctly – visual and locative.

Ironically, —What feels safe is not necessarily safe. And the vice versa. The success of a Shared Space lies on the theory of perception of risk may and thus increased objective safety. When the users feel unsafe they are more alert and thus lesser accidents. Traffic control

devices may make the situation feel safe but in practice, they at times happen to be counterproductive.

So "Do not try to remove that unsafe feeling, but use it to best effect."

http://www.shared-space.org/files/18445/SharedSpace_Eng.pdf

Case Studies:

There are quiet a few impressive case studies that illustrate the conversion of public spaces into shared spaces and proved successful . The strategies followed and the impact of the change in the area. A few of such examples are discussed in the next section of the report.

Case Study: Cirencester and Lewes, East Sussex

"Cirencester and Lewes in East Sussex have adopted the use of paving that reflects the character of the town and the historic buildings. The narrowing of the roads, widening of pavements and the replacement of intrusive and aggressive road markings with cobbled stones naturally calms the speed at which traffic moves and contributes to a safer and friendly environment. The low rise kerbs create less segregation between pedestrian and vehicle areas and the use of cobbles and tactile paving highlights safe

crossings for walkers, buggies, the disabled and elderly people."

Case Study: ClevedonTerrace, Kingsdown, Bristol

"Improved pedestrian provision at ClevedonTerrace by use of shared space and landscaping at the junction (as proposed). The junction, formerly dominated by vehicular traffic, becomes an urban place attractive to pedestrians and cyclists (and vehicular traffic)."

Section 8.3 Shared Space

Case Study: High Street Kensington, London

"High Street Kensington in London provides possibly the most well known streetscape design example in the UK. The scheme includes the removal of pedestrian barriers, minimised road markings, simplified carriageways and pedestrian crossings and the introduction of high quality street furniture. Lessons can be drawn for practice elsewhere in terms of road space reallocation to pedestrians and cyclists, decluttering and liability issues. The scheme was implemented in 2002 and involved the removal of barriers and signage and a much improved, high quality streetscape. The premise behind much of the work was to challenge legal assumptions concerning highway design, e.g. in the event of an accident between a

pedestrian or cyclist and a vehicle. From the financial angle, the elimination of clutter can actually result in cost savings as a result of reduced infrastructure and/or maintenance costs. Following the success of the High Street Kensington scheme, Exhibition Road and Sloane Square (both in London) are to be redesigned on similar principles. Kensington High Street has yielded significant and sustained reductions in injuries to pedestrians. It is reported that, based on two years of 'before and after 'monitoring, casualties fell from 71 in the period before the street was remodelled to 40 afterwards - a drop of 43.7%."

Illustration of the proposed shared space idea

Case Study: Chilham Gateway

"The entrance to Chilham is made less traffic sign dominated and more use is made of the local context. Intrusive white lining is removed along with signage clutter. The road junction is paved with setts, possibly edged with brick, as found outside the Woolpack Inn, to extend the visual influence of the Inn as the natural gatekeeper for the village."

http://acocksgreenfocusgroup.org.uk/wp-content/uploads/2010/08/Ben-Hamilton-Baillie-et-al-Designs-for-life-learni2.pdf

Section 8.3 Shared Space

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Section 9: Activities

9.1 Outdoor Activities

9.2 Outdoor Market

Section 9: Activities

Summary

To revive the Esplanade, outdoor activities could be

considered to improve the environment, social community and economy

of Penarth. The great importance of the seafront to improve social cohesion and economical factors are studied. In addition, from the environmental perspective, these activities have potential to make people aware about the value of the natural environment and also bring about protection to preserve our coast, sea and land. The provision of outdoor activities is one way to draw people in to use the space for more than just a boardwalk by the sea.

Another way to increase the type of activities in the Esplanade is to allow for the market proposed in the Pavilion to expand onto the Esplanade when the weather allows it. With increased use and activity, this could possibly lead to more permanent markets on the waterfront.

Author: EG: MA 70:30

Section 9.1 Outdoor Activities

Outdoor exercise

Introduction

To regenerate the Esplanade, outdoor activities could be considered to improve the environment, social community and

economy of Penarth. In this section, the benefit of the outdoor activities, the social and economical aspects of them are investigated in context of Penarth.

Outdoor activity and beaches

Beaches are not only an immense source of pleasure to a lot of people, but also they provide financial, cultural and social values for communities. In addition, sea shores are so beneficial to health and well being and it is proved that these have positive influence for patient during recovery of serious illness. Unfortunately, people are unaware about the value of coastal environment that pose a threat to disconnection of people from nature and consequently it could lead to the one of the reasons of the obesity epidemic. It is estimated that adults spend approximately 21% of their time outdoors and this figure for children is approximately 9% in UK. So, there is room to improve by considering outdoor activities and encouraging communities to participate in these leisure activities and conferring a healthier lifestyle by such program (HPA, 2008).

The necessity of outdoor activity

—The World Health Organization predicts that depression becomes the second most prevalent of cause of ill health worldwide by 2020 which has resulted from sedentary lifestyle (Mathers C, Loncar D. 2006). This sedentary lifestyle means employees cannot work effectively due to the stress and depression. Also, the Government forecast that 1 in 4 under 16 years old will be suffered from obesity by 2050, as well as 1 in 5 of them has mental disorder (HMSO, 2007). Exercise not only assists people to moderate mental illness, but also it helps people to reduce their extra weight to become fitter and happier.

In addition, nature motivates people to be more active, so by considering outdoor exercise, people possess four significant benefits: reduce stress levels, promotion of physical activity, having strong communication and most importantly – linking to the Pavilion.

By considering the outdoor gym and exiting activity on the seashore people are motivated to become more active. It has also has a positive effect from economical perspective. Because it requires a small level of investment for this measure and hence,

heath service of government can save good money for it (The Blue Gym, 2009).

Case study Brighton

Brighton Beach has recently invested in a playground, paddling pool, shop, restaurant, café, and bar. But also, there are carousels on the beach just along with the Palace Pier (section 3.3). These facilities were used to regenerate the area and provide people with a more active lifestyle (Brighton, 2011). One of the significant features of this beach is providing leisure activities for all aged groups and so, everyone can enjoy it. The seashore between Brighton Marina and Brighton Pier has won the Yellowave award. This is due to the beachfront sports centre facilitating sports such as beachminton, beach volleyball, soccer, rugby, bouldering and Frisbee (iknow, 2010). In addition, a diverse range of water activities are available there. The outdoor activities encourage people to not only use the equipment and achieve the notional advantages of them, but also these boost the local economy by using bars, restaurants, cafés and so forth.

http://www.fragdolls.co.uk/index.php/blogs/detail/categories/jam/brighton_rock

Section 9.1 Outdoor Activities

Although it could be called successful tourism, the beach activities in Brighton are due to the location of Brighton - it is located near London and originates from a successful regeneration program.

In 1990, Brighton was in a bad economic condition and the rate of the unemployment had risen 15% over 10 years. By 1992, an economic development unit in Brighton investigated the roots of this problem. It was concluded that one of the major issues that had an effect on this situation was the state of the sea front. Based on the local business leader's research it was found that the most of the hotels in the city avoided their guests from going to the seafront due to the high rate of crime. The seafront was occupied by drunks and this threatened the safety of the people.

By considering the functions like nightclubs, the atmosphere of the beach altered. Thereafter, by designing and considering different types of the sport activities along the seafront, that meet the requirement of all ages group, a successful regeneration was achieved.

The regeneration of this area caused the wider area achieve more

advantages such as improving the civic pride and boosting the economic condition (CCA, 2000).

To sum up, it could be argued that these activities have a significant potential to regenerate the area.

Esplanade Regeneration

In Penarth, seashore along the Severn Estuary has potential for outside gym for water activities and outdoor exercise (blue and green gym) to encourage people to have a healthier lifestyle. In the UK, during the last 12 years, the green Gym program has obtained a large number of benefits for physical and mental health and indicated a 70% improvement just after 6 month of this program with regard to mental and physical health. This is in addition to stronger participation of the people. So, the Blue Gym program can boost the lifestyle as well (the —Blue Gym program is currently being developed by Peninsula Medical School and they have examined the benefit of this program on fitness

and well being to explore the extra benefit of coastal environments on fitness and health fully) (The Blue Gym, 2009).

This proposed outdoor gym along the seafront encompasses fitness and it is aimed to make exercise fun and more pleasant. Along the Esplanade, a series of exercise stations are proposed to make different circuits on the seashore. Being outdoors offer you visual stimulation that helps time pass more quickly. Indeed, outside stimulates all the senses; relax and relieves stress; enjoy the sense of wind on the skin and improves the cognitive function. In addition, it is the best way to get vitamin D through the skin to meet the requirement of body and remain healthy.

This green exercise provide various activities with different aged groups; children, teenagers, young and old people. It can remove some barriers to have active lifestyle such as financial problems for gym membership (Sustainable Funding, 2011).

This beach improvement which is considered as a part of a coastal tourism project could be funded by European Regional Development Fund. This fund will contribute to the flourishing application to improve the seashore environment such as facilities, parking, toilets and amenities. This fund would be provided at almost 40% of the

initial cost and it is exclusively available for Blue Flag award beaches including Penarth which has won this award.

Source: http://www.tgogc.com/news/2008/04/launch-of-strathclyde-street-gym/

Section 9.1 Outdoor Activities

Conclusion: Environmental and Socio- economic factors

The outdoor exercises do not only try to motivate people to exercise and achieve improvements in terms of physical health and fitness, but also it can work as an awareness campaign that make people be acquainted with the merit of the marine environment. It originates from the intimate connection between the human being and natural environment.

As mentioned above, these activities have potential to make people aware about the value of the natural environment and also bring about protection to preserve our coast, sea and green land. So, it does not only provide advantages for protecting nature from an environmental perspective, but also, it has potential to motivate people and encourage them to have more communication from social perspective. In addition, to equip the seashore for water activity and

also a green gym, there is no need to invest much money; however, a health service, as well as UK society by possessing the healthier employer can save high values. So, outdoor activities are definitely beneficial in terms of environment, society and economy.

In addition to attracting the permanent residents to Esplanade, it boosts the eco tourism of the area and causes more visitors to be charmed by Penarth. As it is obvious from the Shared Spaces concept, considering these activities are feasible and beneficial to all.

In 2009, Penarth marina was awarded its first Blue flag by the First Minister of Sustainability in Wales. (The Blue Flag is an international and prestigious scheme to ensure tourist that seashore is one of the best and highest standard in water quality and safety and also this program act as an incentive to promote the quality of the marina and beaches in Britain) (BBC News, 2010), (KPT, 2010).

The following equipment could be considered for the Esplanade: Stepper, Fitness Bike, Chest Press, Cross Trainer, Dips, Lat Pull down, Press, Pull Ups, Abdominal Bench, Ski Machine, Treadmill. These are equipment that all aged group can use of them as

it shown in images on the previous page.

Source: http://www.lagoon.co.uk/corporate-events-brighton.aspx

Moreover, some activities are proposed for beaches such as:

Basketball court, beach soccer and badminton which are associated

to the young people. In addition, water activities could be proposed

in a diverse range such as: zap cats, wind surfing, sailing, kayaking and

raft building over the Esplanade.

While Penarth does have a pebble beach, disabling some of

these activities, the slip ways allow for an expansion on the existing

water activities available.

Section 9.1 Outdoor Activities

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In addition to the recommended scenario of a market being

located in the main hall of the Pavilion (providing approximately 9.25 stalls

to lease), a direct means of connecting the pavilion to the pier and

Esplanade is via an outdoor market. It is proposed that those who rent the market stalls in the main hall should have the opportunity to move out of the hall and onto the pier and main street of the Esplanade during summer months to make use of the better weather conditions and passers by.

While the Esplanade has endless capacity to entertain the prospect of a significant number of stalls, the Pavilion would retain its use as a storage facility for these stalls. Hence, it is recommended that, for the initial period (post opening), only 10 stalls should be available for outdoor use. The primary focus of this would be that only stalls which have licence to sell in the Pavilion can set up outside – with the intention being if weather conditions were to suddenly change outside, the stalls could be quickly dismantled and flexible enough to move indoors in a relatively short amount of time – limiting the inconvenience and time delays. An example of these simple stalls is pictured below:

However, as a medium to long term goal, it is proposed that the entire Esplanade be shut down on Saturdays during the summer months to allow for an expansion of this market with weather-proof stalls being made available. This could potentially lead to an expansion of the market being

made during the winter months when these stalls could be made available for the occasional Saturday market in line with proposals made in the Social Scenarios chapter. An example of these proposed market stalls is illustrated above:

Section 9.2 Outdoor Market

For an illustration of how both short term and long term market scenarios could be implemented on the Esplanade, please consult the attached map at the end of this section.

Conclusions

In conclusion, the ideas of an outdoor/indoor market provides possibly the most direct link between the Pavilion and Esplanade. What has been discussed here are two possible means of providing this link in the short and long term.

It is recommended that for the initial renovation, the Pavilion should invest in the simpler idea of providing internal space for stalls and only allowing outdoor space (in the immediate vicinity of the Pavilion – i.e. on the pier and directly in front of the main entrance) for stalls which can simply dismantle and relocate inside when necessary.

However, using potential revenue from the leasing of market stalls, it is suggested that the weatherproof stalls discussed could be invested in (should the public interest in the market become reasonable enough) at a price of approximately £180 each [1].

Furthermore, the regularity of these events is something to consider. Whilst the proposals of this and the Social Scenario sections of this report recommend a weekly market in the summer months and occasional ones at other times of the year, the possibility of taking over the entire Esplanade as a traffic-free zone may only be feasible a couple of times a year – for example, during the Penarth Festival. Therefore, the transition from the short term objective of a limited number of stalls, all of which can be accommodated inside the Pavilion, to a long term objective of a traffic-free Esplanade, may require an interim period of simply hiring these weatherproof stalls for these special occasions to allow the public to interact with the market and boost its popularity.

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Simple Market Stall

Source: farm4.static.flickr.com

Weatherproof Market Stall

Source: image.become.co.uk

Section 10: Improving Public

Space

10.1 Public Art

10.2 Seating

10.3Transport

Section 10: Improving Public Space

Summary

This section details how sustainable tourism and

regeneration plans have been adapted to the existing scenario

along Penarth Esplanade. To gain a deeper understanding of ways

to improve public space, it can be ascertained what can be done in

Penarth and how. To determine accessibility and usability of the

Esplanade, the three main features outlined in this section are

public art, seating opportunities and access.

After reviewing the theory behind public and shared

space, ideas which implement certain aspects have been proposed

in a more practical context directly linking to the Esplanade and

the wider identity of Penarth. With three sections proposing

alternative street furniture, art and transport strategies, it is hoped

that these complement the already proposed activities in the

Pavilion to make Penarth Esplanade a singular Shared Space which

the town can use and be proud of.

Section 10.1 Public Art

Public art is a way to make artwork available to all, beyond the walls of a gallery or museum. It is a way to spark conversation and ignite imagination. It is what gives a space a certain identity and charm.

However, this is dependent on the public's perception of what is regarded as ‗good' art. From as far back

as the middle ages, public art was usually in the form of commemorative statues and memorials. That

remained the case up to the emergence of Modernism where artwork became more abstract, it also

became incomprehensible to the general public and more often than not seen as pointless. (Cork, 1991)

Art in public spaces has recently been something usually commissioned through public bodies and local authorities in the form of installations or though the landscape (Miles, 2005). Such examples of public art have lead to iconic pieces which was forever linked to that space. An example is ‗Cloud Gate' by Anish Kapoor in Millennium Park, Chicago. Nicknamed ‗the bean', this installation is possibly the most photographed attraction in Chicago.

Public art is not necessarily restricted to art installations and sculptures specifically designed purely as art, it can be any form of decoration and embellishment that can be in the found in street furniture such as lamp posts. In a sense the architecture surrounding a space can also be seen as art that decorates and animates a space. (Roberts, 1995)

For this reason, it is important to allow people of the community to be involved in the process somehow and have their say. After all, public space is meant to be something shared by all, it is everybody's ‗backyard' and therefore should have a say in what goes on there. The shortlist of the Ebbsfleet project was displayed in the nearby Bluewater shopping mall to allow for public consultation before the final decision was made. The final design is intended to become a landmark, standing by the A2 as a sign to those on the highway that they are almost home. (Tusa, 2008)

Public art can also refer to community-led projects in the form of wall painting, or new genre public artists who are a member of the community. This is essentially the work of the people reflecting the imagination and spirit of the community. This began in the 1960s when it was used as a medium to get the message across when there was no other platform. This was seen during movements for black power, women's rights, national liberation, etc. These works were a reflection of the dominating pop culture in the area and oftentimes were revered as so. (Miles, 2005)

A more current example can still be seen in the streets of Bristol. The works of Banksy started off as graffiti but has come to represent much more to the people of Bristol. For a long time however Bristol City Council did not feel the same way it does now, which is full support for the local – now world renowned – artist. His work depicts ‗anti-establishment' political messages with an air of humour.

He has come to be a cultural icon of Bristol's underground scene. (BBC, 2008)

Cloud Gate :

http://www.tate.org.uk/40artists40days/art

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Banksy Graffiti :

http://www.bbc.co.uk/bristol/content/image_g

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Ebbsfleet Landmark :

http://www.guardian.co.uk/artanddesign/artbl

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Section 10.1 Public Art

Graffiti is slowly becoming a more widely accepted and more

credible form of public art in that it has become a reflection of

today's pop culture. It has become a symbol of the people's

_theoretical right to the city', reclaiming the streets as public domain

by way of imposition through painting on walls rather than on canvas.

(Austin, 2010)

Rather than having fixed art installations or murals, a space

can be animated with temporary art displays. A study completed by

Roberts (1995), which assessed the extent of financial benefit which

may be brought about with public art through the opinions of the

people, revealed people's preference for occasionally changing

artwork in a space to constantly renew and rejuvenate its image. An

example of such a space is Bath Abbey Church Yard. In one occasion,

artist Sophie Ryder displayed a trail of wire sculptures for 6 months

(visitbath.com, 2010) so that the public could not only see and admire them but also interact with them on a different level. The sculptures ranged in sizes from life-size to gigantic, so it gave people more to see, literally. It also gives people in that space something to discuss and talk about with the stranger beside them.

The right kind of art for the right kind of space can not only animate the space and inspire the users culturally, but it can enhance the feel of the space, ultimately adding to the value of the area. Developments, private or public, which incorporate public art, no matter how random or disconnected it may be, tends to give a better impression of the space and indicate safety, security, success and sophistication. (Roberts, 1995)

The argument here though is whether public art should be for public image or public identity. The two may be conflicting in some cases, as mentioned by McCarthy (2006), when the image portrayed through the artwork does not necessarily reflect the identity of the area.Yet with a delicate balance of the two, public art can achieve both through historical associations of the space to better integrate the artwork with the culture of the area.

It can be understood from this that in order to integrate

artwork for the public into public space, a deeper understanding of the local

identity would be required. This means that artwork imposed by an

outsider is not likely to reflect the local identity and could consequently

alter the local image entirely. This is a very delicate matter that is not so

straightforward. What may be successful as art in one place may not still

hold in another. This notion would mean that the role local authorities have

in this domain should be a distant one, allowing art to emerge for the

people, from the people. However this should not relieve their role in

promoting, as well as budgeting, for public art in their cities and towns.

Different local authorities approach it with different policy frameworks.The

level of their commitment usually reflects the level of public interest, with

many lacking funding provisions for public art, but this does not stop them

from searching for other option for funding. (Hamilton et al., 2001)

Sophie Ryder's Sculptures in Bath Abbey Church Yard. (Source:

http://pds.exblog.jp/pds/1/200904/21/18/d0092518_3442627.jpg)

—…public art can indeed contribute significantly to _culture-led'

regeneration in terms of the creation of a distinctive

environment in cultural quarters that allows and encourages a creative milieu as well as development and investment, and that improves social cohesion and enhances quality of life for local people. More specifically, they show that the use of historical associations can provide a valuable means of linking public art with local identity. - (McCarthy, 2006)

Section 10.1 Public Art

Conclusion

Art comes in many forms and is open to interpretation as well as criticism. However public art could potentially, and sometimes subtly, greatly enhance a space. As previously outlined in this section, public art fixtures could go on to become an iconic figure of the place attracting many, sometimes for the wrong reasons. Nevertheless, art is also something very personal, it should not be something imposed on people but emerge from the people themselves. Therefore in this case, it is difficult to propose artwork for the Esplanade but the value of such has been drawn.

This does not mean that physical fixtures are the only way to

introduce art into a space. Architecture and street furniture can also inject art into a space. In Penarth, a clear example would be the Pavilion, an iconic, historical art deco design which is undoubtedly the main feature on the Esplanade. In addition, even the distinct cast iron railing and lamp posts around the Pier and along the Esplanade, down the simple benches have a certain character which decorate the space.

Further down the line, a community led event or competition can engage local artists to make their mark and add to the history of the Esplanade with artwork that represents and responds to the identity of Penarth.

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Section 10.2 Seating

Another important aspect of a public space is the seating; type of seating, availability, orientation, etc. It

is vital to a space to have suitable seating arrangements. There is an ongoing argument of what is considered

_suitable' seating, what people prefer to sit on. However in reality, people will sit wherever they find seating.

This argument is relevant when assessing a good public space. Uncomfortable, uninviting, stiff, cold, overall _bad'

seating could ultimately render a public space unusable or undesirable. Lack of seating could also be the

demise of an urban space. (Shaftoe, 2008)

Movable seating versus fixed seating is another matter, which will be discussed later in more detail.

Materials used is yet another important factor to consider. Cold, hard surfaces would be uncomfortable for

benches used extensively. It also has to do with durability and required maintenance. If a bench requires a lot

of cleaning and maintenance, it is likely to get run down and negatively affect the image of the space as a whole,

hence pushing people away. Therefore the materials used should be resistant to rust, weather and vandalism.

Although no bench can be ultimately vandalism resistant, it should be assessed in relation to the type of

vandalism likely to occur in that area and respond to that. To push the sustainability agenda further, the source

of the material must also be considered. (Francis and Marcus, 1998) & (PPS,N/A)

Another issue is location. Too often benches are located at regular intervals along a path or throughout

the space at fixed distances. Instead seating location should respond to need; where is the action happening?

Benches should be placed accordingly to allow for pedestrians to pass without the benches or those sitting on

them causing a major obstruction. They should be placed near street amenities for convenience of users,

therefore responding to where people are likely to want to sit e.g. near bus stops. (Shaftoe, 2008)

Placing them in a line would be anti-social where having them face each other is invasive, so the

orientation again is crucial. It is safe to say that although there are many parameters to consider in terms of

public seating, it is all relative to the context. It should respond to the behaviour of the users of the space and

aim to meet their needs as well as their habits. Seating provisions do not necessarily have to be through actual

seats and benches, a lot of the most dynamic public spaces are so popular due to stepped surfaces and mixed

landscape all around to give people options for seating and more flexibility. In the end, seating is something to

be used by all and therefore should cater to all. (Francis and Marcus, 1998)

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Districts, and Parks. [ONLINE] available at: http://www.pps.org/articles/benches/ [accessed 5 May, 2011]

Shaftoe, H. (2008) Convivial Urban Spaces – Creating Effective Urban Public Places. Earthscan: London

Lucille Souflette's 'soft bench':

http://www.lucile.be/pages/softbench.html

Bench at Times Square, New York:

http://www.urbanphoto.net/blog/2008/12/23/hij

acking-public-spaces/

Pioneer Courthouse Square, Portland:

http://www.djc.com/blogs/SeattleScape/tag/boise/

Section 10.2.1 Movable Seating

Movable chairs has been proven as the preferred option for users due to the flexibility it offers.Movable

seating allows people to chose where to sit in terms of location and orientation. It also allows people to gather

round in a more social environment rather than in separate benches. (Francis and Marcus, 1998)

The issue with movable seating is it requires surveillance; to ensure the seats are not taken home with

the people using them!

Some examples of movable seating are shown here. In the Parade Gardens in Bath and Jardins de

Luxemburg in Paris (pictured left) movable chairs are provided for the public to use but is closed off at night to

make sure they stay there. The deck chairs used in Bath are convenient to stow away whereas those used in

Paris are quite heavy to make it difficult to run off with. In addition to security, maintenance is an issue,

therefore it would require some form of stewardship. (Shaftoe, 2009)

Depending on the location and limitations of the space where movable chairs are used, the material and

design – and consequently the weight and durability– of the chairs are an important factor to consider. With a

harder ground surface heavy chairs such as steel chairs usually have glides to avoid damage to the surface

however these will eventually wear out. Used on soft ground it is likely to sink in the ground. Lighter chairs

would be easier to move around and store, causing little damage to ground surfaces, yet it is less durable.

(Hannah and Main, 2010)

In Penarth, particularly on the Pier and around the Pavilion, the use of movable chairs would be an

interesting option to have which could potentially liven the space. At the end of the Pier there is a wide space

with a few benches in the centre, having movable chairs would increase seating opportunities while allowing for

flexibility. Those fishing off the Pier would also appreciate the option of being able to place a chair by the edge.

The main concern however would be security and upkeep. A possible scheme would be to have deck chairs

available for hire or with provisions of a deposit from the Pavilion. Deck chairs would be a better option for the

purpose of storage as well as lifting and moving. Having them available through the Pavilion would ensure it is

kept in the area and kept in good condition. People would be able to sit wherever and however they like

including on the beach. By providing flexible seating it could encourage people to use the space.

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Shaftoe, H. (2009) Seating Priorities. Landscape – The Journal of the Landscape Institute. [ONLINE] available at:

http://www.convivialspaces.org/updates.htm [accessed 14 May, 2011]

(Source of above images:

http://www.convivialspaces.org/updates.htm)

South Bank, London (outside National

Theatre)

Jardins de Luxemburg, Paris

Parade Gardens, Bath

Section 10.2.2 Seating as Art – Case Studies

In some urban spaces around the world, artists and architects

experiment with creating seating as art installations, a 2-in-1.

Although a lot of the functionality of such benches may be

compromised for the sake of aesthetics.

The ‗Fungus' chairs (above), designed by Chinese architect Ma

Yandong of MAD for the public art project in Zhangiiang business park in 2007, organised by both the park itself as well as the local government of the Pudong District in Shanghai, China. (Anon, 2008)

These modern mushrooms are made of interlocking modules which create various patterns and combinations. They are scattered across the park to symbolize the view of the modern environment from an ecological viewpoint. (Anon, 2008)

While these mushrooms are theoretically used for people to sit on, they do not seem very comfortable. It seems to act as a resting point rather than a bench for people to sit and socialize on. Nevertheless, the design is eye-catching and provides a focal point for the large park.

Anon. (2008) Fungus Chairs by MAD. Dezeen Magazine. [ONLINE] available at: http://www.dezeen.com/2008/03/23/fungus-chairs-bymad/ [accessed 21 May, 2011]

In Colorado, there was a public art project for Broomfield Park, the first of its kind in Broomfield. A design competition which involved the public to comment resulted in 10 bench designs scattered

around the park. The purpose was to create art that was also functional.

One of the designs is the ‗Lotus' bench designed by artist Matt Cartwright.

This bench sits by the pond in the park taking up a space of over 7 ft x 13

ft. It is made of stainless steel flat bars and pipes to create the petals of the

lotus flower which surrounds a solitary stool in the centre. (Raouf, 2006)

This attractive design can hardly be seen as adequate seating

in a large park, seating only one person. It seems the artistic agenda

supersedes the functional one in this case.

Raouf, N. (2006) Sitting in Style. The Broomfield Enterprise. [ONLINE]

available at: http://cartwrightdesign.com/press.php [accessed 21 May, 2011]

Lotus Bench by Matt Cartwright:

http://cartwrightdesign.com/sculpture.php http://cartwrightdesign.com/fabrication.php

Fungus Chairs by MAD: http://www.dezeen.com/2008/03/23/fungus-chairs-by-mad/

Section 10.2.3 Multifunctional Seating – Case Studies

A new trend in street furniture are benches which are more functional as well as environmentally friendly.

It looks into combining multiple uses into a single unit.

One example is the GreenU designed by a student in North Michigan University (pictured left). The

circular bench provides shading for users and has waste and recycling bins. The structure is made with fly ash

concrete with detailing in bamboo around the central pillar which can also be used to pin poster and the like.

Another example is the futuristic design by Steven Ma; the Eco Bench (below left). Although it does not

seem particularly functional, seating only one or two people at a time, it is a very impressive design. The bench is

constructed using recycled aluminum from planes and 100% recycled glass bottles. The branches at the top have

tiny lights embedded which come on at night. The electricity for these lights are generated through thin film solar

cells along the top of the channels.

And finally, as part of a proposal to regenerate Trangtien Street in Hanoi, Vietnam, the local architectural

firm Studio 8 have designed a very simple, elegant multifunctional bench with seating, waste bins, even flower and

planting pots (pictured below). There are minor variations in the design to provide options, with some benches

the bins and flower pots can be moved to provide space for bikes to park.

Although these designs are not likely to fit in with the Penarth Esplanade, the idea is an interesting one

nevertheless. Such benches serve many purposes but also provide a focal point in the space and makes the space

more unique.

The GreenU by Andrew Lippe:

http://www.designbuzz.com/entry/a-triplefuction-

eco-friendly-structure-the-greenu/

Proposed Street Furniture for Trangtien Street, Vietnam by Studio 8:

http://www.archdaily.com/63286/trangtien-street-studio-8/10-perspective-2-custom/

Eco Bench by Steven Ma:

http://www.homedecoratorinterior.com/green-benchmultifunction-

futuristic-design-produce-electricity/

Section 10.3 Transport

Introduction

Access to the Esplanade in Penarth is a critical aspect of the success of the

Pavilion, Pier and all features of the area. While the majority of this report

regards itself with increasing the potential for usage of the existing and a

variety of proposed facilities, without the simple requirement for visitors

and locals to access and move around the Esplanade, these facilities have

little or no chance of reaching their potentials.

An initial report investigating means of transportation to and around Penarth has already been carried out by colleagues of the authors and this report is available on request from the authors. While this report details the basic ways in which people can and do move around Penarth, this section will focus specifically on how the Esplanade can be opened up to the town, but in a sustainable way. Essentially, this section of the report will detail the existing situation with regard to access and movement around the Esplanade, make a case for change and propose potential sustainable transport solutions incorporating cars, public transport, bicycles, pedestrians and the water.

As the map to the right shows, the Esplanade covers the entire accessible seafront of Penarth. Likewise, the Esplanade itself doesn't suffer from a lack of access routes in terms of the types of transport which are mentioned below:

Review of Existing Situation –Access and Movement

Cars – There are currently three routes in which cars can access the Esplanade. These are illustrated by the relevant arrows from the south on Cliff Road and

from the north (Beach Road) and west (Bridgeman Road) which both direct traffic to the Pavilion. It must be pointed out that at the time of writing, a one

way traffic flow is in operation due south. Parking is currently provided in numerous locations: Firstly, approximately 100 spaces are located at the restaurant

to the south (indicated on map). Another 50 dedicated parking spaces are located along the Esplanade mostly clustered around the restaurants which have

opened in recent years along the seafront. However, as is evident throughout Penarth, when existing parking capacity is not enough, individuals will endeavour

to use any part of the side of roads that don't actually block the route. While it is true that cars provide the most convenient and most direct form of

transport, they are also the highest contributors to pollution and poor public spaces.

Public Transport – At present, there are four bus stops along the Esplanade (1 northbound, 3 southbound). These provide regular services throughout the day

every hour. These services are mainly directed via Penarth town centre to the Vale of Glamorgan and the centre of Cardiff. As recently as last year, a trial bus

service circulating Penarth was launched. With a comprehensive route, including the Esplanade, lack of numbers caused this scheme to be withdrawn.

Section 10.3 Transport

Bicycles – Apart from the embodied energy required to produce them,

bicycles are one of the cleanest forms of transportation. What is clear

about the existing Esplanade is that bicycles aren't particularly catered for. This is due to the steep gradients (especially at the north end of the Esplanade) which prevent all but the most dedicated cyclists attempting to access the seafront. While the slope to the south of the Esplanade isn't too steep, the specialised zones dedicated to either pedestrians or vehicles leaves little attraction for individuals to use bicycles to access the Esplanade. Likewise, the restaurants and other attractions along the Esplanade don't provide incentive to want to cycle to a location where cycle attire is acceptable. The social scenario of a gym in the Pavilion and exercise equipment along the Esplanade could potentially combat this.

Pedestrians – Pedestrians play an integral part of the Esplanade. The Esplanade lends itself to a path which continues south towards Lavernock Point. While the path along the Esplanade does extend along the seafront and onto the pier, it is compromised by vehicle access at different locations (for example, in front of the Pavilion). The lack of consideration of pedestrians with dedicated crossings and road safety features is also something which makes the Esplanade an unattractive site for occasional walking.

Water – As the point at which Penarth connects to the sea, the Esplanade is in a prime position to make use of the water as a means of access. By using the water as a means of access, the process of travelling through Penarth to reach the Esplanade is reversed. Currently, there are three points along the Esplanade where water vessels can access the Esplanade (shown on the map). These (moving from north to south) include a launch jetty for jet skis, the pier itself (where pleasure cruises regularly dock in summer months) and the access ramp for RNLI Lifeboats. Presently, no permanent docking station is available for water vessels. This is due to the high tidal swings and the occasionally poor weather conditions which has been responsible for damage in the past. Penarth Marina (located in Cardiff Bay) does provide a dock, but is located around the headland and is without direct access to the Esplanade.

It is clear that the numerous different means of accessing and moving around the Esplanade are presently catered for with varied success. To build on the sustainable regeneration of the Esplanade, it is essential to provide a sustainable transport strategy which addresses each of these means of transportation and provides for the ones which are both

sustainable, but also practical.

Reasons – Cars and PublicTransport

The concept of cars as the most iconic form of transport is one which is undeniable. As one of the major consumer goods of the past century, it has been suggested by Bannister that, —perhaps the car is embedded so much within our society, that it is impossible to make any real change… .

Comparing this analogy with the ratio of cars to pedestrians seen on the Esplanade in Penarth on a daily basis, it is clear that, inevitably, vehicles will have to be considered when proposing alterations to the existing seafront.

Cars are currently one of the most Carbon intensive means of transportation, however they are also one of the most socially dividing forms of transport. With the ever increasing price of oil (illustrated graphically, above), the car is becoming ever more environmentally, socially and economically unsustainable.

What must be remembered throughout however is that, in addition to the reason of visitor access explained above, disabled access, access for delivery trucks and indeed access for owners and tenants of apartments and flats is required for the Esplanade. For these reasons, the Esplanade must have a

means for vehicular access in any proposed scheme.

Public transport does share in some of the problems created by cars. By making use of heavily congested road networks, and (at certain times) with minimal if any passengers, buses can add to the problems of social separation in the public domain. The advantages that buses and other forms

Price of Crude Oil Source: oil-price.net

Section 10.3 Transport

of public transport possess over cars are an ability to provide higher capacity, with no parking required and a means of disabled access. With regard to disabled access, this is particularly true with the free bus passes available in the UK for disabled and elderly members of society – for whom this could be the primary means of transportation.

Reasons –Water

Water transportation is a key feature of what ranks Penarth in a small number of towns around the UK able to provide a service so integral to Britain's history as an island nation. Currently, two ships (operated by the same travel company) use the pier as a departure point for pleasure cruises. These services visit Penarth on a regular basis throughout the

summer months, but advertise Penarth more as a gateway to Cardiff and the Welsh Mountains – losing trade for the town itself. A much greater cohesion between the providers of travel services such as this and the combination of the Pavilion and Esplanade themselves to market the value of the location as a tourist destination in its own right.

Proposal – Shared Spaces

The notion of —Shared Spaces is one which actually incorporates many of the objectives of this piece of work. In addition to the activities and attractions of the Esplanade discussed in other sections of this chapter, transport plays a major role in how these spaces are organised and divided. The concept of shares spaces is vitally important with regard to transport and allows the transition of Penarth Esplanade to a more sustainably connected locality to take place at a slower rate. This chapter will suggest a shared space which will reduce road markings to implement a single, brick paving method which will be divided between the activities of this chapter. For all proposals written in this section, please read the map alongside, this is provided to illustrate proposals for readers who are either not familiar with the Esplanade or with what is being proposed.

With the recognition that vehicular access will always be essential to the Esplanade for disabled, elderly and delivery access, the first part of this proposal suggests that designated parking spaces be made available for disabled/elderly visitors at intervals between the predominant attractions along the Esplanade. However, to begin the task of traffic reduction along the Esplanade, it is suggested that all on street parking be eliminated in favour of an expanded car park to the south of the Esplanade. While it is true that cars may still be used as a means of travel to the Esplanade (particularly for visitors from outside the town) the effect of this is intended to promote an immediate increase in pedestrian use of the Esplanade and traffic reduction.

With regard to public transport, while it is clear that the recent failure of the seasonal circular bus route around Penarth has been well publicised, it is understood that the local council wishes to re-introduce an altered version for the coming holiday season. One aspect of this is a clear link between the Marina and the Esplanade – which has the potential to encourage visitors from Cardiff to venture into Penarth and down to the Esplanade, rather than continue around the Bay. This report will make a further

proposal to this scheme – that this route include the town centre and train station. Firstly, with regard to the proposed —outdoor/indoor market linking the Pavilion and Esplanade, a link to begin the encouragement of shoppers down from the town centre is an essential requirement. Secondly, with regard to the train station, the Office for Rail Regulation estimates that in recent years, Penarth Railway Station has had a combined footfall in the region of 0.6million people annually. While valid assumptions would regard a significant number of these to be commuters to nearby Cardiff, a simple and direct link for incoming tourists could build on the public transport infrastructure of Penarth. The essential point to make however, regarding all forms of public transportation, is that public awareness vital to any strategy. While the Penarth P1 bus may have been known to local residents (due to regular coverage in the local newspaper), this scheme was limited in it advertisement to those outside the town. Any combination between conventional, circular or dedicated bus routes and trains must build on each other's relationship with the public to ensure the maximum number of potential tourists understand the ease at which the Esplanade can be accessed in the future.

Section 10.3 Transport

To conclude with regard to vehicles in general, the map (included at the end of this section) indicates —road markings . While it is true that these markings loosely indicate the extent to where vehicles are allowed to roam, they essentially funnel traffic allow the space to become safer for pedestrians and cyclists. The fundamental concept of Shared Spaces is that humans and traffic are no longer separated by visual or physical markers, what is also an integral element to this scheme is that pedestrians and cyclists are able to occupy —traffic zones . By reducing the speed limit along the Esplanade and forcing motorists to be wary of pedestrians, this scheme will actively discourage individuals from venturing along the Esplanade in private cars. An argument against this idea could be that by discouraging motorists from venturing to the Esplanade in their cars, the scheme could discourage individuals (understandably used to cars as a primary means of transport) from venturing to the Esplanade completely. This point is a valid one and must be at the forefront of any strategy – hence the increased proposed parking.

The second phase of this strategy is to encourage a more sustainable

means of small-scale transportation. Currently, the major issue regarding bicycle access to the Esplanade are the considerable gradients, particularly towards the north end of the Esplanade. With these in mind, it is clear that future access to the Esplanade will be mainly focused towards the south. To advertise this route more to the more populated town centre, it is suggested that a dedicated cycle lane is implemented to join the town centre with the southern access route. Specifically, this route would include Plymouth Road, Alberta Road and Cliff Road, where it would meet the Shared Space paving. Cyclists should then be further accommodated with increased storage facilities close to disabled / elderly parking. To increase awareness of this route, it is proposed that this is advertised with the appropriate signage in and around the town centre. The map does indicate secondary access routes via orange and red graded roads.

Pedestrianisation is central to this entire proposal. All of the proposals and ideas expressed thus far have been proposed on the basis of making the simple task or pleasure of walking easier, safer and more convenient than another form of transportation which will inevitably incur a —Carbon Cost (the notion that by doing something that requires energy – such as driving a

car uses petrol – will emit Carbon). While the actual activities on the Esplanade will not be discussed in this particular chapter – activities which are all aimed at individuals and groups who might be walking along the Esplanade, the access is a key issue. At present, similar to cycling, the primary hindrance to pedestrians walking to the Esplanade is the steep hill at the north end. While Alexandra Park has attempted to combat this with a quiet and pleasant environment, it has been the experience of the authors that, as visitors to Penarth, the route through the park is under-advertised and when walking through the park, litter and graffiti have provoked negative feelings. With increased signage and better up-keep, this feeling of confusion and sadness could be reduced. However, the link between the park and Esplanade could be further enhanced with simple features such as footprints (below). These elementary features can have the effect of leading people through the park, down to the Esplanade. In addition to these footprints, information posts could also be used at staggered locations to inform visitors of the history of Penarth, excite them with ideas and benefits of sustainable living, and advertise key attractions of the Esplanade to build a sense of economic sustainability for the businesses which occupy

the Esplanade.

Conclusions

In conclusion, the transport section has assessed the existing situation with regard access and movement around the Esplanade for a variety of different types of transport. It is clear that, while the current system has been in place for a number of years (the one way traffic system being a more recent addition) it currently acts to deter sustainable transport and movement of pedestrians and cyclists.

This section has then moved on to suggest a comprehensive Shared Spaces scheme which interlinks the priority of pedestrian safety with the activities discussed in other chapters of this section of the report. It is a difficult suggestion to discourage private cars from accessing the Esplanade – as this

Footprints Source: 123rf.com

is the primary access at the present time and could potentially have a knock-on effect. However, by initially encouraging active movement of pedestrians and

bicycles in the short term, and building on the public transport infrastructure in the medium term, it is hoped that the Esplanade can become a hub for

sustainability initially for the local residents of Penarth, but then the wider tourist market outside the town as well.

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Section 11: Proposals

11.1 Seating

11.2 Access to and within Esplanade

11.3 Shared Space

Section 11: Proposals

Summary

The proposals for the Esplanade make use of the Shared Spaces concept

and incorporate all of the activities, furniture and transport proposals discussed thus

far.

This section essentially illustrates the proposals which in how the

Esplanade is proposed to be altered and arranged.These include:

• Increasing seating opportunities in terms of quantity and variety

• Incorporating outdoor activity equipment and space provisions

• Integrating the streetscape and unifying the Esplanade as a shared public space

• Investigating pedestrian and cycle access to the Esplanade

Section 11.1 Proposed Seating

Functionality and animation is something the Esplanade lacks. It is difficult to produce artwork that will

truly represent Penarth and integrate with the surrounding space. However by embellishing a bench to reflect the

area in terms of its colours and patters would be a way to add art to the space without imposing it as _artwork'.

Incorporating different functions in a single unit allows more use of the bench.

To animate the space as well as increase functionality, this design has explored how to incorporate both in

a way that integrates with the streetscape and identity of Penarth Esplanade. Since public art is best when it is

initiated by the community itself or by local artists which would add a personal touch for people to interact with,

it was difficult to propose artwork for the Esplanade. Instead, the proposed design acts as a decorative element

to somewhat liven and embellish the space more than the average bench.

This bench incorporates seating, waste and recycling bins, with the option of fitting greenery along the top of the bench and/or the flat block below the bins. The organic shape reflects the waves of the water and the overall feel of the space. The materials used are fly ash concrete for durability decorated with broken reclaimed tiles to create a mosaic pattern. The particular pattern of the mosaic could be something done by local artists to add to the history of the space rather than something contracted. By limiting the height of the bench, it allows an unobstructed view of the Esplanade.

(Source of above images: Author)

Section 11.3 Shared spaces

The following maps (Map 11.3.a, Map 11.3.b, Map 11.3.d, Map 11.3.e) show the proposal, seeing the Esplanade as a shared space. The plans are patterned to show the road space and the expected usage if redesigned to function as a shared space. The first two maps indicate the surface patterns of the shared space – it retains the existing pavements (pedestrian) and alters the road (existing) to a paving pattern that makes

the whole surface seem as a single path. The curbs and other level differences on the surfaces are removed and all traffic direction signals are removed within the shared space limit. The pedestrians and the cyclists get a greater advantage over the space, promoting them. The cars and other motor vehicles reduce speeds as they enter this zone and move slowly throughout the shared space. The space being more pedestrian friendly, offers more activities and functions along the esplanade. Two options for the road surfaces are also shown in the plans as option 1 – brick pattern and option- 2 Shotcrete. The former one being a pattern that corresponds to the existing pedestrian pavement and a traditional pattern. The second option is a cheaper alternative which is easier to lay and less disruptive.

Herringbone brick paving pattern

Source: http://www.scofield.com/stampedconcrete_patterns33.html

Tactile paving pattern

Source: http://www.stonecontact.com/product/tactile-paving-tile.htm

Shotcrete paving

Source: http://www.ail.ca/en/home/products/wall-systems/wire-walls.aspx

Concrete and brick

alternate paving pattern –

used for the extended

pedestrian exclusive space

The existing pedestrian path has also been extended, decreasing the vehicular movement path to about 5 meters wide (one way). The rest of the road is declared as no vehicle access space. The sections through the shared space and the elevations give a visual feel of how the Esplanade may appear after being redesigned as a shared space.

Map11.3.c shows the activities (to start with) along the Esplanade. The existing Victorian seating have been rearrange in the first half of the place, replaces with newer seating to accommodate more people. The outdoor gym equipments are placed along the esplanade which connects to the indoor gym activities. On the Saturdays there is also a proposed market that functions from morning 9.00AM to 5PM. The existing seating green space along the esplanade is converted into a playground. Further, there is a deck pulled out along a certain length of the esplanade jus meant for seating or other possible activities, the seating for the deck are moveable ones, thus in case of any special event the space could be costumed to event.

once the space is accepted and used for the activities, more activities can

be brought in and the shared space shall be a well used and the a lively one,

regenerating the whole area.

Gym

Equipments

along the

esplanade.

Section 11.3 Shared Spaces –Map 3e – Sections A-A' and B-B'

Section 12

Project Conclusions

Project Conclusion

Project Conclusions

Penarth Pavilion will undergo an extensive renovation in the

coming years. As a project which is set to unite and instil new life in

an old seaside town in South Wales, this project is one of national

notoriety and significance.

This report has been established following the approval of full

planning consent to begin the detailed design process of the 83 year

old, Grade II listed building. By undertaking an extensive review of sustainable theory and applying it directly to the project in question, it is hoped that both the client and the wider community of Penarth can understand the strength and benefits of including sustainable principles, both to the project on site, and to the wider locality.

This report began by establishing that while its historic and listed status makes it exempt from environmental measures such as BREEAM, the environmental, social and economic benefits of including sustainability in the design process are simply too significant to ignore.

The first main chapter of this report focused on the socioeconomic sustainability of the Pavilion. At present, while a number of intended uses have been proposed as part of planning consent (see Appendix E), the Pavilion lacks a permanent and focal activity in the main hall. A range of scenarios for the main hall were investigated and subsequently merged to propose a multi-purpose schedule with the potential to draw income from a number of activities and clients, both local and further afield, on a regular basis. The issue of

appealing to a wide audience, but maintaining the local community's sense of ownership were primary features which were balanced throughout. By establishing a range of activities to appeal to a range of age groups and sub-community's, the Pavilion can potentially reestablish itself as one of the iconic buildings in the country.

To move on from what has been recommended here, it is suggested that an in-depth operational business plan be devised. By establishing a client base early in development, adaptations to the building can still be amended and a relationship can be built to re-open the Pavilion to the public with a set of activities which can last longer than the so dubbed —honeymoon period .

While these strategies have been suggested, the principle of short term and long term development should also be researched further. This will enable the client to understand what is possible at the moment, and what can be classified as ambitions for the Pavilion in the future.

The second chapter dealt directly with the environmental considerations of the Pavilion. While a BREEAM or similar certification process won't be necessary, a Display Energy Certificate will be necessary.

To ensure the Pavilion doesn't just reduce Carbon emissions for the sake of public image, but truly embraces the concept of environmental sustainability, this report attempted to provide a more detailed investigation into some environmentally sustainable features available in construction. These features included energy efficiency via ventilation and water management as well as renewable sources of energy in solar and hydro-electricity and heating sources. This was in addition to alternative building materials which were also modelled using a software package called Ecotect.

The challenge of maintaining the character of the building – in essence conservation rather than preservation – did prove significant. However, a number of potential sources of environmental sustainability, and some not so applicable, were discovered and presented. It must be mentioned that no concrete recommendations are made in this chapter – just suggestions. The aim of this chapter was to educate the client and the wider community as to the options to consider when applying sustainable features to an existing building, and how they could be pursued at an early design stage.

Project Conclusion

The final chapter addressed the wider sustainability of the Esplanade. The street on which the Pavilion sits is intertwined in the history of both the building and the town. Without one, the other is a lesser mark on the south Wales coastline. This report pursued the need to regenerate the Esplanade as a minor tourist resort. By considering access to and a variety of activities along the Esplanade, this report has presented the simple concept of —Shared Spaces and the benefits of altering the public realm along the Esplanade. To provide the link between the Pavilion and Esplanade, this report has investigated and proposed a number of activities which either link directly with the Pavilion (i.e. the indoor/outdoor market) or supplement what is taking place within the Pavilion (i.e. indoor gym and outdoor exercise). By building on the physical link that the Pavilion has with the Esplanade, this report acknowledges the shared history and indeed shared future that these entities have together.

The above chapters have been set out using the structure for the BREEAM assessment method. It could be argued that an avenue

for this report could have been a direct application of BREEAM guidelines to this project, but for reasons discussed and shown, this method is aimed at a principally environmental goal.

The important point that this report has made is that sustainability does not simply concern environmental quantification, but wider aspects, such as social acceptance and economic provision. Penarth Pavilion has a bright future, with a determined client and willing investors – the renovation of this iconic building could be a turning point in the history of the locality and the town. However, by considering sustainability and all of the principles which the term embodies, Penarth Pavilion has the chance to build on this success even more.

Penarth Pavilion Group – Cardiff University – June 10th 2011.

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Section 13

Appendices

Appendix A Tabulated Comparison of Piers & Pavilions

Appendix B – Sharp Electronics (Manufacturer Details)

Product details

Source:http://www.sharp.co.uk/cps/rde/xbcr/documents/documents/Marketing/Datasheet/Sharp_Flyer_NU_Serie_48_0210_eu.pdf

Appendix B – Ertex Solar (Manufacturer Details)

Cell types

Source: ertex-solar.at/cms/images/stories/ertexfile/Zellentypen.pdf

Appendix B – Ertex Solar (Manufacturer Details)

Transparency for available cell types

Source: http://ertex-solar.at/cms/images/stories/ertexfile/Transparenz.pdf

Appendix C Materials Comparison

Note: This Appendix lists the details of numerous sustainable materials suggested for use in the Pavilion renovation. For more details on specific manufacturers or

suppliers, please contact Penarth_pavilion@hotmail.co.uk.

Table C:1

Table C:2

Table C:3

Appendix C Materials Comparison

Table C:4

Table #:5

Table C:6

Table C:7

Table C:8

Table C:9

Appendix C Materials Comparison

Appendix D Materials Modelling Results for Insulation

Typical Layout:

1. 2.

3.

The above layout refers to how each insulation material has been

modelled and compared.

1. Illustrates a section through the wall and shows how each

material has been fitted onto the Pavilion.

2. Is a table to show each of the materials and the material

properties of these which have been combined to achieve the

proposed U-Value.

3. Is a graph generated from the model of the Pavilion in which the

annual heating and cooling loads are displayed based on a

combination of all of the scenarios presented in Section #.

Appendix D Materials Modelling Results for Insulation

EnviroCork Existing Scenario

Appendix D Materials Modelling Results for Insulation

Appendix D Materials Modelling Results for Insulation

Innotherm Homatherm

Appendix E Pamphlet used in Public Event

Appendix F Detailed Ecotect Results - Conference

Appendix F Detailed Ecotect Results - Gym

Appendix F Detailed Ecotect Results - Casino

Appendix F Detailed Ecotect Results - Gallery

Appendix F Detailed Ecotect Results – Recommended Combo Scenario