Graphic Presentation Handbook

Developed by staff of the former School of Geography, Planning & Environmental Management with adaptations to prefatory material made in February 2017 after the disestablishment of the School.

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Introduction

What does the Graphic Presentation Handbook cover?

The Graphic Presentation Handbook provides a general overview of the what, where, when, why and how issues of graphic presentation in academic writing It is designed to assist you with any questions or difficulties you may have in regards to graphic presentation in your written assignments. Note that this guideline specifically applies to written academic papers, and that not all concepts in this document are appropriate for graphic presentation in other writing genres or for posters, PowerPoints, and other forms of visual presentation.

Who should use this handbook?

- Undergraduate and postgraduate students of all backgrounds and levels of experience.

How to use this handbook

The Graphic Presentation Handbook has been divided into a number of chapters, each relating to a different topic in graphic presentation. The handbook need not be read sequentially, though it is recommended that you take the time to familiarise yourself with the full content of the Graphic Presentation Handbook.

If you have a particular issue or question about graphic presentation, you can either search through the chapters and sub-headings in the contents, or try to find you answer in the Frequently Asked Questions chapter.

You may also choose to browse through the guideline before writing your assignments, or to refresh your memory on certain topics when necessary. You will find a number of useful suggestions and time-saving ideas in the Hints and EditingTips chapter, and make sure to print out a copy of the all important Graphic Presentation Checklist.

Statement of preference

- Note that different course coordinators may wish to issue different requirements, conventions or instructions for a particular course, project or assignment. In all cases, a course coordinator's requirements will take precedence over the information contained in this guideline.

- Should there be a difference between the procedures of the SGPEM Handbook and those contained in the Handbook of University Policies and Procedures (HUPP) (http://www.uq.edu.au/hupp) the HUPP will take precedence.

- Sections within the HUPP relating to assessment can be found at: http://www.uq.edu.au/hupp/index.html?page=25075, and include: 3.30.1 Assessment.

Overview of graphic presentation

What are graphics?

The term graphics refers to the visual features found in academic writing. Graphics include things like graphs, charts, tables, maps, diagrams, photographs, remotely sensed imagery and illustrations.

What are graphics used for?

- In academic writing, graphics are designed to *complement* and *augment* the main text in order to increase the reader's understanding. They are *not* used to make a paper look more interesting or aesthetically pleasing.
- Graphics are commonly used to summarise data and present information that is otherwise difficult to express with words.

What makes a good graphic?

In academic writing, a good graphic generally:

- draws your attention to the data or information it contains, and not its colours or other artistic features;
- gives readers the greatest number of ideas in the shortest amount of time; and
- presents the greatest amount of data and/or information using the smallest amount of space.

You can use these guidelines to test the quality of your graphics.

How to use graphics effectively

To be effective, graphics must be:

- *Concise*- the content of graphics must be directly related to your work and to the point you are trying to make; incidental or irrelevant data should be removed.
- *Independent*- graphics should be self-contained, or in other words the reader should not have to read any other component of the paper (including the main text and other graphics) to understand a given graphic. This independency can be achieved by labelling the graphic with a comprehensive title that answers the who, what, where and when about the graphic's contents.
- *Comprehensible*- the reader must be able to read and understand the content of a graphic for it to be effective.
- *Appropriate*- the graphics used in a paper should be suited to both the writing genre and to the likely readers of the paper.

The role of colour

When writing academic papers, colour should only be included in graphics if it is necessary to convey information. Furthermore, bright colours should generally be avoided as they may distract readers from the content of the graphic.Bear in mind that **if you use colour in your graphics to represent information, you must also print your assignment in colour** (as the information could be lost in greyscale).

Reproducing existing graphics

Sometimes you may wish to incorporate an existing graphic into your paper, either by scanning a hard copy or by cutting and pasting a digital copy. While it is acceptable to do this, you need to bear in mind that the graphic will lose quality and readability during this process. *If the reproduced graphic turns out to be fuzzy, difficult to read, too small or illegible, do not include it in your paper.* If possible, you can try to make a new, clean copy of the graphic yourself to use in your paper (remembering to reference the original source). If it is not possible to reproduce the graphic, you could try to find a suitable substitute.

Should I use words or graphics to present information?

- There are some types of information that are inherently visual e.g. maps, schematic diagrams, and photographs, that cannot be expressed in words. However, it is sometimes possible to explain the information in graphs, charts and tables verbally.
- If you can use words alone to succinctly express a given set of information, then a graphic is not necessary. If it takes too long or becomes confusing to present information with words, then a graphic should be used to summarise the data.

When to include a graphic (see also F.A.Q)

Whether or not you need to include a graphic depends on several factors.

- Firstly you should consider whether the information in your graphic is common knowledge. It is unnecessary to present information that your reader is likely to be familiar with.
- The necessity of a graphic also depends on the point you are trying to make. For instance, if you are only concerned with one particular aspect of a graphic, you could explain this point with words rather than presenting the entire graphic.
- Remember that graphics should only be included in your paper if they contain vital information that is necessary to support the text. Do not use graphics to simply make a paper look more interesting or aesthetically appealing.

Checking the source of my information

- There are many ways in which graphics can be modified to misrepresent data or information. For this reason, you should always view published graphics with a certain degree of skepticism and check the reliability of your information.
- You can test the credibility of your source by checking the author, the date it was written, the context in which it was written, the purpose it serves, and whether or not external sources agree with the information being presented.
- For more information on evaluating resources, read through the UQ library *Evaluating Information Resources "How-to Guide"*, which is available at http://www.library.uq.edu.au/training/EvaluatingInformationResources.pdf.

Misrepresentation of data

- The intentional misrepresentation of data is unethical and completely unacceptable. Always present your data honestly, even if it contradicts with the point you were intending to prove.
- It is also possible to unintentionally misrepresent data. The most common example of this is the use of three dimensional and rotational effects to present graphs with only *two* variables. Although these effects

may seem like a good way to make your graphs more visually appealing, they can actually distort the data. It is therefore strongly recommended that you do not use 3D or rotational effects to present graphs with only 2 variables.

Customising your own graphics

If you are creating your own graphic using computer software, it is likely that your program will automatically assign a default size, colour, style etc. to the graphic. These default computer settings are rarely, if ever, the most appropriate settings for *your* particular graphic. It is therefore important that you customise your graphics to make them suit the information being presented as well as the style and format of your paper.

Customising existing graphics

You may find that you need to adjust existing graphics so suit your purpose and the format of your paper. If you crop a graphic or adjust its brightness or contrast, you will need to affirm this by using the term 'adapted from' in your reference. You do not need to use the phrase 'adapted from' if you have only resized a graphic. Remember that enlarging an existing graphic can reduce the quality of the image, and it is generally recommended that you only ever resize graphics to make them smaller.

Incorporating graphics into your writing

Labelling and numbering

- As well as having a descriptive title, every graphic in a paper must be labelled and numbered so that it can be easily referred to and identified by the reader.
- Graphs, charts, maps and images are labelled as Figures, and the title is written *beneath* the graphic.
- Tables are labelled as Tables, and the title is written *above* the graphic.
- Graphics are numbered consecutively in the order in which they appear (e.g. Figure 1, Figure 2, Figure 3).
- If you are writing a long paper (say more than 2,000 words) it is a good idea to number figures and tables consecutively within chapters (e.g. Table 1.1, Table 1.2).
- The numbering systems for Figures and Tables should be kept separate.
- Note that the labelling system for appendices is different to that in the main body of a paper. For more information, refer to the Appendices chapter in this handbook.

Introducing graphics in the text

- Graphics must be *introduced in the text before they are presented in a report*. This is to ensure that readers understands what is being presented and why.
- Graphics can either be introduced using a sentence, for example "As indicated by Figure 7, the rate of global population growth is expected to accelerate until 2050", or as a parenthetical reference, for example "The rate of global population growth is expected to accelerate until 2050 (Figure 7)".
- To avoid ambiguity, always *refer to graphics by their label and number*.

Contextualising your graphics

- When introducing graphics in the text, it is important that you also discuss their significance and point out any key features. This will help to contextualise the graphic, and to direct the reader's attention to any important points they may have otherwise not noticed.

Formatting your graphics

Placement

- Graphics should be placed as soon as practical after their first mention in the text.
- They can be positioned either below or beside the text, but must be spaced at least one line apart from the text so that they appear as a separate entity.
- Avoid splitting your graphics across two pages. If there is not enough space for your graphic at the bottom of a given page, insert it at the top of the next page.

Dealing with large graphics

There may be times when you find that your graphic is too large to fit on your page. Here are a few hints to help you deal with the presentation of very large graphics:

- If you are presenting a wide graphic, it is acceptable to position the graphic so that it extends beyond the margins of your page
- If a graphic is too wide to fit on your page altogether, you can present it in landscape format (i.e. rotated 90◦)
- If a graphic is larger than the actual size of your report, print it on a large piece of paper then fold it into your report. Take care when you are binding the page that the graphic does not become severed, and that the page will fold out in the correct orientation.

Bear in mind that folding in pages tends to make your assignments bulky; hence this tactic should be used sparingly.

Stylisations

- If you are writing a document in the style of a professional business report (i.e. non-academic journal style) it may appropriate for you to include graphics known as stylisations. Stylisations can include borders, watermarks, company logos or motifs, and appear on each page of the document.
- If you are using stylisations, take care that they do not obscure the main text or any graphics in the report.

Whether graphics belong in the results or discussion section

At times you may also be faced with the decision as to whether a graphic belongs in the results or discussion section of your paper. In general, the results section is used to present a summary of the data and/or statistics from your research, while the discussion section appraises, interprets and explains these results. Therefore,

- graphics depicting summaries of raw data and basic statistical analyses belong in the results, and
- graphics depicting further analyses of the results belong in the discussion section.

Graphs

Graph types and their uses

Scattergrams

Scattergrams are plots of data points that are used to show the correlation between variables (Figure 1). Statistical analyses are commonly used to draw a line of best fit through the points to indicate the direction and strength of the correlation. Scattergrams are commonly used to display the results of a scientific experiment.
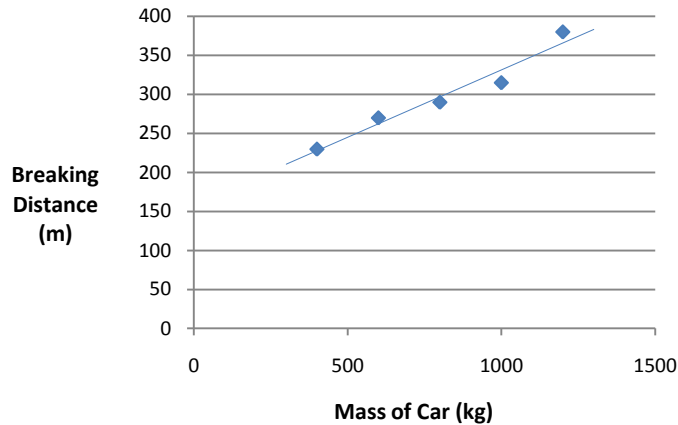
Figure 1: Breaking distances for vehicles travelling at 80km/h (Author date[1])

Line graphs

Line Graphs represent the change in variable Y (vertical axis) as a function of the continuous variable X (horizontal axis). Line graphs are often used to show how a variable has changed over time. More than one data class can be represented on the Y axis (Figure 2).

Figure 2: Population growth within continents over the next 40 years (PRB 2009)

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[1]Author date is used throughout the document as an example reference for mock data

Area graphs

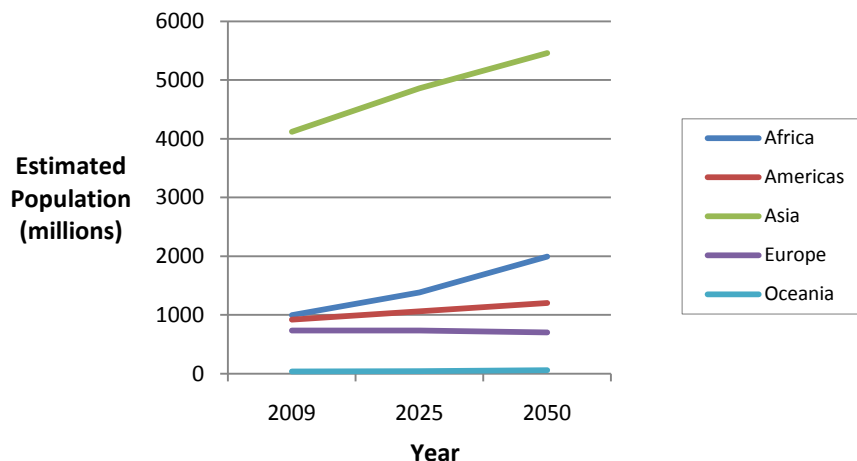**Area Graphs** are similar to line graphs in that they show the distribution of continuous (non-discrete) data. However, the area beneath each line is shaded (using different colours) to emphasise the difference between data classes (Figure 3). Area graphs can be useful to show how cumulative totals change over time.
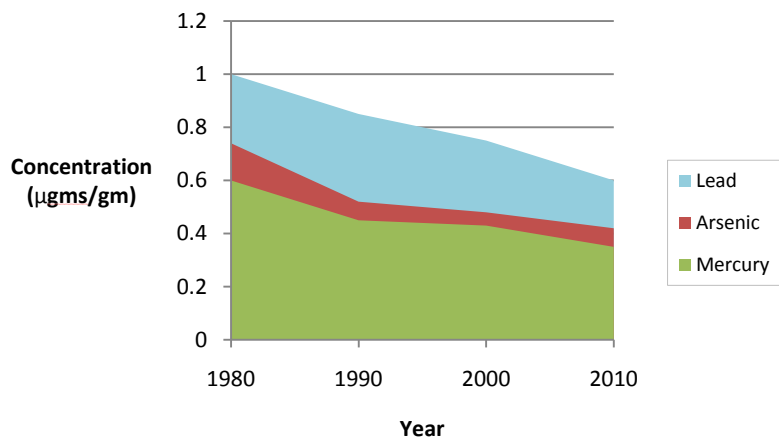
Figure 3. Changes in heavy metal contamination in Brisbane's drinking water since the addition of the DSGT treatment plants (Author date)

Bar graphs

Bar Graphs present the relationship(s) between two or more *non-continuous* variables, whereby the strength of the relationship is proportional to the length of the bars (Figure 4). The bars can either be placed vertically or horizontally, and can show negative values. Bar graphs are useful for comparing multiple variables.

Figure 4. 2008 Populations in Australian States and State Capitals (NSW Government 2008)

Histograms

Histograms present the relationship(s) between *continuous* variables. Like bar graphs, histograms present data in the form of rectangles. Histograms are commonly used to reveal the distribution of univariate data sets (for example the centre, spread, skewness, outliers, etc.).
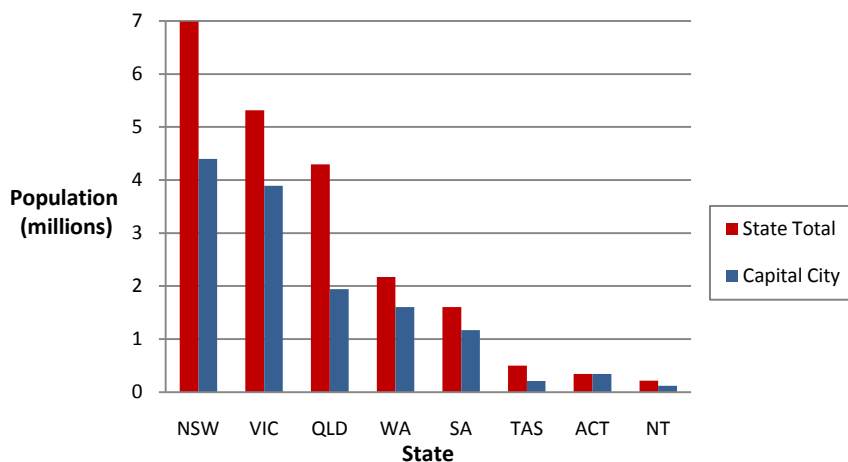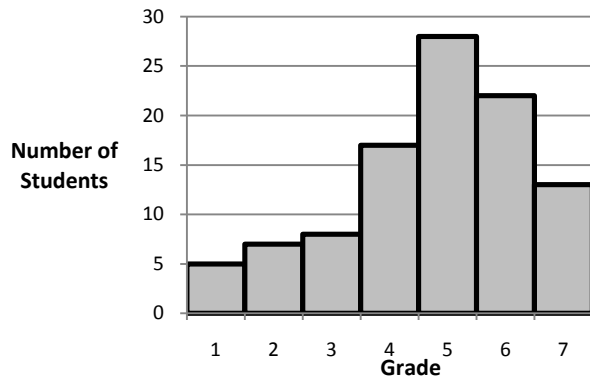

Figure 5. Grades achieved by GEOM1000 students, semester 1 2009, St. Lucia, UQ (Author date)

Population pyramids

Population Pyramids are used to show the distribution of a certain population (e.g. regional, national) in terms of age and sex (Figure 6). There are a few conventions to follow when creating population pyramids:

- Males are shown on the left and females on the right, and are labelled as such
- Age groups are given in 5 year intervals
- Populations can either be presented as absolute values or percentages. If you are using percentages, they must reflect the total population and not just the population within each sex.
- The same scale must be used to represent male and female populations
- Gridlines should be used for the X-axis so that the reader can estimate population values

Figure 6. ERP and Composite Estimate of Indigenous Australians in the Peninsula ATSIC region, 1996 (Taylor and Bell 2002)

Pictographs

Pictographs use symbols and images to represent the value of data (Figure 7). Although pictographs are able to convey the relative si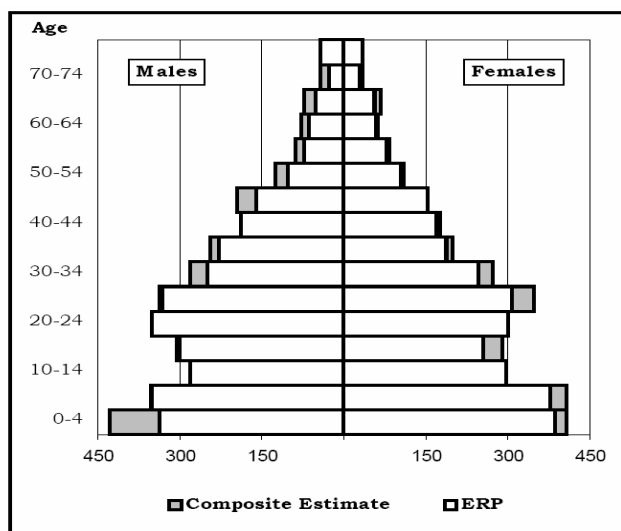ze of data sets, they are limited in that they make it difficult to determine the absolute value of data. For this reason, it is recommended that you do not use pictographs if you anticipate that the reader would be interested in absolute data values.
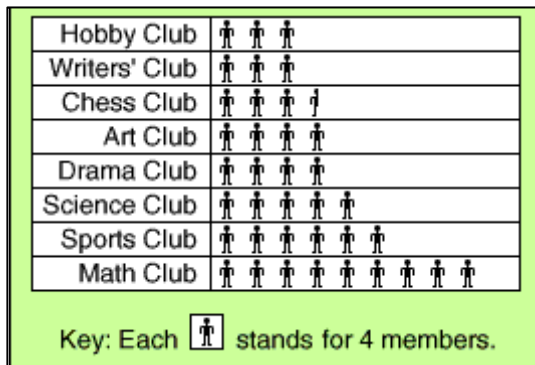
Figure 7. Membership numbers for after-school clubs (Harcourt School Publishers n.d.)

Pie graphs

Pie Graphs are used to visualise the way in which an entity is divided up into smaller parts (Figure 8). While pie graphs may be useful in certain circumstances, it is generally recommended that they be avoided if you are presenting a large number of variables. If you do choose to use a pie graph, you should abide by the following conventions:

- Structure pie graphs so that the largest segment begins at 12 o'clock, with the remaining segments running clockwise in decreasing order.
- Label each segment of the pie with either the total value or percentage. If you label with percentages, be sure to provide the total value somewhere in the graph so that the reader can convert the percentages (should they wish to).
- Use different shading or patters for each pie segment, as this will create contrast and improve readability.

Figure 8. Sales at The Fruit Market, Brisbane 2009 (total sales = $450 000) (Author date)

Dual-axes graphs

Dual-axes graphs are used to present three variables on a single graph. They achieve this by having either two X-axes or two Y-axes. Dual-axes graphs are useful for comparing interrelated variables. For example, Figure 9 presents the historic temperature and atmospheric CO_2 records of Earth simultaneously by means of two Y-axes.
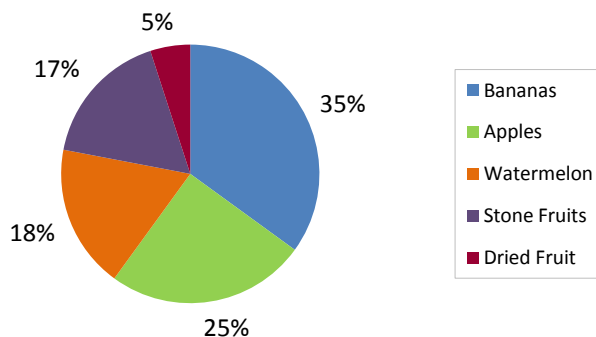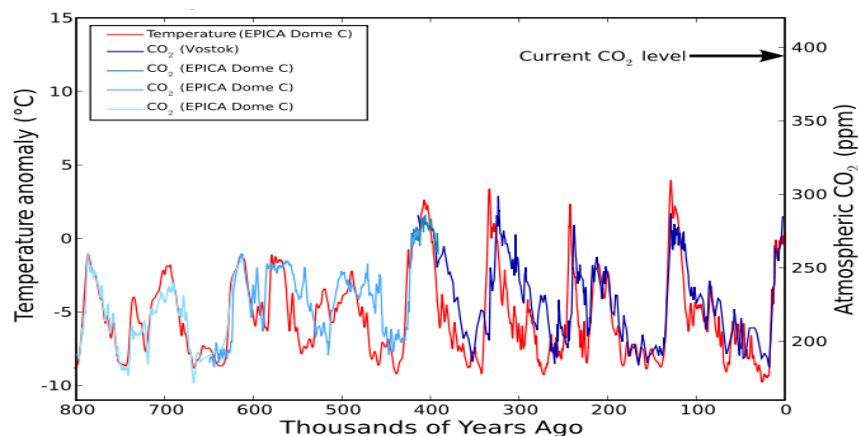

Figure 9. Earth's climate history as reconstructed from Antarctic Ice Cores (McInnes 2009)

Essential graph features

In order to effectively present and communicate data, graphs must have a:

- **Title**- Graphs have succinct yet comprehensive titles that inform the reader about their content. Graph titles are placed *beneath* the graphic as a caption (so if your computer program automatically places a title at the top of a graph, you must drag it to the bottom). The title should not simply repeat the axes labels, or contain the words "Graph of" or "Plot of".
- **Axes labels**- Both the x (horizontal) and y (vertical) axes must have a label to indicate which variable they represent, and if necessary the unit of measurement into which the variables are divided. Origins should always be labelled on graphs (unless a logarithmic scale has been used, as the log of zero is not defined).
- **Tick marks**- Tick marks are used to indicate the scale of the graph. Major tick marks are labelled with a number, symbol or word, depending on the type of data being presented. Minor tick marks are placed within the major tick marks and are not labelled. They are designed to help the reader estimate detailed values off a graph (should they wish to).
- **Source**- Reference the source of your graph in the style consistent with the textual component your report. The reference should either be placed in the title or beneath the title in a source line.
- **Legend** *(if presenting multiple variables)*- Legends are used to indicate the meaning of the shading and/or symbology used in a graph. They should be enclosed by a border, given a title and placed to the right of the graph, below the graph, or if small enough they can sit within the plot area.
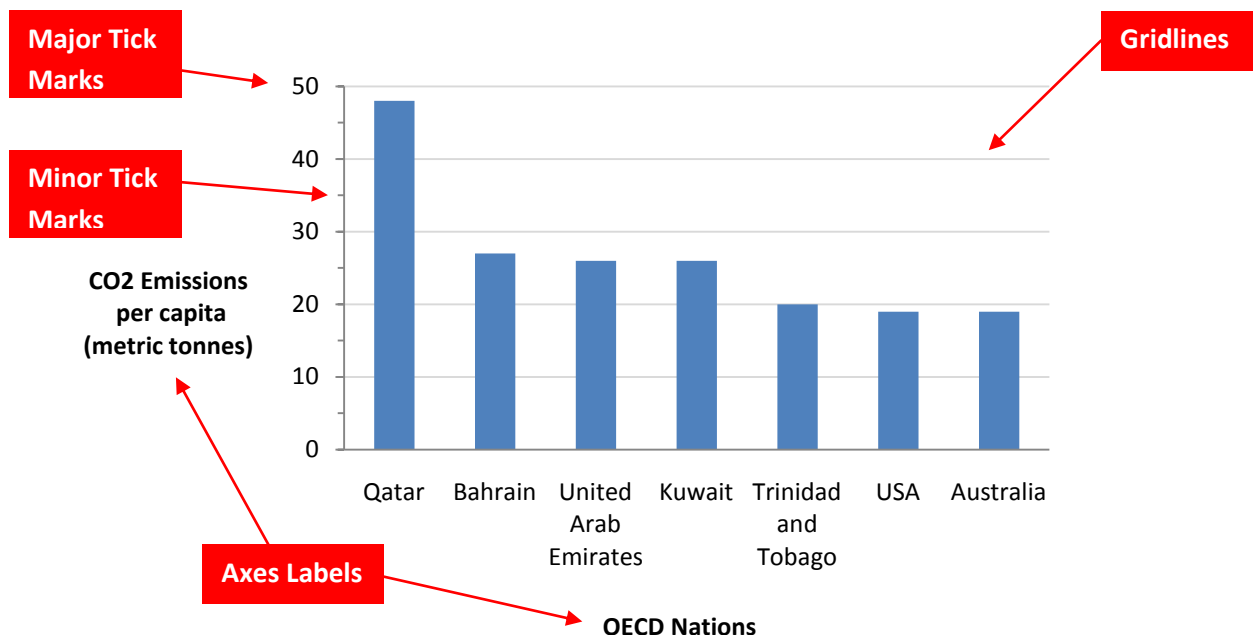
Figure 10. OECD nations with highest carbon dioxide emissions per capita, 2006 (PRB 2009)

Labels in figure: Major Tick Marks, Minor Tick Marks, Gridlines, CO2 Emissions per capita (metric tonnes), Axes Labels, OECD Nations, Source, Title

Chart data (CO2 Emissions per capita, metric tonnes): Qatar 48, Bahrain 27, United Arab Emirates 26, Kuwait 26, Trinidad and Tobago 20, USA 19, Australia 19

Customising your graphs

When you are creating a digital graph, your computer program will automatically set it to a default size, scale and appearance. However, the default settings are rarely (if ever) the most suitable way in which to present your graph as it will not have taken into account the content and context of your data. Customise your graph by adjusting the *shading, scale, symbology* and *labelling* to suit the type of data being presented and the style of your paper:

Shading

- Graphs should be shaded using subtle colours and hatching.
- The type of shading used in a given graph should be chosen to suit the data it contains, and the style of your paper.
- Bear in mind that the rule of thumb is to present graphics using the least amount of ink necessary.

Scale

- Graph scales should be chosen to suit the range of data values so that the data fills up as much space of the graph as possible.
- When the range of data in your graph is very large, it is best to use a logarithmic scale in the relevant axis (or axes).
- If you are beginning an axis with numerical markings on a point other than zero, you should indicate this clearly in the graph label.

Symbols

- Symbols should be used to represent different variables in graphs.

- Symbols need to be large enough to be legible, and able to be easily distinguished from one another.
- Bear in mind that certain symbols have inherent meaning, as do certain colours.

Labelling

- Labels should all be placed in the same orientation so that the reader does not have to turn the page.
- Make sure your labels are sufficiently large so that they are legible.
- Use visual hierarchy to indicate levels of significance (e.g. use bold, italics, and larger font size to make the most important labels stand out).

Additional considerations for graphs

Units of measurement

- To save time and space, the units of measurement used on your graph axes are indicated in the axes labels and enclosed in brackets.

Gridlines

- Gridlines are lines that extend from your tick marks across the length of your graph.
- It may be useful to include gridlines when you have a large or wide-ranging graph, and you anticipate that readers may have trouble reading values off the graph.
- Gridlines run *behind* the plotted data so that they do not obscure the graph, and are weighted finely.

Presenting multiple variables

- When presenting multiple variables, you need to use shading and symbols to represent different data classes.
- Use a legend to indicate the meaning of the shading and/or symbology used in the graph.
- It is recommended that you minimise the number of data classes contained in a single graph, as they can become cluttered and confusing if too many data classes are presented.

Statistical analysis

- If you have used statistical analysis in your graph, you should present all relevant equations and values either in the plot-area of the graph (providing there is sufficient space) or beneath the graph as notes.
- If you have used computer software to perform your statistical analysis, you will need to reference this.

Error bars

- If you are presenting means (averages) of a variable in your graph, you should always include error bars to indicate the associated uncertainty of each mean.
- Note that the value of error bars is rarely the same for each mean. If your computer program automatically generates error bars of equal value it is likely they are incorrect.

Using multiple graphs for data comparison

Graphs are excellent tools for comparing related data sets. However, there are a few things you need to consider when presenting multiple graphs for comparison:

- each graph must be presented at the same size and scale so that the reader can make direct visual comparisons;
- the graphs needs to appear on the same page if they are to be easily compared; and
- human eyes find it much easier to compare lengths than areas, thus it is recommended that you do not use do not use series of pie graphs, area graphs or stacked bar graphs to compare data sets.

Charts

Chart types and their uses

Flow charts

Flow Charts are graphical representations of a process, sequence of events, or network of interactions (Figure 11). There are a few general rules to remember when creating flow charts:

- Alignment indicates simultaneity of events or equal levels of importance (for linear processes)
- Time progresses from left to right and/or top to bottom
- Hierarchy is indicated by tree or pyramid systems
- Linear processes (with distinct beginning and end points) are indicated by straight lines
- Cyclic processes (with no clear beginning or end points) are represented by circular shapes

Remember also that certain fields (e.g. risk assessment) have their own set conventions for flow chart style and symbology, which you may need to use (depending on the type of information you are depicting).

Bill Drafted

Cabinet Approves Bill

Government Members Approve Bill

Introduction of Bill

First Reading

Second Reading

Consideration in Detail

Third Reading
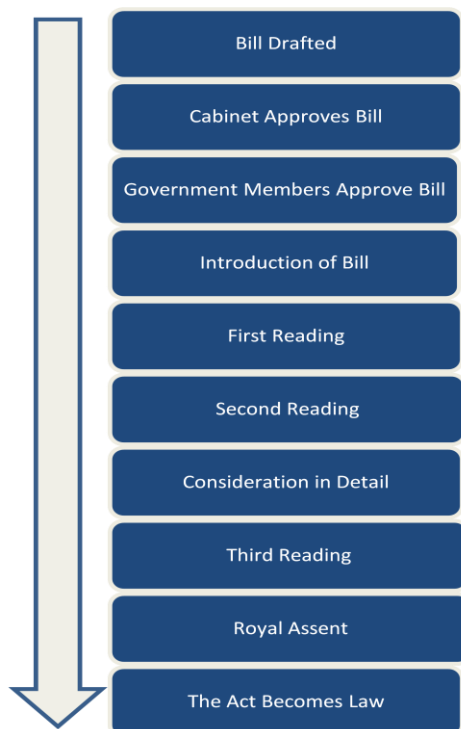
Royal Assent

The Act Becomes Law

Figure 11. How laws are made in Queensland Parliament (Queensland Parliament 2008)

Organisational charts

Organisational Charts are used to represent the structure of groups and/or people within an institution (Figure 12). Hierarchy within the institution is demonstrated by different levels (with the highest ranking at the top of the chart). Relationships and responsibilities between the nodules are indicated by linking devices.
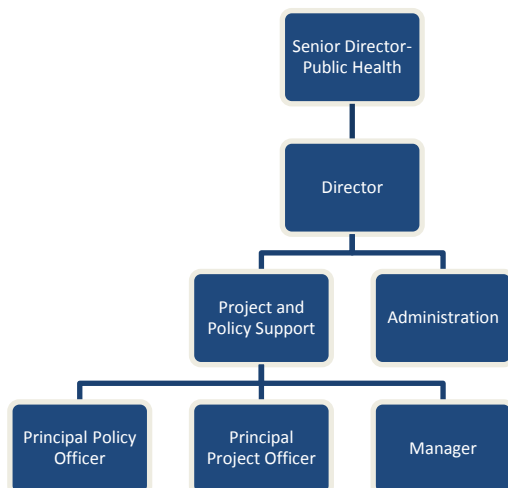
Figure 12. The organisational structure of the Queensland Government's Aboriginal and Torres Strait Islander Health Strategy Unit (Office of the Director General) (adapted from Queensland Health 2008) (example of organisational chart).

Venn diagrams

Venn Diagrams are visual representations of all possible relationships between different sets (groups) (Figure 13). Each set is enclosed by a large circular shape, and positioned so that it overlaps with the set(s) it is related to. Text is then placed in the overlapping regions, to define these relationships.

Figure 13. A Venn diagram is used to show how different fields in geography are related to one another (Kansas State University 2009).

Essential chart features

To present information effectively, every chart must have:

- **Title**- Charts must contain a descriptive title to inform the reader what the chart is about and any other essential information necessary to understand its contents.
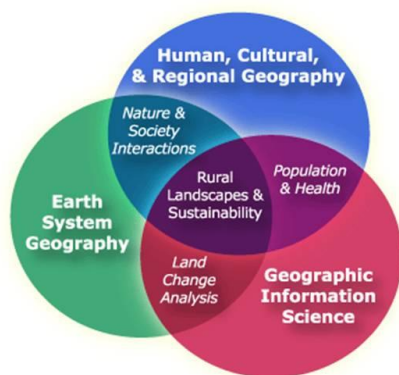- **Nodules**- Nodules are the discrete points within charts that represent people, places, groups or events. The size and colour of nodules can be used to indicate levels of importance.
- **Linking devices**-These are used to indicate progressions, relationships and interactions within charts.
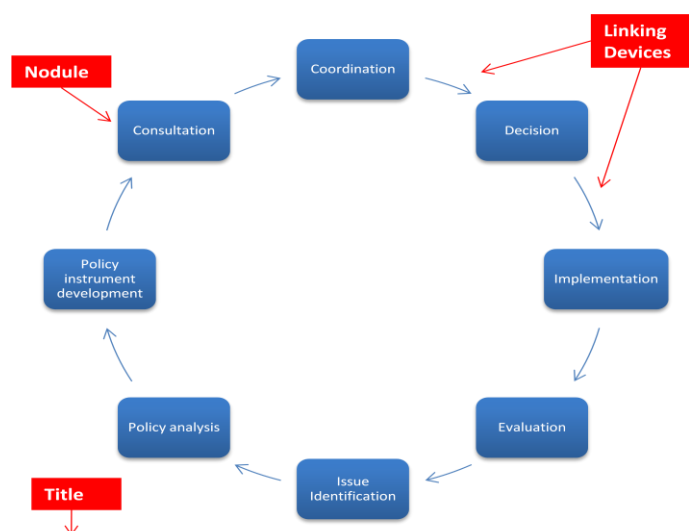
Figure 14. The Australian Policy Cycle (adapted from Althaus et al. 2007)

Tables

Essential table features

To effectively present data and/or information, every table (Table 1) must have:

- **Title**- Titles are placed one line *above* tables, and never inside the table itself. The title should give a clear yet concise description of the table contents, and answer the who, what, where and when questions.
- **Column headings**- these are placed in the first row to explain the contents of each column. As there is usually little space for column headings, it is best to keep them short and simple. If the entries in a column have a common unit of measurement or multiplying factor, this information is placed next to the column heading and enclosed in brackets.
- **Stub**- the stub is the leftmost column in a table. It may contain several sub-headings for different sections within the stub. These sub-headings are indicated by italics, bold font, or similar means.
- **Rule**- The rule is a fine line that separates the column headings from other rows (to avoid any confusion).
- **Borders**- Bold lines are placed at the upper and lower edges of tables, to define their boundaries and separate them from the text.

Title

Column Headings

Sub-Headings

Rule

Stub

Table 1. Mean weekly housing costs within Australian households, 2007-08 (ABS 2009)

Household Characteristics	Mean Cost of Housing ($AU)						Other Tenure Type	All Households
	Home Owners		Renters					
	Without mortgage	With Mortgage	State/territory housing authority	Private landlord	Other landlord type	Total Renters		
Family Composition								
One family	37	366	130	276	153	253	29	227
Multiple family households	32	477	162	253	150	224	–	287
Non-family households	26	335	119	275	153	253	16	223
Dwelling structure								
Separate house	34	369	119	263	152	239	27	209
Semi-detached	25	496	94	270	135	226	12	245
Flat/unit/apartment	22	482	90	274	128	238	8	247
Other	72	168	–	172	101	143	–	71
Total all households	33	384	105	267	142	237	21	216

Depending on the type of information/data being presented, your table may also require:

- **Totals**- If you are presenting quantitative data, it is usually a good idea to provide a row of total values. There may be more than one row of total values, depending on the type of data and number of data classes presented. Rows of total values should be distinguished from other rows by means of italics and/or a fine line.
- **Subheadings**- When there are two or more columns in a table that are directly related to each other, they can be classed together under a single column heading and given sub-headings. These sub-headings are placed within the first row, though are separated from their primary heading by a fine line and are less visually prominent.

When to use a table

- It is only necessary to use a table if your data or information cannot be easily expressed with words.
- If you are presenting a large data set or quantity of information, then you should use a table to organise and summarise this.

Table notes

Sometimes there is certain information that although is directly related to a table's contents, does not have a place within the table itself. This type of information should be included beneath the table as a note, and indicated using superscripted symbology.

Common things included in table notes include:

- Explanations of symbology
- Abbreviations used in table
- Statistical information
- The context in which a variable was measured

You need to be careful that your table notation does not clash with your footnotes or any other symbology used within your paper (e.g. Chicago style referencing).

Conventions for table formatting

Gridlines

- Generally speaking, tables should not have gridlines separating every row and column. Gridlines should only be used to indicate sub-headings and subsets within a table.

Column/row structure

- It is much easier for our eyes to read down a column than across a row. Therefore, you should structure your tables so that whatever you want to compare appears vertically.

Ordering systems

- Rows and columns should always be listed systematically, and not in a random order.
- The best way in which to list rows and columns depends on the type of data or information being presented. Some common examples of include alphabetical, categorical, chronological and numerical ordering systems.

Alignment

- Columns of words are generally left justified, and columns of integers are right justified.
- If you are presenting integers with decimal points, maintain alignment of the data on the decimal point.

Spacing

- Single line spacing should be used within tables, regardless if greater line spacing is used within the main body of the text.

Condensing tables

Generally speaking, you should try to condense your tables to make them as succinct as possible. However, tables should never be condensed at the expense of clarity or legibility (for instance, you should not reduce the font size to make your tables more compact). Here are a couple of hints that may help you to condense your tables:

- If all entries in a column are the same, this information can be stated in words as a table note.
- If you are presenting multiple tables with related information, you may be able to combine them into one large table.

- Remember also that effective graphics are concise. Make sure that all irrelevant data has been extracted from your tables.

Maps

Map types and their uses

General reference (location) maps

General Reference maps (or location maps) represent the location of all significant natural and artificial features within a landscape. They are used as guides to find everyday locations. Examples of general reference maps include street directories and the UQ campus maps found in your student diaries (Figure 15).
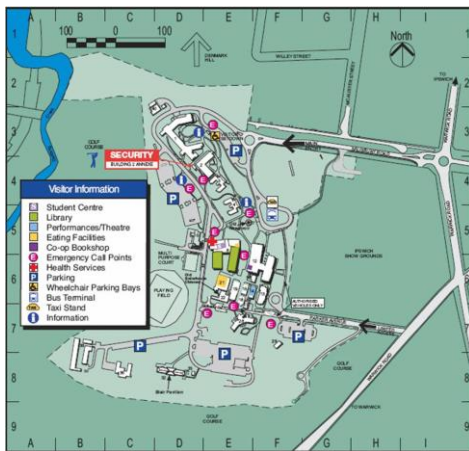
Figure 15. The University of Queensland Ipswich Campus, Ipswich, 2009 (UQ 2009)

Topographic maps

Topographic maps are similar to general reference maps in that they depict prominent geographical features within a landscape. However, topographic maps also reveal detailed information about a landscape's *elevation*. The relief is usually depicted using a series of contour lines (lines of constant elevation) (Figure 16).

Figure 16. Example of a topographic map with contour lines indicating elevation (Salisbury and Atwood 1908)

Thematic maps

Thematic maps are cartographic representations of things and events that relate to a particular topic (Figure 17). They can contain both qualitative and quantitative data. Thematic maps are often used to represent topics such as climate, population densities, geological units, electoral boundaries and land-uses.
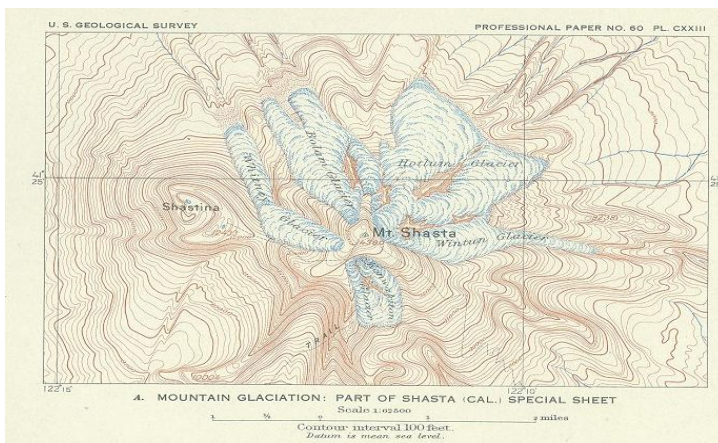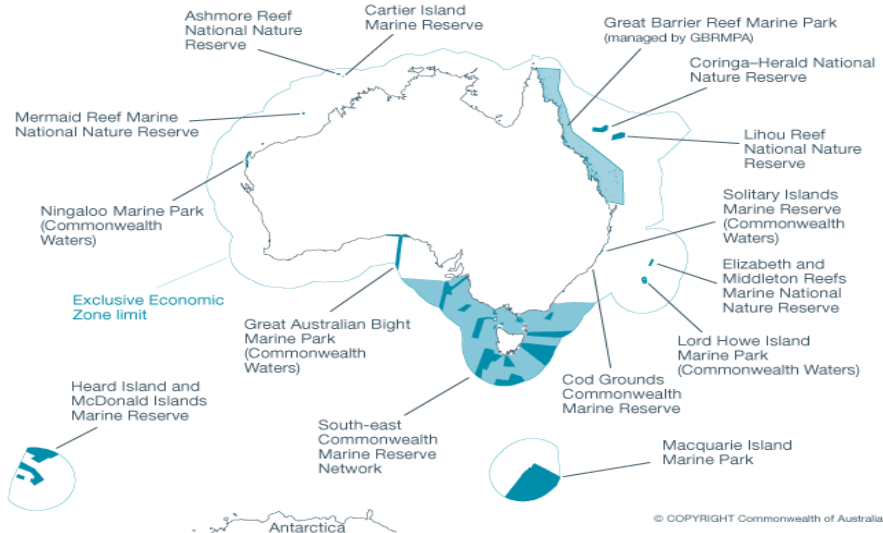

Figure 17. Marine areas protected by the Australian Commonwealth under the EPBC Act as of 2007 (DEWR 2007)

Choropleth maps

Choropleth Maps are a type of thematic map in which all regions are shaded in different colours to reflect the values of the mapped variable, or to represent different data classes (Figure 18). They can display both quantitative and qualitative variables, and are commonly used to represent all kinds of human and physical geographical information.
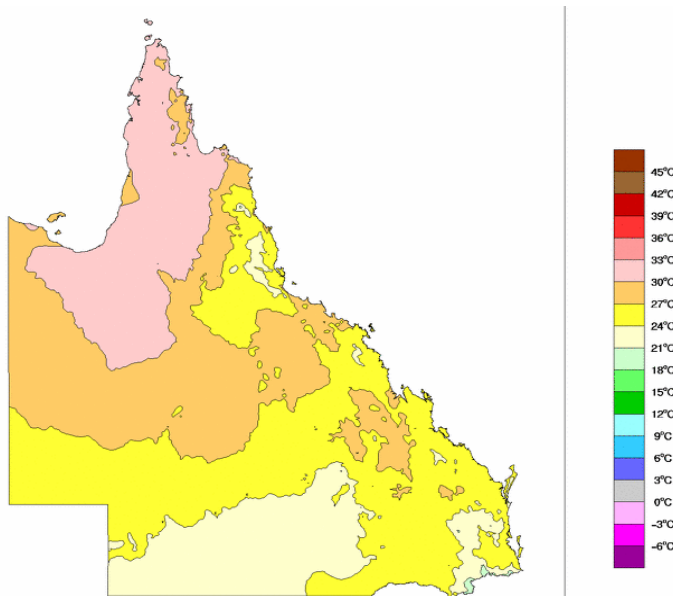
Figure 18. Mean daily maximum temperature across Queensland, 8 May, 2010 (BOM 2010)

Cadastral maps

Cadastral maps represent the boundaries of individual land parcels in a given area, and usually contain details such as land ownership, tenure and obligations (Figure 19).

Figure 19. Example of a cadastral map (Montgomery County Assessor of Property 2010)

Network maps

Network Maps are used to show the information about the routes and pathways of a variable (or variables). Examples of network maps include depictions of journey-to-work patterns, production line routes, and so on (Figure 20).

Figure 20. Journey-to-work trends in southeast Queensland, 2003 (adapted from OESR 2003)

Essential map features

Maps are used to convey the spatial distribution of things and events. But in order to do this successfully, maps must contain the eight essential map features (Figure 21):

- ***Title***- A title should be placed *beneath* the map and outside the neatline, to explain what is being presented and where it is located. The map title should not include the words "Map of" or "Distribution of", as this is obvious
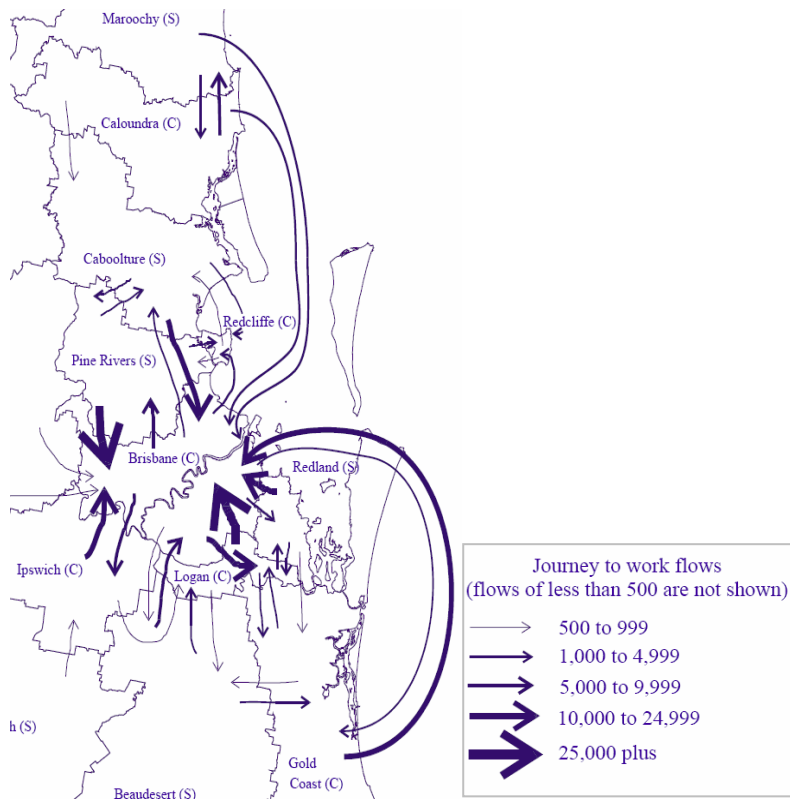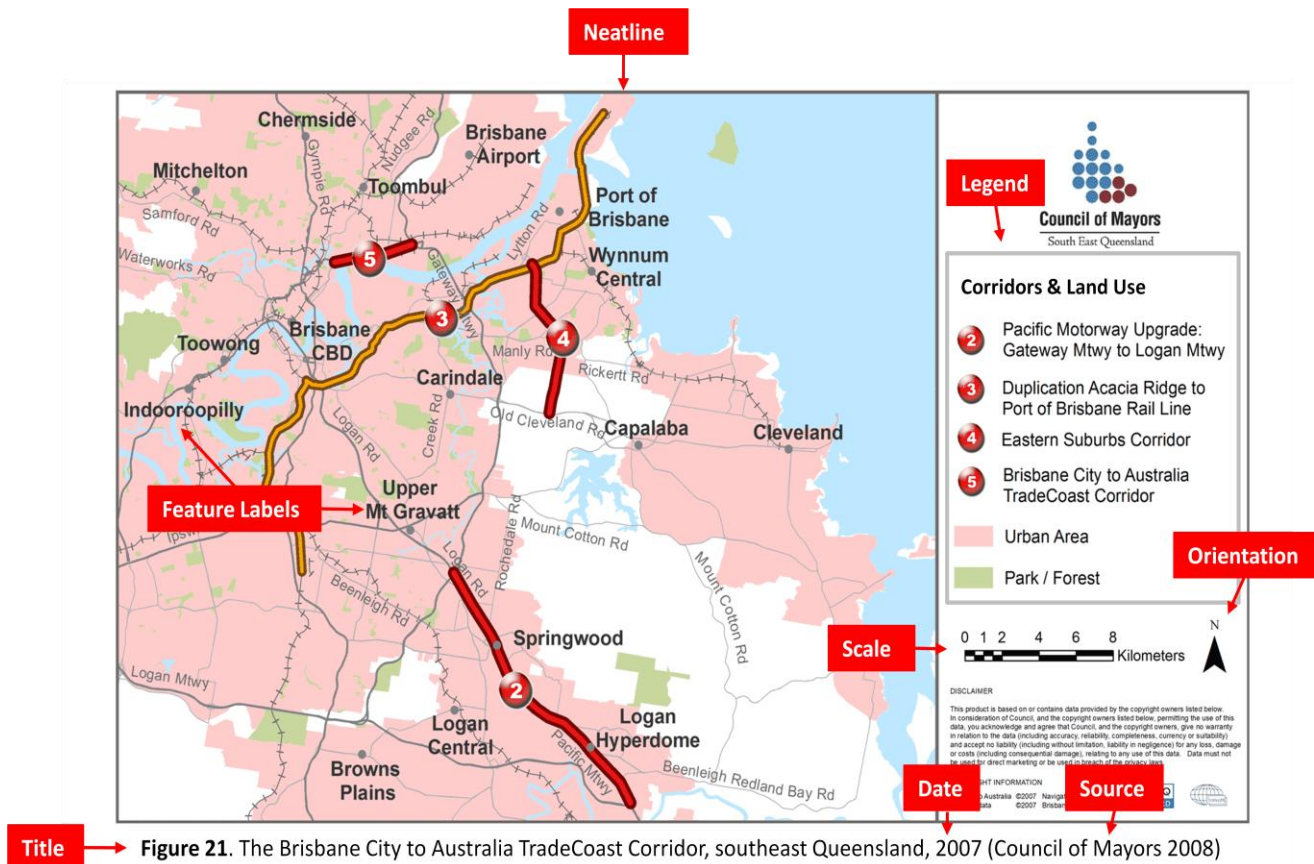- ***Scale***- The scale of the map must be indicated with either a scale bar or as a representative fraction, and placed within the neatline. Scale bars should be divided into consistent units that form round, even figures (e.g. 10m, 20km, 100km).
- ***Orientation***- Orientation must be indicated with either a north arrow (avoid elaborate symbols), lines of longitude and latitude, or graticules. Orientation markers should be placed within the neatline, but must not obstruct the map.
- ***Source***- The source of maps must be indicated using the style of referencing that is consistent with the rest of your paper.
- ***Date***- As the information contained on maps often changes with time, it is necessary to include the date on which the map was created. The date can either be included in the title, or written somewhere on the map itself.
- ***Legend***- A legend should be placed within the neatline in a visually prominent area that does not obscure the map. Legends should be enclosed by a separate border and given a title (the title should contain the words "legend" or "key". If the data classes in your legend have a common unit of measurement, this can be stated in the title.
- ***Feature Labels***- To give your map context, a sufficient number of well-known feature labels should be included. Feature labels can include place names, natural and artificial landmarks, or any other significant points.
- ***Neatline***- The neatline is the fine border around a map that encases all of the maps essential features (except the title).

Figure 21. The Brisbane City to Australia TradeCoast Corridor, southeast Queensland, 2007 (Council of Mayors 2008)

Additional considerations for maps

Using interactive mapping tools

- There are a number of online interactive mapping resources available (such as the *Queensland Government Information Service, MapConnect,* and *Google Earth),* that enable you to generate various types of maps.
- If you intend to use these resources for your assignments, you must remember to include the eight essential map features and to reference the relevant mapping tool you have used.
- You should also try to customise these maps to suit the purpose of your paper.

At which scale should I present my map?

- The level of detail presented on a map is determined by the scale.
- *Small scale* maps cover large areas in low detail.
- *Large scale* maps cover small areas in high detail.
- In order to determine which scale to use for your map, you should consider the level of detail required by your readers and for the genre of your paper.

How many feature labels do I need?

- To give your map context, a sufficient number of well-known feature labels should be included.
- Take care that the feature labels on your map provide a sufficient frame of reference for your reader, so that they will understand which location is being presented on the map.

- If you are unsure about your feature labels, test your map by showing it to your peers and/or supervisors, and asking whether they understand which location is presented.

Images

Image types and their uses

Photographs

Photographs are sometimes used in professional writing to give the reader a frame of reference when it is anticipated that they will not be familiar with a topic. They are also useful tools for comparing and contrasting a given scenario or process. Only use high quality images that give a clear depiction of the object in question and contain no "background noise". If you are reproducing a professional photograph, remember to cite the photographer.

Illustrations

Illustrations refer to sketches of real world objects. They are useful for showing objects that cannot otherwise be photographed (e.g. the inner geological layers of planet Earth) or to present simplified impressions of objects (e.g. anatomical diagrams).

Remotely-sensed imagery

Remotely-sensed images are recordings taken from wireless instruments such as ships, aeroplanes and satellites. These images can be captured using the visible wavelengths of the electromagnetic spectrum, or with non-visible wavelengths (such as microwaves). You may find it useful to include remotely-sensed images in your writing to describe the environmental characteristics of a particular site, and/or how these characteristics change over various spatial and temporal scales.

When to use an image

- Like with all graphics, images should only be used in academic writing if you feel that they are necessary to augment the text and to argue your point. Do not be tempted to include images to make your papers look more interesting or aesthetically appealing.

Choosing an appropriate image

- The effect of an image can differ greatly depending on the perspective from which the object is taken and by the context in which the object is presented.
- Before deciding on an image, think carefully about what exactly you want to demonstrate to your readers. This will help you select the most appropriate image for your paper.

Appendices

When to place graphics in an appendix

- Authors are often faced with the decision as to whether a graphic belongs in the main body of a paper or in an appendix.

- To clarify, all types of graphics (including large graphics) belong in the main body if they augment the text and are *necessary to understand your paper*.
- Appendices are used to include graphics that *do not have to be read to understand the paper*, but may be of interest to certain readers (e.g. those wishing to replicate your study).

Graphics commonly found in an appendix

Common items found in appendices include:

- survey sheets /questionnaires used in an experiment
- sampling procedures used in an experiment
- raw statistical data (of which summary tables are given in the main body of the paper)
- computer programs used for data analysis

How to label an appendix

- Graphics in an appendix are labelled as Appendices, and are either numbered with Roman Numerals or letters according to the order in which they appear.
- Each of your appendices must be referred to in the main body of the paper (either in a sentence or as a footnote) to notify the reader of their presence.
- Refer to appendices by their label and number (e.g. Appendix B, Appendix III) and not their page number.

Hints and editing tips

Tables

- It is much easier to modify the structure of a table before you have entered it onto the computer. Therefore, you should try sketching your tables on a piece of paper to see if the layout is appropriate before you create them on the computer.

Graphs

- Points marked on graphs should be marked using symbols such as o, +, ■,▲ , etc. instead of dot points. Dot points can be obscured by lines drawn on at a later stage, and reproduce well for photocopying or scanning.
- When presenting multiple variables in line graphs, most attention is paid to the thickest and brightest lines. If appropriate for your graph, it might be a good idea to allocate line styles/thickness according to the importance of the data.

Charts

- The first step in creating a flow chart is to identify the discrete points (nodules) within the process, their progression, and any optional paths. The sequence of the process can then be represented using a chain of arrows and other linking devices.

Maps

- Scale bars should be roughly a quarter of the width of the map

- When adding feature labels, take care that they do not obscure the content of the map. Try to insert labels in the same orientation as the map, although you may wish to make them traverse the course of a river for example.

Appendices

- Appendices are placed at the back of the paper behind the list of references
- When there is only one item in an appendix, it should simply be labelled Appendix in a similar heading style to other chapter headings. Where there are multiple separate appendices, they should each be presented on a separate page and labelled Appendix A, Appendix B and so on.

Page layout

- In a page containing nothing but graphics, the spacing between graphics should be uniform across the page
- It is recommended that you do not use font size below 10-point in your writing (though you should check this issue with your lecturer as they may have a different personal preference).

Large graphics

- Graphics should only be produced in landscape format if they are unable to fit on the portrait setting. Page numbers should still appear in the normal (portrait) position even if the graphic is presented in landscape, though they may need to be moved slightly if normal margins have been altered
- Folding of pages should be done such that they fold left or right (and not from the top or bottom) and they should fit within the margin of the report.

Titles

- If titles are in the form of a sentence, they should be punctuated appropriately (e.g. end in a full stop). If a title is simply a descriptive name, it does not require a full stop.
- Titles used for graphics must be consistent with the name given in the List of Figures and Tables. Double check this issue before handing in your assignments.
- When you are incorporating graphics in from another source, do not use the original caption as it is very unlikely that it will suit your purpose of your paper or match your numbering system.

Colour

- If you have used colour to represent information in your graphics, you must print your paper using a colour printer (otherwise that information will be lost)!

In-text references

- When referring to graphics in the text, it is a good idea to insert a non-breaking space (Ctrl + Shift + Space Bar) between the label and number to ensure that they appear on the same line. You can use the same technique when you are typing figures with units of measurement.
- Here are some different terms you can use when referring to graphics in a sentence: show, summarise, reveal, display, provide, demonstrate, suggest, give, illustrate, indicate, and present.

Reproducing graphics from the internet

- Remember that all graphics found on the internet must be cited as with any other source of information. Not all websites will allow you to use their graphics, and it is sometimes necessary to contact the author of the site to gain permission to reproduce their content.

Testing the quality of your graphics

- Remember that a good graphic (i) draws your attention to the data or information it contains, and not its colours or other artistic features; (ii) gives readers the greatest number of ideas in the shortest amount of time; and (iii) presents the greatest amount of data. and/or information using the smallest amount of space. Do your graphics satisfy these conditions?

- A good way to test whether your graphic is self-explanatory is to present it to your peers or lecturer as a stand-alone document and ask them whether they understand its meaning.

Final checks

- Sometimes when you are writing your assignments, you might change the order of your graphics, and add or remove graphics. When this happens, the numbering system in your paper can become confused. Always check that your graphics are labelled sequentially, *and* that the in-text references still correspond to the appropriate graphic.

- Once printed, all pages should be checked to ensure that all texts and graphics have printed successfully (no ink smearing etcetera), and that all fonts are legible. If you have any doubts about the readability of your work, ask a friend or supervisor to check it over.

Graphic presentation checklist

Before handing in your assignments, use this checklist to make sure that you have considered each of the following graphic presentation issues:

Is each graphic in my paper:

- ☐ Labelled appropriately with a descriptive title?
- ☐ Numbered in consecutive order?
- ☐ Introduced in the text before it is presented?
- ☐ Contextualised by discussing its significance and pointing out any key features?
- ☐ Comprehensible and legible?
- ☐ Appropriate for the genre of my paper?
- ☐ Appropriate for the likely readers?
- ☐ An honest representation of the information/data?
- ☐ Formatted using the relevant conventions?
- ☐ Referenced to its original source (if necessary)?

Have I considered these questions?

- ☐ Does each of my graphics augment the text and add to the paper?
- ☐ Have I excluded all irrelevant data and information from my graphics?
- ☐ Are there any graphics in the main body of my paper that belong in the appendix, or vice versa?
- ☐ Are there any graphics in the results section that belong in the discussion section, or vice versa?
- ☐ Do I need to include a list of Tables and Figures at the beginning of my paper?
- ☐ Have I used colour to convey information in my graphics? (If yes, you need to print your paper using coloured ink).

Frequently asked questions

I'm not sure whether I should include this graphic

If you can argue your point or present data/information with words alone, then it is not necessary to use a graphic. If you cannot express the information contained in the graphic with words, then ask yourself:

- ☐ Does it augment the text?
- ☐ Is it directly related to my paper?
- ☐ Is it essential for my argument?
- ☐ Is it appropriate for my likely readers?
- ☐ It is comprehensible?

If you answered yes to each of these questions, then you should include the graphic. You may then need to customise your graphic to ensure it is concise, independent, and formatted with the appropriate conventions.

Should I use a graph or a table to present my data/information?

Graphs present information at a glance, and enable readers to make quick visual comparisons. However, graphs do not always enable the reader to extract specific data values. Tables take a little longer to read than graphs, but they give the reader *precise* figures. Therefore,

- If you want to highlight trends, patterns or significant points in your data it is usually best to use a graph, and
- If it is important for the reader to know the explicit data values (or you anticipate that they may wish to), it is better to use a table.

It is also advised to minimise the number of data classes contained on a single graph, as they can become cluttered and confusing if too many data classes are presented. Hence if you are presenting a large number of variables, it is usually better to use a table.

Which type of graph should I use to present my data?

The best type of graph to use depends on the type of data presented and the context in which the graph is being presented. Ask yourself:

- Is my data continuous or non-continuous?
- How many variables am I presenting?
- Is it likely that my reader will want to read values off my graph, or will they only want to compare data?
- Am I presenting a series of graphs for data comparison, or just a single graph?
- How have I seen this type of data presented in lectures or in other academic publications?

Your answers to these questions should help you to decide the type of graph is best suited for your data.

Do I need a general reference map?

It is not always necessary to include a map each time you mention a location in your paper. Only include a general reference map in your paper if the spatial context of the site is relevant to your topic.

If you decide that the spatial context of a site *is* important to your paper, you should then assess whether the location is common knowledge. It is only necessary to include a general reference map if your readers are likely to be unfamiliar with the site.

I can't find the answer to my question in this handbook- what should I do?

There are a number of excellent resources available to you at the University of Queensland that can also assist you with graphic presentation issues in your written assignments. Student Services runs a writing skills workshop on how to incorporate graphs and tables into your writing. You can find more information on this workshop at the Student Services website:

Available at: http://www.uq.edu.au/student-services/Incorporating+graphs+and+tables+into+your+writing.

The GPEM Essay Writing Handbook, Report Writing Handbook, and Assessment Criteria handbooks provide a detailed overview of the expectations for graphic presentation in your assignments. The Student Centre, Student Services, and UQ Union can assist you with general questions about your assessments, though if you have any specific questions you can always ask your tutors, lecturers and course co-coordinators for advice. A list of useful books on graphic presentation is also provided for you in the Additional Resources chapter at the end of this handbook.

There is a discrepancy between my assessment criteria and the Graphic Presentation Handbook- what should I do?

The information contained in this handbook has been adopted as the School standard. However, course coordinators may wish to issue different requirements, conventions or instructions for a particular course, project or assignment. In all cases, a course coordinator's requirements will take precedence over the information contained in this guideline.

Should there be a difference between the procedures of the SGPEM Handbook and those contained in the *Handbook of University Policies and Procedures* (HUPP) (http://www.uq.edu.au/hupp) the HUPP will take precedence.

What kind of software is available for creating graphics?

Many computer programs are now available that can be used to create good quality graphics, for example Microsoft: Excel, Graph, Word (SmartArt is especially good for flow charts/ organisational charts), Paintbrush, PowerPoint, Organisation Chart; Adobe Illustrator; Macromedia Fireworks, CAD programs, CorelDRAW and CorelGRAPH. Graphs can also be created using statistical analysis and graphing programs such as Quattro-Pro, Stastistica and S-Plus. For more information, refer to the ASK I.T. website or Help Desk.

What are the advantages of using graphics in my report?

Graphics are useful because they present information at a glance – they can summarise and present large quantities of information in a succinct and organised manner. Furthermore, readers will often respond well to graphics because they are frequently exposed to visualisations (though television, advertisement, the web, etcetera) and find it easier to remember information presented in graphic form.

Do I need to include a list of Tables and Figures at the beginning of my report?

It is only necessary to put a list of tables and figures at the beginning of your report if you are writing a long paper (e.g. dissertation), or if your paper contains a large number of graphics.

My graphic looks fuzzy, how can I improve the quality?

Sometimes it is possible to improve the quality of a digital graphic by zooming in on the image before copying and pasting it. However, this technique is only effective if the original graphic is of high resolution. If you cannot improve the quality of the graphic, you can either look for a suitable substitute or try to make a new, clean version of the graphic yourself. Do not include the fuzzy graphic in your paper, as it is likely to cause you to lose marks.

How do I know whether the source of my information is reliable?

Check the source of your information in terms of its author, the date it was written, the context in which it was written, the purpose it serves, and whether other sources agree with the information or data presented. Only once you are confident in the credibility of your source should you include the data in your own writing.

Additional resources

UQ services

There are a number of excellent resources available to you at the University of Queensland that can also assist you with graphic presentation issues in your written assignments.

- Student Services runs a writing skills workshop on how to incorporate graphs and tables into your writing. You can find more information on this workshop at the Student Services website. http://www.uq.edu.au/student-services/Incorporating+graphs+and+tables+into+your+writing.
- The GPEM Essay Writing Handbook, Report Writing Handbook, and Assessment Criteria handbooks provide a detailed overview of the expectations for graphic presentation in your assignments.
- The UQ library website provides a number of helpful resources including the *Safari Tech Books Online* and *How-to Guides*, which can be found at https://www.library.uq.edu.au/training/.
- ASK I.T. offers a range of classes on Microsoft Office in which you can learn how to create graphics using Excel, Word and PowerPoint. For more information on classes and timetables, visit http://askit.uq.edu.au/classes.
- You can also visit a ASK I.T. Help Desk for software support and information about UQ's computer facilities and services

- The Student Centre, Student Services, and UQ Union can assist you with general questions about your assessments, though if you have any specific questions you can always ask your tutors, lecturers and course co-coordinators for advice.
- A list of useful books and websites on graphic presentation is also provided for you at the end of this guideline.

Library resources

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