WEDC

Developing
knowledge and capacity
in water and sanitation

An introduction to visual impact assessment

The appearance of a proposed infrastructure development is an important issue, especially for the local community, so environmental assessments should include careful consideration of likely visual impacts of development projects and propose ways to mitigate against them.

Quantifying visual impact is often subjective and will literally depend on the viewpoint of individuals. This booklet introduces the main factors that need to be considered in making a visual impact assessment.

Contents of this booklet

This booklet is not designed to explain visual assessment in depth, as that requires a greater level of understanding than can be easily delivered in a short note. However, it should be enough to explain to managers and other project staff why visual assessments are needed and how they are carried out.

Booklet 1

Loughborough University

WEDC

Introduction

Assessing the impact of a project before it is implemented is now an established procedure, in order to prevent avoidable damage to the environment and local communities. Impacts can be assessed using a variety of techniques by predicting changes to the local flora and fauna, to the economy, to society, to the health of individuals, and to the built environment. Some impacts are direct and some are indirect. Some can be forecast precisely and some are open to debate and interpretation.

Visual impacts on the local landscape can have both direct and indirect consequences. Increasingly, they can be modelled to display the likely appearance of proposed projects, but the *significance* to viewers is more difficult to quantify.

Reasons for assessing visual impacts

Although a 'quality' landscape is difficult to describe and quantify, people do value the appearance of areas that impress them. Tourists will travel to see the wonders of natural and built environments. People will pay more to live in a house with a good view. People will have a better quality of life if they are not surrounded by squalor and offensive scenes.

Figure 1. A poor environment

Visually intrusive water projects

Water supply and sewerage systems are normally regarded as visually insignificant, but certain aspects can have a significant visual impact locally. Large dams can dominate whole valleys and the impounded reservoirs can completely alter the local landscape. Intakes, outfalls, water treatment works and sewage works are smaller in scale, but they may be prominent near rivers. Water towers and service reservoirs are built on hills and so are very exposed.

There may be an assumption that pipelines are neutral from a visual perspective, but the requirement to keep pipeline routes clear of buildings and trees may leave visual marks on the landscape.

An attractive visual environment does not always correlate with other environmental values. Some areas that are important for wildlife, such as marshes, are not generally regarded as particularly beautiful. Power stations and factories that are vital economically may be blots on the landscape, but are necessary for generating wealth. The challenge is to balance visual amenity with other factors such as industrialization. Environmental assessments can forecast that the benefits of development do not come at an unacceptable cost.

It is not just natural environments that need protecting. Historic urban areas and regions with traditional farming practices may also need protection to ensure that their distinctive appearance is not spoilt by unnecessary projects and short-term considerations.
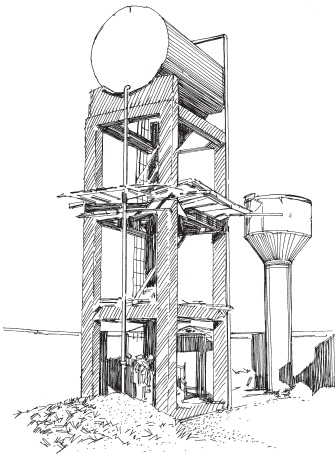

Figure 2. Water towers are very prominent

Elements of the landscape

Visual impacts depend on how the new development relates to the surrounding landscape. Describing the landscape before and after the development will allow these impacts to be assessed.

Trying to capture the range of factors that make up an attractive landscape or a beautiful building is difficult and often depends on a viewer's personal taste.

One way to survey the visual scene is to describe individual elements such as:

- topography or land form (hills and slopes);

- drainage patterns;

- vegetation;

- buildings; and

- other land uses.

This allows a factual approach and provides a record of what is there, but does not necessarily take account of the visual quality of these individual elements and how they work together to contribute to the character of the whole landscape.

For example 'farmland' could range from extensive cattle grazing in an apparently natural setting to landscapes that have been heavily manipulated. The rice terraces on the hills of south-east Asia may be considered a visual delight by some, but large areas of glasshouses for crop production may not.

Visual components

Rather than listing the physical elements that make up a landscape, visual terms can be used.

Form describes the shape of something, so hills may be rounded, jagged or rolling (Figure 3). Cities may be dense and regular, with a strong geometric pattern, or may have a less defined shape. An earth dam may be massive and bulky and match the surrounding hills but the clearly defined engineered shape of a concrete arch dam contrasts with natural landforms.

Line considers boundaries and demarcation between areas. A rectangular block of trees planted on a hillside has a different appearance from an area of woodland that merges to scrubland and then open grassland with no distinct border.

Figure 3. A variety of form

Variation of skylines

Consider the three town skylines sketched here. The tall buildings do not break the skyline in the top sketch, so the mountains behind dominate. In the middle sketch, there is a balance between man-made and natural features on the skyline but the last sketch shows how the town obscures the hills behind.
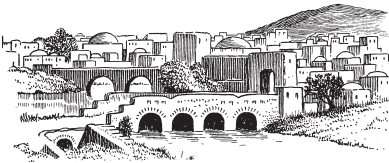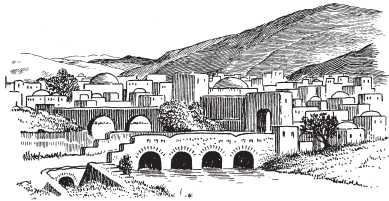

Figure 4. Variation of skylines

The shores of lakes form obvious lines in a scene but the artificial shoreline of a dam contrasts with the sinuous beach of a natural lake.
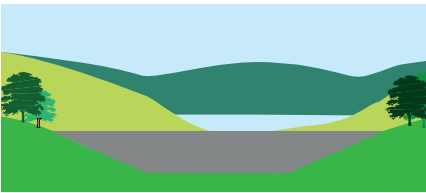

Figure 5. Variation in the colour of a dam

Colour is an obvious aspect of a scene, with the hue of trees or water being noticeable aspects. Contrasting colours may make certain features stand out and bring them to the viewer's attention. Uniformity in colour may be unexciting. Colour can be extended to include more subtle details, such as areas of light and dark. Background, background lighting, shadows, sunlight and reflections will alter the perceived colours.

Texture reflects the nature of the surface. This may be uniform or varied, smooth or rough. Turbulent water can be dramatic whilst a smooth pond is calming and promotes contemplation. The appearance of a woodland with many different species, sizes and ages of tree is different from a plantation of the same species. Other factors can also be recognized, with a range of attributes that each may have (see the Table 1).

Table 1. Visual components and attributes

Scale	Intimate	Small	Large	Vast
Enclosure	Tight	Enclosed	Open	Exposed
Diversity	Uniform	Simple	Diverse	Complex
Texture	Smooth	Textured	Rough	Very rough
Form	Vertical	Sloping	Rolling	Horizontal
Line	Straight	Angular	Curved	Sinuous
Colour	Monochrome	Muted	Colourful	Garish
Balance	Harmonious	Balanced	Discordant	Chaotic
Movement	Dead	Still	Calm	Busy
Pattern	Random	Organized	Regular	Formal

Source: Swanick (2002)

Variety

The four visual aspects (form, line, colour and texture) may be uniform or may vary. There is no simple rule to say how much variation is good. Some towns have buildings all of the same style and have a pleasing harmony. Other uniform urban areas may be dull and drab, having no variety.

Intensity

Variation is simpler to assess than intensity. A concentration of visual features in an area gives a different, perhaps dramatic, appearance compared to the same features spread out and not visible together. In western Uganda there are a series of volcanic lakes that permeate the countryside, giving a different character to the landscape compared with a single, isolated water body.

Figure 6. Lake Bunyonyi, Uganda

Changes over time

Landscapes are not static; they change with the seasons.

In areas where trees lose their leaves for a season, new views may open up that would otherwise be obscured by the tree canopy. In some areas, flowering trees or autumn leaf colour are major tourist attractions.

This variation in view can also occur during the day, with some cityscapes becoming vibrant and exciting at night time, compared with a more drab daytime appearance.

Photographs cannot always capture this change in appearance with time. Landscapes may be full of movement – running water, plants waving in the breeze or people in a busy street. This movement brings changes in texture and may give form to the scene, with dynamism and life that a more static landscape would lack.

Associated factors

Whilst the factors in assessing the visual aspects of a landscape have been discussed, there are also other senses that come into play.

Non-visual factors, like smell and sound, will interact with the view and reinforce (or counteract) the image. The sound of running water, for instance, will add to the experience of observing a stream. The smell of open defecation makes a slum even more unpleasant.

Perceptions

The value of a scene to an individual will depend on personal perceptions and preferences. What is attractive to one person may not be to another.

Tranquillity may be valued by some, with gentle sounds and a harmonious landscape; other people may thrive on the bustle of an urban metropolis. Some people value natural landscapes (or what they perceive to be natural landscapes) over areas where the influence of humankind is obvious.

These personal perspectives are influenced by culture, upbringing, familiarity, literature and religion. Groups of people will share a 'sense of place', where a landscape has a particular character that they value and can recognize. It may be that the area is familiar from paintings, novels or films. It may have historical or religious significance, and so the visual value is partly based on the shared experience of society.

Other considerations

Visual appearance can also be influenced by other issues such as the benefit to society. Heavy industrialization brings employment and economic development, so the change in landscape may be accepted and even valued as a sign of progress. These heavy industrial works can even become accepted as part of the landscape. Fifty kilometres north of Loughborough,

where WEDC is based, are situated a series of old factories that have World Heritage status as do of course, more obviously beautiful buildings such as the Taj Mahal in India and Angkor in Cambodia.

Part of the values placed on a scene will depend on its context. If a landscape is rare or unusual, it may be valued more highly than a view that is commonplace. If a landscape is 'unspoilt' (itself a subjective concept), then it may have a stronger case for preservation than a degraded landscape. A sewage works may raise objections if it resembles an industrial process in the middle of a rural area, but a series of naturalistic treatment lagoons may prove acceptable.

Some landscapes are more sensitive than others. If an area has a strong, uniform character, then additions that do not reflect the nature of the site may stand out. A diverse and varied landscape however may be able to accommodate new features more easily, without disrupting the overall feel of the place.

Landscape features

When assessing a landscape for its visual characteristics, there are various features that can be identified.

Vistas and viewpoints are notable points from where the landscape can be appreciated. They are connected to the landscape so the vista comprises

the location of the viewer and the view they can see from that point. They may be raised above the surrounding area, so the viewer can see a long way. They may be easy to get to, from a road for example. They may offer a view that is obscured and screened elsewhere. Thus bridges in cities allow the wider urban environment to be seen. Waterfronts and parks allow people to see buildings from a distance, so the combinations of different architectural styles are in view, rather than parts of individual structures. Openings in woodland can offer a similar perspective of the wider area, otherwise screened.

Barriers and screens are the opposite of vistas. The slope of the ground, the layout of buildings and tall trees may restrict the views of some areas. The areas that are screened will therefore have a different visual value from an area that has the same quality of scenery but can be seen more easily.

Containment is a value that looks at barriers and screens on a wider scale. A valley is screened from other views by the surrounding hills. There is no intrusion from outside and so the area will have an enclosed feel.

Coherence looks at the way the various individual components of the landscape work together. Although there may be diversity, the separate elements may work together to form a common space with a unique character. Figure 7 shows how elements (such as buildings) can

relate to each other in terms of form, colour and pattern. What one person considers dispersed, another may consider sprawling.

Dominance may be apparent in certain features that have a very strong influence over the surrounding area or are particularly prominent.
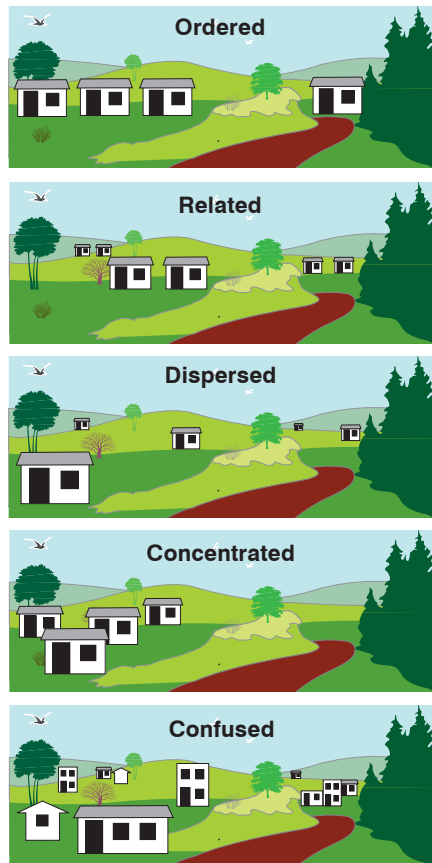

Figure 7. Patterns in the landscape

Desk studies

In undertaking a visual assessment, considerable information can be gathered from secondary sources before visiting the field site. These sources include:

- maps;
- photos;
- aerial photos;
- GIS data;
- diagrams;
- videos; and
- other studies.

This will allow the assessor to locate different land uses, roads, contours and drainage features and from these establish exisiting viewpoints, screens and contained landscapes. There may even be enough information to classify areas of similar appreareance. These may be very crude divisions, such as 'urban' and 'rural', or they may be well defined local landscape character types, with generally accepted patterns of features.

Stakeholders

Another factor that requires preparation before field visits is the identification of the range of stakeholders. As visual appearance is subjective, gaining a variety of opinions on what is valuable and what is undesirable in a landscape is vital if the outcome of the assessment is going to be acceptable to all those who will be directly or indirectly impacted by proposed developments.

Field studies

A desk study can provide a good foundation for a visual assessment, but a visit to the site, inspecting it from different angles and at different times of the day and year, will provide primary information on the local landscape. Field visits are also necessary to meet stakeholders who will be directly affected by the development. It will be important to hear their views and observe patterns of work and understand how travel and recreation may be impacted by the project.

The result of these various studies is to identify the character of the landscape currently – and in the future, with reference to the elements that contribute to this character. How these objective facts are balanced with subjective interpretations (e.g. beauty, dominance, blandness) need to be handled carefully.

Table 2 lists one set of subjective opinions for one region, which reflect the local, cultural and social perspectives. As they relate to the local landscape they cannot be applied to another region with a different character and different cultural values.

Representing the landscape

The field visit will need to be recorded, so annotated maps and photos can be used. Sketches and diagrams may be more useful than a lot of photographs as salient features can be noted in this way, reducing a complex image to reveal the underlying structure.

Table 2. Landscape attributes

	Scenic quality		
	High	Medium	Low
Landform	• High / steep • Isolated • Focal points • Distinctive/ unusual • Complex • Incised • Strong valley form (e.g. "V" or "U") • Cliffs • Ridges • Colour contrast	• Rolling • Rounded • Broad valleys • Shallow gorges • Small rock outcrops • Regular	• Flattish • No dissections • No definition
Vegetation	• Strongly defined • Natural edges • Mix of vegetation within communities • Combinations of vegetation types • Dramatic seasonal colour • Different shapes and sizes, some tall • Irregular	• Indistinct patterns • Large clearings • Coarse texture • Slight variations • Medium	• Large areas of similar vegetation • No discernable patterns
Water form	• Major rivers • Strong flow • Lakes • Waterfalls • Rapids • Steep streams	• Medium to small rivers • Lagoons • Scattered ponds	• Minor streams with intermittent flow • No water

Adapted from: Forest Practice Board (2006)

Video cameras are becoming increasingly available. These can record the dynamic nature of a site whilst the assessor provides a commentary to highlight the important features.

Predicting impacts

There are a variety of techniques that can be used to model the future appearance of a scene. Many of these are artist impressions, but they are becoming increasingly sophisticated.

Simple sketches can be used, but these depend on the skill of the artist. The advances in computing allow photomontages and the manipulation of digital photographs to provide 'before' and 'after' shots of scenes. These may show the site developing over time; how vegetation grows and changes over the seasons and as construction is carried out.

Photos and sketches only give a view from a fixed point. Cross-section sketches allow the relative heights and sight angles to be recorded, so the zone of visual intrusion can be identified vertically as well as horizontally.

Scale models allow a development to be examined from different perspectives. Physical models are now being superseded by computer models that allow the viewer to 'move' through a three dimensional landscape, looking at the development from different angles.

Other computer methods include geographical information systems (GIS), where databases can be used to identify particular zones comparing, for example, vegetation or land use with altitude or orientation.

Identifying features

The prediction process needs to re-assess the landscape for visual qualities and compare this with the existing (or desired) views. The assessor will be looking for features that dominate or intrude and are therefore out of scale with the surrounding area. The converse can also be true, as a development may leave a gap in a landscape that can be just as intrusive as something that has been added.

The visual features may not always be direct. Fumes, smoke, spray and scavenging birds may all impinge on the landscape even if the physical part of the development is hidden.

Significance

Whilst the appearance can be modelled, this visual change needs to be assessed as to its significance. Issues to consider here include:

- the number of viewers who will see it;
- the permanence of the development; and
- the scale compared with the surroundings.

However, these give quantitative indications that need to be considered

alongside qualitative opinions. Using discussion groups, ranking exercises, willingness-to-pay surveys and other socio-economic, participative techniques, will provide a further indication of the views and values of stakeholders.

Mitigation

Assessments should also identify mitigation of adverse impacts and the enhancement of positive ones. This needs to start at the beginning of the project design as adjustments early on can resolve problems that would be expensive to remedy at a later date. Locating the project in an area that is not particularly sensitive is a simple way to reduce visual impacts. If relocation is not possible, there are levels of sensitivity to be considered.

Sensitive areas to avoid include skylines and ridges on hills, as outlines against the sky emphasize the form of intrusions. Screening can be used but this is not always simple as the screen (such as a row of trees in a treeless landscape) may form a visual intrusion itself. Wider screens can take the form of a buffer zone, where the change in land use is merged slowly into the surrounding countryside.

The appearance of the development can be altered to make its form, colour, texture, and especially its height, less intrusive. Straight lines can be changed to curved or staggered (see Figure 8). If strong lines cannot be altered, they can be partly screened to break them up and reduce their dominance. Developments can be approached using a variety of heights and colours to break-up uniformity and create diversity.

Figure 9 shows how the introduction of pipeline can result in a visual gap in the landscape, especially when it leaves a space in a skyline that is otherwise uniform. By altering the route of the pipeline, the space can be made less obvious from a key viewpoint. Winding the pipeline route within the woodland prevents an undesirable vista becoming visible throughout the area.
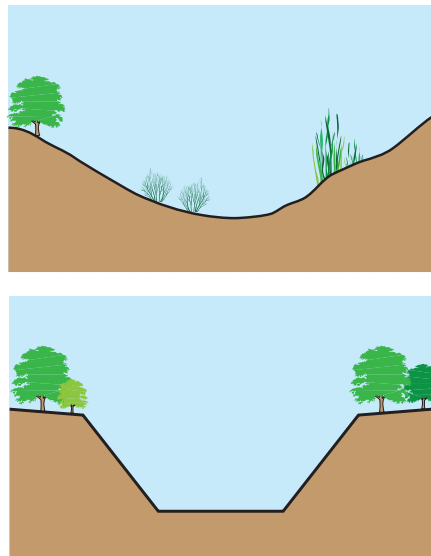

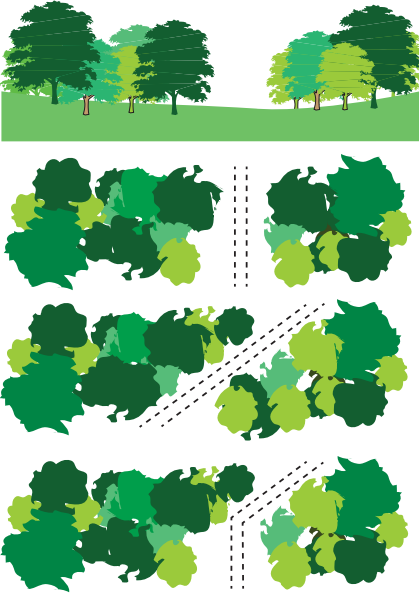**Figure 8.** Cuttings can be integrated into the landscape

Figure 9. Trees in the landscape

Work can also be undertaken to deflect the gaze of the viewer rather than screening a development. Vistas can be created with focal points made to attract attention elsewhere. If a distant vista cannot be created, there are ways to trick the human eye to lead people to imagine that there is more to see just around the corner.

For example, in Figure 9, the gap in the trees could be widened and a feature made of a new visual path through the woodland.

Time is an issue, as visual impacts during construction can be obtrusive and vegetation takes time to recover.

Conclusions

Visual assessments are a skilled combination of objective and subjective examinations of existing landscape characteristics. The subjective interpretation requires both an expert opinion from somebody with experience of analyzing the visual appearance of landscapes and the views of other stakeholders to ensure that the characteristics of the landscape that are valued locally are preserved and enhanced.

References and further reading

CANTER, L. W., 1996. *Environmental Impact Assessment*. 2nd ed. Singapore: McGraw-Hill

FOREST PRACTICE BOARD, 2006. *A Manual for Forest Landscape Management.* Tasmania, Australia. [online] [viewed: 03.03.2011] http://www.fpa.tas.gov.au/fileadmin/ user_upload/PDFs/Landscape_CultHer/ Chapter7_landscape_manual_small.pdf

MORRIS, P. and THERIVEL, R., 2001. *Methods of Environmental Impact Assessment.* 2nd ed. London: Spon Press

SWANWICK, C., 2002. *Landscape Character Assessment. Guidance for England and Scotland.* Countryside Agency/ Scottish Natural Heritage, UK

WEDC Publications

Our knowledge in water and sanitation has developed over 40 years, contributing evidence-based answers to important questions – not only about *what* to do to improve infrastructure and services in low- and middle-income countries – but also *how* to go about it. We invite you to use this knowledge.

We document and publish our knowledge in a number of ways. We produce books; manuals; case study reports; academic papers; fact sheets; technical notes and illustrations; briefing reports; conference papers and more, using both conventional and new media.

The WEDC Knowledge Base online provides links to WEDC resources that are available to download free of charge. Printed editions can also be purchased from the website.

To find out more, visit

http://wedc.lboro.ac.uk/knowledge/ know.html

The Water, Engineering and Development Centre is one of the world's leading education and research institutes for developing knowledge and capacity in water and sanitation for sustainable development and emergency relief.

We focus on solutions for people in low- and middle-income countries, helping to provide evidence-based answers to important questions – not only about what needs to be done to improve basic infrastructure and essential services – but also how to go about it.

Founded in 1971, WEDC is based in the School of Civil and Building Engineering at Loughborough University, one of the top UK universities. This provides a sound basis for scrutiny of all we do: WEDC is regulated, and being part of a leading university gives us a recognised platform of independence and quality.

What makes us stand out from the crowd is our outreach to practitioners – using our knowledge base and our applied research work to develop the capacity of individuals and organizations throughout the world, promoting the integration of social, technical, economic, institutional and environmental activities as a prerequisite for development.

Visit our website to find out more about us and download free resources from The WEDC Knowledge Base.

WEDC

Water, Engineering and Development Centre
The John Pickford Building
School of Civil and Building Engineering
Loughborough University
Leicestershire LE11 3TU UK

t: + (0) 1509 222885
f: + (0) 1509 211079
e: wedc@lboro.ac.uk
w: http://wedc.lboro.ac.uk

Loughborough University